CLOSED OAKVILLE NINTH LINE LANDFILL SITE

2021 SURFACE WATER MONITORING REPORT

REGIONAL MUNICIPALITY OF HALTON

PROJECT NO.: 181-30000-00-106-1005

DATE: DECEMBER 22, 2021

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December 22, 2021

REGIONAL MUNICIPALITY OF HALTON
Public Works – Waste Management & Road Operations
1151 Bronte Road
Oakville, Ontario
L6M 3L1

Attention: Mr. Andy De Jong, Landfill Technologist

Dear Mr. De Jong:

Subject: Closed Oakville Ninth Line Landfill Site
2021 Surface Water Monitoring Report

We are pleased to forward the 2021 Surface Water Monitoring Report for the Closed Oakville Ninth Line Landfill Site. This report presents the results of a supplemental monitoring program to further assess the potential influence of leachate produced at the landfill site on local surface water.

The supplemental monitoring program in 2021 was completed to satisfy the recommendations provided by the Ministry of the Environment, Conservation and Parks (MECP), as outlined in the September 2019 Water Monitoring Action Plan. It is also noted that comments received from the MECP, dated March 2021, regarding the Closed Oakville Ninth Line Landfill Site 2020 Supplemental Monitoring Report were addressed in this report.

It is recommended that the surface water sampling program be continued in 2022 in accordance with the established frequency for the Environmental Management Plan surface water monitoring program for the landfill site. The surface water monitoring program should again be reviewed for the landfill site as part of the next Environmental Management Plan Report, scheduled to be completed in 2023.

Thank you for the opportunity to work on this study. If there are any questions, please contact us.

Yours truly,

Craig Leger, M.Sc., C.E.T.
Environmental Consultant

Greg R. Siiskonen, P.Eng.
Director, Earth & Environment

WSP ref.: 181-30000-00-106-1005

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Date

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Date

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This limitations statement is considered an integral part of this report.

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1 WATER MONITORING ACTION PLAN

As part of the routine management of the Closed Oakville Ninth Line Landfill Site (Site) by the Regional Municipality of Halton (Region), an Environmental Management Plan was prepared in April 2019, with a copy of the report provided to the Ministry of Environment, Conservation and Parks (MECP). The MECP subsequently provided comments on the report which requested that additional water monitoring be completed at the Site to further assess the potential influence of leachate produced at the Site on local groundwater and surface water. A proposed supplemental monitoring program was outlined in a Water Monitoring Action Plan dated September 25, 2019, which was subsequently approved by the MECP via email on September 26, 2019, with no further comments or recommendations. The supplemental monitoring program in 2020 was completed to satisfy the tasks outlined in the approved Action Plan that were scheduled for 2020. The 2021 surface water monitoring program was completed in 2021 as part of the Action Plan.

It is noted that this 2021 Surface Water Monitoring Report is intended to be read in conjunction with the Closed Oakville Ninth Line Landfill Site 2020 Supplemental Monitoring Report. It is also noted that comments from the MECP, dated March 2021 and received December 1, 2021, regarding the 2020 Supplemental Monitoring Report were addressed in this report.

1.1.2 LOCAL SETTING

The Site is located on the west side of Ninth Line, approximately 1 kilometre south of Dundas Street in Oakville, Ontario. See Figure 1, Location Map, for location details. The legal description is Part of Lot 6, Concession 1 SDS, Town of Oakville.

The Site is bounded by the Crusaders Rugby Club to the south and the Ontario Hydro corridor to the north. The western portion of the Site is bounded by Joshua's Creek, as shown in Figure 2. A tributary also discharges to Joshua's Creek near the northwest corner of the Site. This tributary, which receives water from two (2) off-site stormwater ponds located northwest of the Site, discharges to Joshua's Creek on the opposite side of the creek from the refuse area.

The eastern portion of the landfilled area has been converted to a practice field for the Crusaders Rugby Club, as shown in Figure 2. The remaining portion of the landfilled area is vegetated with trees, shrubs, and grasses. The Crusaders Rugby Club area to the south of the Site, which does not contain refuse, currently consists of a rugby playing field (pitch) and a clubhouse.

It appears that the refuse was placed to fill part of the depression between Joshua's Creek and the Ninth Line; thus, the northern and western slopes of the landfill area are steep. The upper part of the landfill, in the area of the rugby practice field, is relatively flat with a slight slope to the west. The thickness of the refuse extends up to 9 metres, based on boreholes 99-1 and 99-2.

The Site, which has a landfilled area of approximately 2.7 ha, predates the current licensing system for landfill sites in Ontario. The landfill does not have an Environmental Compliance Approval (ECA) as operations concluded around 1962-1963, prior to the initialization of the approval system. According to MECP records, the landfill was in operation for approximately six (6) years.

The Town of Oakville continues to own the approximate area of the rugby practice field, and Infrastructure Ontario owns the remainder of the Site. The Region is currently responsible for the environmental management of the landfill.

1.2 OBJECTIVES AND SCOPE

The principal objectives of the 2021 surface water monitoring program for the Site were as follows:

- To assess the effects of the closed landfill site on local surface water resources.
- To assess the potential user risks.
- To determine appropriate trigger criteria.

The program involved a data collection component, collation, and an analysis and interpretation component.

1.3 METHODOLOGY

1.3.1 SURFACE WATER SAMPLING

Stations SW1, SW2, SW4 to SW9, SW11, and SW12 are established along the length of Joshua's Creek, adjacent to the landfilled area. Station SW10 is established along the north tributary, prior to the tributary discharging to Joshua's Creek; and station SW3 and SW13 are established along the ditch on the south side of the refuse area. The locations of the stations are shown in Figure 2.

As outlined in the Action Plan for the Site, water samples were to be obtained at the surface water stations during the spring, summer, and fall in 2020 and 2021. Water sampling events were completed by WSP in 2021 on May 26, August 17, and October 27. It is noted that station SW10 was reported as dry during the summer sampling event.

The samples were collected by placing the sample bottle beneath the water surface. Collected water samples were submitted to Bureau Veritas for analysis of inorganics and metal parameters. Field measurements were also obtained at the stations to determine flow rates.

1.3.2 INTERPRETATION AND REPORTING

Following the collation of the landfill database, analysis and interpretation of the data were completed. This component included the following items.

- Water quality compliance assessment
- Establish trigger levels for increased monitoring
- Consideration of future monitoring

Results of the supplemental monitoring, with conclusions and recommendations, are presented in this report.

2 PHYSICAL SETTING

2.1 LOCAL GEOLOGY

Based on historical information, the interpreted on-site geological conditions are shown in the Schematic Sections, Figure 3. Sections A and B present the geological conditions along the length of the landfilled area, and a typical section through the central portion of the landfilled area. As shown in the figure, the landfilled area is interpreted to extend to the edge of Joshua's Creek.

The Site is situated on a deposit of low bulk hydraulic conductivity clayey silt till, known as Halton Till. The clayey silt till overlies shale bedrock of the Queenston Formation.

The thickness of the refuse over the clayey silt ranges from about 7 metres at monitor 99-2 to 9 metres at monitor 99-1. It is expected that the thickness of the refuse decreases in an easterly direction from Monitor 99-2 and in a westerly direction from Monitor 99-1. The depth to the bedrock has not been historically assessed for the Site; however, since bedrock is present within the Joshua's Creek bed, the thickness of the clayey silt unit overlying the bedrock is expected to be in the range of two to three metres.

2.2 SHALLOW GROUNDWATER FLOW

An interpretation of the shallow groundwater configuration, based on the water level data for May 2020, is presented in Figure 2. The shallow groundwater table, which is a reflection of the local topography, slopes towards the west and Joshua's Creek. It is noted that, within the western portion of the refuse area, there appears to be a groundwater divide along the crown of the refuse area, which is a reflection of the topography. The shallow groundwater data suggest that the ditch located along the south edge of the refuse (south ditch), where the surrounding topography is generally lower, may serve as a slight hydraulic boundary for groundwater flow from the refuse area; although the overall groundwater flow is expected to be westerly, towards Joshua's Creek. The rate of groundwater movement through the refuse is estimated to be in the range of 0.9 m/a to 1.7 m/a, based on horizontal gradients of 0.017 and 0.033, respectively, a porosity of 0.3, and a hydraulic conductivity of $5x10^{-7}$ m/s. The till, which has a lower hydraulic conductivity than the refuse, acts as a relative barrier to the downward flow. Due to this difference in the hydraulic conductivity, it is expected that the shallow groundwater flow through the Site will discharge along the base of the slope and into Joshua's Creek, particularly during periods of higher groundwater levels.

The Region currently completes a spring inspection at this Site on an annual basis, which includes the identification of potential seeps at the Site. The inspections occur during the spring to permit easier identification of seeps while the vegetative growth is minimal, and when the wetter seasonal conditions are more likely to promote the occurrence of seeps. The Region intends to continue this protocol in the future.

2.3 SURFACE WATER FLOW SYSTEM

Joshua's Creek is situated around the western portion of the Site, as shown in Figure 2. A drainage ditch is located along the south boundary of the Site, just north of the pipeline easement. This drainage ditch slopes toward the west and discharges surface runoff to Joshua's Creek. On the north side of the Site, surface drainage is also to the west, towards Joshua's Creek. A tributary also discharges to Joshua's Creek near the northwest corner of the Site. This tributary, which receives water from two (2) off-site stormwater ponds located northwest of the Site, discharges to Joshua's Creek on the opposite side of the

stream from the refuse area. The location of the surface water monitoring stations used for this study are shown in Figure 2.

A summary of the surface water flow rates is presented in Table A-2, in Appendix A. Flow rates are typically lower in the SW10 tributary and the south ditch as compared to Joshua's Creek. It is noted that station SW10 was dry during the summer event. Stations SW3 and SW13 exhibited no measurable flow during the August event, although water samples were still obtained at these locations.

3 STUDY RESULTS

3.1 LEACHATE QUALITY

As presented in the 2020 Supplemental Monitoring Report, the leachate general chemistry concentrations within the refuse are relatively low compared to typical landfill leachate. Overall, the leachate at the Site has elevated concentrations of the general chemistry parameters hardness, dissolved organic carbon (DOC), barium, iron, manganese and total dissolved solids (TDS), as well as the organic parameters benzene and 1,4-dichlorobenzene. For each parameter, the concentrations are near or above their respective ODWS. Additionally, concentrations of total ammonia are noted to be elevated in the leachate and appear to be influencing water quality in Joshua's Creek at locations adjacent to the refuse, such as stations SW7 and SW9. As discussed in further detail in Section 3.2, below, where concentrations of parameters that are elevated in leachate at the Site are also detected at concentrations within surface water at concentrations greater than the upstream surface water quality, such as total ammonia and un-ionized ammonia, the elevated concentrations are not observed at the downstream station, SW4.

Based on the previously reported data and the March 2021 MECP comments, the following leachate indicator parameters (LIPs) are highlighted for the Site: total ammonia, DOC, iron, manganese, benzene and 1,4-dichlorobenzene. The LIPs will be used for evaluating long term trends in leachate and groundwater quality at the Site.

3.2 SURFACE WATER QUALITY

The 2021 and historical surface water laboratory results for inorganic parameters are summarized in Table A-1, Appendix A. For the sampling events in 2021, concentration vs. distance graphs for select parameters are included in Figures A-1 to A-5, Appendix A. The concentration vs. distance graphs include chloride, sulphate, alkalinity, un-ionized ammonia, TOC, barium, boron, TDS, iron, and sodium. These parameters were selected as they represent typical landfill leachate indicator parameters for landfill sites in Ontario.

It was suggested in the March 2021 MECP comments that the water quality associated with stations SW12 and SW13 may have been interchanged in the 2020 Supplemental monitoring Report. Following an evaluation of the site plan and data, it was determined that station SW12 is correctly identified on the site plan as downstream of the landfill while station SW13 is correctly identified as being located within the south ditch adjacent to the refuse area; however, the water quality data had indeed been inadvertently interchanged. The water quality data were revised accordingly.

Based on the three (3) 2021 sampling events included in the figures, there were some distinguishable trends between adjacent surface water stations from the upstream location, SW1, through to the downstream location, SW4. These trends included:

- Water quality along the north side of the refuse area, between stations SW2 and SW7 and/or SW8, was generally comparable to, or lower than, the concentrations at upstream station SW1 for chloride, sulphate, alkalinity, sodium, boron, and TDS for the May, August and October sampling events.
- Concentrations of chloride, sulphate, sodium, and total dissolved solids exhibited generally decreasing trends between the upstream station, SW1, and the adjacent station, SW11, during the May and August sampling events. The higher concentrations at the upstream station may have been associated with road salt influences.
- Concentrations for boron in May and August, alkalinity and barium in August, and iron in October, exhibited generally increasing trends between the upstream station, SW1, and the downstream station, SW4.
- The concentrations of some parameters during the May sampling event, including sulphate, un-ionized ammonia, TOC, and barium exhibited a general peaking between stations SW7 or SW9 before decreasing slightly at the downstream stations. This pattern was also reflected for TOC during the October sampling event. A relative peaking for iron during the May event, and iron and barium during the August event occurred at station SW11, followed by a subsequent slight decrease at the downstream stations.
- Concentrations for chloride, sulphate, TOC, and barium during all three events exhibited slight changes between stations SW8 and SW5 (considerable decrease related to TOC in October), which are likely reflective of the influence from the north tributary.

The concentration trends for several parameters indicate that the refuse area appears to be having an influence on the water quality within Joshua's Creek, although there is a slight influence by discharge from the north tributary on occasion and, to a lesser extent, from the ditch located along the south boundary of the Site. It is noted that the influence from the north tributary was not as notable during the sampling events in 2020 and 2021 compared to the influence observed during historical sampling events. Water quality along the north boundary of the Site, between SW2 and SW7 and/or SW8, is generally comparable to water quality at the upstream station, SW1, with some variations. Water quality along the west boundary of the Site tends to be relatively similar between stations SW5 and SW4.

The surface water quality for the sampling events in 2021 generally complied with the Provincial Water Quality Objectives (PWQOs) with the exceptions of those parameters listed in Table 1. As shown in the table, aluminum, iron, and phosphorus concentrations exceeded the PWQO at a majority of the stations during each 2021 event, along with copper and cobalt during the October event. It is noted that these exceedances also occurred at the upstream station, SW1, and to a lesser extent at the upstream station in the north tributary, SW10. It is also noted that the concentrations for iron and phosphorus are considerably influenced by sediment content within the collected sample. A number of marginal PWQO exceedances related to boron also occurred in 2021. Since the majority of the PWQO exceedances occurred at reference locations SW1 and SW10, the PWQO exceedances along Joshua's Creek are generally attributed to the natural variability of the surface water quality, including upstream and off-site sources, and are not solely attributed to the landfill site. Additionally, concentrations of aluminum, phosphorus, copper and cobalt are not detected at elevated concentrations within the leachate at the Site.

During the August 2021 sampling event, un-ionized ammonia marginally exceeded the PWQO at station SW3, adjacent to the refuse area. As discussed above, un-ionized ammonia concentrations during the May 2021 sampling event also exhibited a general peaking at stations SW7 and SW9, which are also adjacent to the refuse area. The concentration of un-ionized ammonia for each sampling event was observed, however, to be significantly reduced at downstream stations, SW12 and SW4.

The results for the sampling events completed in 2021 indicate that, although the Site does appear to have a minimal influence on the water quality within Joshua's Creek adjacent to the refuse area, there is no measurable adverse landfill influence on water quality within the area and downstream of the refuse area.

3.3 CONCENTRATION VS TIME GRAPHS

As requested in the March 2021 MECP comments, concentration vs. time graphs for select parameters were prepared for the historical surface water sampling results and are included in Figures A-6 to A-15, Appendix A. The select parameters include: chloride, sulphate, alkalinity, un-ionized ammonia, TOC, barium, boron, TDS, iron, and sodium. As previously mentioned, these parameters were selected as they represent typical landfill leachate indicator parameters for landfill sites in Ontario. As indicated in the graphs, parameter concentrations in the surface water have fluctuated greatly over time with no observable trends.

It is noted that concentration vs. time graphs for the groundwater sampling locations were not prepared due to the limited groundwater dataset.

4 TRIGGER CRITERIA

As outlined in the Action Plan, trigger levels are to be established for the Site once the monitoring program has been completed.

4.1 GROUNDWATER TRIGGERS

Sampling of the on-Site groundwater monitoring locations (GP106 and the Clubhouse Well), as well as the leachate monitoring wells (99-1 and 99-2), will continue at the current frequency of once every five (5) years in the spring, in accordance with the established frequency for the Environmental Management Plan monitoring programs. The trigger evaluation for groundwater quality will include a long-term trend analysis to evaluate trends related to the concentrations of the aforementioned LIPs at the groundwater monitoring locations. If an increasing long-term trend of parameter concentration is identified related to three (3) or more of the LIPs, groundwater monitoring frequency will increase from every five (5) years to every two (2) years.

A trend analysis will continue to be completed following each sampling event. In the event that continued increasing trends are identified following an additional three (3) sampling events, an investigation into the cause will be initiated and remedial measures may be evaluated. If the increasing trends are no longer observed after the three (3) additional sampling events, groundwater monitoring will return to once every five (5) years.

4.2 SURFACE WATER TRIGGERS

Sampling of the surface water stations is recommended to continue at the current frequency of once every two (2) years, in accordance with the established frequency for the Environmental Management Plan monitoring program. As recommended by the MECP, and agreed to by WSP and the Region, surface water stations SW5, SW8 and SW12 will be removed from the monitoring program.

It is also recommended that the surface water sampling program be completed in the spring. Based on the chemical results for the events completed in 2020 and 2021, the parameter concentrations within the surface water generally vary between sampling events, and several parameters are affected by the relative sediment loading within the water. Sediment interference with surface water quality results is expected to be minimized in the spring as surface water flows would likely be higher compared to later months.

The trigger evaluation for surface water quality is proposed to include a comparison of the water quality results at downstream station SW4 to the higher value of: i) PWQO concentration and ii) the upgradient surface water concentration at stations SW1 and SW10. A trigger condition will have occurred if trigger

exceedances of three (3) or more parameters are observed at SW4, for two (2) consecutive sampling events. Such a trigger condition will result in the completion of a confirmatory sampling event to verify the results.

In the event that a surface water trigger condition occurs (i.e. two [2] consecutive sampling events with three [3] or more trigger exceedances), the following contingency plan will be implemented:

- Increase the frequency of monitoring from biennially to three (3) times annually at the upstream (SW1 and SW10) and downstream (SW4) sampling locations. Continue to sample the remaining stations on a biennial basis; and,
- During each surface water monitoring event, inspect the landfill side slopes to identify any leachate seeps and/or sources of run-off from the landfill that may be impacting surface water quality.

The surface water monitoring program will return to a biennial frequency following two (2) consecutive sampling events where a trigger condition is absent.

If a trigger condition is observed for three (3) additional, consecutive sampling events, a further investigation into the cause will be initiated and remedial measures may be evaluated.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The following conclusions are based on the findings presented in this report.

- Surface water quality within the surface water channels adjacent to the Site in 2021 was comparable to historical results but water quality varies between sampling events due to climatic conditions and natural variability of the surface water quality, including upstream and off-site sources. The influences from the north tributary and other off-site sources were not as notable in 2020 and 2021 compared to sampling events in previous years.
- Surface water quality generally satisfied the PWQO during the events in 2021, with the exceptions of aluminum, iron, and phosphorus during at least one (1) event at most stations, including upstream stations, which is comparable to historical results. A number of marginal PWQO exceedances related to boron also occurred. Exceedances related to copper and cobalt occurred at most of the stations, including the upstream stations, during the October event. Additionally, it is noted that concentrations of aluminum, phosphorus, copper and cobalt are not detected at elevated concentrations within the leachate at the Site.
- Concentrations of total ammonia are noted to be elevated in the leachate and appear to be influencing water quality in Joshua's Creek at locations adjacent to the refuse and in the south ditch. In 2021, unionized ammonia concentrations exhibited a general peaking at some adjacent to refuse stations, including a single PWQO exceedance during the sampling events. The concentration of unionized ammonia was observed, however, to be significantly reduced at the downstream stations.
- Overall, although the landfill site does appear to have a slight influence on the water quality within Joshua's Creek adjacent to the refuse area, there is no measurable adverse landfill influence on water quality within the area and downstream of the refuse area.

5.2 RECOMMENDATIONS

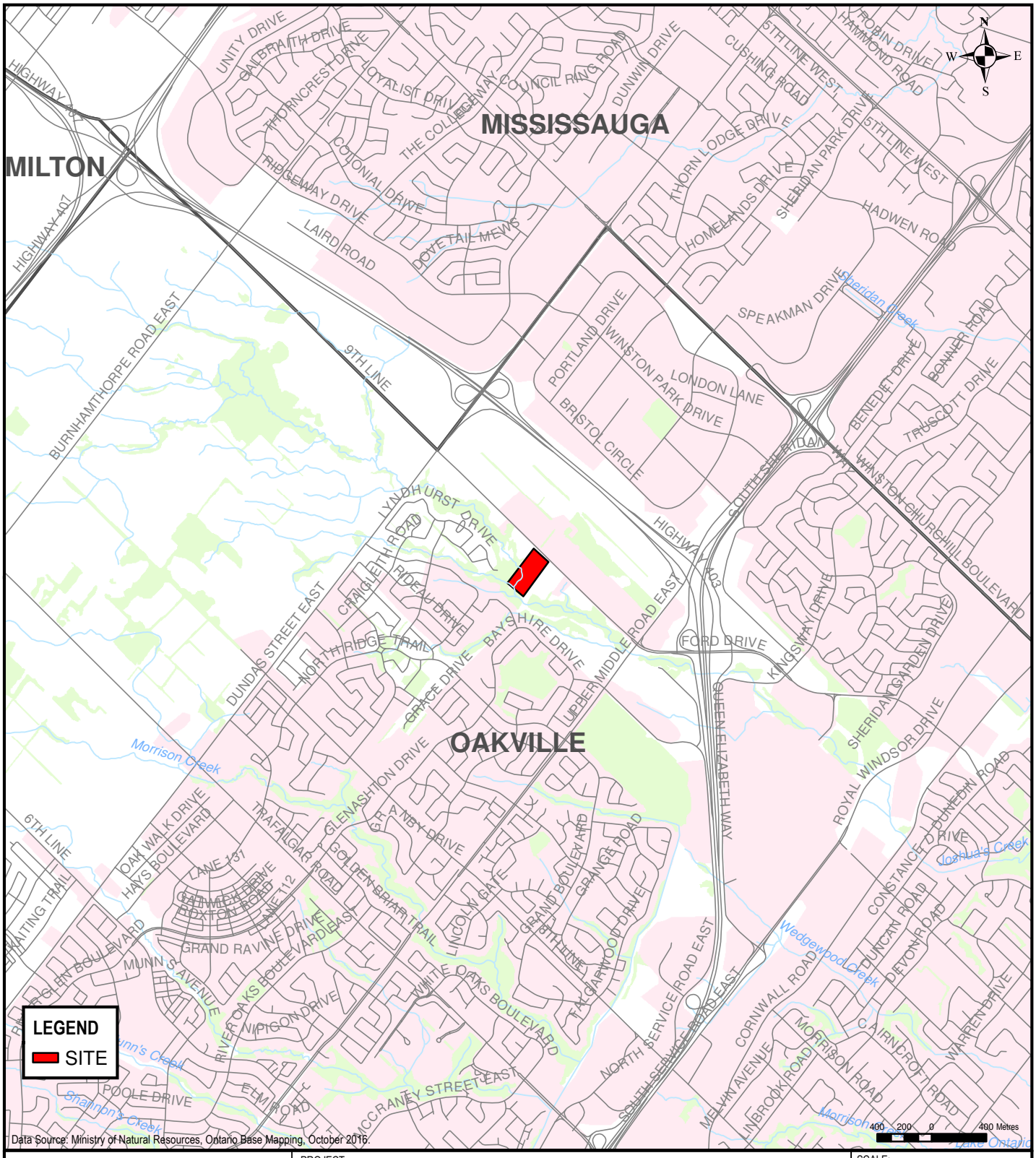
We respectfully submit the following recommendations based on the study findings for your consideration.

- Surface water sampling should continue to be completed on a biennial basis, in accordance with the established frequency for the Environmental Management Plan monitoring program.
- Surface water sampling should be completed in the spring, instead of the fall, as sediment interference with surface water quality results is expected to be minimized in the spring as surface water flows would likely be higher compared to later months.
- As recommended by the MECP, surface water stations SW5, SW8 and SW12 will be removed from the monitoring program.
- The groundwater and surface water trigger programs should be implemented, as described in Section 4.

6 REFERENCES

- Landfill Gas Surface Emission Study, Ninth Line Landfill, Comcor Environmental Limited, February 10, 1999.
- Leachate Sampling and Comparison – Final Report, Ninth Line Landfill, Oakville, Ontario, G.K. Bell & Associates Ltd., April 18, 1995.
- Gas Probe Installation, Ninth Line Landfill, Oakville, Ontario, G.K. Bell & Associates Ltd., September 8, 1994.
- Hydrogeologic Impact Study, Ninth Line Landfill, Town of Oakville, Morrison Beatty Limited, January 30, 1987.
- Closed Oakville Ninth Line Landfill Site Supplemental monitoring program, Jagger Hims Limited, October 2002.
- Closed Oakville Ninth Line Landfill Site 2012 Supplemental monitoring program, WSP Canada Inc., February 2014.
- Closed Oakville Ninth Line Landfill Site 2020 Supplemental Monitoring Report, WSP Canada Inc., December 2020.
- MECP Memorandum – Surface Water Comments, June 20, 2019
- MECP Memorandum – Groundwater Comments, July 22, 2019
- MECP Central Region Covering Letter, August 8, 2019
- MECP Memorandum – Surface Water Comments, March 8, 2021
- Oakville Ninth Line Landfill Site Action Plan, WSP Canada Inc., September 2019

FIGURES



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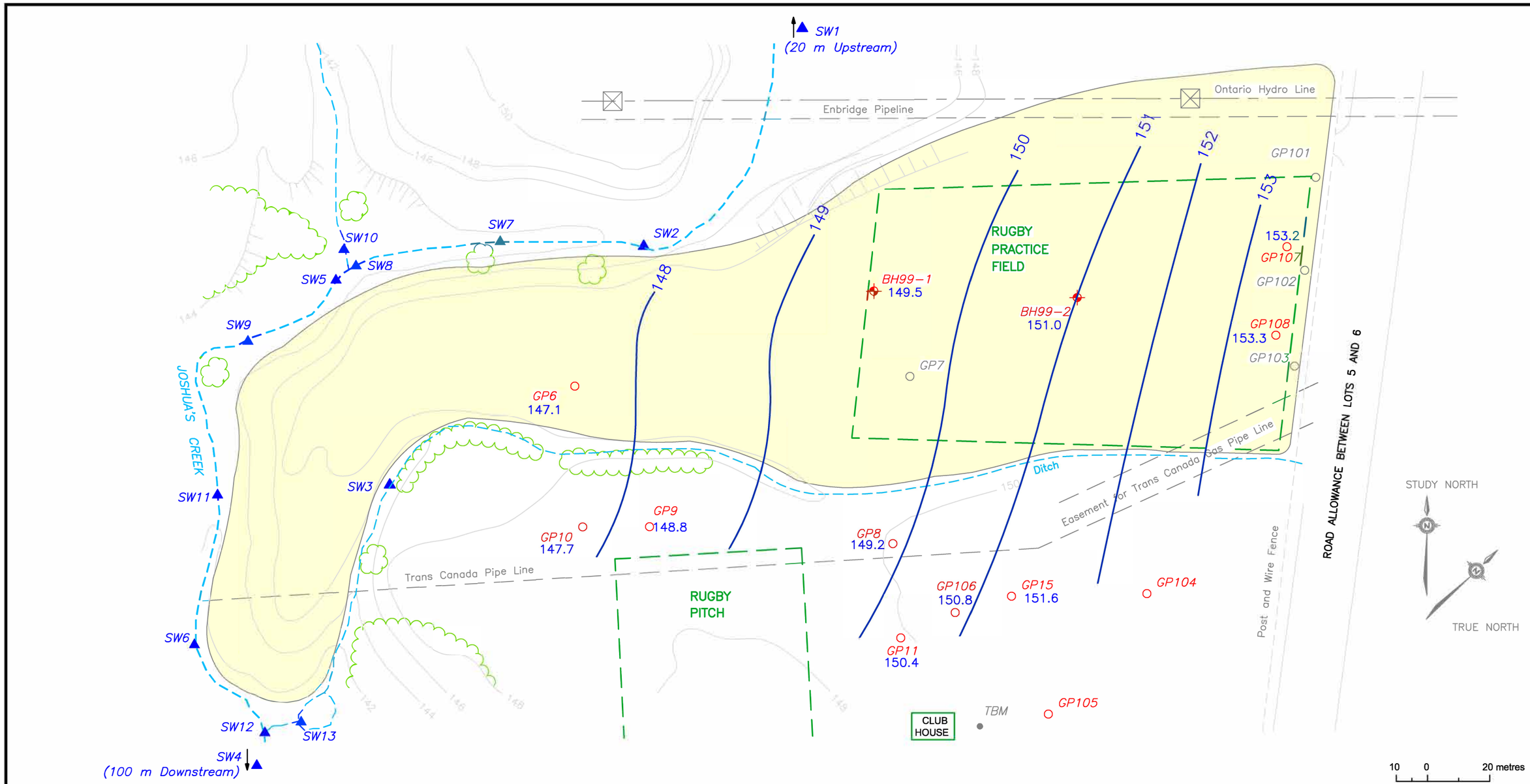
PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2021 SURFACE WATER MONITORING REPORT

TITLE:
LOCATION MAP

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

SCALE:	1:40,000
DRAWN BY:	PLB
CHECKED BY:	SJT
PROJECT NO:	181-30000-00 106
DATE:	DECEMBER 2021
FIGURE NO:	1
REV.:	-

Document Path: T:\181-30000-001106\MXD\181-30000-00 106 Figure 1 Location Map.mxd



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LEGEND

- APPROXIMATE EXTENT OF RUGBY PRACTICE FIELD
- GP101 150.4 — EXISTING GAS PROBE LOCATION, DESIGNATION, AND WATER LEVEL ELEVATION
- GP104 — PREVIOUS GAS PROBE LOCATION AND DESIGNATION
- BH99-1 149.5 — LEACHATE MONITOR LOCATION, DESIGNATION, AND LEACHATE ELEVATION
- TBM — TEMPORARY BENCH MARK LOCATION (Top of green hydro box, approx. 150.3 m)
- SW1 — SURFACE WATER SAMPLING LOCATION AND DESIGNATION
- APPROXIMATE EXTENT OF REFUSE
- GROUNDWATER ELEVATIONS BASED ON MAY 2020 DATA

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

CLIENT REF. #:

PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2021 SURFACE WATER MONITORING REPORT

PROJECT NO: 181-30000-00 106	DATE: DEC. 2021
DESIGNED BY: SJT	
DRAWN BY: PLB	
CHECKED BY: SJT	
FIGURE NO: 2	SCALE: 1:1250

TITLE: SITE PLAN

DISCIPLINE: ENVIRONMENT

ISSUE:

DATE OF:

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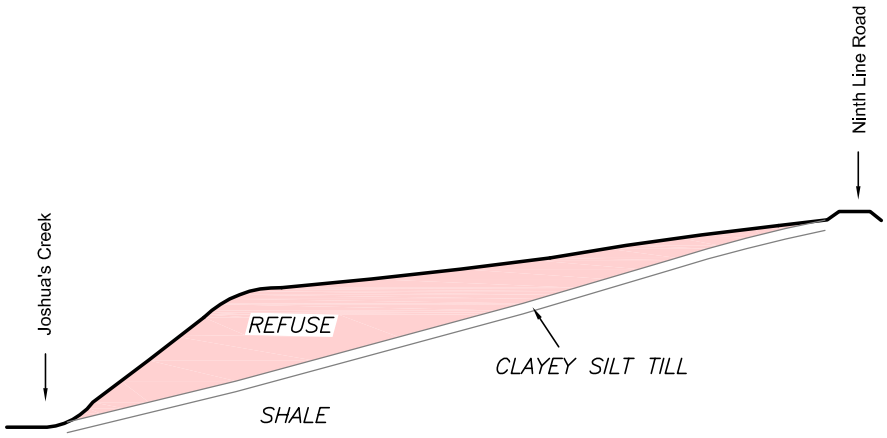
West

East

A

A'

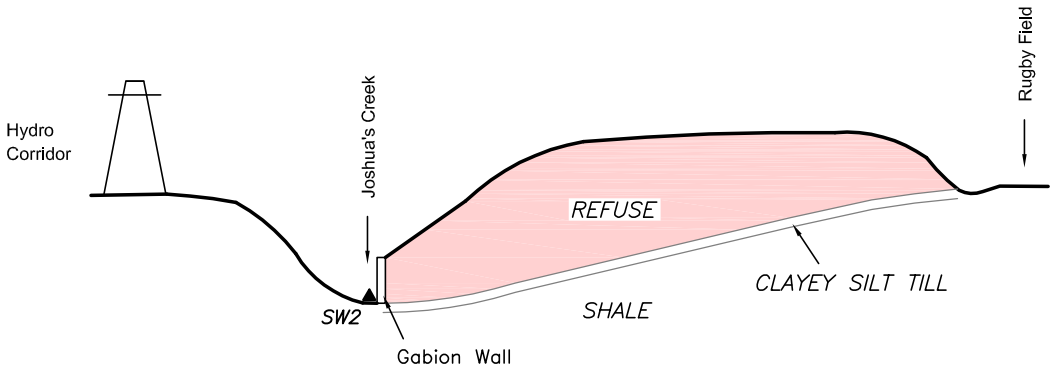


North

South

B

B'



Legend

REFUSE

SW2 ▲ SURFACE WATER STATION

GEOLOGIC CONTACT

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PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2021 SUPPLEMENTAL MONITORING REPORT

TITLE:
SCHEMATIC SECTIONS

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

SCALE: NOT TO SCALE

DRAWN BY: PLB

PROJECT NO: 181-30000-00 106

DATE: DECEMBER 2021

FIGURE NO: 3

REV. #.

TABLES

TABLE 1
SURFACE WATER PWQO EXCEEDANCES
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

			PARAMETER and PWQO								
LOCATION	**STATION**	**SAMPLING EVENT**	**UNIONIZED AMMONIA** (0.020 mg/L)	**ALUMINUM** (0.075 mg/L)	**BORON** (0.200 mg/L)	**Copper** (0.005 mg/L)	**IRON** (0.300 mg/L)	**PHOSPHORUS** (0.030 mg/L)	**COBALT** (0.0006 mg/L)	**CADMIUM** (0.0002 mg/L)	**ZINC** (0.030 mg/L)
UPSTREAM	**SW1**	May-21		0.11				0.047			
		Aug-21						0.044			
		Oct-21		2.00		0.006	2.40	0.18	0.0008		
NORTH TRIBUTARY	**SW10**	May-21		0.15				0.064			
		Oct-21		0.17				0.078			
ADJACENT TO REFUSE AREA	**SW2**	May-21		0.099				0.057			
		Aug-21		0.086				0.053			
		Oct-21		1.90		0.006	2.50	0.17	0.0009		
	SW7	May-21		0.11				0.042			
		Aug-21		0.19				0.042			
		Oct-21		2.00		0.006	2.50	0.18	0.0009		
	SW8	May-21		0.11	0.21			0.064			
		Aug-21						0.039			
		Oct-21		2.20		0.006	2.80	0.19	0.0010		
	SW5	May-21		0.35			0.46	0.084			
		Aug-21		0.084				0.035			
		Oct-21		0.46			0.58	0.096			
	SW9	May-21		0.22			0.81	0.096			
		Aug-21		0.11				0.057			
		Oct-21		2.30		0.006	2.90	0.19	0.0010		
	SW11	May-21		0.61	0.28		0.86	0.110			
		Aug-21		0.59			0.80	0.069			
		Oct-21		2.20		0.006	2.70	0.19	0.0010		
	SW6	May-21		0.43	0.26		0.83	0.097			
		Aug-21		0.13				0.047			
		Oct-21		2.20		0.006	2.80	0.18	0.0010		
DOWNSTREAM	**SW12**	May-21		0.16			0.62	0.12			
		Aug-21		0.52	0.22		0.76	0.098			
		Oct-21		2.30		0.006	2.90	0.19	0.0010		
	SW4	May-21		0.095	0.27			0.048			
		Aug-21		0.12				0.047			
		Oct-21		2.50		0.007	3.00	0.18	0.0010		
SOUTH DITCH	**SW3**	May-21		0.15			2.40	0.080			
		Aug-21	0.022	1.80	0.22	0.016	350	2.0	0.0061	0.0005	0.150
		Oct-21		1.90		0.007	2.60	0.12	0.0008		
	SW13	May-21			0.26			0.047			
		Aug-21		0.31			2.90	0.086	0.00064		
		Oct-21		1.80		0.007	2.30	0.12	0.0008		

NOTES: 1) PWQO - Provicial Water Quality Objectives (1999)
2) Blank indicates parameter concentration was within the PWQO.
3) "-" - Indicates parameter not analysed during the sampling event presented.

APPENDIX

A SURFACE WATER CHEMICAL RESULTS

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	UPSTREAM SW1									
			Jun-86	Nov-86	Jun-94	Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18
pH	**units**	**6.5-8.5**	8.00	8.52	5.90	8.08	7.86	8.09	8.27	7.90	8.03	8.21
Conductivity	**µS/cm**		1191	840	1690	1051	1190	1051	939	1900	870	1600
Turbidity	**NTU**				2	1	1	41.0		5.0	1.9	19.0
Chloride	**mg/L**		157	69	325	173	223	167	130	340	100	320
Phosphate-ortho	**mg/L**		<0.01	0.02	0.06	<1	<0.3	<1	0.01	0.01	<0.010	0.05
Sulphate	**mg/L**		115.0	78.0	166.0	86.7	110.0	138	73	140	43	65
Alkalinity	**mg/L**		341	269	29	285	277	157	192	280	150	230
Bicarbonate	**mg/L**					345	275	189	188			230
Carbonate	**mg/L**					1	2	1	3			4
Hardness	**mg/L**		411	322	221	332	403	287	250	530	260	290
Nitrate	**mg/L**		<0.05	0.10	0.20	0.2	<0.2	0.7	0.7	<0.001	<0.10	<0.10
Nitrite	**mg/L**					<0.2	<0.2	<0.2	<0.01	<0.001	<0.01	<0.010
Total Kjeldahl Nitrogen	**mg/L**				0.93							
Ammonia: total	**mg/L**		0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.05	<0.001	<0.05	0.06
Ammonia: un-ionized	**µg/L**	**20**	1	<1	<1	<1	<1	<1	<0.97	<1	<2	2
Total Organic Carbon	**mg/L**		5.2	6.3	8.5	6.2	7.9	8.7	7.8	4.8	3.4	11
Phenols	**µg/L**									<0.001		
Aluminum	**mg/L**	**0.075 ****	0.130	<0.001	0.025	0.024	<0.03	1.090	0.270	0.100	0.057	0.760
Antimony	**mg/L**				0.004	<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005
Arsenic	**mg/L**				0.002	<0.002		<0.002	<0.001	<0.001	<0.001	0.001
Barium	**mg/L**				0.045	0.051	0.047	0.050	0.036	0.087	0.033	0.051
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005
Bismuth	**mg/L**					<0.001	<0.1	<0.001		<0.001		
Boron	**mg/L**	**0.200**			0.094	0.112	0.090	0.06	0.05	0.19	0.06	0.07
Cadmium	**mg/L**	**0.0002**	<0.003	<0.010	<0.0002	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001
Calcium	**mg/L**		116.0	86.2	64.6	97.2	115.0	80	75	140	64	80
Chromium	**mg/L**	**1.100**	<0.010	<0.010	0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**			<0.001	<0.0001	<0.005	0.0004	<0.0005	<0.01	<0.0005	0.0006
Copper	**mg/L**	**0.005**	<0.010	<0.010	0.0100	0.0018	<0.003	0.0044	0.0030	<0.003	<0.001	0.0048
Iron	**mg/L**	**0.300**			0.02	0.04	0.04	1.16	0.25	0.20	<0.1	1.20
Lead	**mg/L**	**0.025 ******			0.0002	<0.0005	<0.001	0.0009	<0.0005	<0.002	<0.0005	0.0012
Magnesium	**mg/L**		29.3	25.9	14.5	21.5	28.3	21.4	18.0	39.0	17.0	21.0
Manganese	**mg/L**		0.052	0.130	0.029	0.033	0.045	0.022	0.030	0.760	0.150	0.130
Molybdenum	**mg/L**				0.002	0.001	<0.02	0.001	0.001	<0.001	0.001	0.001
Nickel	**mg/L**	**0.025**	<0.030	<0.010	0.003	<0.001	<0.02	0.001	<0.001	<0.0005	<0.001	0.002
Phosphorus	**mg/L**	**0.030**				<0.05	<0.1	0.08	0.05	<0.1	0.015	0.09
Potassium	**mg/L**		5.7	4.0	4.2	4.4	5.0	5.4	3.6	6.0	2.8	5.1
Selenium	**mg/L**				<0.001	<0.002		<0.002	<0.002	<0.004	<0.002	<0.002
Silicon	**mg/L**				3.8	1.39	3.30	3.93	3.10	2.90	1.10	4.00
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001
Sodium	**mg/L**		99.2	45.8	215.0	104.0	115.0	100	97	200	74	210
Strontium	**mg/L**				0.540	0.692	0.730	0.630	0.560	1.300	0.580	0.690
Thallium	**mg/L**	**0.0003**									<0.00005	<0.00005
Tin	**mg/L**				<0.002	<0.001	<0.05	0.001		<0.002		
Titanium	**mg/L**					<0.005	<0.005	0.016	0.010	<0.005	<0.005	0.016
Vanadium	**mg/L**	**0.007**			0.003	<0.0005	<0.005	0.0018	0.0006	<0.001	<0.0005	0.0019
Zinc	**mg/L**	**0.030**	<0.020	<0.010	0.010	<0.005	<0.005	0.009	<0.005	<0.004	<0.005	0.010
Total Dissolved Solids	**mg/L**				872	659	765	606	508	1100		860

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	UPSTREAM SW1 Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.3	7.98	8.14	8.17	8.16	8.1
Conductivity	**µS/cm**		1700	680	2000	2300	1500	800
Turbidity	**NTU**		3.6	9.8	2.1	3.3	<0.1	49
Chloride	**mg/L**		330	88	370	540	250	130
Phosphate-ortho	**mg/L**		<0.010	0.11	0.01	<0.010	0.016	<0.10
Sulphate	**mg/L**		77	33	150	140	120	47
Alkalinity	**mg/L**		250	170	270	270	200	160
Bicarbonate	**mg/L**		240	170	270	270	200	150
Carbonate	**mg/L**		5	1.5	4	4	2.7	1.8
Hardness	**mg/L**		360	210	470	440	330	190
Nitrate	**mg/L**		<0.10	0.36	<0.10	<0.10	0.65	0.7
Nitrite	**mg/L**		<0.010	<0.010	<0.010	<0.010	<0.010	0.013
Total Kjeldahl Nitrogen	**mg/L**							
Ammonia: total	**mg/L**		<0.050	0.11	<0.050	<0.050	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	0.83	<1	<1	<1	<1
Total Organic Carbon	**mg/L**		6.4	5.9	6.8	8.4	6.3	12
Phenols	**µg/L**							
Aluminum	**mg/L**	**0.075 ****	0.230	0.330	0.140	0.110	0.068	2
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	0.001	<0.001	<0.001	<0.001	0.0011
Barium	**mg/L**		0.048	0.028	0.072	0.072	0.043	0.033
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**							
Boron	**mg/L**	**0.200**	0.06	0.08	0.10	0.15	0.13	0.036
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		99	61	130	130	86	59
Chromium	**mg/L**	**1.100**	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00083
Copper	**mg/L**	**0.005**	0.0021	0.0022	0.0018	0.0016	0.0013	0.0057
Iron	**mg/L**	**0.300**	0.41	0.37	0.19	0.18	0.11	2.4
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014
Magnesium	**mg/L**		27.0	15.0	36.0	37.0	26.0	14
Manganese	**mg/L**		0.086	0.350	0.170	0.630	0.110	0.07
Molybdenum	**mg/L**		0.001	0.002	0.001	0.002	0.004	0.0013
Nickel	**mg/L**	**0.025**	0.001	0.001	<0.001	0.001	<0.001	0.0032
Phosphorus	**mg/L**	**0.030**	0.029	0.13	0.058	0.047	0.044	0.18
Potassium	**mg/L**		3.4	4.4	5.6	6.1	5.6	5
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		1.20	2.80	2.30	0.96	0.84	5.1
Silver	**mg/L**	**0.0001**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		210	63	220	300	170	87
Strontium	**mg/L**		0.900	0.520	1.600	1.300	1.100	0.35
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**							
Titanium	**mg/L**		0.008	0.012	0.005	<0.005	<0.005	0.032
Vanadium	**mg/L**	**0.007**	0.0008	0.0014	<0.0005	0.0007	0.0006	0.0033
Zinc	**mg/L**	**0.030**	<0.005	<0.005	<0.005	<0.005	<0.005	0.011
Total Dissolved Solids	**mg/L**		910	370	1100	1300	780	450

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA SW2							
			Sep-99	Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18
pH	**units**	**6.5-8.5**	8.28	8.15	8.03	8.02	8.27	8.10	7.98	8.19
Conductivity	**µS/cm**		1860	1053	1200	1067	937	2000	850	1500
Turbidity	**NTU**		12	1	2	39.0		5.5	1.9	8.5
Chloride	**mg/L**		180	170	224	167	130	370	130	300
Phosphate-ortho	**mg/L**		<0.3	<1	<0.3	<1	0.02	<0.001	0.014	0.055
Sulphate	**mg/L**		185.0	87.8	111.0	138	74	180	59	63
Alkalinity	**mg/L**		563	288	289	159	192	270	160	220
Bicarbonate	**mg/L**		553	349	286	191	189			220
Carbonate	**mg/L**		10.0	1	3	1	3			3
Hardness	**mg/L**		520	343	403	288	250	520	270	280
Nitrate	**mg/L**		0.60	0.2	<0.2	0.7	0.7	0.5	<0.10	0.1
Nitrite	**mg/L**		<0.2	<0.2	<0.2	<0.2	<0.01	0.02	<0.01	<0.010
Total Kjeldahl Nitrogen	**mg/L**									
Ammonia: total	**mg/L**		1.48	0.24	0.45	<0.03	<0.05	0.09	0.55	<0.050
Ammonia: un-ionized	**µg/L**	**20**	59	11	11	<1	<2	1	5	<1
Total Organic Carbon	**mg/L**		20.7	6.8	8.6	8.4	7.8	7.7	4	10
Phenols	**µg/L**							0.0		
Aluminum	**mg/L**	**0.075 ****	0.070	0.032	<0.03	1.240	0.260	0.500	0.045	0.230
Antimony	**mg/L**			<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005
Arsenic	**mg/L**			<0.002		<0.002	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**		0.099	0.054	0.056	0.050	0.035	0.096	0.039	0.046
Beryllium	**mg/L**	**1.100 *****	<0.005	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005
Bismuth	**mg/L**		<0.1	<0.001	<0.1	<0.001		<0.001		
Boron	**mg/L**	**0.200**	1.390	0.122	0.120	0.07	0.06	0.23	0.08	0.07
Cadmium	**mg/L**	**0.0002**	<0.005	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001
Calcium	**mg/L**		98.2	99.8	113.0	80	75	130	64	79
Chromium	**mg/L**	**1.100**	<0.01	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.01	<0.0001	<0.005	0.0005	<0.0005	<0.01	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	<0.01	0.0018	<0.003	0.0047	0.0030	<0.003	<0.001	0.0035
Iron	**mg/L**	**0.300**	0.22	0.11	0.37	1.30	0.24	0.86	0.27	0.40
Lead	**mg/L**	**0.025 ******	<0.001	<0.0005	<0.001	0.0010	<0.0005	<0.002	<0.0005	<0.0005
Magnesium	**mg/L**		66.8	22.7	29.2	21.3	18.0	42.0	17.0	19.0
Manganese	**mg/L**		0.900	0.052	0.102	0.028	0.028	0.410	0.200	0.060
Molybdenum	**mg/L**		<0.05	0.001	<0.02	0.001	0.001	<0.001	0.001	0.001
Nickel	**mg/L**	**0.025**	<0.05	<0.001	<0.02	0.002	<0.001	<0.0005	<0.001	0.001
Phosphorus	**mg/L**	**0.030**	<0.1	<0.05	<0.1	0.09	0.05	0.10	0.016	0.092
Potassium	**mg/L**		22.4	4.8	5.0	5.4	3.6	8.0	3.2	4.9
Selenium	**mg/L**			<0.002		<0.002	<0.002	<0.004	<0.002	<0.002
Silicon	**mg/L**		0.7	1.24	2.40	4.23	3.00	1.90	1.20	3.30
Silver	**mg/L**	**0.0001**	<0.005	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001
Sodium	**mg/L**		236.0	104.0	116.0	99	95	220	68	210
Strontium	**mg/L**		1.410	0.695	0.743	0.649	0.550	1.400	0.550	0.650
Thallium	**mg/L**	**0.0003**							<0.00005	<0.00005
Tin	**mg/L**		<0.10	<0.001	<0.05	0.003		<0.002		
Titanium	**mg/L**		<0.005	<0.005	<0.005	0.017	0.009	0.010	<0.005	0.008
Vanadium	**mg/L**	**0.007**	<0.005	<0.0005	<0.005	0.0021	0.0007	<0.001	<0.0005	0.0009
Zinc	**mg/L**	**0.030**	<0.01	0.007	<0.005	0.009	<0.005	<0.004	<0.005	<0.005
Total Dissolved Solids	**mg/L**		1130	662	775	606	509	1100		820

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA					
			SW2					
			Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.3	7.97	8.14	8.16	8.20	7.86
Conductivity	**µS/cm**		1700	880	2000	2300	1400	800
Turbidity	**NTU**		3	7.1	2.2	3.7	6.9	44
Chloride	**mg/L**		330	140	380	530	240	130
Phosphate-ortho	**mg/L**		<0.010	0.012	<0.010	<0.010	0.013	0.084
Sulphate	**mg/L**		77	47	140	140	110	45
Alkalinity	**mg/L**		250	180	270	270	200	160
Bicarbonate	**mg/L**		240	180	270	260	200	160
Carbonate	**mg/L**		5	1.6	4	4	3	1.1
Hardness	**mg/L**		360	240	490	430	320	200
Nitrate	**mg/L**		<0.10	<0.10	<0.10	<0.10	<0.10	0.7
Nitrite	**mg/L**		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**							
Ammonia: total	**mg/L**		0.1	0.18	0.15	<0.050	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	1	1	1	<1	<1	<1
Total Organic Carbon	**mg/L**		6.6	6.2	6.5	8.6	6.2	12
Phenols	**µg/L**							
Aluminum	**mg/L**	**0.075 ****	0.100	0.500	0.088	0.099	0.086	1.9
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	0.001	<0.001	<0.001	<0.001	0.0011
Barium	**mg/L**		0.049	0.039	0.075	0.070	0.041	0.035
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**							
Boron	**mg/L**	**0.200**	0.07	0.11	0.12	0.14	0.12	0.039
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		96	63	140	130	83	60
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00087
Copper	**mg/L**	**0.005**	0.0017	0.0023	0.0014	0.0015	0.0013	0.0056
Iron	**mg/L**	**0.300**	0.23	0.66	0.18	0.16	0.13	2.5
Lead	**mg/L**	**0.025 ******	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.0016
Magnesium	**mg/L**		27.0	17.0	38.0	36.0	26.0	15
Manganese	**mg/L**		0.090	0.320	0.180	0.820	0.130	0.074
Molybdenum	**mg/L**		0.001	0.002	0.001	0.002	0.003	0.0013
Nickel	**mg/L**	**0.025**	<0.001	0.001	<0.001	0.001	0.001	0.0029
Phosphorus	**mg/L**	**0.030**	0.023	0.07	0.031	0.057	0.053	0.17
Potassium	**mg/L**		3.4	4.1	5.8	6.2	5.3	5.3
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		1.10	1.70	2.30	1.10	0.87	5.1
Silver	**mg/L**	**0.0001**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		210	89	230	300	150	94
Strontium	**mg/L**		0.890	0.630	1.600	1.200	1.000	0.38
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**							
Titanium	**mg/L**		<0.005	0.010	<0.005	<0.005	<0.005	0.033
Vanadium	**mg/L**	**0.007**	0.0005	0.0017	<0.0005	0.0007	0.0006	0.0035
Zinc	**mg/L**	**0.030**	<0.005	0.006	<0.005	<0.005	<0.005	0.012
Total Dissolved Solids	**mg/L**		910	480	1100	1300	750	450

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA											
			SW3											
			Jun-86	Nov-86	Jun-94	Jun-00	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.50	8.50	7.50	8.18	8.23	8.02	7.81	8	8.3	8.13	7.95	8.09
Conductivity	**µS/cm**		836	790	740	811	843	1800	1100	970	1100	1600	1400	850
Turbidity	**NTU**				33	7		8	23	20	5.4	16	230	63
Chloride	**mg/L**		122	72	68	57	46	220	110	98	84	220	160	80
Phosphate-ortho	**mg/L**		0.01	0.03	0.05	<1	ND	<0.001	<0.010	<0.010	<0.010	0.01	<0.010	<0.10
Sulphate	**mg/L**		64.0	66.5	69.0	67.9	75.0	260.0	30	82	88	87	<1.0	96
Alkalinity	**mg/L**		192	264	154	353	291	380	370	300	360	420	480	220
Bicarbonate	**mg/L**					428	286			300	360	420	480	220
Carbonate	**mg/L**					1	5			3	7	5	4	2.5
Hardness	**mg/L**		371	311	217	358	340	710	400	350	450	440	400	290
Nitrate	**mg/L**		<0.05	0.50	0.67	2.0	0.5	0.5	<0.10	0.2	1.3	0.4	<0.10	1.81
Nitrite	**mg/L**					<0.2	0.01	0.08	0.012	0.016	0.046	0.038	0.018	<0.010
Total Kjeldahl Nitrogen	**mg/L**				1.24									
Ammonia: total	**mg/L**		0.05	<0.05	0.11	0.10	<0.05	0.17	0.49	0.18	0.12	0.22	1.6	<0.050
Ammonia: un-ionized	**µg/L**	**20**	5	<3	1	4	<2	3	4	3	2	2	22	<2
Total Organic Carbon	**mg/L**		5.2	5.7	6.6	5.7	7.2	6.8	6.2	6.7	4.6	12	53	14
Phenols	**µg/L**							<0.001						
Aluminum	**mg/L**	**0.075 ****	0.066	0.100	1.200	0.063	0.093	0.600	0.042	0.140	0.052	0.150	1.8	1.9
Antimony	**mg/L**				<0.002	<0.0005	<0.0005	<0.001	0.001	0.001	<0.0005	0.001	0.003	<0.0005
Arsenic	**mg/L**				0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.048	0.0012
Barium	**mg/L**				0.050	0.078	0.110	0.210	0.110	0.090	0.088	0.120	1.200	0.072
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**					<0.001		<0.001						
Boron	**mg/L**	**0.200**			0.140	0.224	0.150	0.260	0.120	0.110	0.170	0.190	0.220	0.071
Cadmium	**mg/L**	**0.0002**	0.003	0.001	<0.0002	<0.0001	0.000	<0.002	<0.0001	<0.0001	<0.0001	0.00010	0.00046	<0.00009
Calcium	**mg/L**		108.0	79.3	61.7	83.5	82.0	180.0	98.0	90.0	98.0	110.0	150.0	82
Chromium	**mg/L**	**1.100**	0.010	0.010	0.003	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	0.006	<0.005
Cobalt	**mg/L**	**0.0006**			0.001	<0.0001	<0.0005	<0.01	0.001	<0.0005	<0.0005	0.0005	0.0061	0.00084
Copper	**mg/L**	**0.005**	0.0100	0.0100	0.0100	0.0030	0.0030	<0.003	0.0011	0.0023	0.0017	0.0029	0.0160	0.0072
Iron	**mg/L**	**0.300**			1.30	0.69	0.43	1.10	2.10	2.10	0.96	2.40	350	2.6
Lead	**mg/L**	**0.025 ******			0.0070	0.0023	0.0024	<0.002	0.0010	0.0029	0.0007	0.0037	0.0300	0.0029
Magnesium	**mg/L**		24.9	27.4	15.2	36.1	39.0	68.0	28.0	31.0	50.0	46.0	39.0	24
Manganese	**mg/L**		0.220	0.120	0.056	0.093	0.100	0.450	1.100	0.220	0.120	0.500	3.800	0.085
Molybdenum	**mg/L**				<0.002	0.003	0.003	<0.001	0.001	0.002	0.003	0.003	0.005	0.0019
Nickel	**mg/L**	**0.025**	0.030	0.010	0.004	0.002	0.001	<0.0005	0.003	0.002	0.002	0.002	0.012	0.0036
Phosphorus	**mg/L**	**0.030**				<0.05	0.02	<0.1	0.014	0.025	0.025	0.08	2.00	0.12
Potassium	**mg/L**		5.7	4.4	7.4	9.7	15.0	18.0	6.3	5.4	7.3	8.6	8.6	13
Selenium	**mg/L**				<0.001	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**				3.7	2.00	2.50	5.90	3.40	3.70	2.40	3.80	17.00	5.7
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		70.1	42.4	53.5	37.4	36.0	140.0	79.0	72.0	60.0	150.0	130.0	63
Strontium	**mg/L**				0.033	1.520	1.500	2.200	1.000	2.100	3.200	2.800	2.900	1.2
Thallium	**mg/L**	**0.0003**							<0.00005	<0.00005	<0.00005	<0.00005	0.000	<0.00005
Tin	**mg/L**				<0.002	<0.001		<0.002						
Titanium	**mg/L**					<0.005	<0.005	0.010	<0.005	0.006	<0.005	0.006	0.036	0.026
Vanadium	**mg/L**	**0.007**			0.00	<0.0005	<0.0005	<0.001	<0.0005	0.001	<0.0005	0.001	0.008	0.003
Zinc	**mg/L**	**0.030**	0.020	0.010	0.033	0.015	0.012	0.210	0.009	0.010	0.007	0.014	0.150	0.021
Total Dissolved Solids	**mg/L**				375	503	465	1100		580	620	880	760	510

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	DOWNSTREAM SW4								
			Jun-86	Nov-86	Jun-94	Jun-00	Sep-00	Nov-11	Aug-14	Nov-16	Oct-18
pH	**units**	**6.5-8.5**	8.54	8.48	7.80	8.26	8.10	8.27	8.18	8	8.11
Conductivity	**µS/cm**		856	775	1160	1011	1180	919	1100	1200	1300
Turbidity	**NTU**				1	2	1.2		3.9	8.2	12
Chloride	**mg/L**		124	72	160	170	226	120	170	170	250
Phosphate-ortho	**mg/L**		0.01	0.05	0.05	<1	<0.3	0.02	0.02	<0.01	0.05
Sulphate	**mg/L**		61.0	66.2	78.0	65.5	83.2	71.0	88.0	87	61
Alkalinity	**mg/L**		208	179	177	287	307	198	200	220	210
Bicarbonate	**mg/L**					348	303	195			210
Carbonate	**mg/L**					1	4	3			3
Hardness	**mg/L**		401	311	267	380	448	260	390	410	270
Nitrate	**mg/L**		<0.05	0.45	0.56	0.5	0.3	1.2	0.4	0.8	0.49
Nitrite	**mg/L**					<0.2	<0.2	<0.01	<0.001	0.012	<0.010
Total Kjeldahl Nitrogen	**mg/L**				1.14						
Ammonia: total	**mg/L**		<0.05	0.05	0.05	0.18	<0.03	<0.05	<0.001	0.061	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<5	3	1	10	<1	<2	<1	1	<1
Total Organic Carbon	**mg/L**		5.6	5.7	9.6	6.1	7.4	7.2	4.3	3.7	8.8
Phenols	**µg/L**								<0.001		
Aluminum	**mg/L**	**0.075 ****	0.072	<0.100	1.300	0.065	<0.03	0.210	0.200	0.220	0.340
Antimony	**mg/L**				0.005	<0.0005		<0.0005	<0.001	<0.0005	<0.0005
Arsenic	**mg/L**				0.002	<0.002		<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**				0.073	0.082	0.073	0.044	0.083	0.069	0.047
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Bismuth	**mg/L**					<0.001	<0.1		<0.001		
Boron	**mg/L**	**0.200**			0.190	0.171	0.16	0.07	0.20	0.21	0.10
Cadmium	**mg/L**	**0.0002**	<0.003	<0.001	<0.0002	<0.0001	<0.005	<0.0001	<0.002	<0.0001	<0.0001
Calcium	**mg/L**		112.0	80.7	71.9	104.0	121	78	94	90	73
Chromium	**mg/L**	**1.100**	<0.010	<0.010	0.004	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**			0.001	<0.0001	<0.005	<0.0005	<0.01	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	<0.010	<0.010	0.0100	0.0026	<0.003	0.0030	<0.003	0.0022	0.0038
Iron	**mg/L**	**0.300**			1.20	0.25	0.14	0.21	0.22	0.44	0.57
Lead	**mg/L**	**0.025 ******			0.0010	<0.0005	<0.001	<0.0005	<0.002	0.0008	0.0006
Magnesium	**mg/L**		29.5	26.6	21.3	28.9	35.7	20.0	37.0	29.0	19.0
Manganese	**mg/L**		0.081	0.012	0.055	0.058	0.039	0.034	0.080	0.220	0.068
Molybdenum	**mg/L**				0.003	0.001	<0.02	0.001	<0.001	0.002	0.002
Nickel	**mg/L**	**0.025**	<0.030	<0.010	0.004	0.001	<0.02	<0.001	<0.0005	0.001	0.002
Phosphorus	**mg/L**	**0.030**				0.05	<0.1	0.0	<0.1	0.038	0.082
Potassium	**mg/L**		6.5	4.1	7.5	5.8	6	4	8	6	5
Selenium	**mg/L**				0.002	<0.002		<0.002	<0.004	<0.002	<0.002
Silicon	**mg/L**				4.9	1.12	2.4	3.1	2.4	2.3	3.2
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.003	<0.0001	<0.5	<0.0001	<0.0001
Sodium	**mg/L**		76.6	42.8	108.0	91.4	109.0	88.0	85.0	93.0	160.0
Strontium	**mg/L**				0.860	1.200	1.290	0.760	2.000	1.600	0.770
Thallium	**mg/L**	**0.0003**								<0.00005	<0.00005
Tin	**mg/L**				<0.002	<0.001	<0.05		<0.002		
Titanium	**mg/L**					<0.005	<0.005	0.010	<0.005	0.008	0.008
Vanadium	**mg/L**	**0.007**			0.00	<0.0005	<0.005	0.001	<0.001	0.001	0.001
Zinc	**mg/L**	**0.030**	<0.020	<0.010	0.009	0.109	<0.005	<0.005	<0.004	0.005	0.007
Total Dissolved Solids	**mg/L**				617	638	768	497	610		730

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	DOWNSTREAM SW4 Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.37	8.2	8.21	8.22	8.25	8.08
Conductivity	**µS/cm**		1500	970	1600	1600	1300	790
Turbidity	**NTU**		3.3	6	1.7	2.4	7.3	54
Chloride	**mg/L**		270	140	270	330	190	130
Phosphate-ortho	**mg/L**		<0.010	0.022	<0.010	<0.010	0.02	<0.10
Sulphate	**mg/L**		75	79	110	100	86	43
Alkalinity	**mg/L**		260	200	260	250	250	150
Bicarbonate	**mg/L**		250	200	260	250	250	150
Carbonate	**mg/L**		6	3	4	4	4	1.7
Hardness	**mg/L**		380	320	410	400	380	190
Nitrate	**mg/L**		0.48	0.45	0.46	0.62	1.17	0.8
Nitrite	**mg/L**		0.011	<0.010	<0.010	0.05	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**							
Ammonia: total	**mg/L**		0.088	<0.050	<0.050	0.08	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	2	<1	<1	1	<1	<2
Total Organic Carbon	**mg/L**		5.6	5.3	4.9	6.5	3.5	11
Phenols	**µg/L**							
Aluminum	**mg/L**	**0.075 ****	0.110	0.260	0.130	0.095	0.120	2.5
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	0.001	<0.001	<0.001	<0.001	0.0012
Barium	**mg/L**		0.059	0.066	0.075	0.082	0.071	0.04
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**							
Boron	**mg/L**	**0.200**	0.10	0.19	0.20	0.27	0.20	0.048
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		98	85	100	110	94	60
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001
Copper	**mg/L**	**0.005**	0.0020	0.0020	0.0019	0.0019	0.0017	0.0065
Iron	**mg/L**	**0.300**	0.31	0.32	0.31	0.18	0.18	3
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0017
Magnesium	**mg/L**		31.0	29.0	33.0	40.0	30.0	15
Manganese	**mg/L**		0.084	0.065	0.180	0.091	0.081	0.075
Molybdenum	**mg/L**		0.002	0.002	0.002	0.003	0.003	0.0014
Nickel	**mg/L**	**0.025**	<0.001	<0.001	0.001	0.001	<0.001	0.0036
Phosphorus	**mg/L**	**0.030**	0.018	0.099	0.034	0.048	0.047	0.18
Potassium	**mg/L**		4	6	6	7	6	5.4
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		1.1	2.9	2.1	1.5	3.0	5.6
Silver	**mg/L**	**0.0001**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		180.0	77.0	150.0	180.0	100.0	90
Strontium	**mg/L**		1.400	1.700	1.800	2.400	1.800	0.46
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**							
Titanium	**mg/L**		0.009	0.006	<0.005	<0.005	0.006	0.04
Vanadium	**mg/L**	**0.007**	0.001	0.002	0.001	0.001	0.001	0.0042
Zinc	**mg/L**	**0.030**	<0.005	<0.005	<0.005	<0.005	<0.005	0.015
Total Dissolved Solids	**mg/L**		830	540	860	890	690	440

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA						
			SW5						
			Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18
pH	**units**	**6.5-8.5**	8.19	8.21	8.05	8.23	8.09	7.99	8.09
Conductivity	**µS/cm**		1098	1240	1073	902	1100	1200	1100
Turbidity	**NTU**		1	1	40.0		4.9	2	6.3
Chloride	**mg/L**		200	256	168	120	160	190	180
Phosphate-ortho	**mg/L**		<1	<0.3	<1	0.02	0.02	0.013	0.033
Sulphate	**mg/L**		72.8	84.5	139	73	85	92	64
Alkalinity	**mg/L**		285	316	162	194	190	190	200
Bicarbonate	**mg/L**		345	311	195	191			200
Carbonate	**mg/L**		1	5	1	3			2
Hardness	**mg/L**		390	464	308	270	380	380	270
Nitrate	**mg/L**		0.2	0.2	0.7	1.6	0.3	0.22	1.26
Nitrite	**mg/L**		<0.2	<0.2	<0.2	<0.01	<0.001	0.015	0.026
Total Kjeldahl Nitrogen	**mg/L**								
Ammonia: total	**mg/L**		0.08	<0.03	<0.03	<0.05	0.06	0.1	0.06
Ammonia: un-ionized	**µg/L**	**20**	4	<1	<1	<2	1	2	<1
Total Organic Carbon	**mg/L**		5.6	7.4	8.2	5.2	4.5	4.3	6.6
Phenols	**µg/L**						<0.001		
Aluminum	**mg/L**	**0.075 ****	0.030	<0.03	1.190	0.310	0.300	0.044	0.220
Antimony	**mg/L**		<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002		<0.002	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**		0.076	0.068	0.053	0.060	0.088	0.053	0.052
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005
Bismuth	**mg/L**		<0.001	<0.1	<0.001		<0.001		
Boron	**mg/L**	**0.200**	0.159	0.170	0.08	0.13	0.21	0.12	0.18
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001
Calcium	**mg/L**		108.0	123.0	85	83	91	87	73
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.005	0.0005	<0.0005	<0.01	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0023	<0.003	0.0046	0.0040	<0.003	0.0013	0.0035
Iron	**mg/L**	**0.300**	0.09	0.10	1.26	0.34	0.37	0.11	0.36
Lead	**mg/L**	**0.025 ******	<0.0005	<0.001	0.0010	<0.0005	<0.002	<0.0005	<0.0005
Magnesium	**mg/L**		29.0	38.3	23.1	23.0	37.0	26.0	20.0
Manganese	**mg/L**		0.027	0.028	0.027	0.046	0.080	0.070	0.047
Molybdenum	**mg/L**		0.001	<0.02	0.001	0.003	<0.001	0.001	0.002
Nickel	**mg/L**	**0.025**	0.001	<0.02	0.002	<0.001	<0.0005	<0.001	0.001
Phosphorus	**mg/L**	**0.030**	<0.05	<0.1	0.07	0.05	<0.1	0.02	0.07
Potassium	**mg/L**		4.9	6.0	5.8	6.0	8.0	4.7	5.4
Selenium	**mg/L**		<0.002		<0.002	<0.002	<0.004	<0.002	<0.002
Silicon	**mg/L**		1.00	3.10	4.19	3.30	2.70	1.70	3.10
Silver	**mg/L**	**0.0001**	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001
Sodium	**mg/L**		106.0	114.0	106	74	80	110	130
Strontium	**mg/L**		1.270	1.540	0.687	1.300	2.200	1.100	1.000
Thallium	**mg/L**	**0.0003**						<0.00005	<0.00005
Tin	**mg/L**		<0.001	<0.05	0.001		<0.002		
Titanium	**mg/L**		<0.005	<0.005	0.017	0.018	<0.005	<0.005	0.007
Vanadium	**mg/L**	**0.007**	<0.0005	<0.005	0.0022	0.0011	<0.001	<0.0005	0.0011
Zinc	**mg/L**	**0.030**	0.015	<0.005	0.025	0.010	<0.004	<0.005	0.010
Total Dissolved Solids	**mg/L**		692	815	624	490	600		610

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA					
			SW5					
			Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.31	8.11	8.17	8.21	8.01	8.28
Conductivity	**µS/cm**		1700	860	1900	2200	1300	780
Turbidity	**NTU**		2.5	5.5	2.5	11	2.7	2.4
Chloride	**mg/L**		330	84	360	480	210	120
Phosphate-ortho	**mg/L**		<0.010	0.039	<0.010	<0.010	0.014	0.033
Sulphate	**mg/L**		78	120	150	130	95	50
Alkalinity	**mg/L**		250	190	260	270	200	160
Bicarbonate	**mg/L**		250	190	260	270	200	150
Carbonate	**mg/L**		5	2.3	4	4	2	2.8
Hardness	**mg/L**		370	320	460	420	290	210
Nitrate	**mg/L**		<0.10	0.98	0.11	0.49	<0.10	1.25
Nitrite	**mg/L**		<0.010	<0.010	<0.010	0.072	<0.010	0.011
Total Kjeldahl Nitrogen	**mg/L**							
Ammonia: total	**mg/L**		0.1	<0.050	0.086	0.1	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	1	<1	1	1	<1	<2
Total Organic Carbon	**mg/L**		6.4	4.8	6.4	11	5.3	4.7
Phenols	**µg/L**							
Aluminum	**mg/L**	**0.075 ****	0.100	0.240	0.200	0.350	0.084	0.46
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Barium	**mg/L**		0.051	0.048	0.067	0.078	0.038	0.046
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**							
Boron	**mg/L**	**0.200**	0.07	0.08	0.13	0.19	0.12	0.13
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		98	83	120	120	78	63
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0019	0.0034	0.0018	0.0037	0.0027	0.0053
Iron	**mg/L**	**0.300**	0.21	0.28	0.22	0.46	0.11	0.58
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	<0.0005	0.0014	<0.0005	0.00085
Magnesium	**mg/L**		28.0	27.0	34.0	37.0	23.0	16
Manganese	**mg/L**		0.090	0.076	0.120	0.340	0.170	0.027
Molybdenum	**mg/L**		0.001	0.002	0.001	0.002	0.003	0.0022
Nickel	**mg/L**	**0.025**	0.001	0.001	<0.001	0.002	0.001	0.0015
Phosphorus	**mg/L**	**0.030**	0.018	0.062	0.029	0.084	0.035	0.096
Potassium	**mg/L**		3.6	5.5	5.5	7.2	4.9	4.7
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		1.00	3.40	2.20	0.73	1.10	3
Silver	**mg/L**	**0.0001**	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		210	62	200	280	140	77
Strontium	**mg/L**		0.920	0.820	1.400	1.200	0.910	0.99
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**							
Titanium	**mg/L**		0.006	0.007	0.015	0.008	<0.005	0.011
Vanadium	**mg/L**	**0.007**	0.0006	0.0012	0.0006	0.0010	0.0006	0.0013
Zinc	**mg/L**	**0.030**	<0.005	0.005	<0.005	0.007	<0.005	0.024
Total Dissolved Solids	**mg/L**		920	510	1100	1200	680	430

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA										
			SW6										
			Jun-00	Sep-00	Nov-11	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.08	8.00	8.28	8.15	8.21	8.33	8.14	8.22	8.14	8.25	8.05
Conductivity	**µS/cm**		1045	1180	926	1200	1300	1600	930	1600	1600	1300	780
Turbidity	**NTU**		2	2.2		1.1	12	2.5	6.5	2.7	7.3	7.4	54
Chloride	**mg/L**		178	219	120	180	250	290	130	270	340	190	130
Phosphate-ortho	**mg/L**		<1	<0.3	0.01	0.02	0.046	<0.010	0.022	<0.010	<0.010	0.022	<0.10
Sulphate	**mg/L**		65.2	81.2	71.0	89	65	79	84	110	100	85	44
Alkalinity	**mg/L**		296	318	197	230	210	250	210	270	240	250	150
Bicarbonate	**mg/L**		359	315	193		210	240	210	260	240	240	150
Carbonate	**mg/L**		1	3	3		3	5	2.7	4	3	4	1.6
Hardness	**mg/L**		362	447	260	430	270	380	330	440	390	360	180
Nitrate	**mg/L**		0.4	0.3	1.2	0.99	0.53	0.43	0.56	0.53	0.69	1.07	0.8
Nitrite	**mg/L**		<0.2	<0.2	<0.01	0.013	<0.010	<0.010	<0.010	<0.010	0.047	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**												
Ammonia: total	**mg/L**		0.31	0.16	<0.05	0.075	<0.050	0.13	0.07	0.087	0.26	0.064	<0.050
Ammonia: un-ionized	**µg/L**	**20**	11	4	<1	1	<1	3	<1	1	3	1	<2
Total Organic Carbon	**mg/L**		6.1	7.2	7.3	3.5	8.5	5.7	4.5	4.7	8.3	3.8	13
Phenols	**µg/L**												
Aluminum	**mg/L**	**0.075 ****	0.022	<0.03	0.230	0.063	0.390	0.086	0.320	0.100	0.430	0.130	2.2
Antimony	**mg/L**		<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.001
Barium	**mg/L**		0.081	0.079	0.043	0.074	0.049	0.056	0.070	0.080	0.093	0.072	0.039
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001	<0.1									
Boron	**mg/L**	**0.200**	0.166	0.17	0.08	0.23	0.11	0.09	0.18	0.21	0.26	0.20	0.05
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		99.6	119	80	98	74	98	83	110	110	92	60
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001
Copper	**mg/L**	**0.005**	0.0023	<0.003	0.0040	0.0016	0.0040	0.0018	0.0020	0.0015	0.0026	0.0023	0.0064
Iron	**mg/L**	**0.300**	0.22	0.32	0.23	0.22	0.67	0.29	0.45	0.24	0.83	0.25	2.8
Lead	**mg/L**	**0.025 ******	<0.0005	<0.001	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	0.0018
Magnesium	**mg/L**		27.4	36.4	21.0	32.0	19.0	29.0	31.0	35.0	38.0	31.0	15
Manganese	**mg/L**		0.082	0.170	0.030	0.082	0.075	0.076	0.120	0.150	0.380	0.130	0.071
Molybdenum	**mg/L**		0.001	<0.02	0.001	0.002	0.002	0.001	0.002	0.002	0.003	0.003	0.0
Nickel	**mg/L**	**0.025**	<0.001	<0.02	0.001	0.001	0.002	<0.001	0.001	0.001	0.002	0.001	0.0033
Phosphorus	**mg/L**	**0.030**	<0.05	<0.1	0.0	0.018	0.097	0.017	0.06	0.027	0.097	0.047	0.18
Potassium	**mg/L**		5.1	6	4	6	5	4	6	6	7	6	5.2
Selenium	**mg/L**		<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		0.90	2.7	3.1	2.3	3.3	1.0	3.1	2.6	2.5	2.9	5.5
Silver	**mg/L**	**0.0001**	<0.0001	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		90.7	105	92	100	160	180	77	160	160	110	88
Strontium	**mg/L**		1.170	1.330	0.780	1.800	0.780	1.200	1.600	1.900	2.300	1.800	0.43
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001	<0.05									
Titanium	**mg/L**		<0.005	<0.005	0.006	0.005	0.011	<0.005	0.007	0.008	0.011	<0.005	0.034
Vanadium	**mg/L**	**0.007**	<0.0005	<0.005	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.0039
Zinc	**mg/L**	**0.030**	<0.005	<0.005	0.013	<0.005	0.008	<0.005	<0.005	<0.005	0.008	<0.005	0.015
Total Dissolved Solids	**mg/L**		644	762	499		720	860	550	880	890	670	430

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA										
			SW7										
			Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.05	8.27	8.19	8.02	8.22	8.38	8.06	8.15	8.13	8.15	8.08
Conductivity	**µS/cm**		1061	943	1900	840	1500	1800	980	2000	2200	1400	810
Turbidity	**NTU**		38.0		7.6	1.7	8.2	2.6	6.1	2.3	3.8	12	50
Chloride	**mg/L**		164	130	330	130	310	330	140	360	500	240	130
Phosphate-ortho	**mg/L**		<1	0.02	0.04	<0.01	0.06	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Sulphate	**mg/L**		139	73.0	180.0	58	63	77	55	150	130	120	43
Alkalinity	**mg/L**		159	193	250	160	220	250	210	270	270	200	160
Bicarbonate	**mg/L**		191	190			220	250	210	270	270	200	160
Carbonate	**mg/L**		1	3			3	6	2.2	4	3	3	1.8
Hardness	**mg/L**		308	250	580	260	280	380	270	470	430	320	190
Nitrate	**mg/L**		0.6	0.7	0.9	0.19	0.2	<0.10	0.52	<0.10	0.16	<0.10	0.67
Nitrite	**mg/L**		<0.2	<0.01	<0.001	0.024	<0.010	<0.010	0.019	<0.010	0.058	<0.010	0.011
Total Kjeldahl Nitrogen	**mg/L**												
Ammonia: total	**mg/L**		<0.03	<0.05	<0.001	0.31	0.063	0.12	0.26	0.16	0.5	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	<2	<1	3	1	1	4	2	7	<1	<2
Total Organic Carbon	**mg/L**		9.8	7.8	5.1	3.9	10	6.6	7	6.8	12	6	13
Phenols	**µg/L**				<0.001								
Aluminum	**mg/L**	**0.075 ****	1.200	0.290	0.200	0.047	0.230	0.091	0.410	0.140	0.110	0.190	2
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001
Barium	**mg/L**		0.052	0.036	0.110	0.040	0.046	0.049	0.051	0.073	0.078	0.042	0.034
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001								
Boron	**mg/L**	**0.200**	0.07	0.06	0.24	0.08	0.07	0.07	0.18	0.11	0.17	0.13	0.039
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		85	79	140	64	77	100	73	130	130	85	60
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0005	<0.0005	0.00088
Copper	**mg/L**	**0.005**	0.0047	0.0030	<0.003	<0.001	0.0035	0.0023	0.0027	0.0015	0.0019	0.0016	0.0059
Iron	**mg/L**	**0.300**	1.24	0.26	0.24	0.17	0.38	0.23	0.51	0.23	0.21	0.27	2.5
Lead	**mg/L**	**0.025 ******	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0015	<0.0005	0.0006	<0.0005	0.0017
Magnesium	**mg/L**		23.3	19.0	52.0	17.0	19.0	27.0	21.0	35.0	37.0	26.0	15
Manganese	**mg/L**		0.024	0.030	0.030	0.150	0.053	0.088	0.330	0.170	0.660	0.160	0.078
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.003	0.0013
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.001	<0.001	0.001	<0.001	0.002	0.001	0.0031
Phosphorus	**mg/L**	**0.030**	0.10	0.0	<0.1	0.013	0.094	0.018	0.042	0.03	0.042	0.042	0.18
Potassium	**mg/L**		5.7	4	9	3	5	4	6	6	7	5	5.1
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		4.26	3.2	3.7	1.1	3.2	1.0	2.2	2.2	1.0	1.1	5.1
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		107	100	180	71	200	210	100	220	290	150	94
Strontium	**mg/L**		0.683	0.580	2.400	0.580	0.690	0.900	0.790	1.400	1.200	1.000	0.38
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001		<0.002								
Titanium	**mg/L**		0.017	0.007	<0.005	<0.005	0.008	<0.005	0.015	<0.005	0.005	<0.005	0.032
Vanadium	**mg/L**	**0.007**	0.0021	0.001	<0.001	<0.0005	0.001	0.001	0.002	0.001	0.001	0.001	0.0034
Zinc	**mg/L**	**0.030**	0.012	<0.005	<0.004	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.011
Total Dissolved Solids	**mg/L**		620	508	1100		830	920	530	1100	1200	750	450

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA										
			SW8										
			Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.08	8.28	8.09	8.06	8.22	8.29	7.97	8.13	8.19	8.14	8.09
Conductivity	**µS/cm**		1070	925	1100	800	1500	1700	1000	2000	2300	1300	790
Turbidity	**NTU**		41.0		6.0	2.2	8.4	2.7	5.3	2.7	5.1	3.3	58
Chloride	**mg/L**		168	120	170	110	310	330	170	370	500	210	130
Phosphate-ortho	**mg/L**		<1	0.02	0.02	<0.01	0.06	<0.010	<0.010	<0.010	<0.010	0.02	<0.10
Sulphate	**mg/L**		137	72.0	89.0	55	64	79	61	150	140	100	43
Alkalinity	**mg/L**		160	197	190	150	220	250	170	270	280	210	160
Bicarbonate	**mg/L**		193	194			220	250	170	260	280	200	150
Carbonate	**mg/L**		1	3			3	5	1.5	3	4	3	1.8
Hardness	**mg/L**		298	260	380	250	280	370	260	470	430	300	190
Nitrate	**mg/L**		0.7	1.1	0.4	0.2	0.2	<0.10	0.18	0.1	0.48	<0.10	0.69
Nitrite	**mg/L**		<0.2	<0.01	<0.001	0.024	<0.010	<0.010	<0.010	<0.010	0.121	<0.010	0.01
Total Kjeldahl Nitrogen	**mg/L**												
Ammonia: total	**mg/L**		<0.03	<0.05	0.07	0.15	<0.050	0.097	0.15	0.098	0.18	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	<1	2	2	<1	2	2	1	2	<1	<2
Total Organic Carbon	**mg/L**		8.5	7.5	4.7	3.8	9.5	6.6	6.7	6.5	10	5.3	13
Phenols	**µg/L**				<0.001								
Aluminum	**mg/L**	**0.075 ****	1.150	0.260	0.200	0.051	0.230	0.091	0.370	0.081	0.110	0.069	2.2
Antimony	**mg/L**		<0.0005	0.001	<0.001	<0.0005	<0.0005	<0.0005	0.001	<0.0005	0.001	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001
Barium	**mg/L**		0.051	0.041	0.087	0.034	0.045	0.050	0.047	0.068	0.082	0.040	0.037
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001								
Boron	**mg/L**	**0.200**	0.07	0.06	0.20	0.08	0.07	0.07	0.12	0.11	0.21	0.12	0.04
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		83	78	92	58	77	100	73	120	130	81	58
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001
Copper	**mg/L**	**0.005**	0.0046	0.0030	<0.003	<0.001	0.0034	0.0017	0.0021	0.0014	0.0025	0.0012	0.0064
Iron	**mg/L**	**0.300**	1.20	0.27	0.32	0.13	0.39	0.22	0.46	0.16	0.19	<0.1	2.8
Lead	**mg/L**	**0.025 ******	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0009	<0.0005	0.0007	<0.0005	0.0018
Magnesium	**mg/L**		21.8	20.0	37.0	16.0	19.0	28.0	21.0	35.0	37.0	24.0	15
Manganese	**mg/L**		0.026	0.029	0.070	0.074	0.057	0.089	0.450	0.100	0.410	0.220	0.074
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.003	0.0
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.002	<0.001	0.001	<0.001	0.002	<0.001	0.0035
Phosphorus	**mg/L**	**0.030**	0.09	0.0	<0.1	0.015	0.09	0.018	0.075	0.022	0.064	0.039	0.19
Potassium	**mg/L**		5.5	4	8	3	5	4	5	6	8	5	5.2
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		4.10	3.1	2.6	1.0	3.2	1.0	2.0	2.0	0.4	1.2	5.3
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		97	92	82	66	200	210	120	210	300	140	89
Strontium	**mg/L**		0.657	0.670	2.100	0.550	0.690	0.910	0.860	1.400	1.300	0.920	0.38
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		0.001		<0.002								
Titanium	**mg/L**		0.016	0.008	<0.005	<0.005	0.009	<0.005	0.008	<0.005	0.006	<0.005	0.033
Vanadium	**mg/L**	**0.007**	0.0021	0.001	<0.001	<0.0005	0.001	0.001	0.002	<0.0005	0.001	0.001	0.0039
Zinc	**mg/L**	**0.030**	0.053	<0.005	<0.004	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.013
Total Dissolved Solids	**mg/L**		609	503	610		830	920	560	1100	1200	690	440

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA SW9										
			Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.11	8.28	8.10	8.14	8.19	8.33	8.12	8.15	8.13	8.20	8.03
Conductivity	**µS/cm**		1084	925	1100	1200	1300	1700	980	1700	1800	1100	790
Turbidity	**NTU**		37.0		5.5	1.2	7.5	2.6	6.4	2.3	6.8	15	56
Chloride	**mg/L**		174	120	170	180	240	320	140	300	350	140	130
Phosphate-ortho	**mg/L**		<1	0.01	0.02	0.017	0.045	<0.010	0.022	<0.010	<0.010	0.03	<0.10
Sulphate	**mg/L**		135	72.0	85.0	91	64	78	77	120	160	110	43
Alkalinity	**mg/L**		169	193	200	230	210	250	210	270	250	220	160
Bicarbonate	**mg/L**		204	190			200	250	210	260	250	210	150
Carbonate	**mg/L**		1	3			3	5	2.6	4	3	3	1.6
Hardness	**mg/L**		293	260	380	410	270	380	330	450	420	310	190
Nitrate	**mg/L**		0.7	1.1	0.4	1.02	0.63	0.32	0.56	0.5	0.51	0.47	0.72
Nitrite	**mg/L**		<0.2	<0.01	<0.001	<0.01	0.01	<0.010	<0.010	<0.010	0.05	<0.010	0.011
Total Kjeldahl Nitrogen	**mg/L**												
Ammonia: total	**mg/L**		<0.03	<0.05	0.08	0.077	0.053	0.12	0.075	0.13	0.83	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	<1	1	1	1	2	2	2	8	<1	<2
Total Organic Carbon	**mg/L**		8.0	7.6	4.6	3.3	8	6.3	4.5	5.3	9.5	5.1	13
Phenols	**µg/L**				<0.001								
Aluminum	**mg/L**	**0.075 ****	1.060	0.220	0.200	0.035	0.230	0.110	0.540	0.076	0.220	0.110	2.3
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.0012
Barium	**mg/L**		0.052	0.038	0.085	0.070	0.046	0.052	0.074	0.075	0.100	0.040	0.04
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001								
Boron	**mg/L**	**0.200**	0.08	0.06	0.21	0.22	0.12	0.08	0.19	0.18	0.20	0.12	0.039
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		81	74	91	93	72	97	85	110	120	74	55
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	<0.0005	0.001
Copper	**mg/L**	**0.005**	0.0043	0.0020	<0.003	0.0012	0.0040	0.0018	0.0025	0.0015	0.0027	0.0016	0.0063
Iron	**mg/L**	**0.300**	1.17	0.25	0.33	0.12	0.39	0.23	0.71	0.18	0.81	0.16	2.9
Lead	**mg/L**	**0.025 ******	0.0009	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	0.0008	<0.0005	0.0017
Magnesium	**mg/L**		22.3	19.0	37.0	31.0	18.0	28.0	31.0	33.0	39.0	22.0	14
Manganese	**mg/L**		0.024	0.025	0.080	0.053	0.050	0.071	0.130	0.130	0.750	0.067	0.069
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.002	0.002	0.001	0.002	0.002	0.002	0.003	0.0013
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.001	<0.001	0.001	<0.001	0.002	0.001	0.0035
Phosphorus	**mg/L**	**0.030**	0.07	0.0	<0.1	0.026	0.082	0.021	0.071	0.032	0.096	0.057	0.19
Potassium	**mg/L**		5.4	4	8	6	5	4	6	6	7	5	5
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.89	2.9	2.6	2.4	3.0	1.0	3.7	2.3	1.1	1.3	5.5
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		99	87	78	96	160	190	77	170	210	130	83
Strontium	**mg/L**		0.739	0.640	2.100	1.900	0.790	1.100	1.700	1.600	1.500	0.850	0.38
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001		<0.002								
Titanium	**mg/L**		0.017	0.006	<0.005	<0.005	0.006	0.005	0.016	<0.005	0.007	<0.005	0.034
Vanadium	**mg/L**	**0.007**	0.0019	<0.0005	<0.001	<0.0005	0.001	0.001	0.002	<0.0005	0.001	0.001	0.0044
Zinc	**mg/L**	**0.030**	0.008	<0.005	<0.004	<0.005	0.006	<0.005	0.007	<0.005	0.007	<0.005	0.012
Total Dissolved Solids	**mg/L**		617	507	590		710	890	550	930	1000	600	440

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	TRIBUTARY SW10								
			Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	May-21	Oct-21
pH	**units**	**6.5-8.5**	8.20	8.23	8.06	8.15	8.03	8.40	8.14	8.2	8.01
Conductivity	**µS/cm**		1348	890	1100	2300	1100	1300	820	1400	790
Turbidity	**NTU**		3.5		8.4	1.4	2.5	1.7	4	3.3	4
Chloride	**mg/L**		266	110	150	430	170	210	66	190	120
Phosphate-ortho	**mg/L**		<1	0.02	0.02	0.027	0.027	<0.010	0.043	0.023	0.023
Sulphate	**mg/L**		95	72.0	77.0	180	68	71	130	220	49
Alkalinity	**mg/L**		229	196	190	300	200	260	190	210	160
Bicarbonate	**mg/L**		277	193			200	260	190	210	150
Carbonate	**mg/L**		1	3			2	6	2.5	3	1.5
Hardness	**mg/L**		396	290	380	690	290	430	320	420	220
Nitrate	**mg/L**		0.5	1.8	0.3	0.33	1.82	2.04	1.22	1.33	1.38
Nitrite	**mg/L**		<0.2	0.02	<0.001	<0.01	0.03	<0.010	<0.010	0.02	<0.010
Total Kjeldahl Nitrogen	**mg/L**										
Ammonia: total	**mg/L**		<0.03	<0.05	<0.001	<0.05	0.07	<0.050	0.061	0.06	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	<2	<1	<2	1	<1	1	1	<2
Total Organic Carbon	**mg/L**		6.0	4.5	4.5	5.7	4.5	3.9	4.9	6.9	4.2
Phenols	**µg/L**				<0.001						
Aluminum	**mg/L**	**0.075 ****	0.074	0.150	0.300	0.056	0.130	0.210	0.300	0.150	0.17
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**		0.089	0.068	0.087	0.096	0.060	0.070	0.049	0.084	0.048
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001						
Boron	**mg/L**	**0.200**	0.20	0.16	0.21	0.23	0.23	0.13	0.08	0.14	0.15
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		103	82	87	150	75	100	81	120	65
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0030	0.0030	<0.003	0.0018	0.0040	0.0018	0.0037	0.0035	0.0053
Iron	**mg/L**	**0.300**	0.05	0.15	0.37	<0.1	0.21	0.31	0.37	0.15	0.21
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00057
Magnesium	**mg/L**		33.5	25.0	35.0	50.0	20.0	37.0	26.0	41.0	16
Manganese	**mg/L**		<0.005	0.036	0.060	0.045	0.030	0.026	0.034	0.043	0.018
Molybdenum	**mg/L**		0.001	0.004	<0.001	0.002	0.003	0.001	0.002	0.002	0.0022
Nickel	**mg/L**	**0.025**	<0.001	<0.001	<0.0005	0.002	0.001	<0.001	0.001	0.002	0.0012
Phosphorus	**mg/L**	**0.030**	<0.05	0.0	<0.1	0.036	0.048	0.023	0.076	0.064	0.078
Potassium	**mg/L**		4.8	7	8	8	6	4	6	6	5
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		2.58	3.1	2.6	3.1	3.0	0.7	3.5	2.0	2.7
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		123	66	73	220	100	120	49	120	77
Strontium	**mg/L**		1.810	1.700	2.200	2.700	1.300	2.000	0.800	1.500	1.1
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		0.002		<0.002						
Titanium	**mg/L**		<0.005	<0.005	<0.005	<0.005	0.006	0.009	0.006	0.006	0.007
Vanadium	**mg/L**	**0.007**	<0.0005	0.001	<0.001	<0.0005	0.001	0.001	0.001	0.001	0.00095
Zinc	**mg/L**	**0.030**	<0.005	0.013	<0.004	<0.005	0.010	<0.005	0.006	0.007	0.026
Total Dissolved Solids	**mg/L**		763	487	570		590	720	500	820	430

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	ADJACENT TO REFUSE AREA						
			SW11						
			Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.21	8.32	8.13	8.11	8.00	8.22	8.07
Conductivity	**µS/cm**		1300	1600	970	1600	1600	1300	770
Turbidity	**NTU**		7.4	2.3	6.9	2.5	9.3	29	54
Chloride	**mg/L**		240	300	130	280	290	200	130
Phosphate-ortho	**mg/L**		0.05	<0.010	0.023	<0.010	<0.010	0.023	<0.10
Sulphate	**mg/L**		63	76	82	120	95	93	42
Alkalinity	**mg/L**		210	250	210	260	240	220	150
Bicarbonate	**mg/L**		210	240	200	260	230	220	150
Carbonate	**mg/L**		3.1	4.8	2.6	3.2	2.2	3.4	1.7
Hardness	**mg/L**		270	370	330	430	390	360	190
Nitrate	**mg/L**		0.54	0.43	0.59	0.55	0.73	1.56	0.8
Nitrite	**mg/L**		0.015	<0.010	<0.010	<0.010	<0.010	0.02	<0.010
Total Kjeldahl Nitrogen	**mg/L**								
Ammonia: total	**mg/L**		<0.050	0.12	0.083	0.10	0.17	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	3	1	2	2	<1	<2
Total Organic Carbon	**mg/L**		8.5	5.6	5.1	5.2	9.9	4.2	12
Phenols	**µg/L**								
Aluminum	**mg/L**	**0.075 ****	0.230	0.099	1.000	0.097	0.610	0.590	2.200
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	<0.001	0.001	0.001	0.001	0.001	0.001
Barium	**mg/L**		0.046	0.057	0.075	0.079	0.091	0.082	0.038
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**								
Boron	**mg/L**	**0.200**	0.11	0.09	0.18	0.22	0.28	0.20	0.05
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		72	97	83	110	110	94	58
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	0.0007	<0.0005	0.0005	0.0005	0.0010
Copper	**mg/L**	**0.005**	0.0033	0.0018	0.0034	0.0016	0.0034	0.0038	0.0063
Iron	**mg/L**	**0.300**	0.37	0.21	1.40	0.20	0.86	0.80	2.70
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	0.0013	<0.0005	0.0009	0.0008	0.0017
Magnesium	**mg/L**		18.0	30.0	29.0	34.0	39.0	31.0	14.0
Manganese	**mg/L**		0.049	0.076	0.270	0.130	0.330	0.100	0.069
Molybdenum	**mg/L**		0.002	0.001	0.002	0.002	0.003	0.003	0.001
Nickel	**mg/L**	**0.025**	0.002	<0.001	0.002	<0.001	0.002	0.002	0.003
Phosphorus	**mg/L**	**0.030**	0.077	0.016	0.1	0.042	0.11	0.069	0.19
Potassium	**mg/L**		4.9	3.9	6.1	6.0	7.2	6.8	5.1
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.10	1.00	4.10	2.50	2.60	4.00	5.30
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		160	180	73	150	160	120	86
Strontium	**mg/L**		0.770	1.300	1.600	1.900	2.500	2.000	0.410
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**								
Titanium	**mg/L**		0.006	0.006	0.018	<0.005	0.012	0.014	0.032
Vanadium	**mg/L**	**0.007**	0.0010	0.0006	0.0028	0.0005	0.0017	0.0018	0.0038
Zinc	**mg/L**	**0.030**	0.006	<0.005	0.012	<0.005	0.014	0.011	0.014
Total Dissolved Solids	**mg/L**		710	860	550	890	840	700	440

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO Objectives	DOWNSTREAM SW12							ADJACENT TO REFUSE AREA SW13					
			Oct-18	Apr-20	Aug-20	Nov-20	May-21	Aug-21	Oct-21	Oct-18	Apr-20	Nov-20	May-21	Aug-21	Oct-21
pH	**units**	**6.5-8.5**	8.22	8.34	8.16	8.21	8.10	8.28	8.07	8.15	8.33	7.92	8.16	8.09	8.04
Conductivity	**µS/cm**		1300	1500	970	1600	1600	1300	790	1000	1100	1400	1500	1400	860
Turbidity	**NTU**		8.4	2.6	6	1.9	3.3	14	60	4.8	3.7	11	6.4	17	57
Chloride	**mg/L**		250	280	140	260	320	200	130	110	82	160	210	170	82
Phosphate-ortho	**mg/L**		0.048	<0.010	0.024	<0.010	<0.010	0.027	<0.10	<0.010	<0.010	<0.010	<0.010	0.017	<0.10
Sulphate	**mg/L**		61	77	81	120	100	88	43	74	89	95	95	36	97
Alkalinity	**mg/L**		210	260	210	270	250	260	150	330	360	360	400	420	230
Bicarbonate	**mg/L**		210	250	200	260	250	250	150	320	360	350	400	410	220
Carbonate	**mg/L**		3.3	5.1	2.8	4	3	4.6	1.7	4.3	7.2	2.8	5.4	4.8	2.3
Hardness	**mg/L**		280	380	330	420	400	400	190	380	460	450	430	390	300
Nitrate	**mg/L**		0.5	0.49	0.56	0.5	0.49	1.29	0.78	0.23	1.27	<0.10	0.19	0.21	1.74
Nitrite	**mg/L**		<0.010	<0.010	<0.010	<0.010	0.036	<0.010	0.01	<0.010	0.045	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**														
Ammonia: total	**mg/L**		<0.050	0.14	<0.050	<0.050	0.053	<0.050	<0.050	<0.050	0.07	<0.050	<0.050	0.21	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	3	<1	<1	<1	<1	<2	<1	1	<1	<2	1	<2
Total Organic Carbon	**mg/L**		8.6	5.7	4.5	4.6	6.8	3.8	12	6.6	4.5	11	16	9.2	14
Phenols	**µg/L**														
Aluminum	**mg/L**	**0.075 ****	0.28	0.078	0.31	0.05	0.067	0.520	2.300	0.160	0.024	0.210	0.160	0.31	1.8
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.00078	<0.0005
Arsenic	**mg/L**		<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.005	<0.001	0.0021	0.0011
Barium	**mg/L**		0.047	0.059	0.062	0.074	0.084	0.082	0.039	0.082	0.081	0.270	0.100	0.11	0.074
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0005	<0.0005	<0.0004	<0.0004	<0.0004	<0.0004
Bismuth	**mg/L**														
Boron	**mg/L**	**0.200**	0.11	0.099	0.18	0.22	0.26	0.22	0.05	0.13	0.16	0.17	0.20	0.18	0.075
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009
Calcium	**mg/L**		77	100	82	110	110	100	59	96	99	120	120	95	86
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.001	<0.0005	<0.0005	0.0011	<0.0005	0.00064	0.00078
Copper	**mg/L**	**0.005**	0.0037	0.0019	0.0023	0.0015	0.0018	0.0030	0.0064	0.0023	0.0016	0.0011	0.0035	0.0032	0.0073
Iron	**mg/L**	**0.300**	0.47	0.23	0.42	0.13	0.13	0.76	2.90	0.71	0.60	7.60	0.62	2.9	2.3
Lead	**mg/L**	**0.025 ******	0.0005	<0.0005	0.00051	<0.0005	<0.0005	0.0009	0.0018	0.0024	<0.0005	0.0021	0.0026	0.0033	0.003
Magnesium	**mg/L**		19	31	29	34	39	34.0	15.0	31.0	47.0	34.0	46.0	35	24
Manganese	**mg/L**		0.054	0.076	0.078	0.086	0.12	0.140	0.076	0.610	0.160	5.000	0.360	1.7	0.087
Molybdenum	**mg/L**		0.0016	0.0014	0.0023	0.002	0.003	0.003	0.001	0.002	0.003	0.001	0.003	0.0035	0.0018
Nickel	**mg/L**	**0.025**	0.0017	<0.001	0.0013	<0.001	0.0011	0.002	0.003	0.002	0.001	0.002	0.002	0.0027	0.0034
Phosphorus	**mg/L**	**0.030**	0.086	0.017	0.062	0.023	0.047	0.098	0.19	0.034	0.018	0.30	0.12	0.086	0.12
Potassium	**mg/L**		5	4.1	5.9	6.1	7.1	6.7	5	5.9	6.9	5.6	8.7	7.4	13
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.3	1	3.1	2.3	1.4	4.10	5.5	3.50	2.20	3.40	3.10	4.7	5.9
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.0001	<0.0001	<0.00009	<0.00009	<0.00009	<0.00009
Sodium	**mg/L**		170	170	75	160	170	110	86	78	58	110	150	130	65
Strontium	**mg/L**		0.8	1.4	1.5	1.9	2.3	2.100	0.430	1.800	3.100	1.600	2.600	1.9	1.2
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**														
Titanium	**mg/L**		0.0079	<0.005	0.0067	<0.005	<0.005	0.008	0.034	<0.005	<0.005	0.006	0.006	0.0069	0.027
Vanadium	**mg/L**	**0.007**	0.0011	0.00055	0.0013	<0.0005	0.00057	0.0016	0.004	0.0006	<0.0005	0.0008	0.0006	0.00079	0.0029
Zinc	**mg/L**	**0.030**	0.006	<0.005	0.01	<0.005	<0.005	0.009	0.015	0.005	<0.005	0.007	0.010	0.018	0.02
Total Dissolved Solids	**mg/L**		730	830	550	870	880	710	440	620	630	760	850	740	510

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.

TABLE A-2
SURFACE WATER FLOW RATES
OAKVILLE NINTH LINE LANDFILL SITE

WATERSHED	MONITORING STATION	Flow Rate (L/s)		
		May 2021	Aug 2021	Oct 2021
UPSTREAM	SW1	6.6	19.6	236.3
ADJACENT TO REFUSE AREA	SW2	6.2	4.3	306.8
	SW7	12.8	10.5	400.0
	SW8	12.3	2.6	198.9
	SW5	14.3	5.6	198.0
	SW9	3.8	16.8	454.1
	SW11	10.6	6.4	396.0
	SW6	8.0	6.6	427.5
DOWNSTREAM	SW12	1.5	14.7	237.9
	SW4	7.0	20.7	192.9
NORTH TRIBUTARY	SW10	2.5	Dry	76.4
SOUTH DITCH	SW3	1.8	NMF	4.6
	SW13	9.4	NMF	8.3

NOTES: 1) NMF - No measurable flow, but sample obtained

2) SP - Separated, ponded area - no continuous flow in channel, but sampled obtained.

3) Dry - Location had insufficient water for sampling

FIGURE A-1

SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS

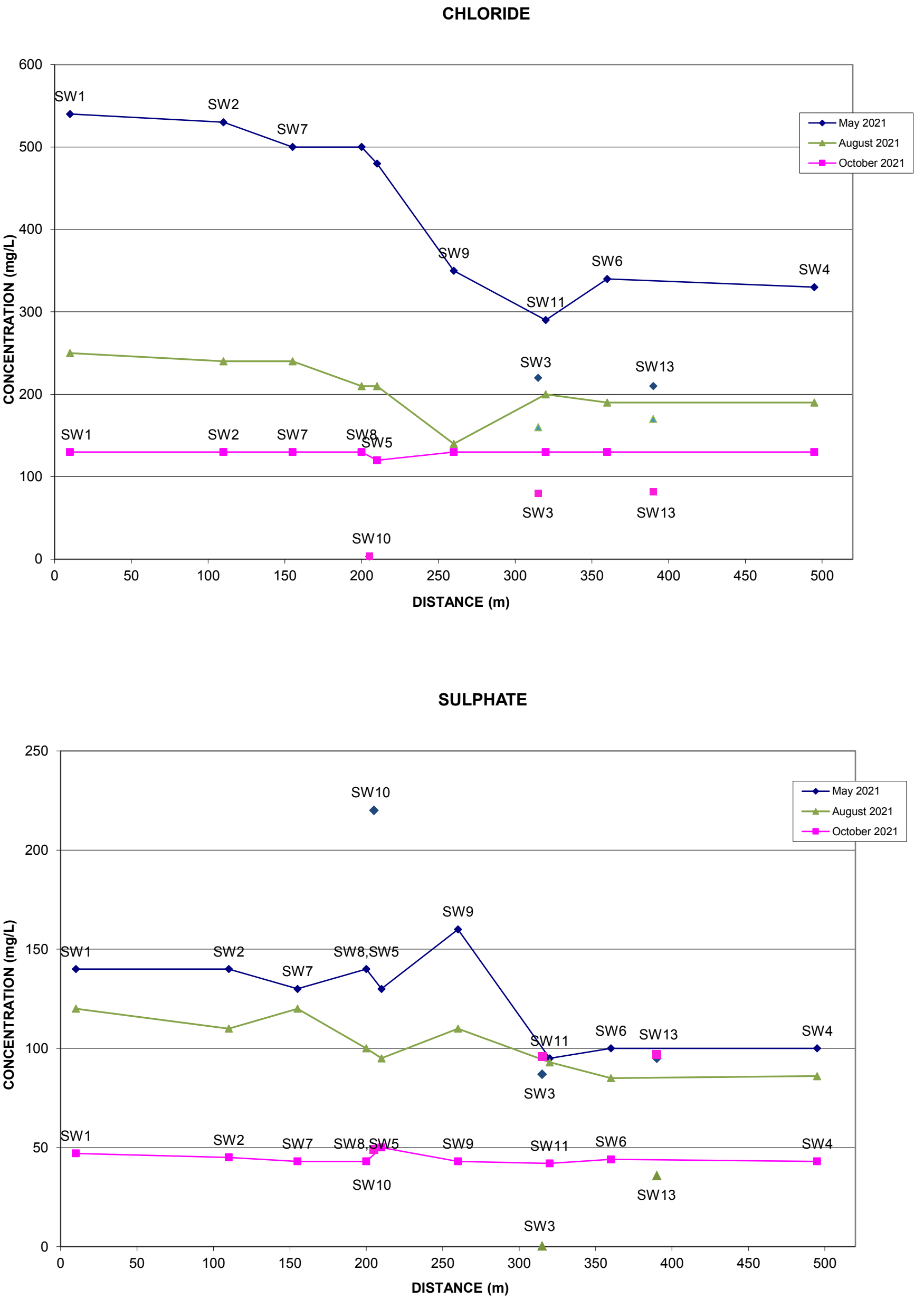
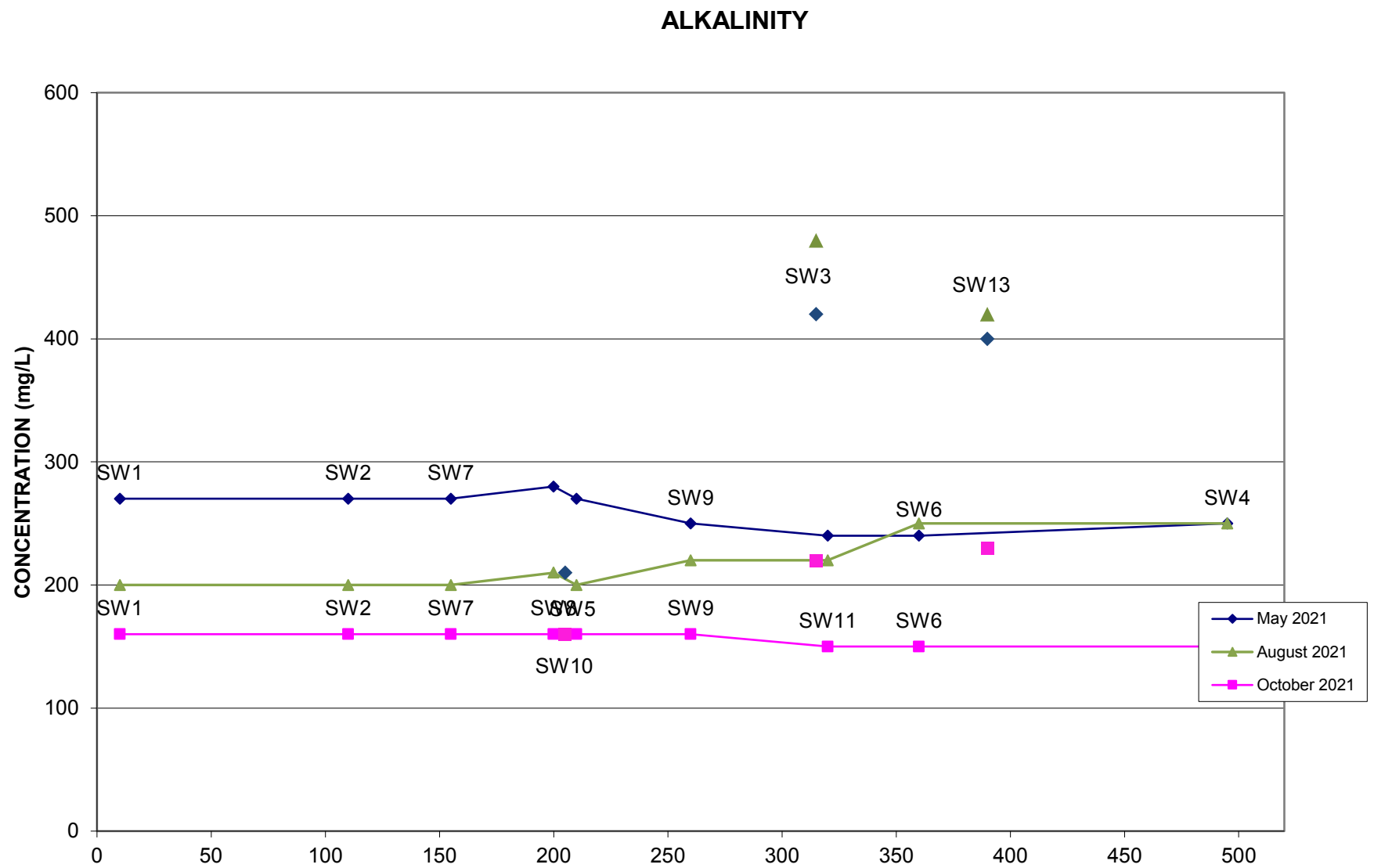


FIGURE A-2

SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



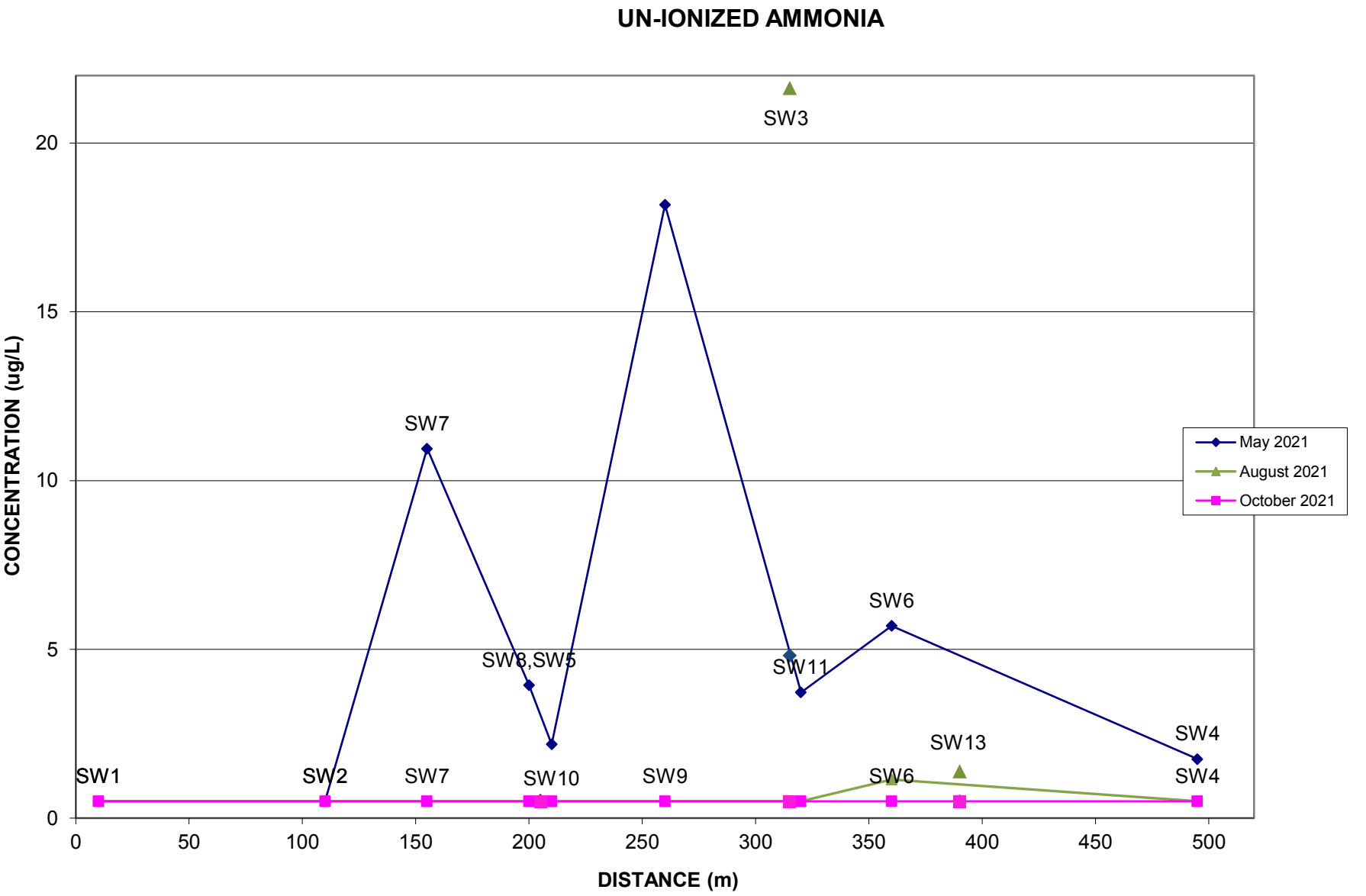
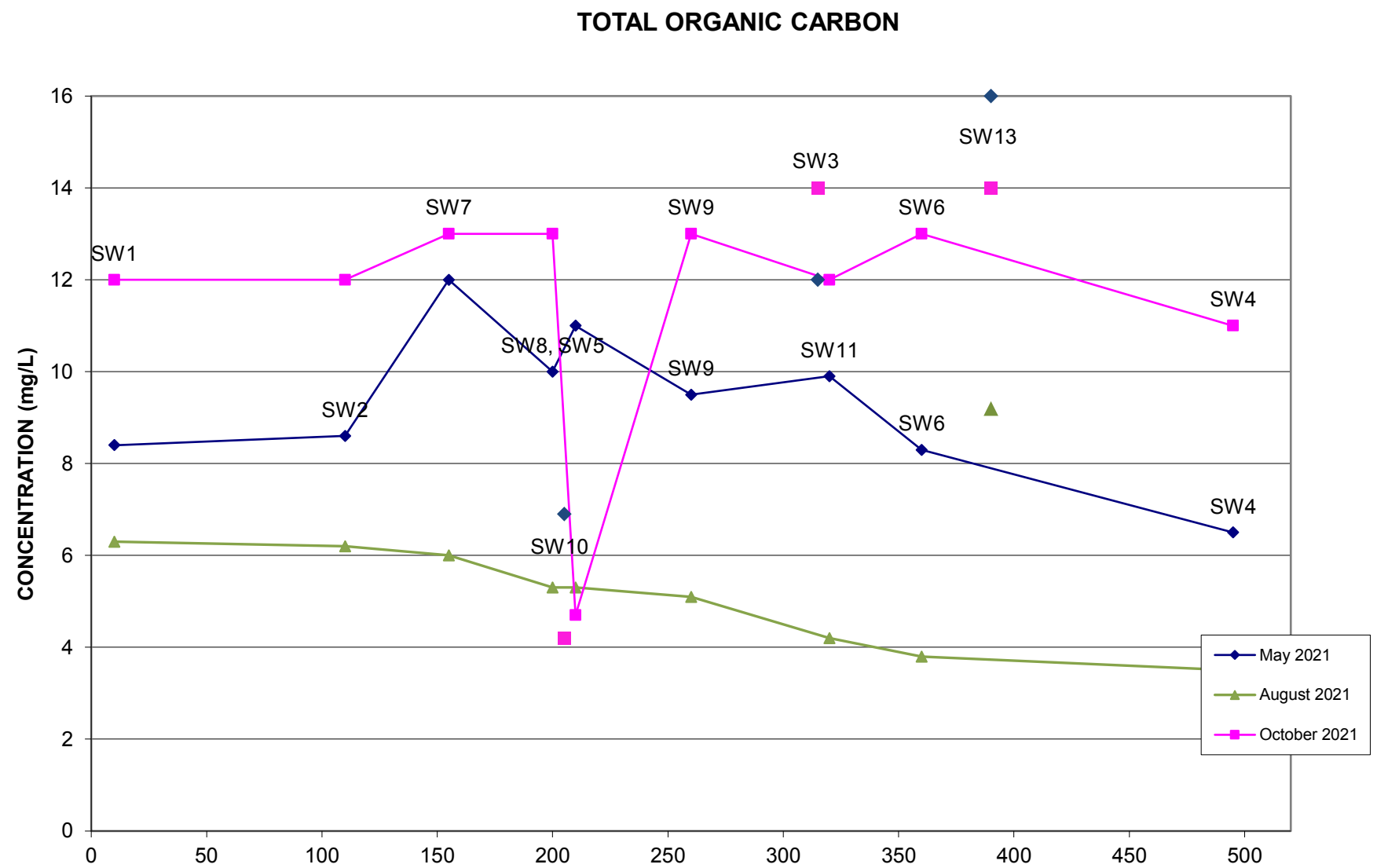


FIGURE A-3

SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



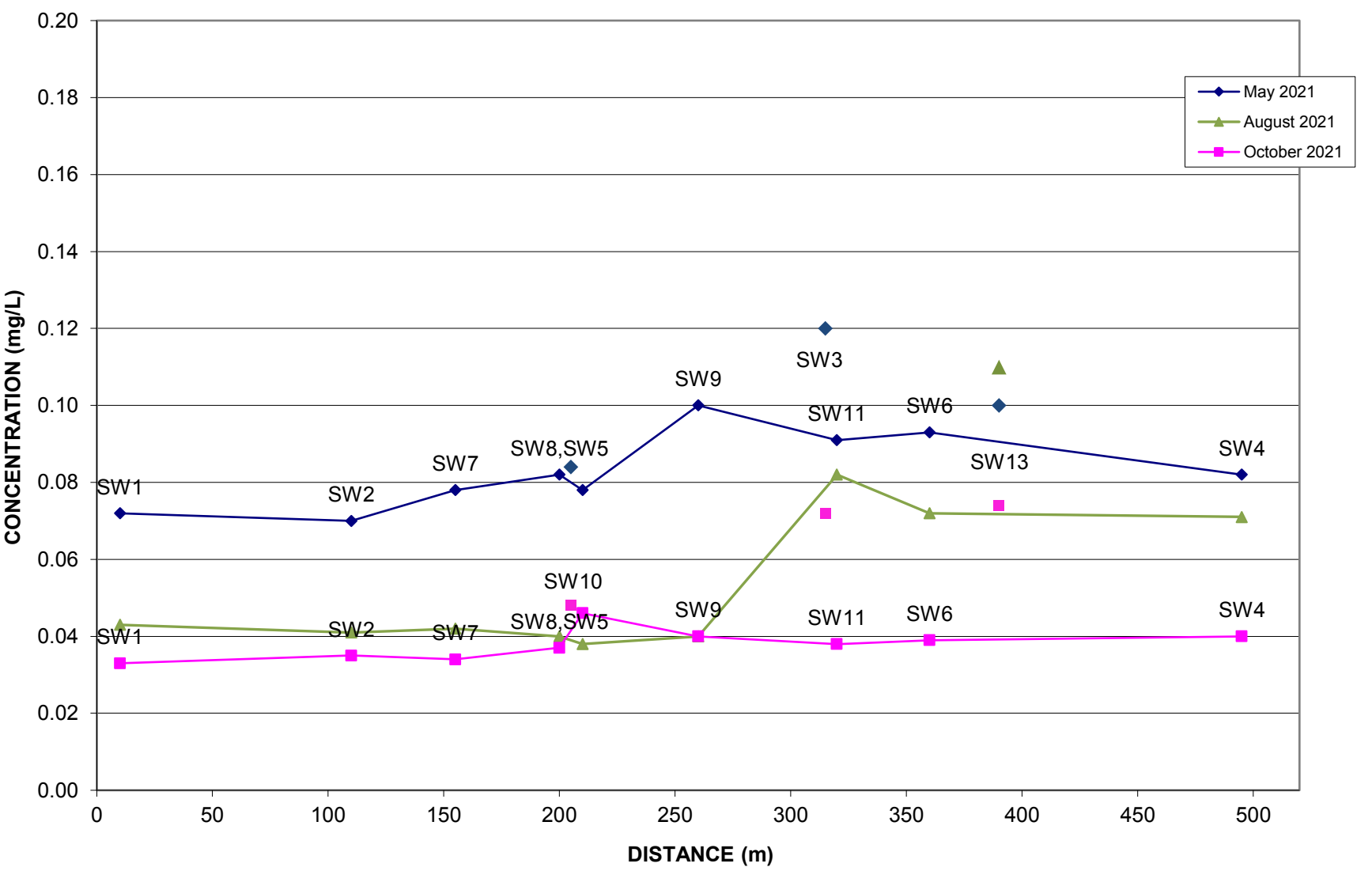


FIGURE A-4

SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS

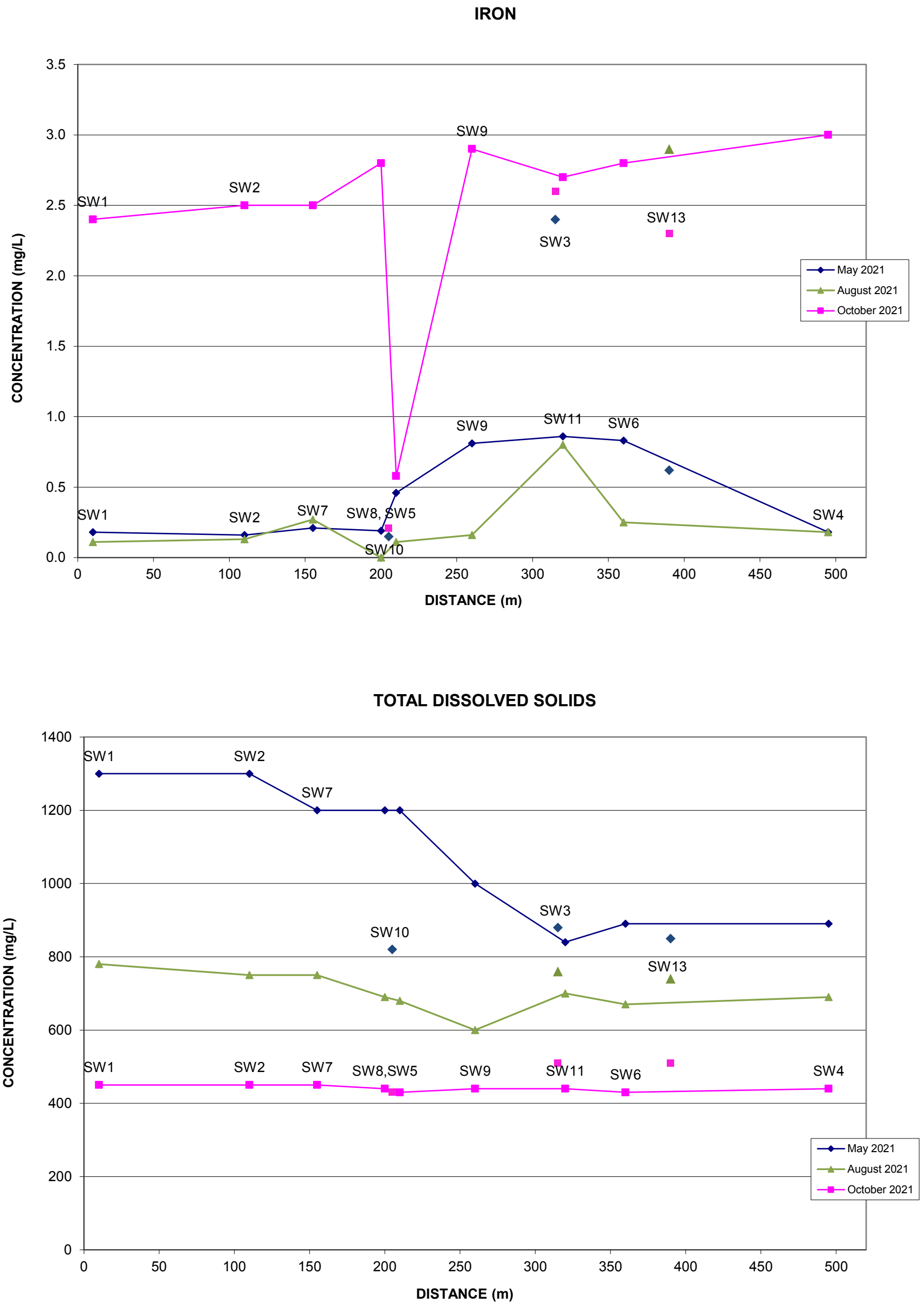


FIGURE A-5

SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS

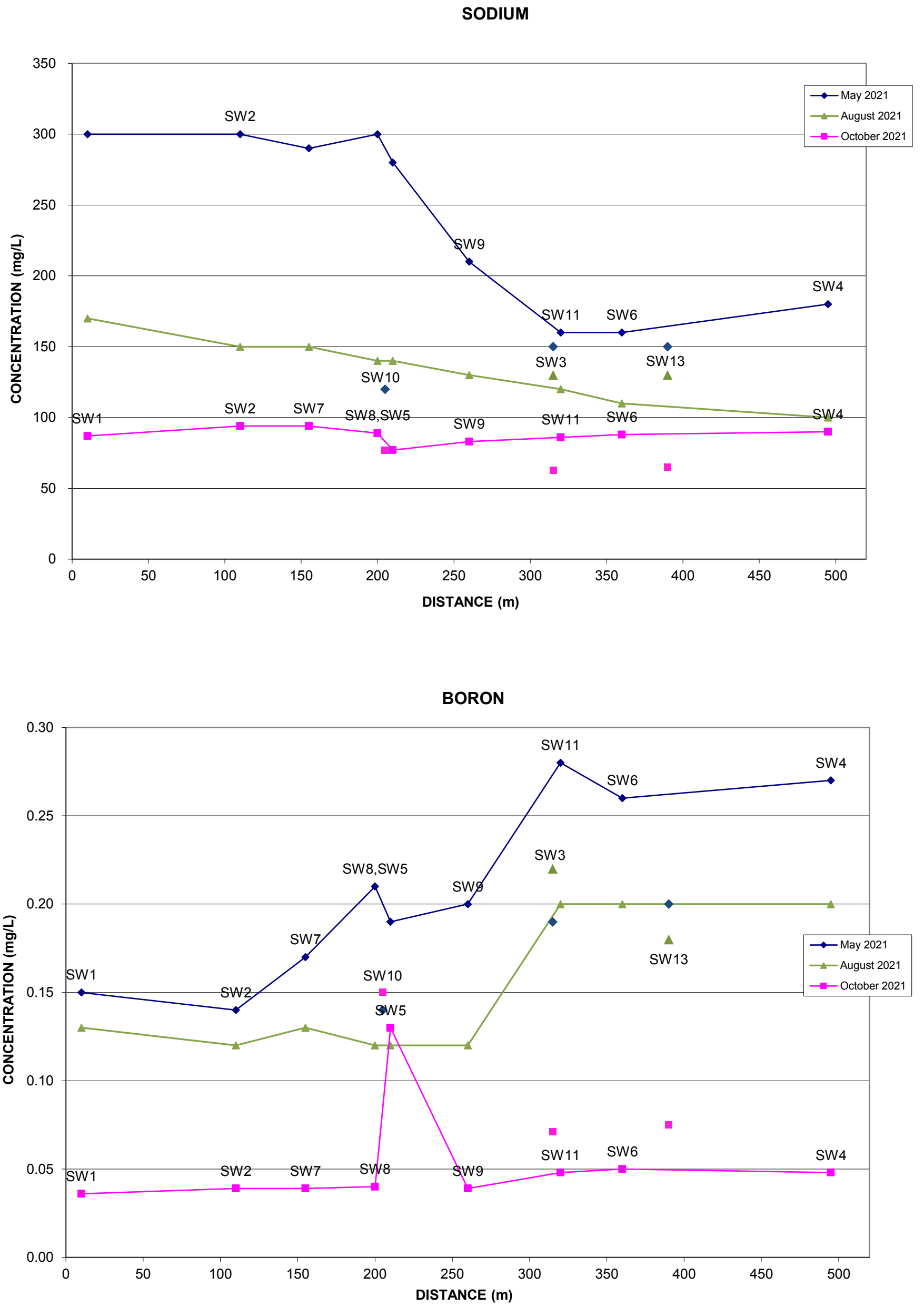
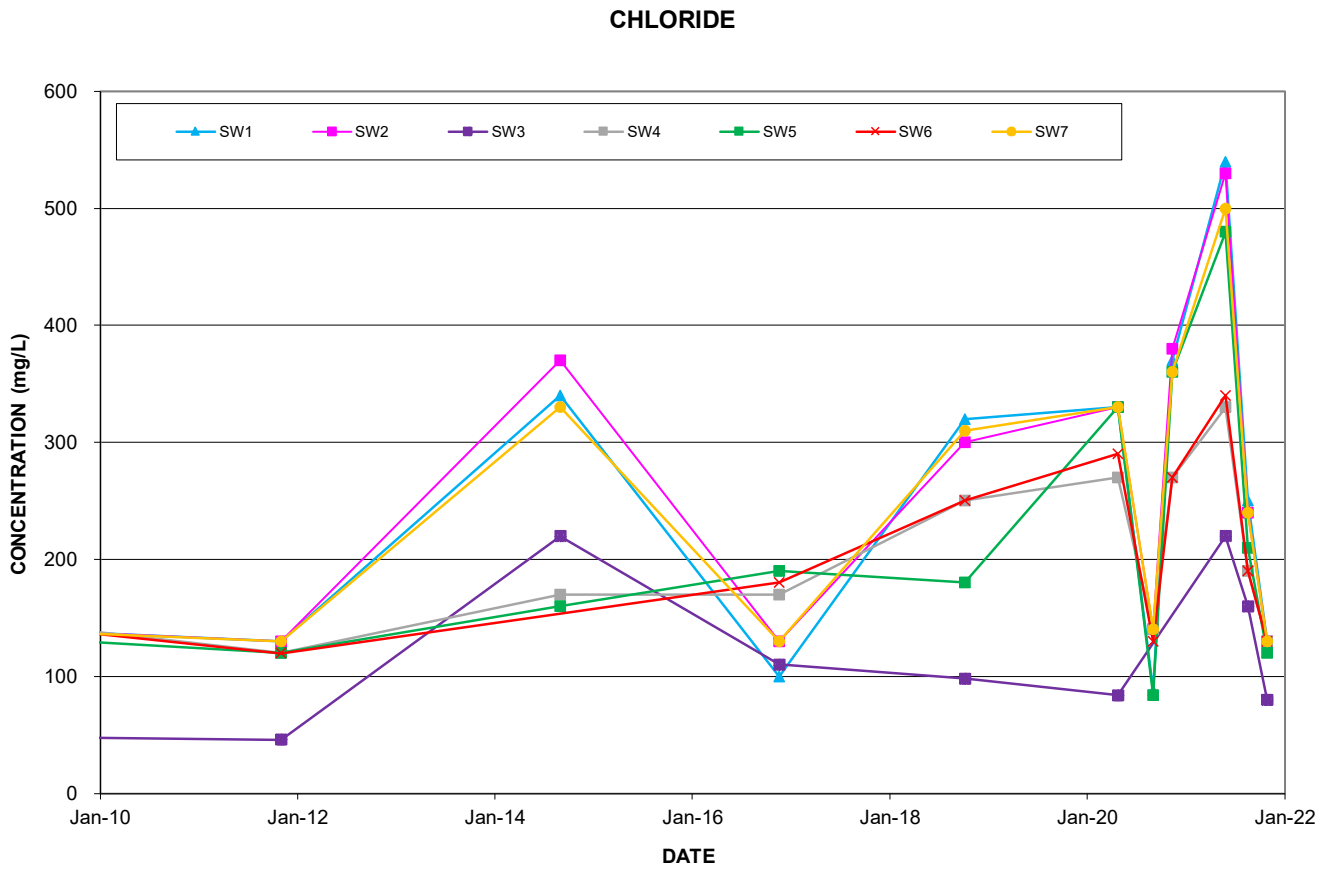


FIGURE A-6
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



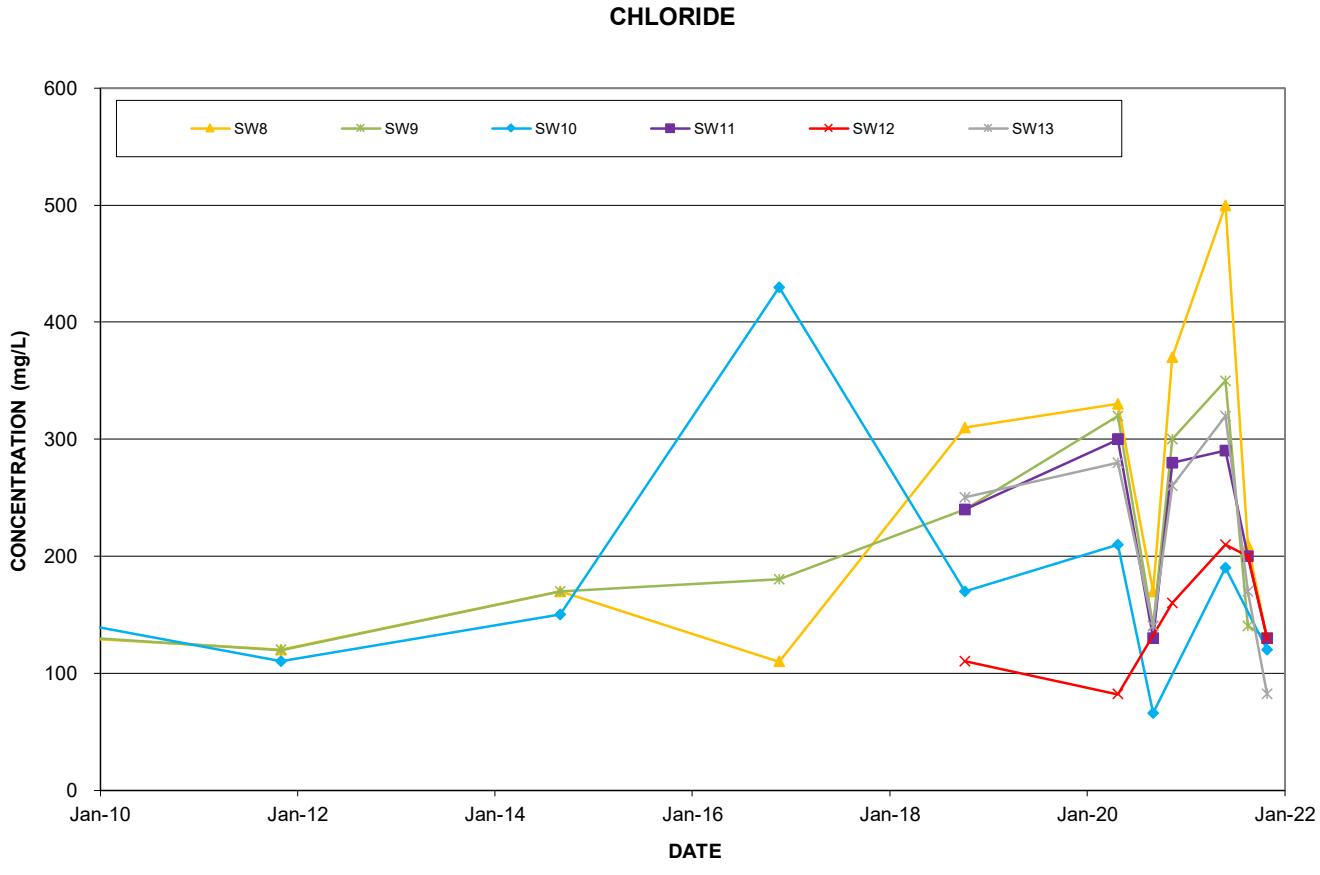
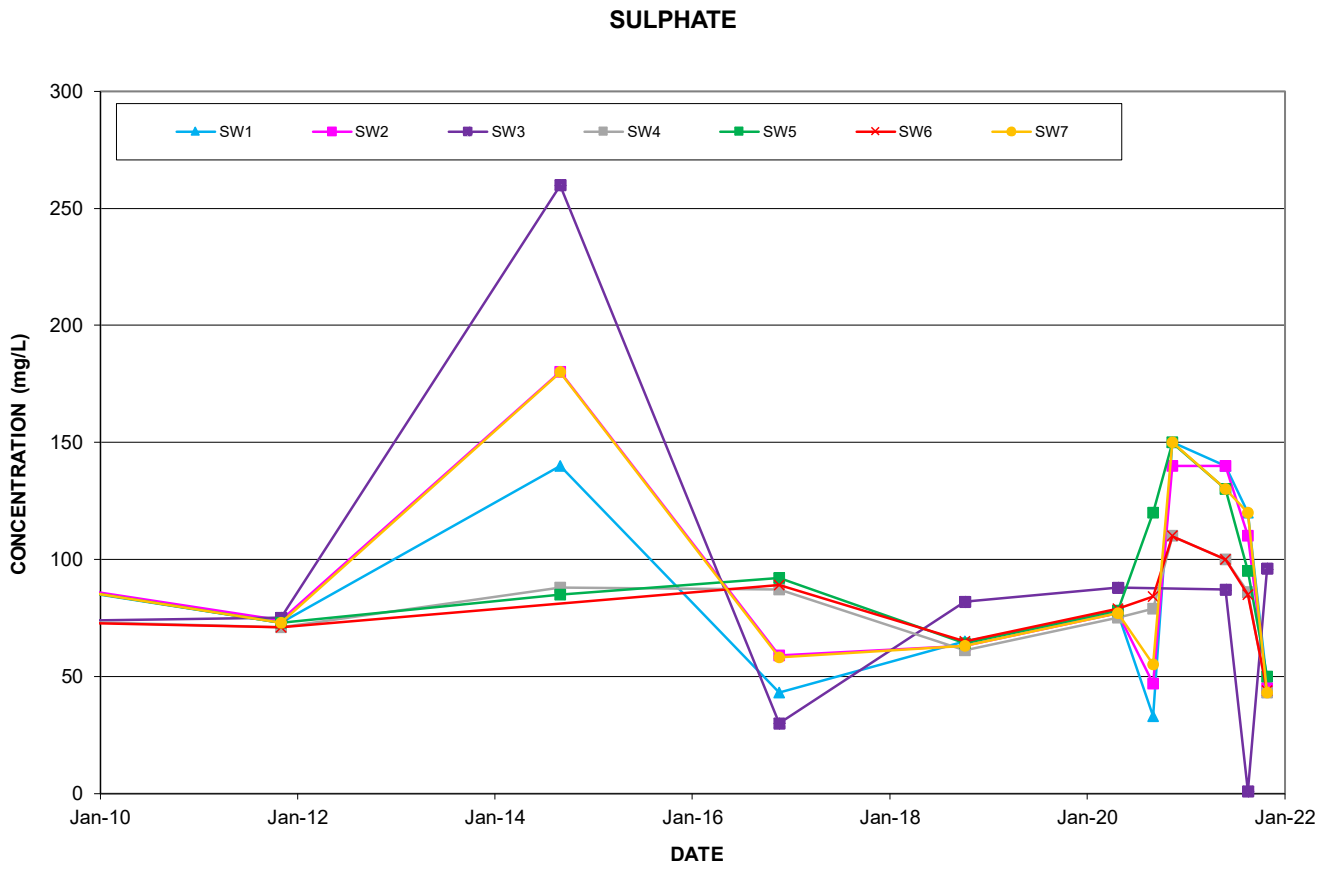


FIGURE A-7
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



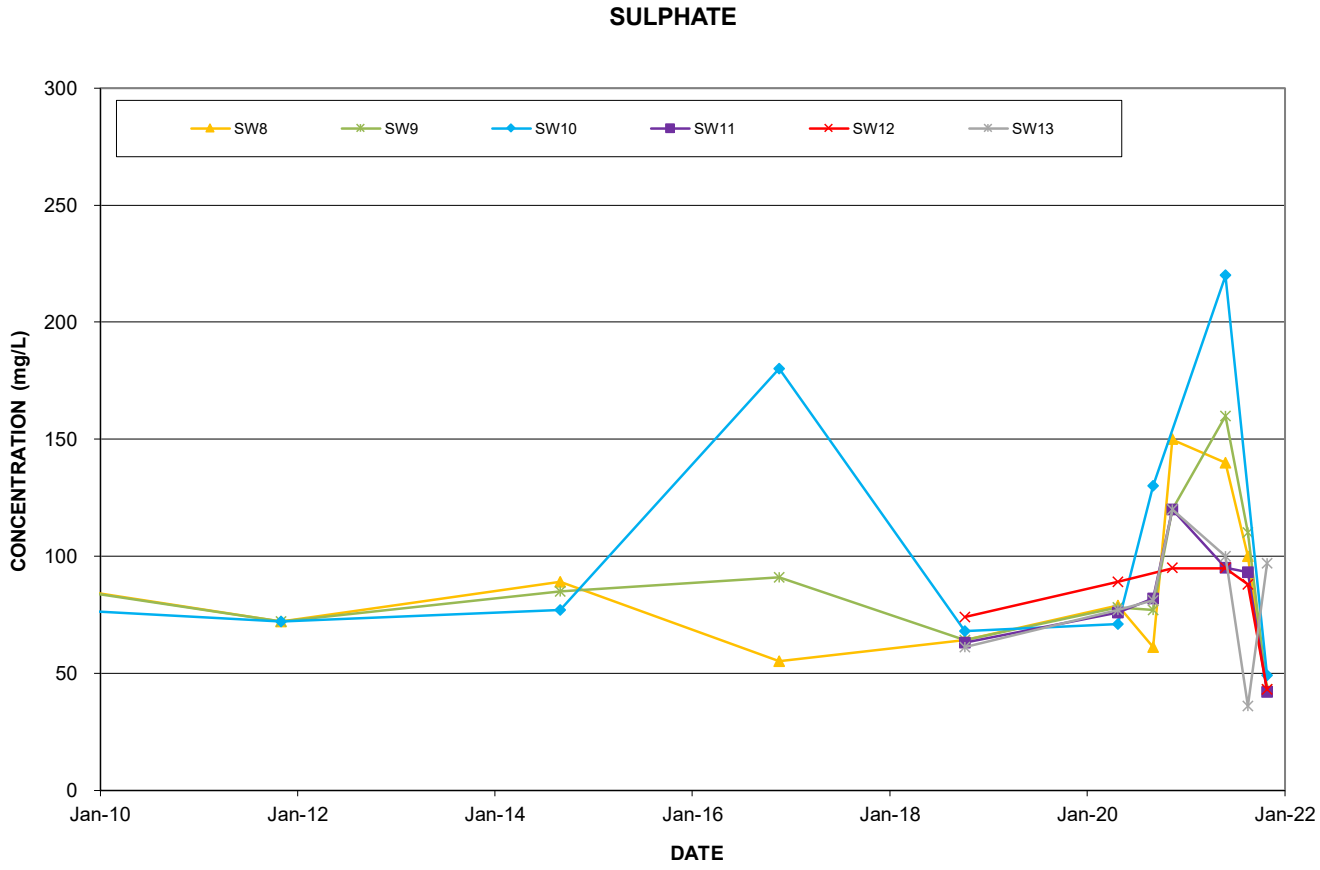
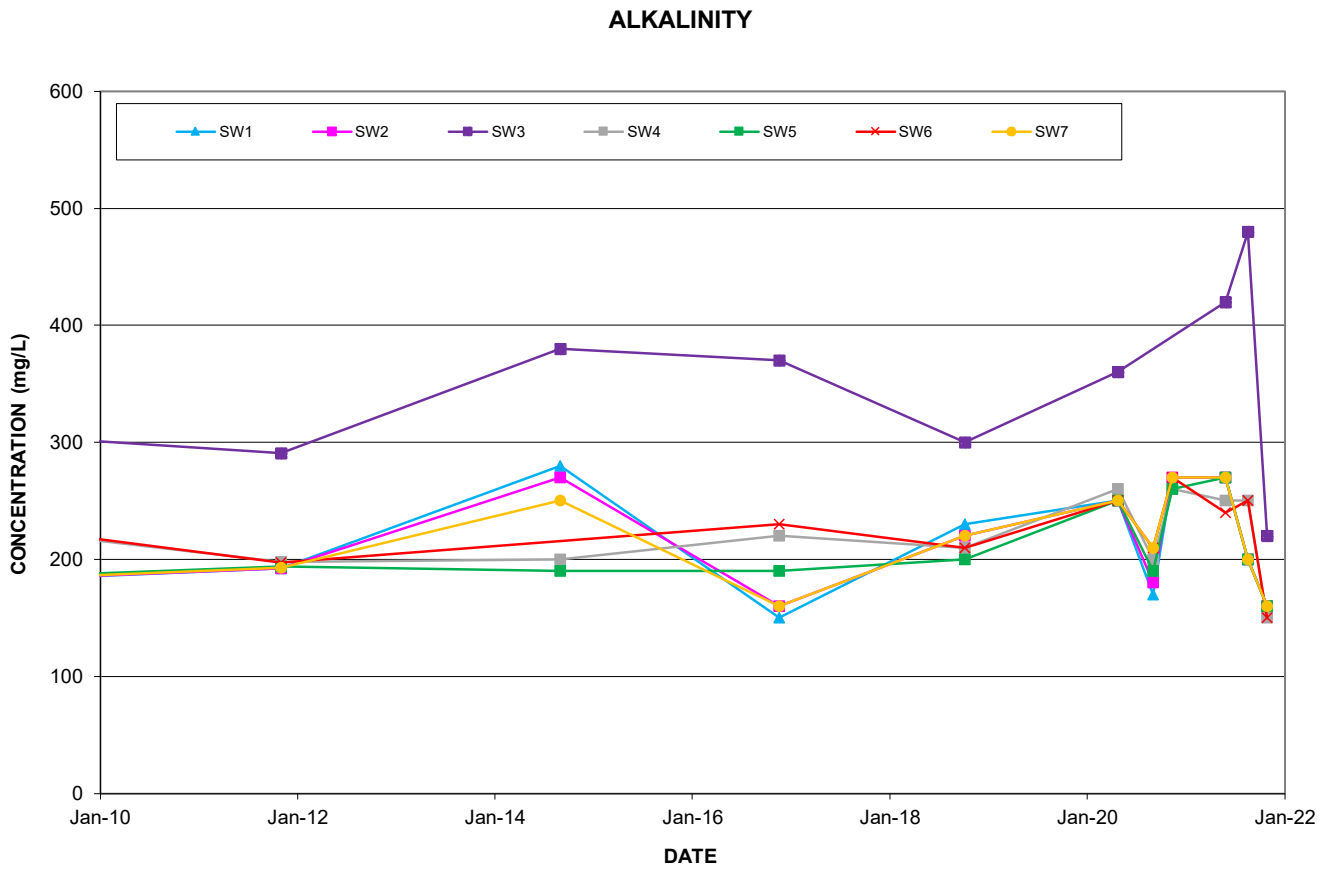


FIGURE A-8
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



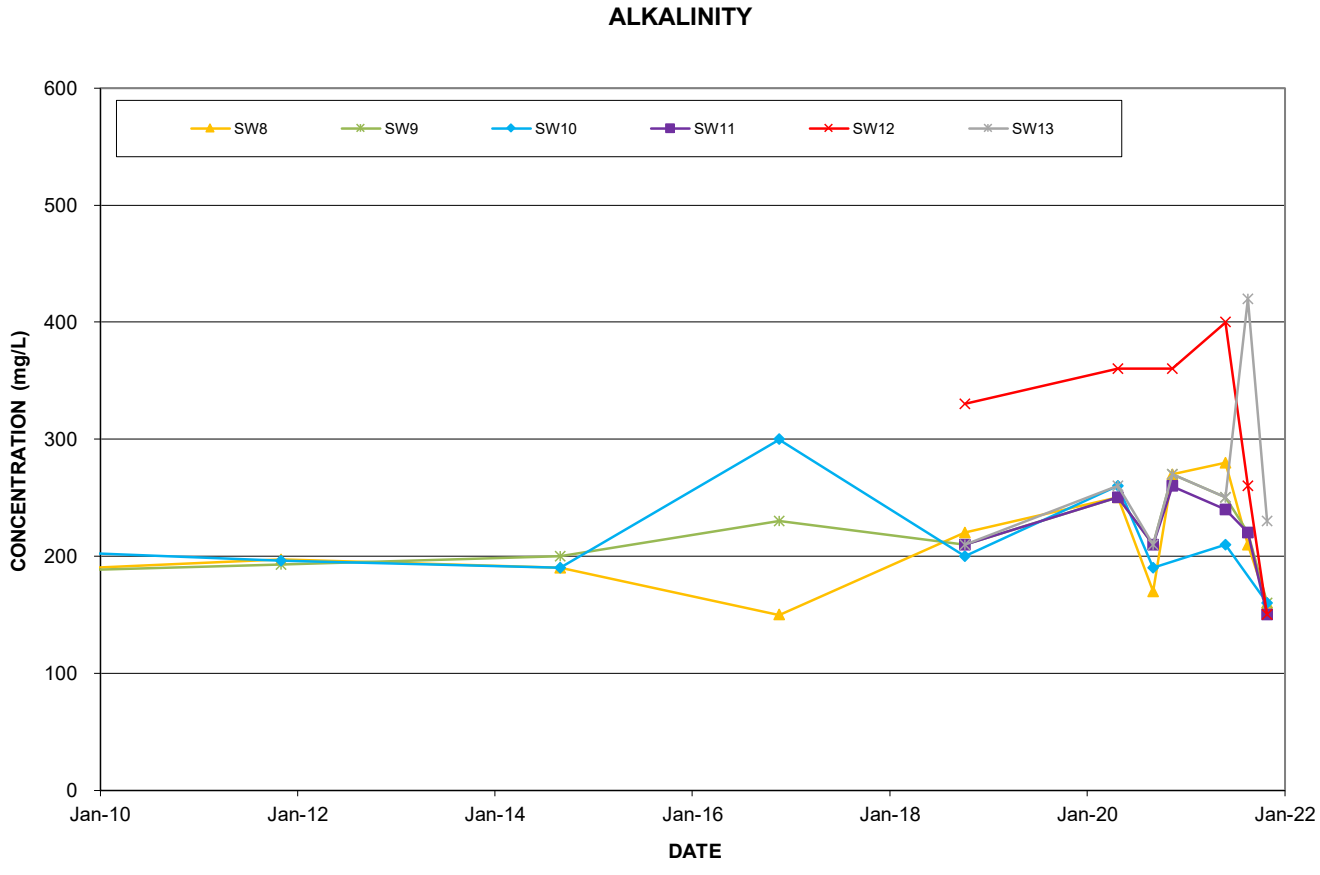
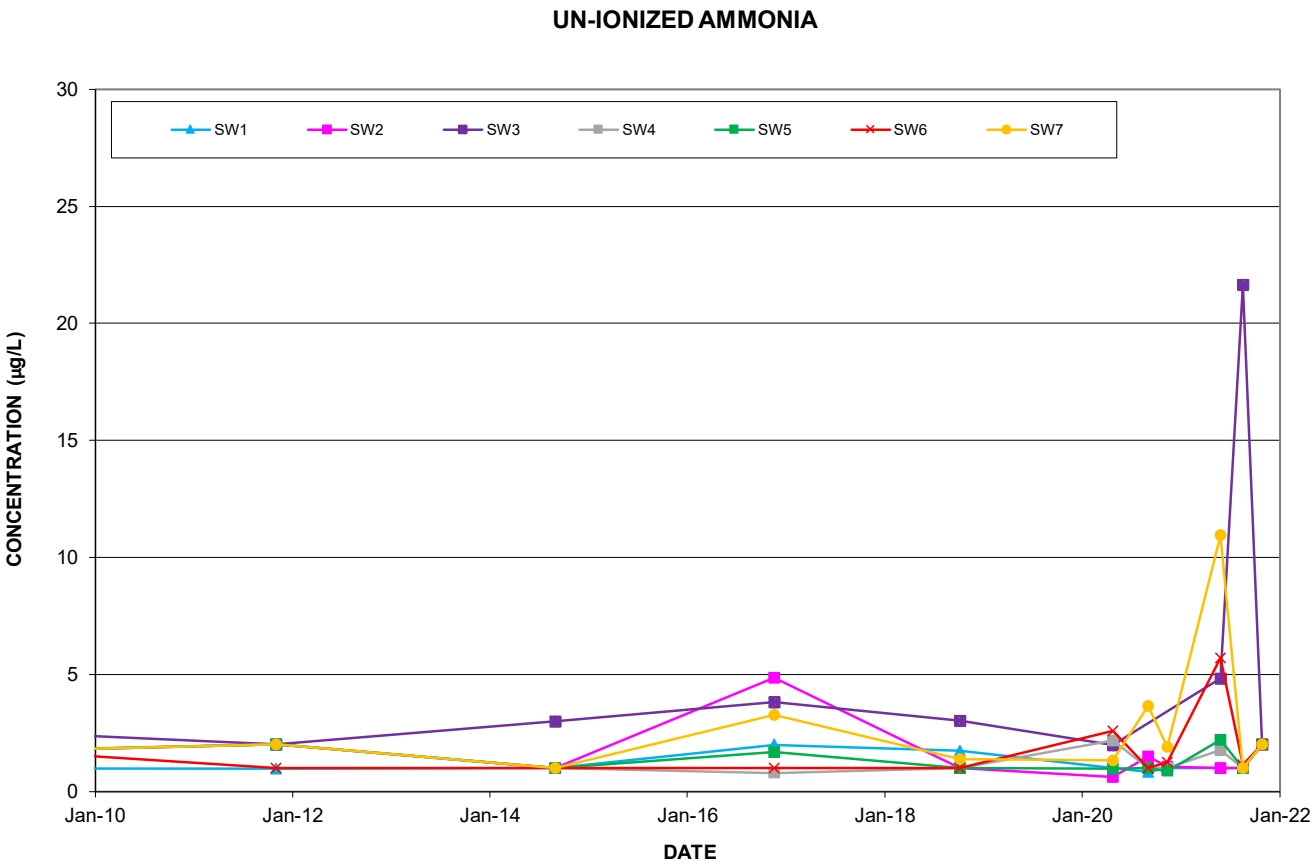


FIGURE A-9
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



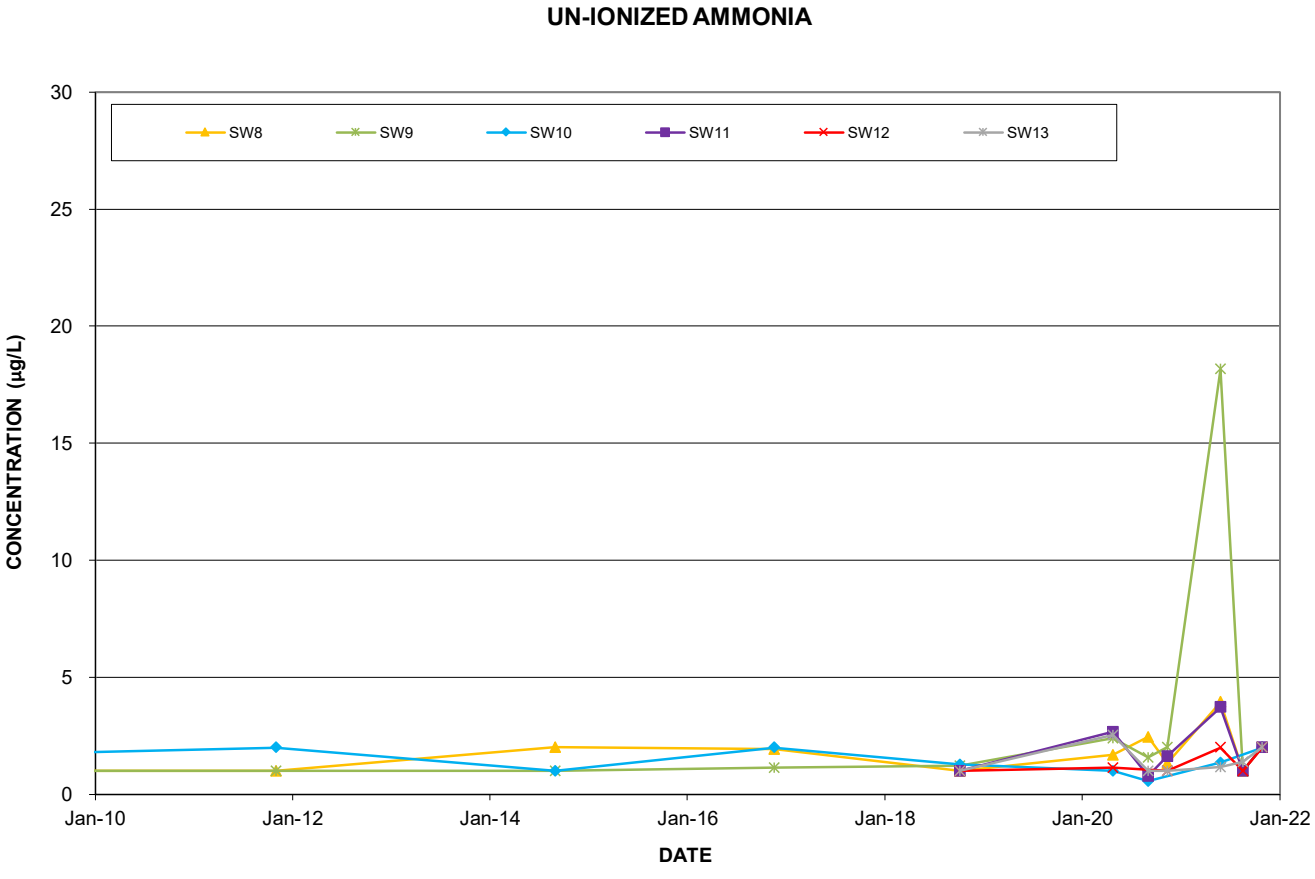
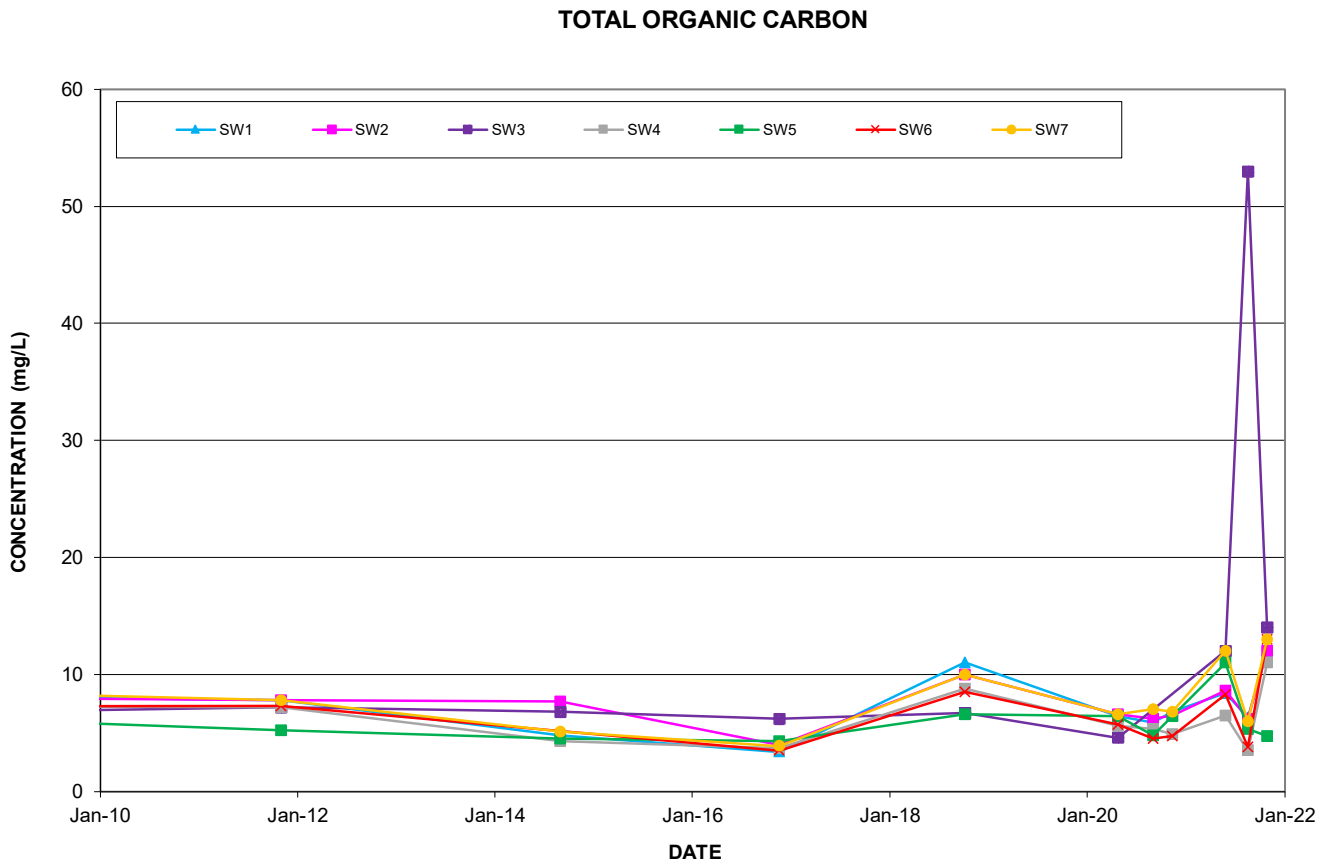


FIGURE A-10
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



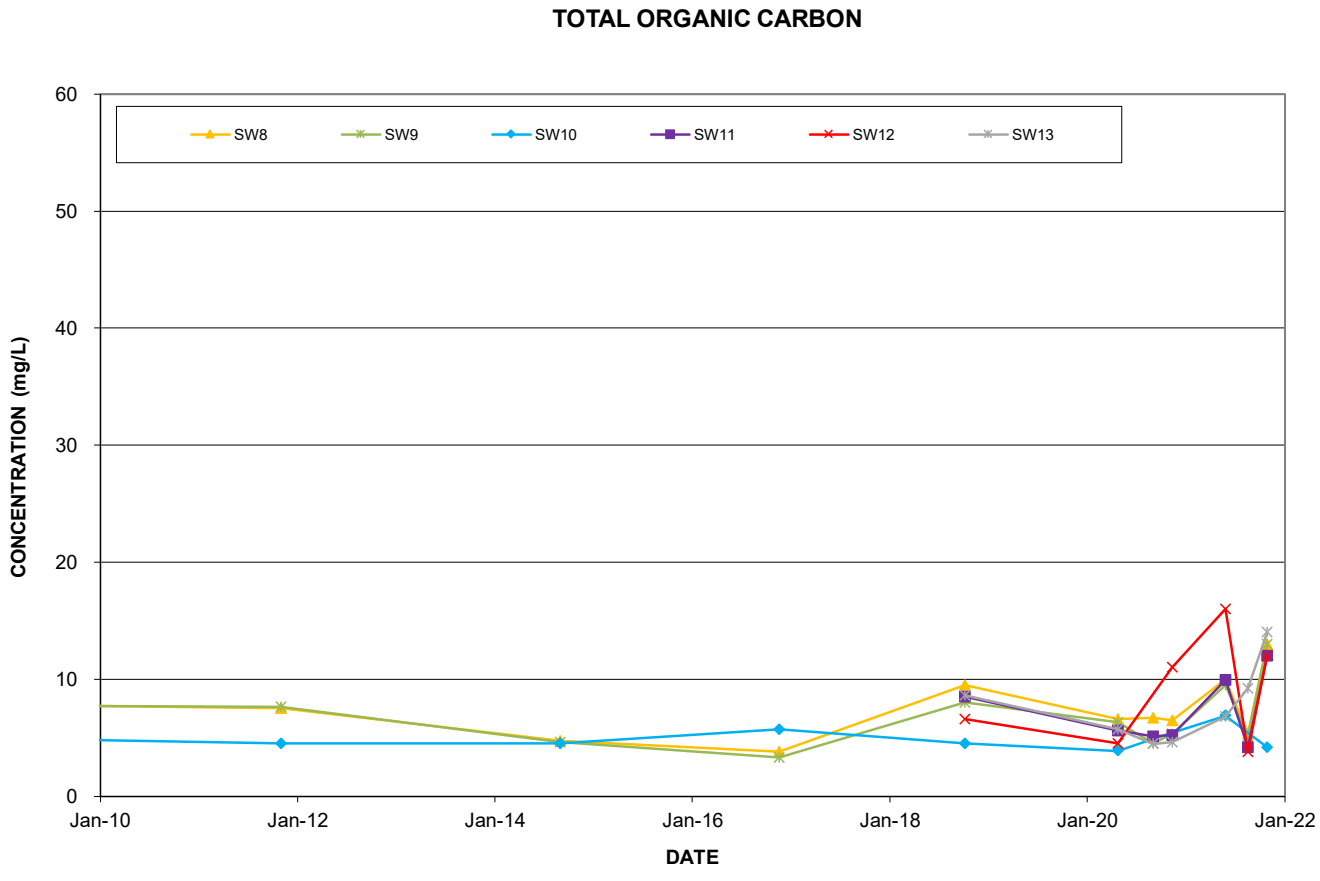
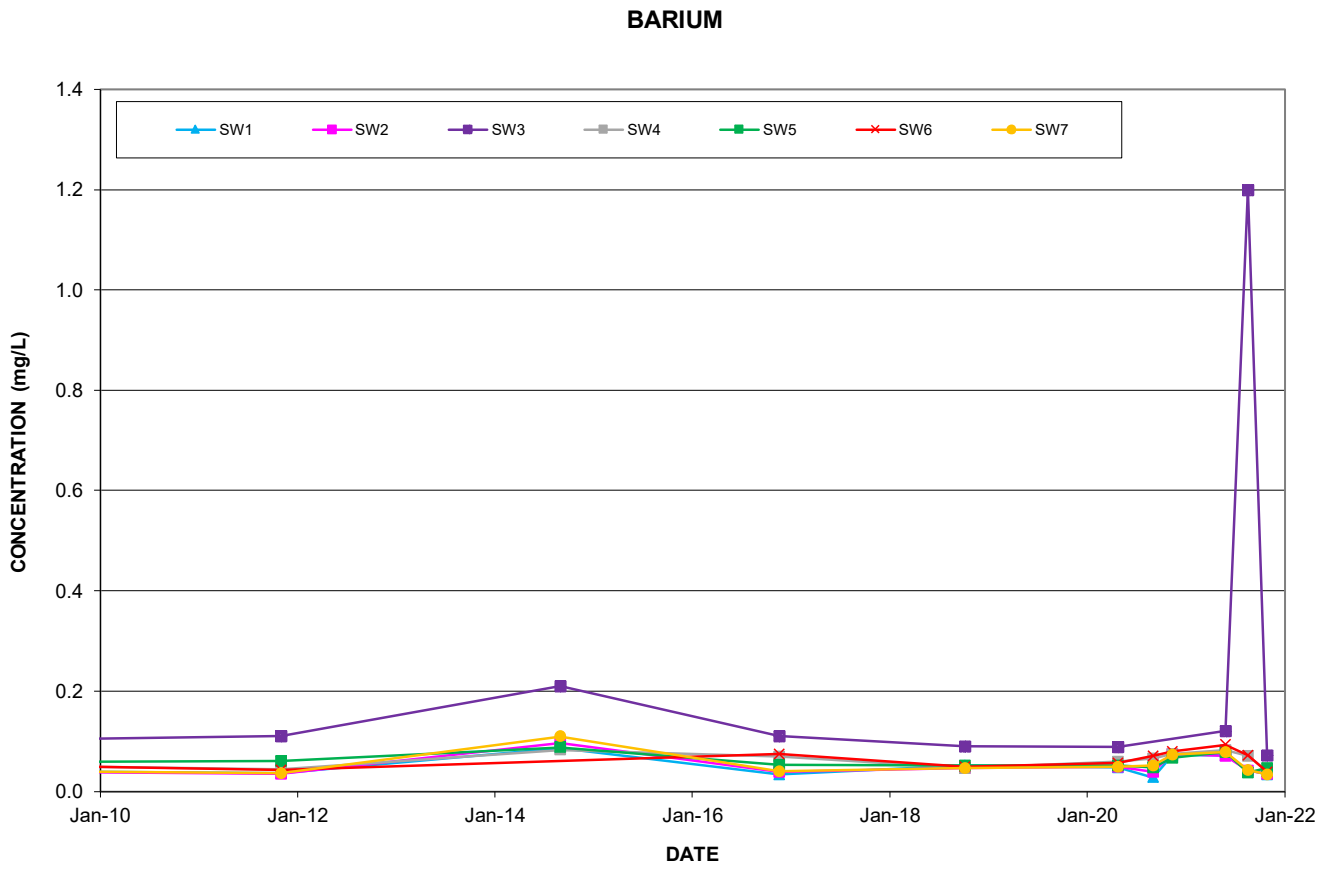


FIGURE A-11
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



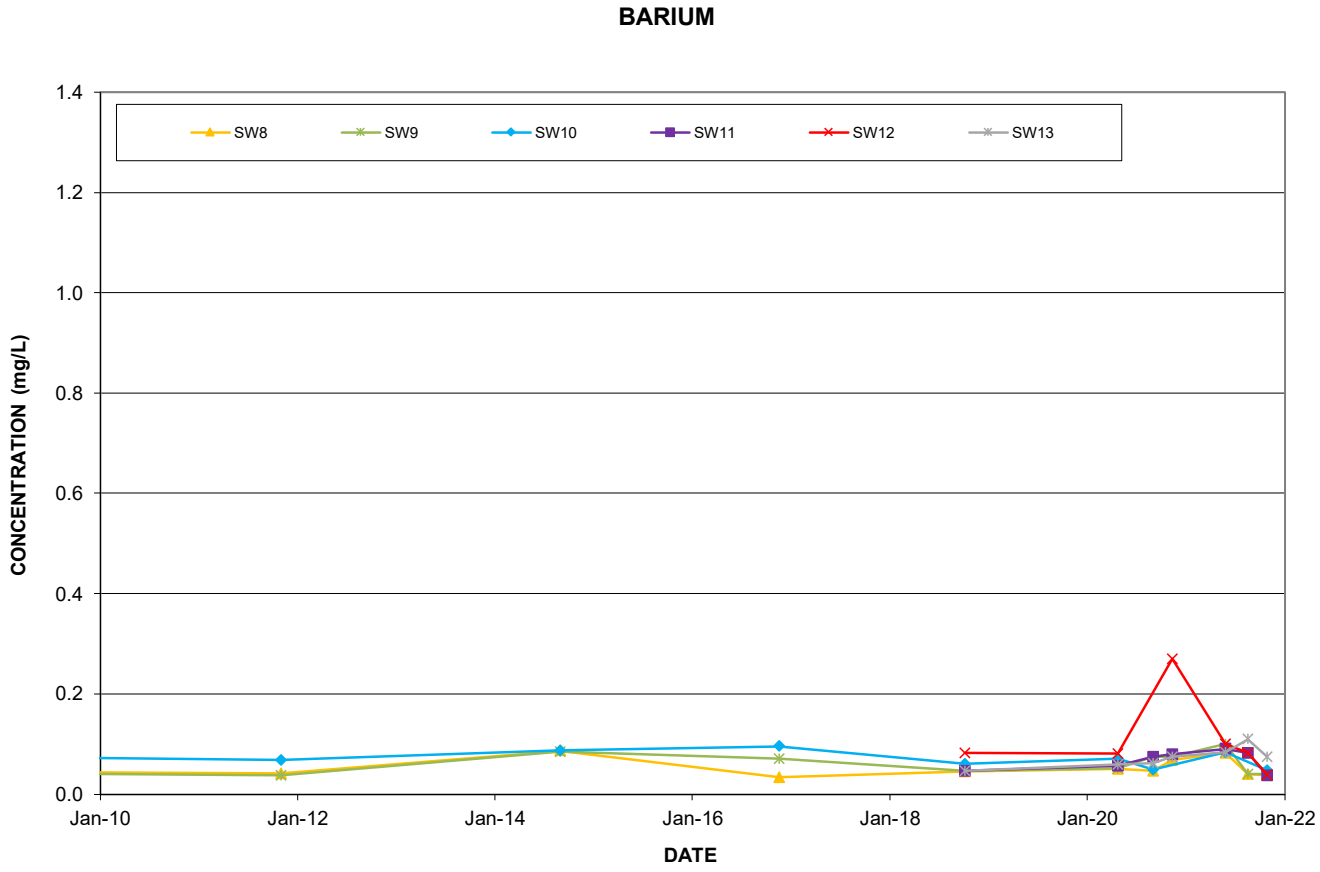
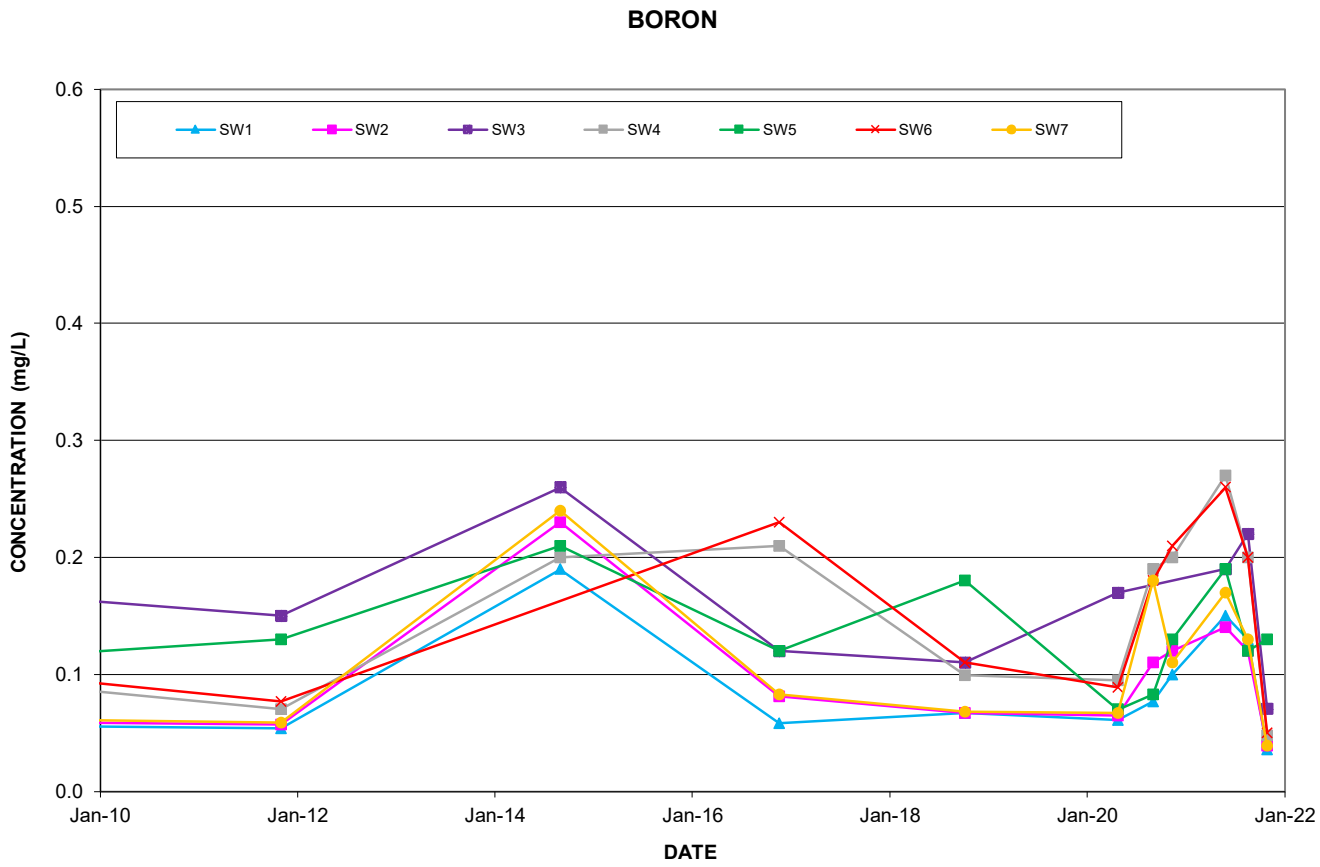


FIGURE A-12
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



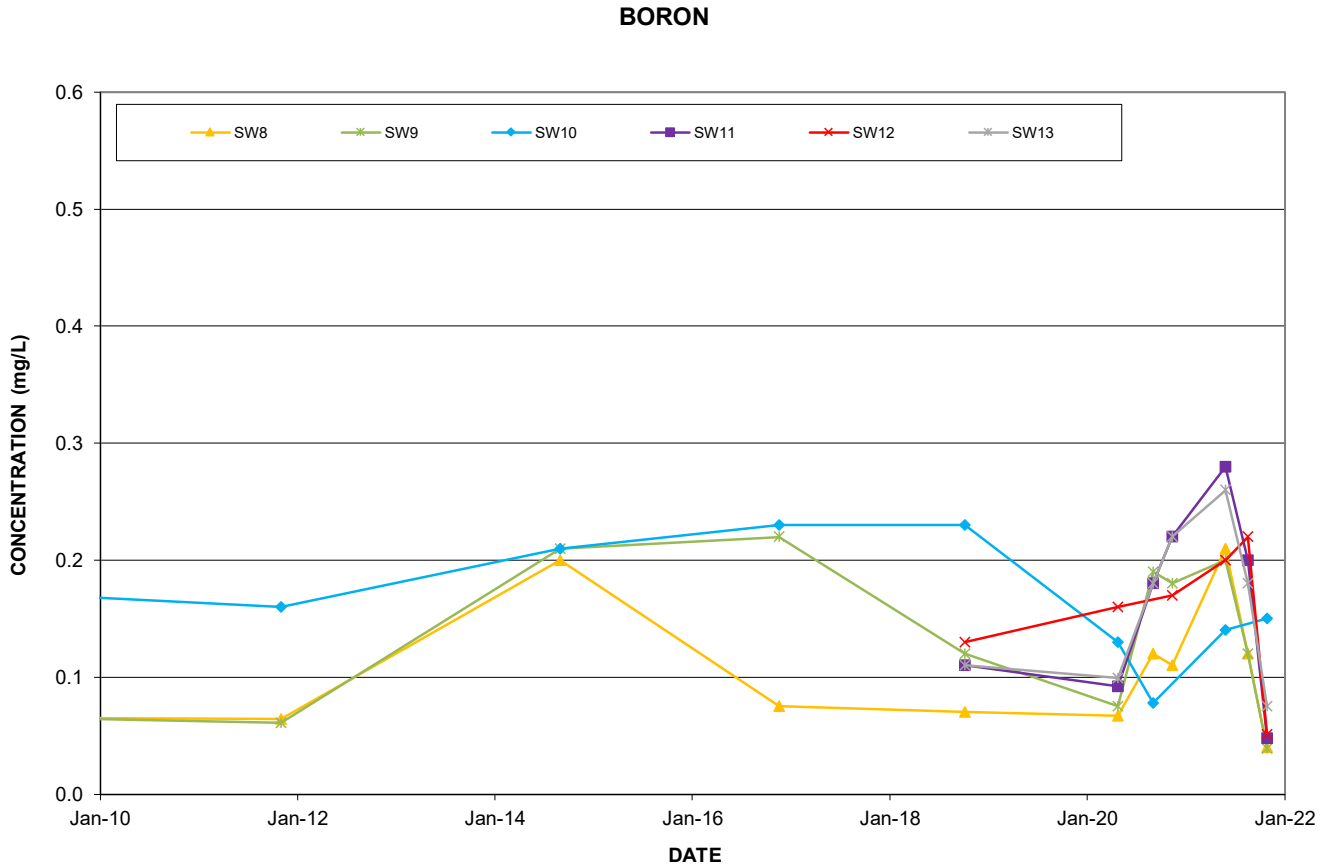
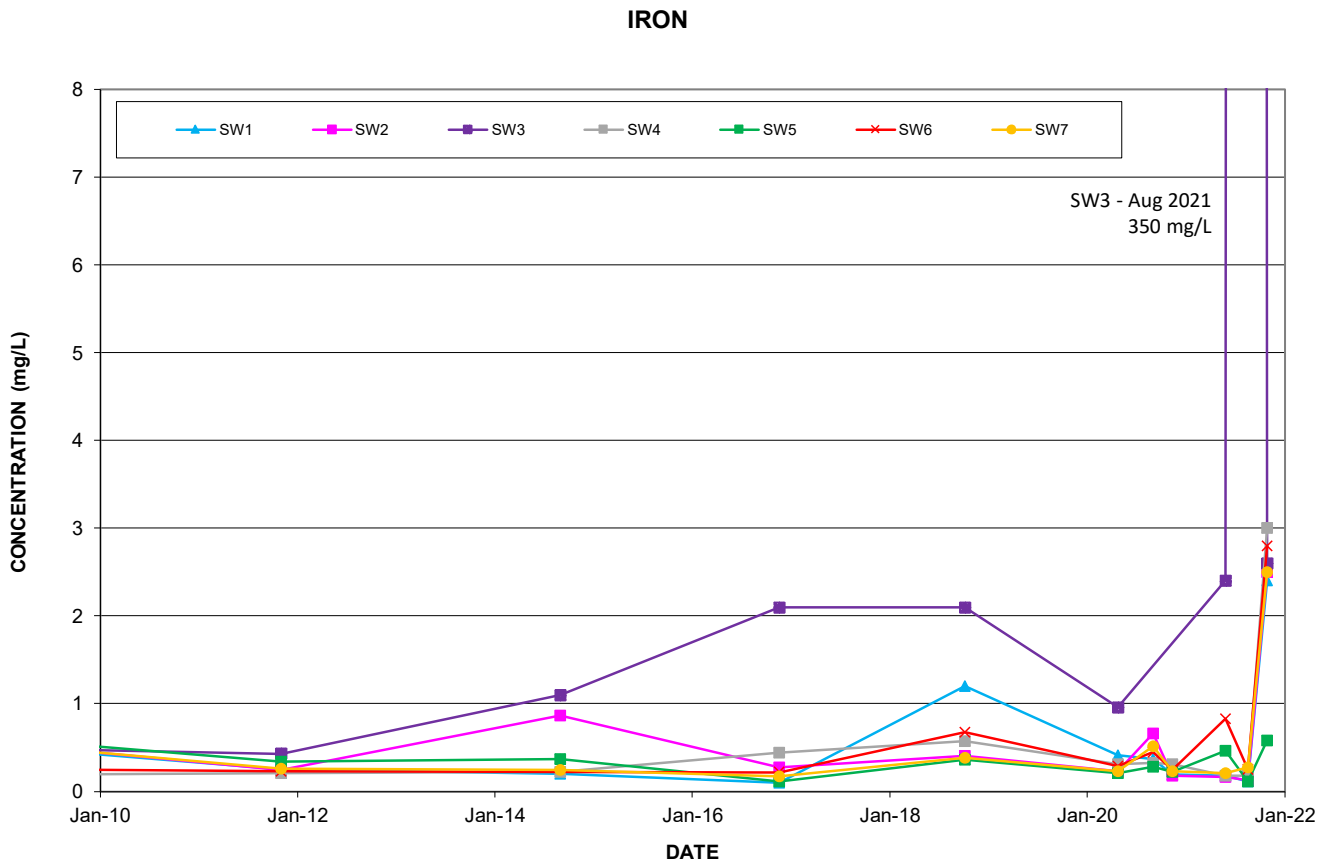


FIGURE A-13
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



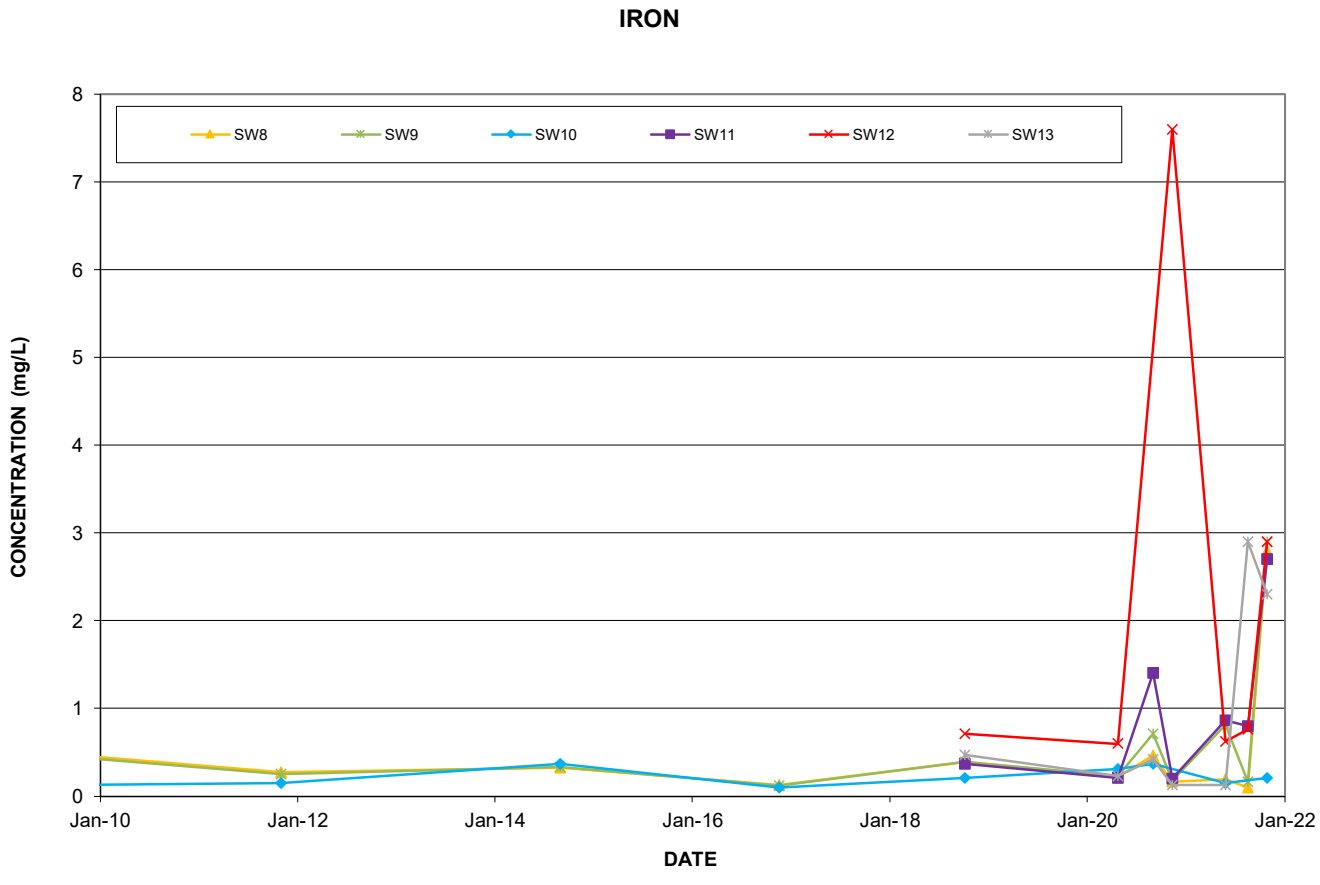
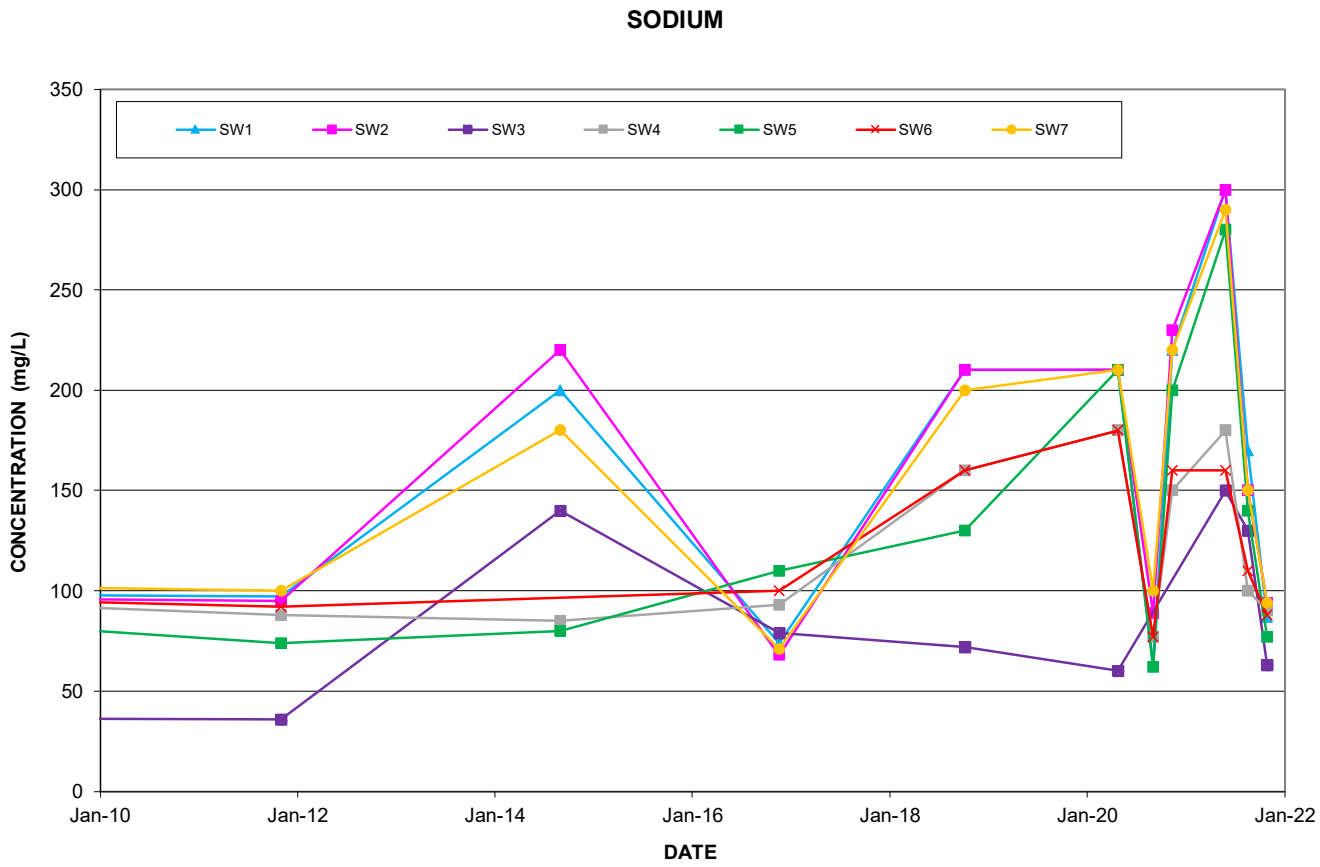


FIGURE A-14
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS



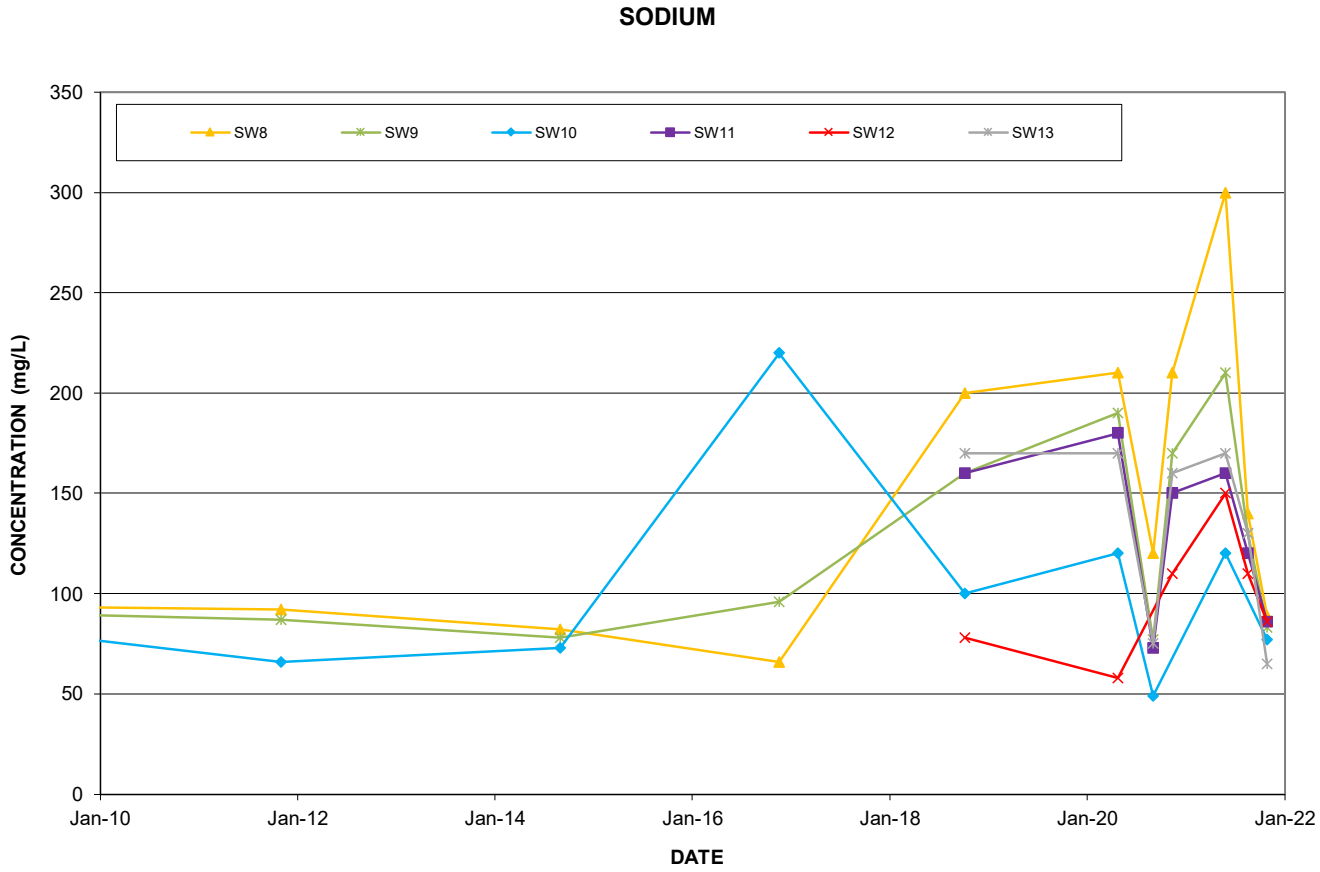


FIGURE A-15
SURFACE WATER STATIONS - CONCENTRATION vs TIME GRAPHS