Groundwater Facility Initiation Report

Introduction:

The Durham York Energy Centre is an energy from waste facility located in the Municipality of Clarington, Ontario. The Durham York Energy Centre is located on approximately 12.1 hectares of rural land. The site property is located on the west side of Osborne Road, southeast of the Courtice Road and Highway 401 interchange, and north of the Courtice Water Pollution Control Plant and the CN Railway.

The water monitoring programs for the site were outlined in the Durham York Energy Centre Groundwater and Surface Water Monitoring Plan, prepared by Stantec Consulting Ltd, dated September 14, 2011, in accordance with Condition 20 of the Environmental Assessment (EA) for the site.

In accordance with the Groundwater and Surface Water Monitoring Plan, baseline, or pre-construction groundwater monitoring commenced in December 2011 prior to facility construction. In January 2013, the Regions submitted a Groundwater and Surface Water Well Development submission which included the borehole logs and the preconstruction baseline groundwater lab analysis.

WSP was retained to monitor groundwater quality conditions in accordance with section 2.0 of the approved Groundwater and Surface Water Monitoring Plan (Stantec, 2011).

Summary of Correspondence with the MOECC on the Groundwater Monitoring Program

The Regions previously submitted Annual Groundwater and Surface Water Monitoring Reports covering the 2012 and 2013 monitoring years. The following table summarizes previous correspondence on the plan and reports with the MOECC:

Date	Submissions/Acknowledgments
September 15, 2011	Final Groundwater and Surface Water Plan Submitted
October 14, 2011	MOECC Approval of Plan
January 28, 2013	Well Development Letter and Report Submission Date
March 4, 2013	MOECC acknowledgement of Well development and Report Submission Date
April 30, 2013	1st Annual Report Submission
May 24, 2013	MOECC Annual Report Comments
September 17, 2013	Teleconference/Meeting per. EA 20.3 (d) Re: 1st Annual Report/Plan
October 18, 2013	Responses to MOECC Report Comments
October 21, 2013	MOECC Approval of Report

April 30, 2014	2nd Annual Report Submission
May 9, 2014	MOECC Approval of Report
June 5, 2014	Teleconference/Meeting per. EA 20.3 (d) Re: 2nd Annual Report/Plan

The purpose of this Groundwater Facility Initiation Report is to summarize the results of all monitoring efforts prior to first receipt of waste in accordance with Condition 20.7 of the EA Notice of Approval. The 2014 Annual Report will be submitted under separate cover prior to April 30, 2015.

Monitor Installation and Maintenance

Six groundwater monitors at four Borehole Locations were installed on the site between December 19 and 21, 2011. Single monitors were installed at Borehole Locations MW1 and MW4, and nests of two groundwater monitors were installed at Borehole Locations MW2 and MW3. These installations were carried out in accordance with the recommended program outlined in the Groundwater and Surface Water Monitoring Plan. In September 2013, monitors MW3A and MW3B were decommissioned due to the construction of the Durham York Energy Centre truck access road in the local area. The two monitors were replaced in March 2014. In addition to the two replacement monitors, two additional groundwater monitors, designated MW5A and MW5B, were installed within the central portion of the property in March 2014.

Well ID	Well Location
MW1	Northwest corner
MW2A &2B (nested)	Northeast corner
MW3A &3B (nested)	Southwest corner
MW4	Southeast corner
MW5A &5B (nested)	Centre of site

During 2012, the riser for Monitor MW4 was shortened in response to the construction of the East Stormwater Management Pond. The monitor shortening involved the removal of 2.6 metres of riser and re-installation of the steel protective casing, in accordance with O. Reg. 903. Approximately 1.5 metres of the total riser were removed in June and the additional 1.1 metres of riser were removed in July 2012. The groundwater elevations within the southeast portion of the site decreased during the November 2012 monitoring event, compared to the March 2012 event, in response to the construction of the East Stormwater Management Pond. This lowering of the water level elevation was exhibited at monitor MW4, which decreased approximately 1.8 metres between March and November 2012. Water level elevations within Monitor MW4 since the November 2012 event are similar to, but slightly higher than, the base elevation of the East Stormwater Management Pond. Potential construction impacts on shallow groundwater elevations were anticipated in Section 2.2 of the Durham York Energy Centre Groundwater and Surface Water Monitoring Plan. The Groundwater Annual monitoring reports did note that the localized influence of the stormwater

management ponds on the shallow groundwater flow regime would not have an adverse influence on the shallow groundwater flow patterns for the areas around the site.

The groundwater elevation at monitor MW1 noticeably decreased during the November 2013 sampling event. The decrease in water level elevation is attributed to excavation activities related to the underground infrastructure and construction of Energy Drive. The influence of the new Energy Drive construction on MW1 will continue to be monitored.

Groundwater monitoring wells MW5A and 5B, in the centre of the site, were established in March 2014, prior to facility operation to monitor for compromise of the waste storage pit. These wells were installed later than the others to avoid interference with site construction as noted in the plan.

Groundwater Sampling

Groundwater sampling events took place as listed in the table below:

Season	2011	2012	2013	2014
Initial sample	December 28	N/A	N/A	N/A
Spring	N/A	March 14	March 22	April 9, June 18
Summer	N/A	June 21	July 12	August 11
Fall	N/A	November 5	September 9, November 26	October 29

Summary of Groundwater Monitoring Program Results

The chemical data collected between December 2011 and October 2014 provide an initial baseline for future comparison of possible groundwater variances. The patterns provide an initial summary of early noticeable patterns at the specific sampling locations and do not indicate an adverse influence on the local shallow groundwater quality from the facility. It is noted that groundwater characteristics will vary between sampling events, and the short term trends listed above are not an indication or a prediction of the future trend for parameter concentrations at this site.

The variations in the groundwater chemistry between the groundwater monitoring locations, and at the two nested monitoring locations (MW2A & 2B and MW3A & 3B) , is attributed to various factors including soil type that the monitors are screened in, off-site (upgradient) influences, and previous land uses at the site. Since groundwater movement through the various silty till soils will be relative slow, compared to a sandy soil, historical influences on the local groundwater quality from previous land uses on-site, and upgradient of the site, will be reflected in the groundwater quality that has been assessed, to date.

The groundwater quality data collected during the sampling events satisfy the drinking water Objectives and Guidelines for the tested parameters, with the exception of a slight exceedance for alkalinity during the June 2012 sampling event at monitor MW4. Although alkalinity is not specifically analysed for the routine monitoring program at this site, the concentration for bicarbonate, a constituent of alkalinity, was 506 mg/L, which slightly exceeds the operational guideline of 500 mg/L. Alkalinity is an operational guideline, as elevated concentrations may produce scale incrustations on utensils, service pipes, and water heaters. It is noted that the concentration for bicarbonate decreased to 346 mg/L during the subsequent November sampling event.

Sodium concentrations generally ranged between 8 mg/L and 36 mg/L at the groundwater monitoring locations, although sodium concentrations at monitor MW3A ranged between 43 mg/L and 50 mg/L. These sodium concentrations satisfy the aesthetic objective for drinking water of 200 mg/L, as indicated in the Technical Support Document for the Ontario Drinking Water Standards, Objectives, and Guidelines. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L, so that information can be communicated to local physicians for their use with patients on sodium restricted diets, the actual aesthetic object for sodium is 200 mg/L. There are no water well users directly downgradient from the Durham York Energy Centre.

The parameter concentrations exhibited at the on-site groundwater monitors are considered to be representative of natural water quality conditions, or are associated with upgradient land uses, in place prior to the construction activities, and are not attributed to the on-site activities.

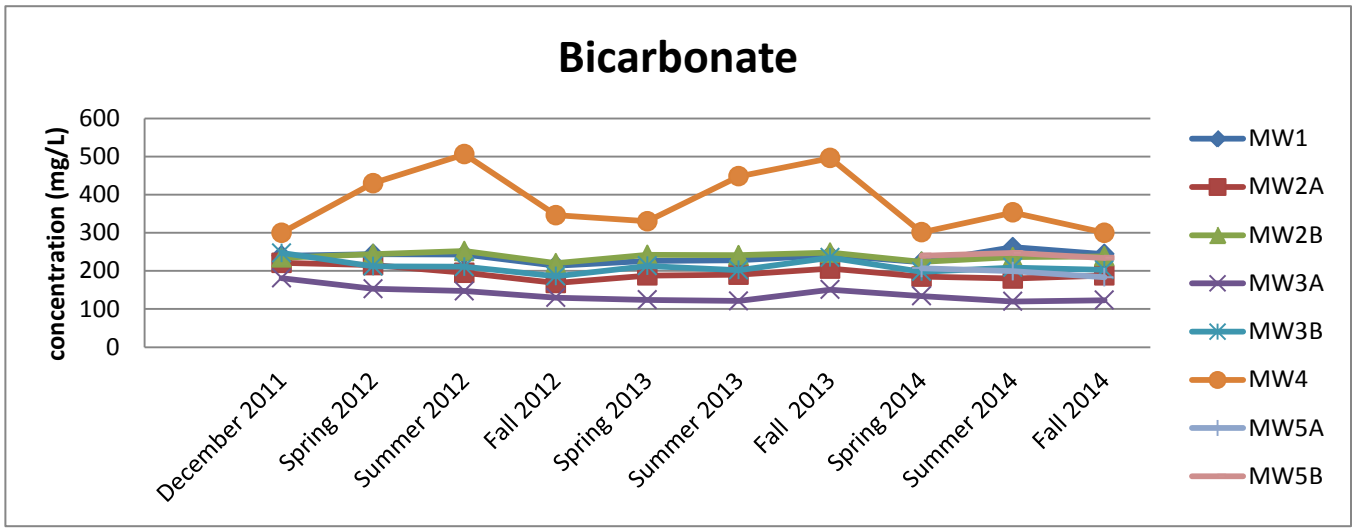
The following time concentration graphs show parameter concentrations for each of the monitoring wells. Please note that there are no time concentration graphs for lead, mercury, cobalt, cadmium and carbonate as most or all of the values have been reported as less than the method detection limit.

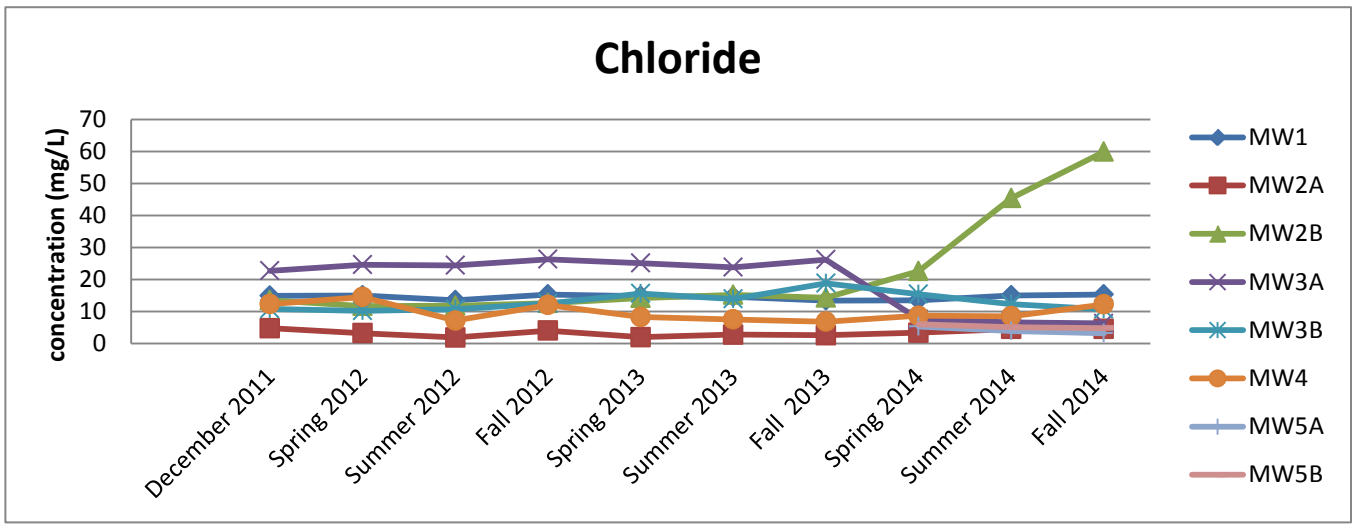
The time concentration graphs for chloride, sodium, sulphate, calcium, magnesium, potassium, boron, and bicarbonate for the groundwater monitors are generally constant over the short term, between December 2011 and November 2014, although the following patterns have been noted.

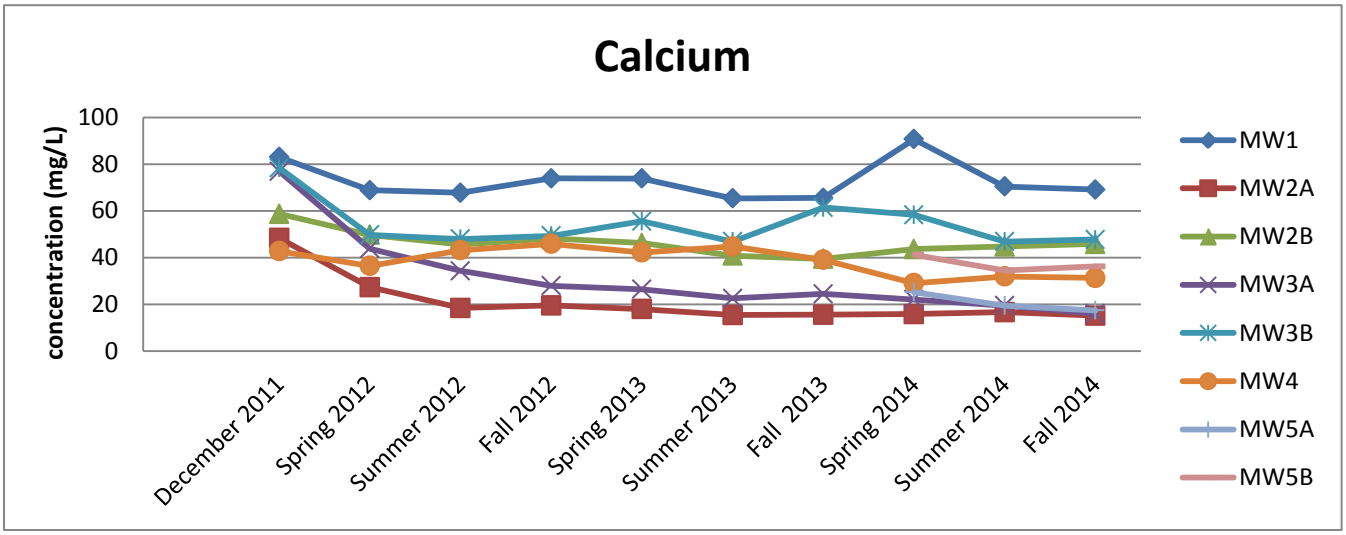
- Within the nested monitors at Borehole Location MW2, concentrations for chloride, sodium, sulphate, calcium, magnesium, and bicarbonate are higher within the shallow monitor, MW2B, compared to the deeper monitor MW2A; whereas boron concentrations were slightly higher at the deeper monitor compared to the shallow monitor, at this location.
- Within the nested monitors at Borehole Location MW3, concentrations for chloride, sodium, and boron (between 2011-2013) are higher within the deeper monitor, MW3A, compared to the shallow monitor MW3B; whereas calcium, magnesium, and bicarbonate concentrations were higher within the shallow

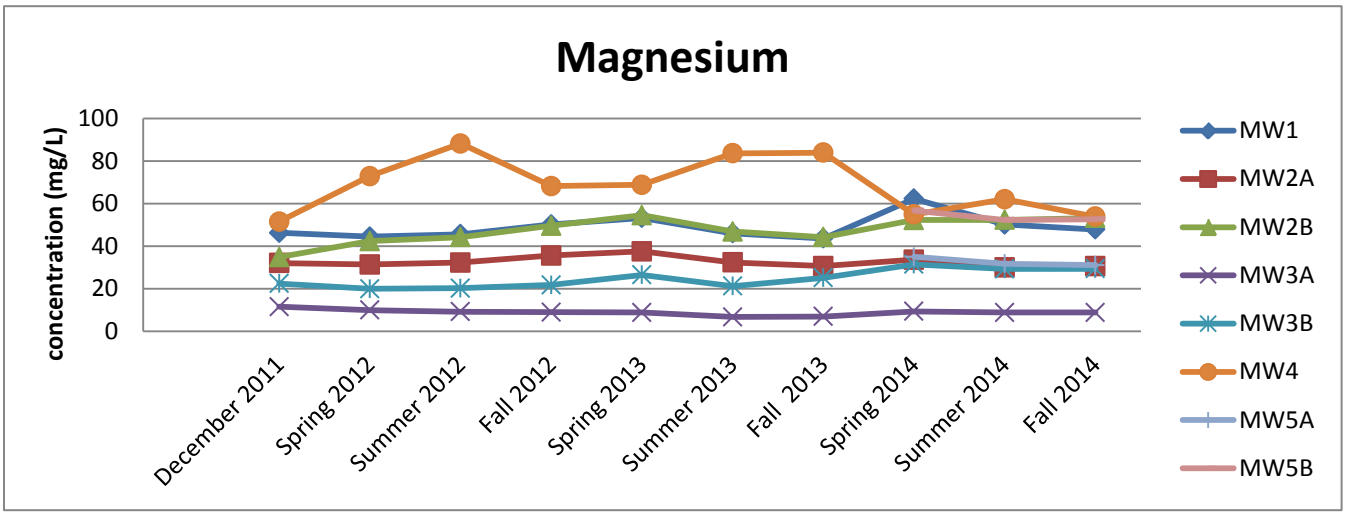
monitor compared to the deeper monitor, at this location. Although a change is noted in 2014 results likely due to the replacement well.

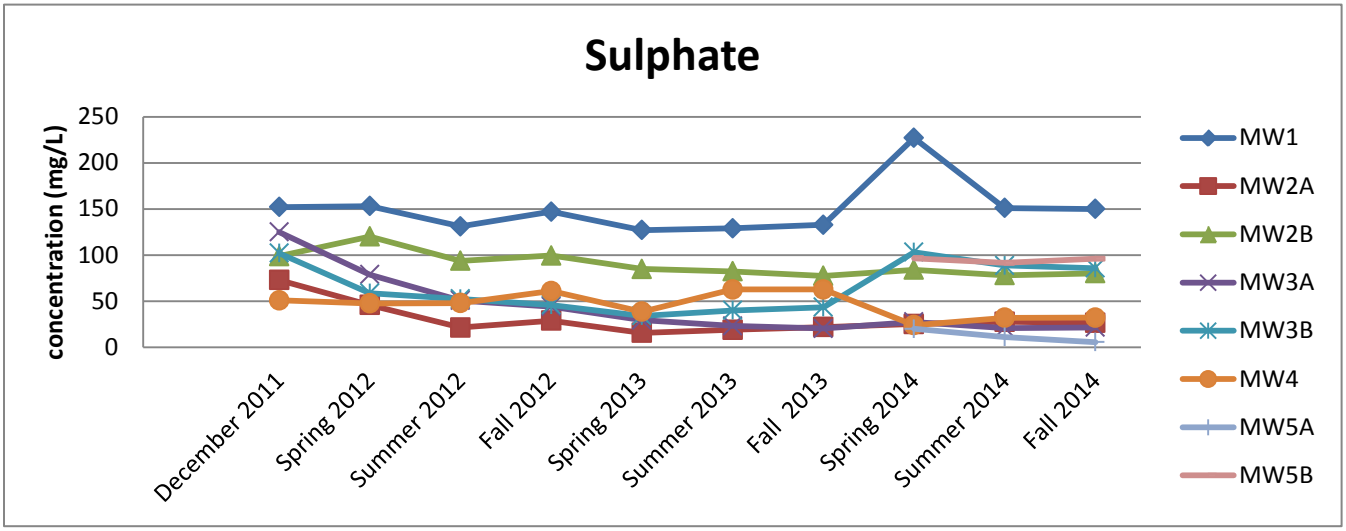
- Concentrations for chloride, magnesium, potassium, and bicarbonate vary over a larger range at Monitor MW4, compared to the other groundwater monitors installed on-site likely due to the variations in soil between the locations.
- Chloride concentrations at monitor 2B have increased over the short term in 2014. Since monitor 2B is located at an upgradient location, the short term increase is attributed to offsite influences such as road salt. The trend at this location will continue to be monitored.

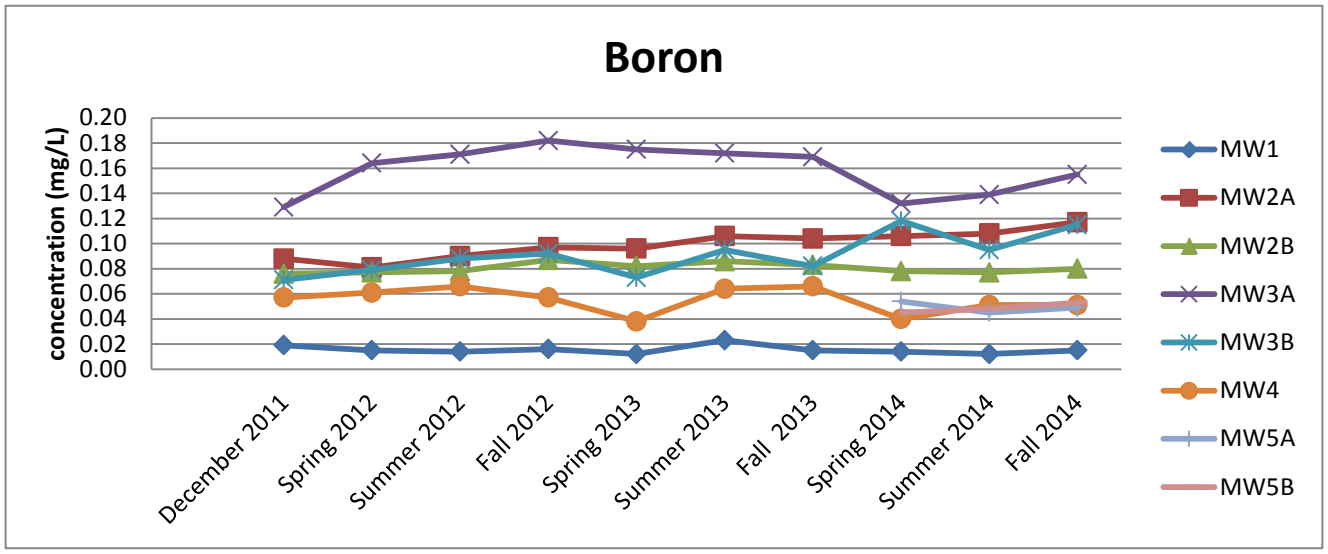


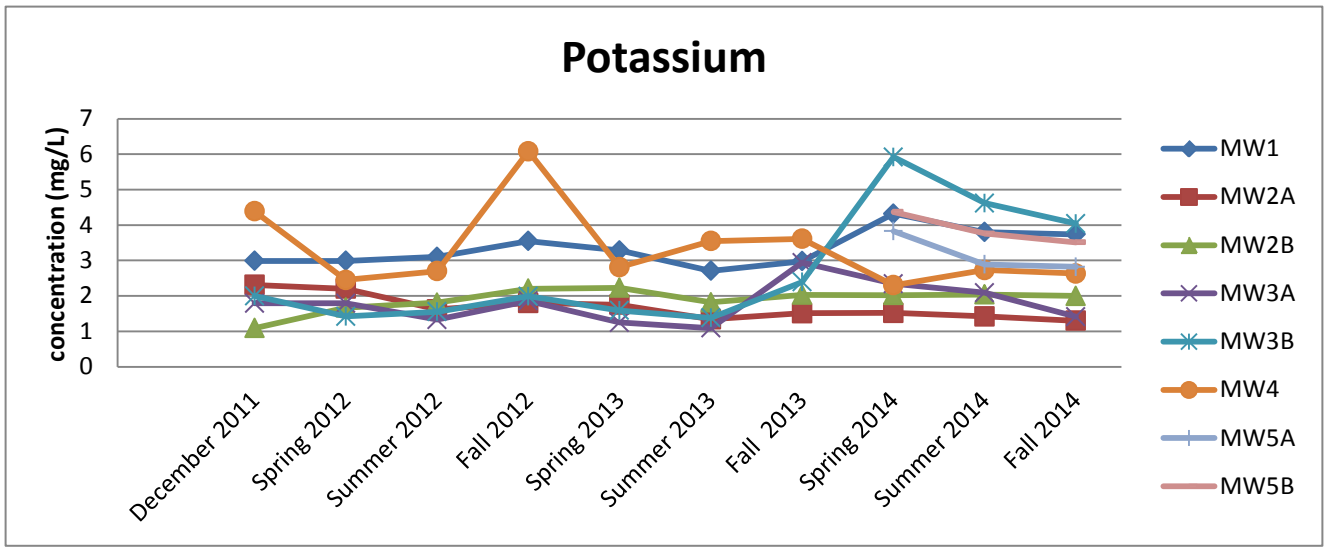


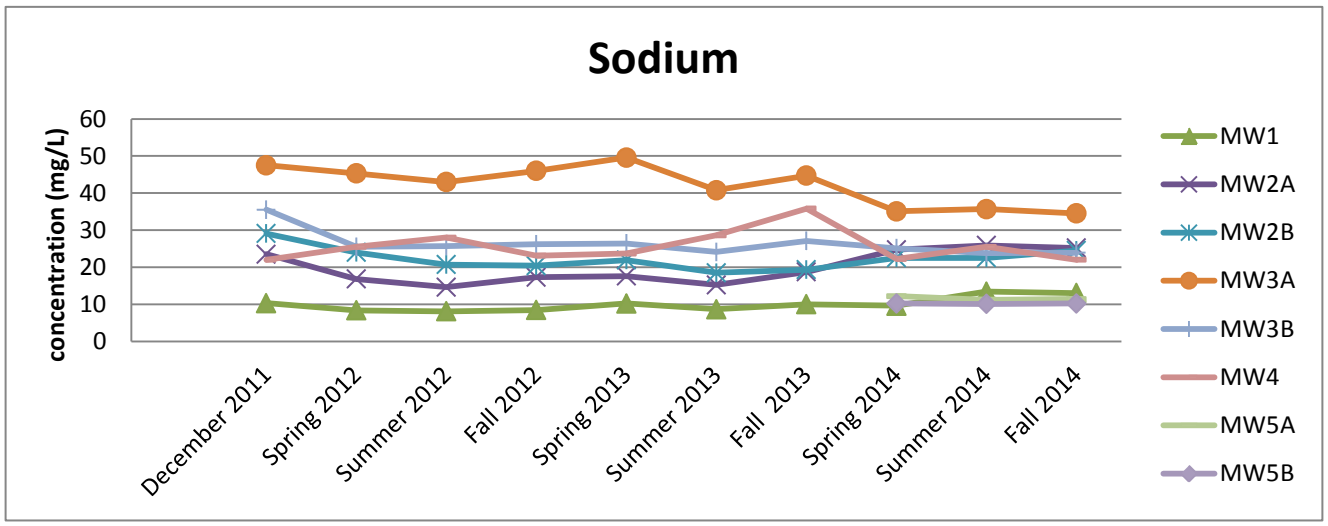

Calcium
concentration (mg/L)
100
80
60
40
20
0
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B


Magnesium
concentration (mg/L)
100
80
60
40
20
0
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B


Sulphate
concentration (mg/L)
250
200
150
100
50
0
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B


Boron
concentration (mg/L)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B


Potassium
concentration (mg/L)
7
6
5
4
3
2
1
0
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B


Sodium
concentration (mg/L)
60
50
40
30
20
10
0
December 2011
Spring 2012
Summer 2012
Fall 2012
Spring 2013
Summer 2013
Fall 2013
Spring 2014
Summer 2014
Fall 2014
MW1
MW2A
MW2B
MW3A
MW3B
MW4
MW5A
MW5B

Conclusions of the Construction Phase Groundwater Monitoring

Facility construction activities have no measurable influence on the shallow groundwater quality on the site. The groundwater quality data gathered to date indicate that concentrations satisfy the Ontario Drinking Water Quality Standards, Objectives, and Guidelines (ODWQS) for the tested parameters. Groundwater quality at each monitoring location is influenced by various factors including the soil type that the monitor is screened in, and historical land uses at the site

Upon the first receipt of waste, the groundwater monitoring program switches from the construction phase to the operations phase for monitoring. The Operations Phase monitoring follows the same frequency of sampling and the same parameters for testing.