CODRINGTON PIT
2015 MONITORING PROGRAM REPORT

Prepared for:
St. Marys Cement Inc. (Canada)
55 Industrial Street
Toronto, Ontario
M4G 3W9

Project No. 13-005-00

Distribution:
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ResEnv Consulting Limited

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December 16, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street
Toronto, Ontario
M4G 3W9

Attention: Mr. Colin Evans
CBM Environment and Lands Manager

Re: Codrington Pit
2015 Monitoring Program Report
File 13-005-00

ResEnv Consulting Limited (ResEnv) is pleased to submit the 2015 Monitoring Program Report in accordance with the Site Plan for the Codrington Pit. A summary of the findings is presented in the executive summary at the front of the report. Details are provided in the report text and technical data are appended.

Thank you for the opportunity to participate in this program. Please contact us if you have any questions.

Yours truly,
ResEnv Consulting Limited

Jason T. Balsdon, M.A.Sc., P.Eng.
Consulting Engineer

EXECUTIVE SUMMARY

St. Marys Cement Inc. (Canada), known locally as CBM Aggregates, owns and operates an above water table pit that is located east of the Village of Codrington, approximately 12 km north of the Town of Brighton. This pit is identified as the Codrington Pit. The pit encompasses lands to the south of Ontario Hydro power-lines in Parts of Lots 32, 33, and 34, Concession 6, Township of Brighton.

The pit was licenced in accordance with its Site Plan on January 30, 2014. In accordance with the Site Plan the Baseline Monitoring Program was completed in 2013 and the Performance Monitoring Program was initiated in 2014. This report presents the monitoring results to the end of 2015.

Based on the findings presented in this report, groundwater elevations, depths, and quality showed no effects from the pit operations in 2015. Similarly, groundwater quality at the residential water wells continued to reflect natural conditions in 2015. No water well complaints were received from residents in 2015. Surface water flow rates and quality also showed no effects from the pit operations in 2015.

It is recommended that the Groundwater Trigger Elevations be updated with the 2015 groundwater levels as they were lower than historically detected and were not affected by pit operations. Also, as the 2015 surface water flow rates show naturally lower values that historically detected, the 2015 flow rates should be used to enhance the baseline database and triggers.

Groundwater and surface water monitoring and reporting should continue in 2016 as outlined in Section 6 of this report.

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1. INTRODUCTION

St. Marys Cement Inc. (Canada), known locally as CBM Aggregates, owns and operates an above water table pit that is located east of the Village of Codrington, approximately 12 km north of the Town of Brighton. This pit is identified as the Codrington Pit. The pit encompasses lands to the south of Ontario Hydro power-lines in Parts of Lots 32, 33, and 34, Concession 6, Township of Brighton. See the Site Location Map of Figure 1 for location details.

The pit was licenced in accordance with its Site Plan on January 30, 2014. In accordance with the Site Plan the Baseline Monitoring Program was completed in 2013 and the Performance Monitoring Program was initiated in 2014. This report presents the monitoring results to the end of 2015.

2. METHODOLOGY

The following groundwater and surface water monitoring was completed during 2015 in accordance with the monitoring requirements of the Site Plan. Details are provided in Table 1 and monitoring locations are shown in Figure 1.

- Quarterly manual groundwater level measurements were obtained for the onsite monitoring wells on March 31, June 3, September 20, and December 11, 2015. Manual groundwater elevations are presented in Table A-1 and Figure A-1, Appendix A. On the same monitoring dates the data were downloaded from the automated water level and temperature probe transducers that measure groundwater levels and temperatures within the monitoring wells at 6 hour intervals. These automated data are presented in Figures A-2 through A-15, Appendix A. It is noted that the automated monitoring was temporarily deactivated in November to allow for the completion of a pumping test, which is documented under separate cover.

- Semiannual sampling was completed for the onsite monitoring wells on March 31 and September 21, 2015. Chemical results are summarized in Table B-1, Appendix B. Parameters were analysed as required, except owing to the laboratory scan package, bismuth was not analyzed, but strontium and vanadium were added.

- Annual residential water well monitoring was completed as summarized below. Groundwater levels are presented in Table A-2, Appendix A. Chemical results are provided in Tables B-2 through B-6, Appendix B. Analytes were the same as those for the onsite monitoring wells, with the addition of bacteria.

ADDRESS	WATER LEVEL DATE	DATE SAMPLED	COMMENTS
[redacted]	June 3, September 21, December 11	September 21	Added to monitoring program in 2015
[redacted]	NA	NA	No one home for two visits and phone numbers no longer in service.
[redacted]	September 21	September 21	
[redacted]	June 3, September 21, December 11	September 21	Added to monitoring program in 2015
[redacted]	September 21	September 21	

- Semiannual water level monitoring was completed for the three wells at the Codrington Fish Research Centre on April 1 and September 21, 2015. Results are provided in Table A-1, Appendix A. There is no access to Well 1 that is used for consumption purposes at the centre.

- Semiannual surface water monitoring at stations SWB and SWC was completed on March 31 and September 21, 2015. Chemical results and flow rates are provided in Table C-1, Appendix C. Watercourse characteristics were used to determine the surface water flow rates. Parameters were analysed as required, except owing to the laboratory scan package, bismuth was not analyzed, but strontium and vanadium were added.

- Annual (field parameters) and semiannual (flow rates) surface water monitoring at springs FH-SW1 and FH-SW2 was completed on April 1 and September 21, 2015. Flow rates and chemical results for the required field parameters are presented in Table C-2, Appendix C. Watercourse characteristics were used to determine the surface water flow rates.

- Precipitation data from the local climatological station in Belleville were documented for use in the assessment of water levels and flow rates. Data prior to each monitoring event are summarized in Table 2.

Laboratory chemical analyses were completed at AGAT Laboratories in Mississauga. Laboratory Certificates of Analysis are on file if required.

3. HYDROGEOLOGIC SETTING

3.1 TOPOGRAPHIC AND PHYSIOGRAPHIC SETTING

The pit is located on a hill, which is approximately 2.5 kilometres (km) wide in an east-west direction and slightly longer in the north-south direction. The hill has a flattened top and is approximately 50 metres (m) higher than the surrounding sand plain.

The maximum natural elevation on the pit is about 204 metres above sea level (m asl) in the western portion of the pit and the minimum elevation is about 180 m asl in the southeastern portion of the pit. A low-lying area at an elevation of about 181 m asl is located in the north-central portion of the pit and is identified to be a seasonal wetland/pond on the topographic mapping. The northern limit of the pit along the Ontario Hydro Easement varies between 180 to 195 m asl, and the southern limit varies between 180 and 195 m asl.

The pit is not in the Oak Ridges Moraine physiographic region or the Oak Ridges Moraine Conservation Plan Area (ORMCPA).

3.2 GEOLOGIC SETTING

The main finding of the extensive drilling on the pit is that there are substantial amounts of sand and gravelly sand in the subsurface and that a large amount of this material is above the water table. Based on a detailed interpretation of the borehole results the subsurface material encountered was grouped into three major units.

Unit 1
Unit 1 includes silt till and silty fine sand that are generally in the order of about 5 m to 8 m thick, but were detected to be at least 11.9 m to 16.8 m deep within the northwestern corner of the pit. This unit is prominent near surface within the northwestern portion of the site.

Unit 2
Unit 2 is the main sand and gravel unit present within the pit. The unit is prominent at surface or below Unit 1 in the southern and eastern portions of the pit. The material of Unit 2 is variable in texture and commonly ranges from fine to medium sand with some (20%) gravel to sand and gravel in approximately equal proportions. The gravel-rich areas appear as lenses or beds within the sand, and the gravel content is variable. The unit reaches a confirmed maximum thickness of 25 m in the south-central and eastern portions of the pit.

Unit 3

Unit 3 is generally fine to medium sand with an occasional lens of coarser material. The unit is present at depth beneath much of the pit and is generally regarded as marginal for use as aggregate due to its fine-grained texture and lack of gravel. Unit 3 is transitional with Unit 2 and essentially represents the gravel-poor phase of the combined unit.

Boreholes advanced near the low-lying area in the north-central portion of the site intersected a shallow silt unit (Unit 1) from 0.6 to 8.2 m below ground surface. This fine grained material tends to restrict the downward movement of water and as a result contains a perched water table.

3.3 GROUNDWATER SETTING

Groundwater levels within the deep monitoring wells on the pit fluctuate on a seasonal basis as a result of the infiltration of precipitation and snowmelt to the water table that will naturally vary between the fall, winter, and spring.

The unconfined groundwater table is inferred to be highest in elevation with the central portion of the pit below the area of high surface topography and where sand occurs near surface. Within the northwestern portion of the site, the fine grained surficial material (silt and silty fine sand) prevents the rapid infiltration of water to the water table and thus prevents the establishment of high water table levels. The direction of groundwater movement is outward from the groundwater high toward the north, south, east, and west. As expected, no groundwater seeps or springs were identified on the pit. The deep unconfined groundwater table is monitored at monitoring wells BH05-2, BH05-18, BH05-19, BH06-1, BH12-2, and BH12-2.

A seasonal perched groundwater table occurs within the wetland/pond area within the north-central portion of the pit. It is interpreted that the perched water table is formed as a result of the slow downward movement of groundwater through the underlying silt. The fine grained soil that contains the perched water table is underdrained by the deeper unconfined water table. Groundwater conditions for the perched water table are assessed based on observations at monitoring well BH05-20.

Based on the water table configuration and the surrounding low areas, it is inferred that vertical hydraulic gradients are downward and the pit is located in a groundwater recharge area.

Considering data to May 2008 and the interpreted groundwater table configuration (Jagger Hims Limited, 2009), the pit average base elevation will be about 177.1 m asl (175.6 m asl + 1.5 m) within the central portion of the pit and will vary along the pit perimeter. Updated groundwater elevations for monitoring wells BH12-1 and BH12-2 were also considered in the pit design. Pit base elevations considered the following data.

MONITOR DESIGNATION	MAXIMUM GROUNDWATER ELEVATION (m asl)	DATE	MINIMUM PIT BASE ELEVATION (m asl)
BH05-2	174.74	May 2008	176.3
BH05-18	167.03	April 2007	168.6
BH05-19	159.82	May 2008	161.3
BH06-1	175.62	May 2008	177.1
BH12-1	153.52	December 2012	155.0
BH12-2	173.09	December 2012	164.5

NOTE: ‘m asl’ indicates meters above sea level.

3.4 GROUNDWATER USE

Residential and stock use of groundwater around the pit occurs from both dug wells and drilled wells. Most wells on record with the Ministry of the Environment and Climate Change are drilled wells, but the results of local water well reconnaissance surveys indicate the presence of a number of dug wells. The dug wells obtain water from an unconfined aquifer, while the drilled wells obtain water from either an unconfined aquifer or deeper confined aquifers.

Six (6) residential water wells were selected for ongoing monitoring around the pit based on the results of the baseline monitoring program as well as the type and depth of the water well. Only residents at the following five wells agreed to participate in the ongoing Performance Monitoring Program. [redacted].

[redacted]

In addition, water wells located over 1.5 km west of the pit at the Codrington Fish Research Centre are included in the Performance Monitoring Program. See Figure 1 for location details.

3.5 SURFACE WATER

On a regional basis, there are few surface watercourses located within 2 km of the pit. One watercourse is Cold Creek, which is about 1 km south of the pit and flows in an easterly direction. A tributary that contributes to Cold Creek originates within 500 m of the pit, as shown in Figure 1, and flows below Old Wooler Road. The status of this tributary is assessed by monitoring station SWC.

Tributaries of Marsh Creek are located north, west, and east of the pit.

- About 1 km west of the pit a tributary flows in a northerly direction toward Murray Marsh, which is located about 2 km northeast of the pit. This tributary has a component of groundwater baseflow that is assessed at stations FH-SW1 and FH-SW2, which are located at the Codrington Fish Research Centre.
- Near the southeastern corner of the pit is a tributary of Marsh Creek. Station SWB allows for the ongoing assessment of groundwater baseflow into this watercourse.
- North of the pit are a number of groundwater seeps and springs that combine with runoff to contribute to surface water flow within tributaries that flow toward Marsh Creek.

4. 2015 PIT OPERATION SUMMARY

In 2015, operations at the pit were related to the construction of infrastructure, including: completion of the scale house and the completion of the pit access road and internal access roads. Some material extraction occurred and was removed from the pit. No extraction occurred below the water table.

4.1 COMPLAINTS AND RESPONSES

No formal complaints regarding pit operations were received in 2015.

5. MONITORING RESULTS

5.1 GROUNDWATER ELEVATIONS AND DEPTHS

Groundwater Trigger Elevations were established for the onsite monitoring wells based on groundwater elevations measured to the end of 2014. These Trigger Elevations represent the minimum groundwater elevation observed. Groundwater elevations that are detected below the Trigger Elevation will initiate a data review progressive process that includes:

1) assessing if the low groundwater elevation is a result of pit operations or if it is a natural occurrence related to climate conditions;
2) if the low elevation is related to pit operations, confirmatory water level measurements will be collected;
3) if the low elevations related to pit operations are confirmed, then mitigation measures will be implemented.

The Groundwater Trigger Elevations and the minimum elevations for 2015 are summarized in the following table.

MONITORING WELL DESIGNATION	GROUNDWATER TRIGGER ELEVATION (m ASL)	MINIMUM 2015 GROUNDWATER ELEVATION (m ASL)	ACCEPTABLE GROUNDWATER ELEVATION (Yes/No)
BH05-2	173.38	173.30	No
BH05-18	166.47	166.43	No
BH05-19	159.29	159.48	Yes
BH05-20	178.18	180.17	Yes
BH06-1	174.05	174.03	No
BH12-1	152.39	152.73	Yes
BH12-2	167.85	173.24	Yes

NOTES:
1) 'm ASL' indicates metres above sea level.
2) '*' indicates minimum value based on pressure transducer result as manual measurement affected by bentonite.

The minimum groundwater elevations for 2015 satisfied the Groundwater Trigger Elevations, except at BH05-2, BH05-18, and BH06-1 in December. As these three monitoring wells are distantly removed from the area of activity within the pit and no water taking occurred for pit operations, it is interpreted that the low water levels are a result of the drier summer and fall months. Therefore, it is recommended that the Groundwater Trigger Elevations be updated with the 2015 groundwater levels.

Groundwater Trigger Levels were also established for the residential water wells and the water wells located at the Codrington Fish Research Centre. The Groundwater Trigger Depths and the maximum depths for 2015 are summarized in the following table. It is noted that depths are used for the water wells since the geodetic elevation of the wells were not available.

MONITORING WELL DESIGNATION	GROUNDWATER TRIGGER DEPTH (m)	MAXIMUM 2015 GROUNDWATER DEPTH (m)	ACCEPTABLE GROUNDWATER DEPTH (Yes/No)
[redacted]	3.71*	3.71	-
[redacted]	2.89	Not Available	Yes
[redacted]	2.39	2.3	Yes
[redacted]	2.45*	2.45	-
[redacted]	3.56	3.48	Yes
CFRC – Well2	Flowing	Flowing	Yes
CFRC – Well 3	1.55	1.55	Yes
CFRC – Well 4	2.07	2.07	Yes

NOTES:
1) 'm' indicates metres.
2) '*' indicates used 2015 level as no baseline levels available.

The Site Plan provides a Water Well Complaint process that details a mitigation process for complaints from residents about the quality or quality of water within their water well. This process will also be used if the monitoring program identifies an unacceptable pit effect to the well water.

Based on the groundwater hydrographs presented in Figures A-1 through A-15, Appendix A, the groundwater levels in 2015 continued to show seasonal patterns of higher groundwater elevations during the late winter, spring, and early summer when snowmelt occurs and/or precipitation is typically greatest. Lower groundwater elevations during the late summer, fall, and winter reflect the influence of less precipitation and more evapotranspiration.

One pattern of note is the greater groundwater elevation changes that occur at monitoring well BH05-20, which is developed within the shallow silt below the low-lying area within the north-central portion of the pit. The groundwater elevations at this monitoring well reflect the elevation of the perched water table, and during some portions of the year the groundwater elevations reflect the elevation of the ponded water around the monitoring well. In 2012 the perched water table achieved a low elevation of almost 5 m below ground surface, whereas in 2015 the low elevation was only about 2.8 m below ground surface.

A comparison of groundwater elevations at BH05-20 (perched water table) to those at nearby BH05-19 (unconfined water table) indicates that the groundwater moves in a downward direction at this location and that water that ponds within the low-lying area continues to drain through the underlying fine grained soil into the deeper unconfined water table.

Temperature graphs for the groundwater at each of the deeper monitoring wells show the expected pattern of generally constant temperatures (7 ºC to 9 ºC) for groundwater. In contrast, within the perched water table at BH05-20 the groundwater temperature fluctuates over a greater range (6 ºC to 11 ºC) as the shallow groundwater is affected more by the ambient temperature of ponded water.

In summary, there were no observed effects on groundwater elevations or depths from operations at the pit in 2015.

5.2 GROUNDWATER QUALITY

Groundwater Trigger Concentrations were established based on major ions as presented in the Trilinear diagram of Figure 2, as well as based on the Ontario Drinking Water Standards, Objectives, and Guidelines (2006) (ODWSOG) that are included in the chemical summary tables of Tables B-1 through B-6, Appendix B. Major ions include parameters that constitute a major proportion of the water quality, and include: alkalinity, chloride, sulphate, calcium, magnesium, potassium, and sodium.

The Trilinear diagram shows that groundwater obtained from the onsite monitoring wells and the residential water wells in 2015 is similar and plots in a similar location to baseline conditions on the diagram. A notable change in groundwater quality will result in a shift in the plotted location of a monitoring well or residential water well on the diagram. For example, [redacted].

Figure B-1 to B-3, Appendix B, provide time concentration graphs for total dissolved solids (TDS), nitrate, and total phosphorous to allow for an assessment of water quality changes with time. In general the 2015 concentrations for these three parameters are similar to baseline conditions. BH05-20 tends to show the highest TDS concentrations, possibly as a result of shallow groundwater effects from the silt within the low-lying area. BH05-18 tends to show the highest nutrient concentrations (nitrate and total phosphorus), likely as a result of agricultural fertilizers.

The following table provides the Trigger Concentrations that are based on 75% of the ODWSOG.

PARAMETER	ODWSOG (mg/L)	TRIGGER CONCENTRATION (mg/L)
TDS	500	375
DOC	5.0	3.75
Sulphate	500	375
Chloride	250	188
Nitrate	10.0	7.5
Aluminum	0.1	0.075
Barium	1.0	0.75
Boron	5.0	3.75
Cadmium	0.005	0.0038
Chromium	0.05	0.038
Copper	1	0.75
Iron	0.3	0.225
Lead	0.01	0.075
Manganese	0.05	0.038
Sodium	200	150
Zinc	5	3.75

NOTE: ‘mg/L’ indicates milligrams per litre.

Nitrate exceeded the Trigger Concentration in groundwater at BH05-18 for the September monitoring event only, aluminum exceeded the Trigger Concentration at BH12-1 in September, and iron and manganese exceeded the Trigger Concentrations in groundwater at 263 Aranda Way.

Hardness was excluded from the Trigger Concentrations as groundwater in the area of the pit is naturally hard and typically exceeds the ODWSOG of 100 milligrams per litre (mg/L). For the onsite monitoring wells the level of turbidity also typically exceeds the ODWSOG as a result of the agitation of sediment within the monitoring wells during sampling.

The nitrate concentration in groundwater at BH05-18 exceeded the ODWSOG of 10 mg/L in September 2015. Groundwater at BH05-19 also showed elevated nitrate concentrations. Elevated nitrate concentrations have historically occurred during baseline conditions at both monitoring wells likely as a result of the application of agricultural fertilizers.

Periodic elevated aluminum and manganese concentrations occur naturally and are often a result of water turbidity. Elevated iron concentrations often occur with elevated manganese concentrations.

[redacted].

In summary, there were no observed effects on groundwater quality from operations at the pit in 2015.

5.3 SURFACE WATER FLOW RATES

Surface water flow rates show a notable difference between stations SWB and SWC as presented in Figure C-1, Appendix C. Station SWB is located right at the groundwater discharge point and thus the flow rates reflect local groundwater elevations. Seasonal patterns or influences from precipitation and overland flow are not apparent. As shown in the following table, the flow rates at SWB for 2015 were within the flow rate range for baseline conditions, except for the low flow rate (0.2 L/s) during September 2015. As the pit operations have not affected groundwater levels near the pit boundaries, the low flow rate in September reflects naturally dry conditions.

STATION	TRIGGER FLOW RATES (2013 and 2014) (L/s)	2015 FLOW RATES (L/s)
SWB	0.35 – 1.67	0.2 – 0.7
SWC	<1 – 51.9	1 – 12.6
FH-SW1	2.9 – 7.4	2.3 – 6.8
FH-SW2	4.9 – 69.4	6.4 – 36.9

NOTE: ‘L/s’ indicates litres per second.

At station SWC the surface water flow rates show an influence from groundwater baseflow, precipitation, and overland flow. A seasonal pattern of flow rates is apparent with greater flow rates during the spring (April) and lower flow rates during the summer and fall. As shown in the table provided above, the flow rates at SWC for 2015 were within the flow rate range for baseline conditions. Similar to station SWB, the September flow rate is lower than observed in April 2015.

At the Codrington Fish Research Centre, the flow rates at stations FH-SW1 and FH-SW2 also show a notable difference. FH-SW1 is located right at a groundwater discharge point, whereas as FH-SW2 is located further from the spring source and shows an influence from groundwater baseflow, precipitation, and overland flow. Only the September flow rate at FH-SW1 showed a slight decrease in 2015 relative to baseline conditions. However, as operations at the pit had not extracted below the water table and local groundwater elevations and surface water flow had not been influence by pit operations, the slight decrease in flow rate at FH-SW1 is attributed to natural conditions.

It is recommended that the baseline Trigger Flow Rates be updated with the 2015 flow rates to account for the naturally low flow rates measured in September 2015.

5.4 SURFACE WATER QUALITY

Surface Water Trigger Concentrations were established based on major ions as presented in the Trilinear diagrams of Figure 2, as well as based on the Provincial Water Quality Objectives (1994 plus updates) (PWQO) that are included in the chemical summary tables of Tables C-1 and C-2, Appendix C.

The Trilinear diagrams show that the surface water quality is similar, and is similar to groundwater quality, except at station FH-SW1, which shows a slightly greater chloride and sulphate composition. A notable change in surface water quality will result in a shift in the plotted location of a station on the diagram.

Figure C-2 to C-4, Appendix C, provide time concentration graphs for total dissolved solids (TDS), nitrate, and total phosphorous to allow for an assessment of water quality changes with time. In general the 2015 concentrations for these three parameters are similar to baseline conditions, with surface water at station SWB generally showing lower concentrations than at station SWC.

The following table provides the Trigger Concentrations that are based on 75% of the PWQO.

PARAMETER	PWQO (µg/L)	TRIGGER CONCENTRATION (µg/L)
Ammonia (unionized)	0.02*	<0.02**
Aluminum	75	56
Beryllium	1100	825
Boron	200	150
Cadmium	0.5	0.375
Chromium	8.9	6.68
Cobalt	0.9	0.68
Copper	5	3.75
Iron	300	225
Lead	25.0	18.8
Molybdenum	40	30
Nickel	25	18.8
Phosphorus	30	22.5
Silver	0.1	0.1**
Vanadium	6	4.5
Zinc	20	15

NOTES:

1) 'µg/L' indicates micrograms per litre.
2) '*' indicates value is milligrams per litre (mg/L).
3) '**' indicates Trigger Concentration is analytical method detection limit.

Surface water quality naturally satisfies the Trigger Concentrations and PWQO, except for total phosphorus at stations SWB and SWC, and for iron at station SWC. A second pattern of note is that parameter concentrations tend to be greater at station SWC compared to station SWB, likely as a result of the contribution of overland flow and its influence on soil erosion.

In summary the surface water quality shows no effects for the pit.

6. 2016 MONITORING PROGRAM

Based on the 2015 monitoring program findings, it is recommended that the Performance Monitoring Program detailed in the Site Plan, and presented in Table 1 be continued in 2016. The 2016 Monitoring Program Report should be completed prior to March 31, 2017.

7. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings presented in this report, we are pleased to provide the following conclusions.

- Groundwater elevations, depths, and quality showed no effects from the pit operations in 2015. Similarly, groundwater quality at the residential water wells continued to reflect natural conditions in 2015. No water well complaints were received from residents in 2015.

- Surface water flow rates and quality showed no effects from the pit operations in 2015.

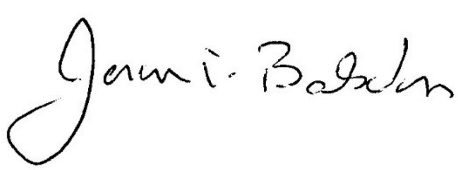
The following recommendations are provided for consideration in 2016.

- The Groundwater Trigger Elevations should be updated with the 2015 groundwater levels as they were lower than historically detected and were not affected by pit operations.

- As the 2015 surface water flow rates show naturally lower values that historically detected, the 2015 flow rates should be used to enhance the baseline database and triggers.

- Groundwater and surface water monitoring and reporting should continue in 2016 as outlined in Section 6 of this report.

Prepared by:
ResEnv Consulting Limited



Jason T. Balsdon, M.A.Sc., P.Eng.
Consulting Engineer

8. REFERENCES

Ontario Ministry of the Environment (MOE), 2003, Revised June 2006.
Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. PIBS 4449e01.

Ontario Ministry of the Environment and Energy (MOEE), 1994 and updates.
Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy. ISBN 0-7778-8473-9 rev, PIBS 3303B.

Tables

TABLE 1
MONITORING PROGRAM SUMMARY
CODRINGTON PIT

MONITORING PROGRAM			
MONITORING LOCATIONS	**FREQUENCY**	**PARAMETERS**	**COMMENTS**
GROUNDWATER			
BH05-2, BH05-18, BH05-18, BH05-19, BH06-1, BH12-1 (formerly A), BH12-2 (formerly C)	Quarterly	Water Levels	BH05-19 and BH05-20 will be decommissioned during extraction.
	Semiannually	Field parameters, inorganics, metals	
	Annually if onsite fueling or fuel storage.	Petroleum Hydrocarbons	
Six (6) Residential Wells within 1 km*	Annually	Water Levels	Proposed residential wells include: 1 north of site, 1 east of site, and 4 along Old Wooler Road.
	Annually	Field parameters, inorganics, metals, microbiological.	
Fish Hatchery Wells (assume 2)	Semiannually	Water Levels	Where access is granted.
SURFACE WATER			
SWB, SWC	Semiannually	Flow Rates	Tributaries of Marsh Creek and Cold Creek.
	Semiannually	Field Parameters, Inorganics, Metals	
Fish Hatchery Springs	Semiannually	Flow Rates	Where access is granted.
	Annually	Field Parameters	

NOTES:

1) * denotes wells to be sampled will depend on access approval by landowner.

2) Quarterly indicates March, June, September, and December.

3) Annually indicates September.

4) Semiannually indicates March and September.

5) Field parameters include: pH, temperature, conductivity, turbidity, and dissolved oxygen.

6) Inorganics include: TDS, hardness, total ammonia, conductivity, DOC, orthophosphate, pH, sulphate, alkalinity, chloride, nitrite, and nitrate.

7) Metals include: aluminum, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, silver, sodium, strontium, vanadium, and zinc.

8) Petroleum Hydrocarbons include: BTEX and PH (F2 to F4).

9) Microbiological includes: background, total coliforms, E-Coli, and streptococci.

10) Precipitation conditions will be documented prior to sampling springs and undertaking sampling activities.

TABLE 2
PRECIPITATION SUMMARY
CODRINGTON PIT

DATE	PRECIPITATION (mm)
March 25	0
March 26	8.1
March 27	4.2
March 28	Trace
March 29	0
March 30	3.0
March 31	Trace

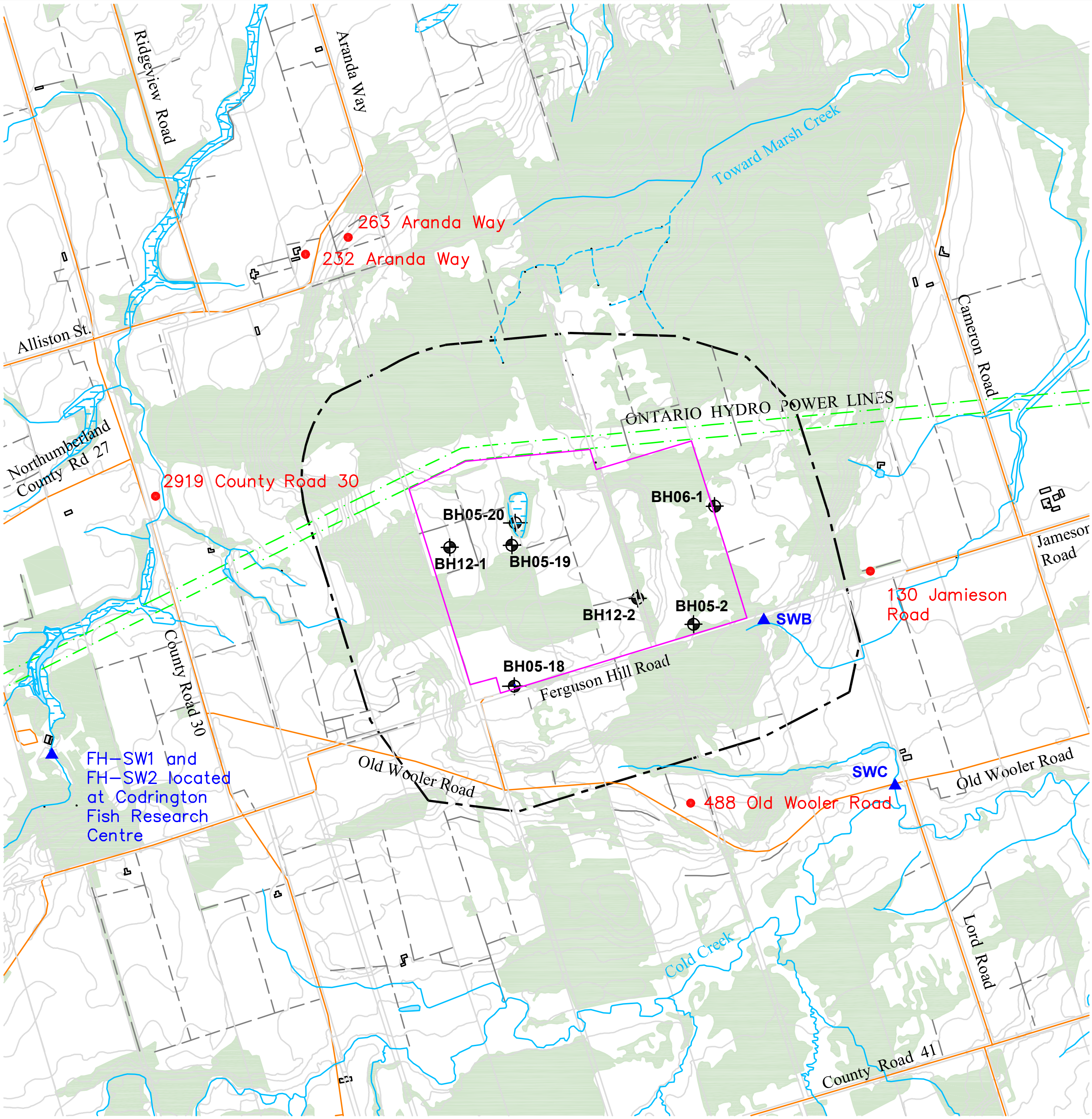
DATE	PRECIPITATION (mm)
May 28	0
May 29	Trace
May 30	21.8
May 31	10.2
June 1	Trace
June 2	6.0
June 3	0

DATE	PRECIPITATION (mm)
September 15	0
September 16	0
September 17	0
September 18	0
September 19	6.0
September 20	0
September 21	0

DATE	PRECIPITATION (mm)
December 5	0
December 6	0
December 7	0
December 8	0
December 9	0.4
December 10	0.6
December 11	Trace

NOTE: 'mm' indicates millimetres. Data from Belleville, except December 9 to 11 is from Trenton A.

Figures



LEGEND

PIT LOCATION

BH05-2 MONITORING WELL LOCATION AND DESIGNATION

500 m RADIUS FROM THE PIT

APPROXIMATE LOCATION OF DOMESTIC WATER WELLS

SWB SURFACE WATER STATION LOCATION AND DESIGNATION

250 0 250 m

MAP SOURCE:
OBM 1:10000 MAPPING, NAD 83, ZONE 18 AND HYDROGEOLOGICAL STUDY (GENIVAR, 2013).

SITE LOCATION MAP

2015 MONITORING PROGRAM REPORT - CODRINGTON PIT
for St. Marys Cement Inc. (Canada)

DATE: DECEMBER 2015	SCALE: 1:25000
PROJECT: 13-005-00	REF. NO.: F1-SP

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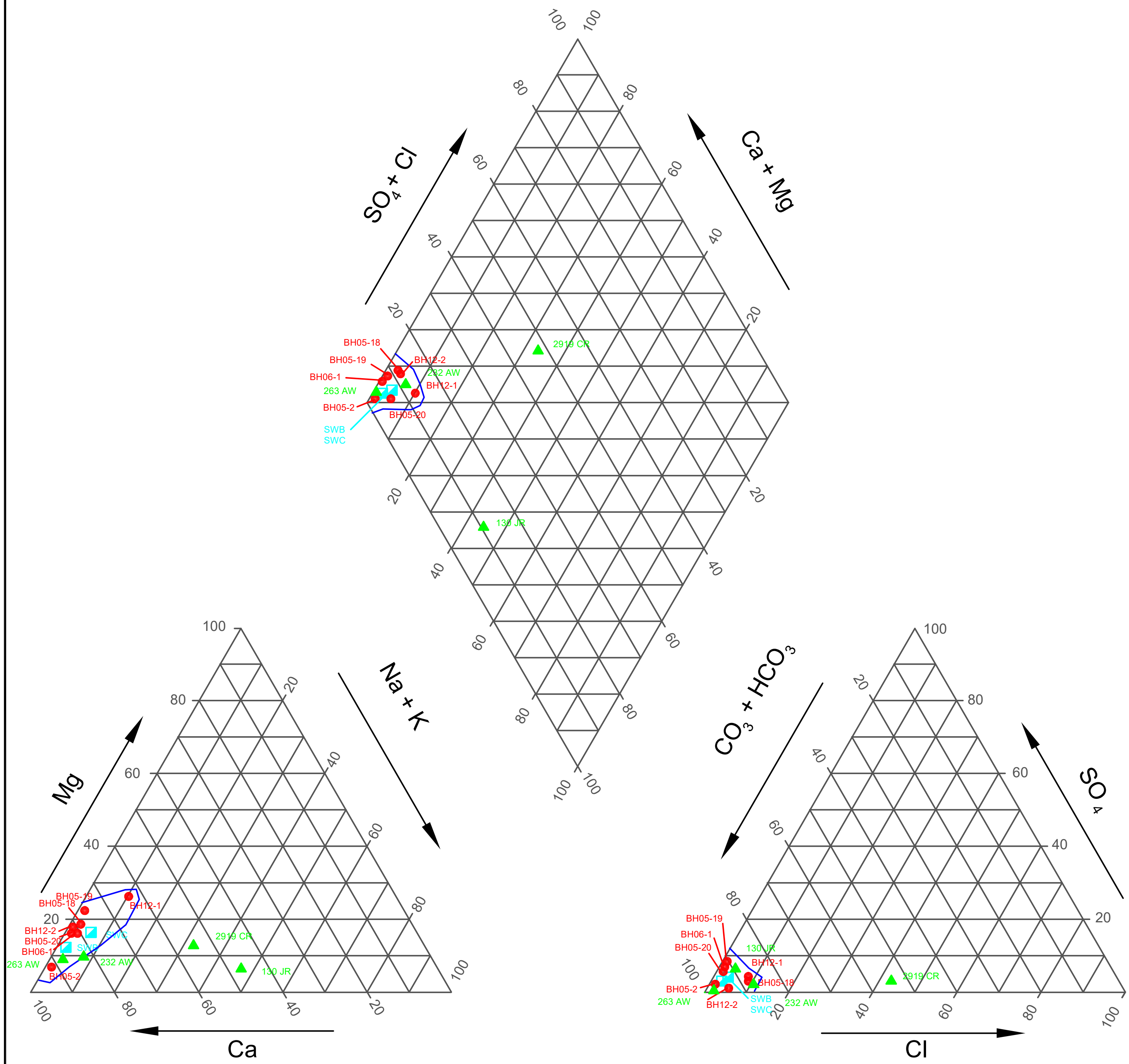
FIGURE 1



LEGEND

BASELINE GROUNDWATER AND SURFACE WATER QUALITY (PRE 2015)

MONITORING WELL

RESIDENTIAL WELL

SURFACE WATER

2015 WATER QUALITY - TRILINEAR DIAGRAM

2015 MONITORING PROGRAM REPORT
CODRINGTON PIT
For St. Marys Cement Inc. (Canada)

DATE: DECEMBER 2015	SCALE: AS SHOWN
PROJECT: 13-005-00	REF. NO.: F2

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FIGURE
2