

Memorandum

To: James "Buzz" Surwilo, VTDEC Waste Management
Michael Laurent, Omya, Inc.

From: Rhiannon Scott PhD, David Adilman PG; Geosyntec Consultants

Date: 29 April 2016

Subject: Proposed Modifications to the Approved Monitoring Plan, Omya Verpol Site and Hogback Quarry, Florence, VT.

This memorandum presents proposed modifications to monitoring requirements as set forth in the current Monitoring Plan for the Omya Verpol Site (Geosyntec, 2012). The approved plan incorporated several rounds of modifications to the original Site Monitoring Plan written in 2008 (Geosyntec, 2008). The most recent revisions to the Monitoring Plan were approved by the Vermont Department of Environmental Conservation (VTDEC) on October 1, 2012, and have been implemented since the May 2013 monitoring event. In this memorandum we propose further changes to the 2012 approved plan based on results of recent monitoring events through October 2015 and Omya's November 19, 2015 Solid Waste Disposal Certification. This certification allows the disposal of tailings in an unlined Tailings Management Facility (TMF), adjacent to the lined TMF (VTDEC, 2015). These modifications are presented by analyte class (flotation agent, metals and perchlorate) and media (groundwater and surface water) below. A revised Monitoring Plan table (Table 1) is attached along with figures illustrating the proposed changes. Figure 1 presents the 2016 proposed monitoring locations and analytes for groundwater and surface water and Figure 2 presents the 2012 approved groundwater and surface water monitoring program for comparison. This document has received preliminary approval from the Vermont Agency of Natural Resources.

Flotation Agent

Under the current monitoring program, flotation agent analysis is conducted at 10 on-site groundwater monitoring wells and 9 surface water monitoring locations (Figure 2). Since the fall of 2006, groundwater and surface water samples have been analyzed for flotation agent compounds using the high performance liquid chromatography/tandem mass spectrometer (HPLC/MS/MS) method (developed by Test America of Sacramento, CA).

Omya used a tall oil hydroxyethyl imidazoline (TOHI)-based flotation agent that contained residual aminoethylethanolamine (AEEA) until October 2010, when the use of a new tall oil diethylenetriamine imidazoline (TODI)-based flotation agent containing residual diethylenetriamine (DETA) commenced. Tailings containing flotation agents were historically disposed of in the unlined Tailings Settling Cells and Tailings Management Areas (TMAs).

Between October 2009 and December 31, 2010, these former unlined facilities were closed, and since January 3, 2011 the tailings have been mechanically dewatered prior to being disposed in the new lined TMF. The switch to a DETA-derived flotation agent should result in no significant increase in AEEA and TOHI concentrations in groundwater or surface water during future monitoring, and no significant increases have been observed. Monitoring for DETA commenced in May 2011 and DETA has not been detected in any groundwater or surface water samples. Further, new tailings management practices limit the possibility of release of any flotation agent constituents to surface water or groundwater.

Groundwater

Since flotation agent monitoring began in the fall of 2006, flotation agent compounds AEEA and TOHI have been detected in only three monitoring wells (Wells B and 2 [AEEA and TOHI], and Well K [AEEA only]), all of which are located immediately downgradient of the former unlined TMAs.

The nine years of groundwater data and revised practices at the site indicate that AEEA and TOHI are unlikely to be detected in other groundwater monitoring wells. We recognize the importance of continued monitoring for AEEA and TOHI, and therefore do not recommend the removal of all monitoring wells with no AEEA or TOHI detections. We recommend eliminating flotation agent analysis from three select monitoring wells: Well J, Well 96-2, and Well R.

Well J is screened deeper than the bottom of the Dolomite TMA. Well J-1 has a shallower screened interval that is more appropriate for monitoring groundwater that may come in contact with residual tailings in the closed Dolomite TMA. Therefore, we recommend the continued sampling of Well J-1 and the elimination of flotation agent analysis at Well J.

Neither AEEA nor TOHI has been detected at Well 96-2 or Well R, and neither location is immediately downgradient of a TMF; therefore, we recommend the elimination of flotation agent monitoring from Well 96-2 and Well R.

In addition to J-1 mentioned above, several monitoring wells will continue to be monitored for flotation agent constituents (Figure 1). Well K and Well L-1 (the replacement for Well L) will continue to be sampled for AEEA, TOHI, and DETA. Well M will also continue to be monitored for AEEA. CDP Well (#5) will continue to be monitored for AEEA and DETA per the 2012 sampling plan. Well B and Well 2, where flotation agent constituents have historically been detected, will also continue to be sampled for AEEA and TOHI.

In the unlikely event that AEEA or TOHI is detected in any of the wells L-1, M, or CDP Well (#5), then AEEA/TOHI analysis would resume at downgradient wells, Wells R and 96-2.

We recommend that DETA be added to the Monitoring Plan for Well B and Well 2, which are both near the current lined TMF and newly permitted adjacent unlined TMF.

Surface Water

As described in the Omya Stormwater Pollution Prevention Plan (Vanasse Hangen Brustlin, Inc., 2011), stormwater from the Tailings Management Facility Phase I Area is collected in the East Settling Basin. Because this basin is located adjacent to the newly permitted unlined TMF, we recommend the addition of DETA analysis at the East Settling Basin (Figure 1).

Metals (Arsenic, Iron, Manganese)

Under the 2012 Monitoring Plan, collection of samples for metals analysis occurs at 18 on-site wells and 1 surface water location. The purpose of metals analysis is to evaluate the extent and potential causes of elevated arsenic and manganese at the site. Analysis for iron is primarily directed at evaluation of groundwater geochemistry. Through October 2015, 18 rounds of groundwater data have been collected for these metals. The existing data define the extent of arsenic, indicate that the extent is not increasing, and demonstrate that no significant exposures to arsenic exist.

Groundwater

We recommend the elimination of metals sampling at five locations where arsenic has never been detected above its Vermont Groundwater Enforcement Standard (VTGES) of 10 µg/L:

- Well J
- Well N
- Well 96-1
- Well 96-2
- Well R

Iron concentrations at Well 96-2 and Well 96-1 have been below the secondary VTGES since 2009. The iron concentrations at Well J, Well N, and Well R are above the secondary VTGES, but remain steady. Manganese concentrations have never been above the VTGES except at Well J where concentrations hover around the VTGES and are steady.

Additionally, arsenic and manganese concentrations have never been detected above their respective VTGES at Well C-2. Iron concentrations at Well C-2 have been below the secondary VTGES since 2009. Metals behavior at Well C-2 is well understood based on the data that has been collected since 2008; however, Well C-2 is the furthest upgradient well and provides information on the geochemistry upgradient of the TMF Area. Therefore, we recommend Well C-2 be sampled for metals annually in May.

We recognize the importance of continuing to monitor the extent of arsenic and manganese across the site; therefore, twelve groundwater wells located throughout the site will continue to be analyzed in May and October for all three metals:

- Well B
- Well E
- Well K
- Well L-1
- Well 2
- CDP Well #5
- MW-10
- Well J-1
- Well D
- Well T
- Well U
- Well V

If site conditions change or if arsenic or manganese concentrations at these wells suggest that the extent of elevated arsenic is increasing, we may recommend expanding the monitoring effort to include additional existing wells.

Surface Water

We recommend that metals analysis at MSGP S/N 002 be suspended. MSGP S/N 002 is only sampled when the PIQ is discharging to the location during the sampling event. This has occurred in only 3 of 18 sampling events since 2007 and arsenic concentrations have never been detected above the VTGES.

Perchlorate

Under the 2012 Monitoring Plan, collection of samples for perchlorate analysis occurs at three locations in the Hogback Quarry. There is no VTGES for perchlorate; however, there is a Vermont Health Advisory for perchlorate of 4 µg/L. Perchlorate concentrations at the Northern Outfall and the Quarry Sump have been well below the Vermont Health Advisory since sampling began in 2008. We recommend the elimination of perchlorate sampling at the Northern Outfall.

Perchlorate concentrations in the Southern Outfall have periodically been above the Vermont Health Advisory; since the Quarry Sump feeds into the Southern Outfall, we recommend keeping perchlorate sampling at the Quarry Sump and Southern Outfall.

Under the 2012 Monitoring Plan, the field duplicate and field blank for perchlorate is collected at the Northern Outfall. Since we are recommending the removal of perchlorate sampling at the

Northern Outfall, we recommend performing the field duplicate and field blank at the Southern Outfall.

Other Analytes

We may at times wish to collect additional samples or conduct additional analyses to evaluate the fate and transport of arsenic at the Site. These additional analyses may include analytes such as alkalinity, nitrate, sulfate, chloride, phosphate, free ferrous iron, and total organic carbon (TOC).

Contingency

Attachment 1 shows Omya's planned future tailings management areas. Omya is currently managing tailings in the Phase 1 area; as the Phase I area reaches capacity, tailings will be managed in the Phase 2 area followed by the Phase 3 area. As tailings are moved to new areas, additional analyses, or sampling locations maybe added to the sampling plan (e.g. the addition of DETA to Well J-1).

Summary

The attached recommended sampling table incorporates the following changes relative to the approved October 2012 Monitoring Plan:

- Elimination of all flotation agent analysis at Well J, Well 96-2, and Well R;
- Addition of DETA analysis at Well B and Well 2;
- Addition of DETA at the East Settling Basin;
- Elimination of metals analysis at Well J, Well N, Well 96-1, Well 96-2, and Well R;
- Modifying metals sampling at Well C-2 to occur annually in May;
- Elimination of metals analysis at surface water location MSGP S/N 002;
- Elimination of perchlorate sampling at the Northern Outfall; and
- Addition of a field duplicate and field blank from the Southern Outfall.

Thank you for your consideration of these recommendations, which we believe provide an appropriate focus going forward for monitoring at this site. We would be happy to discuss them with you in detail at your convenience.

References

Cambridge Environmental and Geosyntec Consultants, 2008, An Assessment of the Environmental and Public Health Impacts of Omya's Operations in Florence, Vermont: Integrated Report, February 15, 2008.

Geosyntec Consultants, 2008, Site Monitoring Plan, Omya Verpol Plant, Florence, Vermont, March 2008.

Geosyntec Consultants, 2012, Proposed Modifications to the Approved Monitoring Plan, Omya Verpol Site and Hogback Quarry, Florence, Vermont, April 2012.

Vanasse Hangen Brustlin, Inc., 2011, Stormwater Pollution Prevention Plan for Omya Inc. Verpol Plant, Pittsford, Vermont, October 2011.

VTDEC, 2015, Solid Waste Disposal Facility Certification, Omya, Inc., Verpol Site, Whipple Hollow Road, Florence Vermont, November 19, 2015. Vermont Agency of Natural Resources, Department of Environmental Conservation, Waste Management and Prevention Division.

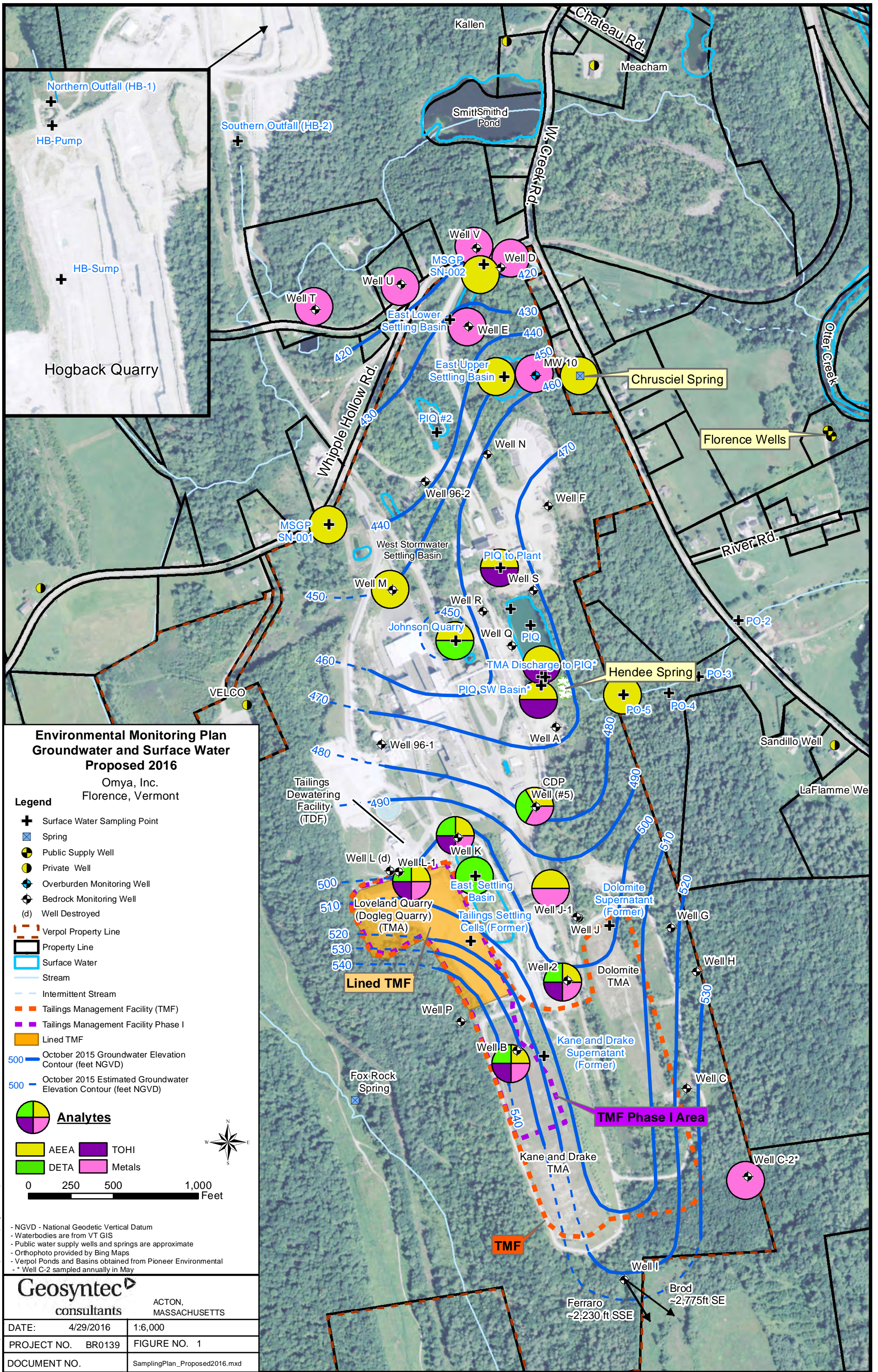
Table 1
Environmental Monitoring Plan
April 2016
Omya, Inc.
Florence, Vermont

SAMPLING LOCATIONS	QA/QC SAMPLES									
	Flotation Agent ¹			Perchlorate ²	Metals (total/ dissolved) ³	Field Duplicates	MS/MSD AEEA, TOHI, DETA ⁴	MS/MSD metals	Field Blank	Equipment Rinsate
	AEEA	TOHI	DETA							
GROUNDWATER MONITORING WELLS										
Well B	X	X	X		X	X		X		
Well C-2 ⁵					X					
Well D					X					
Well E					X					
Well J										
Well K	X	X	X		X	X		X		
Well L-1	X	X	X		X					
Well M	X									
Well N										
Well 96-1										
Well 96-2										
Well 2	X	X	X		X					
CDP Well (#5)	X		X		X		X		X	
MW-10 (East Plant)					X					
Well J-1	X				X					
Well R										
Well T					X					
Well U					X					
Well V					X					
SURFACE WATER										
PO-5 (Hendee Spring)	X									
East Settling Basin			X							
PIQ to Plant ^{6,7}	X	X								
TMA Discharge to PIQ ^{6,7}	X	X								
PIQ SW Basin ⁶	X	X				X				
Johnson Quarry	X		X				X			
EUSB ⁸	X									
MSGP S/N 001 ⁸	X									
MSGP S/N 002 ⁸	X									
Chrusciel Spring ⁸	X									
Hogback Quarry										
Quarry Sump				X						
Northern Outfall										
Southern Outfall				X		X			X	

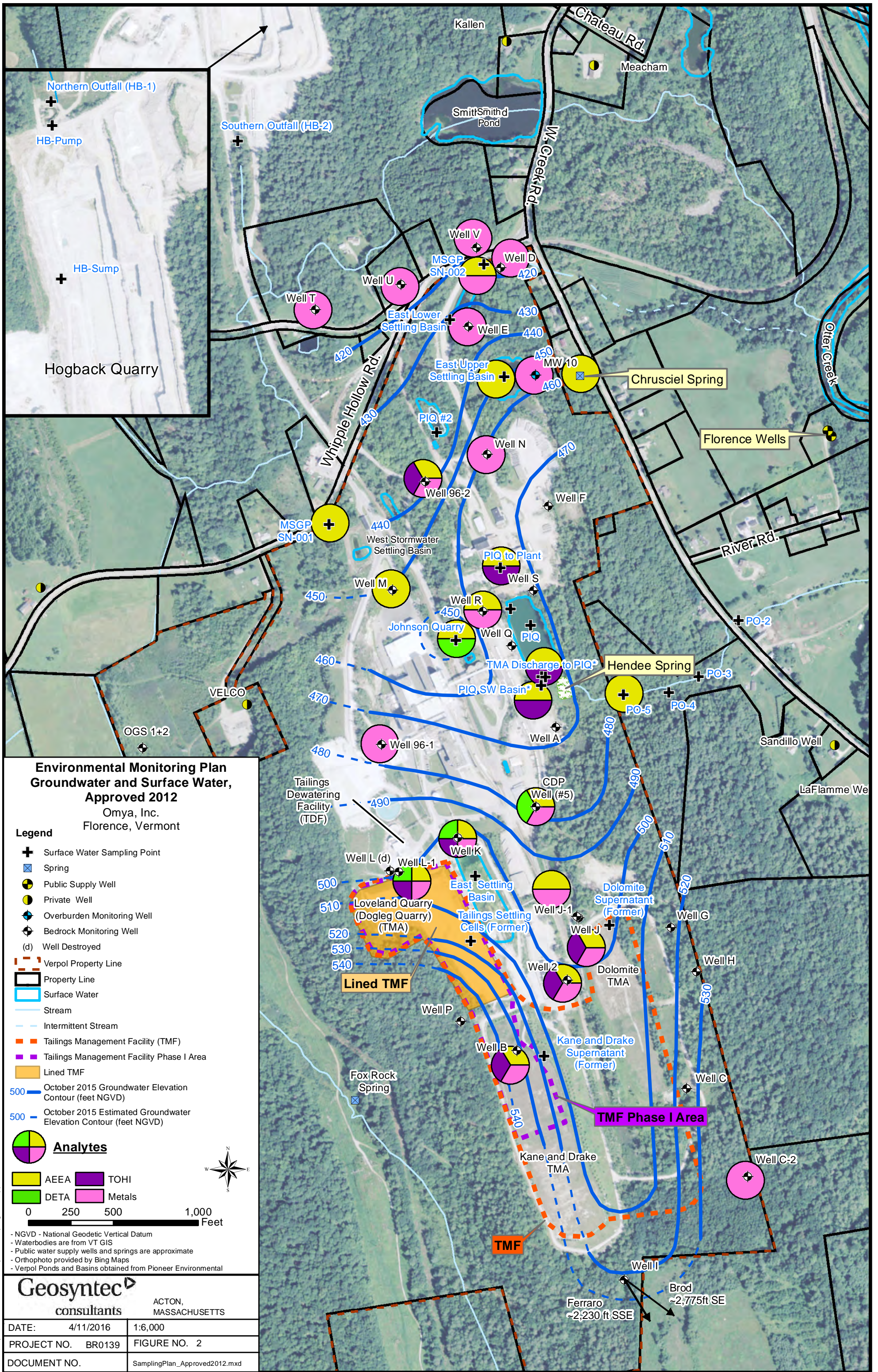
One (1) per
day for each
analyte

NOTES:

- 1) Analysis by GC/MS/MS
- 2) Analysis by EPA Method 332.0
- 3) Analysis by EPA Method 6020 for total and dissolved As, Mn, and Fe
- 4) Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples for AEEA should be spiked at 10 ppb and 100 ppb
- 5) Well C-2 will be sampled annually in May
- 6) Surface water locations sampled quarterly (May, August, October, February)
- 7) These locations will be sampled, but analysis for AEEA/TOHI will be put on hold and will proceed only if AEEA/TOHI is detected in the PIQ SW Basin sample
- 8) These locations will be sampled only if the PIQ is discharging to these locations during the sampling event



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**Environmental Monitoring Plan
Groundwater and Surface Water,
Approved 2012**
Omya, Inc.
Florence, Vermont

- Legend**
- ⊕ Surface Water Sampling Point
 - ⊗ Spring
 - Public Supply Well
 - Private Well
 - ⊕ Overburden Monitoring Well
 - ⊕ Bedrock Monitoring Well
 - (d) Well Destroyed
 - - - Verpol Property Line
 - ▭ Property Line
 - ▭ Surface Water
 - Stream
 - - - Intermittent Stream
 - ▭ Tailings Management Facility (TMF)
 - ▭ Tailings Management Facility Phase I Area
 - ▭ Lined TMF
 - 500 October 2015 Groundwater Elevation Contour (feet NGVD)
 - 500 - - - October 2015 Estimated Groundwater Elevation Contour (feet NGVD)

- Analytes**
- AEEA
 - DETA
 - TOHI
 - Metals
- 0 250 500 1,000 Feet

- NGVD - National Geodetic Vertical Datum
 - Waterbodies are from VT GIS
 - Public water supply wells and springs are approximate
 - Orthophoto provided by Bing Maps
 - Verpol Ponds and Basins obtained from Pioneer Environmental

Geosyntec
 consultants
 ACTON,
 MASSACHUSETTS

DATE:	4/11/2016	1:6,000
PROJECT NO.	BR0139	FIGURE NO. 2
DOCUMENT NO.	SamplingPlan_Approved2012.mxd	

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ATTACHEMNT 1 – Omya Overall Site Development



Figure 1

Overall Site Development

TMF ACT 250 Application

Omya Inc., Verpol Facility
Florence, Vermont

Drawn By: D. Dombrowsky
Designed By: K. Anderson
Reviewed By: E. Steinhauser
Date: March 2010

Note:

1. This figure illustrates the general layout of the proposed Tailings Management Facility (TMF) with respect to the existing Tailings Management Area (TMAs) and other site features at the Verpol Facility.
2. The TMAs and the former settling cells are being closed either under a Interim Certification or as part of the TMF Certification, both issued by the Solid Waste Program of the Vermont Agency of Natural Resources.
2. The existing topography and site features were created from:
 - A. A plan provided electronically by Omya Inc., of Florence, Vermont in a file titled "Florence_11_2009.dwg", based on aerial photography performed on November 2, 2009. Horizontal datum is Vermont State Plane Coordinate System. The vertical datum is based on NAVD-88.
 - B. The existing grades shown below the water surface in the Loveland TMA were provided electronically by Enman Engineering, P.C. of Rutland, Vermont, in a file titled "OMYA_Florence_Plant_081201.dwg", based on ground survey performed. Horizontal datum is Vermont State Plane Coordinate System. The vertical datum is based on NAVD-88.

Legend

- Property Line
- Groundwater Well
- Tailing Management Area
- Tailings Management Facility

