Technical Memorandum

1 Tech Drive, Suite 310
Andover, MA 01810

T: 978.794.0336

Prepared for: Aggregate Industries

Project Title: Swampscott Quarry – Review of Dust Sample Results

Project No.: 151967.106

Date: December 17, 2019

To: Jarrett Temple

From: Tamara Sorell, Brown and Caldwell

Copy to: Stephanie Herbster, Aggregate Industries
Shelby Hundley, Aggregate Industries

Prepared by: Tamara L. Sorell
Tamara L, Sorell, PhD, BCES, Managing Principal

Reviewed by: Lynnette Gerbert
Lynnette Gerbert, Principal Toxicologist

Limitations:

This document was prepared solely for Aggregate Industries in accordance with professional standards at the time the services were performed and in accordance with the contract between Aggregate Industries and Brown and Caldwell dated November 13, 2019. This document is governed by the specific scope of work authorized by Aggregate Industries; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided Aggregate Industries and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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List of Tables

Section 1: Background

Aggregate Industries (Aggregate) operates a quarry at 30 Danvers Road in Swampscott, Massachusetts. Aggregate contracted with Tech Environmental to collect a representative sample of expelled materials from the rock drill. Tech Environmental collected a sample on November 1, 2019 and submitted the sample to EMSL Analytical, Inc. (EMSL) for analysis of crystalline silica by Method Modified OSHA ID-142 X-Ray Diffraction (XRD) and Modified NIOSH Method 7500, and for Target Analyte Metals (TAL), which includes two nonmetals (arsenic and selenium).

Aggregate requested that Brown and Caldwell (BC) review these results to better understand potential health risks to human health and the environment.

Section 2: Results

Table 1 presents the analytical data and screening results. The EMSL laboratory report appears in Attachment 1. EMSL only reported results, with no quality control information. Therefore, BC did not perform a data quality review and cannot attest to the validity of the laboratory analysis, but only the results relative to established thresholds.

For all but the detected arsenic concentration, the bulk results did not exceed United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for soil or Massachusetts Department of Environmental Protection (MassDEP) Method 1 S-1 soil standards, which are protective of direct contact (incidental ingestion, dermal contact and dust inhalation) by residents (all life stages).

The EPA RSLs are non-enforceable hypothetical risk-based values based on conservative assumptions about toxicity and exposure. Cancer-based RSLs assume daily exposure over a 30-year residency period that includes sensitive early life stages. Noncancer-based RSLs assume exposure from birth to six years (early life stages). Residents are assumed to be exposed via accidental ingestion, skin contact over large portions of the body, and inhalation of dust based on default assumptions about soil suspension in air. The RSLs are intended to be protective in all climates; there is no allowance for reduced exposures due to clothing or limited outdoor time in cold or wet periods. The RSLs are for screening and were not developed as risk management (e.g., clean-up) standards.

The MassDEP S-1 standards were developed as clean-up standards and while they are also risk-based (assumptions differ slightly from EPA but they also consider long-term, full-time exposure), they also account for typical background concentrations.

The consideration of background is why the arsenic RSL and S-1 values are so different.

While the arsenic concentration was above its RSL, the concentration was well below the Method 1 S-1 soil standard, which, as discussed above, is based on background concentrations in soil. MassDEP has established a background concentration of 20 mg/kg for background in soils state wide. Concentrations below that are not subject to clean-up or other risk management in Massachusetts.

Thallium was undetected but at a higher concentration than the soil screening levels due to the concentration reported at detection limit of the analysis methodology. These results indicate that direct contact with the dust material analyzed may not be a significant health concern.

It should be noted the there is substantial uncertainty associated with this screening evaluation since only one sample was collected (which may not be representative of the quarry material overall). It should also be noted that this analysis was performed on on-site soils and that neither ambient dust concentrations in the

community nor airborne chemicals were measured. Therefore, BC cannot draw any conclusions regarding dust exposures.

Section 3: Conclusions

Based on this screening evaluation, no concentrations in the bulk dust sample, except one as noted above, exceed direct contact benchmarks. However, the contribution of this material to dust in residential areas is unknown.

Table 1
Summary of Results and Risk Screening

Parameter	Result (mg/kg)		EPA Soil RSL (mg/kg)	Exceeded?	MassDEP Method 1 S1 Soil Standard (mg/kg)	Exceeded?
Silica (a-Quartz)	118000					
Silica (Cristobalite)	33000					
Silica (Tridymite)	1000	U				
Total Silica (crystalline)	151000		4300000	NO	--	N/A
Aluminum	5000	D	77000	NO	--	N/A
Antimony	7.0		31	NO	20	NO
Arsenic	2.8		0.68	YES	20	NO
Barium	18		15000	NO	1000	NO
Beryllium	0.70		160	NO	90	NO
Cadmium	4	UD	71	NO	70	NO
Chromium	20		120000	NO	1000	NO
Cobalt	14		23	NO	--	N/A
Copper	22		3100	NO	--	N/A
Iron	25000	D	55000	NO	--	N/A
Lead	1.5		400	NO	200	NO
Manganese	120		1800	NO	--	N/A
Nickel	15		1500	NO	600	NO
Selenium	2	U	390	NO	400	NO
Silver	2.5		390	NO	100	NO
Thallium	20	UD	0.78	Unknown	8	Unknown
Vanadium	83		390	NO	400	NO
Zinc	53		23000	NO	1000	NO
Mercury	0.045	U	23	NO	20	NO

All values in milligrams per kilogram (mg/kg)
U - Not detected at the reporting limits shown
D - Analyzed as a secondary dilution
RSL - Regional Screening Level for Residents
Method 1 S1 standard - for unrestricted residential settings
https://www.mass.gov/files/documents/2016/08/ni/inh0708.pdf
N/A - Not applicable (no screening level)

Dashes indicate no value available. Note that calcium, magnesium, potassium and sodium are considered "nutritional elements" and are not evaluated for risk

Attachment A: EMSL Report

TECH environmental
FOCUSED KNOWLEDGE. REAL SOLUTIONS.

November 12, 2019

Mr. Jarrett Temple
Region Manager Land + Environment
Aggregate Industries Northeast Region, Inc.
1715 Broadway
Saugus, MA 01906

Re: Quarry Dust Sampling & Analysis, Swampscott, MA ***Ref. 4513***

Dear Mr. Temple:

Tech Environmental, Inc. (Tech) collected a sample of expelled materials from the rock drill at the Aggregate Industries (AI) quarry operation at 30 Danvers Road in Swampscott, MA, and arranged for its analysis for composition of silica and metals. Tech collected the sample of expelled materials from the rock drill on Friday, November 1, 2019, and shipped it to EMSL Analytical, Inc. in Cinnaminson, NJ for analysis. EMSL Analytical, Inc. analyzed the sample for its compositions of silica and metals at their laboratories in Cinnaminson, NJ. The EMSL Analytical, Inc. laboratory reports are attached to this letter. The attached table summarizes the laboratory results.

Please call if you have any questions.

Sincerely yours,

TECH ENVIRONMENTAL, INC.

Marc C. Wallace, QEP, INCE
Vice President
4513/AI Swampscott Quarry Dust Sampling

SUMMARY OF LABORATORY REULTS
FOR SWAMPOSCOTT QUARRY SAMPLE

Material	Concentration (% by weight)	Laboratory Analysis
Silica (a-Quartz)	11.80%	Crystalline Silica by NIOSH 7500 Mod
Silica (Cristobalite)	3.30%	
Silica (Tridymite)	<0.1%*	
Aluminum (Al)	0.50%	TAL Metals (23) via 6010C/7471B
Antimony (Sb)	0.001%	
Arsenic (As)	0.0003%	
Barium (Ba)	0.002%	
Beryllium (Be)	0.0001%	
Cadmium (Cd)	<0.0004%*	
Calcium (Ca)	0.73%	
Chromium (Cr)	0.002%	
Cobalt (Co)	0.001%	
Copper (Cu)	0.002%	
Iron (Fe)	2.50%	
Lead (Pb)	0.0002%	
Magnesium (Mg)	0.38%	
Manganese (Mn)	0.01%	
Mercury (Hg)	<0.000005%*	
Nickel (Ni)	0.002%	
Potassium (K)	0.11%	
Selenium (Se)	<0.0002%*	
Silver (Ag)	0.0003%	
Sodium (Na)	0.04%	
Thallium (Tl)	<0.002%*	
Vanadium (V)	0.01%	
Zinc (Zn)	0.01%	

* These compounds were not detected (ND) at the reporting limit. The value presented is the reporting limit (RL) for that silica species or metal analysis.

EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 858-4800

Attn. *Matthew Riegert*
Tech Environmental, Inc.
303 Wyman Street, Suite 295
Waltham, MA 02451
mriegert@techenv.com
Phone: 781-890-2220

EMSL Case No.:	361902907
Sample(s) Received:	11/5/2019
Date of Reporting:	11/7/2019
Date Printed:	11/7/2019
Reported By:	J Hu

- Laboratory Report –

Crystalline Silica by NIOSH 7500 Mod

Project: Swampscott

Procurement of Samples and Analytical Overview:

The material for analysis (one bulk sample) arrived at EMSL Analytical (Cinnaminson, NJ) on November 5, 2019. The package arrived in satisfactory condition with no evidence of damage to the contents. The purpose of the analysis is to determine the quantity of crystalline silica in the material. The data reported herein has been obtained using the following equipment and methodologies.

Methods & Equipment: X-ray Diffraction (XRD)

Modified NIOSH 7500 – Silica, Crystalline
Modified OSHA ID-142 – Crystalline Silica, Quartz and Cristobalite

Analyzed by: *Jian Hu, Ph.D.*, *Seniors Laboratory Scientist* — November 6, 2019 *Date*

Reviewed/Approved: *Eugenia Mirica, Ph.D.*, *Laboratory Manager* — November 7, 2019 *Date*

EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 858-4800

Attn. *Matthew Riegert*
Tech Environmental, Inc.
303 Wyman Street, Suite 295
Waltham, MA 02451
mriegert@techenv.com
Phone: 781-890-2220

EMSL Case No.:	361902907
Sample(s) Received:	11/5/2019
Date of Reporting:	11/7/2019
Date Printed:	11/7/2019
Reported By:	J Hu

Results and Discussion:

Silica, Crystalline Analysis of Bulk Material
Performed X-Ray Diffraction (XRD) Method Modified OSHA ID-142 & Modified NIOSH Method 7500, Issue 4, 3/15/03

Sample ID	Description	α-Quartz (wt%)	Cristobalite (wt%)	Tridymite (wt%)
Swampscott 361902907-0001	Drill Filings	11.8	3.3	<0.1

Notes:

1. Reporting limit (Quartz, Cristobalite, Tridymite) = 0.1 wt%
2. Cristobalite may be overestimated due to interference by feldspar

EMSL Analytical, Inc.

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Phone: (856) 858-4800

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EMSL Case No.:	361902907
Sample(s) Received:	11/5/2019
Date of Reporting:	11/7/2019
Date Printed:	11/7/2019
Reported By:	J Hu

Important Terms, Conditions, and Limitations:

Sample Retention: Samples analyzed by EMSL will be retained for 60 days after analysis date. Storage beyond this period is available for a fee with written request prior to the initial 30 day period. Samples containing hazardous/toxic substances which require special handling may be returned to the client immediately. EMSL reserves the right to charge a sample disposal or return shipping fee.

Change Orders and Cancellation: All changes in the scope of work or turnaround time requested by the client after sample acceptance must be made in writing and confirmed in writing by EMSL. If requested changes result in a change in cost the client must accept payment responsibility. In the event work is cancelled by a client, EMSL will complete work in progress and invoice for work completed to the point of cancellation notice. EMSL is not responsible for holding times that are exceeded due to such changes.

Warranty: EMSL warrants to its clients that all services provided hereunder shall be performed in accordance with established and recognized analytical testing procedures, when available. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied. EMSL disclaims any other warranties, express or implied, including a warranty of fitness for particular purpose and warranty of merchantability.

Limits of Liability: In no event shall EMSL be liable for indirect, special, consequential, or incidental damages, including, but not limited to, damages for loss of profit or goodwill regardless of the negligence (either sole or concurrent) of EMSL and whether EMSL has been informed of the possibility of such damages, arising out of or in connection with EMSL's services thereunder or the delivery, use, reliance upon or interpretation of test results by client or any third party. We accept no legal responsibility for the purposes for which the client uses the test results. EMSL will not be held responsible for the improper selection of sampling devices even if we supply the device to the user. The user of the sampling device has the sole responsibility to select the proper sampler and sampling conditions to insure that a valid sample is taken for analysis. Any resampling performed will be at the sole discretion of EMSL, the cost of which shall be limited to the reasonable value of the original sample delivery group (SDG) samples. In no event shall EMSL be liable to a client or any third party, whether based upon theories of tort, contract or any other legal or equitable theory, in excess of the amount paid to EMSL by client thereunder.

The data and other information contained in this report, as well as any accompanying documents, represent only the samples analyzed. They are reported upon the condition that they are not to be reproduced wholly or in part for advertising or other purposes without the written approval from the laboratory.

EMSL ANALYTICAL, INC.
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Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 361902907

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

OrderID: 361902907

Report To Contact Name: Matthew Riegert	**Bill To Company:** Tech Environmental, Inc.	**Client ID #:**
Company Name: Tech Environmental, Inc.	**Attention To:** Matthew Riegert	
Street: 303 Wyman Street, Suite 295	**Street:** 303 Wyman Street, Suite 295	
City: Waltham **State/Province:** MA **Zip/Postal Code:** 02451	**City:** Waltham **State/Province:** MA **Zip/Postal Code:** 02451	
Phone : 781-890-2220 **Fax :** 781-890-9451	**Phone:** 781-890-2220 **Fax:** 781-890-9451	
Project Name: Swampscott	**Email Results To:** mriegert@techenv.com	**U.S. State where Samples Collected:** MA
# Samples in Shipment:	**Date of Shipment:** 11-4-19 **Purchase Order:** 4513	**Sampled By (Signature):**

Turnaround Time (TAT) – Please Check: If No Selection Made, Standard 2 Week TAT Will Apply

☐ 2 Week ☐ 1 Week ☐ 4 Day ☐ 3 Day ☑ 2 Day ☐ 1 Day ☐ Other (Call Lab)

Media Type:

Manufacturer/Part #: **Lot #:**

Client Sample ID	Location/Description	Analyte / Method	Media	Flow (lpm)	Sample Time On	Sample Time Off	Volume / Area	Sample Type	Sample Date	Comments
Swampscott	Drill Filings	Silica - All	Soil	NA	10:00	NA	NA	☑ Area ☐ Personal	11-1-19	Silica-Crystalline, 3 Species, Bulk
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		

RECEIVED
EMSL
CINNAMINSON, NJ
2019 NOV -5 A 9:47

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	11/4/19	Bob FX 945	11/5/19

Comments:

$1B

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn: **MATT RIEGERT** 11/11/2019
Tech Environmental, Inc.
303 Wyman Street
Suite 295
Waltham, MA 02451
Phone: (781) 890-2220
Fax: (781) 890-9451

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 11/5/2019. The results are tabulated on the attached data pages for the following client designated project:

Swampscott

The reference number for these samples is EMSL Order #011914127. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director

The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The CRM recovery for Sodium was outside of the method control limits (high).
The QC sample duplicate RPD results for Calcium, Manganese, Zinc and Mercury were outside of the method control limits.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.EMSL.com EnvChemistry2@emsl.com

EMSL Order:	011914127
CustomerID:	TECH63
CustomerPO:	4513
ProjectID:	

Attn: **MATT RIEGERT**
Tech Environmental, Inc.
303 Wyman Street
Suite 295
Waltham, MA 02451

Phone: (781) 890-2220
Fax: (781) 890-9451
Received: 11/05/19 9:25 AM

Project: **Swampscott**

Analytical Results

Client Sample Description Swampscott ***Collected:*** 11/1/2019 10:00:00 AM ***Lab ID:*** *011914127-0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date & Analyst*		*Analysis Date & Analyst*	
METALS								
3050B/6010D	Aluminum	5000 D		99 mg/Kg	11/7/2019	AM	11/11/19 16:08	PV
3050B/6010D	Antimony	7.0		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Arsenic	2.8		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Barium	18		9.9 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Beryllium	0.70		0.40 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Cadmium	ND D		4.0 mg/Kg	11/7/2019	AM	11/11/19 16:08	PV
3050B/6010D	Calcium	7300 D		990 mg/Kg	11/7/2019	AM	11/11/19 16:08	PV
3050B/6010D	Chromium	20		0.99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Cobalt	14		0.99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Copper	22		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Iron	25000 D		990 mg/Kg	11/7/2019	AM	11/11/19 16:08	PV
3050B/6010D	Lead	1.5		0.99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Magnesium	3800		99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Manganese	120		1.5 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Nickel	15		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Potassium	1100		99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Selenium	ND		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Silver	2.5		0.99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Sodium	350		99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Thallium	ND D		20 mg/Kg	11/7/2019	AM	11/11/19 16:08	PV
3050B/6010D	Vanadium	83		0.99 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
3050B/6010D	Zinc	53		2.0 mg/Kg	11/7/2019	AM	11/08/19 18:36	DM
7471B	Mercury	ND		0.045 mg/Kg	11/11/2019	SW	11/11/19 0:00	SW
WET								
SM 2540G	Total Solids	98		N/A %	11/6/2019	RD	11/06/19 0:00	RD

Definitions:

MDL - method detection limit
J - Result was below the reporting limit, but at or above the MDL
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit (Analytical)
D - Dilution

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Environmental Chemistry Chain of Custody

EMSL Order Number (*Lab Use Only*): 011914127

PHONE:
FAX:

Report To Contact Name: Matthew Riegert			**Bill To Company:** Tech Environmental, Inc. (TECH63)		
Company Name: Tech Environmental, Inc.			**Attention To:** Matthew Riegert		
Street: 303 Wyman Street, Suite 295			**Street:** 303 Wyman Street, Suite 295		
City: Waltham	**State/Province:** MA	**Zip/Postal Code:** 02451	**City:** Waltham	**State/Province:** MA	**Zip/Postal Code:** 02451
Phone: 781-890-2220	**Fax:** 781-890-9451		**Phone:** 781-890-2220	**Fax:** 781-890-9451	
Project Name: Swampscott		**Email Results To:** mriegert@techenv.com		**Purchase Order:** 4513	
U.S. State where Samples Collected: MA		**Number of Samples in Shipment:**		**Date of Shipment:** 11-4-19	
Sample for Compliance? Yes ☐ No ■ **If yes, NPDES?** ☐ **Other (Specify):** NA			**PWS ID #:** NA	**State Reporting Required? (Y/N)** N	
Samples Collected by: EMSL ☐ **Client** ■ **check one**		**Sampled By (Signature):**		**Samples Received Chilled? (Y/N)** N	
Standard Turnaround Time: ☐ 2 Weeks		**The following TATs are subject to lab approval:** ☐ 1 Week ☐ 4 Days ☐ 3 Days ■ 2 Days ☐ 1 Day			

Failure to complete will hinder processing of samples

Client Sample ID	Comp	Grab	Collect Date/Time	Matrix (W=Water S=Soil A=Air SL=Sludge O= Other)	Preservative (1=HCL 2=HNO3 3=H2SO4 4=ICE 5=Other)	List Test(s) Needed: TAL Metals (23)				Field pH	Field pH Test Time	Field Temp. Deg C	Field Temp. Test Time	Comments
Swampscott	☒	☐	11-1-19 / 10:00	SOIL	NA	X								TAL METALS (23)
	☐	☐												
	☐	☐												
	☐	☐												
	☐	☐												

Released By (Signature)	Date & Time	Received By	Date & Time
	11/4/19 4pm		11/5 9:25 am

Please indicate reporting requirements: ☐ Results Only ☐ Results and QC ☐ Reduced Deliverables ☐ Disk Deliverable ☐ Other _____

Instructions or Comments:
Email change TAT to 4 day. 11/5 MF

Note: Field pH and Field Temperature are tested on the same day as the date of sample collection. **(Lab) Received Temperature:** 21 °C