ATTACHMENT B

Memorandum

To: Robert Schena, Fox Rothschild LLP **Date:** October 28, 2021

From: Julie Goodman, Ph.D., DABT, FACE, ATS

Subject: 2021 Rock Hill Quarry Perimeter Sampling

On five occasions in 2021 (June 23, July 6, July 28, August 27, and September 10), Hanson Aggregates PA LLC (Hanson) performed perimeter ambient air sampling at the Rock Hill Quarry (Gutshall, 2021; RJLG, 2021a,b). In the five rounds of sampling, only one structure was detected among the 40 samples that were collected, and this structure was not a phase-contrast microscopy equivalent (PCMe) structure. This is, it was not an asbestiform elongate mineral particle (EMP), according to the United States Environmental Protection Agency's (US EPA) "Framework for Investigating Asbestos-Contaminated Superfund Sites" (Framework) (US EPA, 2008). These results do not provide evidence for any background asbestos concentrations at the perimeter of the quarry.

Based on the sampling at the perimeter of the quarry, it is my professional opinion that the current background concentrations of EMPs in the air do not present a risk to the community. This single structure, even assuming it was a PCMe structure, is 10 times lower than Hanson's proposed screening level of 0.01 PCMe fibers per cubic centimeter (f/cc) and, if it were a PCMe structure, would be associated with a cancer risk within US EPA's acceptable range of 10^{-4} to 10^{-6}.

Because the highest possible concentrations of asbestos from the quarry to which the community could be exposed is at the perimeter of the quarry, the assessment of background off-site asbestos is unnecessary. It is my professional opinion that this sampling serves as an acceptable baseline assessment against which future measurements of asbestos at the perimeter can be compared, and that using data collected at the perimeter of the quarry will be protective of the community because it will represent the maximum potential asbestos exposure from quarry operations.

1 Sampling and Analysis Methods

Air monitoring samples were collected from eight locations (M1 to M8) on the perimeter of the Rock Hill Quarry site, as shown in Figure 1, below, on June 23, July 6, July 28, August 27, and September 10, 2021. One of the sampling locations (M2) is located in an area described as "aggregate stockpiles," which had overburden material that was quarried and stockpiled at some point in the past.

RJ Lee Group (RJLG) analyzed all of the air samples using International Organization for Standardization (ISO) Method 10312 (modified per Office of Solid Waste and Emergency Response [OSWER] Directive #9200.0-68), which describes the preparation and analysis of ambient air samples using transmission electron microscopy (TEM) and electron diffraction and energy dispersive X-ray analyses (Bandli, 2021; US EPA, 2008). TEM analysis identifies and records asbestos fibers and asbestos structures, which include "bundles, clusters, and matrices" (US EPA, 2008, p. C-3). According to US EPA's Framework, this "method is used for the determination of the concentration of asbestos structures in air samples, and includes measurements of lengths, widths, and aspect ratio… of the asbestos structures. The method allows

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determination of the type of asbestos fibers present in a sample, but cannot discriminate between individual structures of asbestos and non-asbestos forms of amphibole minerals" (US EPA, 2008, pp. C-1-C-2). When "a TEM analyst visually detects a structure that morphologically resembles an asbestos mineral," additional tests are performed using electron diffraction and X-ray analysis to examine the crystal structure of the fiber (US EPA, 2008, p. C-4). US EPA's Framework specifically defines PCMe structures as the following:

> [C]hrysotile and amphibole structures identified through transmission electron microscopy (TEM) analysis that are equivalent to those that would be identified in the same sample through phase contrast microscopy analysis, with the main difference being that TEM additionally permits the specific identification of asbestos fibers. PCMe structures are **asbestiform** structures greater than 5 microns in length having at least a 3 to 1 length to width (aspect) ratio. (US EPA, 2008, p. A-3) (emphasis added)

As such, even if a structure exceeds 5 μm, it is not a PCMe structure if it does not have an asbestiform morphology.

Hanson stated in its September 14, 2021, letter to the Pennsylvania Department of Environmental Protection (PADEP) that "[a]ll fibers, regardless of length, are counted by Hanson at the perimeter air monitors. All perimeter air monitoring sampling results are shared with the Pennsylvania Department of Environmental Protection… within twenty-four (24) hours of receipt by Hanson" (Hanson, 2021). This sampling procedure is consistent with the US EPA's Framework, which outlined two steps: (1) a general counting scheme in which all asbestos fibers ≥0.5 μm in length are identified, and (2) for the purposes of determining risk, all fibers >5 μm with an aspect ratio of ≥3:1 and a width ≥0.25 μm and ≤3 μm are counted (US EPA, 2008). Hanson also collected water samples on June 23, 2021 (Hanson Aggregates PA, LLC, 2020).

Water samples were analyzed by RJLG using US EPA method 100.1 600/4-03-043, which also employs TEM analysis (Hanson Aggregates PA, LLC, 2020; Chatfield and Dillon, 1983). In this method, all asbestos fibers with a length >0.5 μm and an aspect ratio ≥3:1 are counted. Determining the number of fibers with lengths >5 μm can be useful for determining the quantity of asbestos fibers present in water that, if the water were to evaporate, could become airborne.

2 Sampling Results

RJLG counted all structures ≥0.5 μm long with aspect ratios ≥3:1 from the air samples collected on June 23, July 6, July 28, August 27, and September 10 (Gutshall, 2021; RJLG, 2021b,c). No asbestos fibers or asbestos structures were detected in the air samples that were collected on June 23, July 28, August 27, or September 10 (RJLG, 2021a-d).

Regarding its analysis of eight air samples collected on July 6, 2021, RJLG reported that there were "no countable structures (≥0.5 μm long, ≥3:1 aspect ratio)" in seven of the samples (Bandli, 2021). One amphibole structure was detected in Sample 0706-4, which was collected at location M5. RJLG reported that the structure was 5.5 μm long and 0.7 μm wide, yielding an aspect ratio of 7.86, but indicated that, based on electron diffraction and energy dispersive X-ray analyses, the structure "does not have characteristics of asbestiform morphology" (Bandli, 2021). That is, the detected amphibole fiber was a cleavage fragment.

Cleavage fragments are formed by the fragmentation of a non-fibrous mineral (*e.g.*, when a rock is crushed). The distinction between naturally occurring asbestos (NOA) fibers and cleavage fragments, even of the same mineral, is important, because they have different physical and toxicological characteristics (*i.e.*, their ability, or lack thereof, to cause health effects in humans) and different surface properties, such as roughness

(NRC, 1984), as a result of the way in which they are formed. Cleavage fragments are always non-asbestiform particles (Campbell *et al*., 1977). Exposure to cleavage fragments has not been shown to present similar health risks as exposure to asbestiform fibers (Gamble and Gibbs, 2008; Addison and McConnell, 2008; Mossman, 2008; Williams *et al*., 2013).

No asbestos structures were detected in the seven water samples collected on June 23, 2021 (Hanson Aggregates PA, LLC. 2020).

These analyses demonstrate that there is no measurable asbestos at the perimeter of the Rock Hill Quarry when there is no activity occurring at the site.

3 Risk Assessment

I analyzed the results of five rounds of sampling to determine potential baseline exposures to asbestos in the air at the perimeter of the site and evaluate any potential human health risks at baseline. The primary pathway through which the community around the Rock Hill Quarry might be exposed to asbestos in the air from the site at baseline is *via* inhalation.

Out of 40 samples, 39 had no detectable EMPs and 1 sample had 0.001 s/cc. According to US EPA guidance, "[w]hen computing the mean of a set of asbestos measurements, samples that are 'non-detect' should be evaluated using a value of zero" (US EPA, 2008, p. 19).[1] Thus, I calculated a mean of 0.000025 s/cc among these samples.

Because the only structure detected was not a PCMe structure, these data do not indicate there is any inhalation risk from current background asbestos exposures at the quarry perimeter. However, assuming it was an asbestos fiber, and assuming a person would be exposed continuously (*i.e*., 24 hours per day, 365 days per year) over a lifetime starting at birth, and using the inhalation unit risk (IUR) of 0.23 calculated by US EPA (2008, Table 2), I calculated a lifetime cancer risk of 5.8 in 1,000,000, which is well within US EPA's acceptable range of 10^{-4} to 10^{-6}. This is also well below Hanson's proposed action level of 0.01 f/cc, which is consistent with US EPA's Framework. This lifetime exposure scenario is a worst-case exposure scenario and assumes that the structure was asbestos and not, as determined by RJLG, a cleavage fragment. Because the structure was a cleavage fragment and not asbestos, the true risk of exposure to current background conditions is zero.

Based on the risk calculations discussed above, and consistent with risk assessment guidance in US EPA's Framework, no further action is necessary at this time to evaluate the potential for off-site asbestos because no PCMe structures were detected at the quarry perimeter during the background sampling events (US EPA, 2008, p. 9). Further, the one cleavage fragment structure, even assuming it qualified as asbestiform, did not exceed Hanson's proposed screening level or US EPA's acceptable risk level. For the same reason, no mitigation of asbestos generated at the quarry is necessary at this time.

With respect to water, based on a hydrogeological survey performed in 2017, there were no known surface water intakes for a public water supply within 10 miles downstream from the quarry, and there were only two wells within a half-mile of the quarry (EarthRes, 2018). Even if it were drinking water, considering the limit of detection, the lack of asbestos structures detected in water samples indicate that if there is any asbestos present, it would be in concentrations well below US EPA's recommended ambient surface water criterion of 7 million fibers per liter (MFL) and the federal drinking water maximum contaminant level of 7 MFL that exceed 10 μm in length (US EPA, 2020). I also note that inhalation is the primary route of

[1] According to US EPA (2008, p. 19) using half of the limit of detection for non-detects (*i.e*., rather than zero) "may lead to a substantial overestimate of the true mean of a group of samples."

exposure for asbestos and, as stated by the Agency for Toxic Substances and Disease Registry, "[s]tudies in humans and animals indicate that ingestion of asbestos causes little or no risk of noncarcinogenic injury" (ATSDR, 2001).

4 Risk Management

Asbestos risks to receptors occur primarily through inhalation. The potential risk of exposure to the community from asbestos generated during quarry operations could occur through two primary pathways: quarry operations that result in asbestos emissions into the ambient air that migrate, off-site and transport of mined aggregate that potential contains asbestos material.

4.1 Quarry Operations

Hanson will conduct air monitoring at the perimeter during quarry operations; these data will also be provided to PADEP.

If asbestos is measured off-site, it may not be possible to determine from where it originated. In contrast, perimeter sampling can be assumed to represent the worst-case scenario with respect to asbestos exposure from the quarry for people in the community, especially sensitive receptors. This is because asbestos does not significantly migrate from its source. Several studies have shown that asbestos concentrations in air decrease with increasing distance from a specific source, because fibers mix with ambient and outdoor air (Kuryvial *et al*., 1974; Donovan *et al*., 2011; Ilgren *et al*., 2015).

As stated by Hanson in its September 14, 2021, letter:

> Perimeter data provides the most accurate data as it relates to NOA from the Rock Hill Quarry, offers the most conservative background assessment scenario as it relates to offsite receptors, and provides readily comparable data against which Hanson can assess any incremental risk posed by future detections of NOA. Hanson's determination to extrapolate risk based on detections (if any) of NOA at the quarry perimeter also accounts for the impracticality of tracing asbestos encountered far offsite back to an original generator. (Hanson, 2021)

If asbestos structures detected during perimeter monitoring exceed Hanson's proposed screening level, Hanson has indicated in its Asbestos Monitoring and Mitigation Plan (AMMP) that it will take appropriate measures to mitigate exposures.

4.2 Transport of Product Off-site

Regarding potential exposures to asbestos through the transportation of aggregate product off-site, Hanson stated in its AMMP that it will employ several mitigation measures with respect to truck traffic to limit the potential for asbestos to leave the quarry, including:

- Dedicated street-sweepers to clean paved roads and public roadways near site entrances;
- A truck wash with spray nozzles to remove loose and dusty material from loaded trucks leaving the site through the main gate;
- A requirement that all trucks transporting materials off-site will be covered with tarps or other devices; and

- A posted vehicle speed limit of 15 miles per hour on haul roads in quarry and stockpile areas.

5 Conclusions

The results of five rounds of perimeter sampling, including the area with rock piles, have indicated that no background levels of asbestos are detected in the air at the Rock Hill Quarry. Only one fiber was detected, and it was a cleavage fragment. Going forward, perimeter sampling during quarry operations will represent worst-case scenarios regarding potential exposures to the community, because concentrations of asbestos decrease with increasing distance from its source.

Therefore, as a result of the background analysis, I conclude the following:

- Asbestos fibers were not detected in the air at the perimeter of the quarry;
- The lack of asbestos in the air at the perimeter of the quarry indicates that background concentrations of asbestos do not currently pose a health risk to the community;
- Assessing community exposure to asbestos generated during quarry operations based on perimeter sampling assumes the "worst-case" exposure scenario and will be most protective of the community; and
- Because perimeter sampling is so conservative, no further off-site sampling is necessary at this time to evaluate exposure to asbestos generated at the quarry.

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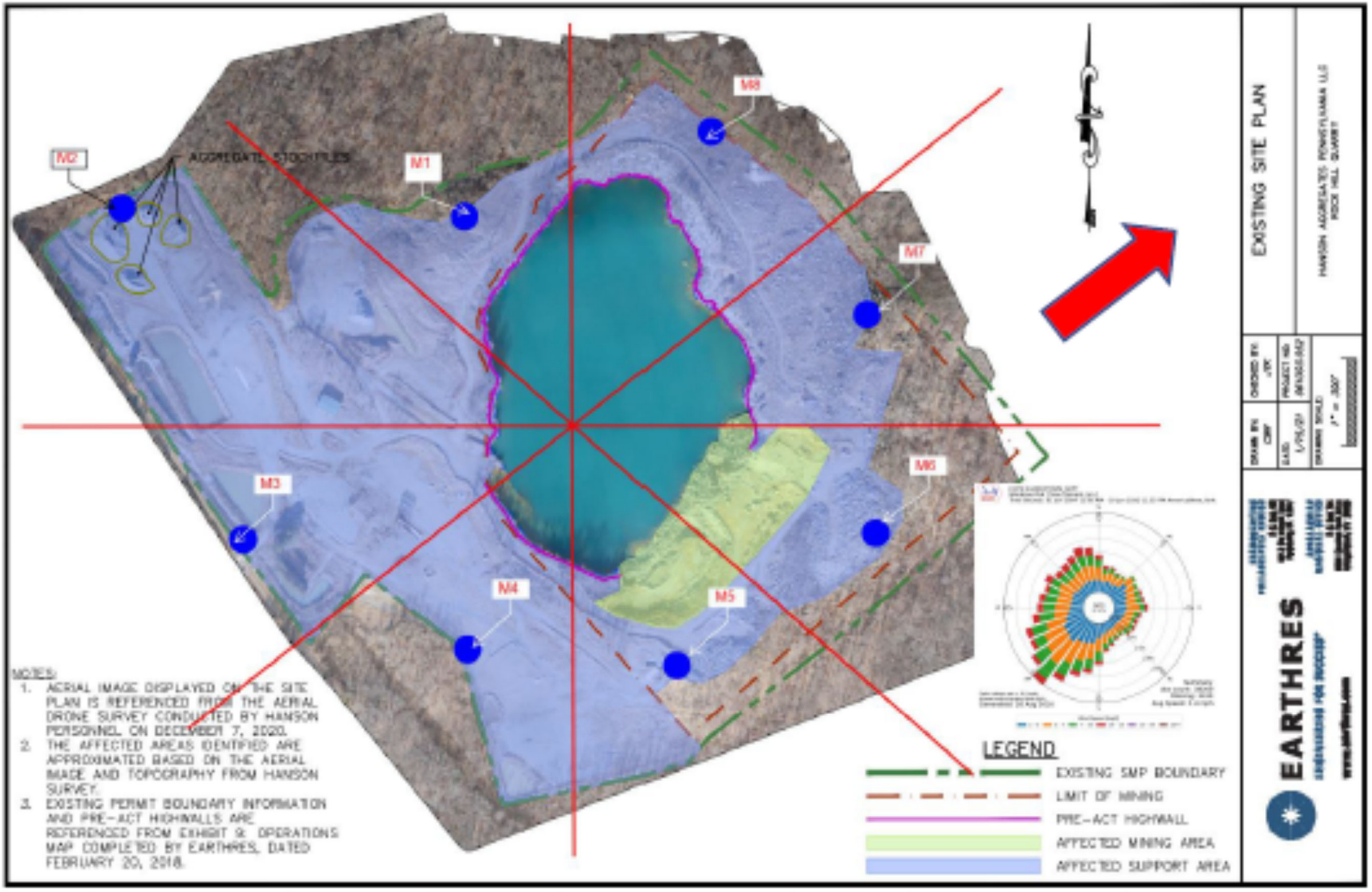

Figure 1 Rock Hill Quarry Site Map with Sample Collection Locations. Source: Bandli (2021).