UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Re: Report of Initial Fingerprinting Findings
Puerto Rico Olefin Site, Peñuelas, Puerto Rico

Dear Mr. Toro:

EPA has reviewed the study which you conducted and the resulting report, which you provided to us entitled, "Report of Initial Fingerprinting Findings Related to Puerto Rico Olefin Site, Peñuelas, Puerto Rico", or the "Report", and we offer the following comments. There were two principle findings in the Report: one is the proposition that there is a way to distinguish sources of asbestos in the area (i.e., fingerprinting the sources), and the second is the proposition that there are sources of asbestos in the area other than from the Puerto Rico Olefin facility.

The fingerprinting portion of the report examined three different techniques for fingerprinting the source of the asbestos detected during the sampling events performed for the study. These techniques, discussed below in more detail, consist of mineralogy, fiber size, and surface chemistry of the chrysotile fibers.

Mineralogy – In the Report, the proposition is presented that there was a specific fingerprint that consisted of chrysotile and lizardite being found together in quarry rock collected in the region near San German. The conclusion in the Report is that the identified fingerprint was evident in samples collected in the community of Tallaboa and therefore the source of the asbestos in the community was likely attributable to the local quarried rock that was used in driveways and road building. The fingerprint methodology referenced World Trade Center-related research where dust associated with the collapse of the two towers was examined to determine the mineralogical makeup of that dust, which in turn was used to determine if the source of dust collected in nearby buildings was from the WTC towers' collapse. The fingerprinting of the dust associated with the WTC collapse relied on five primary markers and four secondary markers. The primary markers were slag wool, rock wool, soda-lime glass, concrete particles, and gypsum, and the secondary markers were FeOx, ZnOx, silica, and chrysotile.

Although there may be a fingerprint that is associated with the asbestos fibers that were found to be present in the sampling results obtained in the Tallaboa area, reliance on only two components that were not consistently found to be present together is not a robust indicator. Note that in the two quarry samples that were collected (AP3 and AP4), chrysotile and lizardite were only found together in one of these samples, which indicates the quarry rock does not meet the fingerprint criteria. Additionally, the eight samples collected in the Tallaboa community did not all show the chrysotile-lizardite fingerprint. In fact, three of the samples from beyond the facility property only contained chrysotile (samples ER1 – from the restaurant near the facility, ER2 – from the Headstart building, and ER4 – from the Jorge Lucas Perez Valdivieso School), and all three of these locations are believed to be related to and/or impacted by the facility, and the facility is represented in the Report by sample ER6, which also only contained chrysotile.

The remaining five samples contained both chrysotile and lizardite, but there was not a spatial pattern to the occurrences. As seen in Figure 6 of the Report, samples denoted with red pins (i.e., chrysotile-lizardite) on the map are interspersed with yellow pins (i.e., chrysotile only) with no discernable pattern. Additional work, as well as a more robust set of criteria, would be needed to determine if asbestos released from the Puerto Rico Olefins site can be reliably distinguished from other potential sources using mineralogy as a fingerprinting tool.

Fiber size – The size of asbestos fibers detected in the thermal insulation found in structures at the Puerto Rico Olefins facility were also evaluated in the Report. The sizes were compared to the size of asbestos fibers detected in the dust in the samples beyond the facility property boundary. However, we do not agree that comparing fiber size from potential source material (i.e., ACM thermal insulation collected at the Puerto Rico Olefins facility) with fiber length from dust samples obtained from beyond the facility boundaries is not an appropriate comparison. The fibers in the ACM, which are pure, mined asbestos, are still intact and not yet released to the environment. Typically, chrysotile fibers have the characteristics of being long, thin fibers (up to 20 micrometers in length). When ACM is friable or in poor condition, the fibers can be broken and released to the environment as smaller fibers. Once a fiber is released to the environment, it can undergo changes in size as a result of weathering and other physical processes. Thus, it is expected that the fiber characteristics from pure asbestos containing material would be different (and longer) than the fiber characteristics of asbestos released to the environment that has undergone weathering and other physical processes during its transport away from a location.

Surface Chemistry – Elemental composition of the surface chemistry of fibers was also evaluated as part of the fingerprinting analysis in the Report. Fibers from ACM collected at the facility (i.e., thermal insulation) were analyzed for surface chemistry, and no aluminum and only trace amounts of iron were detected on those fibers. Fibers from the dust and gravel samples were also analyzed for surface chemistry, and aluminum was detected as well as higher concentrations of iron on the surface. The conclusion set forth in the Report was that because the surface chemistry was different between the two types of samples, the asbestos detected beyond the facility was not related to asbestos detected at the facility.

Similar to the discussion regarding fiber size, comparing surface chemistry of unweathered chrysotile to weathered chrysotile is not an appropriate comparison. Chrysotile fibers in their mined form, which is what is used in materials such as the thermal insulation found at the facility, can have different surface chemistry than chrysotile fibers that have been released into the environment and have been subjected to weathering. Weathering can cause dissolution of magnesium from the brucite layer (outer shell) of chrysotile, which can transform the surface layer from a positive charge to a negative charge (Holmes 2010; Bales 1985).[1] This change in the surface area charge can allow cations, such as iron and aluminum, to bind to the surface of the weathered chrysotile fiber. Therefore, this can explain a different ratio of cations, such as iron or aluminum, on the surface of ACM in the mined form versus weathered ACM.

With regard to the findings in the Report concerning "Other Sources", the report briefly describes several other potential sources of asbestos that may be present in the buildings in the community. These identified potential sources include stucco, spray on ceilings, and corrugated roof panels. EPA acknowledges that building materials in structures in the community may contain ACM, which is why extensive sampling has been undertaken to determine if there are other sources of ACM in the buildings that EPA is proposing to be remediated. The results of those surveys have indicated that, with an isolated exception, the building materials are not a source of asbestos contamination in the surveyed buildings.

Lastly, there are several statements in the Report regarding high levels of background asbestos in the community. Given that the samples that were collected by EPA were analyzed to determine the presence or absence of asbestos, utilizing very high detection limits, it is not evident to us that there is a condition of elevated concentrations of asbestos in the region. Additional analytical work would need to be performed to examine and determine background concentrations of asbestos in the region and in other locales in Puerto Rico. This work would entail collecting soil and air samples to establish concentrations of asbestos in the environment. Evaluation of other potential sources of asbestos in the areas sampled would also need to occur. EPA does acknowledge that there could be additional sources of asbestos in the area, especially with the decaying industrial complexes in the region and the identification of serpentine rock in the southwest portion of Puerto Rico, however, much more work would need to be completed to quantify and determine if there is an issue in the community or region regarding naturally occurring asbestos.

Based on the above findings, EPA concludes that additional investigation and evaluation would need to be conducted to determine if a fingerprinting methodology could be developed to determine the origin of asbestos detected in the area surrounding the Puerto Rico Olefin facility. The authors of the Report implicitly confirm this in their characterization in the very title of the

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[1] Holmes, E., et al. Processes affecting surface and chemical properties of chrysotile: Implications for reclamation of asbestos in the natural environment. Can. J. Soil Sci. (2012) 92: 229_242; Bales, R. and J. Morgan. Surface Charge and Adsorption Properties of Chrysotile Asbestos in Natural Waters. Environ. Sci. Technol. (1985), Vol. 19, No. 12.

Report as "initial findings". This supports our conclusion that more work would be necessary to prove or disprove the hypothesis presented in the Report.

Additionally, EPA considers that its current assumptions, based on eye-witness testimony and sampling data that indicate that there was a release of asbestos from the Puerto Rico Olefins facility into the community to the southeast, is the most likely source of the majority asbestos found to be present in the portion of the community surrounding the facility, on which EPA is focusing. EPA has shown the concentration of asbestos within the ¼ to ½ mile downwind zone to the east of the facility to have much higher asbestos concentrations than in other areas that were sampled, by several orders of magnitude. There were also two samples taken in this area that had both chrysotile and amosite, which is also present at the facility. Becausence amosite was not found in the quarry samples, this suggests a localized influence from the facility as the source to the ambient environment within at least a limited zone surrounding the facility.
We hope that our sharing these observations helps clarify and possibly resolve the remaining issues regarding this Site. Your counsel may contact Hector Velez (at 787 977-5850) or James Doyle (at 212 637-3165) if you wish to discuss this matter further.

Respectfully,

Chloe Metz
Chief, Technical Support Section
Emergency and Remedial Response Division

cc: Gerardo Gonzalez-Roman, Esq. (via email)
Howard Epstein, Esq. (via email)