NO. 03-21-00204-CV

IN THE THIRD DISTRICT COURT OF APPEALS
AUSTIN, TEXAS

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, and VULCAN CONSTRUCTION MATERIALS, LLC,
Appellants,

v.

FRIENDS OF DRY COMAL CREEK and STOP 3009 VULCAN QUARRY, et al.
Appellees

On Appeal from the 353rd Judicial District Court
Travis County, Texas, Cause No. D-1-GN-20-000941

INITIAL BRIEF OF APPELLEES FRIENDS OF DRY COMAL CREEK AND STOP 3009 VULCAN QUARRY

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STATEMENT OF THE CASE

Appellants' Statements of the Case are correct, except Appellant Vulcan includes in footnote 2 argument that its facility, which it rechristens a "plant," will be the source of very small emissions. Appellees contest that the facility, absent its quarry and roadways, is a plant, and they contest that allowed emissions from even the facility, alone, may fairly be characterized as "very small."

STATEMENT REGARDING ORAL ARGUMENT

This case turns mostly on points of law, and Appellees doubt the Court will benefit from oral argument on those points. Appellees do not seek oral argument, but should the Court determine that oral argument would be useful to the resolution of this appeal, Appellees request an opportunity to present oral argument to the Court.

RECORD REFERENCES

In this brief, citations to the Clerk's Record are referred to as "C.R. [Page number]", and citations to the Reporter's Record are referred to as "R.R. [Page number]". Citations to the Administrative Record are referred to as "[Volume number] A.R. [Item number] [Page number (where applicable)]".

ISSUES PRESENTED

1. TCEQ determined that Vulcan's expected crystalline silica emissions would be consistent with a regulatory standard, "protection of public health," because non-regulatory guidance exempts all rock crusher permit applications from making that demonstration, and the same non-regulatory guidance exempts increases of ambient air concentrations of silica below a certain threshold from making that regulatory demonstration. Was TCEQ's determination made in violation of statutory and regulatory provisions or in excess of the agency's statutory authority or, as found by the district court, arbitrary and capricious?

2. TCEQ determined that another regulatory standard, that expected particulate emissions from a source will not "cause or contribute to" a violation of the National Ambient Air Quality Standards, had been met by Vulcan, because non-regulatory guidance allows, in all instances, the disregard of non-"facility" emissions, e.g., roadways and quarries, when calculating a source's off-site air quality impacts and cumulative air quality impacts of it and other sources. Was TCEQ's determination made in violation of statutory and regulatory provisions or in excess of the agency's statutory authority or, as found by the district court, arbitrary and capricious?

3. TCEQ determined that Vulcan's expected crystalline silica air emissions could reasonably be derived from the silica content of a "representative" composite sample consisting of material from three drilled cores described as being from the north, central and south of the 1500-acre quarry site. The record in the case includes no core photographs or logs that lay out the physical characteristics of the cores, but the record does include extensive evidence of probable silica content inconsistent with that Vulcan reported for the three core samples. Under these circumstances, was TCEQ's determination the core samples were "representative" arbitrary and capricious or, as found by the district court, not supported by substantial evidence considering the reliable and probative evidence in the record as a whole?

4. The administrative law judges and (vicariously) the TCEQ invoked "trade secret" law to bar Appellees' access, even subject to the terms of a protective order, to the data on all 41 subsurface cores drilled by Vulcan, which data were provided to and reviewed by Vulcan's testifying expert witness. Was this a misapplication of trade secret law and, as found by the district court, an

abuse of discretion by the ALJs and TCEQ that prejudiced the substantial rights of the Appellees?

STATEMENT OF FACTS

I. Proposed operations and general setting.

Vulcan's proposed rock-crushing facility and associated emission sources would be located in Comal County east of Bulverde but west of New Braunfels. Several residences are within a one-mile radius of the crusher location, and the permit application drew considerable public opposition. Appellant TCEQ prepared early in the proceeding an annotated aerial photo,[1] below, of the area neighboring the Vulcan site. In this aerial photo, persons who requested hearings are reflected as yellow dots; the green intermittent circle is the one-mile radius around the initial crusher location. The quarry within which the crusher will sit is reflected by the red boundary. The permit is for a "portable" rock crusher, allowing the crusher to be moved to any point at the quarry, so long as its mechanical equipment remains at least 2,119 feet from the property line of the quarry and the stockpiles remain at least 25 feet from the property line.[2]

[1] 1 A.R. 51, PDF p. 226.

[2] 1 A.R. 174, PDF p. 8; 2-A A.R. 180, Tab D, Ex. 30, p. 5.

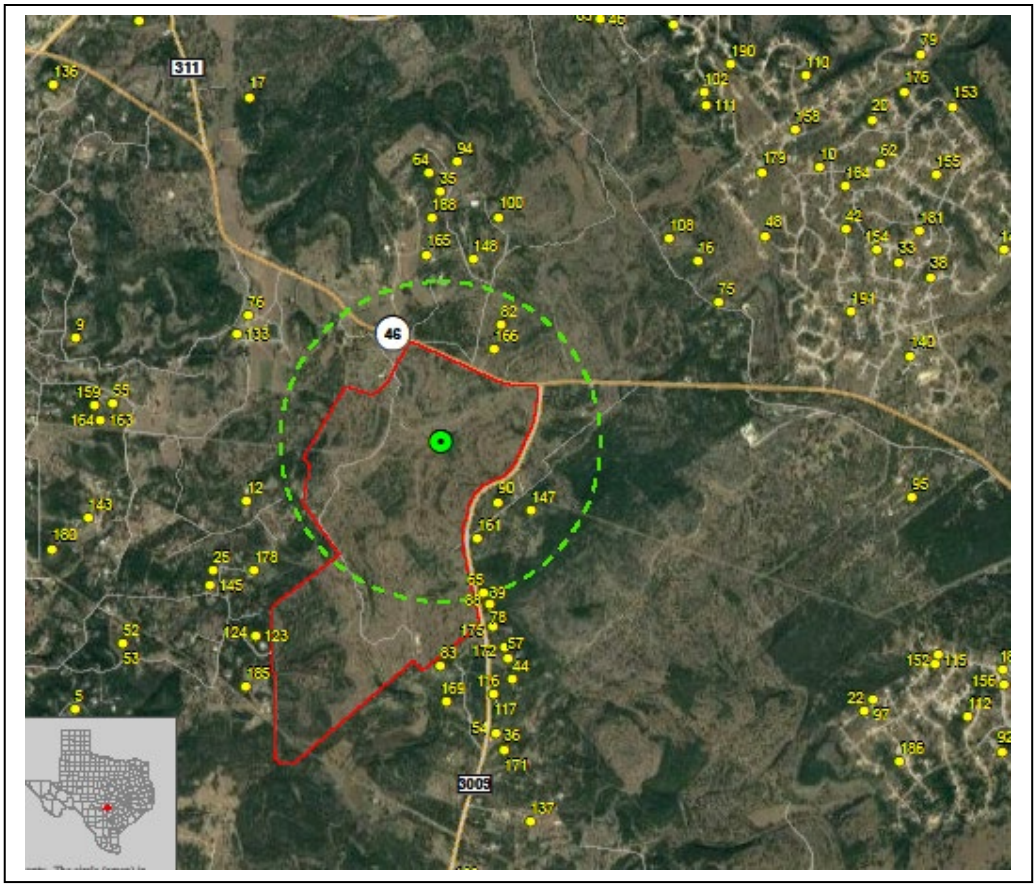

Figure 1: Proposed location of the Vulcan rock crusher and quarry[3]

The rock crusher, associated stockpiles and the entrance roadway from FM 3009 to the first stockpile will occupy approximately 55 acres[4] within a 1500-acre[5] open-pit limestone quarry operated by Vulcan that would cover an almost 3-mile stretch of Edward Aquifer Recharge Zone and reach the southwest corner of SH-46 and FM 3009.

[3] 2-B3 A.R. 257.

[4] 2-A A.R.180, Tab D, Ex. 22, pp. 43-44.

[5] 3 A.R. 271, p. 155:22-23.

The rock-crushing "facility" (a term of art explained, *infra*) will consist of (1) a funnel-like stone input "hopper;" (2) three stone-crushing devices arranged in series; (3) two screen- or grate-like structures that filter the crushed stone into different size categories; (4) seven conveyer belts that move the crushed or filtered stone from one location to another; and (5) four stockpiles where the crushed and sorted stone is stored. There are also three diesel engines and a diesel fuel tank associated with the facility. Appendix 1 to this brief includes the Vulcan's facility schematic[6] from the revised permit application.

The plant operations will generate various air contaminants. Particulate matter, i.e., limestone dust, will be the major contaminant of concern to area residents. The particulate emissions will be an aesthetic problem, of course, but they will also include some crystalline silica, and that is a regulated carcinogen.

II. Facts bearing on, most specifically, crystalline silica.

Pollutants regulated by the TCEQ include "criteria pollutants," and "non-criteria pollutants." "Criteria pollutants" are those pollutants for which the EPA has established National Ambient Air Quality Standards (NAAQS) pursuant to the Clean Air Act. 42 U.S.C. § 7409. These are sulfur dioxide, particulate matter, carbon monoxide, ozone, oxides of nitrogen/nitrogen dioxide, and lead. 40 C.F.R. §§ 50.4 through 50.17. "Non-criteria pollutants" encompasses all other air pollutants.

[6] 2-A A.R.180, Tab D, Ex. 23, p. 27.

Crystalline silica can be a component of particulate matter and is, itself, a non-criteria pollutant.

Crystalline silica is potentially harmful to human health. Acute impacts of crystalline silica inhalation can include respiratory tract inflammation,[7] while more long-term impacts can include debilitating respiratory tract diseases such as silicosis, emphysema, obstructive airway disease, and lung cancer.[8] The occurrence of silicosis is a result of the cumulative amount of crystalline silica to which a person has been exposed.[9] Accordingly, Dr. Jong-Song Lee, Senior Toxicologist of the TCEQ's Toxicology Division, testified that the risk of silicosis is toxicologically influenced by all of the different sources of crystalline silica in an area.[10]

TCEQ has established short-term and long-term air quality guideline levels, known as an "effects screening levels" or "ESLs," for crystalline silica.[11] An ESL is the concentration level of a pollutant in the air below which TCEQ does not expect adverse health and welfare effects, and above which TCEQ performs a more in-depth review of a permit application.[12]

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[7] 2-B2 A.R. 239, p. 7.

[8] 2-B3 A.R. 247, p. 8.

[9] 2-B2 A.R. 223, p. 21; 3 A.R. 272, p. 297.

[10] 3 A.R. 272, pp. 299-301.

[11] 2-B3 A.R. 248, p. 8; TCEQ Fact Sheet re: Crystalline Silica, included as Appendix 2 to this brief.

[12] A-B2 A.R. 237, p. 6.

A TCEQ rule provides that the permit application must include information demonstrating that "[t]he emissions from the proposed facility will comply with all rules and regulations of the commission and with the intent of the Texas Clean Air Act (TCAA), including protection of the public health and property of the public." 30 Tex. Admin. Code § 116.111(a)(2). Despite this rule, TCEQ has adopted air dispersion modeling guidance stating that emissions of particulate matter from rock crushers do not require a health effects review.[13] Hearing testimony was that TCEQ has no documentation of the basis for this exception.[14] The Executive Director of the TCEQ relied upon this guidance to determine that no health effects review was required for Vulcan's permit application, thereby, concluding that modeling of silica impacts was not required.[15]

Even so, Vulcan provided constrained source modeling of the ambient crystalline silica concentrations it claimed would result from the operation of its facility *if* all silica emissions from the remainder of the 1500 acre quarry were ignored and *if* all emissions of silica from use of the quarry roads beyond the entrance road to the rock crusher, itself, were ignored.[16] This limited modeling indicated silica

[13] 2-B2 A.R. 223, p. 21.

[14] 3 A.R. 272, pp. 269-270.

[15] 1 A.R. 45, p. 18.

[16] 2-B1 A.R. 185, pp. 9-12.

concentrations in the air that would be below TCEQ's ESL for silica.[17] Premised upon this modeled concentration of crystalline silica, Vulcan asserted that its modeling showed that there would be no adverse impact to public health as a result of silica emissions from the facility.[18]

The evidence indicated that emissions from the omitted quarry operations and quarry roads would potentially be significant. Appellees' expert, Mr. Howard Gebhart, testified that fugitive dust emissions, which contain some crystalline silica, from the quarry operations and quarry roads would likely dwarf the dust emissions of the rock crusher that had been modeled by Vulcan.[19] Vulcan's constrained source modeling, i.e., the modeling that included the entrance roadway emissions, indicated the maximum off-site concentration of crystalline silica would be 20 times the concentration it had modeled when the entrance roadway emissions were not included.[20]

III. Facts bearing on, most specifically, the NAAQS analysis issue.

Every state must have and Texas does have an EPA-approved State Implementation Plan. Such plans must include procedures by which the State will

[17] 2-B1 A.R. 185, p. 12.

[18] 2-B1 A.R. 187, p. 26.

[19] 2-B3 A.R. 240, p. 5:13-15.

[20] 2-A A.R. 180, Tab D, Ex. 22, PDF p. 52.

prevent construction of any stationary source, if operation of the source would interfere with the attainment or maintenance of a primary or secondary National Ambient Air Quality Standards. 40 C.F.R. § 51.160(b)(2). In this case, that "non-interference" demonstration was made with computerized air dispersion modeling. The guidance documents[21] on which Appellants relied in conducting or auditing, as the case was for Appellant TCEQ, the computerized air dispersion modeling recommend adding the pollutant concentrations to occur off site from (1) the new source or sources (2) to the "ambient" air concentrations of those pollutants and, in some instances, (3) to the concentrations contributed by nearby off-site sources that might distort the region's general ambient air quality by creating pollutant concentration gradients. This latter addition is intended to capture the impacts of off-site sources for which emissions are not reflected in the ambient air conditions.

The evidence showed haul road emissions are of outsized importance. Vulcan's rock crusher will not be isolated from the State's transportation grid; there will be an at least two-thirds of a half-mile driveway connecting the crushed-rock stockpiles to FM 3009.[22] The crusher will be co-located with a Vulcan limestone quarry operation, which operation, itself, includes a number of emission sources.[23]

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[21] 2-B2 A.R. 234 (APDG ["Air Permits Division Guidance"] 6232); 40 C.F.R. Part 51, App. W.

[22] 2-A A.R. 180, Tab D, Ex. 22, p. 44.

[23] 2-B 1 A.R. 183, pp. 30:7-9; 30:12-14; 56:1-3; 56:18-24; 58:4-7.

Appellants contend on-site roadway and quarry emissions need not be considered when modeling the ambient-air impacts of crusher operations. Were that not so, however, fugitive dust emissions from internal crusher plant roads and the fugitive dust emissions from the limestone extraction and handling at the quarry would likely dwarf the emissions from the rock crusher and other processing equipment that were modeled by Vulcan and TCEQ.[24]

There is in the record of this case a fair amount of information about the size and consequences of the emissions from some non-permitted sources, i.e., the haul roads and quarry operations, that Vulcan did not include and TCEQ practice does not require be included in the NAAQS modeling analysis. A table, shortly below, summarizes this information.

Vulcan voluntarily calculated PM_{10} and $PM_{2.5}$ roadway emissions arising from the crusher plant entrance to the first plant product stockpile.[25] The calculations showed 18.24 tons/year PM_{10} from unpaved portions of the entrance roads and 0.86 tons/year from the paved portions of the entrance roads – so, a total of 19.10 tons/year from the entrance roads, alone.[26] This compares to the total PM_{10} emissions from the "facility" portion of the rock crusher source of 4.07 tons/year.[27]

[24] 2-B3 A.R. 240, pp. 5:13-15; 6:23-24; 17:18-20.

[25] 2-A A.R. 180, Tab D, Ex. 22, pp. 20 (narrative) and 44 (plot).

[6] 2-A A.R. 180, Tab D, Ex. 22, PDF pp. 66-67 (Tables EC-4 and EC-5).

[27] 2-A A.R. 180, Tab D, Ex. 23, p. 29.

For the total entrance roadway $PM_{2.5}$ emissions, Vulcan calculated 2.03 tons/year, which compares to 1.07 tons/year calculated to arise from the "facility" portion of the rock crusher source.[28] From these modeling results, on sees that entrance roadway PM_{10} emissions are almost five times rock crusher "facility" PM_{10} emissions, and entrance roadway $PM_{2.5}$ emissions are almost twice rock crusher "facility" $PM_{2.5}$ emissions.

Annual PM Emissions (facility, entrance road)		
Source	**Tons/year**	**Reference**
Permitted facility		
PM_{10}	4.07	Note 27
$PM_{2.5}$	1.07	Note 27
Entrance drive, unpaved		
PM_{10}	18.24	Note 26, EC-4
$PM_{2.5}$	1.82	Note 26, EC-4
Entrance drive, paved		
PM_{10}	0.86	Note 26, EC-5
$PM_{2.5}$	0.21	Note 26, EC-5
Entrance drive, total		
PM_{10}	19.10	18.24 + 0.86
$PM_{2.5}$	2.03	1.82 + 0.21

[28] 2-A A.R. 180, Tab D, Ex. 22, PDF pp. 66-67; 2-A A.R. 180, Tab D, Ex. 23, p. 29.

Vulcan did not report the off-site pollutant concentrations attributable to entrance roadway PM_{10} emissions. However, it did report the off-site impacts of entrance roadway $PM_{2.5}$ emissions. If one considered the "facility" emissions, alone, the maximum expected off-site $PM_{2.5}$ concentration would be 0.04 micrograms/cubic meter; however, if one included in the consideration $PM_{2.5}$ emissions from the entrance roadways, the maximum expected off-site $PM_{2.5}$ concentration would be 13 times more, 0.57 micrograms/cubic meter.[29]

Friends' expert testified that the excluding emissions from known and foreseeable roads and quarries is inconsistent with other jurisdictions' practices, and non-permitting of roads and quarries "does not logically justify disregarding contaminants arising from those sources when describing air quality conditions or impacts."[30]

In summary, some facts are known and not disputed about the relative particulate-matter contributions attributable to roadways and to the proposed rock crusher, alone. For small particulate matter, i.e., $PM_{2.5}$ and smaller, some facts are known about the off-site impacts of these two pollution sources. In both cases, the facts show the rock crusher, alone, to be very much less harmful to air quality than is the entrance roadway.

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[29] 2-A A.R. 180, Tab D, Ex. 22, PDF p.50 (Appendix A, Table 1).

[30] 2-B3 A.R. 240, p. 6:16-18.

The peculiar nature of the environs of the Vulcan site were not considered by Vulcan in its NAAQS analyses. There are numerous quarries and rock crushers just south of the proposed Vulcan quarry and rock crusher. Local citizens refer to this area as "quarry row."[31] An exhibit, an annotated Google Earth aerial photo, from the record of this case,[32] to which 10 and 20-kilometer radii around the initial crusher site have been added, is Appendix 3 to this brief.[33] It reflects the density of quarries and rock crushers in the area; there are parts or all of 14 within a 20-km radius of the proposed Vulcan crusher. The windrose[34] generated at the small airport nearest at the proposed Vulcan quarry and crusher shows the wind to be predominately from the south (SSW through SSE), and Friends' expert witness explained these winds would be expected to transport particulate matter north toward the Vulcan site.[35] That, of course, also impacts the neighbors near the Vulcan site. The Martin-Marietta quarry and rock crusher are approximately 9.3 km southwest of the proposed Vulcan

[31] 2-B3 A.R. 256, p. 9:1-6.

[32] 2-B3 A.R. 242. Appellant TCEQ, in its initial brief to this Court, p. 59, disparages the Google Earth aerial photo for lacking a visible scale. However, Friends' expert witness testified without challenge that the aerial photo truthfully depicts the features it depicts; 2-B3 A.R. 240, p. 7:21-23. The Martin-Marietta quarry and crusher are depicted on the aerial photo, as is the proposed Vulcan crusher, and the distance between them is in evidence at 9.3 km. 2-A A.R. 180, Tab D, Ex. 22, p. 9.

[33] C.R. 171 (2-B3 A.R. 242 annotated).

[34] 2-B3 A.R. 243.

[35] 2-B3 A.R. 240, p. 9:4-10.

crusher. None of Vulcan's air modeling considered quarry or haul road emissions from the Martin-Marietta site.

Vulcan also used distant ambient air quality data as surrogates for local data. There is no air quality monitor in Comal County that measures ambient air concentrations of PM_{10} or $PM_{2.5}$ (or NO2, SO2, or CO, for that matter).[36] Appellant Vulcan selected two different air quality monitoring sites in Bexar County, the next county to the south, as sites with, respectively, PM_{10} and $PM_{2.5}$ conditions that would, allegedly, be representative of ambient conditions at the site of the proposed Vulcan rock crusher and quarry. (The allegedly representative conditions for ambient NO_2 concentrations were drawn from Ellis County, i.e., 7 counties away, and the allegedly representative conditions for CO concentrations were drawn from McMullen County, 4 counties away.) Vulcan presented various rationales for its decisions about how to characterize ambient air conditions at its Comal County site, but none of these rationales included the number of quarries or rock crushers in the surrogate counties or the quantities of emissions from quarries or haul roads near the surrogate monitor sites.[37]

IV. Regarding, specifically, the discovery issue.

[36] 2-A A.R. 180, Tab D, Ex. 22, p. 12.

[37] 2-A A.R. 180, Tab D, Ex. 22, pp. 13-18.

The crystalline silica content of the rock to be quarried at Vulcan's site determines the amount of crystalline silica to which members of the public will be exposed in the particulate matter, i.e., dust, emitted from the quarry and roadways and crusher facility.[38]

Friends served timely pre-trial production requests seeking all documents associated with any subsurface investigation performed within the facility property. This request specified that it covered boring logs, field notes, drillers notes, and all sampling results for any sample collected at the site.[39] Friends also requested all documents related to any analysis or evaluation of the characteristics of the materials that Vulcan intended to process at the facility.[40] Further, the scheduling order for this matter also included a deadline by which Vulcan was required to disclose to the other parties all documents that had been provided to, reviewed by, or prepared by or for all testifying experts.[41]

In response to the production request, Vulcan asserted a "trade secret" privilege and refused to produce responsive material, even under a protective order.[42] Friends moved to compel production, but the ALJs ruled that withholding

[38] 2-B1 A.R. 185, p. 35:16-17.

[39] 1 A.R. 111, Attachment A, p. 6.

[40] 1 A.R. 178, p. 10.

[41] 1 A.R. 106, p. 3; Tex. R. Civ. P. 194.2(f)(4)(A).

[42] 1 A.R. 178, p. 11.

the "trade secret" information would not work as an injustice.[43] The order provided the following on the injustice issue:

> It does not appear that nondisclosure will work injustice. However, it would create an injustice if Applicant were allowed to use the privileged information in any way as part of the additional evidence in support of the permit. Applicant's additional evidence may not rely on any responsive information that was not produced, and Applicant may not cross-examine using that information, either.[44]

Subsequently, another protesting party—the "Harrison Protestants" (now, Reeh Appellees)—commissioned a subsurface investigation to collect core samples from a nearby private property.[45] The Harrison samples' lab analyses revealed silica content decidedly higher than the silica content in Vulcan's assertedly "representative" sample.[46] Friends had some off-site samples of their own, and those samples and the Harrison samples supported the opinion of Friends' expert witness that the silica content from Vulcan's allegedly "representative" sample was too low to be considered reliable.

At hearing, Vulcan's witness regarding geology, Dr. Eversull, testified she had reviewed trade secret material that had been withheld from Friends and opined that the Vulcan sample was properly collected and consolidated.[47] Friends then

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[43] 1 A.R. 178, p. 11.

[44] 1 A.R. 178, p. 11.

[45] 1 A.R. 150.

[46] 1 A.R. 150.

[47] 1 A.R. 178, p. 11.

moved for a continuance to obtain and review the trade secret material, and the motion was denied.[48]

V. Post-hearing proceedings

TCEQ's Statement of Facts accurately describes the agency proceedings subsequent to the two-day hearing in this matter.

SUMMARY OF THE ARGUMENT

For its decision in this case, Appellant TCEQ relied very heavily on guidances or rules of thumb neither imposed by the Legislature nor developed pursuant to the Administrative Procedure Act's rulemaking process. That is not how the power of the State is supposed to be exercised. In addition to this very fundamental error, the agency made a further garden-variety discovery and evidentiary error that also prejudiced the substantial rights of Appellees.

The operation of a state agency in compliance with formally adopted and publicly available rules is fundamental to operation in accordance with the rule of law. As the United States Supreme Court has recognized, "sunlight is said to be the best of disinfectants." *Buckley v. Valeo,* 424 U.S. 1, 67 (1976). In this case, TCEQ, for the most part, grounded its decision upon policies that have been hidden from the light of the formal rulemaking process. TCEQ relies for its decision on a non-regulatory categorical exemption of rock crushers from a health effects review, a

[48] 1 A.R. 178, p. 14.

non-regulatory categorical exemption of silica emissions from a health effects review when below certain concentrations, and a non-regulatory categorical disregard for non-facility sources of particulates. For the categorical exemption of rock crushers from a health effects analysis, TCEQ does not even have a record of the basis of the purported policy. While Friends disagrees with these exemptions on their merits, the Court in this case need not reach the substantive merits of these categorical exemptions. TCEQ's reliance on invalid "rules," alone, requires reversal of TCEQ's issuance of Vulcan's permit at issue in this case.

Further, the ALJs' decision allowing Vulcan to withhold critical data—data that was foundational to the expert opinion testimony offered by Vulcan's geology witness regarding the crystalline silica content in the subsurface materials—constituted an abuse of discretion. Without this data, Friends was denied an opportunity to effectively cross-examine Vulcan's expert regarding the basis for her opinions, which in turn rendered her opinions unreliable. The Commission's decision to issue a permit to Vulcan was, thus, also characterized by an abuse of discretion and was arbitrary and capricious.

ARGUMENT

I. On *de novo* review of the trial court decision, TCEQ's interpretation of statutes is due serious consideration only if reasonable, and TCEQ's interpretation of its own rules is due deference only if reasonable and consistent with the applicable rules and statute.

This Court reviews the Commission's decision under the standards set forth in the Texas Administrative Procedure Act (APA). Tex. Gov't Code § 2001.174. Under this standard, the decision of an agency must be reversed if it is arbitrary or capricious. If an agency has failed to follow the clear, unambiguous language of its own regulation, the agency decision must be reversed as arbitrary and capricious. *Public Utility Com'n of Texas v. Gulf States Utilities Co.,* 809 S.W.2d 201, 207 (Tex. 1991). An agency decision may be supported by substantial evidence, but still be arbitrary and capricious. *Texas Department of Insurance v. State Farm Lloyds,* 260 S.W.3d 233, 245 (Tex. App. – Austin, 2008, *no pet.*), *Texas Health Facilities Commission v. Charter Medical-Dallas, Inc.*, 665 S.W.2d 446, 454 (Tex. 1984).

Administrative rules are interpreted in the same manner as statutes, and deference is given to an agency's interpretation of its own rules so long as that interpretation "is reasonable and does not contradict the plain meaning of the statute." *Perry Homes v. Strayhorn,* 108 S.W.3d 444, 448 (Tex. App. – Austin, 2003). Whether an agency failed to follow its rules presents a question of law. *Smith v. Montemayor*, No. 03-02-00466-CV, 2003 WL 21401591, at *4 (Tex. App.—Austin June 19, 2003, no pet.) (mem. op.). An agency interpretation of a rule that

defeats the purpose of the underlying rule is generally unreasonable. *Combined Specialty Ins. Co. v. Deese,* 266 S.W.3d 653, 661 (Tex. App. – Dallas 2008, no pet.), *Tex. Citrus Exch. v. Sharp,* 955 S.W.2d 164, 170–71 (Tex. App.–Austin 1997, no pet.). Statutory interpretations that have not been adopted through the rigors of a formal rulemaking process are entitled to less deference than agency interpretations that have undergone the notice and comment process associated with formal rulemaking. *Christensen v. Harris County,* 529 U.S. 576, 587 (2000). Informal agency interpretations – such as those contained in guidance documents - are entitled to respect by the courts, but only to the extent that the interpretation has the power to persuade. *Id.*

A presumption favors adopting rules of general applicability through the formal rulemaking procedures as opposed to administrative adjudication. *Rodriguez v. Service Lloyds Ins. Co.,* 997 S.W.2d 248, 255 (Tex. 1999). The Legislature delegates formal rulemaking power to an agency in the expectation that an agency will ordinarily adopt rules of general application through that power. *Id.* Allowing an agency to create broad amendments to its rules without following the rulemaking process undercuts the APA. *Id.* Indeed, a "rule" that is not properly promulgated under mandatory APA procedures is invalid, and an agency decision based on an invalid rule must be reversed and remanded to the agency if substantial rights of the appellant have been prejudiced thereby. *Texas*

State Board of Pharmacy v. Witcher, 447 S.W.3d 520, 527 (Tex. App. – Austin 2014, pet. denied), *see also* Texas Water Code § 5.105 ("Except as otherwise specifically provided by this code, the commission, *by rule*, shall establish and approve *all* general policy of the commission.") (emphasis added).

II. TCEQ's determination that crystalline silica emissions would be sufficiently low to be protective of public health was based upon invalid rules not properly adopted pursuant to the Texas Administrative Procedure Act, and, therefore, was in violation of statutory provisions and was arbitrary and capricious.

Without exception, 30 Tex. Admin. Code § 116.111(a)(2)(A)(i) provides that to be granted, an application for an air permit must demonstrate that "[t]he emissions from the proposed facility will comply with all rules and regulations of the commission and with the intent of the Texas Clean Air Act (TCAA), including protection of the health and property of the public." This is consistent with the provision of the TCAA that an air permit is to be granted if there is "no indication that the emissions from the facility will contravene the intent of this chapter, including protection of the public's health and physical property." Tex. Health & Safety Code § 382.0518(b)(2).

The statutory purposes of the TCAA include safeguarding the state's air resources by controlling emissions of air contaminants, "consistent with the protection of public health, general welfare, and physical property." Tex. Health & Safety Code § 382.002(a). The purpose of a permit is to ensure that the permittee

will not emit any contaminant "that will cause or contribute to air pollution." Tex. Health & Safety Code § 382.085(a). "Air pollution" is "the presence in the atmosphere of one or more air contaminants or combination of air contaminants in such concentration and of such duration that . . . are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property." Tex. Health & Safety Code § 382.003(3).

TCEQ's claim that "there is no provision of the Act or TCEQ rules that requires a health effects analysis for non-criteria pollutants like crystalline silica to support every NSR permit application[,]"[49] is contrary to these regulatory and statutory provisions. The applicable statute and rule require a demonstration that proposed emissions will not cause or contribute to adverse effects on human health, *without regard to the nature of the pollutant causing the impact*.

TCEQ's conclusion that emissions of silica from the facility will not violate 30 Tex. Admin. Code § 116.111(a)(2)(A), as embodied in Conclusion of Law No. 12 in TCEQ's Final Order, is founded on general policies nowhere set forth in rule or statute.

As an initial defense, TCEQ and Vulcan assert that the Commission's finding of no adverse impact to human health is justified by the exception of all rock crushers from a health effects analysis according to TCEQ guidance document APDG 5874,

[49] Brief of Appellant TCEQ, p. 22.

"Modeling and Effects Review Applicability" (MERA guidance).[50] That document was not the result of notice and comment rulemaking, and it describes its authority inconsistently: "While this document defines the minimum level of modeling and effects review required for a project it is not regulatory and does not limit the permit reviewer's ability to require a sitewide modeling and effects review."[51] Appendix B to that guidance document contains a statement that certain categories of projects do not require an effects review, including, "[e]missions of particulate matter from rock crushers."[52] TCEQ's Work Leader for the Air Permits division testified that this exemption of rock crushers from a health effects review was applied by the agency regularly and uniformly for limestone crushers,[53] such as Vulcan's application at issue here.[54] TCEQ's decision to issue Vulcan's permit was premised, at least in large part, upon this general policy, so, TCEQ's decision was premised upon an invalid rule.

Under the Texas APA, a rule (1) is an "agency statement of general applicability" that either "implements, interprets or prescribes law or policy," or describes an agency's "procedure or practice requirements;" (2) "includes the

[50] Brief of Appellant TCEQ, p. 21; Brief of Appellant Vulcan, p. 29.

[51] 2-B2 A.R. 223, p. 1.

[52] 2-B2 A.R. 223, p. 21.

[53] 2-B2 A.R. 211, p. 33.

[54] 3 A.R. 272, p. 302:5-21.

amendment or repeal of a prior rule"; and (3) "does not include a statement regarding only the internal management of a state agency not affecting private property rights or procedures." Tex. Gov't Code § 2001.003(6)(A)-(C). Within this context, a statement is of "general applicability" when it is "directed at a class by description, that is, directed at all persons similarly situated, rather than at named individuals." *WBD Oil and Gas Co. v. Railroad Com'n of Texas,* 35 S.W.3d 34, 42 (Tex. App. – Austin 1999), *rev'd on other grounds*, 104 S.W.3d 69 (Tex. 2003). A statement is not limited to the internal management of a state agency where the statement has binding effect on private parties. *Texas State Board of Pharmacy v. Witcher,* 447 S.W.3d 520, 529 (Tex. App. – Austin 2014, pet. denied) (*Witcher*).

The MERA guidance is an agency statement directed at all applicants for a rock crusher permit and to all persons who might oppose such a permit. The statement prescribes TCEQ policy regarding the nature of the health effects demonstration (or absence thereof) applicable to rock crushers. Furthermore, as reflected by the testimony of the Executive Director's staff, this policy is being applied in a binding manner. TCEQ's statement in the MERA guidance that rock crushers are not subject to a health effects review is, by law, an invalid rule.

In the alternative, TCEQ and Vulcan argue that TCEQ's finding that silica emissions from the facility will be consistent with the protection of human health is justified by Vulcan's "voluntary" health effects analysis. But, this analysis was also

premised upon invalid rules. In particular, Vulcan's health effects analysis for silica was dependent upon a general policy that all emissions for non-criteria pollutants from non-facility sources are to be ignored in determining the need for a health-effects analysis, and a general policy that a health effects analysis is not required if the off-site concentration of silica do not exceed the particular "effects screening levels" ("ESL") for the contaminant at issue.[55] Modeling to determine the off-site maximum concentration of crystalline silica included no consideration of background concentrations of silica from other sources (such as the surrounding quarry and other nearby quarry operations).[56] The Executive Director took the general position that if the concentration of a non-criteria pollutant, such as silica, is below the identified ESL, then a health effects review by TCEQ's toxicology division is not required.[57] TCEQ's Senior Toxicologist testified that if the predicted maximum off-site ambient concentration of a non-criteria pollutant is modeled to be beneath the relevant ESL, then no further health effects analysis is required.[58] TCEQ's final order, to an important degree, premised its finding that crystalline silica emissions would not negatively impact human health on a finding that crystalline silica emissions would not cause ambient air concentrations in excess of

[55] 2-A A.R. 180, Tab D, Ex. 22, pp. 43-45.

[56] 2-A A.R. 180, Tab D, Ex. 25, p. 4.

[57] 2-B2 A.R. 211, p. 35:4-7.

[58] 2-BR A.R. 237, p. 9:30-34.

TCEQ's ESL for crystalline silica.[59] But, this finding was based on an invalid rule and a badly incomplete data set missing the emissions from the Vulcan quarry and from on-site and nearby roads.

TCEQ has not adopted any rule that exempts a source's (or facility's) contributions to ambient concentrations below ESL levels from the health effects demonstration required by 30 Tex. Admin. Code § 116.111(a)(2)(A). A demonstration that the *incremental* increase in an air contaminant caused by proposed emissions is below a particular threshold does not logically demonstrate that the emissions will not *contribute* to an adverse effect on human health when combined with ambient air conditions.

In summary, TCEQ and Vulcan's arguments in defense of the agency's finding that silica emissions will not harm human health imbue a guidance document with authority to supersede the explicit provisions of TCEQ's rules that have been adopted through the formal APA procedures. TCEQ's general policy of exempting rock crushers from a health effects analysis and TCEQ's general policy of finding that no health effects analysis is needed for emissions that cause an increase in ambient concentrations beneath the applicable ESL are invalid rules. Grounding TCEQ's decision upon either of these bases asserted by TCEQ and Vulcan

[59] 1 A.R.173, p. 5, Finding of Fact 22.

constitutes reliance upon an invalid rule, rendering TCEQ's issuance of the permit in violation of statutory provisions, and arbitrary and capricious.

The Court in this case need not reach the question of whether TCEQ may categorically exempt rock crushers from a health effects analysis, or categorically exempt all emission increases below a certain effects screening level as not requiring a health effects analysis. TCEQ may still seek to create such categorical exemptions through a properly-adopted rule, and at that point the substantive validity of such categorical exemptions could be determined. But until TCEQ undertakes such a rulemaking, in accordance with the APA's requirements, TCEQ was wrong to rely on such a categorical exemption as justification for its decision in this case.

III. TCEQ erred to supersede, with non-regulatory guidance, the legal requirement that there be particulate matter NAAQS analyses that consider emissions from sources, whether permitted or to be permitted or not subject to permitting.

The crux of the NAAQS demonstration dispute. Appellant TCEQ contends that, contrary to the determination of the district court, Appellant Vulcan made all the NAAQS demonstrations required by applicable statutes and regulations. This is not so, because Appellant Vulcan had a duty to demonstrate that emissions from its "facility," when combined with those of nearby "sources" and more generalized ambient, i.e., background, air conditions would not lead to off-site particulate concentrations that exceeded the NAAQS for particulate matter. It did not do this.

NAAQS enforcement through permitting. 30 Tex. Admin. Code §101.21 requires that the NAAQS be enforced throughout all parts of Texas. Texas has an EPA-approved State Implementation Plan; the goal of such a plan is to attain and maintain the primary and secondary NAAQS. 40 U.S.C. § 7410(a). Such plans must include procedures by which the State will prevent construction of any stationary source, if operation of the source would interfere with the attainment or maintenance of a primary or secondary NAAQS. 40 C.F.R. § 51.160(b)(2).

NAAQS background, briefly. NAAQS exist for six "criteria" air pollutants: carbon monoxide, lead, nitrogen oxide, ozone, particulate matter, and sulfur dioxide. The NAAQS for each of these is stated as a concentration in the air, either parts/(million or billion) or micrograms/cubic meter. Depending on the contaminant in question, the concentration is calculated over a time period varying from an hour to a year. In the case of particulate matter, there are primary and secondary standards for two sizes of particles, those less than 2.5 micrometers across and those less than 10 micrometers across. The latter includes the former. EPA maintains an accessible and current table of the NAAQS at: https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Particulate matter is the criterion pollutant of which crystalline silica is a component; most dust is coarse particulate matter, i.e., in the diameter range of 2.5 to 10 micrometers.

Making the NAAQS demonstration. Neither Texas statutory nor regulatory law describes how the would-be minor-source permittee or the TCEQ is to demonstrate that source emissions will not cause or contribute to a NAAQS violation or interfere with NAAQS attainment or maintenance. 30 Tex. Admin. Code § 116.111(a)(2)(J) does allow the TCEQ executive director to require computerized air dispersion modeling to determine air quality impacts. TCEQ's regulations do not provide any standards regarding the air dispersion modeling process.

In lieu of such standards, Appellant TCEQ offers two guidance documents to elaborate on what the agency intends by "computerized air dispersion modeling."[60] The first of these is a TCEQ guidance document, *APDG 6232, Air Quality Modeling Guidelines.*[61] This document, in its own terms, "is not regulatory."[62] It certainly was not developed pursuant to APA notice-and-comment rulemaking. The second guidance document is Appendix W to 40 C.F.R. Part 51 and the regulatory preamble language that accompanied its recent amendment. Appendix W is a guidance document, but it has gone through *Federal Register* notice-and-comment. The version utilized in this case became effective in early 2017.[63]

[60] 2-B2 A.R. 232, p. 5:6-32.

[61] 2-B2 A.R. 234.

[62] 2-B2 A.R. 234, p. 10.

[63] 2-B2 A.R. 235.

Computerized air dispersion modeling was the NAAQS demonstration method used by Vulcan in this case. If the Vulcan source were a major source, its NAAQS demonstration would be controlled to some extent by regulation. For example, some major-source significant impact levels (SILs) have been subjected to notice-and-comment rulemaking and are codified at 40 C.F.R. § 51.165(b)(2). (Though the numbers are codified, use of these and other SILs in major-source permitting is controversial and requires certain case-specific justifications. *Sierra Club v. E.P.A.*, 705 F.3d 458, 463-464, (D.C. Cir. 2013), discussed more, *infra*). As noted, however, for minor-source NAAQS analyses, there are no statutory or regulatory standards that detail any of the processes that must be used for computerized air dispersion modeling.

The district court determined Vulcan's modeling efforts, contrary to TCEQs' view, were inappropriate, arbitrary and capricious, and not supported by substantial evidence. The Appellants' view is that Vulcan properly conducted single-source or preliminary NAAQS impacts analyses for all the criteria pollutants and, then, properly conducted full NAAQS impacts analyses for only two of the pollutants, sulfur dioxide (1-hour averaging time) and nitrogen dioxide (1-hour averaging time). Vulcan winnowed the pollutants for the full NAAQS impacts analyses based on whether the single-source analyses indicated off-site impacts fell beneath certain *de minimis* concentration levels.

Vulcan did not conduct a full NAAQS analysis for the particulate matter impacts of its project. Thus, the cumulative particulate emissions impacts of the Vulcan "facility" and of its and other nearby non-permitted "sources" were not determined or added to ambient air background conditions and compared to the particulate matter NAAQS. Vulcan forwent the full particulates NAAQS, because the preliminary NAAQS analyses for PM_{10} and $PM_{2.5}$ impacts from the "facility," considered in isolation, predicted off-site concentrations below the (non-regulatory) *de minimis* levels. Appellees and the district court objected to this shortcut.

The law. To-be-permitted sources, whether to be permitted by EPA or by a state, may not cause or contribute to a NAAQS violation.[64] 40 C.F.R. § 51.160(b)(2). Texas has a SIP-approved air permitting program. 40 C.F.R. § 52.2270. There is in neither the SIP-approved program nor elsewhere in Texas law a statutory or regulatory basis, a "law," that sets out the exception on which the Appellants rely.

[64] Vulcan's witness on health impacts acknowledged this. When asked if there would be a concern regarding the impact on public health and welfare if the NAAQS were exceeded as a result of the project, she responded, "Well, in a -- for a permit such as this, the modeled emissions cannot exceed the NAAQS. I mean, that's -- that's a requirement of the permitting process." 3 A.R. 271, p. 123:3-9. The TCEQ air dispersion modeling guidance document on which TCEQ's modeling expert relied is to similar effect: "An applicant must demonstrate that the proposed operation, as represented in the air permit application, would not cause or contribute to a National Ambient Air Quality Standard (NAAQS) or Prevention of Significant Deterioration (PSD) Increment violation and would be protective of public health, general welfare, and physical property…." Later, the guidance provides, "Technically, all TCEQ permits are federal in that the state must implement a minor NSR permitting program to ensure the NAAQS and increments are attained." 2-B2 A.R. 234, pp. 11, 14.

TCEQ has definitely created, by practice, such an exception. In its initial brief to this Court, Appellant TCEQ, at pages 5-6, describes the preliminary impact analysis and concludes, "when an applicant shows that the [single-source maximum ground level concentration, GLCmax,] for a criteria pollutant is below the applicable [significant impact level, SIL], the NAAQS demonstration is complete for that pollutant." Elsewhere, the brief repeats that "a full NAAQS analysis is not necessary when the GLCmax for a criteria pollutant does not exceed the applicable SIL." [65] At hearing in this case, TCEQ's witness on modeling testified, "The applicant conducts air dispersion modeling with the proposed emission rates of criteria pollutants for the project. If the modeling results are less than the applicable Significant Impact Levels (SILs), the modeling demonstration is complete."[66] (Appellees contest that this automatic truncation of the analysis is permissible, but the witness is credited with correctly focusing on project – and not on "facility" – emissions.)

The TCEQ guidance on which Ms. Melton, the TCEQ modeling expert, relied describes a 6-step NAAQS analysis process for minor NSR sources. Step One instructs: "Conduct a preliminary impact determination to predict whether the proposed source(s) could make a significant impact on existing air quality. … If the

[65] Brief of Appellant TCEQ, pp. 45-46.

[66] 2-B2 A.R. 232, p. 16:4-11.

sources do not make a significant impact for a pollutant of concern, the demonstration is complete."[67] (emphasis added)

This exclusion was not developed via notice-and-comment rulemaking. Nonetheless, it is treated by the agency as a rule.

This Court has considered at length the problem of this sort of rulemaking-by-practice. *Witcher,* 447 S.W.3d at 541-42. In *Witcher*, the Court examined the enforceability of an agency practice that was long-standing and well-documented and uniformly applied but that had not been adopted by notice-and-comment rulemaking. The agency had a properly-adopted rule that identified 27 factors that were relevant to determining the sanction to be imposed, and the challenged agency practice was that, if a particular one of those factors were present, then, a certain sanction was automatically imposed. This Court, in *Witcher*, explored a number of cases, including a couple of Texas Supreme Court cases (*El Paso Hosp. Dist. v. Texas Health & Human Servs. Comm'n,* 247 S.W.3d 709 (Tex. 2008) and *Rodriguez v. Service Lloyds Ins. Co.*, 997 S.W.2d 248 (Tex. 1999)). This Court affirmed the district court, which had rejected the underlying agency decision, because the decision was based on the long-standing agency practice that was, in effect, an improperly formulated "rule;" this Court noted, at 534 and per *El Paso Hosp. Dist.*,

[67] 2-B2 A.R. 234, p. 17.

"a rule that is not adopted in accordance with the APA's rulemaking procedures is typically invalid."

In another context, Appellant TCEQ has created by notice-and-comment rulemaking an exception to an unequivocal regulatory standard. EPA Clean Water Act regulations require that each state that issues wastewater permits have antidegradation permitting provisions ensuring, at a minimum, that the quality of the waters exceeding a "fishable/swimmable" standard not be degraded, unless certain findings related to important economic or social development are made. 40 C.F.R. § 131.12(a)(2). TCEQ's predecessor adapted the EPA-required antidegradation provision, which includes no *de minimis* exception, to nonetheless allow a *de minimis* exception, and the state agency implemented the exception via notice-and-comment rulemaking. Thus, Texas softened the EPA minimum standard by defining "degradation" to mean "lowering of water quality by more than a de minimis extent." 30 Tex. Admin. Code § 307.4(b)(2). In its notice-and-comment rulemaking, the agency explained the exception was created "to avoid the administrative burden of determining economic and social justification for very small or nonexistent degrees of degradation." 13 Tex. Reg. 1776, at 1779-1780 (April 15, 1988). One may disagree with the fact of "administrative burden" or as to the "administrative burden" vs. "water quality" tradeoff, but the agency's judgment was made in full public view

and implemented consistent with the APA, following notice and an opportunity for public comment.

As to whether Appellant TCEQ could have legally, i.e., via the notice-and-comment rulemaking process, created the exception applied in the immediate case – that is a more difficult question, because the federal Clean Air Act is so strict regarding enforcement of the NAAQS. Whether TCEQ could create by notice-and-comment rulemaking such an automatic exception has not been litigated in Texas. That question, as to EPA, however, has received a lot of attention – ultimately, not decisively – at the D.C. Court of Appeals.

In *Sierra Club v. EPA, et al*., 705 F.3d 458 (D.C. Cir. 2013), Sierra Club sued EPA for creating, by a new rule, an automatic exemption from full NAAQS modeling by a permit applicant of the impacts of emissions of $PM_{2.5}$ and its precursors, if the off-site impacts of the emissions from the source, considered alone, did not exceed the $PM_{2.5}$ SIL. Once challenged, EPA agreed with the Sierra Club that the automatic nature of the exemption was an error and sought to have the new rule vacated and remanded. Sierra Club contended vacation and remand were insufficient; Sierra Club argued no remand was warranted here.

Sierra Club's position was that the section of the Clean Air Act (i.e., 42 U.S.C. § 7475, CAA § 165) to which EPA's *de minimis* exception would apply was so extraordinarily strict that there could be no such exception and that the court needed

to say so. Sierra Club offered some examples of instances in which the automatic exception would be indefensible. For example, if a proposed source or modification were in an area that is close to violating the NAAQS, that source could cause or contribute to a violation of the NAAQS, even if its emissions, alone, would have an off-site impact below the SIL; an impact lower than the SIL could be large enough, when added to the background concentration, to push the area above the NAAQS. Sierra Club further noted that, because the challenged EPA regulation automatically exempted a source with a proposed impact below the SIL from demonstrating it would not cause or contribute to a violation of the NAAQS, unlimited numbers of sources whose impacts, separately, were modeled to be less than the SILs could cumulatively cause a violation of the NAAQS. Also, Sierra Club pointed out that a source to be permitted in an attainment area and for which, considered alone, associated off-site impacts would be below the SILs might, nonetheless, worsen an existing violation in a downwind nonattainment area. *Sierra Club*, 705 F.3d at 463.

Since there are no air quality monitors in Comal County or near the Vulcan site, no evidence was presented to the agency regarding how close to a NAAQS particulate violation the Vulan site is. Thus, it is hard to evaluate how relevant Sierra Club's first example is to the case at bar. But, Sierra Club's second example certainly resonates, here. There are lots of unpermitted "sources" nearby and, likely, some of the nearby rock crushers were themselves modeled to emit particulates with

de minimis impacts and, thus, their permitting also evaded cumulative impact analyses.

In the end, the D.C. Circuit declined, on ripeness grounds, to decide if Sierra Club were correct about the illegitimacy of the use of the $PM_{2.5}$ SIL as an automatic exception to a NAAQS demonstration. The court reasoned, "On remand the EPA may promulgate regulations that do not include SILs or do include SILs that do not allow the construction or modification of a source to evade the requirements of the Act as do the SILs in the current rule." *Sierra Club,* 705 F.3d at 464. This certainly suggests that the court's view is that the then-current rule's automatic SIL exception to full NAAQS review was not legally supportable.

The *Sierra Club* case does not provide a perfect roadmap for addressing the legal authority of Appellant TCEQ to automatically apply even properly-adopted *de minimis* exceptions to the review of Vulcan's rock crusher application. *Sierra Club v. EPA* dealt with the role of SILs in the permitting of major NSR sources, not in the permitting of minor NSR sources, such as the Vulcan rock crusher. It focused on the $PM_{2.5}$ SIL, not on SILs in general. But, the case showcases the depth and breadth of issues that would surely have been raised by commenters, had TCEQ undertaken, as it should have, a notice-and-comment rulemaking regarding its automatic exception practice.

After the vacation and remand in *Sierra Club v. EPA*, EPA did not re-propose a similar rule, i.e., a rule with an automatic exemption. Instead, a few years later, it revised its air quality models guidelines, 40 C.F.R. Part 51, Appendix W, to, among many other things, make less conspicuous the role of SILs in NAAQS-analysis modeling. (*E.g.*, "EPA has revised section 9.2.3 of [Appendix W] to make more clear that this two-stage approach is a recommendation and not a requirement. … [I]nterested parties retain the opportunity … to call for a cumulative impact analysis to make the required demonstration in the context of individual permits;" and "we have removed the term 'significant impact' from many parts of section 9.2.3.")[68] The Federal Register announcement of these revisions is one of the two documents TCEQ's modeling witness at hearing indicated had informed her review of Vulcan's modeling.[69]

Appellants assert that the legality of the automatic exclusion of *de minimis*-impact facilities from full NAAQS analysis and of non-permitted emission sources from even preliminary NAAQS analyses makes no difference, because Vulcan performed, in this case, a full NAAQS analysis.[70] This argument is unpersuasive, because (1) the full NAAQS analysis that was conducted for $PM_{2.5}$ annual impacts

[68] 2-B2 A.R. 235, p. 5199.

[69] 2-B2 A.R. 232, p. 5:6-32.

[70] Brief of Appellant TCEQ, p. 38; Brief of Appellant Vulcan Construction Materials, p. 42.

omitted several non-permitted emission sources, e.g., quarry sources and most haul roads; and (2) the full NAAQS analysis that was conducted for PM_{10} annual and $PM_{2.5}$ 24-hour impacts omitted all non-permitted emission sources.

As noted, earlier, there are no statutory or regulatory standards that constrain the modeling, itself. (Appellant Vulcan is particularly assertive that the Texas Clean Air Act and TCEQ rules only require NAAQS modeling include emissions from "facilities." For this proposition, Vulcan cites a section of the Act and two regulatory provisions. In fact, none of these three excludes consideration of non-facility air emissions.)[71] Also as noted, TCEQ has a regulation, 30 Tex. Admin. Code § 116.111(a)(2)(J), under which "computerized air dispersion modeling may be required by the executive director." TCEQ's guidance document on air quality modeling, APDG 6232,[72] although not regulatory, is presumably due deference on the broad issue of what the agency considers to be "computerized air dispersion modeling."

APDG sets out, at pages 17-18, a 6-step process for conducting a minor NSR NAAQS analysis. Step 3 of that process directs the modeler to determine the "associated parameters" for off-property sources for which impacts will be modeled

[71] Brief of Appellant Vulcan Construction Materials, p. 47 and footnote 120. Vulcan also asserts that TCEQ "does not have the legal authority" to require model inputs include non-facility emissions. For this proposition, it cites the views of several engineers but no law. Brief of Appellant Vulcan Construction Materials, p. 48 and footnote 122.

[72] 2-B2 A.R. 234.

in the full NAAQS analysis. The APDG guidance does not limit the data collected to that associated with "facilities."

Vulcan determined to collect these data for sources within a 10 km radius of its crusher.[73] Vulcan determined the Martin-Marietta rock crusher and quarry were within that 10 km radius. The APDG Step 3 guidance warns: "It is the responsibility of the person conducting the modeling to obtain these data and ensure their accuracy. …. In addition, if the person conducting the modeling is aware of source data not provided by the [TCEQ Information Resources Division], … the data should be included as applicable." Vulcan included the Martin-Marietta crusher emissions but did not include the quarry or roadway sources at the Martin-Marietta site in any of its "full" NAAQS modeling.

The 6-step minor NSR analysis process described in the main body of APDG 6232 does not address directly the consideration to be given to on-property sources that are not "facilities." However, it directs one to Appendix E "for additional guidance on conducting the Minor NAAQS analysis." Appendix E explains that the full NAAQS review "considers all emissions at the site under review, as well as emissions from nearby sources and background concentrations." This portion of the guidance makes no distinction between emissions from on-site sources that are

[73] 2-A A.R. 180, Tab D, Ex. 22, p. 9. This decision was likely underpinned by the recommendation in Appendix W of Part 51: "In most cases, the few nearby sources will be located within the first 10 to 20 km from the source(s) under consideration." 2-B2 A.R. 235, p. 5221, Col. 3.

"facilities" and those sources that are not. This is logical, in that the guidance, neither in its main text nor in the appendix, indicates that nearby non-permitted off-site sources may be disregarded in gathering inputs for the computerized air dispersion modeling; to require the emissions from more distant sources be considered but not to require consideration of emissions at the site under review be considered would make no sense.

In sum, Appellants' reliance on TCEQ's practice of automatically exempting from full NAAQS analysis "facility" emissions' impacts, if those fall below *de minimis* levels cannot support the TCEQ permitting decision, because that practice was adopted outside the notice-and-comment rulemaking requirements of the Administrative Procedure Act. Additionally, the permitting decision was based, in part, on air dispersion modeling that failed to consider the contributions of nearby emission sources, i.e., quarries and haul roads, to the pollution concentrations to which Vulcans' facility's pollution would be added. This is not supported by either logic or the agency's guidance document. And, as laid out in this brief's Statement of Facts, the evidence in the record is very clear that particulate emissions from project roadways, alone, overwhelm those from the "facility," alone. Because emissions from nearby quarries and haul roads were excluded from the modeling, the cumulative off-site concentrations that should be compared to the NAAQS were never determined.

The district court was correct to and this Court, also, should reject the agency's decision that the NAAQS-compliance demonstration was adequate.

IV. TCEQ's health effects analysis was not supported by substantial evidence, since it relied upon a conclusory characterization of the material to be mined and processed at the rock crusher.

As discussed above, the predicted crystalline silica concentrations depended critically upon the characterization of the crystalline silica content of the material to be mined. This, in turn was based upon a single composite sample that Vulcan baldly asserted to be representative of the entire 1500-acre site without providing supporting information regarding the location, depth, or quantity of material comprising the sample. In light of this lack of support, the trial court properly found that Vulcan's silica emissions calculations are not based on representative site conditions, and TCEQ's determination that Vulcan's silica emissions calculations are representative of those to be expected from the site is not supported by substantial evidence.[74] Appellee Friends addresses facets of this issue, i.e., crystalline silica health effects analysis not supported by credible underlying data, elsewhere in this brief. To avoid duplicative briefing, Appellee Friends also adopts the arguments presented by the Reeh Appellees regarding TCEQ's failure to base its air quality analysis upon a representative sample of the material to be mined at the site.

[74] C.R. p. 536.

V. The ALJs' denial of Friends' motion to compel discovery regarding Applicant's subsurface geological investigation, their limitation on Friends' ability to cross-examine regarding Vulcan's expert regarding geology issues, and the denial of Friends' Motion for Continuance to inspect documents was in error and constituted an abuse of discretion. The Commission's decision, granting Vulcan's permit, was, thus, based on an abuse of discretion that prejudiced Appellees' substantial rights, and it was based on legally insufficient evidence.

On this issue, Appellant TCEQ does not attempt to defend the ALJs' decision to allow Vulcan to withhold relevant information from Appellees. Rather, TCEQ argues that Appellees' substantial rights were not prejudiced by this ruling.

Appellant Vulcan, on the other hand, maintains that the ALJs correctly ruled that the disputed data—*i.e.,* data generated from Vulcan's subsurface investigation—was subject to trade-secret privilege and should be withheld from production. Vulcan further argues that the ALJs correctly prohibited Appellees from accessing the withheld data or from cross-examining Vulcan's experts regarding the withheld data because Appellees failed to demonstrate that the data was necessary to prevent injustice.

Appellees will address these arguments, in turn, below.

The disputed data. As explained above, the particulate, *i.e*., dust, emissions from Vulcan's quarry, roadways, and crusher will contain crystalline silica in the percentage of its presence in the limestone that is quarried and crushed. The concentration of silica within the material crushed influences the concentration of

silica in the emissions from a plant. Vulcan's reports confirm this fact. Vulcan's Air Quality Analysis Modeling Report stated that the particulate matter, *i.e.*, its makeup, emitted at the plant, "will be the limestone that will be processed and handled at the proposed crushing plant."[75] In fact, Vulcan's modeling of silica emissions assumed that the proportion of silica in the particulate emissions from the plant would be exactly the same as the proportion of silica contained in the subsurface samples.[76] Thus, information regarding the silica content of the subsurface materials at the site is critically important to determining whether the predicted silica emissions are at concentrations that would endanger human health and welfare.

In order to characterize the silica content for the material to be mined and crushed, Vulcan's geology expert, Dr. Eversull, testified that Vulcan relied upon subsurface data collected from three holes drilled at unspecified locations within the 1500 acre site.[77] Dr. Eversull claimed that samples of one to three inches in thickness were taken from these undisclosed cores at ten foot intervals, and she testified that an unidentified subset of this total number of samples was mixed together into a single "composite" sample of unidentified volume.[78] Then, an unidentified smaller

[75] 2-A A.R. 180, Tab D, Ex. 22, p. 10.

[76] 2-B1 A.R. 185, p. 35:15;36:13.

[77] 3 A.R. 271, p. 155.

[78] 3 A.R. 271, pp. 157-58.

volume of that composite sample was tested to determine its silica content.[79] That final number (0.2% silica) was identified in the application as a "representative sample" of silica for the entire site, and utilized to characterize all of the material to be crushed at the facility for its entire life.[80]

These samples—taken from three borings drilled at undisclosed locations on the site—were the remaining samples from a larger subsurface investigation conducted by Vulcan, purportedly to evaluate the economic viability of the proposed project. As part of that investigation, Vulcan had collected subsurface samples from 41 borings drilled on the site.[81] The data collected from the earlier subsurface investigation, including from the 41 borings, was withheld from production by Vulcan, based on a claim of trade secret privilege.

Vulcan's expert's testimony and the basis for her opinions. During the hearing on the merits, Friends' counsel sought to explore the basis of Vulcan's "representative sample" upon which the modeling of silica emissions entirely relied. Dr. Eversull, Vulcan's expert witness, provided circular and evasive testimony regarding the basis for her opinion that the composite sample that was tested was indeed "representative."

[79] 3 A.R. 271, p. 158.

[80] 2-B1 A.R. 198, p. 5:13-23.

[81] 3 A.R. 271, p. 156.

Dr. Eversull admitted that she supervised the earlier subsurface investigation that included the drilling of 41 borings at the 1500-acre site.[82] And she explained that the reason 41 borings were drilled is because geologists "always want more data," in part to determine "the quality of the [subsurface] material" and "to define the quantity."[83]

She also explained that "mother nature is not perfectly homogeneous," and the concentration of crystalline silica in the materials beneath the 1500-acre site will likely vary from one spot to another.[84] According to Dr. Eversull, "that's why we collect samples from different·locations to try to represent that lateral variability."[85] ·When asked to estimate what area around a borehole is represented by a single boring—"how far laterally can you interpolate based upon what you observed in one boring?"—Dr. Eversull responded, "[T]hat's the $64,000 question in geology, and it depends a lot on where -- what type of environment you're sampling."[86]

About a year later, when Dr. Eversull was asked by her environmental manager whether she had any data regarding silica content from the site, she

[82] 2-B1 A.R. 198, p. 6.

[83] 3 A.R. 271, p. 156; *see also* 3 A.R. 271, p. 185:11-16 (testifying that that the depositional environment influences the quantity of crystalline silica one would expect to find in a formation).

[84] 3 A.R. 271, pp. 189-90.

[85] 3 A.R. 271, p. 190.

[86] 3 A.R. 271, pp. 210-11.

"decided it was appropriate to take a sample and have it analyzed."[87] ·To collect a "representative" sample for analysis and recognizing that the deposition environment influences crystalline silica concentrations, Dr. Eversull testified that "based on what we saw in the 41 borings, that three taken at three different areas on the property was sufficient to capture any variability, any lateral change that we saw from the·north part of the acreage to the south part."[88] She continued, explaining that "the whole drilling program gives us a sense of how homogeneous the unit is. . . . [W]e had a sense that three borings from three different parts of the property was sufficient to capture -- the entire property was sufficient to capture, in this case, not -- not a lot of variability."[89] In short, Dr. Eversull testified that based on what she saw from the entire subsurface investigation, including the 41 borings, she opined that a composite sample taken from 3 borings was adequate to characterize the entire 1500-acre site—to "represent the whole property."[90]

Dr. Eversull further admitted that photographs of the materials that were extruded from the subsurface—the cores—were used to document and create a photographic record of the subsurface materials.[91] She explained that boring logs are

[87] 3 A.R. 271, p. 153.

[88] 3 A.R. 271, p. 213:9-13.

[89] 3 A.R. 271, p. 214:1-8.

[90] 3 A.R. 271, p. 202:20.

[91] 3 A.R. 271, p. 172.

typically created to provide a detailed description of the subsurface materials. Together, the photographs and the boring logs provide a detailed record of the cores collected from the subsurface, which can be used if the cores are destroyed.[92] In this case, Vulcan created a detailed record—with boring logs and photographs—of the subsurface investigation conducted at the site. But Dr. Eversull maintained that she did not review any of these materials "in preparation for [her] testimony" at the hearing, because they were not "relevant"[93] and were not the "sole basis" for her opinion.[94] The ALJs did not allow Friends' counsel to further explore the relevance of this data to Dr. Eversull's opinion.

1. *The ALJs abused their discretion in prohibiting Appellees' access to the subsurface data that formed the basis for Vulcan's expert witness opinion testimony, based on Vulcan's trade-secret claim.*

The party resisting discovery by invocation of a trade secret claim must establish that the information is a trade secret. The burden then shifts to the requesting party to establish that the information is necessary for a fair adjudication of its claims. If the requesting party meets this burden, the trial court should ordinarily compel disclosure of the information, subject to an appropriate protective order. *In re Cont'l Gen. Tire, Inc*., 979 S.W.2d 609, 613 (Tex. 1998).

[92] 3 A.R. 271, pp. 174-75.

[93] 3 A.R. 271, p. 159:15-20.

[94] 3 A.R. 271, pp. 166-67.

To meet its burden of establishing trade-secret protection, Vulcan was required to satisfy a six-factor test. *John Paul Mitchell Sys. v. Randalls Food Mkts., Inc*., 17 S.W.3d 721, 738 (Tex. App.—Austin 2000, pet. denied) (quoting *Chapa v. Garcia*, 848 S.W.2d 667, 670 (Tex. 1992). Important for this case, one of those six factors is that the subject matter of a trade secret must be kept secret. *Id.* Here, Vulcan failed to establish this factor.

Vulcan argues that it did not include any of the trade secret information in its Application or otherwise provide it to TCEQ or to anyone else, which means Vulcan did not waive its trade secret claim for such information. But Vulcan takes too narrow a view of the data that was disclosed to TCEQ via its application.

Assuming the characterization of its silica content and the basis for that characterization were, at one time, properly considered trade secret, Vulcan abandoned the trade secret status of the information when it submitted its application to the TCEQ.[95] That publicly available application included a laboratory report purporting to characterize the total crystalline silica content of a composite sample from the site. Vulcan repeatedly asserted that this sample was "representative" of the materials to be handled at the site.[96] By making this data and characterization of the data publicly known, Vulcan abandoned the trade secret status of such sampling

[95] 2-A A.R. 180, Tab D, Ex. 1.

[96] 2-B1 A.R. 198, p. 5:13-23.

data. That is, if the characterization of the composite subsurface sample is truly "representative" of the materials to be processed at the site, then, any additional subsurface data collected by Vulcan should be consistent with the "representative" sample that was used to characterize the materials at the site. It was, thus, error for the ALJs to find that the geologic information regarding the silica content of the subsurface materials constituted a "trade secret," when Vulcan submitted this information—in different form—to TCEQ, a public agency.

Even if material is protected trade secret material, it still must be disclosed in the discovery process, if its nondisclosure would work an injustice. In order to justify disclosure of trade secret material, the party seeking production of the information must establish that the information sought is relevant and necessary to the proof of, or defense against, a material element of one or more causes of action presented in the case, and that it is reasonable to conclude that the information sought is essential to a fair resolution of the lawsuit. *John Paul Mitchell Systems v. Randalls Food Markets, Inc.*, 17 S.W.3d 721, 738 (Tex. App. – Austin 2000).

Friends satisfied its burden of establishing that the withheld information was relevant and necessary to the issues presented by Vulcan's requested permit and was essential to a fair resolution of the case. Dr. Eversull's own testimony demonstrated that the withheld data formed the basis, at least in part, for her expert opinion

testimony; yet, Friends was denied the opportunity to evaluate whether this foundational data was reliable and competent.

Dr. Eversull opinion was based on the "representative samples" that were analyzed. That is, her opinion was based on a threshold assumption that the samples analyzed were reliable and truly "representative" of the entire site. Whether this assumption was a reliable one could not be determined without access to the subsurface data that was collected and made available to Dr. Eversull. Because Vulcan was allowed to withhold the subsurface data that it had collected, Friends (and the ALJs and ultimately, the Commission) was denied an opportunity to explore the connection between this foundational data and Dr. Eversull's opinion; that is, Friends was denied access to information that was essential to a fair resolution of this case.

The admissibility of expert testimony and the gatekeeping function of the trier of fact have been extensively analyzed and discussed by appellate courts. One of the foundational principles of those appellate analyses is that each material part of an expert's opinion must be reliable before the expert testimony is admissible; the opinion must be based on a reliable foundation. *Gharda USA, Inc. v. Control Solutions, Inc*., 464 S.W.3d 338, 349 (Tex. 2015); *Whirlpool Corp. v. Camacho*, 298 S.W.3d 631, 637 (Tex. 2009); *E.I. du Pont de Nemours & Co. v. Robinson*, 923 S.W.2d 549, 557 (Tex. 1995); *see also Gunn v. McCoy*, 554 S.W.3d 645, 662 (Tex.

2018) (expert's opinion may be considered unreliable if it is based on assumed facts that vary materially from actual facts or if it is based on tests or data that do not support conclusions reached).

An expert's opinion is not admissible if it is based on unreliable foundational data or information. *See, e.g., Merrell Dow Pharms. v. Havner*, 953 S.W.2d 706, 714 (Tex. 1997) ("The underlying data [upon which the expert relied in forming her opinions] needs to be independently evaluated in determining if the opinion itself is reliable."). "If an expert relies upon unreliable foundational data, any opinion drawn from that data is ... inadmissible." *Helena Chem. Co. v. Wilkins*, 47 S.W.3d 486, 499 (Tex. 2001). Therefore, the "factual basis, data, [and] principles" must be reliable. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 151 (1999).

Moreover, if an expert makes assumptions regarding the facts in the case, the assumptions must be supported by the evidence. *Burroughs Wellcome Co. v. Crye*, 907 S.W.2d 497, 499 (Tex. 1995) (finding that physician improperly relied on assumed facts, which were contrary to the evidence); *see also* Tex. R. Evid. 705(c). Thus, an expert cannot base their opinion on unverified or unreliable information.

In performing its gatekeeping function and employing the standards described above, the trier of fact does not decide whether the expert's conclusions are correct; rather, the trier of fact determines whether the analysis used to reach those conclusions is reliable. *Gammill v. Jack Williams Chevrolet, Inc.,* 972 S.W.2d 713,

728 (Tex. 1998). Courts must "rigorously examine the validity of facts and assumptions on which the testimony is based, as well as the principles, research, and methodology underlying the expert's conclusions and the manner in which the principles and methodologies are applied by the expert to reach the conclusions." *Whirlpool Corp.*, 298 S.W.3d at 637. If an expert's testimony is not reliable—that is, if there is too great an analytical gap between the data relied upon and the opinion offered—it is not evidence. *Havner*, 953 S.W.2d at 713.

Vulcan's brief to this Court relies heavily on Dr. Eversull's own testimony explaining that the purpose of the initial subsurface investigation—the drilling of the 41 borings—"was not to allow determination of the crystalline silica percentage of the aggregate material underlying the property to allow calculation of the Plant's crystalline silica emissions."[97] Thus, argues Vulcan, the data collected from that subsurface investigation were properly withheld from disclosure because Dr. Eversull did not rely on that information in analyzing the representative sample she used to estimate crystalline silica emissions. But Vulcan's argument misses the mark.

The motivation for Vulcan's initial subsurface investigation and collection of core samples from 41 borings is not relevant to the inquiry here. The issue is whether Dr. Eversull's opinions were based on "representative" samples, as she claims, and

[97] Vulcan's Brief, pp. 32-33 (emphasis in original).

whether her assumptions are reliable based on the reliable and accurate foundational data.

Dr. Eversull testified that her opinions were based on the threshold assumption that the samples she relied on were "representative" of the materials found beneath the surface of the 1500-acre site. The reliability or validity of this assumption, in turn, depends on a number of foundational factors, such as whether there were a sufficient number of samples collected, at sufficient depths and from appropriately spaced locations; whether the samples were of a sufficient volume and of a sufficient quality, and were not biased or otherwise compromised; whether proper methods were used to collect the samples, store them, and transport them to a laboratory.

In other words, to test whether Dr. Eversull's opinions were based on reliable, representative samples, Friends was entitled to all the subsurface data collected by Vulcan and made available to Dr. Eversull—to determine whether the subsurface was indeed as homogeneous as Dr. Eversull claims, justifying the use of a composite sample consisting of a subset of materials from only 3 boring locations on a 1500-acre site. Dr. Eversull admitted, during her testimony, that the subsurface is expected to consist of some lateral variability, but she opined that 3 samples were sufficient to capture that variability for a 1500-acre site.

By allowing Vulcan to withhold this information from Friends, Friends was denied the opportunity to inquire whether Dr. Eversull's assumption that the samples she relied on to come up with the 0.2% silica content figure were truly, reliably representative of the subsurface materials at the site. Friends was denied the opportunity to test whether her opinion of the subsurface lateral variability was reliable. This is because Friends was denied access to the very information that would have addressed this issue. Friends, the ALJs, the Commission, the trial court, and now this Court, are expected to accept Dr. Eversull's assumption—that the samples she relied on were representative samples—based only on the testimony offered by Dr. Eversull herself. *But see Gharda USA*, 464 S.W.3d at 351 (opinion testimony connected to existing data only by expert's "ipse dixit" is unreliable and not evidence); *Cooper Tire & Rubber Co. v. Mendez*, 204 S.W.3d 797, 801 (Tex. 2006) (expert must explain how their opinions are connected to facts of case; otherwise, expert's mere subjective opinion has no probative value); *Rogers v. Zanetti*, 518 S.W.3d 394, 409 (Tex. 2017) ("An expert's familiarity with the facts is not alone a satisfactory basis for his or her opinion."). The basis for Dr. Eversull's opinions was necessary for resolution of the issues presented in this case, and the ALJs therefore erred in denying Friends access to this foundational data, and the Commission erred in granting Vulcan a permit despite the absence of this foundation data from the record.

In short, Friends demonstrated that Vulcan's "trade secret" data was necessary for resolution of the issues presented in this case. The silica content of the subsurface materials at the site is an essential component of Vulcan's permit application. The nondisclosure of the withheld information worked an "injustice" in this case. And the ALJs' ruling, allowing the nondisclosure of this information constituted an abuse of discretion. *See Joe v. Two Thirty Nine Joint Venture*, 145 S.W.3d 150, 161 (Tex.2004).

2. *Appellees' substantial rights were prejudiced by the ALJs' abuse of discretion in denying them access to information essential to resolution of the issues presented in this case and in denying them the opportunity to cross-examine witnesses regarding this withheld information.*

For the reasons described above, Appellees' substantial rights were prejudiced by the ALJs' abuse of discretion in prohibiting Appellees from accessing Vulcan's subsurface investigation data. That is, in their effort to demonstrate compliance with TCEQ's regulations, Vulcan's engineers performed modeling of predicted silica concentrations, and they did so based on Dr. Eversull's characterization of a "representative" composite sample.

If reliable modeling had demonstrated that the predicted emissions included silica concentrations that endanger human health and welfare, then Vulcan's requested permit should have been denied. Accordingly, the silica concentrations in the predicted emissions from the proposed facility are of crucial importance to this

case, and any information that influences the level of those emissions is critically important to this case.

Without the subsurface data collected by Vulcan and analyzed by Dr. Eversull, it was impossible for Friends to challenge or verify Vulcan's claim that the sample provided in the application was "representative" of the geologic data gathered at the site. Dr. Eversull's opinion testimony was, essentially, legally insufficient and inadmissible, because Friends, the ALJs, and the Commission were denied the opportunity to rigorously examine the validity of facts and assumptions on which Dr. Eversull's testimony was based. *See Whirlpool Corp.*, 298 S.W.3d at 637. And the Commission's decision to issue a permit, based on this unreliable and unverified opinion testimony prejudiced Friends' substantial rights.

Moreover, by denying Friends the opportunity to vet Dr. Eversull's opinions via cross-examination, the ALJs effectively denied Friends' their right to due process. Caselaw acknowledges that "[c]ross-examination is a safeguard essential to a fair trial and a cornerstone in the quest for truth." *Davidson v. Great Nat'l Life Ins. Co*., 737 S.W.2d 312, 314 (Tex. 1987). The Supreme Court has similarly acknowledged: "In almost every setting where important decisions turn on questions of fact, due process requires an opportunity to confront and cross-examine adverse witnesses." *Goldberg v. Kelly*, 397 U.S. 254, 269 (1970). Absent cross-examination,

neither a decision-maker nor a reviewing court can determine whether the evidence in the record is "reliable and probative." *Id*.

In administrative proceedings, due process requires that parties be accorded a full and fair hearing on disputed fact issues. *See City of Arlington v. Centerfolds, Inc.*, 232 S.W.3d 238, 250 (Tex. App.—Fort Worth 2007, pet. denied) (citing *City of Corpus Christi v. Pub. Util. Comm'n*, 51 S.W.3d 231, 262 (Tex. 2001); *Hammack v. Pub. Util. Comm'n*, 131 S.W.3d 713, 731 (Tex. App.—Austin 2004, pet. denied)). Indeed, the Administrative Procedure Act provides: "In a contested case, a party may conduct cross-examination required for a full and true disclosure of the facts." Tex. Gov't Code § 2001.087. "The right to cross examine adverse witnesses and to examine and rebut all evidence is not confined to court trials, but applies also to administrative hearings." *Richardson v. City of Pasadena*, 513 S.W.2d 1, 4 (Tex. 1974). Courts have held that the right to cross-examine a witness is a substantial right, and denial of that right is error. *Davidson*, 737 S.W.2d 314; *City of Arlington*, 232 S.W.3d at 250.

In this case, the ALJs not only allowed Vulcan to withhold the subsurface geological data that would allow Friends to challenge or verify whether Vulcan's composite sample was truly "representative," but they also denied Friends the opportunity to inquire about Vulcan's subsurface investigation via cross-examination of Dr. Eversull. The result was that Vulcan was able to present its own

opinion regarding silica content in the subsurface materials from the site, unchallenged. Friends and the other protesting parties were denied the opportunity to cross-examine Vulcan's witnesses to develop a full and true disclosure of the factual underpinnings of Vulcan's theories—a denial of Friends' due process rights, in and of itself.

Moreover, the ALJs and the Commission were unable to verify whether Vulcan's expert's opinion testimony was reliable and based on reliable foundational data. And the resulting issuance of the permit to Vulcan, based on unchallenged, unreliable, and inadmissible opinion testimony, prejudiced the substantial rights of Friends.

Both TCEQ and Vulcan argue that Friends' substantial rights were not prejudiced by the ALJs' decision, because Dr. Eversull's opinions were not necessary to resolution of the issues in this case. Vulcan, in particular, argues that the Administrative Record supports TCEQ's determination the Plant's crystalline silica emissions would not negatively affect public health or welfare even if the 0.2% was a little more than 27%, and Vulcan's modeling established that the crystalline silica emissions did not approach 27%.[98]

This argument presumes that the method Vulcan relied on to calculate particulate emissions was correct; that is, this presumes that Vulcan included all

[98] *See, e.g.,* Vulcan's Brief, p. 35.

emission sources in calculating particulate emissions. But as explained, above, Vulcan failed to do so. Vulcan failed to consider all sources of emissions, in determining that crystalline silica content in the subsurface materials could approach 27% without affecting public health and welfare. Vulcan is simply mistaken in arguing that Eversull's opinions regarding the crystalline silica content in the subsurface materials is irrelevant to the issue of whether emissions for its project will impact public health and welfare.

Finally, both TCEQ and Vulcan argue that Friends' substantial rights were not prejudiced by the ALJs' ruling because Dr. Eversull's testimony was not essential to the issues presented;[99] they argue that her testimony was cumulative of other evidence. For support, they point to a Bureau of Economic Geology ("BEG") report and U.S. Geological Survey reports, TCEQ's MERA guidance, and analysis of grab samples of aggregate material from an adjacent property. But a review of Dr. Eversull's testimony reveals that none of these materials informed the basis of her assumption that a composite of samples from 3 boreholes was representative of the entire 1500-acre site.

TCEQ's reliance on the MERA guidance document in support of the argument that no health effects analysis for crystalline silica emissions was required has been

[99] Dr. Eversull offered testimony regarding "whether emissions of silica from the proposed plant will negatively impact human health and welfare," [2-B1 A.R. 198, p. 5, ll. 4-6] an issue referred to SOAH by the Commission and thus essential to the resolution of this case.

addressed above. In short, TCEQ's reliance on this document was erroneous. In any event, the MERA document cannot be considered cumulative of Dr. Eversull's opinions regarding whether the sample she analyzed was reliably representative of the entire site.

Similarly, arguments offered by TCEQ and Vulcan that Vulcan's 0.2% crystalline silica figure was consistent with the known composition of the Edwards Group formation based on the BEG report is unavailing. Their argument can be summarized thusly: the 0.2% figure must be assumed to be reliable—regardless of the foundational basis of this figure—because it is consistent with the BEG report. But as explained above, the 0.2% figure is the result of a purported analysis of some composite samples taken from unidentified locations and depths; it was not based on the BEG report. That the 0.2% figure is consistent with the BEG report says nothing about whether there is a connection between the data Dr. Eversull relied on and the opinion she offered.

And references to the grab samples collected by the Appellees from adjacent property likewise are no substitute for the foundational data that informed Dr. Eversull's opinions. To the contrary, these samples demonstrated that Dr. Eversull's

opinion regarding the homogeneity of the subsurface materials in the area is *not* reliable.[100]

Despite Vulcan's representations to the contrary, the record reveals that there is no basis for Dr. Eversull's opinion that the composite sample she analyzed was representative of the subsurface materials at the site, other than her observations from her earlier investigation of the subsurface. As she explained: "that's why we collect samples from different locations to try to represent that lateral variability."[101] There was no alternative means of testing the reliability of Dr. Eversull's opinion; the data from the subsurface investigation were essential to resolution of the issue on which she offered her opinion testimony. *See In re Union Pac. R.R.*, 294 S.W.3d 589, 592–93 (Tex. 2009) (orig. proceeding).

PRAYER

As set forth above, TCEQ's decision to issue Vulcan's requested permit was arbitrary and capricious, in violation of applicable statutory and regulatory provisions, in excess of the agency's authority, and an abuse of discretion. Accordingly, the trial court's judgement reversing TCEQ's decision to issue the permit was proper, and should be affirmed.

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[100] *See* the discussion in Reeh Appellees' Response Brief regarding the results of the analysis of the grab samples from adjacent property.

[101] 3 A.R. 271, p. 190.

Respectfully Submitted,

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CERTIFICATE OF COMPLIANCE WITH TX. R. APP. P. 9

By my signature below, I, David Frederick, certify that the preceding document contains 13,496 words, exclusive of the contents listed in Texas Rule of Appellate Procedure 9.4(i)(1).

/s/ David Frederick
David Frederick

CERTIFICATE OF SERVICE

By my signature below, I certify that on September 13, 2021, a copy of the foregoing document was served upon the parties identified below via electronic service.

/s/ David Frederick
David Frederick

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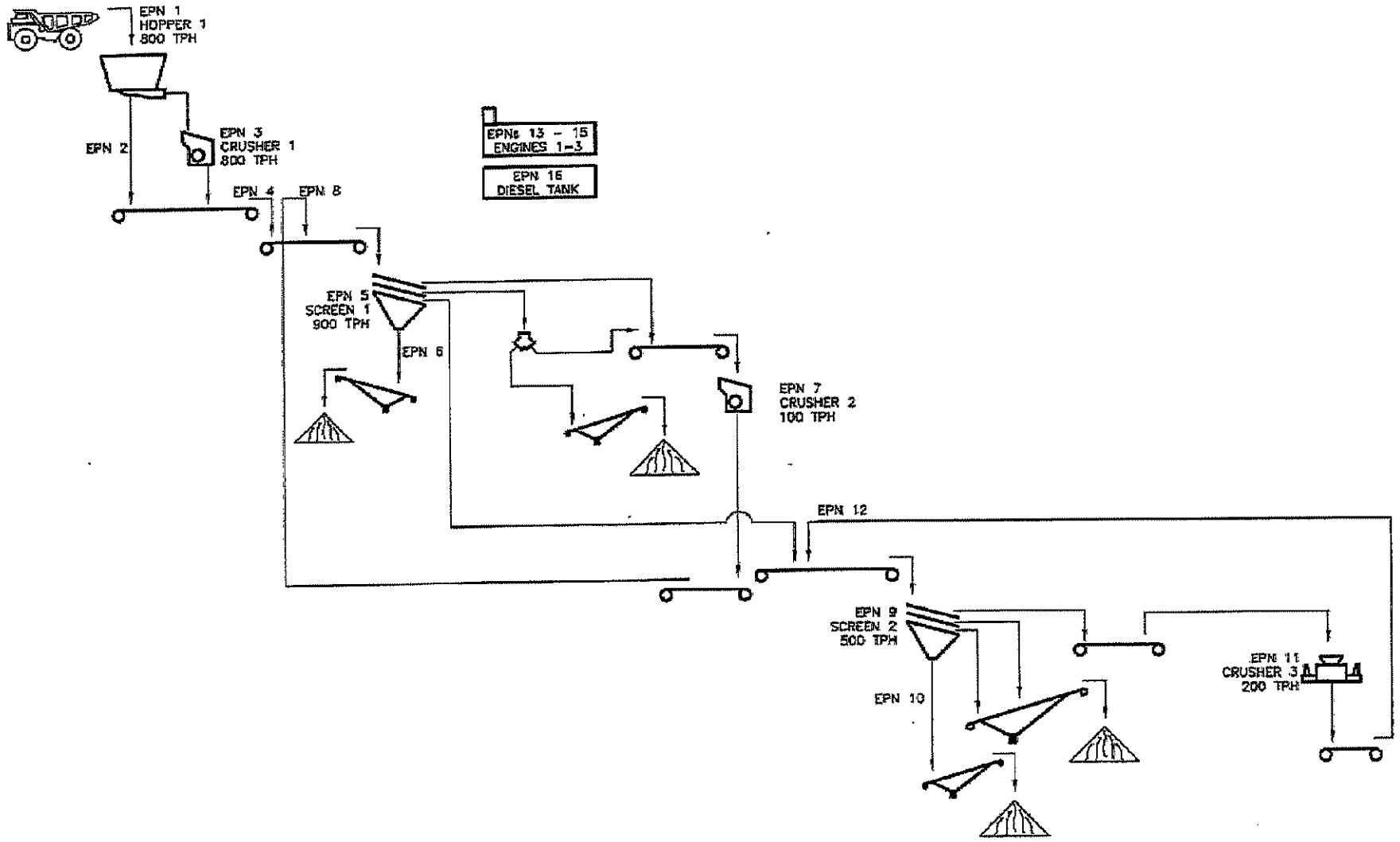
APPENDIX 1



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APP-000343

SHEET NO.: 1 OF 1

IMAGE: N/A	
ISSUE DATE:	06/14/2017
DRAWN BY:	KS
CHECKED BY:	MF
SCALE: 1" =	NTS
JOB NO.:	10003-452

FLOW DIAGRAM

AIR QUALITY PERMIT APPLICATION
VULCAN CONSTRUCTION MATERIALS, LLC
BULVERDE, COMAL COUNTY, TEXAS

REV.	DESCRIPTION	BY	DATE

WESTWARD
Environmental. Engineering. Natural Resources.
P.O. Box 2205 Boerne, Texas 78006
(830) 249-8284 Fax: (830) 249-0221
TBPE REG. NO.: F-4524
TBPG REG. NO.: 50112

APPENDIX 2

CRYSTALLINE SILICA

AMBIENT AIR MONITORING AND EVALUATION OF COMMUNITY HEALTH IMPACTS NEAR AGGREGATE PRODUCTION OPERATIONS

TOXICOLOGY, RISK ASSESSMENT, AND RESEARCH DIVISION
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AS-202 (12/20)
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CONTENTS

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AMCV	air monitoring comparison value
APO	aggregate production operation
ATSDR	Agency for Toxic Substances and Disease Registry
BACT	Best Available Control Technologies
CAA	Clean Air Act
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
d	day(s)
DNR	Department of Natural Resources
DSD	Development support document
EPA	Environmental Protection Agency
ESL	effects screening level
ft	feet
h or hr	hour(s)
HAP	hazardous air pollutant
IDEM	Indiana Department of Environmental Management
IPCS	International Programme on Chemical Safety
LOD	limit of detection
LOQ	limit of quantification
m	meter(s)
MDE	Maryland Department of the Environment
min	minute(s)
MPCA	Minnesota Pollution Control Agency
µg/m^3	micrograms per cubic meter
µm	micron or micrometer
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NSR	New Source Review
OSHA	Occupational Safety and Health Administration
PM	particulate matter
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 µm. Also referred to as fine particles.
$PM_{2.5–15}$	Particulate matter with an aerodynamic diameter greater than 2.5 µm and less than 15 µm
PM_4	Particulate matter with an aerodynamic diameter less than or equal to 4 µm. Refers to respirable particles that are inhaled past the upper airways and reach into the human lung.
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 µm. Refers to particles that penetrate past the larynx into the thoracic region.
ReV	Reference Value
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDM	total dichotomous mass
TDSHS	Texas Department of State Health Services
UCL-95	95% upper confidence limit of the arithmetic mean
URF	unit risk factor

SUMMARY

Aggregate production operations (APOs) are defined in 30 Texas Administrative Code, Chapter 342, as sites where aggregates are removed or extracted from the earth, including entire areas of extraction, stripped areas, haulage ramps, and the land on which the plant processing the raw materials is located, exclusive of any land owned or leased by the responsible party not being currently used in the production of aggregates. Aggregates are defined as any commonly recognized construction material originating from an APO from which an operator extracts dimension stone, crushed and broken limestone, crushed and broken granite, crushed and broken stone not elsewhere classified, construction sand and gravel, industrial sand, dirt, soil, or caliche (i.e., mineral deposits containing calcium carbonate). Aggregates do not include clay or shale mined for use in the manufacturing of structural clay products.

Aggregates may contain silica, which occurs in two forms: amorphous and crystalline. Silica—present in soil, sand, and rock formations—is the most abundant mineral in the earth's crust (ATSDR 2019). Crystalline silica is significantly more hazardous than amorphous silica and is recognized as an occupational inhalation hazard. In the United States, approximately 2.3 million workers in 676,000 workplaces are exposed to crystalline silica; this includes approximately 2 million workers in the construction industry (OSHA 2016). Workers exposed daily for several years up to a lifetime to high workplace levels of fine particles of crystalline silica may develop silicosis: an irreversible, progressive, and fatal rare lung disease.

The effects of inhaled crystalline silica are strictly associated with occupational exposure to particles of respirable size—that is, small enough to be inhaled and reach into the lungs (i.e., PM_4, particulate matter with an aerodynamic diameter less than or equal to 4 micrometers (µm), which can be seen using a light microscope). The size of the particles that cause silicosis is at least 100 times smaller than ordinary sand found on beaches and playgrounds. Exposure in the workplace is regulated by the Occupational Safety and Health Administration (OSHA).

Despite the vast number of laborers working with silica-containing materials, targeted efforts in workplaces have largely been successful in minimizing potential exposure of workers to respirable crystalline silica and preventing silicosis. The most recent prevalence data for silicosis in Texas is from 2016; in that year, the annual age-adjusted hospitalization rate for silicosis was 4 per one million residents. And, from 1999 to 2018, the total number of silicosis-associated deaths in Texas was 157, with an age-adjusted death rate of 0.4 per one million residents (Bell and Mazurek 2020).

It is important to note that the risk from community exposure to crystalline silica differs from the risk associated with occupational exposure. Airborne silica, both in amorphous and crystalline forms, is a ubiquitous mineral that is not unique to areas near APOs, construction sites, and other silica-generating activities, and is not unique to Texas. Moreover, not all airborne ambient crystalline silica is small enough to be inhaled and reach deep into the lungs. Silica in ambient air is not specifically regulated by the United States Environmental Protection Agency (EPA). Federal standards, known as the National Ambient Air Quality Standards (NAAQS), for particulate matter (PM), a constituent that may include silica, are promulgated for fine particles with an aerodynamic diameter less than or equal to 2.5 µm ($PM_{2.5}$) and for respirable particles with an aerodynamic diameter less than or equal to 10 µm (PM_{10}). APOs require an air permit prior to start of operation and must meet federal standards for $PM_{2.5}$ and PM_{10}.

The Texas Commission on Environmental Quality (TCEQ) has developed health-based air monitoring comparison values (AMCVs) for crystalline silica. These AMCVs are not standards; they are guidelines that are protective of human health and welfare. Health-based AMCVs are safe levels at which exposure is unlikely to result in adverse health effects.

In October 2019, TCEQ began ambient air $PM_{2.5}$ monitoring at sites that are located within one mile of APOs in central Texas. There are currently five monitoring sites located predominantly downwind of APOs. The available data show that the concentrations of $PM_{2.5}$ at the monitoring sites near APOs currently

follow the general regional trend for $PM_{2.5}$. The data also indicate that APOs do not appear to have an impact on measured $PM_{2.5}$ concentrations.

Although crystalline silica monitoring is not required under U.S. regulations, monitoring has been periodically conducted in urban areas, including Dallas and El Paso, and near APOs. In ambient air of 22 U.S. cities, annual average $PM_{2.5}$ crystalline silica concentrations ranged from 0 to 1.9 µg/m³ (Davis et al. 1984), while the estimated annual average PM_{10} crystalline silica concentrations of 17 U.S. cities ranged from 0.3 to 5.0 µg/m³ (USEPA 1996). The range of respirable crystalline silica (PM_4) concentrations measured near APOs ranged from 0 (many samples were below the limit of detection) to 2.8 µg/m³ (Richards et al. 2009, MPCA May 2015, MPCA Dec. 2015, MPCA 2018, Richards and Brozell 2015, Peters et al. 2017).

The results of these monitoring studies indicate that the overall contribution of APOs to ambient air concentrations of particulate matter and crystalline silica is minimal or negligible. When compared to TCEQ's AMCVs for crystalline silica, the concentrations of crystalline silica near APOs are generally not likely to cause chronic adverse health effects and are not associated with silicosis (ATSDR 2019).

BACKGROUND

Citizens are concerned about the impact of aggregate production operations (APOs) in their communities. This includes the potential for increased emissions of particulate matter, which may contain crystalline silica, near these facilities. This document provides the definition of an APO, according to the Texas Administrative Code, and briefly describes what is involved in the granting of air permits for these facilities. APOs must meet the federal requirement for $PM_{2.5}$ and PM_{10}, which are regulated under the National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations, Part 50 [40 CFR 50]). Silica, in both amorphous and crystalline forms, is the most abundant mineral in the earth's crust (ATSDR 2019). APOs are a potential source of crystalline silica.

Although there is no federal requirement for the Texas Commission on Environmental Quality (TCEQ) to measure ambient levels of crystalline silica, TCEQ has reviewed the available information, including peer-reviewed published literature, on the adverse health effects of airborne crystalline silica, and developed health-protective air monitoring comparison values (AMCVs) and effects screening levels (ESLs). AMCV is a collective term for all chemical-specific short- and long-term air concentrations that are used to evaluate air monitoring data. ESLs are used in the evaluation of air permit applications as well as proposed rules and regulations (e.g., Permits by Rule). AMCVs and ESLs are not standards, but rather they are guidelines and are safe levels at which exposure is unlikely to result in adverse health effects.

Crystalline silica is a known occupational health hazard in workers exposed for several years, up to a lifetime, to high workplace concentrations of respirable crystalline silica particles (OSHA 2016). Respirable particles are approximately 100 times smaller than ordinary sand found in playgrounds and on beaches. Respirable crystalline silica is significantly more hazardous than amorphous silica (ATSDR 2019, OSHA 2016). Occupational exposure to respirable crystalline silica may result in silicosis, a rare and incurable, but preventable, lung disease (ATSDR 2019, Leung et al. 2012).

TCEQ has reviewed the existing guidelines and regulations for ambient crystalline silica in other states and has summarized the available air monitoring data of crystalline silica in urban areas and in vicinities near APOs throughout the United States. Currently, there are no air monitoring data for crystalline silica near APOs in Texas. However, based on data collected throughout the United States, the contribution of crystalline silica from these facilities to ambient air levels of particulate matter and respirable crystalline silica is negligible or minimal. Moreover, the levels generally are below the health-based AMCVs for crystalline silica developed by TCEQ. In summary, ambient air concentrations of crystalline silica near APOs are generally not likely to cause chronic adverse health effects and are not sufficiently high to cause silicosis (ATSDR 2019).

AGGREGATE PRODUCTION OPERATIONS

APOs are defined in 30 Texas Administrative Code, Chapter 342 (30 TAC 342), as sites from which aggregates are being or have been removed or extracted from the earth, including entire areas of extraction, stripped areas, haulage ramps, and the land on which the plant processing the raw materials is located, exclusive of any land owned or leased by the responsible party not being currently used in the production of aggregates. Aggregates are defined as any commonly recognized construction material originating from an APO from which an operator extracts dimension stone, crushed and broken limestone, crushed and broken granite, crushed and broken stone not elsewhere classified, construction sand and gravel, industrial sand, dirt, soil, or caliche (i.e., mineral deposits containing calcium carbonate) (30 TAC 342.1). Aggregates do not include clay or shale mined for use in the manufacturing of structural clay products.

Crystalline silica, one of the most abundant minerals in the earth's crust, is ubiquitous in the environment (ATSDR 2019, Leung et al. 2012). APOs, which can be found in most states, are necessary for the construction of homes, buildings, and infrastructure. Texas has approximately 1,000 registered APOs. Facilities such as rock crushers may be located at APOs. A rock crusher breaks larger rocks down into cobblestones, gravel, or other smaller pieces. Those smaller pieces are sorted by size so that they can be used for pavement, construction, etc. Aggregates from these operations may contain crystalline silica.

There are two ways rock crushers may be authorized to operate in Texas: via a standard permit or via a New Source Review (NSR) permit. Rock crushing plants, concrete batch plants, and hot-mix asphalt plants that are authorized under standard permits have limitations in production, hours of operation on site, and established setback distances (Table 1). These limitations are listed as requirements in the applicable standard permits (Texas Health and Safety Code, Section 382.05195, Standard Permit [THSC 382.05195]).

Facilities at APOs that do not meet the requirements of a standard permit are authorized under a case-by-case NSR permit. Equipment authorized under an NSR permit is limited to certain estimated emissions that are determined based on throughput and United States Environmental Protection Agency (EPA) estimated emission factors. Authorized equipment must also meet current Best Available Control Technologies (BACT) and best management practices,

Table 1. Operation Differences Between Permanent and Temporary Standard Permits for Rock and Concrete Crushers

Operations	Permanent Standard Permit	Temporary Standard Permit: Tier I	Temporary Standard Permit: Tier II
Operation Limits	≤ 2,640 hr in any 12-month period	45 days or 360 operating hr	180 days or 1,080 operating hr
Throughput Limits	≤ 200 tons/hr	≤ 125 tons/hr	≤ 250 tons/hr
Footprint of Plant: distance to property line	≥ 200 ft	≥ 200 ft	≥ 300 ft
Crusher Location: distance from any residence, school, or place of worship	≥ 440 yards	≥ 440 yards (concrete crushers)	≥ 440 yards (concrete crushers)
Facility Location	≥ 550 ft from any other rock crusher, concrete crusher, concrete batch plant, or hot-mix asphalt plant	Crushing facilities are not located or operated on the same site as any concrete batch plant or asphalt plant	≥ 550 ft from any concrete batch plant or hot-mix asphalt plant; may not locate or operate on the same site as any other crusher

Note: For general information, please refer to www.tceq.texas.gov/permitting/air/guidance/newsourcereview/rocks/nsr_fac_rock.html or www.tceq.texas.gov/assistance/industry/aggregate-production.

For permanent standard permits, refer to www.tceq.texas.gov/permitting/air/newsourcereview/mechanical/permcrush.html.

For temporary standard permits, Tier I and Tier II, refer to www.tceq.texas.gov/permitting/air/newsourcereview/mechanical/tempcrush.html.

in accordance with TCEQ requirements (www.tceq.texas.gov/permitting/air/guidance/newsourcereview/rocks/nsr_fac_rock.html). A BACT review provides the basis for the minimum set of controls an applicant is required to employ, and staff must confirm that the emissions from the facility will comply with the rules of TCEQ, which may include a toxicological evaluation of the potential for off-property health impacts of emissions from the proposed activity.

The technical requirements established in the rock and concrete crushing standard permit ensure that facilities operating under the standard permit achieve the emission standards determined to be protective of human health and the environment (THSC 382.05195). During the protectiveness review conducted during the development of the standard permit, TCEQ examined the potential for emissions of particulate matter from rock crushing facilities and determined that facilities operating under the standard permit conditions would meet the NAAQS for PM_{10} and $PM_{2.5}$.

Regarding cumulative emissions and the operation of rock crushers in a certain area, the standard permit establishes a separation distance of 550 feet, based on the impacts analysis, between any crushing facility authorized under the standard permit and either an additional operating crushing facility, concrete batch plant, or hot-mix asphalt plant to help ensure that cumulative emissions do not result in adverse off-property impacts. If this distance is not met, the new crushing facility authorized under the standard permit cannot operate at the same time as the additional crushing facility, concrete batch plant, or hot-mix asphalt plant. Therefore, if the plants are operated in accordance with the standard permit, there should be no adverse impact on air quality as a result of multiple plants' operations.

The Texas Clean Air Act (THSC 382.065) requires that all concrete crushing facilities in Texas be located at least 440 yards from residences, places of worship, or schools. All air permit authorizations must show that they are protective of human health and the environment at the property line. Both rock and concrete crushers authorized by the Temporary Rock and Concrete Crushers Standard Permit or the Permanent Rock and Concrete Crushers Standard Permit must meet additional distance requirements to the property line (at a minimum, 200 ft). Rock and concrete crushers authorized by an individual NSR permit must undergo a site-specific protectiveness review, which includes air-dispersion modeling of proposed emissions, to determine the location of the crusher from the property line.

CRYSTALLINE SILICA

Silica (silicon dioxide, SiO_2) is the most abundant mineral in the environment, with over 95% of the earth's crust made of minerals containing silica (ATSDR 2019, Leung et al. 2012). Silica exists in two forms: crystalline and amorphous (ATSDR 2019). Airborne silica, both in amorphous and crystalline forms, is ubiquitous in the environment, and may be found in airborne particles from various sources such as paved and unpaved roads, wind-blown soil, and agricultural activities, as well as industrial sources such as construction, foundries, glass manufacturing, abrasive blasting or any industrial or commercial use of sand and quartz, and mining and rock crushing operations.

Crystalline silica occurs naturally in four polymorphs: (1) quartz, the most common, which is in granite, shale, and beach sand, and in trace amounts in soil, (2) cristobalite, (3) tridymite, and (4) tripoli (ATSDR 2019, Leung et al. 2012). Crystalline silica is significantly more hazardous than amorphous silica and is recognized as an important occupational inhalation hazard (ATSDR 2019, OSHA 2016). Workers exposed daily for several years up to a lifetime to high occupational levels of fine respirable particles of crystalline silica may develop silicosis, an irreversible, progressive and fatal, but preventable, lung disease (ATSDR 2019).

The effects of inhaled crystalline silica are strictly associated with occupational exposure to particles that are of respirable size, which is particulate matter with an aerodynamic diameter of 4 µm or less (ACGIH 2019). Particles of this size are small enough to be inhaled past the upper airways and penetrate the human lung (Brown et al. 2013). Because of the natural hardness of silica, high energy is required to fracture this mineral into respirable size (OSHA 2016). Activities

such as grinding, cutting, sawing, drilling, crushing, and abrasive blasting of stone, rock, concrete, mortar, or brick may generate respirable crystalline silica. The size of the particles that cause silicosis is at least 100 times smaller than ordinary sand found on beaches and playgrounds (OSHA 2016).

Occupations associated with exposures to respirable crystalline silica include construction, stone countertop fabrication, and hydraulic fracking. Virtually any process that involves movement of earth (e.g., mining, farming, and construction), mechanical disturbance of silica-containing products such as masonry and concrete, or use of sand or other silica-containing products may potentially expose a worker to crystalline silica (IPCS 2000).

Regulations and guidelines for exposures to crystalline silica in the workplace initially were established in 1946 by the American Conference of Governmental Industrial Hygienists (ACGIH), in 1971 by the Occupational Safety and Health Administration (OSHA), and in 1974 by the National Institute for Occupational Safety and Health (NIOSH) (ACGIH 2020, Mossman and Glenn 2013). In the United States, approximately 2.3 million workers in 676,000 workplaces are exposed to crystalline silica; this includes approximately 2 million workers in the construction industry (Centers for Disease Control and Prevention website, www.cdc.gov; OSHA 2016). Yet silicosis is a rare disease with generally a long latency period (National Institutes of Health's Genetic and Rare Diseases Information Center website, www.rarediseases.info.nih.gov; Leung et al. 2012). It is estimated that during 1987–1997, approximately 3,600–7,300 new silicosis cases were diagnosed yearly in the United States (ATSDR 2019). As reported by the NIOSH in 1994, 13,744 deaths with silicosis as a possible contributor (mentioned in the death certificate) occurred in the United States during 1968–1990 (ATSDR 2019).

Since then, silicosis mortality has declined due to improved industrial hygiene standards and more stringent regulatory standards and guidelines for occupational exposures (ATSDR 2019, Bang et al. 2005, Bell and Mazurek 2020). A recent resurgence in occurrences of silicosis in younger workers involved with new tasks and occupations (e.g., quartz countertop installation and hydraulic fracturing) emphasizes the need for appropriate industrial hygiene practices (Bang et al. 2015, Friedman et al. 2015, Mazurek et al. 2015, Mazurek et al. 2017, Bell and Mazurek 2020). The cumulative dose of respirable silica in exposed workers (respirable concentration multiplied by duration of exposure) is the most important factor in the development of silicosis (ATSDR 2019, Leung et al. 2012).

It is important to note that the risk of community exposure to crystalline silica differs from the risk of occupational exposure. Airborne silica, both in amorphous and crystalline forms, is a ubiquitous pollutant that is not unique to areas near APOs, sand mining, construction, and other silica-generating activities. Moreover, not all crystalline silica in ambient air is respirable (PM_4). Monitored respirable crystalline silica levels in ambient air are generally not likely to cause chronic adverse health effects and are not sufficiently high enough to cause silicosis. The health-based AMCVs for crystalline silica developed by TCEQ are protective of human health and welfare.

Silicosis in Texas

Silicosis is an occupational lung disease that is caused by long-term exposure to high workplace levels of respirable crystalline silica. Silicosis is a reportable disease in Texas, meaning that health-care providers, hospitals, laboratories, and other designated professionals report confirmed or suspected occupational cases of and deaths from silicosis (25 TAC 99.1) to the Texas Department of State Health Services (TDSHS), which then reports the data to the Centers for Disease Control and Prevention (CDC).

In 2014, the TDSHS received a report of the first case of silicosis reported in the United States associated with silica dust exposure during fabrication of engineered stone countertops (Friedman et al. 2015). In 2019, the TDSHS received reports of an apparent cluster of 12 silicosis cases among workers at an engineered stone countertop manufacturing and fabrication facility (also reported in Rose et al. 2019). Silicosis is defined as an occupational disease, meaning that workers who are exposed to high levels of silica occupationally are at risk of developing silicosis. The general public is not at risk of developing silicosis; however, some members of the general public could

potentially be exposed to high levels of silica through hobbies, such as pottery making.

According to information (shown in Figure 1) available on the TDSHS website, www.dshs.texas.gov/epitox/Asbestosis-and-Silicosis-Surveillance/, the age-adjusted hospital discharge rates and age-adjusted death rates in Texas show that overall the burden of silicosis decreased from 2004 to 2010. In more recent statistics provided by the TDSHS, the age-adjusted hospital discharge rates from 2011 to 2016 continued to decrease; the average annual age-adjusted rate for inpatient hospitalizations for silicosis was 4.7 per million Texas residents (Table 2). This annual age-adjusted rate for inpatient hospitalizations is lower than the corresponding rate from 2004 to 2010.

Because the reporting rules of the CDC and TDSHS do not allow public reporting of deaths fewer than 10 and 5, respectively, for each year, the exact number of deaths in Texas from silicosis is not publicly available for each year, but they are generally below 10 from 2005 to 2016. The CDC website reports deaths in Texas from 2001 to 2010 (Table 3). The TDSHS provided data from 2011 to 2016 showing between 35 and 38 total deaths from silicosis in Texas, resulting in an approximate average annual age-adjusted silicosis death rate of 0.3 per one million Texas residents (Table 4). Bell and Mazurek (2020) recently summarized the number of silicosis-associated deaths and age-adjusted death rates among persons aged 15 years or older in 26 states, including Texas, from 1999 to 2018. In Texas, the total number of silicosis-associated deaths was 157 from 1999 to 2018, with an age-adjusted death rate of 0.4 per one million residents.

Figure 1. Texas Annual Age-Adjusted Rates for Silicosis Hospital Discharges and Mortality by Year, 2004–2010, per 1 Million Population

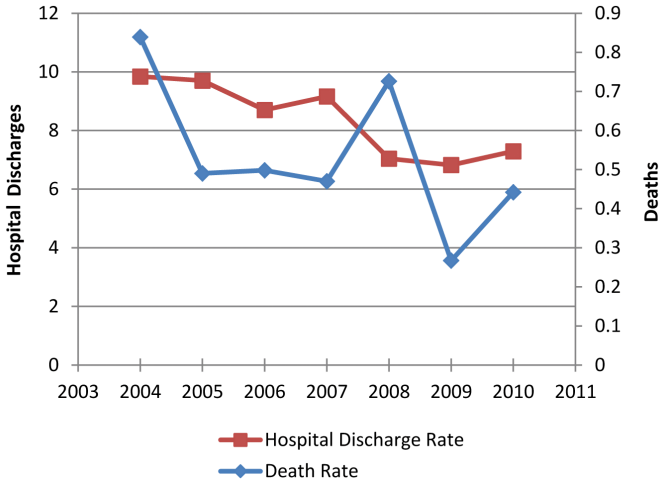


Table 2. TDSHS Occupational Health Indicator (OHI): Silicosis

	2011	2012	2013	2014	2015	2016
OHI 9.4.1: Annual Number of Inpatient Hospital Discharges	92	94	112	90	91	88
OHI 9.4.3: Annual Age-Adjusted Rate of Inpatient Hospitalizations for Silicosis (per million Texas residents)	5.1	5.0	5.6	4.4	4.2	4.0

Table 3. CDC Silicosis Mortality: Number of Deaths from Silicosis in Texas, 2001–2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Texas	<10[a]	14	15	12	<10	<10	<10	12	<10	<10

a. Statistics for fewer than 10 decedents are omitted from CDC tables and figures.

Table 4. TDSHS Silicosis Mortality: Number of Deaths from Silicosis in Texas, 2011–2016

	2011	2012	2013	2014	2015	2016
Texas	5	5	8	6	10	<5[a]

a. Data are suppressed for fewer than 5 decedents.

For more information regarding silicosis in Texas, please contact the TDSHS Asbestosis and Silicosis Surveillance Program of the Environmental and Injury Epidemiology and Toxicology Unit at 512-776-7222.

Regulations and Guidelines

Crystalline silica is not one of the six criteria air pollutants regulated under the Clean Air Act (CAA), which requires EPA to establish the NAAQS, and is not included on EPA's list of 187 hazardous air pollutants (www.epa.gov/haps/what-are-hazardous-air-pollutants). The six criteria pollutants regulated under the CAA are carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter ($PM_{2.5}$ and PM_{10}) (40 CFR 50). Particulate matter, measured as $PM_{2.5}$ and PM_{10}, is a mixture of various substances, including some that may contain crystalline silica (e.g., crustal materials). Since crystalline silica is widely considered an occupational hazard and not an ambient air quality concern, EPA does not monitor for crystalline silica, nor does it have an approved method for monitoring for crystalline silica in ambient air. There is no federal regulation or EPA standard for ambient crystalline silica concentrations, and there is no EPA requirement for TCEQ to monitor for crystalline silica.

TCEQ has established AMCVs for crystalline silica, which are used as guidelines to evaluate ambient air concentrations of PM_4 crystalline silica and are protective of human health and welfare (Table 5). Health-based AMCVs are safe levels at which exposure is unlikely to result in adverse health effects. These values were developed using state-of-the-science guidance, which was subject to scientific peer review and public comment (TCEQ 2015). The TCEQ guidelines incorporate standard scientific methods commonly used by other agencies, including EPA.

Short-term AMCVs are based on data concerning acute health effects, odor potential, and acute vegetation effects, while long-term AMCVs are based on data concerning chronic health or vegetation effects. The health-based AMCVs for crystalline silica are shown in Table 5 (TCEQ 2009, 2020). In summary, AMCVs are designed to prevent adverse health effects of PM_4 crystalline silica, including respiratory disease such as silicosis and lung cancer, for all members of the general population, including potentially sensitive subpopulations (e.g., children, the elderly, and those with pre-existing health conditions).

TCEQ reviewed the website of each state's environmental protection agency to determine which other state agencies have regulations or guidelines for crystalline silica in ambient air. Of the 50 states, 14 (including Texas) appear to have guidelines in place and one state appears to have a draft rule regarding health-based ambient air concentrations of crystalline silica.

The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment has set a chronic reference exposure level of 3 µg/m^3 for respirable crystalline silica (PM_4). Agencies in Indiana, Michigan, Minnesota, and New Jersey have adopted the chronic reference exposure level of 3 µg/m^3, and the Oregon Department of Environmental Quality has this exposure level listed in a draft rule. The New York Department of Environmental Conservation has adopted TCEQ's chronic threshold non-cancer reference value of 2 µg/m^3. Note that TCEQ's carcinogenic-based long-term reference value is 0.27 µg/m^3. States with guidelines for crystalline silica are shown in Table 6. This information is current as of March 2020.

Agencies in other states (Maryland, New Hampshire, North Dakota) clearly indicated that their guidelines for ambient air concentrations of crystalline silica were derived using the ACGIH threshold limit value–time weighted average (TLV-TWA) of 25 µg/m^3 respirable crystalline silica (PM_4) for an 8-hour workday. When not otherwise specified, it was assumed that PM_4 is indicated for the ambient air concentration levels in states that derived their guidelines or regulations from the ACGIH guidelines.

Table 5. Air Monitoring Comparison Values (AMCVs) for Crystalline Silica in Ambient Air

	AMCV (µg/m^3) (applies to PM_4)
Short-Term AMCV (1-hr)	47
Short-Term AMCV (24-hr)	24
Long-Term AMCV	0.27

AMBIENT AIR MONITORING

Crystalline Silica Monitoring Method

Ambient air concentrations of crystalline silica are generally not likely to pose a health threat. Crystalline silica in ambient air is not regulated by the EPA and the EPA does not require crystalline silica to be monitored. Even though ambient measurement of crystalline silica is not federally required, the TCEQ has developed health-based AMCVs for crystalline silica. Since the EPA does not typically monitor for crystalline silica in ambient air, there are no EPA-approved methods for monitoring or analytical analysis of crystalline silica in ambient air. However, NIOSH has developed methods for personal monitoring and analysis of crystalline silica for worker safety. Several monitoring studies that have been conducted across the United States have utilized the NIOSH methods, with modification, to successfully measure ambient levels of crystalline silica.

In 2015, an ambient PM_4 crystalline silica sampling method was described by Richards and Brozell that combined the high-volume sampling capability of $PM_{2.5}$

Table 6. Exposure Limits for Crystalline Silica in Air, by State

State	Agency	Level of Crystalline Silica ($\mu g/m^3$)	Duration	PM Measured
California	CalEPA	3	Chronic	PM_4
Idaho	Department of Environmental Quality	2.5 (cristobalite, tridymite) 5 (quartz, tripoli)	24-hr	Not specified
Indiana	IDEM	3.1 (indoor air residential screening level)	Chronic	PM_4
Maryland	MDE	0.25	Chronic	PM_4
Michigan	Department of Environment, Great Lakes, and Energy	3.0	Chronic	PM_4
Minnesota	Pollution Control Agency	3.0	Chronic	PM_4
New Hampshire	Department of Environmental Services	0.060	Chronic – carcinogen	PM_4
New Jersey	Department of Environmental Protection	3.0	Chronic	PM_4
New York	Department of Environmental Conservation	2.0	Chronic	PM_4
North Dakota	Department of Environmental Quality	0.5 (guideline concentration)	8-hr	PM_4
Oregon	Department of Environmental Quality	3 (draft)	Chronic	PM_4
Texas	TCEQ	0.27	Chronic – carcinogen	PM_4
Vermont	Department of Environmental Conservation	0.12	Chronic	Not specified
Virginia	Department of Environmental Quality	3	Chronic	Respirable
Washington	Department of Ecology	3	24-hr	Respirable

Abbreviations: CalEPA, California Environmental Protection Agency's Office of Environmental Health Hazard Assessment. IDEM, Indiana Department of Environmental Management. MDE, Maryland Department of the Environment. PM, particulate matter. TCEQ, Texas Commission on Environmental Quality.

reference method samplers meeting the requirements of 40 CFR 50, Appendix L with the sensitive crystalline silica analytical capabilities provided by the X-ray diffraction (XRD) analysis procedures in NIOSH Method 7500. Typically, PM is measured either with a 50% cut-off point of 2.5 or 10 µm. When particles pass through the size-selective inlet, there is a 50% efficiency cut-off at the aerodynamic diameter specified. For instance, the $PM_{2.5}$ size fraction ranges from 0 to 2.5 µm in aerodynamic diameter.

To get a 50% cut-off point of 4 µm for crystalline silica, a 2.5 µm inlet can be modified to gain the desired aerodynamic diameter cut-off point of 4 µm. A polyvinyl chloride filter, as outlined in NIOSH Method 7500, is used to monitor for crystalline silica. XRD analysis, also outlined in NIOSH Method 7500, quantifies the amount of crystalline silica in a sample using X-rays that show a specific diffraction pattern in the presence of crystalline silica (due to the uniform pattern of a crystal structure). This approach provides a direct measurement of crystalline silica in the respirable size range of interest (4 µm) (Richards and Brozell 2015).

Several studies that used these modified methods also used approved sampling equipment, procedures, and quality-assurance parameters from the EPA sampling methods specified in 40 CFR 50, Appendix L, to keep as close to the speciated particulate matter EPA sampling methods as possible. Quality-assurance procedures required for federal reference methods, such as those used for $PM_{2.5}$ sample collection, are also applicable to the adjusted methods for PM_4 sample collection (Richards and Brozell 2015).

Use of these modified sample collection and analysis procedures can provide reliable quantitative measurements of crystalline silica in ambient air that may be compared to safe levels, such as the TCEQ AMCVs.

Crystalline Silica and PM Monitoring Studies

Although crystalline silica air monitoring is not required under U.S. regulations, monitoring has been periodically conducted in urban areas and near APOs, industrial sand mines, and sand processing plants. Ambient air monitoring of crystalline silica in urban areas has been performed in 22 locations in various states, including Texas (Davis et al. 1984, USEPA 1996). In addition, ambient air monitoring for particulate matter and/or crystalline silica near APOs has been conducted in several states, including Texas. Texas has placed five stationary $PM_{2.5}$ ambient air monitoring sites within one mile of APOs in central Texas. Available data from these sites indicate that APOs do not appear to have an impact on the measured ambient air concentrations of $PM_{2.5}$.

Upwind and downwind ambient air monitoring at facilities in California, Colorado, Minnesota, North Carolina, Virginia, and Wisconsin revealed that the overall contribution of APOs to ambient air concentrations of PM and crystalline silica is minimal or negligible. The results are consistent with plant operations such as hauling, loading, and screening that do not involve the large amount of energy necessary to break mineral material down to respirable size. Monitored crystalline silica levels in ambient air are generally not likely to cause acute or chronic adverse health effects.

In many of the studies, total $PM_{2.5}$ and/or total PM_{10} concentrations were measured. As mentioned previously, $PM_{2.5}$ and PM_{10} sampling and measurements should be performed in accordance with EPA requirements (40 CFR 50), which specify a 24-hour sample collection. Primary ambient air quality standards define levels of air quality, with an adequate margin of safety, that protect public health (40 CFR 50). Secondary ambient air quality standards define levels of air quality that protect public welfare from any known or anticipated adverse effects of a pollutant (40 CFR 50).

The current standards for $PM_{2.5}$ include primary and secondary annual arithmetic means averaged over 3 years (12 and 15 $\mu g/m^3$, respectively), and primary and secondary 24-hour, 98th percentile values averaged over 3 years (35 $\mu g/m^3$ for both primary and secondary standards [40 CFR 50]). The current primary and secondary standard for PM_{10} is a 24-hour value of 150 $\mu g/m^3$ not to be exceeded more than once per year on average over a 3-year period (40 CFR 50). Because crystalline silica may be a component of particulate matter, including $PM_{2.5}$ and PM_{10}, several studies included measurements of total $PM_{2.5}$ and/or PM_{10} to determine the potential contribution of crystalline silica to total PM.

Ambient Air Monitoring in Urban Areas

The following sections provide a summary of the ambient monitoring of crystalline silica and particulate matter that has been conducted in urban areas. See Table 7 for a tabular summary of these studies.

Davis et al. 1984

An investigation of ambient air quartz concentrations was performed using aerosol samples collected in 1980 at EPA's Inhalable Particulate Network sites. Samplers operated for 24 hours once every sixth day for a duration of 1 year. A total of 228 filter samples collected from 22 cities was used for measurement of quartz concentrations. Total $PM_{2.5}$ and total $PM_{2.5–15}$ samples (104 for each) were collected on Teflon filters using a dichotomous sampler, which has a virtual impactor design and separates particles into two sizes: (1) less than 2.5 µm ($PM_{2.5}$) and (2) greater than 2.5 µm, with a sampling inlet designed to eliminate particles greater than an approximate 15 µm aerodynamic diameter ($PM_{2.5–15}$). Samples were analyzed for quartz using X-ray diffraction. In individual cities, including Dallas and El Paso, ambient average $PM_{2.5}$ quartz levels ranged from 0 to 1.9 µg/m³, and ambient average $PM2_{2.5–15}$ quartz concentrations ranged from 0.9 to 8.0 µg/m³.

United States Environmental Protection Agency 1996

From 1987 to 1993, EPA estimated annual PM_{10} average quartz concentrations in 17 urban areas, including Dallas and El Paso. These estimates were based on the percent quartz composition in the total dichotomous mass (TDM) (% quartz in TDM = % quartz in $PM_{2.5}$ + % quartz in $PM_{2.5–15}$) reported in each of the 17 individual cities from Davis et al. 1984. For each city, taking into account the percent quartz in the TDM and the average PM_{10} concentrations from 1987 to 1993 (i.e., a 7-year average), EPA calculated a 7-year average PM_{10} concentration for each city (PM_{10} quartz = % quartz in TDM x 7-year average PM_{10} concentration). The estimated annual average PM_{10} quartz concentrations ranged from 0.3 to 5.0 µg/m³. Across the 17 cities, the overall average PM_{10} quartz level was 1.9 µg/m³.

Pennsylvania Department of Environmental Protection 2016

Ambient background levels of PM_4 crystalline silica and of total $PM_{2.5}$ and PM_{10} were measured in Tunkhannock, Pennsylvania, in response to citizen concerns regarding a silica sand facility that was planned to be built in the township. If built, the facility would have been next to a day-care center and two adjacent little-league baseball fields. Residents were concerned about exposure to crystalline silica, as well as diesel emissions from an increase in truck traffic. One monitor each was sited upwind, downwind, and lateral to the location of the planned facility. For 30 days, a total of 113 24-hour samples were collected for measurement of PM_4 crystalline silica, prior to planned construction of the facility. During this same time frame, a total of 105 samples were collected for measurement of total $PM_{2.5}$ and PM_{10}.

Samples were collected in accordance with EPA procedures and were analyzed by a laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Analysis of PM_4 crystalline silica was performed using NIOSH method 7500 X-ray diffraction with a reporting limit of 1 µg/m³. Total $PM_{2.5}$ and PM_{10} analyses were conducted as specified in 40 CFR 50, Appendices J and L, respectively.

The short-term $PM_{2.5}$ and PM_{10} results in the Tunkhannock area were comparable to other PM samplers operating in the region; there were no concentrations higher than the numerical values of the NAAQS for $PM_{2.5}$ and PM_{10}. For each day, measured concentrations of total $PM_{2.5}$ and PM_{10} were similar at all three sites throughout the sampling period. The analysis for crystalline silica (measured as PM_4) indicated non-detects for the majority of samples; for the three PM_4 crystalline silica samples that had concentrations above the detection limits, the concentrations were 0.69 or 0.75 µg/m³ quartz. These trace amounts were insufficient to raise concern about potential short-term adverse health impacts. The report compares results to Minnesota's 3 µg/m³ health-based chronic value for crystalline silica and TCEQ's 2 µg/m³ chronic threshold non-carcinogen reference value for crystalline silica. The plant cancelled construction of the silica transloading facility; therefore, ambient air monitoring for crystalline silica was discontinued.

Ambient Air Monitoring $PM_{2.5}$ Data Near APOs in Central Texas

TCEQ has an extensive ambient air monitoring network that includes sampling for PM. PM samples are collected and analyzed in accordance with EPA requirements. In October 2019, TCEQ began to install five new ambient air $PM_{2.5}$ monitoring sites near APOs in central Texas. Each of these new monitoring sites is located within one mile of an APO in a predominantly downwind configuration. Between October 2019 and May 2020, four new $PM_{2.5}$ ambient monitors came online near APOs in the San Antonio area, and in July 2020, one new $PM_{2.5}$ ambient monitor came online near an APO in the Austin area (Figure 2).

Available total $PM_{2.5}$ data collected from these monitors, beginning as early as October 2019, were compared to the value of the 24-hour $PM_{2.5}$ NAAQS (35 µg/m^3). With the exception of one day, total $PM_{2.5}$ concentrations were lower than 35 µg/m^3. There was a documented Saharan dust event that spanned from June 26 to July 9, 2020. On June 27, 2020, all monitors collecting $PM_{2.5}$ data in central Texas had measured 24-hour total $PM_{2.5}$ concentrations higher than 35 µg/m^3 (the range was 59.1 to 68.9 µg/m^3), resulting in a regional average of 62.3 µg/m^3. Throughout the period evaluated (Oct. 1, 2019 through Sept. 15, 2020), the concentrations of total $PM_{2.5}$ near APOs followed the general regional $PM_{2.5}$ trend. Ambient air concentrations of total $PM_{2.5}$ at the new monitors were similar to background levels, indicating that APOs do not appear to have an impact on measured total $PM_{2.5}$ concentrations. ($PM_{2.5}$ data may be accessed via the agency's $PM_{2.5}$ Data webpage, www.tceq.texas.gov/agency/data/lookup-data/pm25.html.)

Ambient Air Monitoring Studies Near APOs

Air monitoring data have been collected near silica sand mining and processing facilities in several states, with emphasis either on $PM_{2.5}$ concentrations or crystalline silica concentrations in ambient air. The following sections and Table 7 provide summaries of these studies.

Particulate Matter 2.5

The following sections provide a summary of studies that have been conducted near APOs to determine the contribution APOs may make to $PM_{2.5}$ concentrations in ambient air.

Colorado, North Carolina, and Virginia

Richards et al. 1999

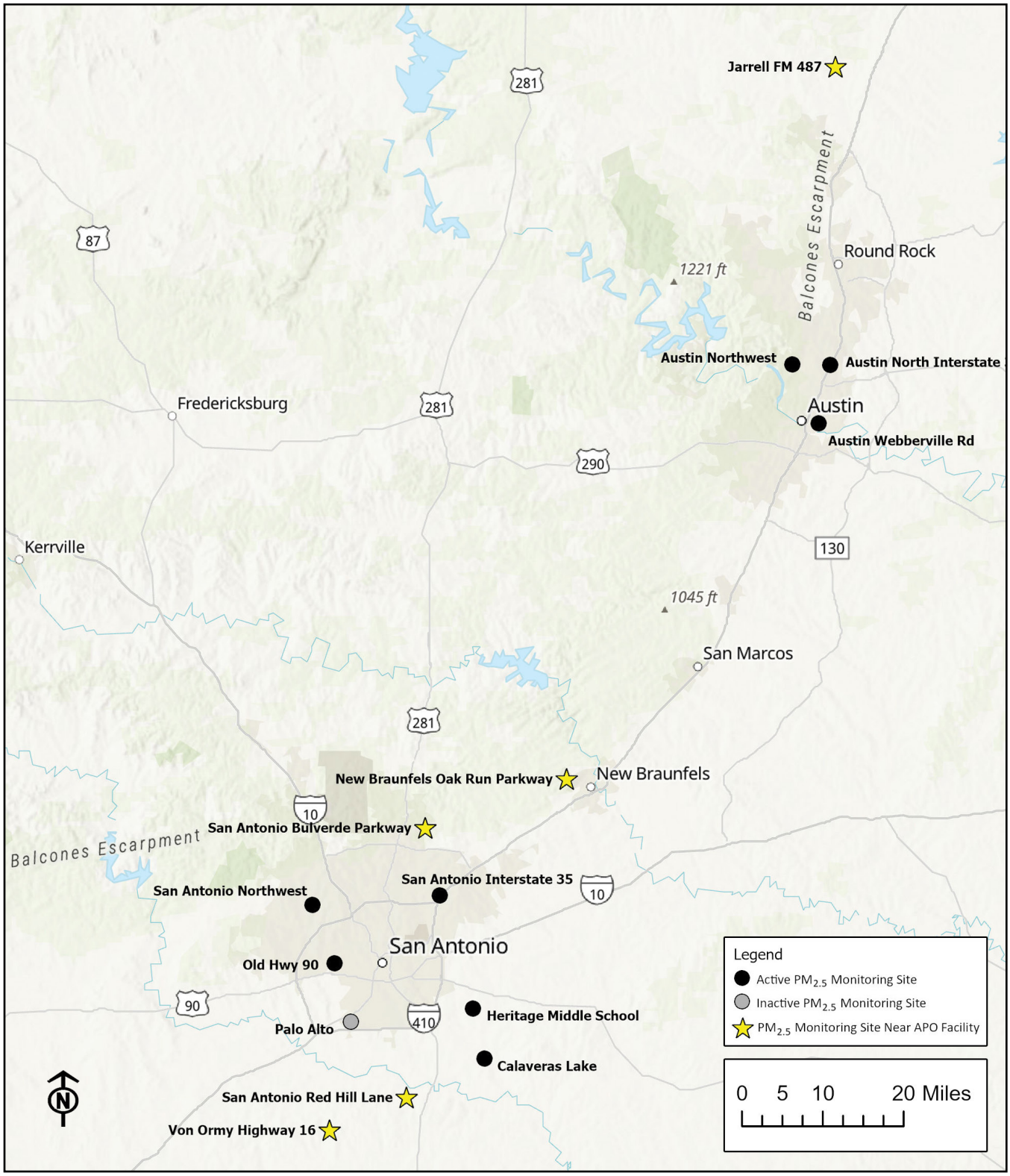
The National Stone Association sponsored a series of three ambient monitoring projects to evaluate the impact of stone crushing plants on ambient levels of $PM_{2.5}$. Ambient air monitoring for $PM_{2.5}$ was performed near stone crushing plants in Benson, North Carolina; Leesburg, Virginia; and Denver, Colorado. All three plants were large permanent facilities with typical processing equipment and quarries. At each plant, one monitor was located upwind and two monitors were located downwind within plant boundary lines. Ambient concentrations were measured in accordance with the EPA method as defined in 40 CFR 50 (USEPA 1997) and monitoring was performed 24 hours per day for 30 consecutive days during normal to high production rates.

At the Benson plant, ambient $PM_{2.5}$ levels were low and the concentration difference between the upwind and downwind sites was only 0.7 µg/m^3. Analysis of the $PM_{2.5}$ composition revealed that most of the particulate matter was composed of ammonium sulfate and organics, neither of which are products or byproducts of the plant or plant activities. In addition, negligible quantities of mineral particulate matter were found in the $PM_{2.5}$ samples collected downwind.

At the Leesburg plant, the upwind and downwind concentration data tracked very closely, with a mean downwind to upwind difference of 1.6 µg/m^3, showing that the plant had little impact on $PM_{2.5}$ concentrations. Chemical analysis of the $PM_{2.5}$ filters indicated that the particulate matter consisted of sulfates, ammonium compounds, and organics; mineral PM, which is the type of dust emitted by stone crushing plants, was not detected.

At the Denver plant, mineral PM levels were very low, and most of the $PM_{2.5}$ consisted of sulfates, nitrates, ammonium compounds, and organic and elemental carbonaceous compounds. Overall, the results indicate that stone crushing operations have negligible impact on ambient $PM_{2.5}$ concentrations.

Figure 2. $PM_{2.5}$ Ambient Air Monitoring Site Locations in Central Texas: TCEQ Region 11 – Austin and Region 13 – San Antonio



Note: This map was generated by the Toxicology Division (TD). No claims are made to the accuracy or completeness of the data, or to the suitability of the map for a particular use. This area may contain facilities other than those identified. For more information regarding this map, please contact the TD at 512-239-3900.

Date Created: 11/23/2020

Minnesota and Wisconsin

Walters et al. 2015

The aim of this pilot study was to measure total $PM_{2.5}$ concentrations around fracking-sand plants in Wisconsin and Minnesota. Limited sampling was conducted, and no measurements of crystalline silica were performed. Six nominal 24-hour ambient air samples were collected with an SKC deployable particulate sampler using the $PM_{2.5}$ sampling head. Five of the six samples were collected for approximately 24 hours (~22 to 24 hr), and one sample was collected for 347 minutes. Two of the samples were collected near inactive mines. Sampling conditions included calm and high wind, and rain and snow conditions, at 30 to 1,300 meters from operations. The results were compared to the nearest monitored $PM_{2.5}$ levels in the ambient air network of the Wisconsin Department of Natural Resources (DNR) and/or Minnesota Pollution Control Agency (MPCA), matched hour for hour to sampling times.

The authors stated that the measured fine particulate levels were likely due to a combination of regional pollution, car and diesel truck exhaust, local industrial pollution, and fracking-sand particulate emissions. In this pilot study, the range of concentrations of total $PM_{2.5}$ was 5.82–50.8 µg/m^3 $PM_{2.5}$. Generally, lower concentrations of $PM_{2.5}$ were seen with higher wind conditions, heavy snowfall, and heavy rain conditions. Also, lower concentrations of $PM_{2.5}$ were seen near inactive mines. The samples with $PM_{2.5}$ concentrations above the numerical value of the NAAQS also were higher than $PM_{2.5}$ levels measured at the nearest agency (DNR or MPCA) network sites, which were in the range of 0–13.5 µg/m^3. Overall, the results of the study are limited due to the small sample size and, therefore, conclusions cannot be made about the impact of APOs on total $PM_{2.5}$.

Crystalline Silica

The following sections provide a summary of studies that have been conducted near APOs to determine the contribution that APOs may make to crystalline silica concentrations in ambient air. See Table 7 for a tabular summary of these studies.

Monitored crystalline silica levels in ambient air are generally not likely to cause acute or chronic adverse health effects. The air monitoring studies listed below show that emissions from crystalline silica sources beyond the workplace are minimal. There is a general consensus among air quality professionals that ambient levels of crystalline silica pose little risk of silicosis. Overall, the results near facilities at various locations indicated similar low ambient levels of respirable crystalline silica.

California

Shiraki and Holmén 2002

The goal of this study was to provide preliminary data on ambient crystalline silica concentrations near a sand and gravel facility in California and to develop analytical techniques to distinguish source and background crystalline silica contributions so that exposure was not overestimated. Particulate matter measurements were made at four locations downwind and one location upwind of the facility in Tracy, California. Samples were collected on eight separate test periods, and PM_{10} samples of three sampling periods were analyzed for quartz concentrations using X-ray diffraction. Sampling durations were 2.7 to 11.5 hours; the authors did not state the duration of sampling for the samples subjected to analysis of PM_{10} quartz.

The highest concentrations of quartz PM_{10} observed were closest to the source at the facility. At three locations downwind, which encompassed the main plant where conveyor, separating, and crushing equipment and product piles were located, quartz PM_{10} concentrations were 26.2 to 97.2 µg/m^3. The downwind location outside of the gate of the plant and the upwind location had quartz PM_{10} concentrations of 5.4–16.3 µg/m^3 and 4.1 – < 5.4 µg/m^3, respectively. Of note, the current NAAQS value for PM_{10}, which reflects all particulate matter with an aerodynamic diameter ≤ 10 µm, is 150 µg/m^3 (24-hour sample).

Based on the study, the operations at the facility did contribute to ambient concentrations of crystalline silica. However, the authors note that the airborne quartz concentrations were of the same order of magnitude as those measured in respirable dust during agricultural operations in California. In addition, sampling was done during the dry season, and quartz concentrations during the wet season are expected to

be lower due to reduced facility activity and reduced emissions when facility product piles have higher moisture content. It is important to note that concentrations of PM_{10} crystalline silica will be greater than PM_4 crystalline silica, as PM_{10} includes more particles. However, unlike with PM_4, not all the particles in PM_{10} are respirable, meaning that they will not deposit deep into the lungs where they can cause damage. Another limitation of this study was the small number of samples analyzed for levels of quartz PM_{10}.

Richards et al. 2009

This investigation was sponsored by the California Construction and Industrial Minerals Association and the National Stone, Sand, and Gravel Association. The goal was to measure ambient respirable (PM_4) crystalline silica at two sand and gravel plants located in Carroll Canyon and Vernalis, California. The authors adapted the EPA reference method for $PM_{2.5}$ filter-based samplers to provide respirable particulate (PM_4) filter samples (USEPA 1997). The sampler was modified to have a 50% cut point of 4 µm instead of 2.5 µm by reducing the airflow used for monitoring $PM_{2.5}$. The adequacy of the cut size was confirmed using National Institute of Standards and Technology traceable microspheres. Crystalline silica content of PM_4 was measured using the NIOSH method 7500 X-ray diffraction (NIOSH 2003). The minimal detectable limit was 0.3 µg/m^3. At each facility, two samplers were located downwind from the quarry and processing equipment, and one sampler was located upwind of the entire facility. Samples were collected during three consecutive 24-hour periods. Concentrations of ambient crystalline silica ranged from 0 (below the detectable limit) to 2.8 µg/m^3. Differences between the upwind and downwind concentrations were small. Slightly higher upwind values observed were due to the emissions from unpaved roads near the upwind monitoring sites. In summary, the sand and gravel plants had a slight impact, if any, on ambient concentrations of PM_4 crystalline silica.

Minnesota

Minnesota Pollution Control Agency 2015 (May)

In response to community requests regarding the impact of diesel truck traffic and activities related to silica sand mining, MPCA placed air monitors at the Family Young Men's Christian Association in downtown Winona, and at a reference location in Stanton, Minnesota. The Stanton location did not have sand-related facilities or transportation in the area but did have other sources of airborne silica from unpaved roads and farm fields. The monitors collected 24-hour measurements of respirable crystalline silica (PM_4) every 6 days for 1 year. At each site, a total of 61 samples were collected for measurement of crystalline silica.

The Winona monitor had two samples with detectable crystalline silica concentrations, and the Stanton monitor had ten detected samples. The samples with detectable concentrations at the Winona site were just above the limit of detection of 0.3 µg/m^3; therefore, the average crystalline silica concentration in Winona was estimated to be < 0.3 µg/m^3. At the Stanton site, all the samples with detectable concentrations were < 1 µg/m^3; the 95% upper confidence limit of the arithmetic mean (UCL-95) was 0.4 µg/m^3. Total $PM_{2.5}$ also was measured at the Winona site. There was one measured value that was higher than the numerical value of the NAAQS for $PM_{2.5}$ over the one-year monitoring period. This measured $PM_{2.5}$ value (daily concentration ~ 39 µg/m^3) occurred on a day when the crystalline silica measurement was not detected and was due to a regional weather pattern with a strong temperature inversion, light winds, and heavy fog. In summary, the ambient concentrations of crystalline silica in Winona, located near silica sand mining, were mostly non-detectable and were within the UCL-95 of the reference location in Stanton, which was not near a silica sand mining plant.

Minnesota Pollution Control Agency 2015 (October)

This study evaluated crystalline silica concentrations in PM_{10} for 17 months at a single location northeast of and outside Shakopee Sand (formerly Great Plains Sands) in Jordan, Minnesota, which is approximately 25 miles southwest of Minneapolis. Samples were collected for 24 hours once every 12 days. Seven samples were collected pre-permit and 37 samples were collected post-permit. Activities conducted after issuance of the permit were construction, mining, blasting, and stockpiling. The limit of detection was 1 µg/m^3. All PM_{10} crystalline silica samples were below the limit of

detection, except for one sample collected pre-permit with a concentration < 2 µg/m^3 (~ 1.9 µg/m^3) and one sample collected post-permit with a concentration < 1.5 µg/m^3 (~ 1.4 µg/m^3). In addition, total PM_{10} was measured for three years at one fenceline location northeast of and one fenceline location south of the facility. Throughout the 3-year period, there were no measured concentrations higher than the numerical value of the NAAQS for PM_{10} (i.e., no daily total PM_{10} concentrations were greater than 150 µg/m^3). This study demonstrates that the plant activities at this silica sand facility had negligible contributions to ambient PM_{10} crystalline silica.

Minnesota Pollution Control Agency 2015 (December)

In this study, ambient air monitoring of PM_4 crystalline silica was performed at one fenceline location north of and one fenceline location south of the Titan Lansing Transload (previously Tiller) Corporation's sand processing facility in North Branch, Minnesota. The facility is located approximately 35 miles north of the Twin Cities (Saint Paul and Minneapolis). Sampling occurred for 24 hours, once every 6 days, for approximately 68 weeks over the course of 2 years. The total sampling duration was not the entire 2 years (i.e., 104 weeks), as some samples were invalidated due to flow rate problems and maintenance issues with the monitors. Regardless, valid data were collected during a period of approximately 68 weeks.

Most of the samples were below the detection limit. Some samples were above the detection limit (not specified); those samples above the detection limit ranged from < 2 µg/m^3 to ~ 6 µg/m^3 PM_4 crystalline silica. Wind and pollution roses were developed and reviewed for days when the samples were above the detection limit. The contribution of the sand processing facility to PM_4 crystalline silica was concluded to be minimal because about half the samples with detectable levels occurred on days when the monitor was either upwind or offwind of the facility. The UCL-95 PM_4 crystalline silica values for the monitors were 1.8 and 1.7 µg/m^3. In addition, total $PM_{2.5}$ and PM_{10} levels were measured at both monitoring locations for 2.75 years and there were no measured concentrations higher than the numerical values of the NAAQS for either $PM_{2.5}$ or PM_{10}. Overall, the sand processing facility contribution to ambient crystalline silica was minimal.

Minnesota Pollution Control Agency 2018

The aim of this study was to conduct ambient air monitoring for PM_4 crystalline silica outside of the Jordan Sands LLC sand mining and processing facility in Mankato, Minnesota. The facility includes a wet plant for washing and screening; a dry plant for drying, screening, and sorting; stockpile areas for raw sandstone, wet sand, and sorted material; a rail loadout facility; an office; a maintenance building; and staging areas. Two monitors were located at opposite sides (north, south) of the facility. One monitor was located near the dry plant and large outdoor storage sand pile and the other monitor was located near the mine site. Total PM_{10} and $PM_{2.5}$ were measured in accordance with EPA regulations, once every 6 days, for 3 years.

At both monitors, there were no measured concentrations higher than the numerical values of the NAAQS for PM_{10} and $PM_{2.5}$ over the 3-year period. In addition, PM_4 crystalline silica was measured every 6 days for most of the 3-year period (no data were collected for a few weeks in 2014 through November 2016, and from mid-December 2016 through March 2017). The majority of the crystalline silica results were below the detection limit, which appears to be 0.3 µg/m^3, as shown on the graphs. For those samples above the limit of detection, the PM_4 crystalline silica values were ≤ 1 µg/m^3. Overall, the sand mining and processing facility contribution to ambient crystalline concentrations was determined to be negligible or minimal.

Wisconsin

Richards and Brozell 2015

The purpose of this study was to conduct long-term fenceline monitoring for respirable (PM_4) crystalline silica near four Wisconsin facilities (three fracking-sand mines and one fracking-sand processing plant in Chippewa and Barron counties). Prior to this study, the Wisconsin DNR and MPCA expressed concerns regarding the lack of ambient respirable crystalline silica data in communities near fracking-sand producing facilities. The authors adapted the EPA reference method for $PM_{2.5}$ filter-based samplers to provide respirable particulate

(PM_4) filter samples (USEPA 1997). Crystalline silica content of PM_4 was measured by an accredited laboratory using the NIOSH method 7500 X-ray diffraction (NIOSH 2003). The limit of quantification (LOQ) for crystalline silica was 0.31 µg/m³. Three samplers were placed near the fenceline at each facility: two downwind from the facility, and one upwind.

All sampling locations met sampling site criteria specified by EPA (USEPA 2013). At each facility, the sampling locations were 10 to 150 meters from the closest fugitive dust source and 500 to 1,000 meters from the most distant fugitive dust source. Samplers operated on a once-every-third-day schedule and the sampling days matched the once-every-third-day calendar schedule used by EPA and state agency monitoring networks. Therefore, the data generated could be compared with data generated simultaneously with state agency $PM_{2.5}$ samplers. Sampling time was between 23 and 25 hours in duration, and samples were collected for 2 years. A total of 2,128 24-hour-average samples were collected from the eight different sample locations at four facilities.

Variations in the total PM_4 data were very similar to variations in total $PM_{2.5}$ data, suggesting that most of the total PM_4 particulate matter was background total $PM_{2.5}$ particulate matter. As expected, the total PM_4 concentrations were slightly higher than the total $PM_{2.5}$ concentrations, because the total PM_4 size range extends into the coarse mode of ambient particulate matter. For respirable crystalline silica, 88% of the 2,128 samples were below the LOQ of 0.31 µg/m³. Across the four facilities, the annual averages calculated based on LOQ/√2 values substituted for the below-LOQ samples ranged from 0.22 to 0.33 µg/m³. In addition, 24-hour sample upwind to downwind differences were zero on 78% of the days and were very small on the remaining days. Overall, the results indicate that the sand mining and processing facilities contribute very little, if any, to the ambient respirable crystalline silica concentrations.

Peters et al. 2017

The aim of this study was to evaluate the impact of proppant sand mining and processing activities on particulate matter concentrations, including respirable (PM_4) crystalline silica, in a Wisconsin community. PM_4 crystalline silica concentrations were measured in Trempealeau County, Wisconsin, outside of 17 residential homes within 800 meters of the property line of facilities with active sand mining, processing, and/or transport. Sampling using PM_4 samplers occurred for a minimum of 48 hours, and samples were analyzed for crystalline silica using NIOSH method 7500 X-ray diffraction (NIOSH 1994). The minimum reporting limit for crystalline silica (defined as five times the minimum detectable level) was 0.4 µg/m³.

Crystalline silica was detected above the limit of detection in seven of 17 samples. Of those samples, quartz represented 2% to 4% of the mass. All PM_4 crystalline silica concentrations were below the minimal reporting level of 0.4 µg/m³. Additionally, long-term air monitoring at homes near the sand mining and processing operations revealed that total PM concentrations were well below the numerical values of the NAAQS for $PM_{2.5}$ and PM_{10}. The authors noted higher local concentrations when the averaging time was shortened from 24 hours to 1 hour or 5 minutes. Elevated short-term (5 min) total $PM_{2.5}$ and PM_{10} concentrations were more likely to occur when the wind was blowing from the sand facility; these elevated concentrations occurred less than 3% of the sampling time.

These infrequent peak concentrations may explain observed dust deposits that raised concerns from the community. Spikes in concentrations may also result from a variety of industrial, community, agricultural, and natural sources. Overall, the 24-hour total $PM_{2.5}$ and PM_{10} concentrations were within the numerical values of the NAAQS for $PM_{2.5}$ and PM_{10}. Respirable crystalline silica concentrations measured near residences were below the minimal reporting level of 0.4 µg/m³, indicating that the proppant sand mining and processing facilities made minor contributions, if any, to the ambient respirable crystalline silica concentrations.

Summary of Crystalline Silica Air Monitoring Studies

The following table (Table 7) provides a summary of the crystalline silica measurements from studies that measured crystalline silica in urban areas and in areas near APOs.

Table 7. Crystalline Silica Air Monitoring: Baseline and At or Near Sand Mining, Fracking-Sand, and Sand and Gravel Facilities in the United States

Study	Location of Study	Facility	Distance	Crystalline Silica ($\mu g/m^3$)	Duration	PM measured
Davis et al. 1984	22 U.S. Cities[a]	N/A	Baseline	0–1.9 0.9–8.0	24 h every 6 d for 1 year	$PM_{2.5}$ $PM_{2.5-15}$
USEPA 1996	17 U.S. Cities[a]	N/A	Baseline	0.3–5.0	24 h every 6 d for 7 years	PM_{10}
PA DEP 2016	Pennsylvania (Tunkhannock)	N/A	Baseline	Most < LOD; 3 samples: 0.69 – 0.75	24 h every d for 30 d	PM_4
Shiraki and Holmén 2002	California (Tracy)	Sand and gravel facility	1 fenceline location downwind 1 fenceline location upwind	4.1 – <5.4 5.4–16.3	2.7 – 11.5 h, 8 samples collected	PM_{10}
Richards et al. 2009	California (Carroll Canyon, Vernalis)	2 sand and gravel facilities	2 fenceline locations downwind, and 1 fenceline location upwind	0–2.8	3 consecutive 24-h periods	PM_4
MPCA May 2015	Minnesota (Winona, Stanton)	Diesel truck traffic and sand mining	Winona – fenceline urban location near facility Stanton – reference location not near facility	Most < LOD; 2 samples: ~0.3 Most < LOD; 10 samples > LOD; UCL-95 = 0.4	24 h every 6 d for 1 year	PM_4
MPCA Oct. 2015	Minnesota (Jordan)	Shakopee Sand sand mining facility	1 fenceline location 7 samples pre-permit 37 samples post-permit	 Most < LOD; 1 sample ~1.9 Most < LOD; 1 sample ~1.4	24 h every 12 d for 17 months	PM_{10}
MPCA Dec. 2015	Minnesota (North Branch)	Titan Lansing sand processing facility	2 opposite fenceline locations	UCL-95 values of 1.7 and 1.8 at each monitor	24 h every 6 d for 68 weeks over the course of 2 years	PM_4
MPCA 2018	Minnesota (Mankato)	Jordan Sands sand mining and processing facility	2 opposite fenceline locations	Most < LOD; maximum = 1	24 h every 6 d for 3 years	PM_4
Richards and Brozell 2015	Wisconsin (Chippewa and Barron Counties)	3 fracking-sand mines and 1 fracking-sand processing plant	At each facility: 2 fenceline locations downwind and 1 fenceline location upwind	0.22–0.33 (range of annual average of all 4 facilities)	23–25 h every 3 d for 2 years	PM_4
Peters et al. 2017	Wisconsin (Trempealeau County)	Sand mining facility	17 homes within 800 m of facility	All samples <0.4	48 h, 17 samples collected	PM_4

Abbreviations: MPCA, Minnesota Pollution Control Agency. PA DEP, Pennsylvania Department of Environmental Protection. PM, particulate matter. USEPA, U.S. Environmental Protection Agency.

a. Includes Dallas and El Paso, Texas

CONCLUSION

TCEQ has reviewed ambient air crystalline silica levels measured near APOs in various locations throughout the United States where data are available. These data indicate that the contribution of crystalline silica from these facilities to ambient levels of particulate matter and respirable crystalline silica is negligible or minimal and that the levels generally are below the health-based AMCVs for crystalline silica developed by the TCEQ.

For respirable crystalline silica (PM_4), the 24-hour AMCV is 24 µg/m^3, and the long-term AMCV is 0.27 µg/m^3. In urban areas throughout the United States, average annual ambient air concentrations of crystalline silica in $PM_{2.5}$ and in PM_{10} were 0–1.9 µg/m^3 and 0.3–5.0 µg/m^3, respectively. The range of respirable crystalline silica (PM_4) measured in samples collected for 24 or 48 hours near APOs ranged from 0 (many samples were below the limit of detection) to 2.8 µg/m^3. Levels of crystalline silica in PM_{10} near APOs were higher, as these measurements include larger particles that are not respirable and will not reach into the human lung. Additionally, some PM_{10} crystalline silica levels near APOs reflect a duration of sampling significantly shorter than 24 hours, which is the sampling duration that provides an average concentration reflective of a 24-hour period and provides a direct comparison to 24-hour comparison values, as well as the duration of sampling specified in the EPA method for measurement of PM_{10}.

Health-based AMCVs are safe levels at which exposure is unlikely to result in adverse health effects. When compared to TCEQ's AMCVs for crystalline silica, the ambient air concentrations of crystalline silica near APOs are generally not likely to cause acute or chronic adverse health effects and are not associated with silicosis. While there is no federal requirement for TCEQ to measure ambient levels of crystalline silica, federal standards for PM, a component of which may include silica, are in effect for $PM_{2.5}$ and PM_{10}.

It is important to note that APOs in Texas require an air permit prior to start of operation and must meet federal standards for $PM_{2.5}$ and PM_{10}. In October 2019, TCEQ began installing ambient air $PM_{2.5}$ monitoring sites located within one mile of APOs in central Texas. There are currently five sites near APOs that are located predominantly downwind of these facilities. The available data currently show the concentrations of $PM_{2.5}$ at these monitoring sites near APOs follow the general regional trend for $PM_{2.5}$. The data also indicate that APOs do not appear to have an impact on measured $PM_{2.5}$ concentrations.

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APPENDIX 3

Exhibit A: Exh. Friends-102 with 10km and 20km radii around Vulcan Site

Quarry Row Open-Pit Mines
Loop 1604 to Loop 337