OFFICE OF AIR QUALITY PLANNING AND STANDARDS

RESEARCH TRIANGLE PARK, NC 27711

December 10, 2024

MEMORANDUM

SUBJECT: Alternative Demonstration Approach for the 2024 Secondary Sulfur Dioxide National Ambient Air Quality Standard under the Prevention of Significant Deterioration Program

FROM: Peter Tsirigotis, Director Tsirigotis, Peter Digitally signed by Tsirigotis, Peter Date: 2024.12.10 15:14:30 -05'00'

TO: Regional Air Division Directors, Regions 1-10

On December 10, 2024, the Environmental Protection Agency (EPA) revised the secondary sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) from a 3-hour average standard to an annual average standard set at 10 parts per billion (ppb), averaged over 3 consecutive years. Under the Prevention of Significant Deterioration (PSD) program, any permit issued on and after the effective date of the new secondary annual SO_2 NAAQS for construction at a stationary source that increases SO_2 emissions in significant amounts will need to be supported by a demonstration that the increased emissions from the proposed major stationary source or major modification will not cause or contribute to violation of that standard. The EPA's regulations specify air quality models and requirements for applying such models to make this demonstration for the pollutants subject to NAAQS. The EPA has also provided recommendations in regulations and guidance memoranda that permit applicants and reviewing authorities may follow to make this showing. Permit applicants and reviewing authorities can use these existing resources to make the required showing for the new secondary annual SO_2 NAAQS, but these parties may need to take additional steps and collect additional data to do so in certain circumstances. To help facilitate implementation of the new secondary annual SO_2 NAAQS under the PSD program without these additional burdens, the EPA developed a streamlined, alternative PSD demonstration approach.

Based on the attached technical analysis, the EPA has determined that a demonstration that increased SO_2 emissions will not cause or contribute to a violation of the primary 1-hour SO_2 standard can suffice to demonstrate that SO_2 emissions will also not cause or contribute to a violation of the secondary annual SO_2 standard. Thus, permit applicants and reviewing authorities may rely on the demonstration for the primary 1-hour SO_2 NAAQS to also satisfy the demonstration requirement for the secondary annual SO_2 NAAQS. Permit applicants and reviewing authorities are not required to follow this alternative PSD demonstration approach but may choose to do so based on this memorandum and the attached technical analysis.

The alternative PSD demonstration approach for the secondary annual SO_2 NAAQS described in this memorandum and the attached technical analysis is not final agency action and does not create any binding requirements on permitting authorities, permit applicants or the public.

BACKGROUND

The statutory requirements for a PSD permit program set forth under part C of title I of the Clean Air Act (CAA) (sections 160 through 169) are implemented through the EPA's PSD regulations found at 40 CFR 51.166 (minimum requirements for an approvable PSD State Implementation Plan) and 40 CFR 52.21 (PSD permitting program for permits issued under the EPA's federal permitting authority). Among other things, the PSD program requires that new or modified stationary sources complete a demonstration using air quality modeling or other methods to show that their proposed emissions increases will not cause or contribute to a violation of any NAAQS that is in effect at the time the final permit is issued. Accordingly, on and after the effective date of the new secondary annual SO_2 NAAQS, PSD permits will require such a demonstration for the primary 1-hour SO_2 NAAQS and the secondary annual SO_2 NAAQS if the construction for which the permit is required is projected to increase SO_2 emissions by a significant amount. *See* CAA section 165(a)(3)(B), 40 CFR 51.166(k), (m), 40 CFR 52.21(k), (m). Under 40 CFR 51.166(l)(1) and 40 CFR 52.21(l)(1), all applications of air quality modeling for purposes of determining whether a new or modified source will cause or contribute to a NAAQS violation must be based upon air quality models specified in appendix W to 40 CFR part 51.

Under section 9.2.3 of appendix W, the EPA recommends a multi-stage approach to making the required demonstration that increased emissions will not cause or contribute to a violation of the NAAQS. The first stage involves a source impact analysis where only the impact of the new or modifying source is considered and the second stage involves a cumulative impact analysis that considers all sources affecting the air quality in the area. A value representing the level of impact that would cause or contribute to a violation, often called a significant impact level (SIL), may be used in the first and second stages of the demonstration to determine whether the proposed emissions increase would cause or contribute to a modeled violation.

Permit applicants and reviewing authorities may face additional burdens in making the required PSD demonstration directly with the new secondary annual SO_2 NAAQS. For example, the EPA has not developed a recommended SIL corresponding with the new secondary standard, meaning that permit applicants and reviewing authorities wishing to do so would have to develop their own SIL value and provide a rationale and technical justification for that value in the record for individual PSD permit actions. Additionally, AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model), the required regulatory dispersion model, is not currently updated to generate outputs consistent with the form of the new secondary annual SO_2 NAAQS through post-processing, meaning that permit applicants would have to perform their own post-processing. Finally, where a cumulative impact analysis is necessary to make the required showing for the new secondary annual SO_2 NAAQS, permit applicants and reviewing authorities may experience challenges with relying on existing monitoring data to adequately represent background concentrations of SO_2. The current SO_2 monitoring network is primarily source-oriented and designed to measure concentrations in areas of high SO_2 emissions proximate to population centers and to sources, and there are a limited number of monitors distant enough from emissions areas to establish the information necessary for area specific estimates of background concentrations. Therefore, there may be situations where prospective sources subject to PSD or existing sources proposing a major modification would need to collect new data to determine the representative annual background concentrations of SO_2.

ALTERNATIVE PSD DEMONSTRATION APPROACH

To streamline the development of applications associated with implementing the new secondary annual SO_2 NAAQS under the PSD program, this memorandum with attached technical analysis supports the use of an alternative demonstration approach that permit applicants and reviewing authorities may rely upon to support PSD air quality demonstration requirements for the secondary annual SO_2 NAAQS. As described in detail in the attachment, the EPA conducted a two-pronged technical analysis of the relationships between the secondary annual SO_2 standard and the primary 1-hour SO_2 NAAQS and determined that there is sufficient evidence that a demonstration that emissions will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS serves as a suitable alternative for demonstrating those emissions will not cause or contribute to a violation of the secondary annual SO_2 NAAQS. As such, the EPA supports sources undergoing PSD review for SO_2 relying upon their analysis demonstrating that they will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS to also demonstrate that they will not cause or contribute to a violation of the secondary annual SO_2 NAAQS. This technically justified surrogate approach avoids the need for two separate SO_2 impact analysis demonstrations for the primary and secondary SO_2 standards. This alternative PSD demonstration approach thus serves to streamline air quality analyses in a manner consistent with the CAA and PSD regulations.

Where the recommended alternative demonstration approach is used to make the required demonstration for the secondary SO_2 standard in PSD permit applications, this memorandum may be cited, and the findings associated with the alternative demonstration approach should be included as part of the permit record. Within parameters set forth in applicable regulations, permitting authorities have the discretion to accept different demonstration approaches in the review of individual permit applications, provided the reviewing authority is satisfied that such approach demonstrates that the proposed emissions increases will not cause or contribute to a violation of the NAAQS.

OTHER CONSIDERATIONS

The EPA provided a technical analysis supporting the alternative PSD demonstration approach for the secondary annual SO_2 NAAQS for public review and comment.[1] Most commenters supported the alternative PSD demonstration approach and those that opposed it did not provide any substantive comments on the technical analysis that provided grounds for the EPA to reconsider or revise the analysis or its conclusions.

[1] 89 FR 26620 (April 15, 2024); Tillerson, C, Mintz, D and Hawes, T; Memorandum to Secondary NOx/SOx/PM NAAQS Review Docket (EPA–HQ– OAR–2014–0128). Technical Analyses to Support Alternative Demonstration Approach for Proposed Secondary SO_2 NAAQS under NSR/PSD Program. January 31, 2024. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

Given the suitability of the alternative demonstration approach, the EPA does not currently plan to develop additional regulations, guidance, or data to support implementation of the secondary annual SO_2 NAAQS under the PSD program. This memorandum with attached technical analysis supports the use of a streamlined, alternative PSD demonstration approach that relies on the demonstration for the primary 1-hour SO_2 NAAQS as a suitable surrogate for demonstrating that emissions will not cause or contribute to a violation of the secondary annual SO_2 NAAQS. Permit applicants and reviewing authorities are not required to rely on the alternative PSD demonstration approach and may elect to make a direct demonstration for the secondary annual standard using existing regulations, models, and other tools. However, because of the challenges that may be involved with such a demonstration and the additional resources that would be required, the EPA recommends using the technically justified alternative PSD demonstration approach.

Please share this memorandum and the attached technical analysis with the PSD reviewing authorities in your Region. If you have questions regarding the memorandum, please contact Rochelle King at *king.rochelle@epa.gov* or (919) 541-1390. If you have questions regarding the technical demonstration document, please contact Tyler Fox at *fox.tyler@epa.gov* or (919) 541-5562.

Attachment

cc: Tyler Fox
Rochelle King
Scott Mathias
Richard Wayland

Attachment

Technical Analysis to Support Alternative Demonstration Approach for Secondary Sulfur Dioxide National Ambient Air Quality Standard under the Prevention of Significant Deterioration Program

BACKGROUND

To support consideration of an alternative demonstration approach that could be used by Prevention of Significant Deterioration (PSD) permit applicants, the EPA conducted a two-pronged technical analysis of the relationships between the new secondary annual standard and the primary 1-hour sulfur dioxide (SO_2) primary National Ambient Air Quality Standard (NAAQS). The first prong of the analysis addressed aspects of a PSD source impact analysis by evaluating whether an individual source's impact resulting in a small increase in 1-hour SO_2 concentration, as defined by the significant impact level (SIL) for the primary 1-hour SO_2 NAAQS, would produce a comparably small increase in the annual SO_2 concentration. This analysis includes modeled estimates of SO_2 for a range of source types and scenarios. The analysis indicates that small increases in 1-hour SO_2 concentrations caused by individual sources produce similarly small changes in the annual SO_2 concentrations. The second prong of the analysis addresses aspects of a PSD cumulative impact analysis indicating that a demonstration showing attainment of the primary 1-hour SO_2 standard is expected to also show attainment of the new secondary annual SO_2 standard. The analysis is based on 2017 to 2022 air quality data and compares the primary 1-hour SO_2 standard with a level of 75 parts per billion (ppb), and the new secondary annual SO_2 standard with a level of 10 ppb. This analysis indicates that all monitoring sites meeting the primary 1-hour SO_2 standard would also meet the new secondary annual SO_2 standard. Only two monitoring sites violated the new secondary annual SO_2 standard during the 2017-2019 to 2020-2022 design value periods; however, both sites also violated the primary 1-hour SO_2 standard of 75 ppb.[2]

The EPA believes that the technical analysis described in this attachment is robust and has broad application across all areas in the United States. The relationships shown in this attachment support relying on this alternative PSD demonstration approach even after adjustment and updates to tools that may be used to make the required NAAQS demonstration. Based on this technical analysis, the EPA currently believes that there is sufficient evidence that a demonstration that increased emissions will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS serves as a suitable surrogate for demonstrating those emissions will not cause or contribute to violation of the new secondary annual SO_2 NAAQS under the PSD program. As such, the EPA supports sources undergoing PSD review for SO_2 relying upon their analysis demonstrating that they will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS to also demonstrate that they will not cause or contribute to a violation of the secondary annual SO_2 NAAQS.

[2] For this analysis, we did not include monitoring sites located in Hawaii since our focus was on anthropogenic emissions. Yet had we included those sites where there is a notable contribution of nonanthropogenic volcanic emissions, our results and overall conclusions would not have changed.

TECHNICAL ANALYSIS

This section examines use of a demonstration that emissions will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS as a surrogate for demonstrating such emissions will not cause or contribute to a violation of the secondary annual SO_2 NAAQS of 10 ppb in the context of two aspects of the PSD program. First, in context of a source impact analysis, we examine whether an air quality impact at the SIL for the primary 1-hour SO_2 NAAQS would correspond to a comparably small value for annual SO_2 concentrations. A SIL may be used in PSD applications for determining whether a proposed source's impact on air quality is considered significant. If a proposed source's impact exceeds the SIL, then a cumulative impact analysis would be needed for that proposed source to determine if its emissions will cause or contribute to potential NAAQS violations. The second aspect of the technical basis, in context of a cumulative impact analysis, focuses on whether area-specific NAAQS compliance would be similar under the secondary annual SO_2 NAAQS as under the primary 1-hour SO_2 NAAQS.

A Small Increase in 1-hour SO_2 Concentration Produces a Comparably Small Increase in Annual SO_2 Concentration

For a source impact analysis under the primary 1-hour SO_2 NAAQS to be suitable for demonstrating emissions will not cause a violation of the secondary annual SO_2 NAAQS, a small increase in a modeled 1-hour SO_2 concentration as defined by the applicable SIL value should produce a comparably small increase in a modeled annual averaged SO_2 concentration. In this analysis, the small increase in an annual SO_2 design concentration is determined by the increase in emissions that would correspond to the level of the 1-hour SO_2 SIL of 3 ppb recommended in EPA guidance.[3] This 1-hour SO_2 SIL of 3 ppb or 7.86 micrograms per cubic meter ($\mu g/m^3$) is equal to 4 percent of the primary 1-hour SO_2 NAAQS of 75 ppb. EPA's view is that a PSD permit applicant that demonstrates the increase in the 1-hour SO_2 design concentration resulting from an increase in that new or modifying source's emissions will be less than or equal to the 1-hour SIL value can conclude in most cases that this increase in emissions will not cause or contribute to a violation of the 1-hour SO_2 NAAQS.[4]

To demonstrate the association between the primary 1-hour SO_2 NAAQS and the secondary annual SO_2 NAAQS set at 10 ppb, dispersion modeling was performed using EPA's AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model). AERMOD is the EPA's preferred dispersion model for predicting ground-level pollutant concentrations in the nearfield (≤ 50 km) since its promulgation in 2005 into the EPA's *Guideline on Air Quality Models*, commonly referred to as the *Guideline* (Appendix W to 40 CFR Part 51). AERMOD is the primary air quality model used under the PSD program for new or modifying sources and has been used extensively in the implementation of the primary 1-hour SO_2 NAAQS.

[3] Memorandum from Stephen D. Page, EPA OAQPS, to EPA Regional Air Division Directors, "Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program," August 23, 2010.
[4] EPA Memorandum: Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program. August 23, 2010.

To demonstrate the association of a small increase in the 1-hour SO_2 design concentration with a small increase in the annual SO_2 design concentration, existing AERMOD dispersion modeling performed for the Risk and Exposure Assessment (REA)[5] during the most recent review of the primary 1-hour SO_2 NAAQS was adapted for this purpose. The REA modeling assessment includes a variety of industrial source types in different areas across the United States. Three different sites were modeled which include a total of 11 industrial facilities within the following industrial sectors: electric generation, wastewater treatment, engine manufacturing, chemical manufacturing, battery recycling, glass manufacturing, and oil and gas refinement. Table 1 lists the study areas and the industrial sources in each area that were included in the REA modeling. The REA modeling for each of the sources listed in Table 1 was adapted and remodeled for the technical analysis herein over the 3-year period of 2011-2013. Refer to the referenced REA for descriptions of the areas, sources, and model setup performed for the REA, such as the emissions and meteorological data that were used. Adaptations to the REA modeling are discussed later in this section. Figure 1 through Figure 3, taken from the referenced REA, show the locations of the modeling domains for each of the study areas and the location of each of the facilities.

Table 1. Study Areas and Industrial Sources (Types) Modeled

Study Area	Facility Name	NEI ID
Fall River, MA	Brayton Point Energy (EGU[6])	5058411
Indianapolis, IN	Belmont Advanced Wastewater Treatment Plant (water treatment) Citizens Thermal (EGU) Indianapolis Power & Light Co. (IPL) – Harding Street Generation Station (EGU) Rolls Royce Corporation (combustion engine manufacture) Vertellus Specialties (chemical manufacturing) Quemetco (lead battery recycling)	4885211 4885311 7255211 7972011 7972111 8235411
Tulsa, OK	Public Service Co. of Oklahoma (PSO) – Northeastern Power Station (EGU) Sapulpa Glass Plant (glass manufacturing) Tulsa Refinery West (oil/gas refinery) Tulsa Refinery East (oil/gas refinery)	8212411 7320611 8402711 8003911

[5] Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides. EPA-452/R-18-003. May 2018.

[6] EGU = Electric generating unit.

Fall River, MA

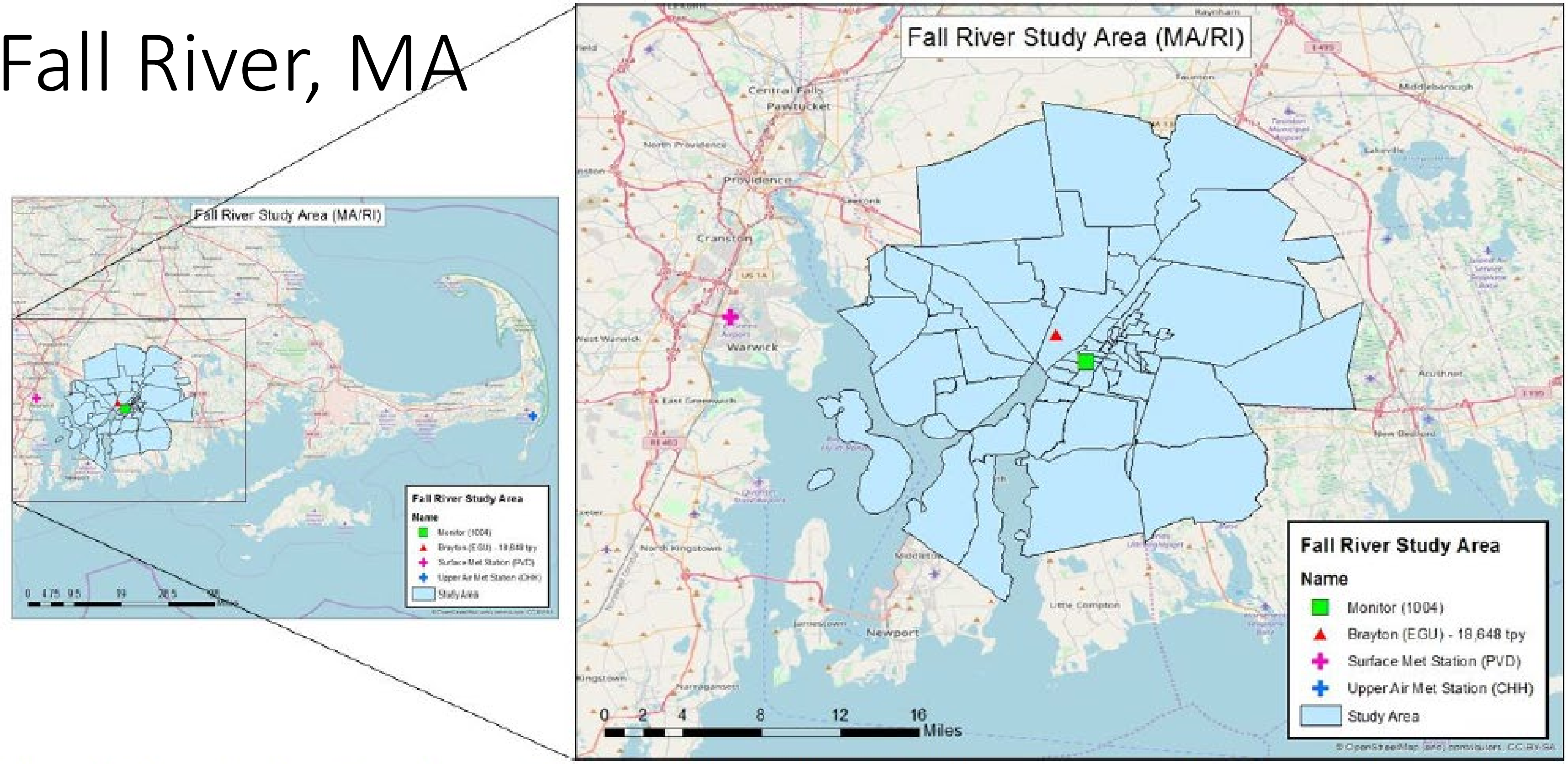

Figure 1. Fall River, MA Study Area and Modeling Domain

From Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides, EPA-452/R-18-003, May 2018.

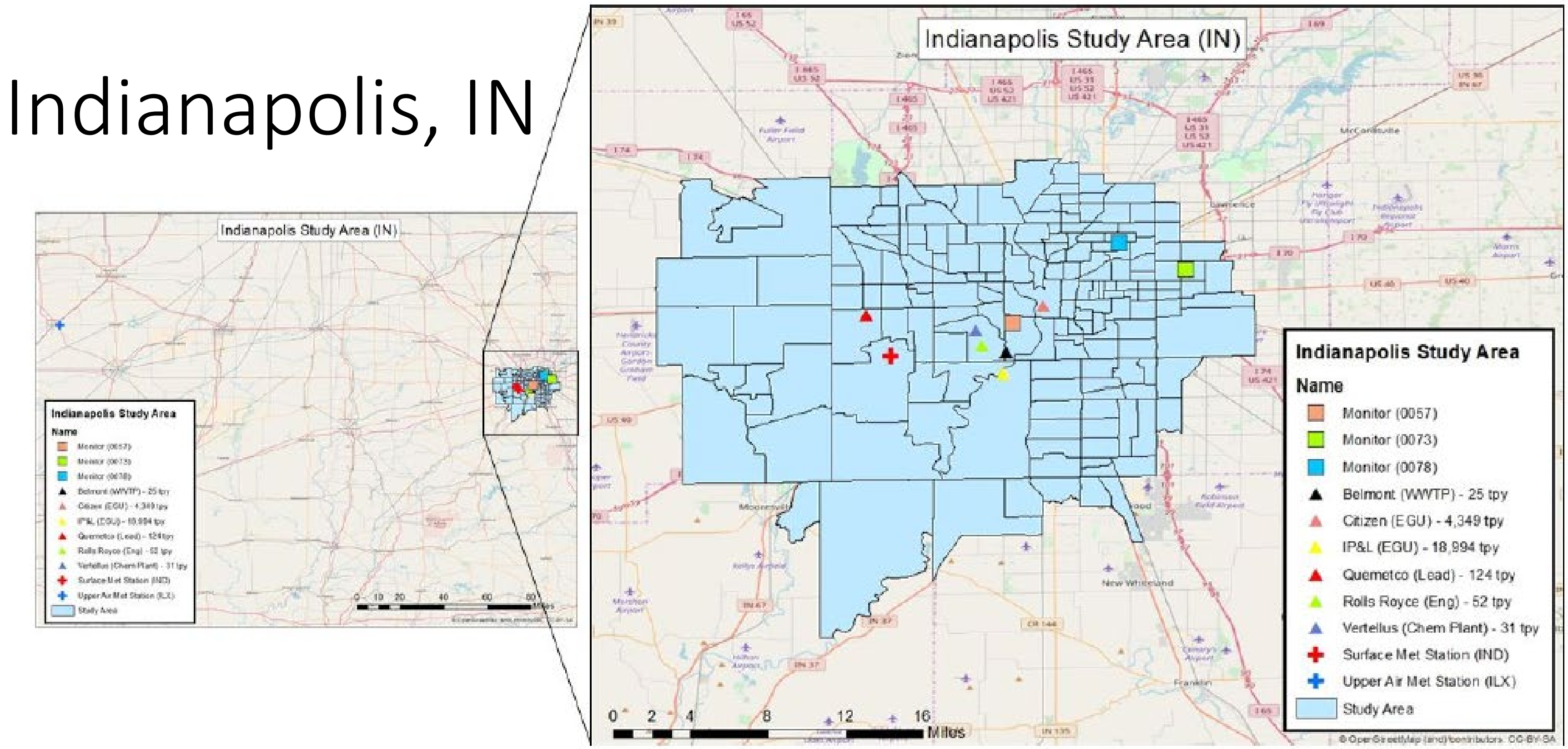

Figure 2. Indianapolis, IN Study Area and Modeling Domain

From Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides, EPA-452/R-18-003, May 2018.

Tulsa, OK

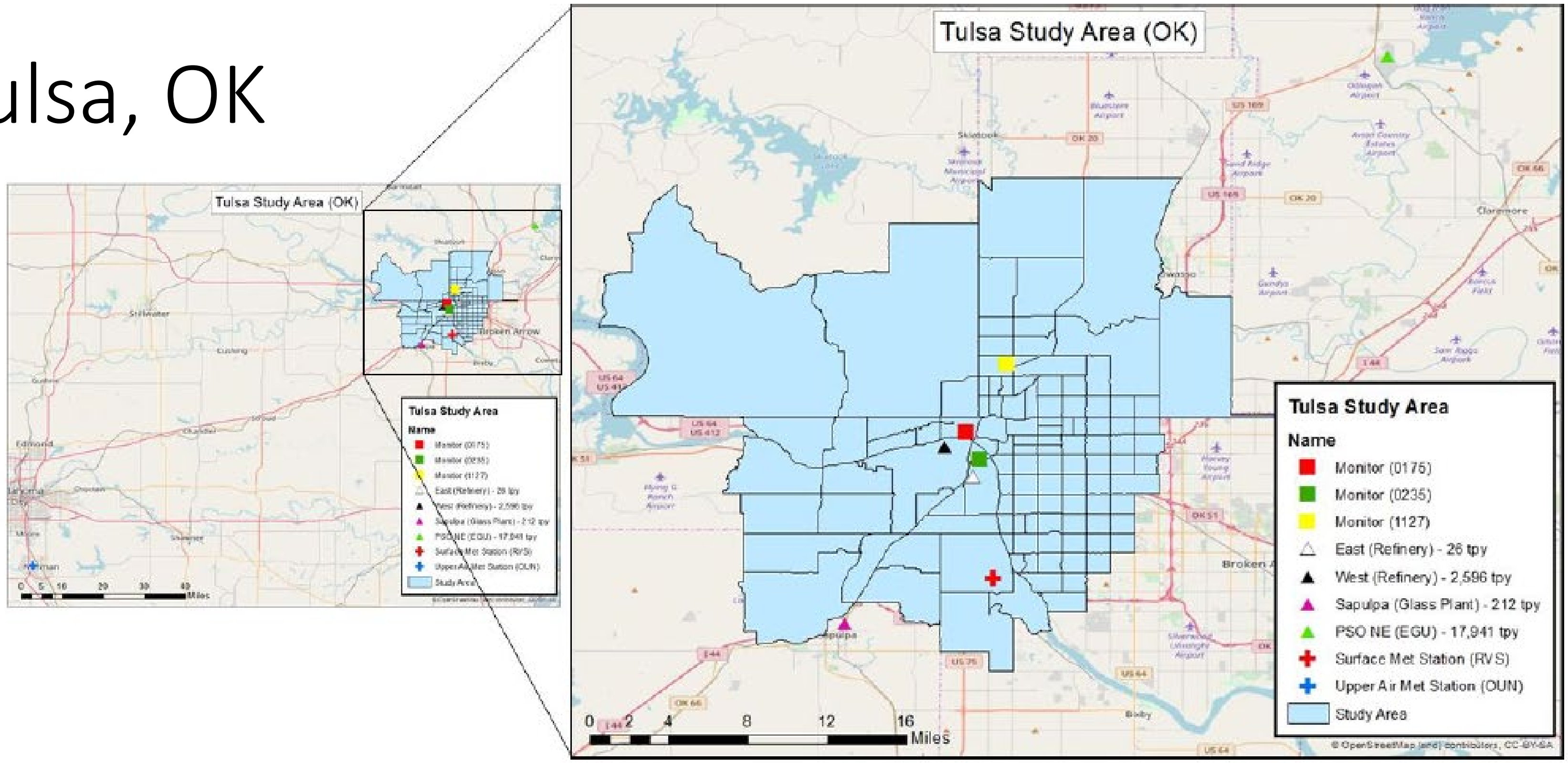

Figure 3. Tulsa, OK Study Area and Modeling Domain

From Risk and Exposure Assessment for the Review of the Primary National Ambient Air Quality Standard for Sulfur Oxides, EPA-452/R-18-003, May 2018.

For the technical analysis herein, each facility in Table 1 was modeled separately from all others to observe the increase in ground-level annual SO_2 concentrations associated with that facility's emissions increase that yields a small increase in the 1-hour concentrations. In addition, three of the sources within the Indianapolis area – IPL Harding Street Generating Station, Vertellus Specialties, and Quemetco - were also modeled as though they were in the Fall River area to observe the change in the annual design concentrations in a different topographical and meteorological environment. Note that the relative locations of the release points of these three facilities when modeled in the Fall River environment were not maintained. Rather, the source characteristics of the Fall River Brayton facility were replaced with the source characteristics of the Indianapolis sources. Because Vertellus and Quemetco are relatively small sources, they were modeled together as a single source in the Fall River area while the IPL facility was modeled separately. Background concentrations were not included in this modeling demonstration so that emission rates and concentrations could be scaled as needed. Two of the sources in Tulsa, OK - PSO Northeastern Power Station and the Sapulpa Glass Plant - are located outside of the receptor grid used for the REA modeling. For the technical analysis herein, the receptor grid for each of these sources was extended to ensure the area of maximum concentration would be captured in the modeling for these sources.

The original REA modeling for each of the facilities listed in Table 1 was adapted and modeled as follows:

1. Variable emissions rates (e.g., hourly, monthly) used in the REA modeling were averaged for each emission point separately for each year, resulting in a single constant year-specific emission rate for each emission point within each source (i.e., a constant emission rate was used each year for each emission point, and emission rates only varied by year).
2. Each facility was modeled to get a base annual design concentration. The annual design concentration was computed as the highest of the 3-year averages of the yearly annual concentrations across all receptors, consistent with the form of the new secondary annual standard.
3. Each facility was modeled to get a 1-hour concentration to compare to the EPA-recommended 1-hour SO_2 SIL value of 3 ppb (7.86 $\mu g/m^3$). The 1-hour concentration for comparison to the SIL was computed as the maximum of the 3-year average of the highest 1-hour concentrations, across all receptors.
4. For each facility, the ratio of the 1-hour result from #3 to the EPA-recommended SIL concentration was computed and used to scale the annual concentrations from #1 for each year at each receptor to get the difference in the concentrations based on the increase in emissions that would result in a modeled concentration equal to the 1-hour SIL value.
5. The increase in each receptor concentration for each year, from #4, was added to each modeled receptor concentration each year, from #1, to get an increased concentration at each receptor for each year.
6. A new annual design concentration was then computed based on the increased modeled annual concentration, and the difference was computed between the new annual design concentration and the original modeled design concentration from #2.

Table 2 shows the modeling results for each facility including the average annual emissions before and after the emissions increase, the amount of the emissions increase, the annual design concentration before and after the emissions increase, and the amount of increase in the annual design concentration (last column on the right). For most of the facilities modeled, the amount of increase in the annual design concentration is less than or equal to 1.0 percent of an annual standard of 10 ppb. For all but two facilities the increase in the annual design concentration is less than or equal to 2.0 percent of an annual standard of 10 ppb. The largest increase modeled is 3.5 percent of an annual standard of 10 ppb.

The contour plots in Figure A1 through Figure A13 in the Appendix to this document show the location of the emission releases for each facility modeled and the amount of the increase in the annual SO_2 modeled design concentration based on a small increase in the 1-hour SO_2 modeled design concentration, reflective of the 1-hour SIL value. For each of the facilities modeled, the area of the peak ground-level SO_2 concentration and where the increase in the modeled annual design concentrations is the greatest occurs very near to the facility, within about 2 kilometers (km) for all facilities and less than 1 km, at or near the fence line for most of the facilities. Thus, similar to the primary 1-hour SO_2 standard, the greatest increase in the modeled annual design concentrations is localized near the facility rather than some distance downwind of the facility. Overall, results in Table 2 and Figure A1 through Figure A13 in the Appendix suggest that a small increase in 1-hour SO_2 concentration produces a comparably small increase in annual SO_2 concentration and thereby provides support that demonstrating emissions will not cause or contribute to a violation of the primary 1-hour SO_2 NAAQS is suitable also for making this demonstration for the new secondary annual SO_2 NAAQS under the PSD program.

Table 2. AERMOD Modeling Results for Annual SO_2 Design Concentration Changes by Study Area and Source Type

Site - Facility	**Annual Emissions** (before increase) *TPY*	**Emissions Increase** *TPY*	**Annual Emissions** (after increase) *TPY*	**Annual Design Concentration** (before increase) *µg/m³ (ppb)*	**Annual Design Concentration** (after increase) *µg/m³ (ppb)*	**Increase in Design Concentration** *µg/m³ (ppb)*	**Increase as % of Annual Std of 10 ppb**
Fall River, MA							
- Brayton Point Energy	8,733	483	9,216	2.25 (0.86)	2.37 (0.91)	0.12 (0.05)	0.5%
- *Vertellus Specialties and Quemetco**	142	9	151	4.02 (1.54)	4.28 (1.63)	0.26 (0.10)	1.0%
- *Citizen's Thermal**	4,009	90	4,099	4.86 (1.86)	4.97 (1.90)	0.11 (0.04)	0.4%
Indianapolis, IN							
- Belmont Advanced Wastewater Treatment Plant	23	2	25	1.92 (0.73)	2.10 (0.80)	0.18 (0.07)	0.7%
- Citizen's Thermal	4,009	158	4,167	5.19 (1.98)	5.39 (2.06)	0.20 (0.08)	0.8%
- IPL - Harding Street Generating Station	22,837	239	23,076	23.40 (8.93)	23.64 (9.03)	0.25 (0.09)	0.9%
- Rolls Royce Corporation	42	2	44	4.14 (1.58)	4.33 (1.65)	0.19 (0.07)	0.7%
- Vertellus Specialties	27	3	30	2.71 (1.04)	3.03 (1.16)	0.32 (0.12)	1.2%
- Quemetco	115	30	145	0.95 (0.36)	1.19 (0.45)	0.24 (0.09)	0.9%
Tulsa, OK							
- PSO Northeastern Power Station	17,941	5,63	17,846	5.69 (2.17)	5.88 (2.25)	0.19 (0.07)	0.7%
- Sapulpa Gas Plant	222	41	263	2.98 (1.14)	3.53 (1.35)	0.55 (0.21)	2.1%
- Tulsa Refinery West	1,892	79	1,971	22.05 (8.42)	22.97 (8.77)	0.92 (0.35)	3.5%
- Tulsa Refinery East	24	97	121	0.13 (0.05)	0.66 (0.25)	0.53 (0.20)	2%

** Indianapolis, IN source releases also modeled at the Fall River, MA site.*

Monitoring Sites that Meet the Primary 1-hour SO_2 NAAQS of 75 ppb Also Meet the Secondary Annual SO_2 NAAQS of 10 ppb

For a cumulative impact analysis under the primary 1-hour SO_2 NAAQS to be suitable for the secondary annual SO_2 NAAQS, the areas that meet the primary 1-hour SO_2 NAAQS should also meet annual concentration levels for the secondary SO_2 NAAQS. In this section, we describe an ambient data analysis for monitored areas across the U.S. that evaluates the relationship between the primary 1-hour SO_2 NAAQS of 75 ppb and the secondary annual SO_2 NAAQS of 10 ppb. The analysis demonstrates that all monitoring sites that meet the primary 1-hour SO_2 NAAQS of 75 ppb also meet the secondary annual SO_2 NAAQS of 10 ppb.

The analysis is summarized in the scatter plot shown in Figure 4 that compares site-level ambient SO_2 concentrations based on the primary 1-hour SO_2 NAAQS of 75 ppb and the concentration levels for the secondary annual SO_2 NAAQS of 10 ppb. This figure shows that all monitoring sites meeting the primary 1-hour SO_2 NAAQS of 75 ppb also meet the secondary annual SO_2 NAAQS of 10 ppb. Further, only two monitoring sites violate the secondary annual SO_2 standard of 10 ppb during the 2017-2019 to 2020-2022 design value (DV) periods. Both sites, which are in New Madrid County, MO, also violate the primary 1-hour SO_2 standard of 75 ppb. Thus, during the period analyzed, all monitoring sites that meet the primary 1-hour SO_2 NAAQS of 75 ppb also meet the secondary annual SO_2 NAAQS of 10 ppb.

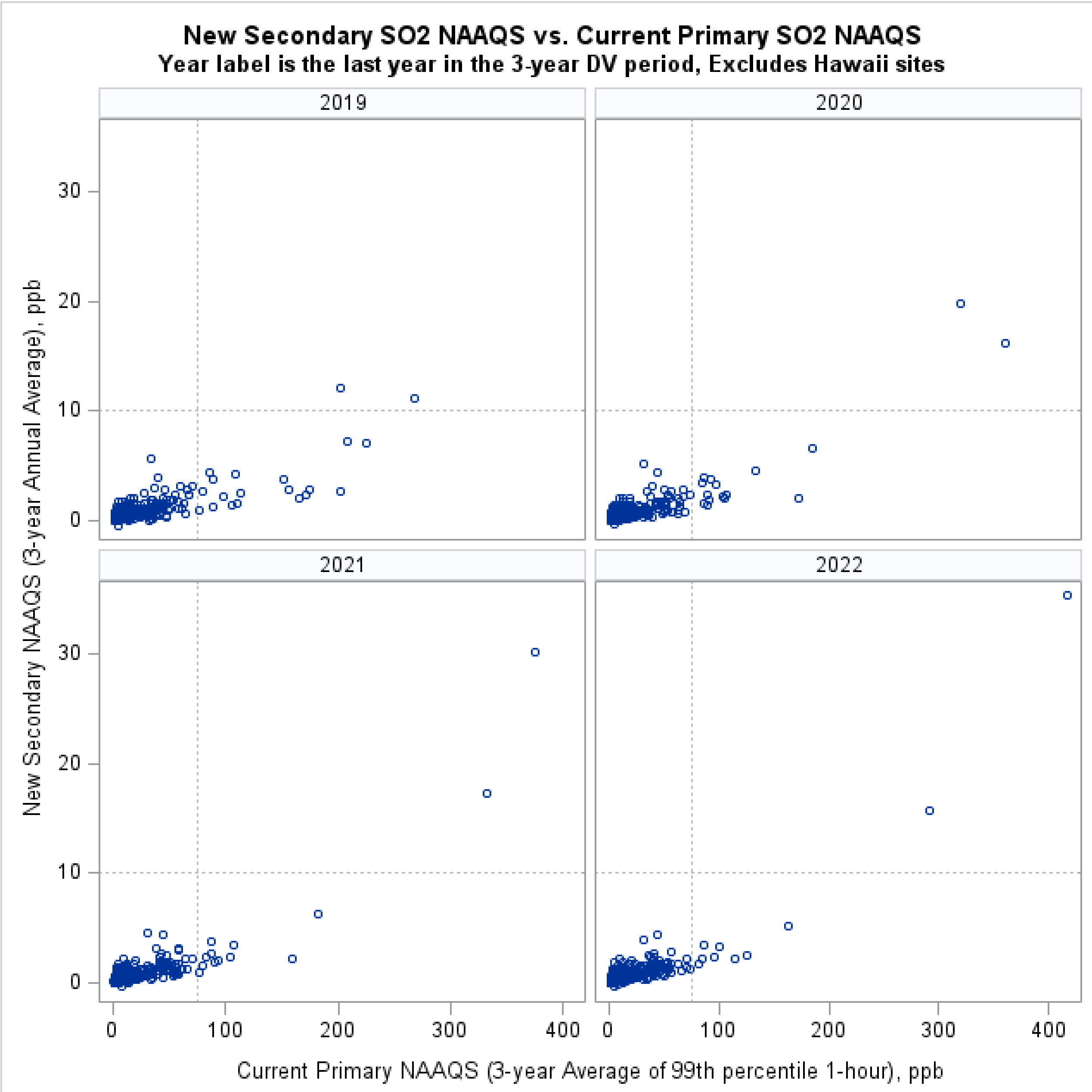

Figure 4. Scatter plot of site-level concentrations for the secondary annual SO_2 NAAQS of 10 ppb compared to the primary 1-hour SO_2 NAAQS of 75 ppb: 2019-2022 Design Values

Overall, design values based on 2017-2019 to 2020-2022 monitoring data show that sites meeting the primary 1-hour SO_2 NAAQS would also meet a 10 ppb secondary annual SO_2 NAAQS. Therefore, the results indicate that a cumulative impact analysis that demonstrates compliance with the primary 1-hour SO_2 NAAQS of 75 ppb is generally suitable for demonstrating compliance with the secondary annual SO_2 NAAQS of 10 ppb for PSD applications.

APPENDIX

Contour Plots Showing Amount of Increase in Modeled Design Concentration for Annual SO_2 Standard

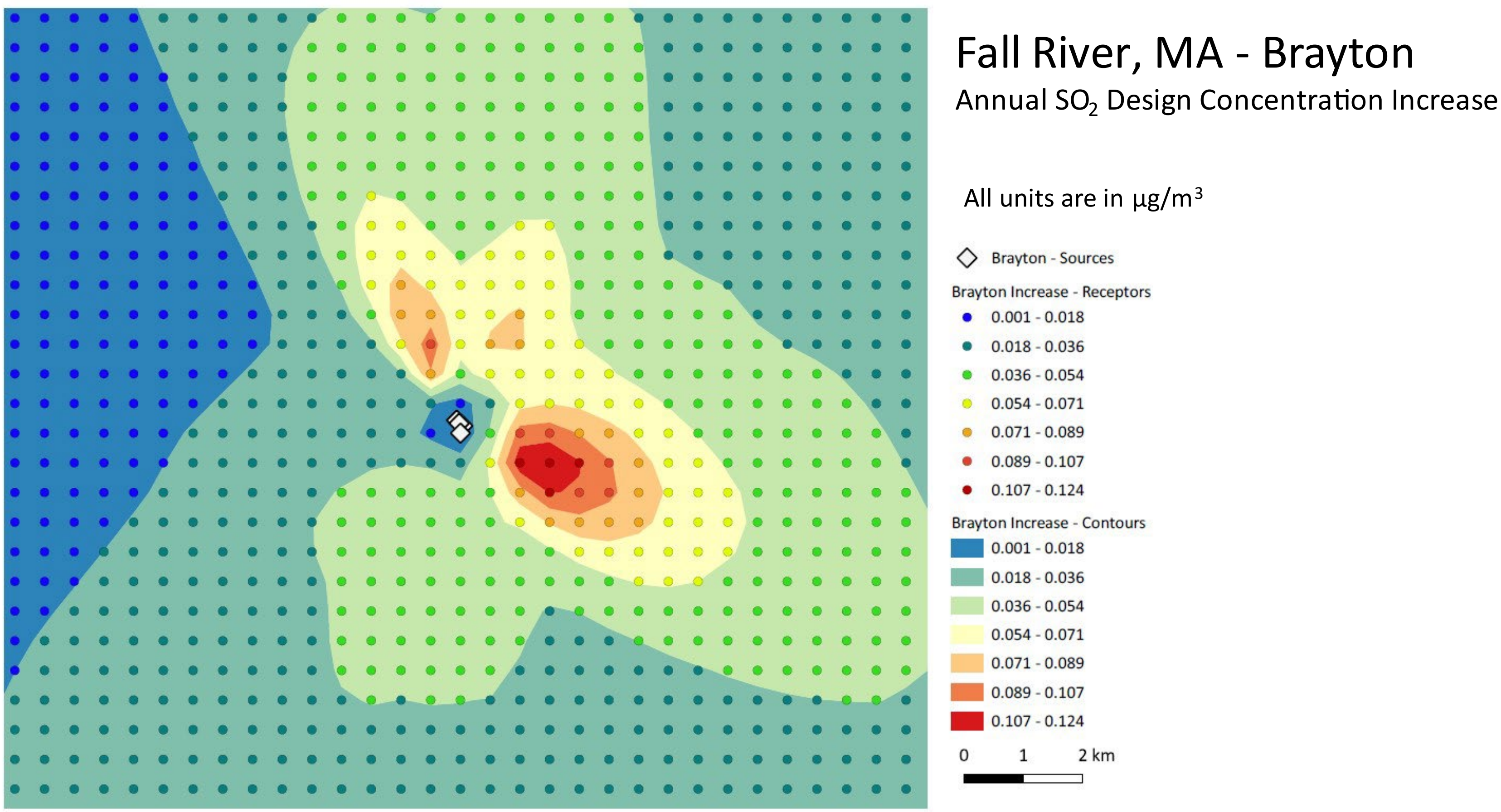

Figure A1. Increase in Annual SO_2 Design Concentration for Brayton Facility at Fall River, MA.

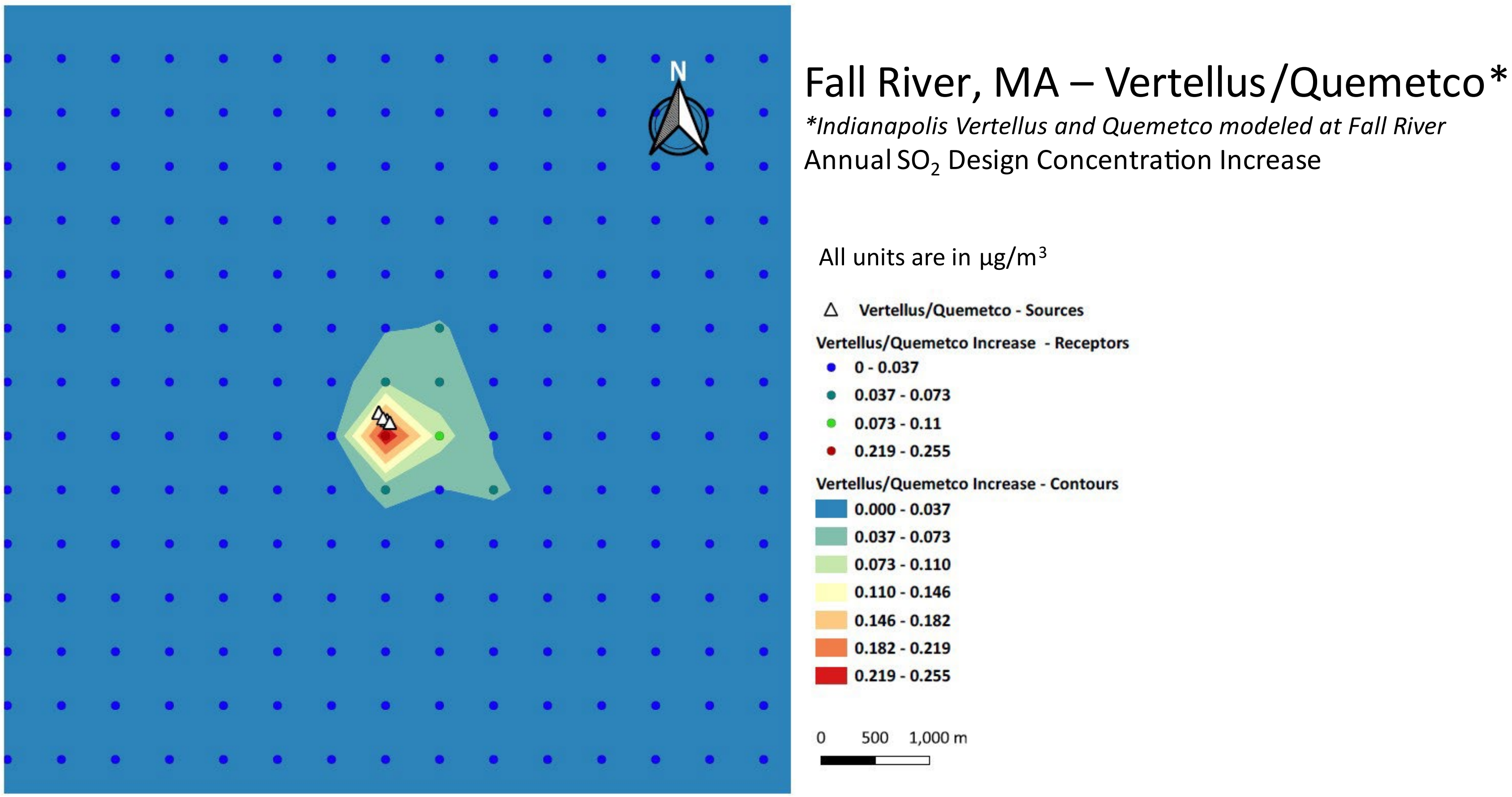

Figure A2. Increase in Annual SO_2 Design Concentration for Vertellus and Quemetco Sources Modeled with Fall River, MA, Terrain and Meteorology.

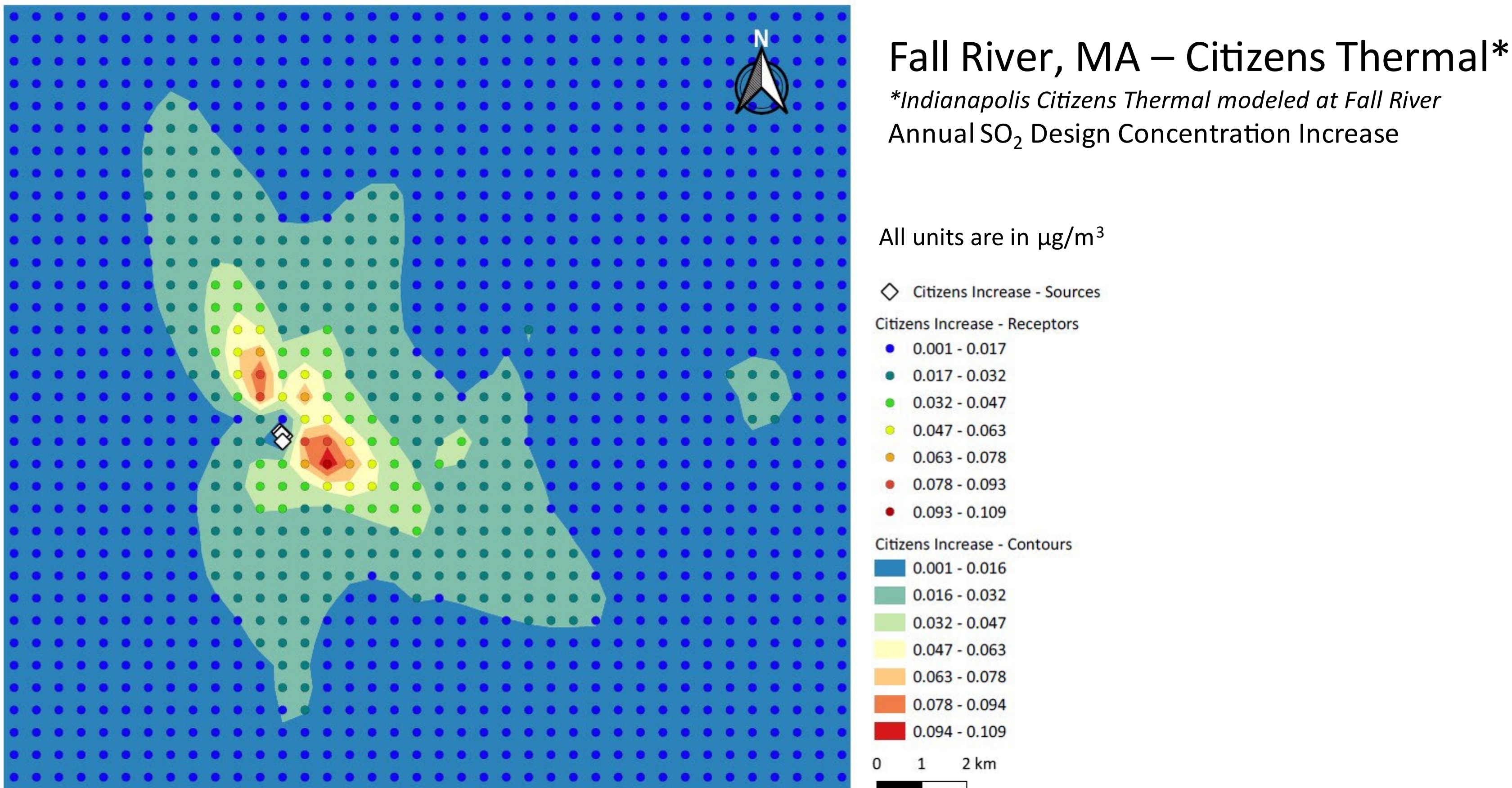

Figure A3. Increase in Annual SO_2 Design Concentration for Citizens Thermal Sources Modeled with Fall River, MA, Terrain and Meteorology.

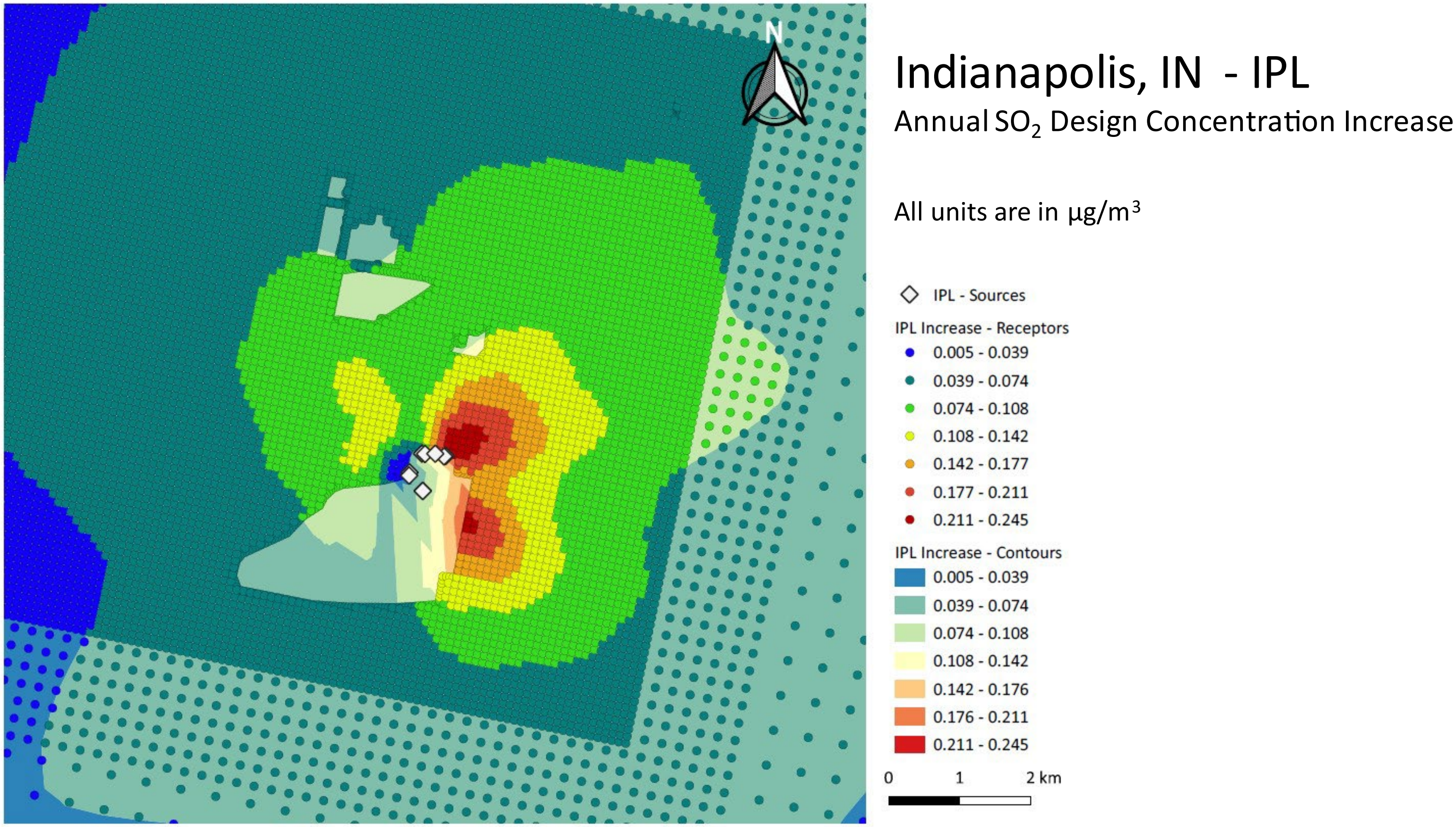

Figure A4. Increase in Annual SO_2 Design Concentration for IPL – Harding Street Generating Station in Indianapolis, IN.

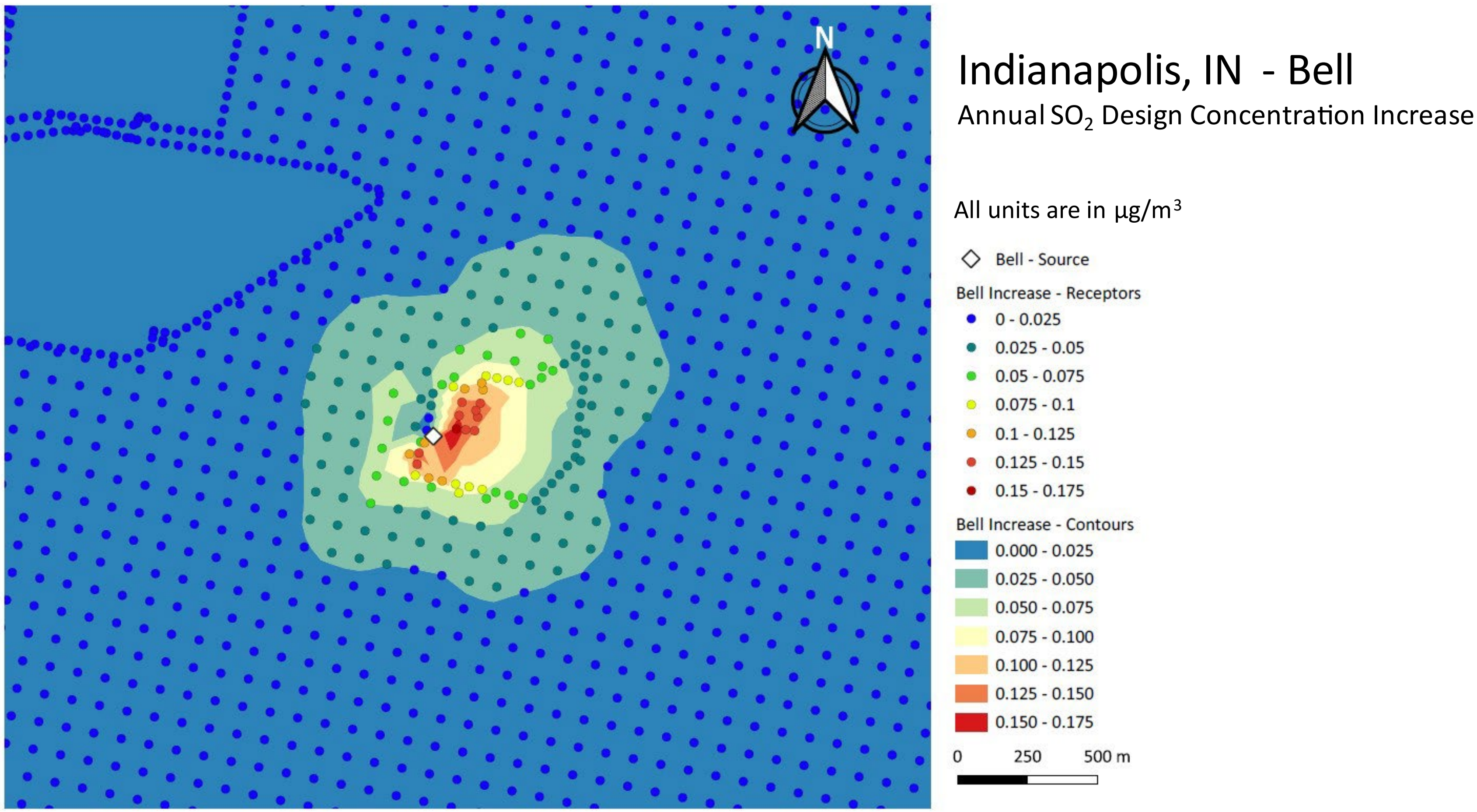

Figure A5. Increase in Annual SO_2 Design Concentration for Belmont Advanced Wastewater Treatment Facility in Indianapolis, IN.

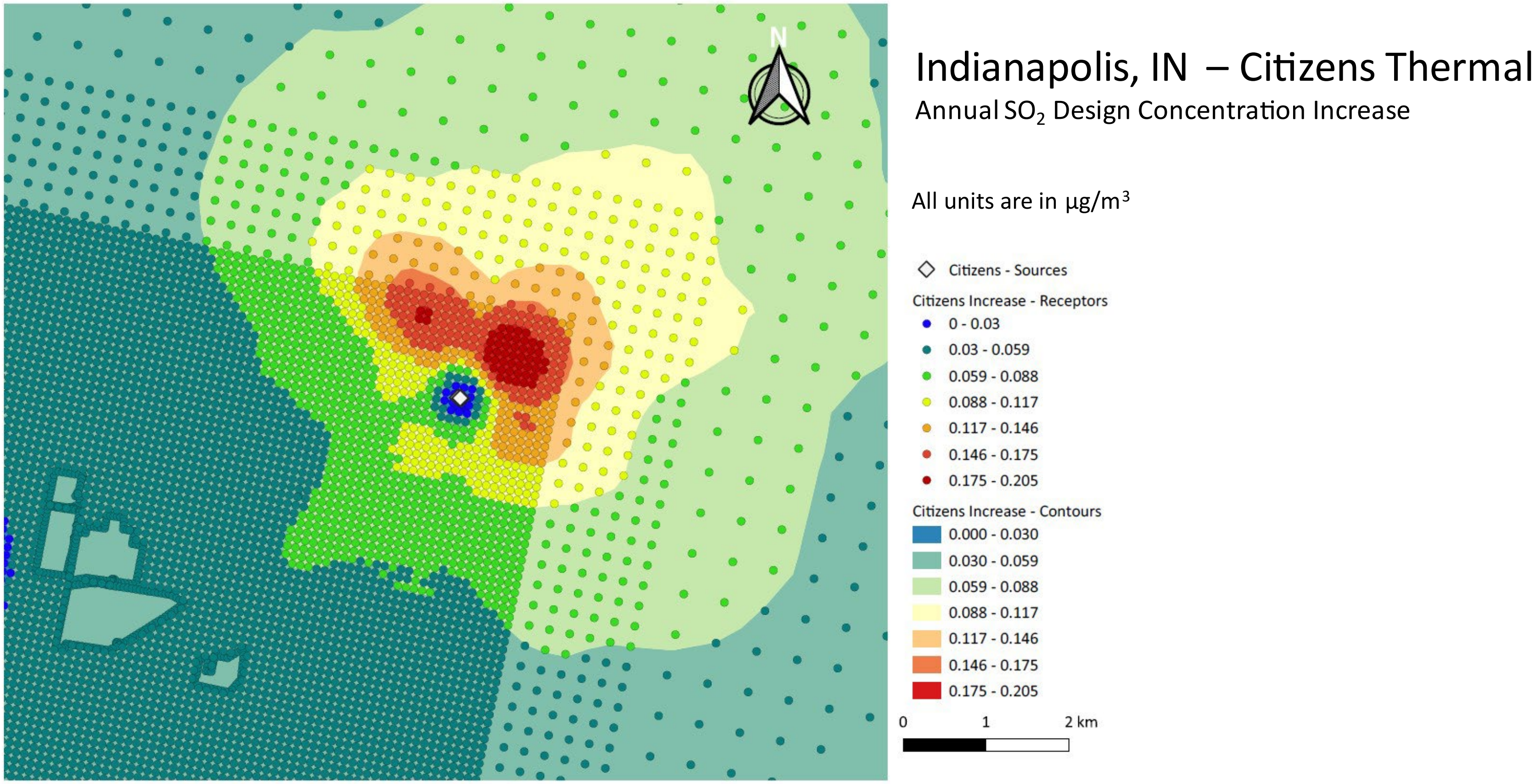

Figure A6. Increase in Annual SO_2 Design Concentration for Citizens Thermal Facility in Indianapolis, IN.

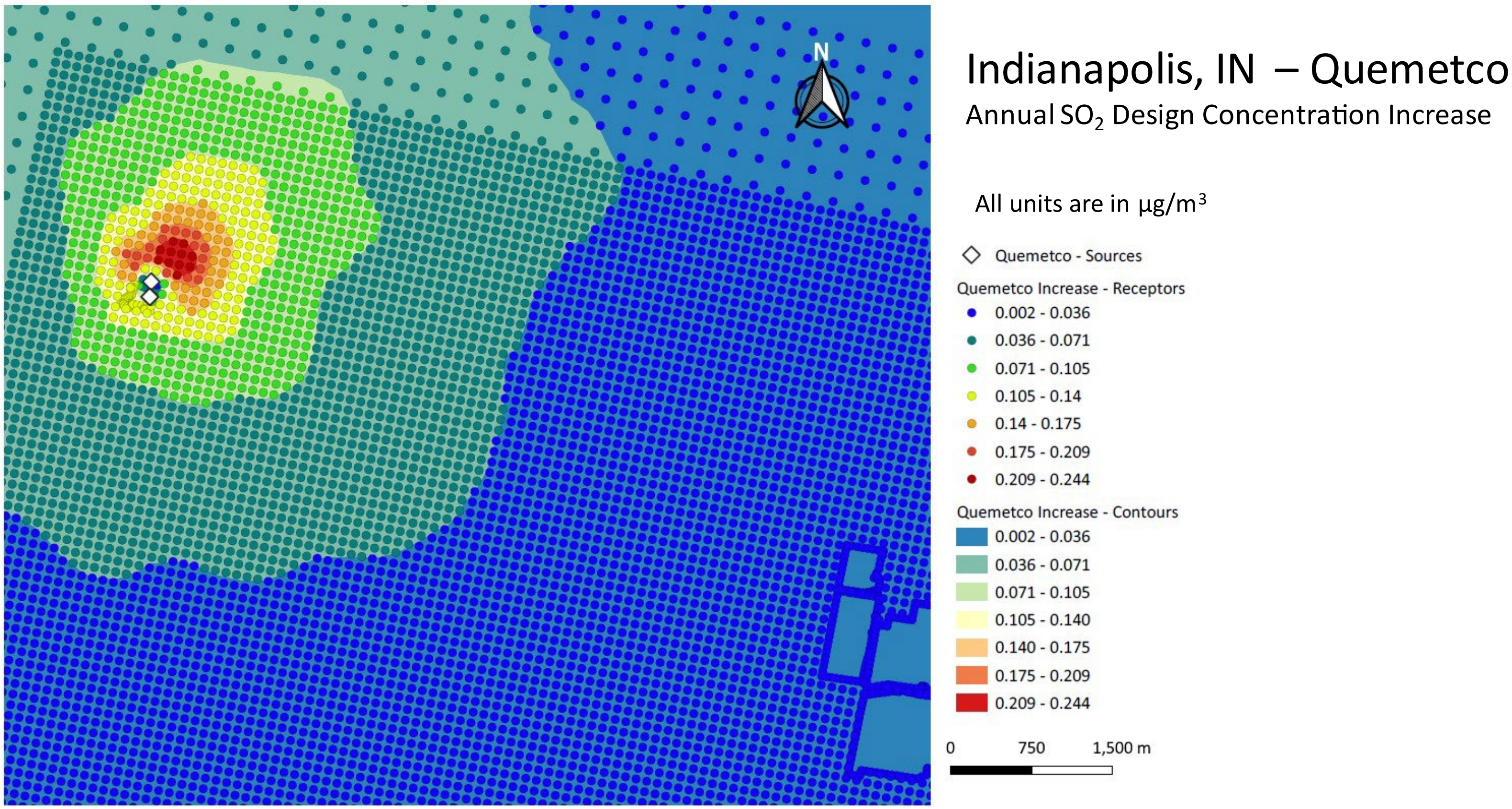

Figure A7. Increase in Annual SO_2 Design Concentration for Quemetco Facility in Indianapolis, IN.

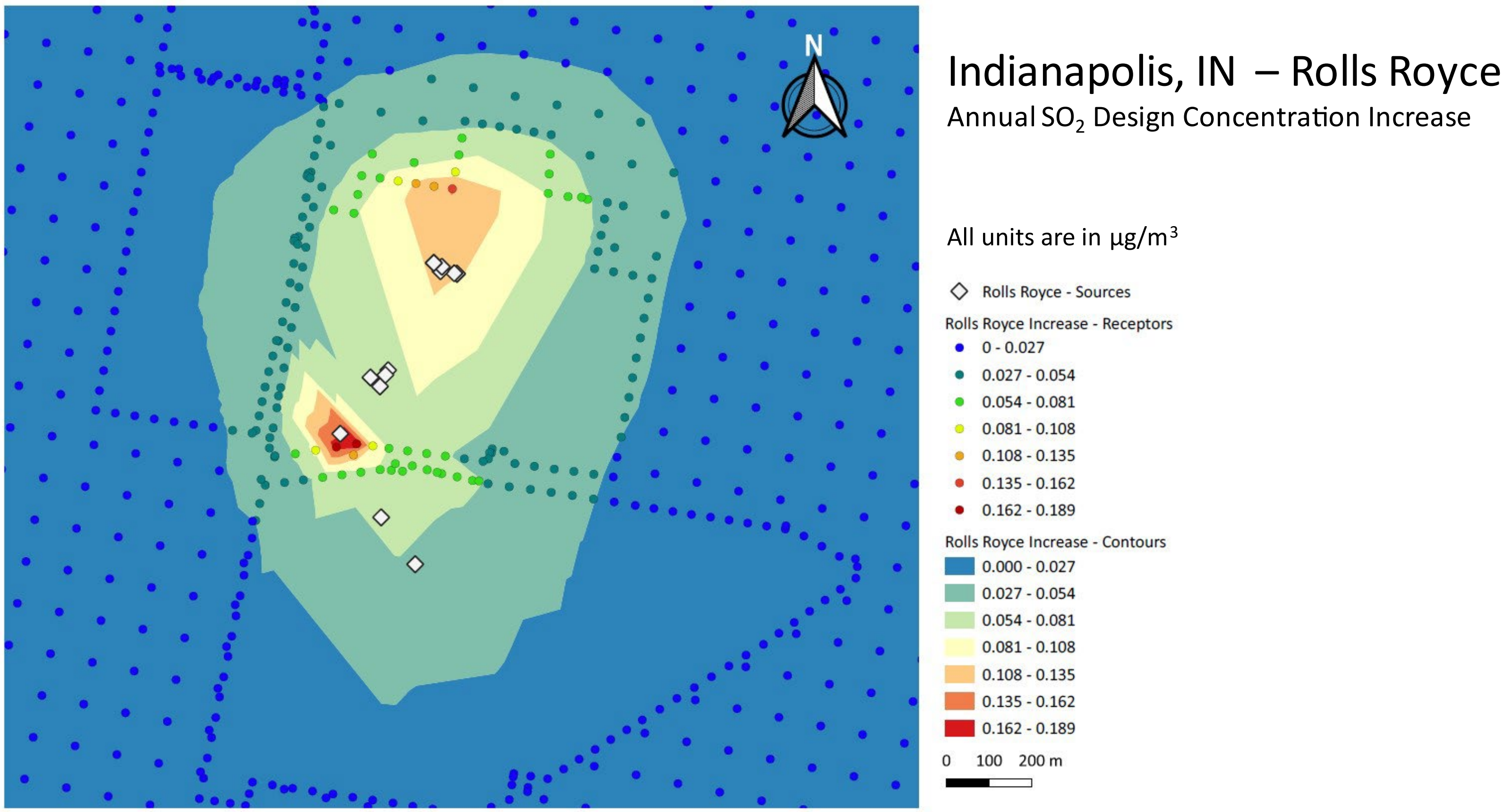

Figure A8. Increase in Annual SO_2 Design Concentration for Rolls Royce Facility in Indianapolis, IN.

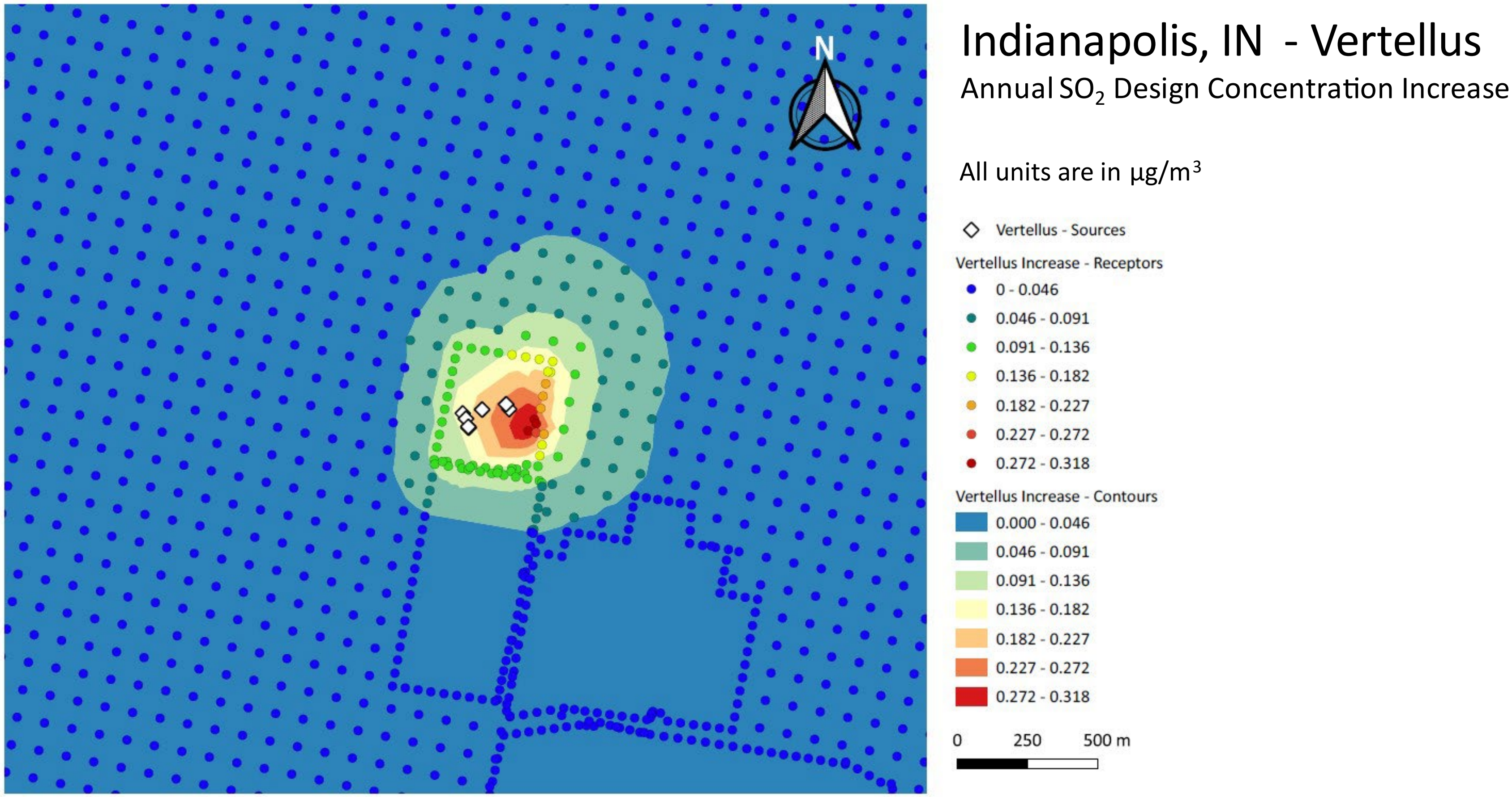

Figure A9. Increase in Annual SO_2 Design Concentration for Vertellus Facility in Indianapolis, IN.

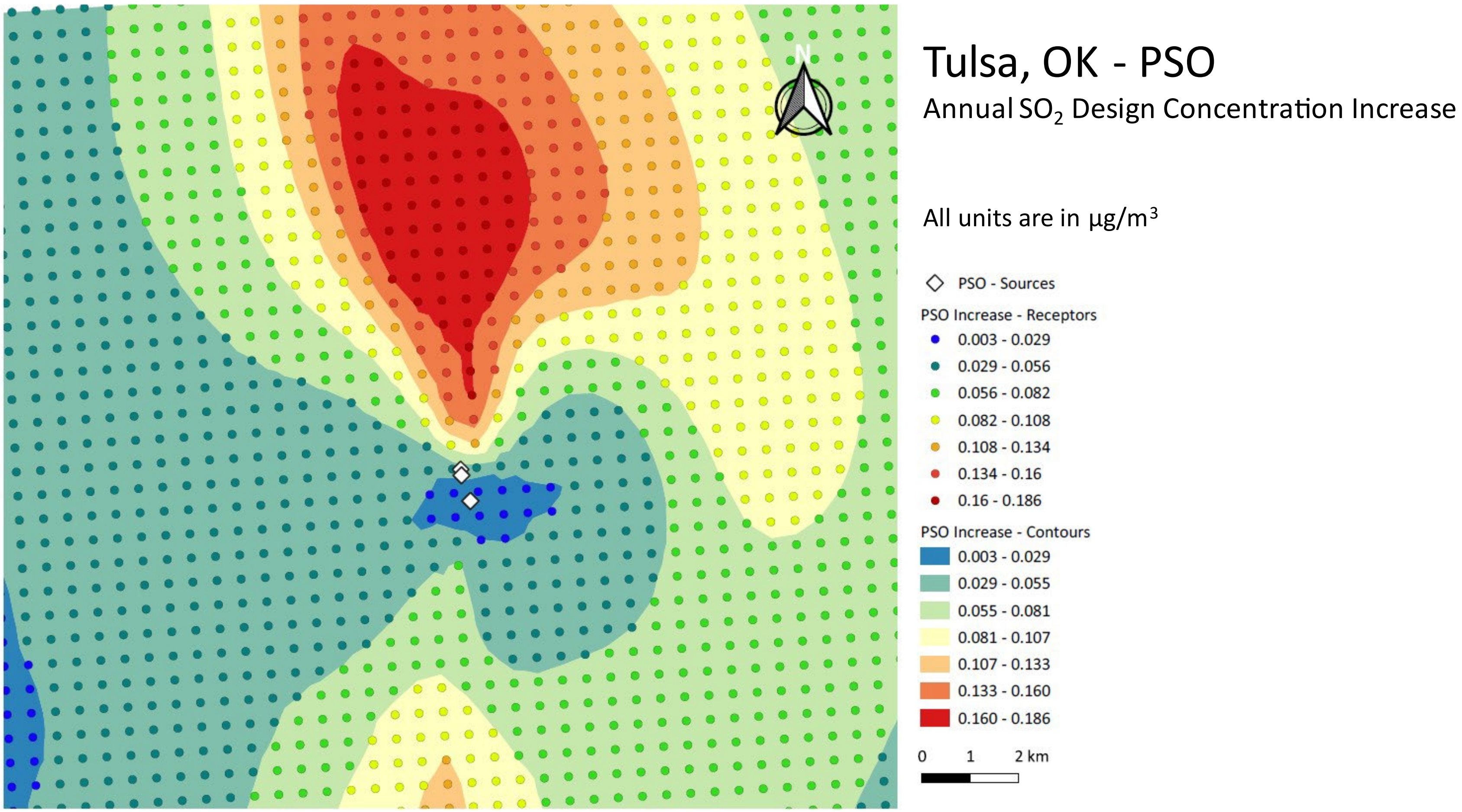

Figure A10. Increase in Annual SO_2 Design Concentration for PSO – Northeastern Power Station in Tulsa, OK.

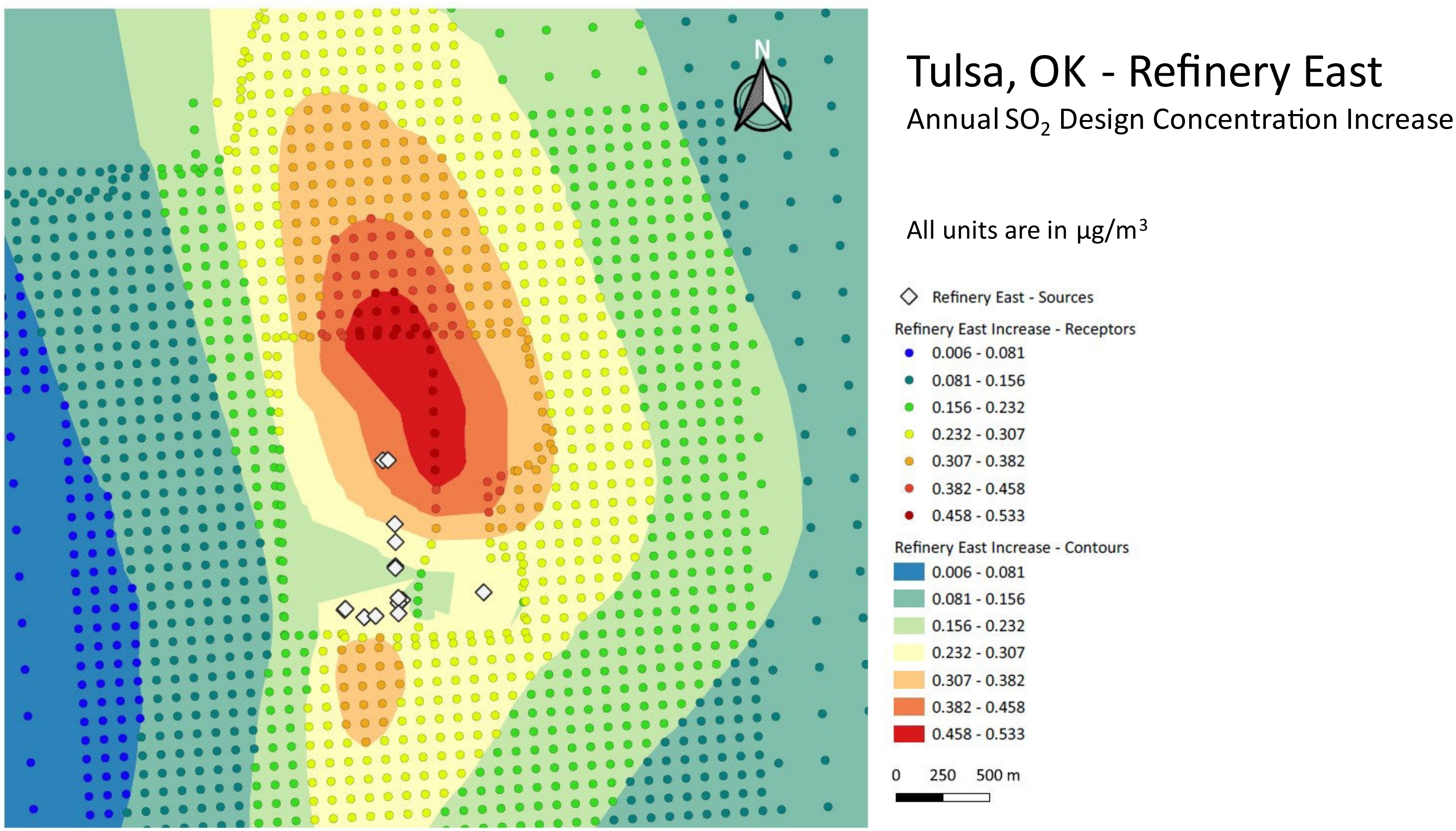

Figure A11. Increase in Annual SO_2 Design Concentration for Refinery East Facility in Tulsa, OK.

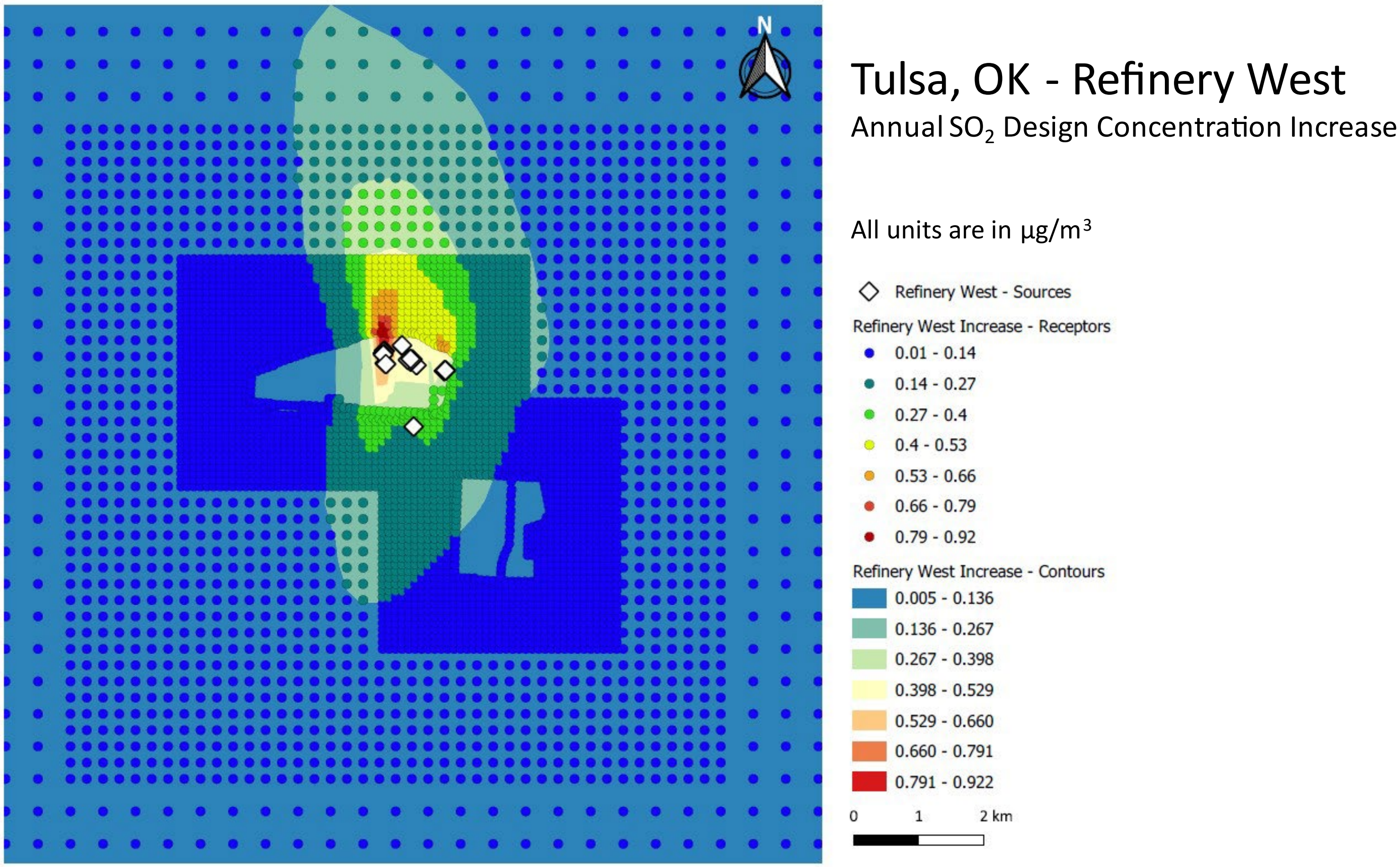

Figure A12. Increase in Annual SO_2 Design Concentration for Refinery West Facility in Tulsa, OK

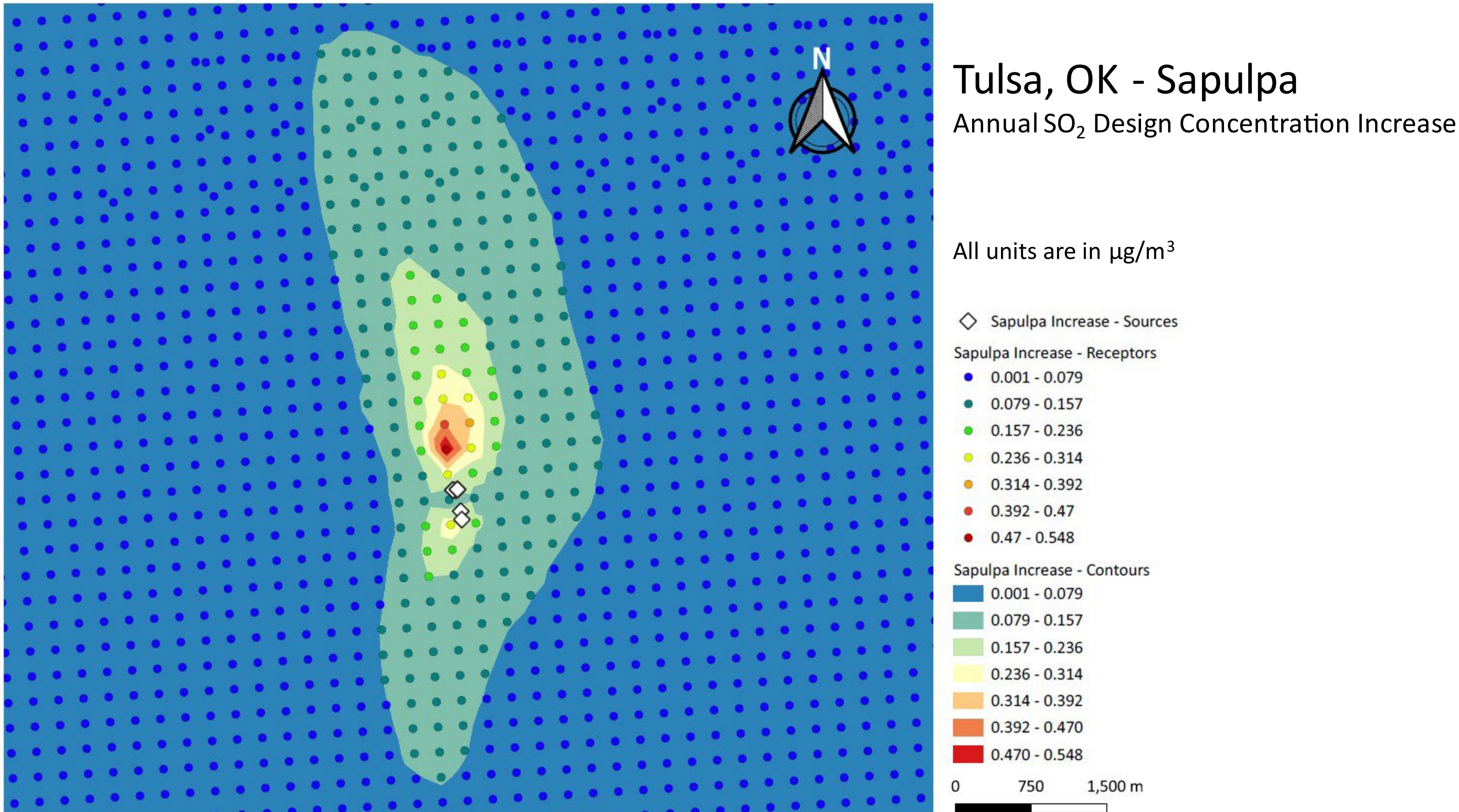

Figure A13. Increase in Annual SO_2 Design Concentration for Sapulpa Facility in Tulsa, OK