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DEPARTMENT FOR ENVIRONMENTAL PROTECTION**

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July 7, 2020

Ms. Mary S. Walker
Regional Administrator
US EPA Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960

RE: 2010 1-Hour SO₂ NAAQS Nonattainment Boundary Recommendation for the Henderson and Webster County, Kentucky Area

Dear Ms. Walker:

On behalf of the Commonwealth of Kentucky, the Kentucky Energy and Environment Cabinet (Cabinet) respectfully submits a nonattainment boundary recommendation for the undesignated portion of Henderson County and all of Webster County, Kentucky, in accordance with the Clean Air Act. The Cabinet requests the Environmental Protection Agency to approve this recommendation for the area that is not attaining the 2010 1-hour sulfur dioxide (SO₂) National Ambient Air Quality Standard (NAAQS).

The Cabinet recommends that only the portion of Henderson County outlined in the attached boundary recommendation, where the violating SO₂ monitor is located, be included in the nonattainment boundary. The Cabinet recommends that all of Webster County and the remaining portion of Henderson County be designated as attainment/unclassifiable in respect to the 2010 SO₂ NAAQS.

If you have any questions or comments concerning this matter, please contact Mrs. Melissa Duff, Director, Division for Air Quality, at (502)782-6597 or melissa.duff@ky.gov.

Sincerely,

Rebecca W. Goodman
Secretary

Cc: Lynorae Benjamin, Region 4 US EPA
Scott Davis, Region 4 US EPA

Henderson and Webster Counties, Kentucky

2010 1-hour SO₂ Nonattainment Boundary Recommendation

Recommendation:

The Kentucky Division for Air Quality (Division), on behalf of the Energy and Environment Cabinet (Cabinet), recommends only a portion of Henderson County be designated nonattainment for the 2010 1-hour sulfur dioxide (SO₂) NAAQS. The recommended boundary is defined by the area located between Edward T. Breathitt Pennyryle Parkway (to the west) and the Green River (to the east), south of Moss and Moss Road, and north of the Century Aluminum Sebree, LLC railroad spur and Big Rivers Electric coal haul road. The Division recommends that all of Webster County, Kentucky be designated as attainment/unclassifiable with respect to the 2010 1-hour SO₂ NAAQS.

Discussion:

The Sebree SO₂ monitor (AQS ID 21-101-1011) in Henderson County was sited in 2016 in response to the 2010 1-hour SO₂ Data Requirements Rule (DRR). The monitor is located at Alcan Aluminum Road, near the Century Aluminum Sebree, LLC facility, a SO₂ source identified in the third round evaluations of the SO₂ DRR. The monitoring site is also near the Big Rivers Electric Corporation-Green Station and Reid-HMP&L Station 2 facilities. For purposes of determining the nonattainment boundary, SO₂ is presumed to be directly emitted from the sources, with the highest concentrations located relatively close to the SO₂ sources, and concentrations diminishing at distances farther away from SO₂ sources. For this boundary recommendation, the Division is following the March 20, 2015 Stephen Page memo from EPA, “*Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard*,” (Guidance). Within the Guidance are the following five factors that help to determine boundaries for nonattainment areas that are less than an entire county: (1) Air quality data or dispersion modeling results; (2) Emissions-related data; (3) Meteorology; (4) Geography/topography; and (5) Jurisdictional boundaries.

I. Air Quality Data

The Division currently operates one SO₂ monitor in Henderson County, Kentucky: Sebree SO₂ DRR site (21-101-1011). This monitor began operation on January 1, 2017, and is included in Kentucky’s Annual Monitoring Network Plan as required by 40 CFR 58.10.

Attainment of the SO₂ standard is achieved when the 3-year average of the 99th percentile annual distribution of the daily maximum is less than or equal to 75 ppb. Table 1 below provides the design value based on 2017-2019 data.

Table 1. SO₂ 99th Percentiles and Design Value (ppb)

Monitor Site	2017	2018	2019	2017-2019 DV
Sebree SO ₂ DRR Site 21-101-1011	94	102	99	98

As Table 1 indicates, the 3-year design value for the Sebree monitor is above the 1-hour SO₂ NAAQS of 75 ppb.

II. SO₂ Emissions Data

The area surrounding the SO₂ DRR monitor in Sebree, Kentucky, has a relatively small number of SO₂ sources located within a 20 km radius. Century Aluminum Sebree, LLC, Big Rivers Electric Corporation’s (BREC) Robert A. Reid Station/Henderson Municipal Power and Light (HMP&L) Station 2, and BREC’s Green Station were the only sources that emitted more than one ton of SO₂ in the years spanning 2017-2019. BREC Reid Station has not operated since 2016. Table 2 provides the 2017-2019 actual emissions for the SO₂ sources located within 20 km of the Sebree SO₂ DRR monitor.

Table 2. 2017-2019 SO₂ Actual Emissions Data

Facility Name	EIS Facility ID	2017 (tpy)	2018 (tpy)	2019 (tpy)
Century Aluminum Sebree LLC	7352311	4,629	4,239	4,315*
Big Rivers Electric Corp. Green Station	6067211	3,108	4,114	2,916
Big Rivers Electric Corp. Reid Station / HMP&L Station 2	6098611	1,408	848	17

* Emissions data from the 2019 version of the Kentucky EIS, not yet verified by the facility

Century Aluminum Sebree, LLC and the two BREC stations emitted a combined total of 9,202.16 tons of SO₂ in 2018. The above facilities are all are within 1 km of the Sebree SO₂ DRR monitor.

As of February 1, 2019, BREC retired the two HMP&L units. The retirement was the result of the City of Henderson, Kentucky, and BREC choosing not to renew their contract agreement. BREC Reid 1 has not operated since 2016 and reported zero SO₂ emissions for 2017-2019. The Division is expecting an announcement of retirement of the Reid unit in June 2020.

In order to determine if SO₂ emissions from BREC’s Green Station influenced the monitored violations, the Division modeled the two boiler units for the period of 2017-2019 using CAMD data. Three scenarios were modeled: no background, Baskett monitor background (12ppb dv) and Owensboro background (24ppb dv), all with updated meteorological data. All predicted maximum impacts were below the SO₂ standard and East of the Sebree SO₂ DRR monitor. These results are included in Appendix B.

III. Meteorology

The use of HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory) backward trajectory modeling allows the Division to review and understand weather patterns at hours of maximum observed SO₂ concentrations at the Sebree SO₂ DRR monitor. Figures 1-12 indicate the paths the winds were recorded taking the moments before the four annual 1-hour maximum

SO₂ concentrations were recorded for years 2017-2019 at the Sebree SO₂ DRR monitor. Appendix A contains the remaining HYSPLITs for all exceedance days for 2017-2019.

Figure 1. 1st Max 2019



Note: The Big Rivers facilities (RD Green and Reid/HMP&L Station 2) are identified as “Big Rivers – Sebree Station” on all HYSPLITs to minimize “clutter” on the figures.

Figure 2. 2nd Max 2019



Figure 3. 3rd Max 2019

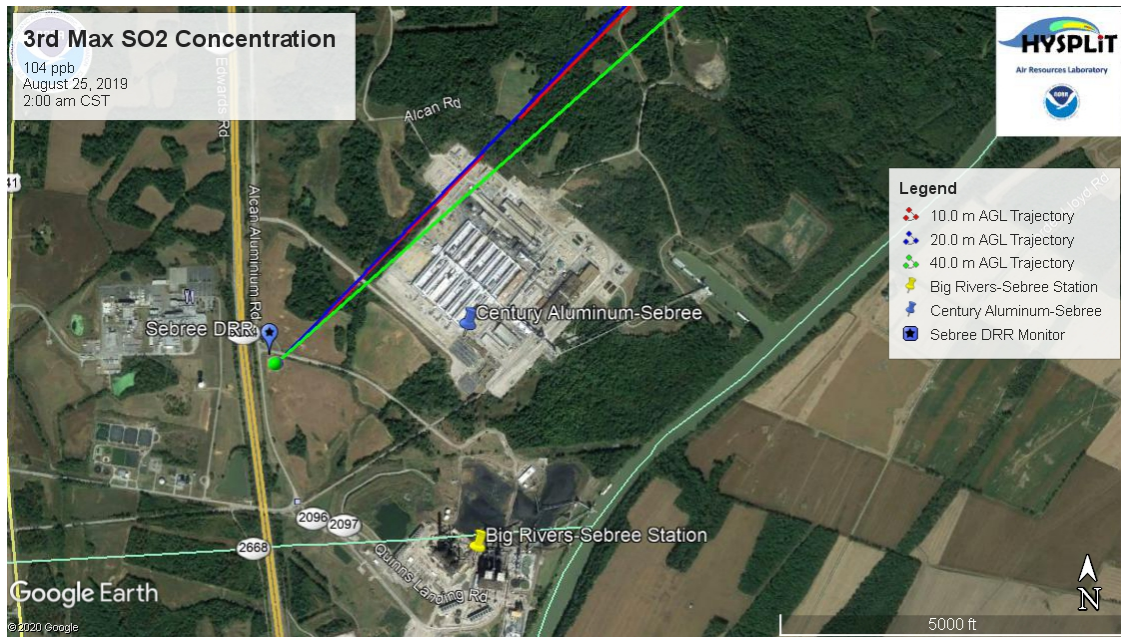


Figure 4. 4th Max 2019



Figure 5. 1st Max 2018

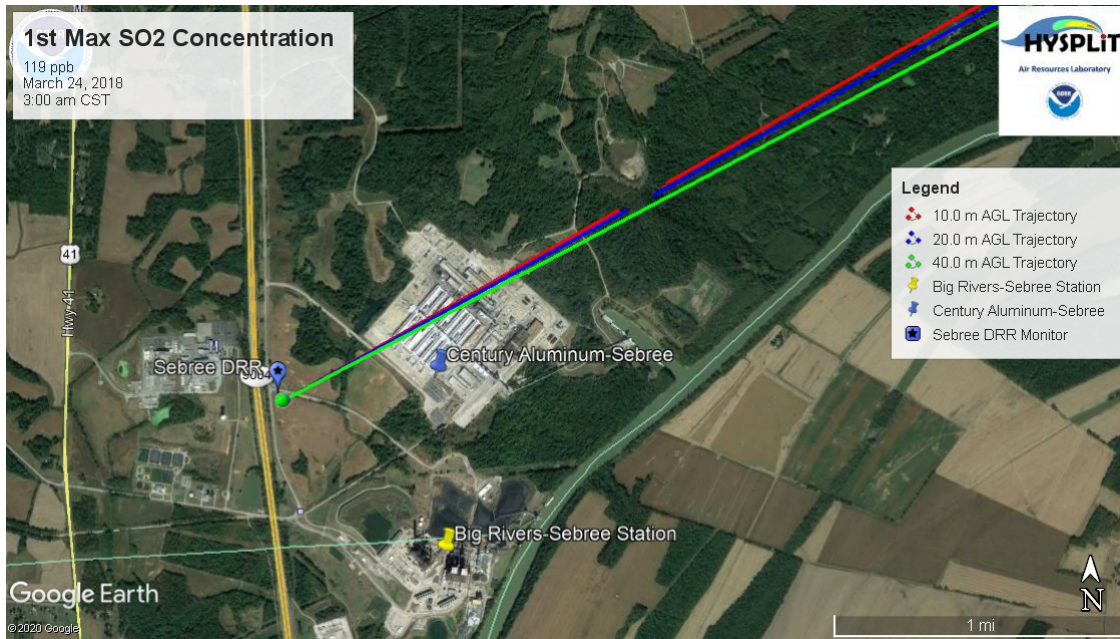


Figure 6. 2nd Max 2018

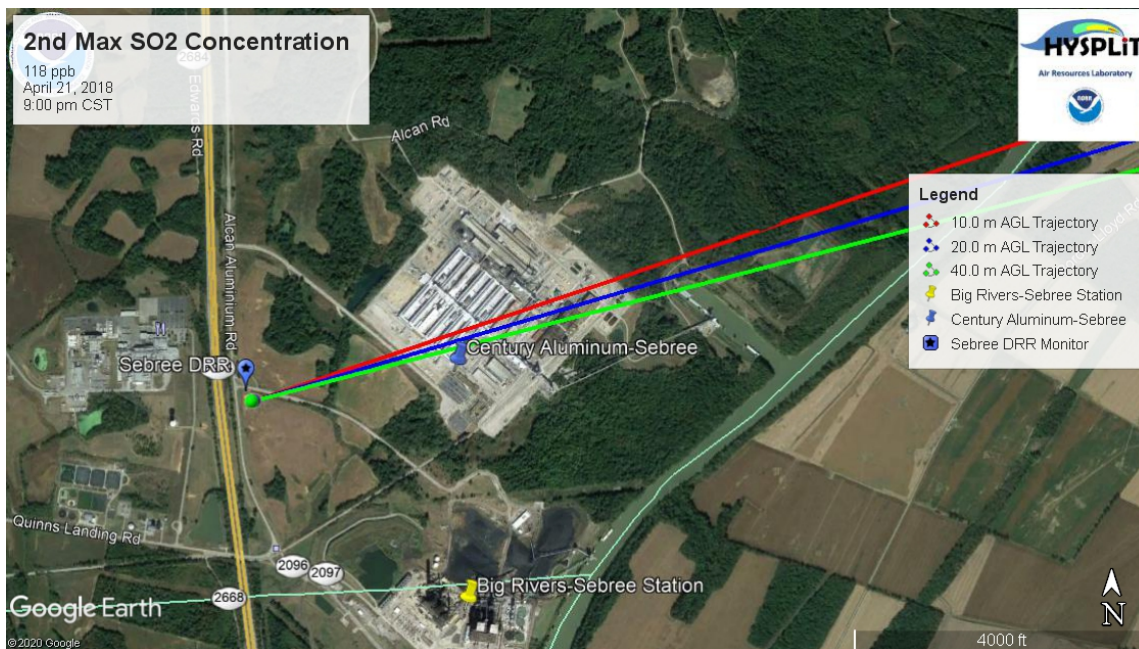


Figure 7. 3rd Max 2018

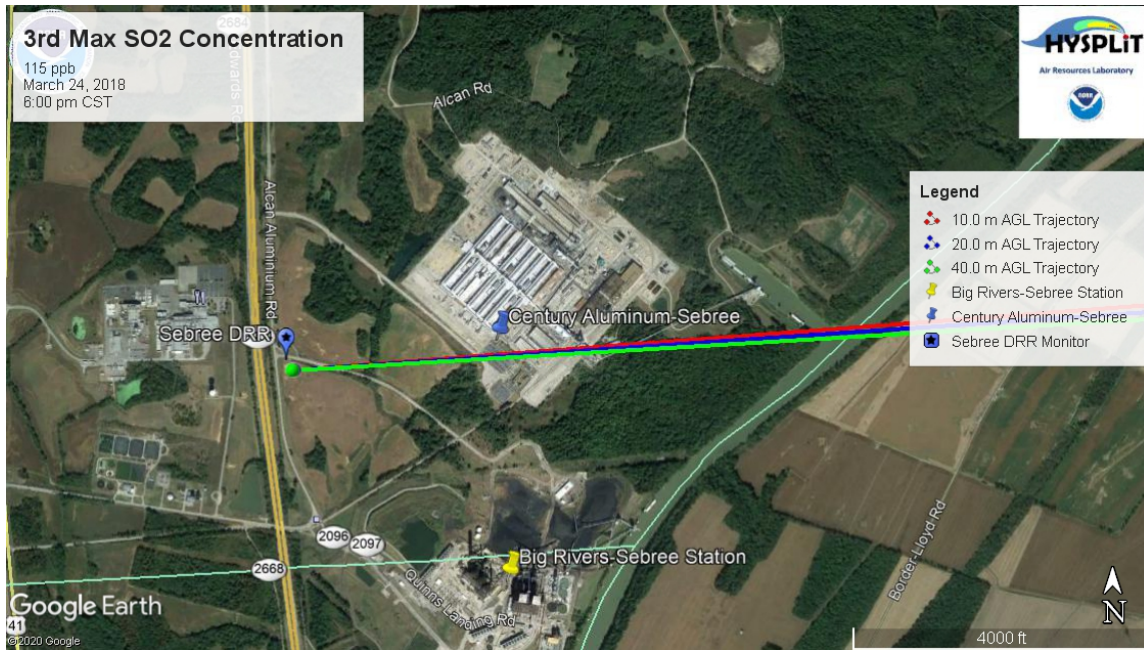


Figure 8. 4th Max 2018

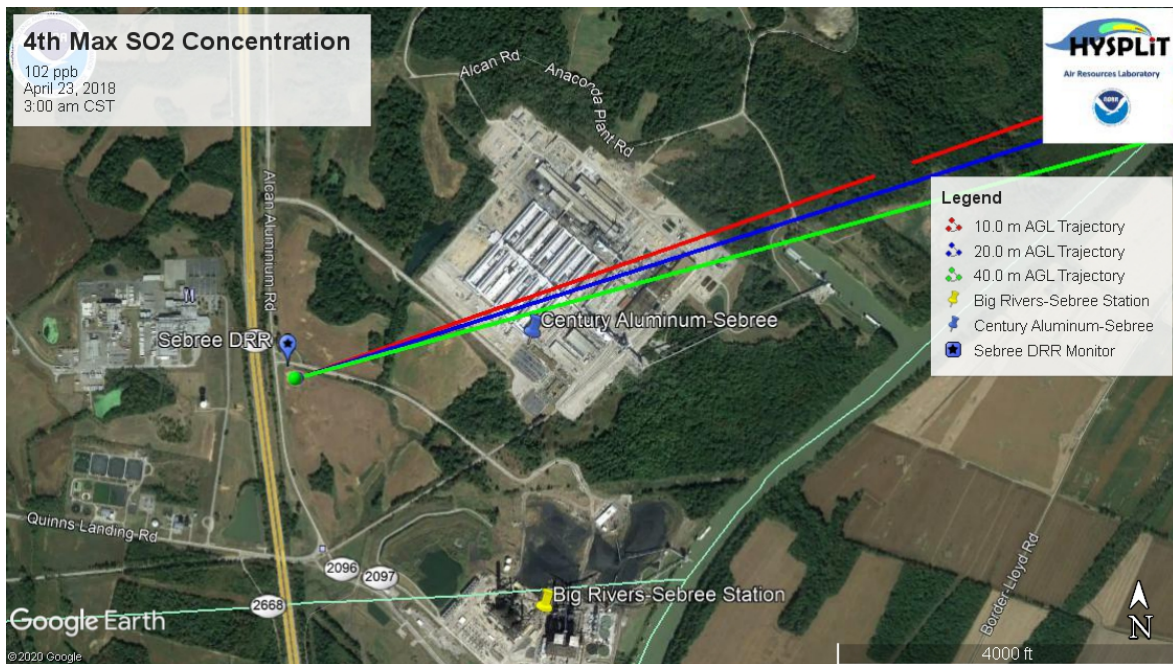


Figure 9. 1st Max 2017

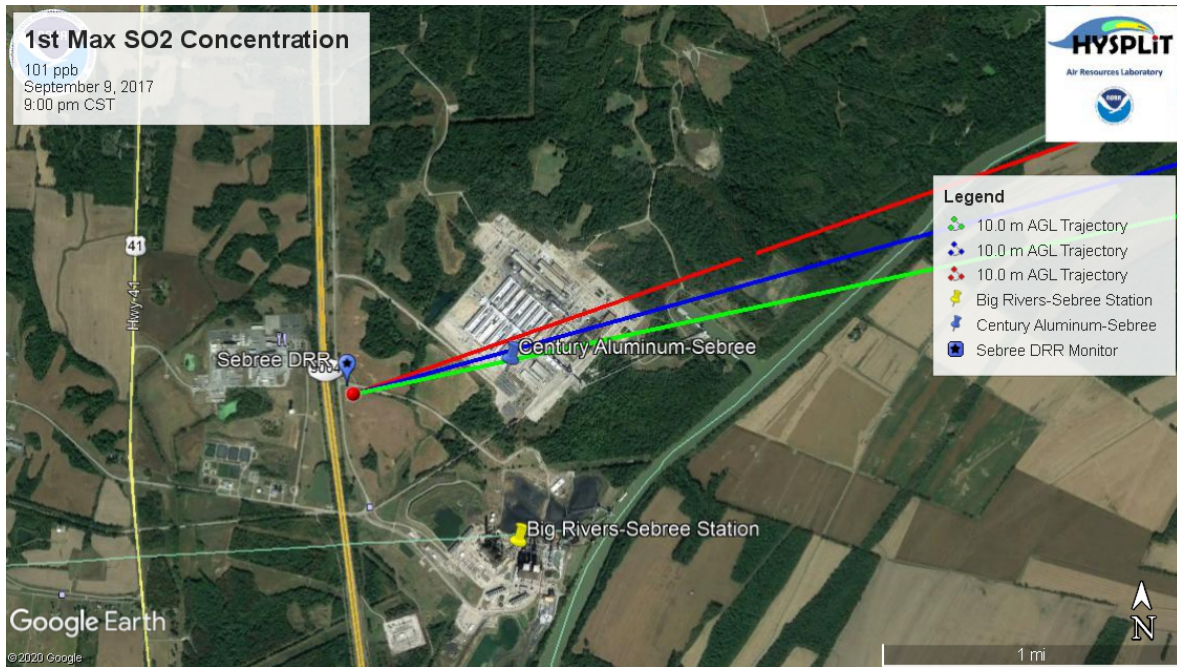


Figure 10. 2nd Max 2017

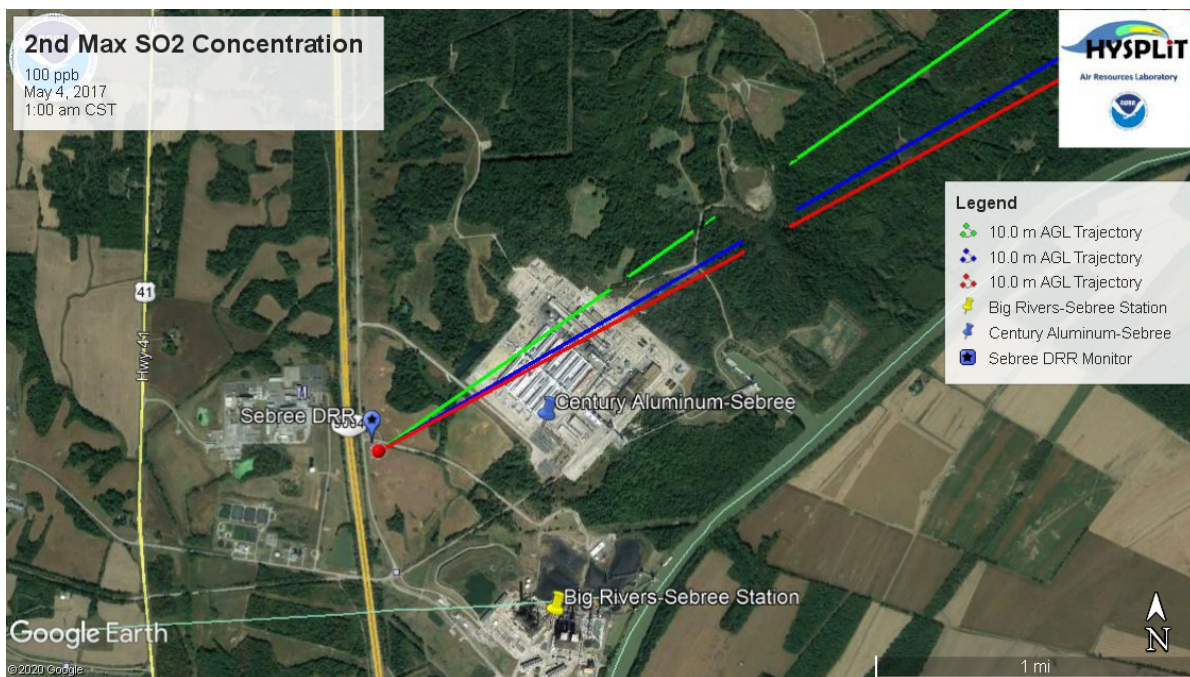


Figure 11. 3rd Max 2017

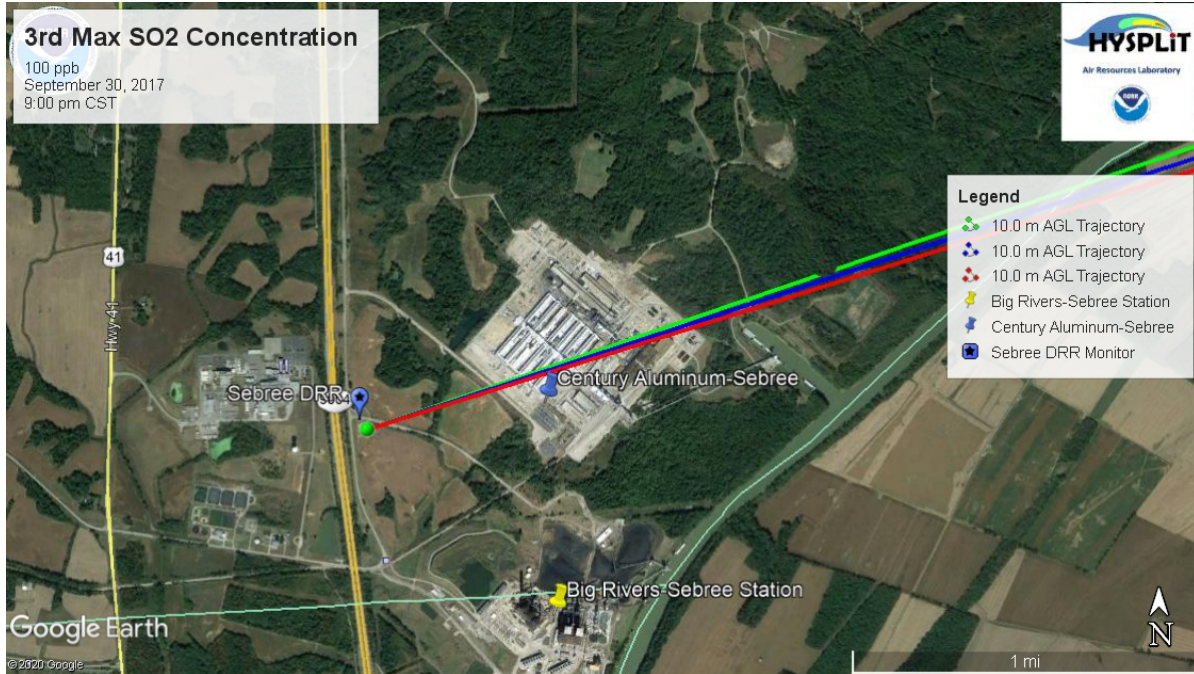
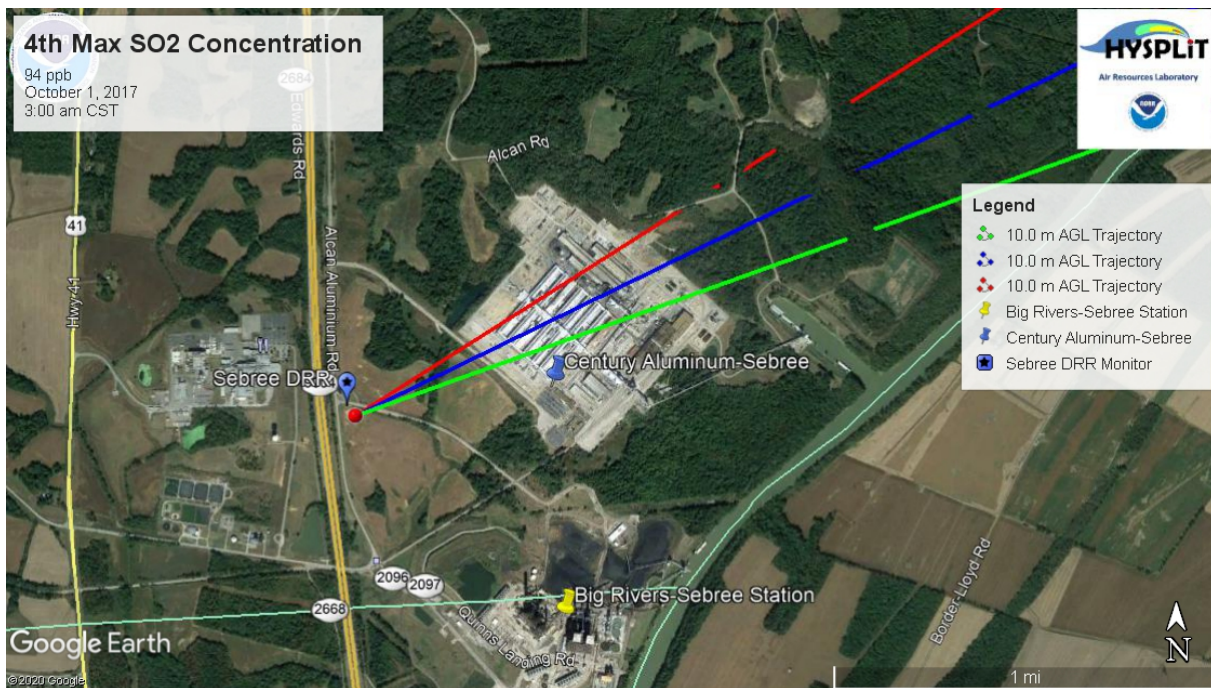


Figure 12. 4th Max 2017



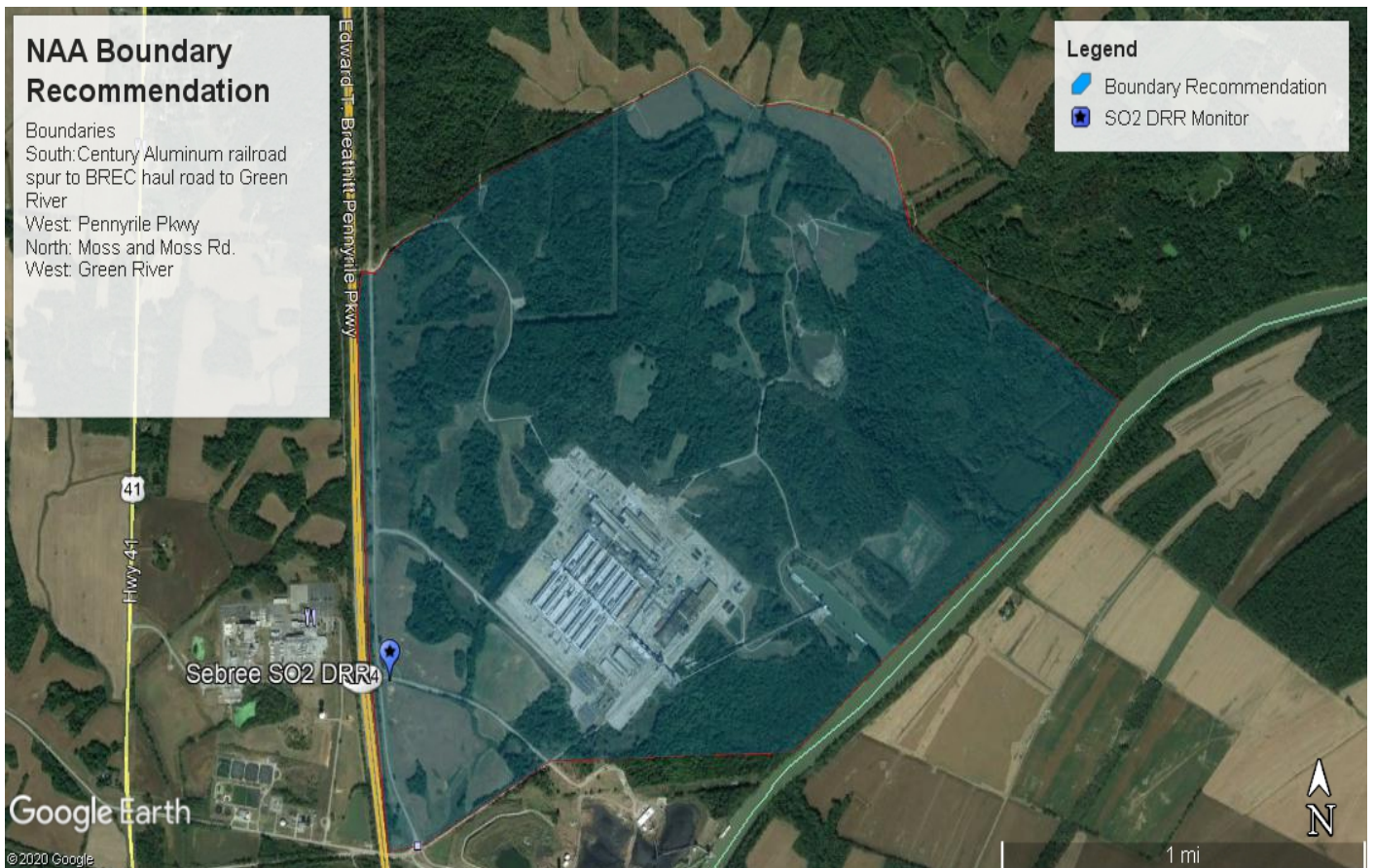
IV. Geography/Topography

The topography and geography of the area surrounding the monitor do not impact the violations at the Sebree SO₂ DRR monitor as there are no significant changes in elevation between the facilities mentioned in Section II and the monitor.

V. Jurisdictional Boundary

The Guidance recommends nonattainment boundaries have “well-defined jurisdictional lines such as township borders, immovable landmarks such as major roadways or other permanent and readily identifiable boundaries.” The Division recommends boundaries (indicated in Figure 13) which include a US Highway to the west, a local road to the north, a river to the east/southeast, and a railroad spur to the south.

Figure 13. Map of Sebree Boundary Recommendation



Conclusion

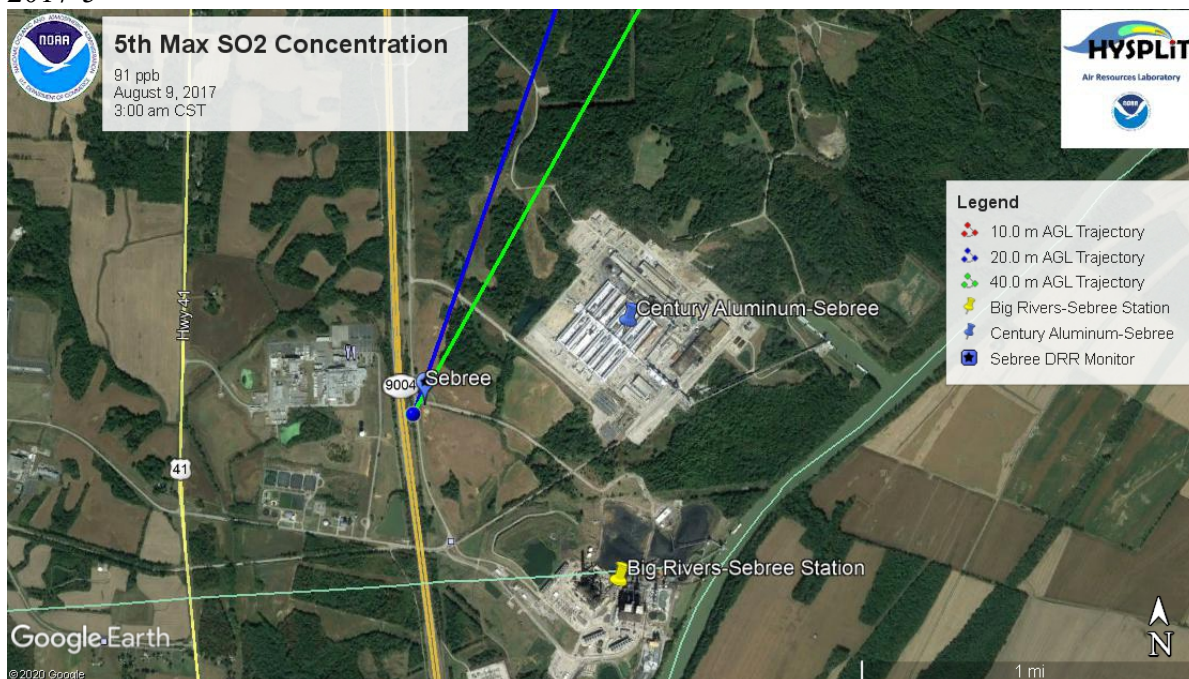
After analyzing the five factors outlined in the Guidance, the Division recommends the boundaries illustrated in Figure 13, which utilize permanent and readily identifiable landmarks, and include the violating monitor and the culpable SO₂ source (Century Aluminum). The BREC facilities are not included in the boundary recommendation. HYSPLIT modeling demonstrates that the Century Aluminum Sebree facility is culpable for the monitored violations during 2017-2019. The SO₂ emissions from BREC, while not insignificant, are not a major contributor to the monitor violations due to the tall stacks, which allow for greater transport and dispersion, as opposed to the relatively low roof vents at the Century Aluminum Sebree facility.

Based upon the information presented in this boundary recommendation, the Division recommends that all of Webster County, Kentucky be designated as attainment/unclassifiable with respect to the 2010 SO₂ NAAQS.

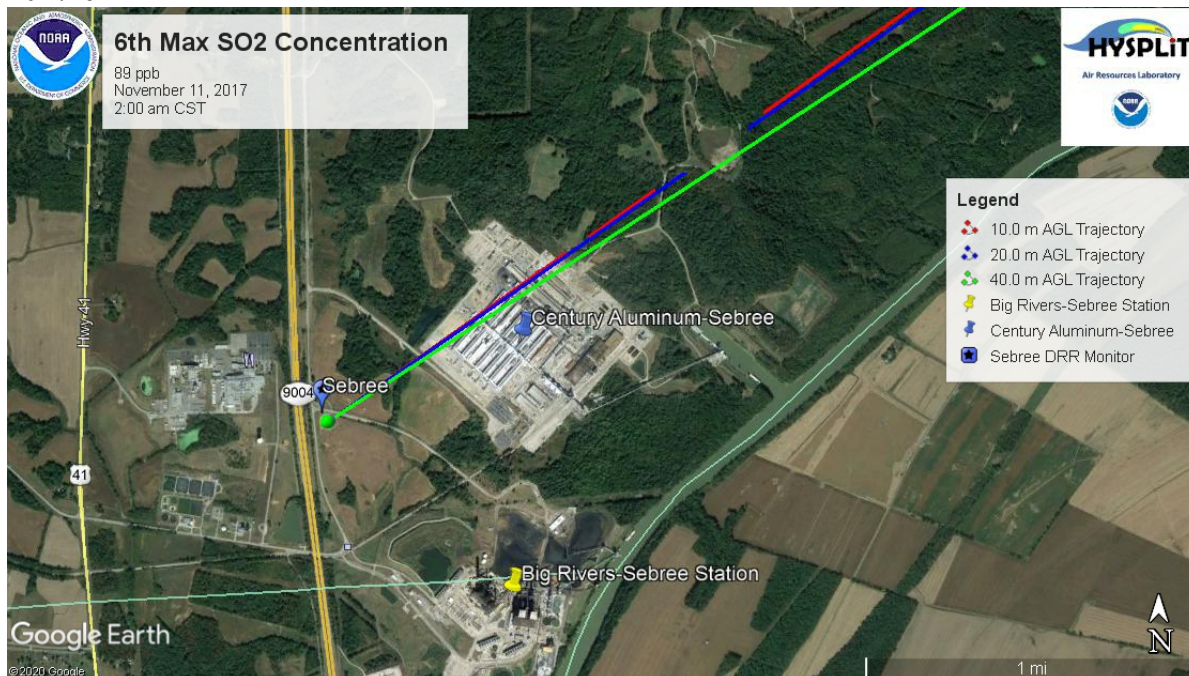
APPENDIX A

HYSPLIT trajectories were evaluated for all the days the Sebree monitored recorded an exceedance of the SO₂ NAAQS. All but one exceedance day reveals the wind trajectories passing over the nearby Century Aluminum facility. Figure 2018-5 shows the winds passing over the BREC facility. In 2018, HMP&L station emitted higher emissions than in 2019, and is now retired.

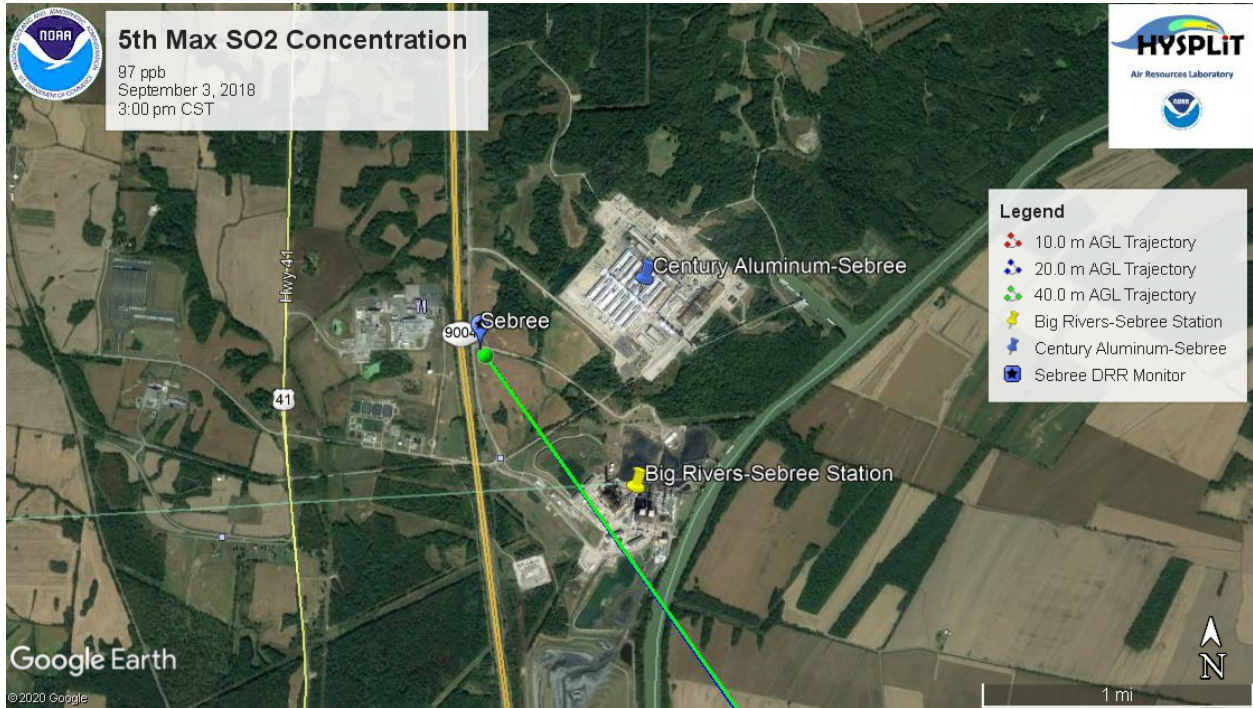
2017-5



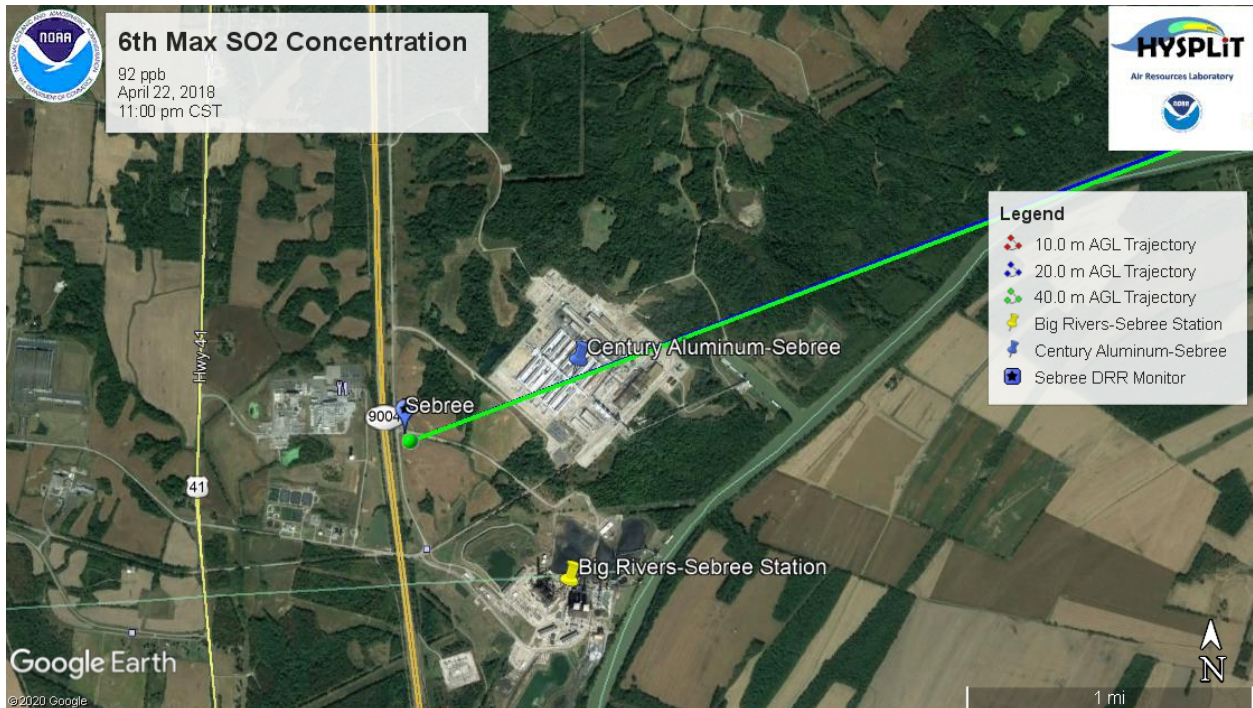
2017-6



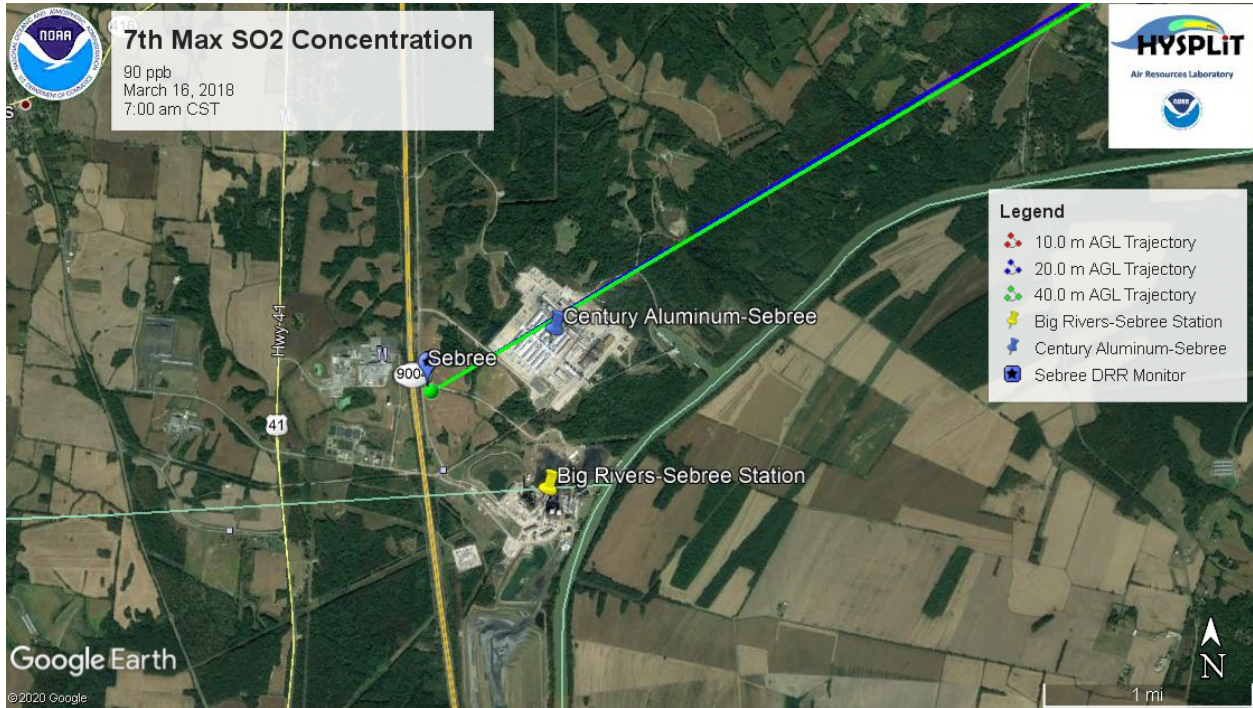
2018-5



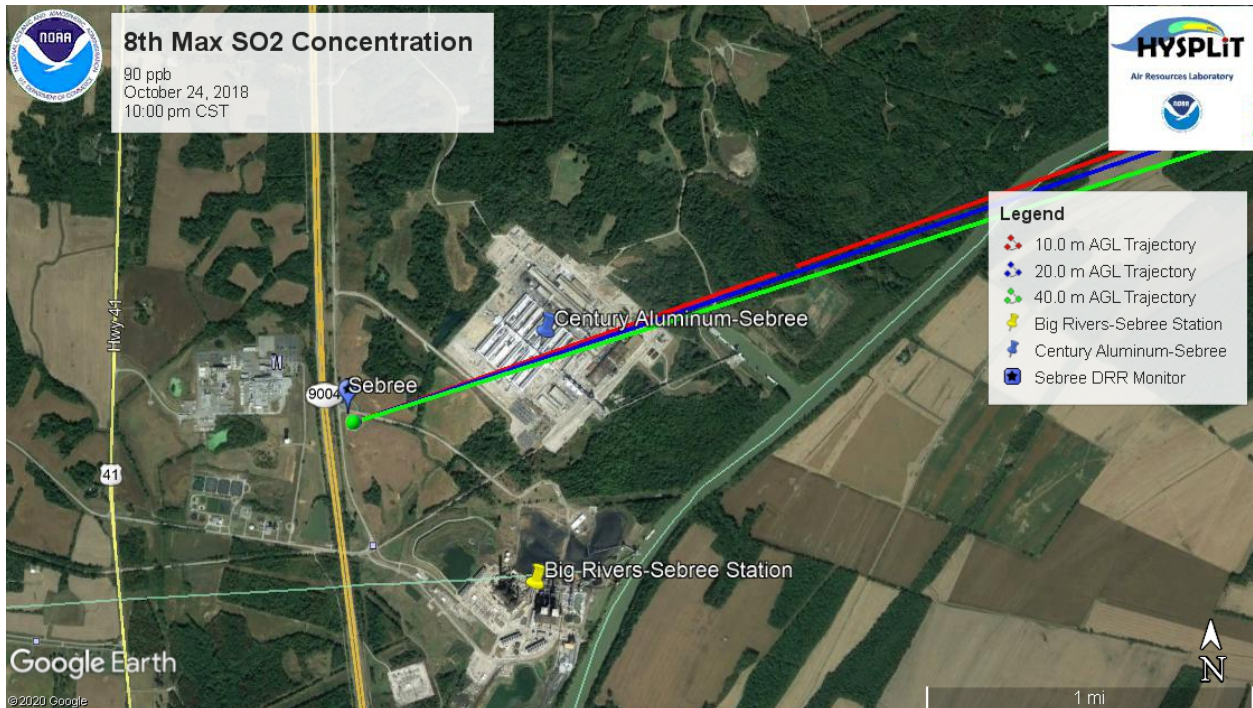
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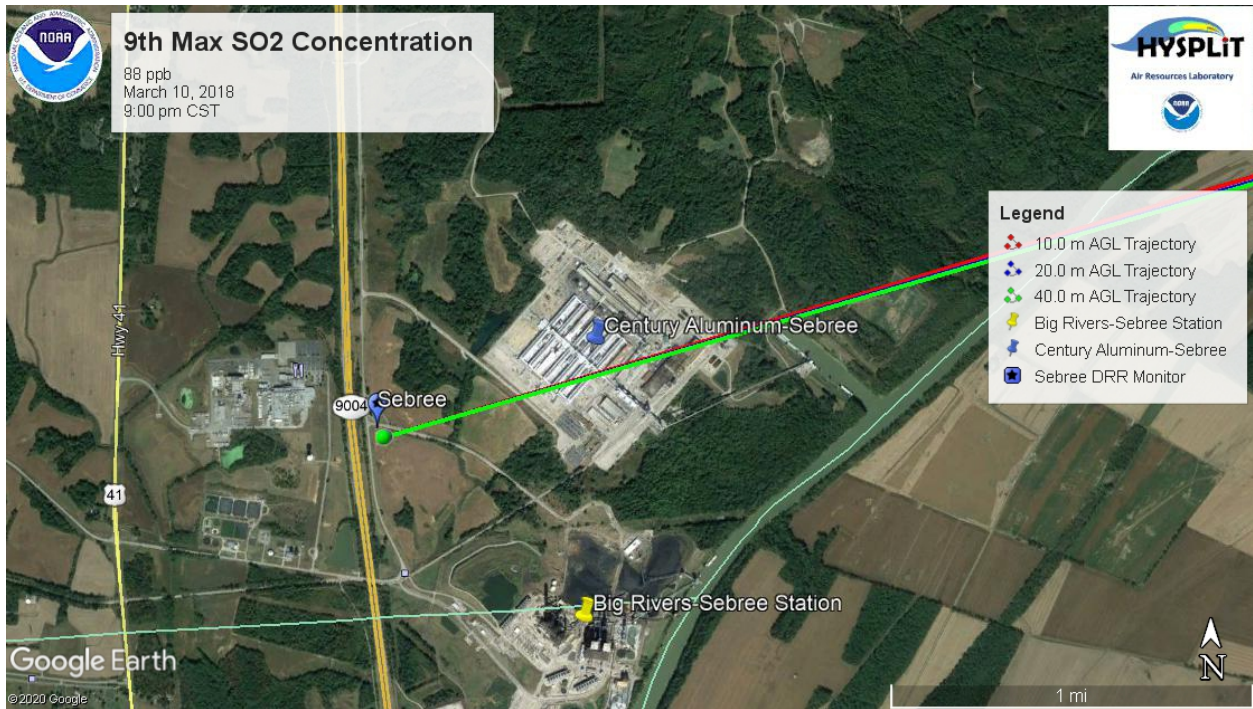
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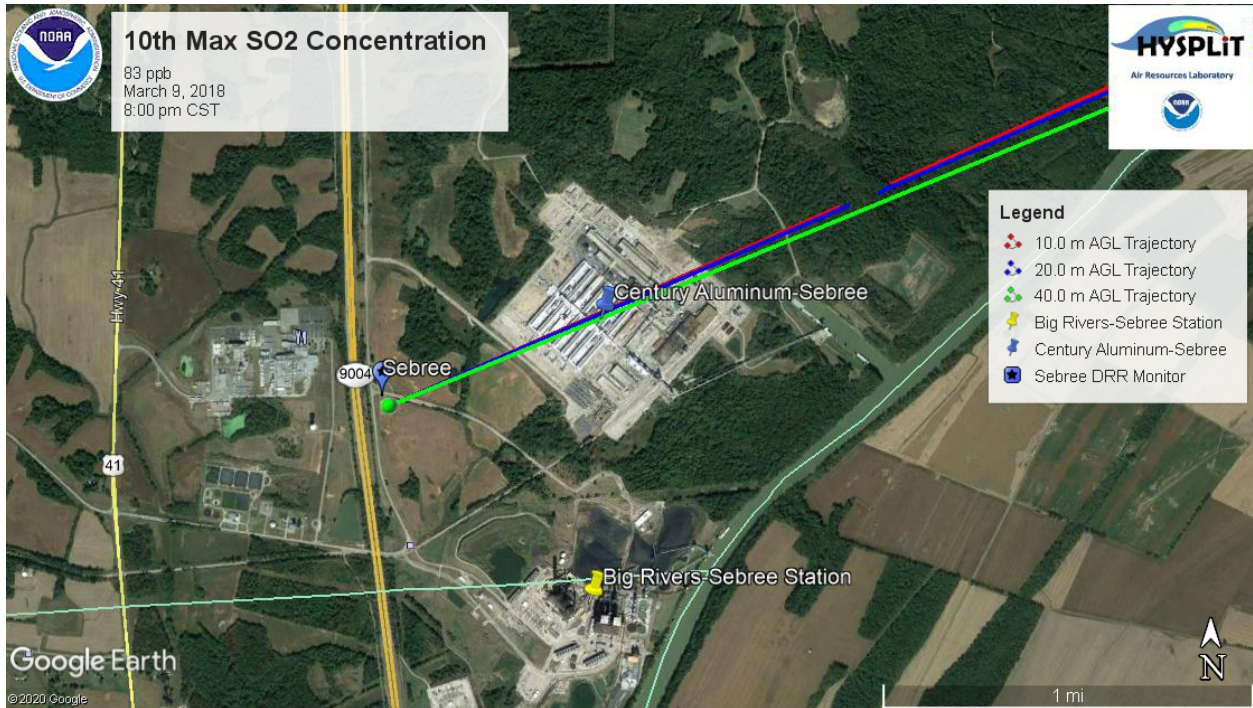
2018-8



2018-9



2018-10



2018-11



2019-5



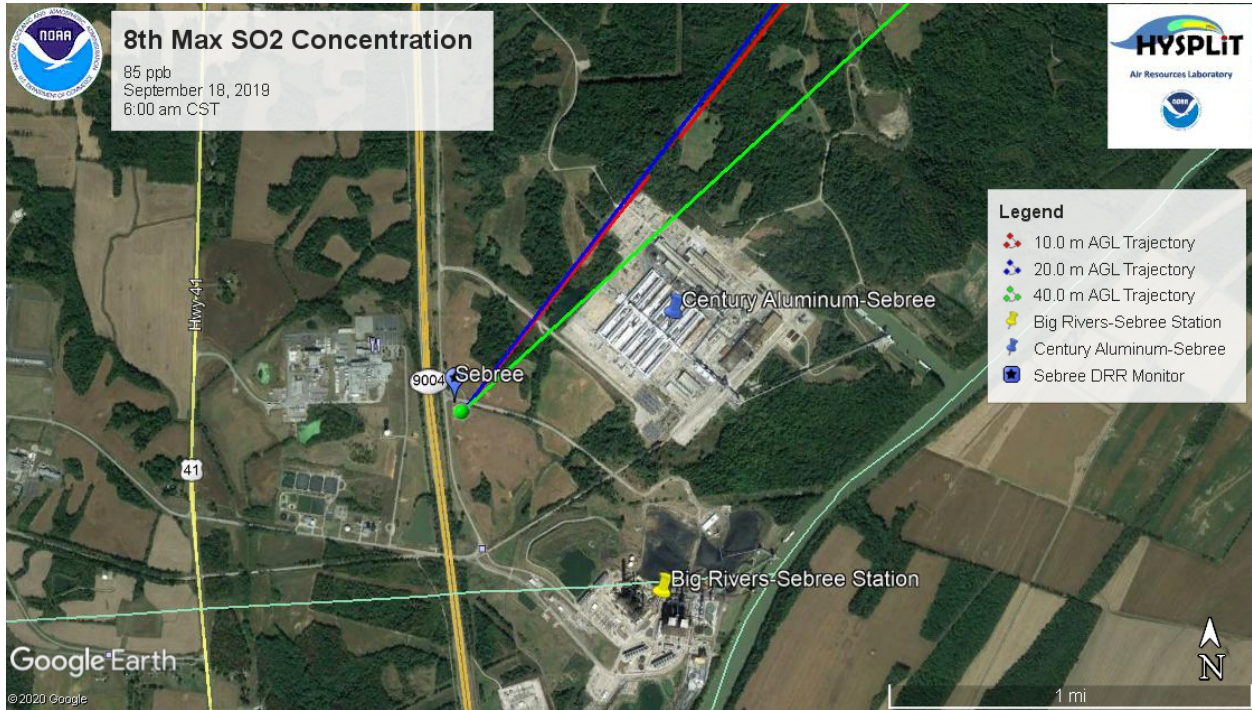
2019-6



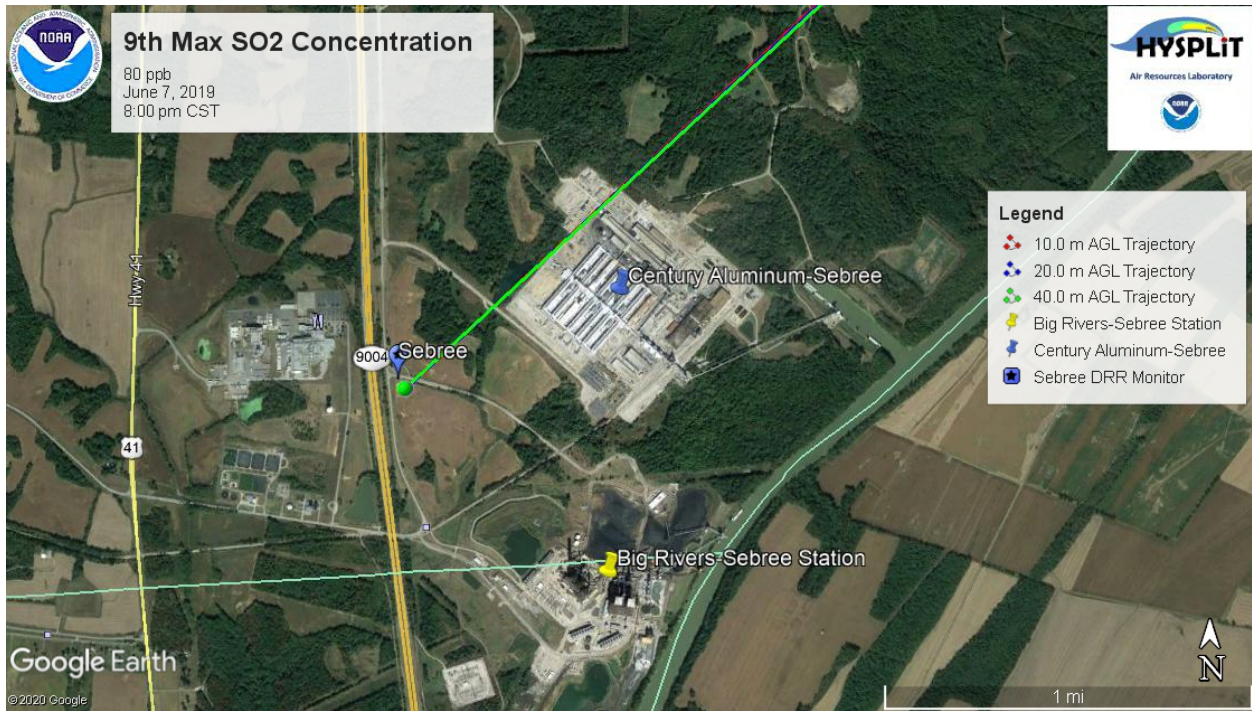
2019-7



2019-8



2019-9



2019-10



APPENDIX B

The BREC Green Station was modeled using 2017-2019 emissions, and 2017-2019 meteorological data. Three modeling scenarios were evaluated: 1. Green Station without background; 2. Green Station with background from the Baskett monitor (12 ppb dv); 3. Green Station with background from the Owensboro monitor (24 ppb dv). The modeling isopleths for the three scenarios are given below, respectively. The modeling reveals that BREC Green Station is not causing a violation of the 2010 1-hr SO₂ NAAQS.

Figure 1a. Scenario 1. Max impact 125 µg/m³

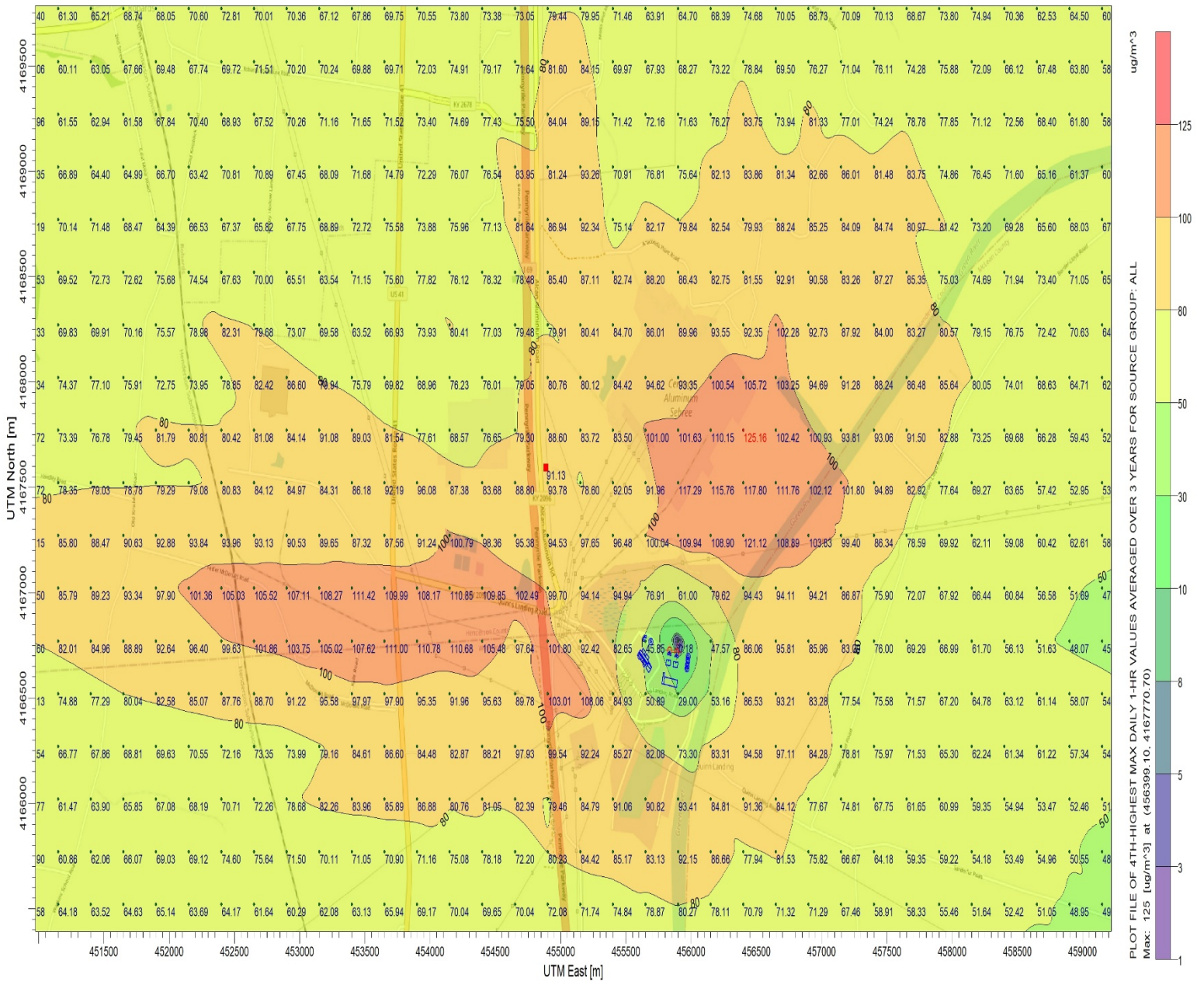


Figure 1b. Scenario 1. Max impact 125 $\mu\text{g}/\text{m}^3$

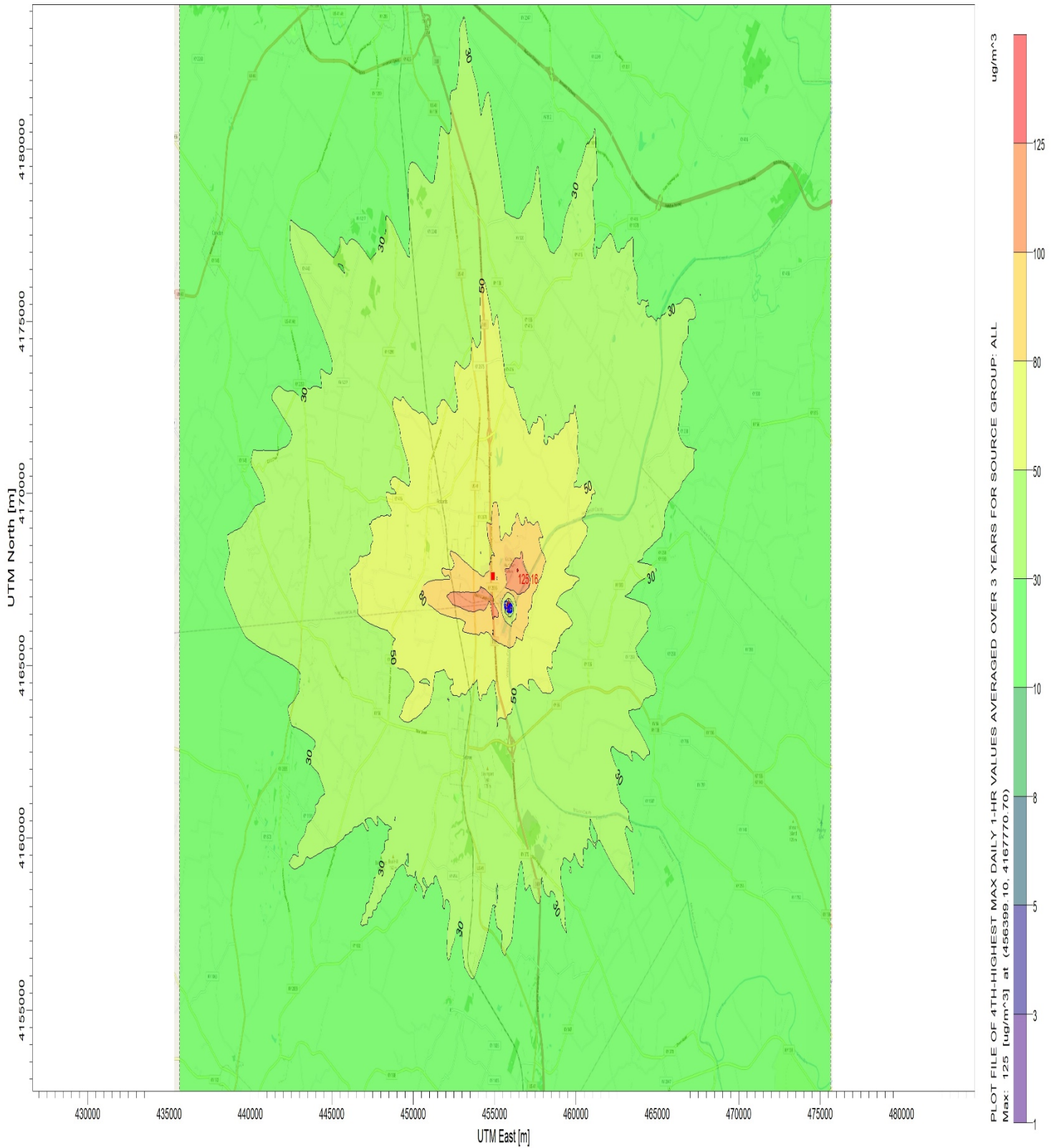


Figure 2a. Scenario 2. Max impact $156 \mu\text{g}/\text{m}^3$

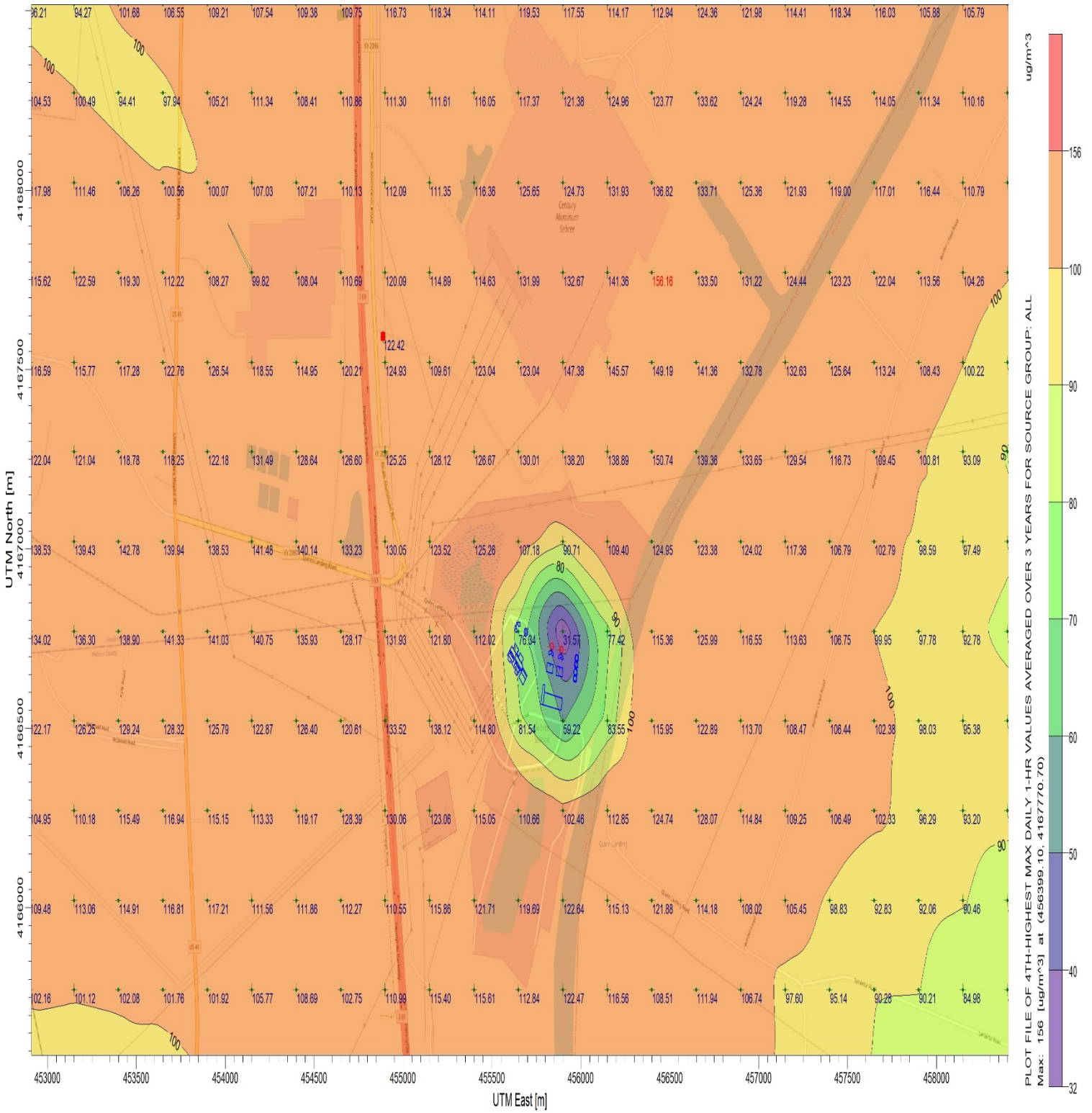


Figure 2b. Scenario 2. Max impact 156 $\mu\text{g}/\text{m}^3$

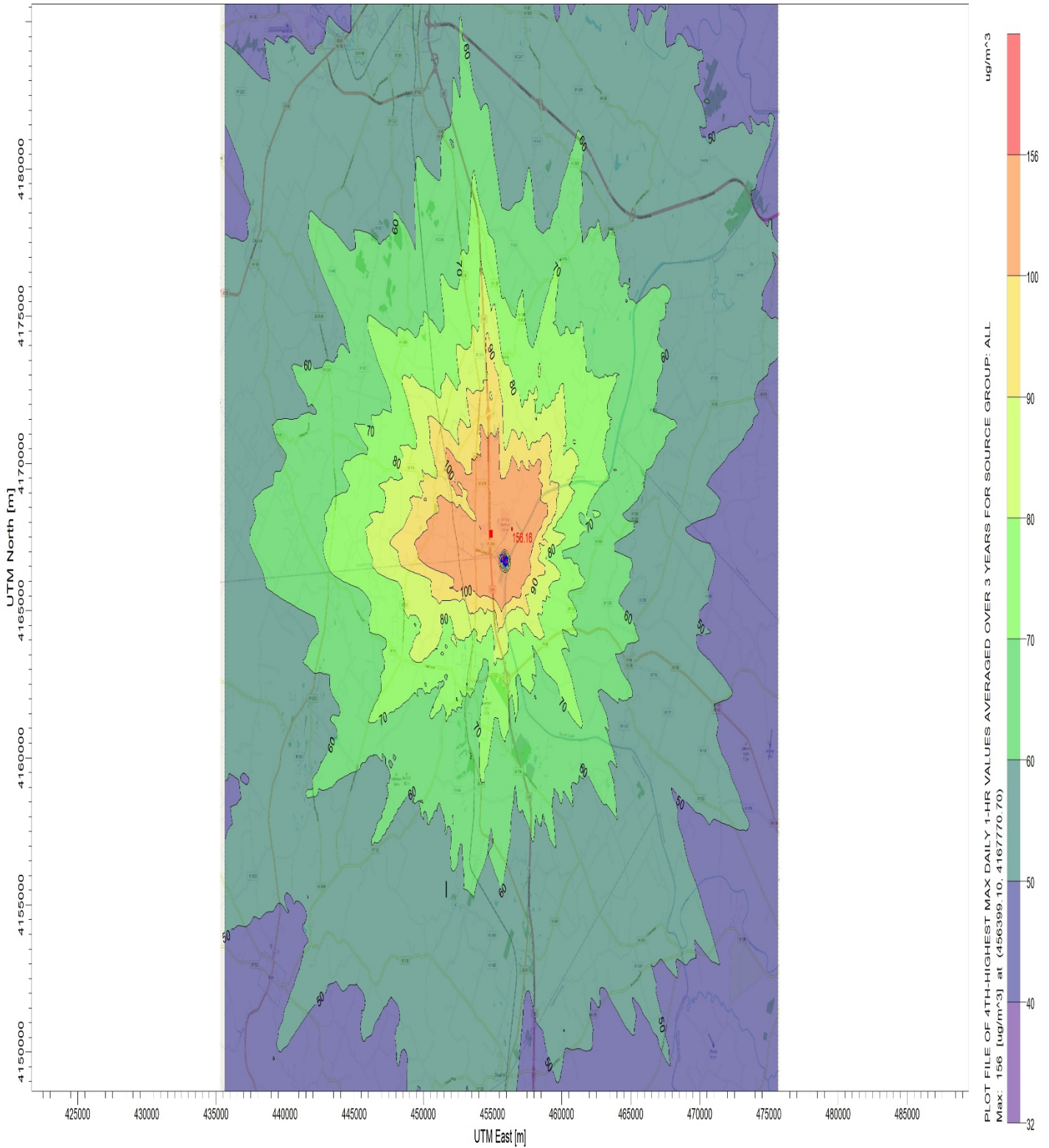


Figure 3a. Scenario 3. Max impact 188 $\mu\text{g}/\text{m}^3$

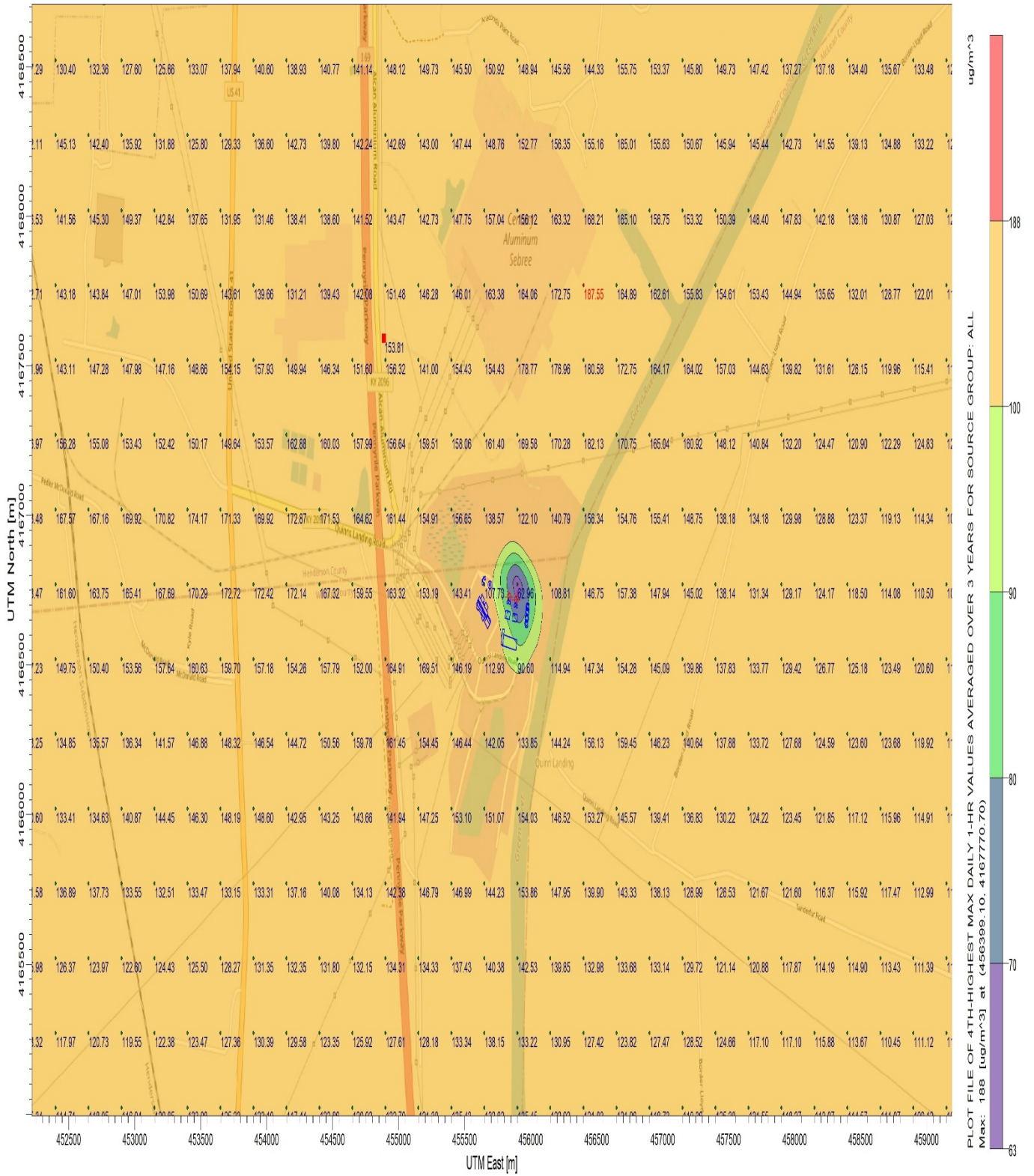


Figure 3b. Scenario 3. Max impact 188 $\mu\text{g}/\text{m}^3$

