MEMORANDUM

SUBJECT: Fenceline Ambient Benzene Concentrations for the Coke Oven Batteries Technology Review

FROM: Michael Moeller, USEPA/OAQPS/Health and Environmental Impacts Division

TO: National Emission Standards for Hazardous Air Pollutants for Coke Oven Batteries, Technology Review (Docket No. EPA-HQ- OAR-2003-0051)

DATE: April 20, 2023

Background

Benzene is a key hazardous air pollutant, as well as a primary constituent of coke oven emissions, present in nearly all coke facility equipment exhaust. To support the effort to develop a fenceline monitoring program around coke facilities, the EPA estimated the maximum off-site annual ambient benzene concentrations surrounding each of the 14 coke facilities in the country based on the benzene emissions inventory developed for these sources.

Approach

For the fenceline monitoring analysis, the EPA used the emissions estimates and release characteristics for hazardous air pollutants (HAP) at current coke facilities, as derived from stack test data obtained through two information collection requests (ICRs), in 2016 and 2022. These ICRs were developed pursuant to the EPA's authority in section 114 of the Clean Air Act and in support of the technology review required by CAA section112(d)(6) for the Coke Oven Batteries source category. Details on the ICR and development of the emissions inventory can be found in the docket for the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coke Oven Batteries (40 CFR part 63, subpart L) (docket no. EPA-HQ- OAR-2003-0051). These data are believed to be the best available, most current emissions inventory for this industry.

The EPA used this inventory to develop estimates of HAP emissions at each facility after full implementation of the proposed standards, as described in the proposal preamble for the NESHAP for Coke Ovens: Pushing, Quenching, and Battery Stacks (40 CFR part 63, subpart CCCCC), residual risk and technology review and the aforementioned Coke Ovens Battery NESHAP. This inventory was called the "post-control" emissions inventory. While the ICR and emissions inventory contained estimates of all HAP emitted from the facility, as noted above, benzene was selected as a surrogate of these emissions for purposes of estimating fenceline HAP concentrations.

Following development of the post-control emissions inventory, long- term ambient concentrations for each facility in the source category were estimated using the EPA's American Meteorological Society/EPA Regulatory Model dispersion modeling system (AERMOD). The AERMOD is a state-of-the-science Gaussian plume dispersion model that is preferred by the EPA for modeling point, area, and volume sources of continuous air emissions from facility applications. The model is used to develop annual average ambient concentrations through the simulation of hour-by-hour dispersion from the emission sources into the surrounding

atmosphere. Hourly emission rates used for this simulation are generated by evenly dividing the total annual emission rate from the inventory into the 8,760 hours of the year. Concentrations are estimated by the model at a set of polar grid receptors centered on the facility as well as surrounding census block centroid receptors extending from the facility outward to 50 km. For purposes of this modeling analysis, the EPA assumed that the nearest offsite polar grid receptor (P) was the best representation of each facility's fenceline concentration in the post-control case, unless there was a census block centroid that was nearer to the fenceline than the nearest off-site polar grid receptor (see Attachment 1). Only receptors (either the polar or census block) that were estimated to be outside the facility fenceline were considered in determining the maximum benzene level for each facility. Meteorology for the analysis generally consisted of a single year of data from a nearby national weather service office. Further details on the approach used are provided in the report called "Residual Risk Assessment for the Coke Ovens: Pushing, Quenching, and Battery Stacks Source Category in Support of the 2023 Risk and Technology Review Proposed Rule," which is located in the rule docket.

Results

Individual facility estimates of the maximum ambient annual average offsite benzene concentration are provided in Attachment 1. The maximum offsite annual average at any facility is estimated to be 3 μg/m3. The average of the estimated maximum concentrations across all 14 facilities is 0.9 μg/m3. Five facilities are estimated to create maximum ambient benzene levels above 1 μg/m3. In most cases, maximum off-site annual average concentrations are estimated to occur at or just adjacent to the facilities fenceline. Figure 1 shows the value and location of the maximum facility-level annual average benzene concentration at the facility with the highest modeled value in this analysis. As the figure illustrates, this concentration is near, but just outside of, the fenceline of the facility.

These estimates of ambient benzene concentrations are due only to the facility-specific emissions of benzene in the inventory noted above and do not reflect ambient levels from other nearby sources of benzene such as adjacent facilities or mobile source emissions. Further, the estimates do not include potential contributions from unidentified or unquantified on-site sources, and are subject to the typical uncertainties associated with estimating emissions and modeling atmospheric dispersion.

Figure 1 – Maximum Off-site Annual Average Benzene Concentration Adjacent to Facility 8115611

Attachment 1
Maximum Predicted Off-Site Ambient Annual Benzene Concentrations

Facility EIS ID	Maximum Benzene Concentration (µg/m3)	Census Block/Polar Receptor	Latitude (degrees)	Longitude (degrees)
8115611	3	P	41.2047	-80.814
8330811	3	P	40.1638	-79.889
1018711	2	P	33.5791	-86.781
16662611	1	P	42.2824	-83.113
4864311	1	P	40.3469	-80.606
948811	0.9	P	33.5623	-86.804
8204511	0.9	P	40.3091	-79.883
8008811	0.7	P	39.4781	-84.386
7376511	0.3	P	41.6264	-87.146
4034811	0.0003	P	37.2342	-82.035
8182811	0.0001	P	41.6827	-87.417
9236811	0.00006	P	38.6001	-82.822
10923611	0.00006	P	38.6989	-90.131
15484911	0.00005	P	39.4714	-84.397