Memorandum

To: Tertia Speiser, U.S. Department of Energy
Acting ESF#12 Logistics, Finance, and Administration Section Chief
Office of Cybersecurity, Energy Security, and Emergency Response (CESER)
U.S. Department of Energy

From: ICF

Date: March 6, 2024

Re: **DRAFT** - Special Environmental Analysis of the PJM Interconnection, LLC (PJM) Generating Units during Department of Energy (DOE) Emergency Order No. 202-22-4 (Federal Power Act Section 202(c)) between December 24, 2022, and December 26, 2022.

1 Introduction

On December 24, 2022, U.S. Department of Energy (DOE) issued Order No. 202-22-4 that permitted PJM Interconnection, LLC (PJM) to operate under Federal Power Act Section 202(c) conditions for a limited period. DOE found that an emergency exists "in the electricity grid operated by PJM Interconnection, LLC (PJM) due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance" of an Emergency Order would "meet the emergency and serve the public interest." Under the Order PJM was authorized to operate specific electric generating resources (Specified Resources) located within the PJM grid at their maximum generation output levels when directed to do so by PJM, notwithstanding air quality or other permit limitations.

Of the Specified Resources identified in the Order, two generating units owned by Calpine ran as allowed by the Order at levels that exceeded their permitted operating hour limits. Those generators were:

- Bethlehem Energy Center 1 and 2, (collectively referred to as Bethlehem 1&2 in this report) two dual-fuel natural gas/fuel-oil based units (565 MW each, total 1,130 MW) consisting of 6 combustion turbine generators (CTGs) and located in Bethlehem, PA; and
- York Energy Center 1 (referred to as York 1 in this report), a dual-fuel natural gas/fuel-oil based unit (565 MW) consisting of 3 CTGs and located in Peach Bottom Township, PA.

The Order also required PJM to "take reasonable measures to inform affected communities where all Specified Resources operate that PJM has been issued (the) Order, in a manner that ensures that as many members of the community as possible are aware of the Order (Order at paragraph F).

The Order was limited to a 3-day period starting at 5:30 PM EST on December 24, 2022, and ending at 12:00 PM EST on December 26, 2022. PJM was required to submit a report documenting operations of the covered resources under the emergency order. PJM filed its final report on January 6, 2023.

This memorandum summarizes ICF's review of documents PJM provided to DOE in compliance with the Order issued pursuant to Section 202(c) of the Federal Power Act concerning operations of the Specified Resources between December 24, 2022, and December 26, 2022[1] pursuant to the Order (the "order period"). ICF conducted this analysis at the direction of DOE and the conclusions summarized here are intended to satisfy the DOE's NEPA requirements. Specifically, ICF reviewed:

- Operations and emissions data from covered generating units to determine whether any emissions during operation outside of permit limits would have caused ambient (outdoor) pollutant concentrations in the region to exceed any National Ambient Air Quality Standards (NAAQS) or the Commonwealth's standards (Pennsylvania Ambient Air Quality Standard, PAAQS).
- Location coordinates of the Specified Resources to determine the potential for Environmental Justice impacts of the Order.
- The robustness of community engagement plans.

2 Emissions Evaluation

2.1 Approach

ICF has reviewed the information supplied by PJM for the two Specified Resources [2] listed in Section 1 and presents the findings below.

The sections below summarize emissions information provided by PJM for those hours during which operations exceeded the limits in the units' respective air quality permits. The permitted limits on operations and emissions are set by the Pennsylvania Department of Environmental Protection (PADEP) at levels that are intended to ensure that ambient concentrations will not violate the NAAQS or PAAQS. Table 1 shows the operations outside of permit limits that occurred during the Order period.

[1] The documents reviewed are posted on the Department of Energy's (DOE) web site at the following link: https://www.energy.gov/ceser/federal-power-act-section-202c-pjm-december-2022

[2] PJM initially did not provide DOE all emissions data. DOE followed up to obtain the remaining data.[3] Figures 7 and 8 show DACs located within a 10-km radius around York 1 and Bethlehem 1&2

Table 1. Operations Outside of Permit Limits During Order Period

Description	Permit Limit (Facility-wide)	Actual Operation	Exceedance Amount
Bethlehem 1&2 (6 CTGs)			
Fuel oil operating hours limit (hr/day)	108	122.61 on 12/24/22	14.61 on 12/24/22
Fuel oil consumption limit (gal/day)	No daily limit	Not applicable	Not applicable
York 1 (3 CTGs)			
Fuel oil operating hours limit (hr/day)	59.5	65.73 on 12/24/22	6.23 on 12/24/22
Fuel oil consumption limit (gal/day)	612,850	657,460 on 12/24/22	44,610 on 12/24/22

Source: PJM
CTG = combustion turbine generator
gal = gallons
hr = hours

Emissions were reported for carbon monoxide (CO), nitrogen oxides (NO_X), particulate matter of 10 microns diameter and smaller (PM_{10}), sulfur dioxide (SO_2), and volatile organic compounds (VOC). Permit limits were exceeded only for time of operation on fuel oil and (for York 1 only) fuel oil consumption. Neither facility exceeded its permit limits for emissions.

2.2 Analysis of Operations and Emissions by Facility

This section summarizes operations and emissions information provided by Calpine for those hours during which operations exceeded the limits in the units' respective air quality permits as described above. The permitted limits on emissions are set on a unit-by-unit basis by PADEP at levels that are intended to ensure that ambient concentrations will not violate any NAAQS or PAAQS. Calpine reported emissions for CO, NO_X, PM_{10}, sulfur oxides (SO_X), and volatile organic compounds (VOC). Permit limits were exceeded only for hours of operation using fuel oil. There were no exceedances of permit conditions that limit emissions themselves.

Table 2 summarizes the reported emissions from Bethlehem 1&2 and York 1 for the Order Period. The emissions in Table 2 represent the total mass (in pounds) of emissions that could have contributed to ambient pollutant concentrations during the Order period. The permits for Bethlehem and York do not include limits on the number of pounds emitted per day as shown in Table 2. Rather, the permits limit the volumetric concentrations (parts per million) of pollutants in the exhaust gases, the number of pounds emitted per startup or shutdown event, and the total facility emissions in tons per year. Calpine did not report any exceedances of the permit limits for concentrations, pounds per startup/shutdown, or tons per year. As noted above, permit limits were exceeded only for time of operation on fuel oil and (for York 1 only) fuel consumption as shown in Table 1.

Table 2. Operating Hours and Emissions During Order Period

Description	Hour of Day	Status of Permit Exceedance		Facility Operating Hours	Emissions (lb)				
					CO	NO_X	PM_{10}	SO_X	VOC
Bethlehem 1&2									
December 24, 2022	00:00-19:17	No		108.0	6.04	3,479.4	3,874.3	6,979.2	68.1
		19:18-21:50	Yes	14.6	1.02	227.4	424.9	766.4	8.34
		21:50-24:00	No	0.0	0.0	0.0	0.0	0.0	0.0
		00:00-24:00 (entire day)		122.6	7.05	3,706.8	4,299.2	7,745.8	76.4
December 25, 2022	00:00-24:00	No		38.3	4.7	1,030.5	1,181.5	2,067.1	29.2
December 26, 2022	00:00-24:00	No		82.9	2.8	1,154.2	1,470.0	2,648.5	27.3
Total				**243.7**	**9.1**	**2,718.4**	**3,476.4**	**6,202.5**	**72.1**
York 1									
December 24, 2022	00:00-19.50	No		59.5	24.6	1,291.6	118.9	51.0	18.2
	19:50-22:00	Yes		6.2	40.6	128.4	11.7	4.9	1.9
	22:00-24:00	No		0.0	0.0	0.0	0.0	0.0	0.0
	00:00-24:00 (entire day)			65.7	65.2	1,420.0	130.6	55.9	20.1
December 25, 2022	00:00-24:00	No		0.00	0.0	0.0	0.0	0.0	0.0
December 26, 2022	00:00-24:00	No		0.0	0.0	0.0	0.0	0.0	0.0
Total				**65.7**	**72.8**	**1,421.4**	**130.6**	**55.9**	**20.1**

Source: PJM
Sum of individual values may not equal total due to rounding.

2.2.1 Bethlehem 1&2

Bethlehem 1&2 each consist of three CTGs. Bethlehem 1&2 exceeded its operating hour limits on fuel oil by 14.6 hours (2.435 hours per CTG) on December 24, 2022, as shown in Table 1. Bethlehem 1&2 did not exceed its permit limits for emissions.

The nearest air quality monitor to Bethlehem 1&2 is in Freemansburg, PA, 1.7 miles to the west-northwest (EPA AQS Site ID: 420950025). This monitor measures nitrogen dioxide (NO_2), ozone, SO_2, and particulate matter of 2.5 microns diameter and smaller ($PM_{2.5}$). However, no NO_2 measurements were reported at this location during the Order Period. The Freemansburg monitor did not record any exceedances of the NAAQS for any of the other pollutants during the Order period. The nearest CO and NO_2 air quality monitor to Bethlehem 1&2 is in Scranton, PA, 57 miles to the north-northwest (EPA AQS Site ID: 420692006). It did not record any exceedances of the CO or NO_2 NAAQS during the Order Period. Because of the distance between Bethlehem 1&2 and the monitoring sites, it is unlikely that any impacts due to Bethlehem 1&2 would be discernible at this monitor.

The behavior of the emissions plume in the atmosphere has a crucial influence on the air quality impacts, i.e., the changes in pollutant concentrations that would occur at ground level beyond the facility site. A taller stack, higher velocity of exhaust from the stack exit, and higher exhaust temperature all lead to greater plume dispersion and lower ground-level concentrations. Conversely, a shorter stack, lower exhaust velocity, and lower exhaust temperature lead to higher ground-level concentrations. Each of the six CTG heat recovery steam generator (HRSG) stacks at Bethlehem 1&2 has a stack height of 188 feet above grade which is relatively high in terms of dispersion potential, an exhaust velocity of 67 feet per second which is moderately high, and an exhaust temperature of 225 degrees Fahrenheit (ºF) which is relatively low. Each of the six CTG bypass stacks at Bethlehem 1&2 has a stack height of 136 feet above grade which is relatively high in terms of dispersion potential, an exhaust velocity of 107 feet per second which is moderately high, and an exhaust temperature of 990ºF which is relatively high. These values indicate relatively good dispersion of the emissions (despite the relatively low temperature at the HSRG stacks) and thus relatively low concentrations. These values combined with the fact that Bethlehem 1&2 did not exceed its permit limits on recorded emissions suggest that the maximum concentrations that occurred during the period of the Order were unlikely to have exceeded the NAAQS or PAAQS.

2.2.2 York 1

York 1 consists of three CTGs. York 1 exceeded its fuel oil operating hour limits by 6.23 hours (0.41 hours per CTG) and its fuel oil consumption limit by 44,610 gallons (14,870 gallons per CTG) on December 24, 2022, as shown in Table 1. York 1 did not exceed its permit limits for emissions.

The nearest air quality monitor to York 1 is in York, PA, 27 miles to the northwest (EPA AQS Site ID: 421330008). This monitor measures NO_2, ozone (in season, March 1 – October 31), SO_2, and $PM_{2.5}$. It did not record any exceedances of the NAAQS for any of these pollutants during the Order period. The nearest CO air quality monitor to York 1 is in Essex, Maryland, 32 miles to the south-southwest (EPA AQS Site ID: 240053001). It did not record any exceedances of the CO NAAQS during the Order Period. Because of the distance between York 1 and the monitoring sites, it is unlikely that any impacts due to the plant would be discernible at these monitors.

The behavior of the emissions plume in the atmosphere has a crucial influence on the air quality impacts, i.e., the changes in pollutant concentrations that would occur at ground level beyond the facility site. A taller stack, higher velocity of exhaust from the stack exit, and higher exhaust temperature all lead to greater plume dispersion and lower ground-level concentrations. Conversely, a shorter stack, lower exhaust velocity, and lower exhaust temperature lead to higher ground-level concentrations. Each of the three CTG stacks at York 1 has a stack height of 188 feet above grade which is relatively high in terms of dispersion potential, and an exhaust velocity of 58.5 feet per second which is moderately high. Exhaust temperatures during the Order period were 206ºF for Unit 1, 240ºF for Unit 2, and 100ºF for Unit 3, which are relatively low. These height, velocity, and temperature values together indicate relatively good dispersion of the emissions (despite the relatively low temperatures) and thus relatively low concentrations. These values combined with the fact that York 1 did not exceed its permit limits on emissions suggest that the maximum concentrations that occurred during the Order period were unlikely to have exceeded the NAAQS or PAAQS.

2.3 Conclusions

Based on the reported operations and emissions, it appears unlikely that the emissions at Bethlehem 1&2 and York 1 during the period in which permit limits were exceeded would have increased ambient concentrations enough to cause or worsen a violation of the NAAQS or PAAQS. Further evaluation could support this preliminary conclusion. Such evaluation could include review of measured ambient pollutant levels at additional monitoring stations during the reporting period in the region around the generating facilities, review of meteorological conditions during the reporting period, and dispersion modeling of ambient concentrations in the region.

3 Environmental Justice Implications for the Affected Population

This section highlights the potential environmental justice (EJ) implications for the affected population in the region of interest. ICF's evaluation was based on data from U.S. EPA's EJScreen tool, available at ejscreen.epa.gov/mapper. EPA's EJScreen is a GIS-based mapping tool for evaluating potential EJ impacts across the United States. The tool allows users to combine demographic and environmental information on a user-selected area. The data used for these purposes in EJScreen are based on publicly available data sources, such as the American Community Survey from the Census Bureau for demographic data and various EPA data sources for environmental indicators. ICF used this screening tool for this analysis because it provides a method consistent with EPA's approach for defining EJ vulnerabilities for affected populations.

3.1 Analyzing Demographic Characteristics of Nearby Populations

To identify the vulnerable populations around York 1 and Bethlehem 1&2 during the 3-day period in December 2022, ICF extracted the demographic and environmental characteristics of those living within a pre-specified 2-km and 10-km radius around the affected units. ICF chose the 2-km radius to better isolate the demographic and environmental characteristics of the population near the generating units. The 10-km radius was chosen to analyze the EJ characteristics in a wider region around the affected units.

The EJScreen also identifies if a census tract is designated as a Disadvantaged Community (DAC) in the pre-specified 2-km and 10-km radii.[3] The EPA defines DAC as any census tract that is identified as disadvantaged in the Climate and Economic Justice Screening Tool (CEJST); and/or census block group that is at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the state or nation; and any that are within Tribal lands.[4,5] To calculate a single supplemental index for one block group, EJScreen multiplies the environmental indicator by socioeconomic information. The socioeconomic indicators include

[3] Figures 7 and 8 show DACs located within a 10-km radius around York 1 and Bethlehem 1&2

[4] U.S. Environmental Protection Agency (EPA), 2023. EJScreen Technical Documentation, LIDAC Technical Guidance - Final_2.pdf (epa.gov),pg. 4

[5] CEJST considers communities disadvantaged if they are in census tracts that meet the thresholds for at least one of tool's categories of burden, or if they are on land within the boundaries of a federally recognized tribe Source: https://screeningtool.geoplatform.gov/en/methodology#3/33.47/-97.5

people of color, low-income, unemployment levels, limited English speakers, less than high school education, percent of people under the age of five, and percent of people over 64.[6]

To identify the vulnerable population around the power plants that are likely to be impacted by any potential exceedances during the 3-day period, ICF extracted the demographic and environmental characteristics of those living within the pre-specified 2-km and 10-km radii around the affected units.

Figure 1 below overlays 2-km circles around York 1 and Bethlehem 1&2 and provides a high-level visualization of the area around the two plants. A 2-km radius ensures the neighborhoods around the units are captured in detail.

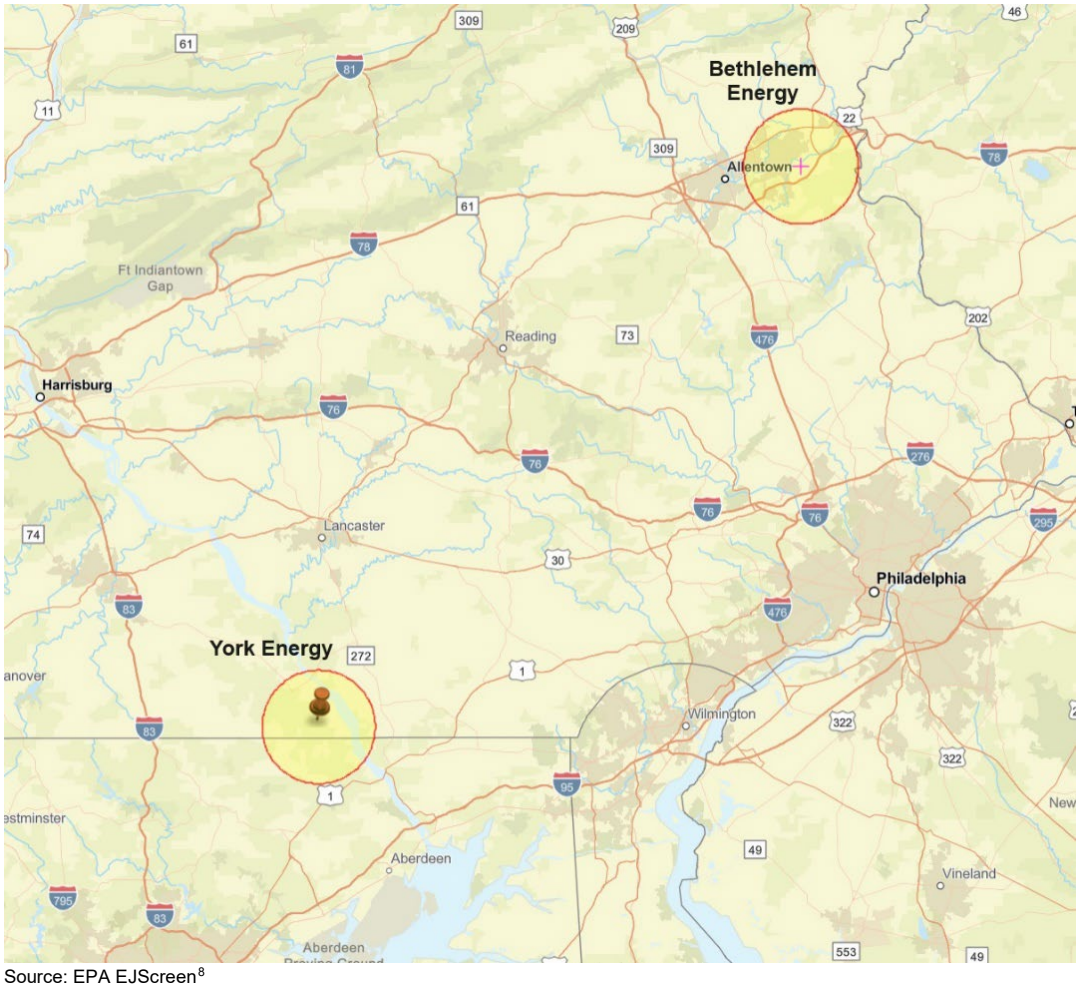
Figure 1. 2-km Radius around the Affected Units

[6] U.S. Environmental Protection Agency (EPA), 2023. EJScreen Technical Documentation, https://www.epa.gov/ejscreen/ejscreen-map-descriptions

Source: EPA EJScreen[7]

Figure 2 below overlays 10-km circles around the two units. Using a 10-km radius around these units captures a greater share of the potentially affected population. Note that even under the 10-km radius, the two plants are sufficiently far apart, without any overlapping populations.

Figure 2. 10-km Radius around the Affected Units



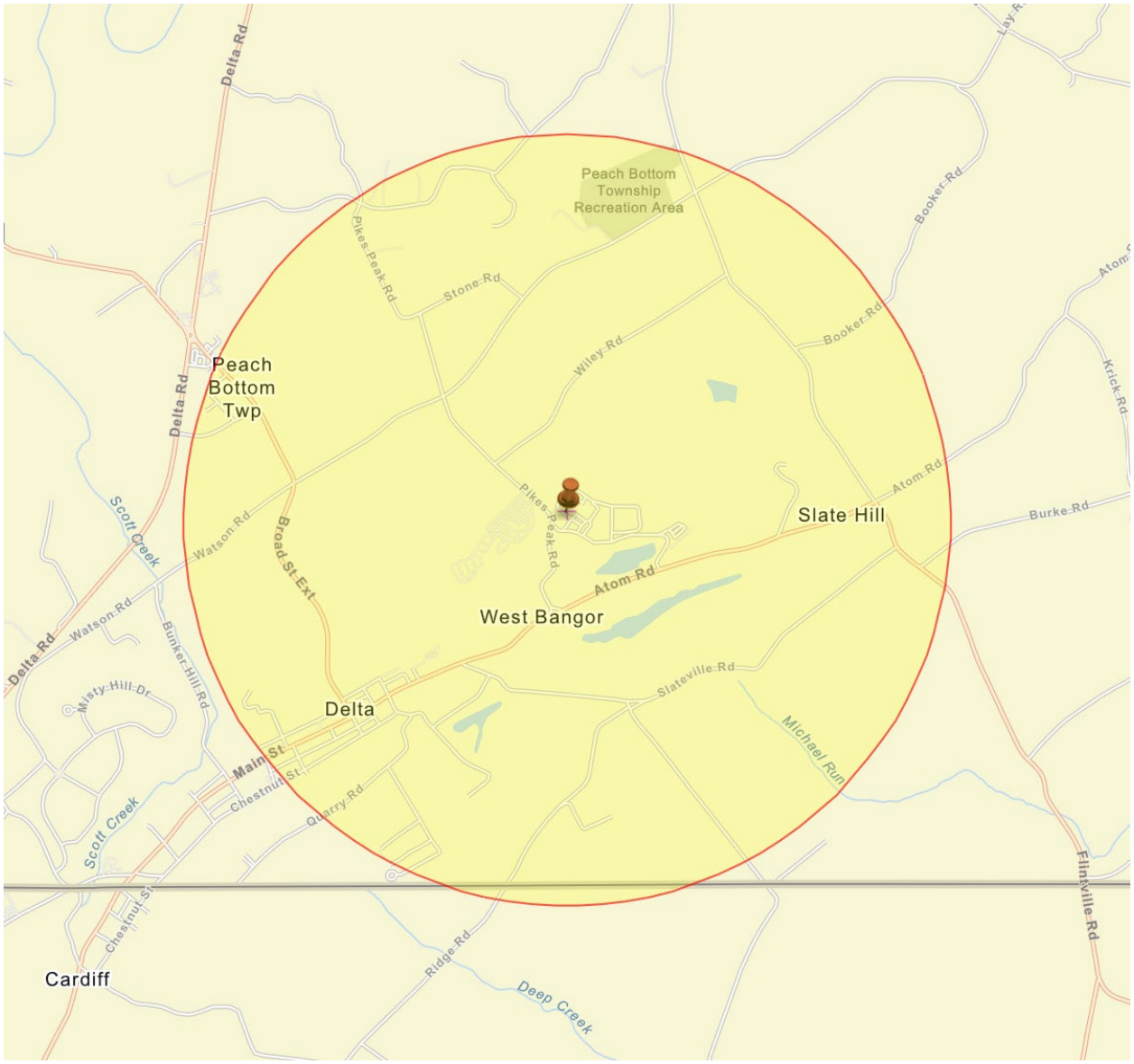
Source: EPA EJScreen[8]

Figure 3 focuses on the region in the 2-km radius around York 1. Based on the figure, the affected unit appears to be in a less populated area with some nearby homes and an elementary school.

[7] United States Environmental Protection Agency. 2023 version. EJScreen. Retrieved: 12,08,2023, www.epa.gov/ejscreen

[8] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Figure 3: 2-km radius around York 1

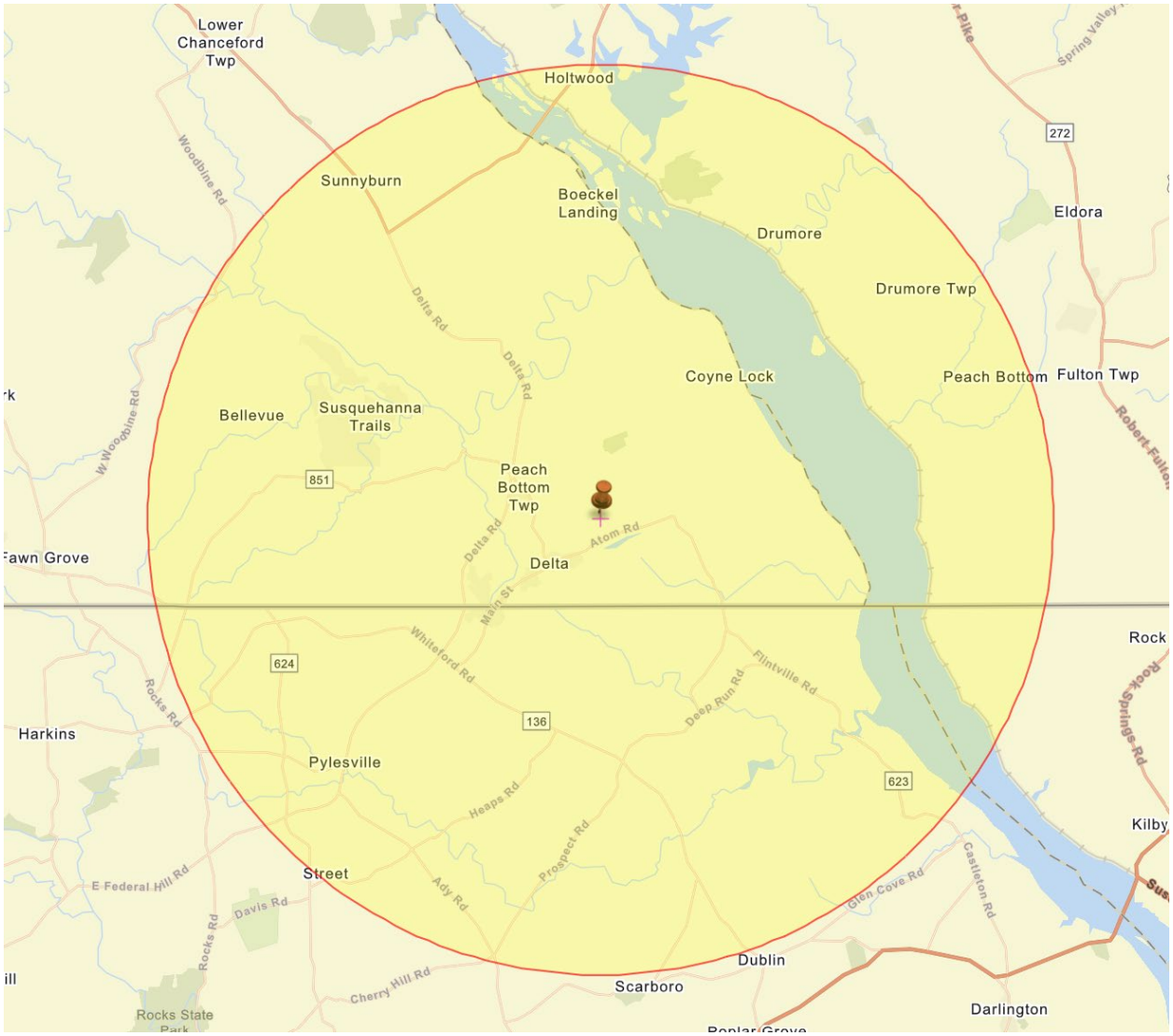


Source: EPA EJScreen[9]

Figure 4 shows the region within the 10-km radius around York 1 in more detail, which captures a wider area with more neighborhoods and a greater share of the potentially affected population.

[9] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Figure 4. 10-km radius around York 1

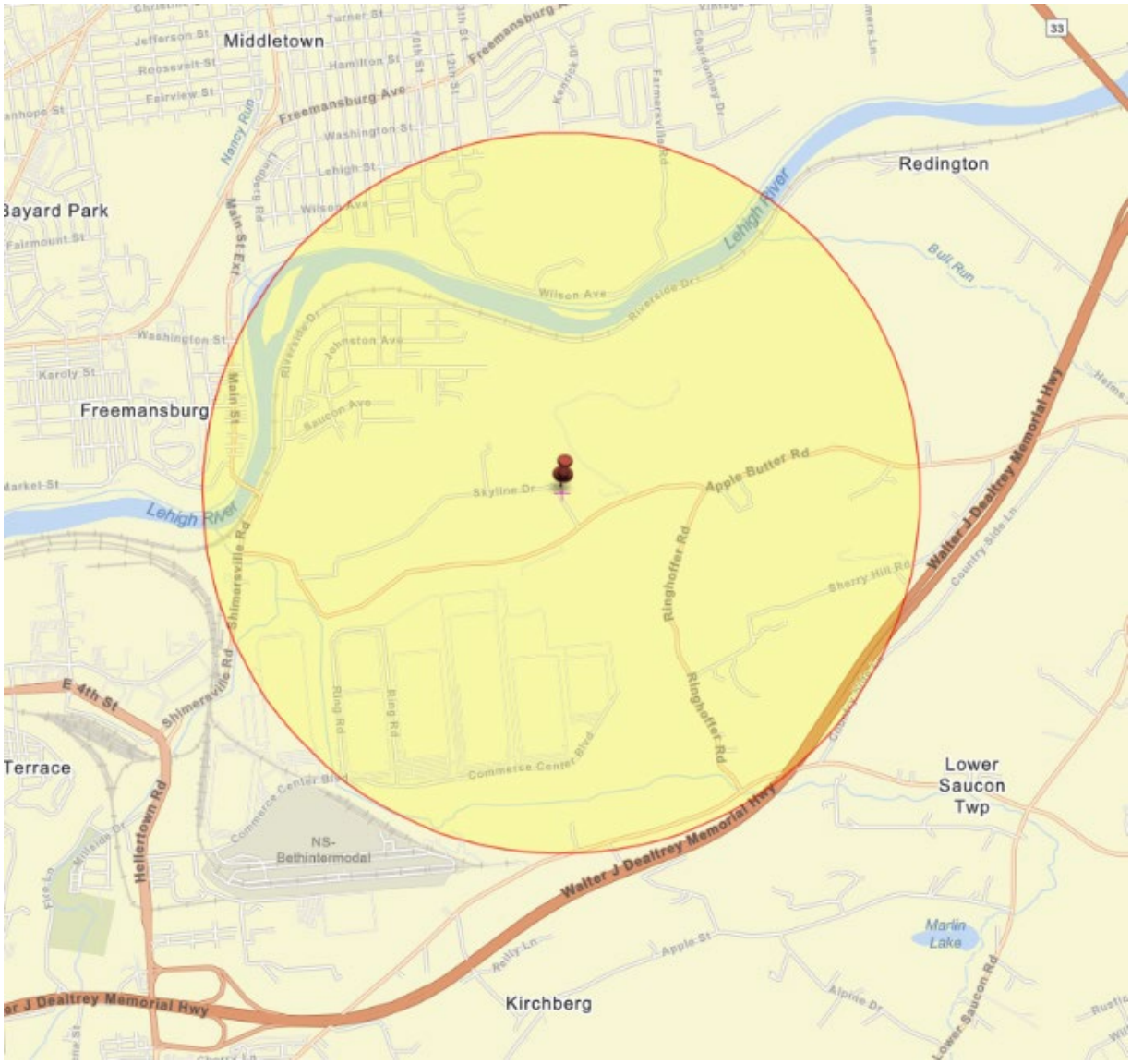


Source: EPA EJScreen[10]

Figure 5 below highlights the region within a 2-km radius around Bethlehem 1&2. A 2-km radius ensures the neighborhoods around the affected units are captured in more detail. It appears that there are some residential neighborhoods within 2-km around Bethlehem 1&2 and the population in these neighborhoods are the focus of our assessment below.

[10] EJScreen. Retrieved: 12,08,2023, www.epa.gov/ejscreen

Figure 5. 2-km radius around Bethlehem 1&2

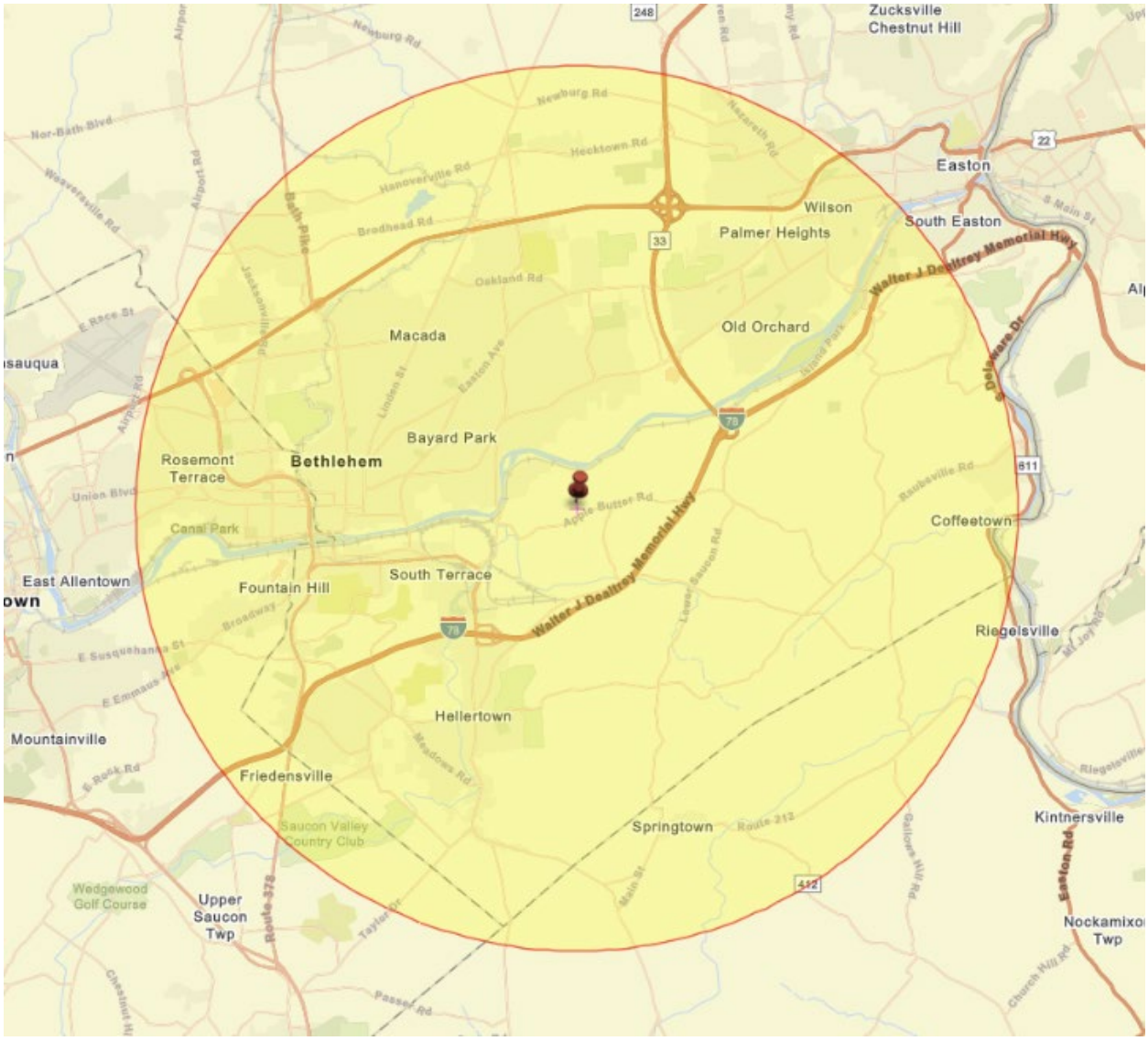


Source: EPA EJScreen[11]

Figure 6 shows the wider region around Bethlehem 1&2 in a 10-km radius, and it captures a wider area and a greater share of the potentially affected population.

[11] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Figure 6. 10-km radius around Bethlehem 1&2



Source: EPA EJScreen[12]

Using these custom boundaries, ICF extracted the demographic and environmental data from EJScreen to identify the potential EJ vulnerabilities for the population living around these power plants. Table 3 indicates the age ranges of population in the 2-km and 10-km radii around the affected units.

[12] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Table 3. Distribution of the Affected Population by Age

Age	York 1		Bethlehem 1&2	
	2-km Radius	10-km Radius	2-km Radius	10-km Radius
Total Population	**1,030**	**17,093**	**1,853**	**183,339**
1 to 4	6%	5%	2%	6%
5 to 17	21%	19%	15%	14%
18 to 64	52%	60%	62%	61%
65 and up	21%	16%	21%	19%

Source: EPA EJScreen[13]

The total population exposed to any potential EJ concerns for York 1 ranges from 1,030 to 17,093 while that range is significantly higher for Bethlehem 1&2 at 1,853 to 183,339. As shown in Table 3, for both units, the largest proportion of the population exposed to any potential EJ concerns falls within the 18 - 64 age group. Note that for York 1, 27 percent of the total population exposed to any potential EJ concerns in the 2-km radius fall within the 1-17 age group. This age group consists of young children who are likely to be more vulnerable to air toxins.

Table 4. Distribution of the Affected Population by Race

Race	York 1		Bethlehem Energy 1&2	
	2-km Radius	10-km Radius	2-km Radius	10-km Radius
Total Population	**1,030**	**17,093**	**1,853**	**183,339**
White	90%	95%	74%	67%
Black	4%	1%	5%	6%
American Indian	0%	0%	0%	0%
Asian	0%	1%	2%	3%
Hawaiian/Pacific Islander	0%	0%	0%	0%
Other race	0%	0%	0%	0%
Two or more races	2%	1%	4%	3%
Hispanic	4%	2%	16%	21%

Source: EPA EJScreen[14]

Table 4 shows the breakdown of the population by race in the 2-km and 10-km radius for the two units. Race information is broken down to show the population that identify themselves as White, other people of color (Black, American Indian, Asian, Hawaiian/Pacific Islander, or other race), or belong to the Hispanic ethnicity.[15] In the area within the 2-km and 10-km radius of both power plants, the population that identifies as White make up the majority of the population, followed by Hispanic, and Black.

[13] EJScreen. Retrieved: 11,24,2023, www.epa.gov/ejscreen

[14] EJScreen. Retrieved: 11,24,2023, www.epa.gov/ejscreen

[15] EJScreen defines people of color as individuals who list their racial status as a race other than white alone, and/or list their ethnicity as Hispanic or Latino. Source: U.S. Environmental Protection Agency (EPA), 2023. EJScreen Technical Documentation, https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf

Table 5. Demographics of the Affected Population

Demographic Indicators	York 1		Bethlehem 1&2		State Average
	2-km Radius	10-km Radius	2-km Radius	10-km Radius	
Total Population	**1,030**	**17,093**	**1,853**	**183,339**	
People of Color	10%	5%	26%	33%	**24%**
Low Income	24%	21%	22%	24%	**28%**
Unemployed[16]	13%	5%	3%	5%	**6%**
Limited English-Speaking[17] Households	0%	1%	1%	4%	**2%**
Population with Less Than High School Education[18]	19%	14%	7%	9%	**9%**

Source: EPA EJScreen[19]

As shown in Table 5, in the case of York 1, 24 percent of the population in the 2-km radius is low-income. Low-income population is defined as those whose household income is less than twice the federal poverty level in the past 12 months. At the 10-km radius, the low-income population decreases to 21 percent. The low-income populations around York 1, both at the 2-km and 10-km radius are lower than the state average of 28 percent. In the 2-km radius around the power plant, 10 percent of the population is people of color, lower than the state average of 24 percent. However, in the 10-km radius, the percentage of people of color decreases to 5 percent, implying that the population closest to the affected unit is likely to have a higher proportion of people of color than in the wider radius. In terms of employment, 13 percent of the population in the 2-km radius is unemployed, which is higher than the state average of 6 percent. With respect to their educational attainment, the populations in both the 2-km and 10-km radii have a higher share of people with less than a high school education compared to the state average of 9 percent. This indicates that the area around the unit is lagging in terms of high school educated population compared to the state average. Thus, while the population near York 1 may not have any distinguishable differences with the wider state population in terms of their race and employment status, they are more likely to have differences in educational attainment.

Analyzing the population demographics around Bethlehem 1&2 in Table 5, 22 percent of the population in the 2-km radius is low-income. For the 10-km radius, the low-income population increases slightly to 24 percent. The low-income populations around Bethlehem 1&2, both at the 2-km and 10-km radii are lower than the state average of 28 percent. In the 2-km and 10-km radii around the power plant, 26 and 33 percent of the population are people of color, respectively, both higher than the state average of 24 percent. In terms of employment, 3 and 5 percent of the population are unemployed in the 2-km and 10-km radii of the power plant, respectively, lower than the state average of 6 percent. With respect to educational attainment, the population in the 2-km and 10-km radii have about the similar share of people with less than a high school

[16] Unemployed is defined as individuals who did not have a job during the reporting period, made at least one specific active effort to find a job, and were available to work. Source: EPA, EJScreen Technical Documentation, https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf

[17] EJScreen defines limited English-speaking households as a household in which no one over the age of 14 years old speaks only English or speaks a non-English language and speaks English "'very well'" as reported in the American Community Survey. Source: EPA, EJScreen Technical Documentation, https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf

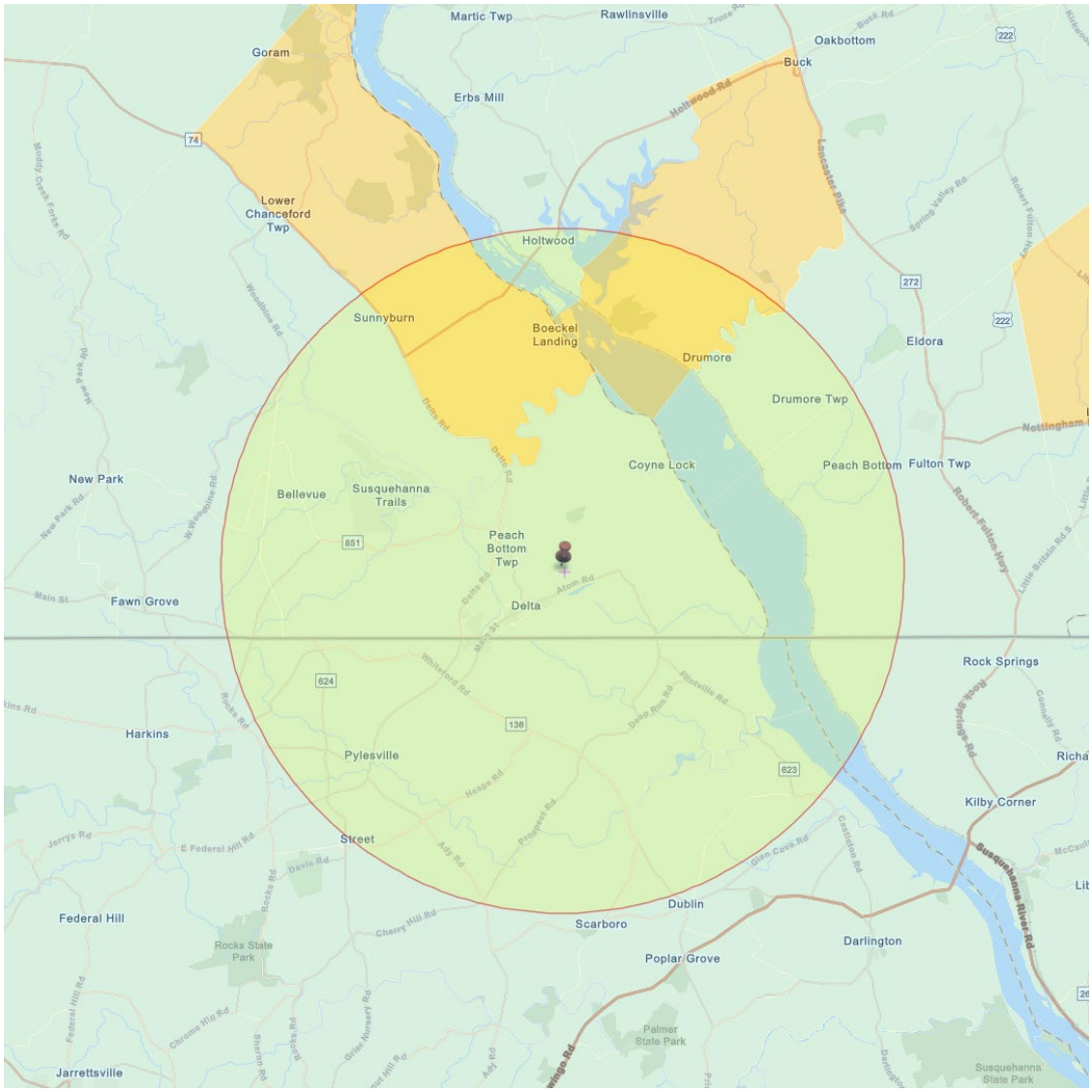
[18] EJScreen defines less than high school education as people 25 years or older who did not receive a high school diploma. Source: EPA, EJScreen Technical Documentation, https://www.epa.gov/system/files/ documents/2023-06/ejscreen-tech-doc-version-2-2.pdf

[19] EJScreen. Retrieved: 11,24,2023, www.epa.gov/ejscreen

education compared to the state average of 9 percent. This shows that the area around the power plant is similar to the other parts of the state in terms of high school educated population. While the population near Bethlehem 1&2 may have similar demographic characteristics relative to the wider state population in terms of their educational attainment, they are more likely to be people of color with slightly better income levels than the state average.

Figure 7 below shows DACs located within a 10-km radius around York 1. Census tracts designated as DACs are highlighted in orange. These census tracts are designated as DACs based on the DAC criteria set by EPA as mentioned above. Based on the figure, there are two DACs within the 10-km radius around the power plant implying that the population would be more vulnerable to EJ concerns compared to the population of the other areas within the radius.

Figure 7. DACs within 10-km radius around York 1

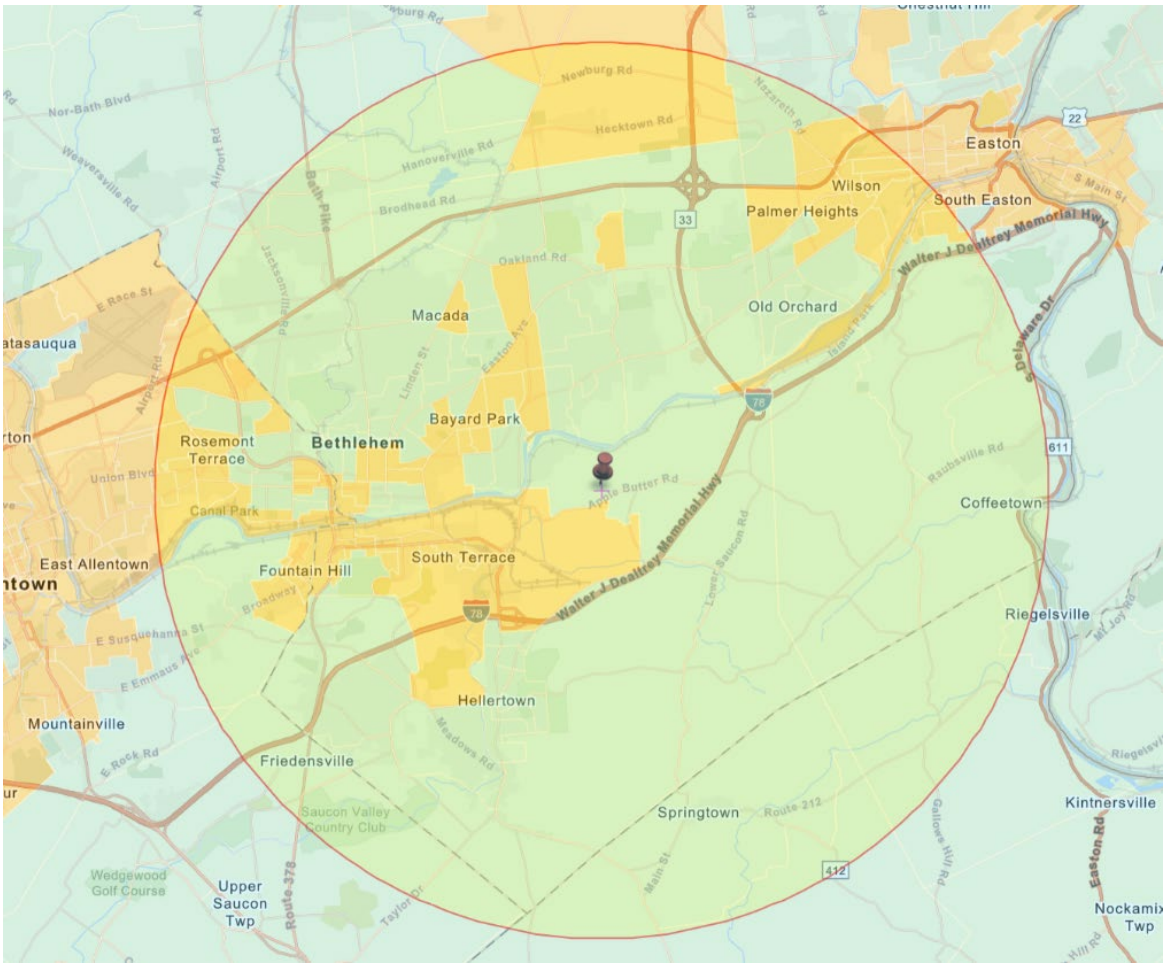


Source: EPA EJScreen[20]

[20] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Figure 8 below shows DACs located within a 10-km radius around Bethlehem 1&2. Based on the figure, there are several DACs within the 10-km radius around the power plant, indicating a large share of the population in the area would be more vulnerable to EJ concerns compared to the population in the other areas within the radius.

Figure 8. DACs within 10-km radius around Bethlehem 1&2



Source: EPA EJScreen[21]

3.2 Combining Demographic Information with Environmental Indicators

To understand the EJ vulnerabilities of the population living around the power plants, ICF analyzed the various environmental pollutant indicators from EJScreen and compared their values with the state averages. Table 6 below shows the values of the various environmental indicators of interest (see Table 6 notes for definitions of these pollutant indicators) around the 2-km and 10-km radii of both York 1 and Bethlehem 1&2.

[21] EJScreen. Retrieved: 12,07,2023, www.epa.gov/ejscreen

Table 6. Environmental Indicators Data

Environmental Indicators	York 1		Bethlehem 1&2		State Average
	2-km Radius	10-km Radius	2-km Radius	10-km Radius	
Particulate Matter (PM 2.5 in ug/m3)	8.19	8.14	8.5	8.52	**8.65**
Ozone (ppb)	63	63.5	62.8	62.5	**61.6**
Diesel PM (ug/m3)	0.144	0.148	0.247	0.287	**0.233**
Air Toxics Cancer Risk (risk per MM)	20	20	30	31	**26**
Air Toxics Respiratory Hazard Index	0.2	0.25	0.35	0.34	**0.28**
Toxic Releases to Air	2,400	2,200	6,900	12,000	**4,000**
Traffic Proximity and Volume	1.3	2.9	50	170	**200**
Lead Paint	0.47	0.3	0.35	0.46	**0.49**
Superfund Proximity	0.046	0.049	0.23	0.28	**0.18**
RMP Facility Proximity	0.49	0.2	1.1	0.8	**0.45**
Hazardous Waste Proximity	0.093	0.13	1	1.8	**1.4**
Underground Storage Tanks	0.16	0.15	1.3	3.1	**3.6**
Wastewater Discharge	0.00086	0.0005	0.41	0.13	**1.7**

Source: EPA EJScreen[22]

- Particulate Matter (PM2.5 in ug/m3) – PM2.5 levels in the air, measured in µg/m3 annual average *(Note: Only PM2.5 data is available in EPA EJ Screen)*
- Ozone—Ozone annual mean top 10 of daily maximum 8-hour concentration in air
- Diesel PM (ug/m3) – Diesel particulate matter level in the air, measured in µg/m3
- Air Toxics Cancer Risk (risk per MM) – Lifetime cancer risk from inhalation of air toxics
- Air Toxics Respiratory HI – Air toxics respiratory hazard index (ratio of exposure concentration to health-based reference concentration)
- Toxic Releases to Air Indicator (TRI)—Risk Screening Environmental indicators (RSEI) modeled toxicity-weighted concentrations in air of TRI listed chemicals
- Traffic Proximity and Volume—Count of vehicles at major roads within 500 meters, divided by the distance in meters (daily traffic count/distance to road)
- Lead Paint—Percent of housing units built pre-1960, as indicator of potential lead paint exposure
- Superfund Proximity—Count of proposed and listed NPL sites within 5-km, divided by distance in km (site count/km distance)
- RMP Facility Proximity—Count of RMP (potential chemical accident management plan) facilities within 5-km, divided by distance in km (facility count/km distance)
- Hazardous Waste Proximity—Count of hazardous waste management facilities within 5-km, divided by distance in km (facility count/km distance)
- Underground Storage Tanks—Weighted count of USTs per sq. km
- Wastewater Discharge—Toxicity-weighted stream concentrations at stream segments within 500 meters, divided by distance in km (toxicity-weighted concentration/m distance)

Based on the environmental indicators in Table 6, the area within the 2-km and 10-km radii of Bethlehem 1&2 has higher values for Ozone, Air Toxics Cancer Risk, Air Toxics Respiratory Hazard Index and Toxic Releases to Air compared to the state averages. This indicates that the population near the affected units is more vulnerable with respect to these environmental indicators compared to the rest of the state. In the case of York 1, Ozone values are higher than the state average in both the 2-km and 10-km radius of the power plant.

3.3 Conclusion – Environmental Justice Analysis

Using the data from EPA's EJScreen, it appears the population in the 18-64 age group in the region around the affected units are likely to be more vulnerable to EJ considerations compared

[22] EJScreen. Retrieved: 11,24,2023, www.epa.gov/ejscreen

to the rest of Pennsylvania. As discussed in the air quality analysis above, DOE's emergency authorization under Section 202(c) of the Federal Power Act allowed increased operations of the power plants. However, those changes do not appear to have caused any violation of the NAAQS or PAAQS. Analyzing the *baseline, business-as-usual* EJ concerns for the population around these power plants indicate that a large proportion of the population surrounding the units could be considered vulnerable to EJ concerns since they belong to DACs, have limited socioeconomic opportunities, and are exposed to higher risks for several environmental indicators under those baseline conditions. But those conditions are unlikely to have been exacerbated by DOE's emergency authorization. As discussed in Section 2.3, further review of ambient pollutant levels and meteorological conditions, and potentially dispersion modeling, if conducted, could help refine these conclusions.

4 Review of PJM's Emergency Communications

Our review of PJM's emergency communications plan and implementation were based upon industry best-practices that emergency communications should consist of four main components: 1) pre-emergency activities and preparations, 2) creating holding statement(s) during the emergency, 3) monitoring media and stakeholders during the emergency and 4) post-emergency evaluations. ICF reviewed PJM's summary community outreach efforts related to the order period against this four-part framework. Our review, per the Statement of Work, was limited to documents provided by PJM to DOE, as well as the information available at the following link: Federal Power Act Section 202(c): PJM December 2022 | Department of Energy. Additional documents we identified relative to emergency communications and community outreach was a 131-page document with the name – "*Winter Storm Elliott Event Analysis and Recommendation Report*"[23] (specifically the section titled "Government, Member and Media Outreach") and PJM's "Call for Conservation" press release. These documents were also included in our analyses.

4.1 Review of PJM's Community Notice

Order No. 202-22-4 required PJM to *"inform affected communities where all Specified Resources operate that PJM has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order and explains clearly what the Order allows PJM to do. At a minimum, PJM shall post a description of this Order on its website (with a link to this Order) and identify the name, municipality or other political subdivision, and zip code of Specified Resources covered by this Order, as the Specified Resources may be updated pursuant to paragraph D above. In addition, if a Specified Resource operates pursuant to this Order, a general description of the action authorized by this Order will be included in any press release issued by PJM with respect to the cold weather event and will include a reference to the website posting required by the preceding sentence for further information."*[24]

4.2 Review of PJM's Community Engagement

In the summary of its community outreach, PJM noted that its "communications and government policy teams relayed critical situation updates in a timely fashion; short operational update videos

[23] https://www.pjm.com/-/media/library/reports-notices/special-reports/2023/20230717-winter-storm-elliott-event-analysis-and-recommendation-report.ashx
[24] https://www.energy.gov/sites/default/files/2022-12/PJM%20202%28c%29%20Order.pdf

from PJM leadership were used to reach a wide audience by television, print and digital media, while external-facing personnel used the same videos to update their important state and federal contacts. The Call for Conservation was widely amplified by Transmission Owners, regulators and even governors' offices on social and traditional media."

Prior to the issuance of the Order, PJM "published on its news site, *Inside Lines*, a series of articles noting the Cold Weather Advisory and subsequent Cold Weather Alert updates, in addition to amplifying them on social media." Specifically, on December 23, PJM "posted a news release on PJM.com…and sent the release via email to Transmission Owner communicators, members and media contacts, and posted to Twitter and LinkedIn." PJM notes that the "decision to issue a Call for Conservation was made…so that both Transmission Owners and PJM's press release would reach any outlets or audiences that could respond late Friday into early Saturday morning and have some impact on the morning peak."

On December 24, PJM "reissued the news release to…extensive media and member communicators' contact lists…and retweeted the Call for Conservation news release." Additionally, PJM "activated its crisis communications plan…to make sure sufficient resources were available to handle outreach and media response needs Saturday and Sunday."

PJM met with Transmission Owner communicators on December 24 and from that meeting, "more than 30 partners (including elected officials and regulators, in addition to members) joined in the effort to amplify the Call for Conservation to their customers, gaining nearly 1 million impressions on Twitter alone." Specifically, PJM noted that "two governors tweeted the Call for Conservation and attracted two of the top three Twitter impression totals."

On December 24 and December 25, PJM "responded to approximately 50 media requests, including at least 20 interviews." Furthermore, "PJM worked with customer-facing members' communications departments, who referred inquiries to PJM. In follow-up discussions, these members indicated that PJM's willingness to handle local media requests freed them to handle other pressing issues at the distribution level."

Additionally, PJM "posted three video updates…at the top of PJM.com homepage." These videos were promoted via Twitter, LinkedIn, and Facebook. PJM noted that the "posts promoting the video received more than 300,000 impressions."

Between December 23 and December 25, PJM "tracked more than 70 news stories noting PJM's Call for Conservation. This included national and newswire coverage from CNN, the Associated Press and Bloomberg, as well as regional coverage from television, radio and print media throughout the region PJM serves." Furthermore, PJM noted that "more than 1,800 unique users accessed the [PJM Now app] during Winter Storm Elliott, and the app was opened 6,600 times on Dec. 25 – compared with an average daily use of 750 app opens. The PJM Now app experienced unprecedented usage that slowed service during the storm, and PJM's Inside Lines news site went down Saturday because of unprecedented usage." PJM indicated that they have "taken steps to enhance these platforms so that similar usage levels will not result in the same performance issues as experienced during Winter Storm Elliott."

Finally, PJM "noted the end of the Call for Conservation on Sunday, Dec. 25, with direct email to members, social media posts and video on PJM.com."

4.2.1 Initial Findings

Based upon a review of PJM's community notice in support of DOE's Emergency Order No. 202-22-4, we found their efforts to be comprehensive relative to the order direction.

In reviewing the communications and outreach channels that PJM planned to use to inform the impacted citizens of the Emergency Order, ICF's assessment is that PJM's efforts were more than sufficient to reach a large portion of the impacted customers with the "Call for Conservation." Additionally, Order details, including links, were posted on PJM.com on Dec. 24, and included in the subsequent press release submissions to four news outlets in the areas of the power plants in Bethlehem and York County.

4.2.2 Opportunities to Strengthen Community Engagement

PJM's outreach effort was broad and did allow customers to provide some feedback or discussion among the communicating parties. ICF typically recommends that outreach also include some form of follow-up with stakeholders to ensure they received and were able to, and did, disseminate the Emergency Order information, which PJM seems to have accomplished. This kind of two-way dialogue is helpful in ensuring the impacted communities 1) understand the details of the Emergency Order, and 2) are given an opportunity to ask questions and provide feedback. PJM could have also considered holding community meetings in the impacted areas to allow for customer and stakeholder input; such meetings would also likely garner media coverage.

For future emergency communications, PJM may consider additional language or cultural considerations be made to prioritize environmental justice. Such outreach would include tactics like in-language communications and/or outreach specifically targeted at hard-to-reach or disadvantaged communities.

4.3 Additional Best Practices for Community Engagement during Emergencies

As mentioned earlier, four main sections are found in successful emergency communications: 1) pre-emergency preparations, 2) creating a holding statement, 3) monitoring media and stakeholders during the emergency and 4) post-emergency evaluations. ICF offers the following observations based on these standard practices in emergency communications.

4.3.1 Pre-emergency Preparatory Activities

Primarily, it is recommended to have several systems and approaches developed prior to crisis events, so that when emergencies occur there are previously approved procedures and communications at the ready, saving time and expediting responses.

For the sake of speed, an organization should proactively draw up a template with potential emergency scenarios, designate the appropriate channels for communication, and then plug in the necessary information if the actual incident occurs. Emergency response communications generally need to be sent to various people in multiple departments. Potential audiences include government agencies and offices (state and local), specific companies or industries impacted by the incident, media, the community, elected officials, and other authorities. The need for cultural

considerations e.g., language or manner of contact, are also identified. Modes and processes for follow-up with the various stakeholders during the emergency are also determined, acknowledging the need for flexibility during the event. Certainly, there are unique features of each emergency that may require some communications to be tailored to that event. PJM had pre-prepared lists of entities that it tailored when it informed the community in which the covered resources are located about the emergency order. Based on best practices, PJM may consider an annual review of their emergency communications protocol, in addition to administering automated message tests on an annual basis. Another best-practice for consideration would be to regularly review and confirm stakeholder contact information.

4.3.2 Create a Holding Statement

PJM could consider pre-prepared holding statements for emergency orders. In an emergency, when minutes count, saying “no comment” in the first wave of press coverage is not an option. To avoid a panic situation when crafting and securing internal approval for an initial response to media or community inquiries, the best practice is to have a holding statement ready.

The holding statement does not need to be lengthy, nor does it need to address all aspects of what the media is seeking. A few brief sentences grounded in accuracy, PJM’s values, and empathy should be the framework for the statement—and it should be issued quickly. Being timely is critical to controlling the narrative.

PJM may not have all the information they need, but they can let the media and public know that more information will be shared as it becomes available. This approach will buy PJM valuable time and buy them credibility with key reporters and important stakeholders. The key is to communicate that PJM is on top of the situation and not making the situation worse.

To implement this strategy, a set of holding statements that address the most likely issues or emergencies should be drafted and pre-cleared through leadership. This will compress the amount of time needed to modify and secure final approval for the statement when the emergency occurs.

Increasingly, organizations communicate directly with affected communities through social media. Similar holding statements created for social media channels and directed at these communities could be developed and pre-cleared through leadership.

4.3.3 Media and Stakeholder Monitoring

It is apparent that PJM established in advance of the emergency guidance on how media and community stakeholder monitoring would be executed. Once PJM executed its media plan, it started monitoring the media and communities’ responses.

It is vital that a protocol be established in advance of any significant issue or emergency that guides how media and stakeholder monitoring/listening will be executed. Being able to evaluate and review the statements and information being articulated by stakeholders and presented through media channels will inform sound decision making as to whether to issue a holding statement, conduct a press interview, post an update on social media—or not comment publicly.

Each monitoring report should capture and summarize the sources, key articles and stories, amplification, tone/sentiment, reach of the journalists and stakeholders, and patterns of coverage from one report to the next. As social media becomes increasingly important and by-passes

traditional media, it is also important to monitor the social media channels of communities affected by the emergency order.

4.3.4 Analyzing Effectiveness of Communication

It is apparent that PJM had a plan to analyze the effectiveness of its communication plan post-emergency. PJM tracked media requests, media interviews, social media impressions, unique users on its app, and drafted an analysis and recommendations report.

It is useful to analyze the effectiveness of communications and engagement during the emergency (as much as possible) and certainly after the event. During the emergency media coverage and stakeholder/community feedback on social media or through other channels will give PJM information on the effectiveness of its outreach. Such information received in a timely manner could allow for changes in outreach plans.

After an emergency, PJM should continue to evaluate the effectiveness of its outreach. How did the communities and stakeholders feel about the communications? Did they feel informed in a timely manner? Were all the people impacted reached with the information they needed? What was done well? What could have been better? New insights from this post-emergency analysis that lead to improvements should be incorporated into subsequent emergency outreach plans.

4.4 Conclusions

Based on ICF's review, PJM's community notice for DOE Order No. 202-22-4 was comprehensive and thorough. Outreach channels and tactics were quite sufficient, most likely reaching the majority of impacted PJM customers with timely emergency information.