CPV Keasbey, LLC
Keasbey Energy Center Project
(Facility ID 18940)

Air Quality Modeling Report
Section 5 – Air Quality Impact Analysis (Revised)

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5.0 AIR QUALITY IMPACT ANALYSIS

5.1 Regional Description

CPV Keasbey, LLC (CPV Keasbey) is proposing to construct a nominal 630-megawatt (MW) combined cycle power facility (to be known as the Keasbey Energy Center) on an approximately eleven (11) acre parcel of land controlled by CPV Shore Urban Renewal, LLC that will share a property boundary with CPV Shore, LLC's (CPV Shore) Woodbridge Energy Center in Woodbridge Township, Middlesex County, New Jersey (both facilities are shown on Figure 5-1). The CPV Keasbey facility (combustion turbine) will be fueled exclusively by natural gas. Ultra-low sulfur diesel (ULSD) will be used to fuel the emergency generator and diesel fire pump.

Existing land uses in the vicinity of the proposed site include industrial development, commercial development, neighborhood businesses, and residential neighborhoods. The nearest residential locations are approximately 0.8 miles (1.3 kilometers) to the northeast), along Sunnyview Oval immediately north of Route 440 and along King Georges Post Road immediately south of Route 440. Access to the property is provided directly from Riverside Drive.

The proposed facility site is located along the northwestern edge of the Atlantic Coastal Plain Province in New Jersey. Terrain elevations in this Province range from sea level to 391 feet above mean sea level (MSL), at Crawford Hill, Holmdel, New Jersey. Topography in the immediate area is generally flat, with elevations at sea level on the Raritan River and elevations rising upwards of and exceeding 200 feet in Fords, New Jersey. The elevation of the proposed facility site is approximately 22.5 feet above MSL.

The proposed facility single 160 foot high exhaust stack will be located at a grade elevation of 22.5 feet above mean sea level and at approximately 40° 30' 53" North Latitude, 74° 19' 16" West Longitude, North American Datum 1983 (NAD83). The approximate Universal Transverse Mercator (UTM) coordinates of the proposed facility stack are 557,515 meters Easting, 4,485,100 meters Northing, in Zone 18, NAD83. Figure 5-2 shows the Proposed Facility location and the surrounding area.

5.2 Background Ambient Air Quality

Background ambient air quality data was obtained from various approved existing monitoring locations. These monitors have been designed, sited, and operated in accordance with U.S. EPA monitoring guidelines in terms of quality assurance and quality control of the data collection and the reliability of the data itself which are outlined at the EPA's Report on the Environment website https://www.epa.gov/report-environment. This website documents the QA/QC components of the data collection process.

Based on review of the locations of NJDEP ambient air quality monitoring sites, the closest NJDEP monitoring sites were used to represent the current background air quality in the site area. Background data for CO and SO_2 was obtained from a New Jersey monitoring station located in in Union County (EPA AIRData #34-039-0004). The monitor is located at Interchange 13 on the New Jersey Turnpike (Elizabeth Lab), approximately 17 km northeast of the proposed facility. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for PM-10 was obtained from a Jersey City monitoring station located in Hudson County, New Jersey (EPA AIRData # 34-017-1003), approximately 32 km northeast of the proposed facility. The monitor is located at 355 Newark Avenue in a commercial/urban area. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for NO_2 was obtained from an East Brunswick monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 11 km west-southwest of the proposed facility. The monitor is located at Rutgers University (Veg. Research Farm #3 on Ryders Lane) in an agricultural/rural area with proximate commercial uses (i.e., Route 1 and Interstate 95). This monitor's close proximity to the Project site would qualify it to be representative of the ambient air quality within the project area.

Background data for PM-2.5 was obtained from an East Brunswick Township monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 10 km west-southwest of the proposed facility. The monitor is located at Rutgers University's Cook College (67 Ryders Lane) in an agricultural/rural area with proximate commercial uses. This monitor's close proximity would qualify it to be representative of the ambient air quality within the project area.

The monitoring data for the most recent three years (2017 – 2019) are presented and compared to the NAAQS in Table 5-1. The maximum measured concentrations for each of these pollutants during the last three years are all below applicable standards and will be used in the NAAQS analysis.

5.3 Preconstruction Ambient Air Quality Monitoring Exemption

Pursuant to the PSD regulations codified in 40 CFR 52.21, U.S. EPA may exempt a proposed PSD source, otherwise subject to the one-year pre-construction ambient monitoring requirement, if existing quality assured ambient air quality data are available from alternate locations that are representative of conditions at the proposed facility location.

TRC, on behalf of CPV Keasbey, LLC, prepared and submitted a preconstruction monitoring exemption request to the NJDEP for its review on July 12, 2016. A copy of this request is included in Appendix D. U.S. EPA Region II provided comments on this request on July 26, 2016. A copy of these comments is also included in Appendix D. TRC, on behalf of CPV Keasbey, LLC, prepared and submitted a response to the U.S. EPA Regions II's July 26, 2016 comments on the July 12, 2016 preconstruction ambient monitoring waiver request on March 30, 2017. A copy of this response is included in Appendix D. Note that while there has been additional activity within the region since 2016, the ambient background concentrations for all criteria pollutants are lower for the period from 2017-2019 from the period of 2013-2015. As such, the air quality in the area has improved since the issuance of preconstruction monitoring waiver in March of 2017.

5.4 Modeling Methodology

Air quality dispersion modeling was performed consistent with the procedures found in the following documents: Guideline on Air Quality Models (Revised) (U.S. EPA, 2017), New Source Review Workshop Manual (U.S. EPA, 1990), Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (U.S. EPA, 1992), Guidance on Preparing an Air Quality Modeling Protocol - Technical Manual 1002 (NJDEP, 2018), and the final version of the Keasbey Energy Center Air Quality Modeling Protocol submitted on February 18, 2021 and conditionally approved by the NJDEP on April 19, 2021.

The following methodology was incorporated into the assessment:

- Use of five (5) years (2013 – 2017) of concurrent meteorological data collected from a meteorological tower at Newark Liberty International Airport, approximately 22 km north-northeast of the proposed facility and from radiosondes launched from Brookhaven National Labs, New York, approximately 127 kilometers to the east of the proposed facility site. It should be noted that AERMOD model-ready surface and profile files were provided by NJDEP for use in the air quality modeling analyses;

- Load screening of the combustion turbine operating scenarios (with and without duct firing and with and without evaporative cooling) at the proposed Keasbey Energy Center firing natural gas to account for varying loads;

- Load screening of the combustion turbine operating scenarios (with and without duct firing and with and without evaporative cooling) at the existing Woodbridge Energy Center firing natural gas to account for varying loads; and,

- Modeling of plant startup/shutdown scenarios as well as modeling of auxiliary equipment (i.e., emergency equipment and auxiliary boilers) at both the existing Woodbridge and proposed Keasbey facilities.

The modeling methodology used for assessing the Proposed Facility's air quality impact is detailed in the following:

- Revised Air Quality Modeling Protocol (Revision 3) submitted to the NJDEP on February 18, 2021.

- NJDEP's conditional acceptance letter (dated April 19, 2021) of the final version of the Air Quality Modeling Protocol submitted on February 18, 2021.

A copy of NJDEP's conditional acceptance letter can be found in Appendix D.

5.4.1 Urban/Rural Area Analysis

A land cover classification analysis was performed to determine whether the urban source modeling option in AERMOD should be used in quantifying ground-level concentrations. The urban option in AERMOD accounts for the effects of increased surface heating on pollutant dispersion under stable atmospheric conditions. Essentially, the urban convective boundary layer forms in the night when stable rural air flows onto a warmer urban surface. The urban surface is warmer than the rural surface because the urban surface cools at a slower rate than the rural surface when the sun sets.

The USGS map (see Figure 5-3a) covering the area within a 3-kilometer radius of the site as well as the full modeling domain (20 kilometers by 20 kilometers) was reviewed and indicated that the majority of the surrounding area includes water, wooded areas, parks, and non-densely packed structures.

Additionally, the "AERMOD Implementation Guide" published on August 3, 2015 cautions users against applying the Land Use Procedure on a source-by-source basis and instead consider the potential for urban heat island influences across the full modeling domain. This approach is consistent with the fact that the urban heat island is not a localized effect, but is more regional in character.

Because the urban heat island is more of a regional effect, the Urban Source option in AERMOD will not be utilized since the area within 3 kilometers of the proposed site as well as the full modeling domain is not located in the New York City metropolitan area and thus, would not be subject to the New York City metropolitan area heat island.

The rural determination is further supported in an area coverage analysis of the United States Geological Survey (USGS) National Land Cover Dataset for 2011 (NLCD2011) (see Figure 5-3b). The percentages of each land use type (according to the Auer Land Use Classification Method) is as follows:

- I1/I2/C1 (Heavy Industrial/Light-moderate Industrial/Commercial): 16% (urban)
- R1 (Common Residential, low intensity): 19% (rural)
- R2/R3 (Compact Residential, high intensity): 25% (urban)
- R4/A1 (Estate Residential/Metropolitan Natural): 9% (rural)
- A3 (Undeveloped/Uncultivated/Wasteland): 15% (rural)
- A4 (Undeveloped/Rural): 5% (rural)
- A5 (Water Surfaces/Rivers/Lakes: 11% (rural)

Further, categories 23 (Developed, Medium Intensity) and 24 (Developed, High Intensity) are 25% and 16%, respectively, of the 3-kilometer radius area, for a total of 41% urban, with the remaining 59% classified as rural.

In order to properly characterize the land use, the classifications of canopy and impervious surface data layers should also be included. Figure 5-3c is included to present the composite land use classifications of impervious surfaces greater than 50% and canopy greater than 40%. In as much as the urban classifications represented by land use categories 23 and 24 are defined by percentage of impervious surface, the pixels for categories 23 and 24 (urban) are identical to impervious surface greater than 50%, and thus no further differentiation between urban or rural land use is provided.

Canopy does not define any other land use category and percent of canopy can be associated with any other category, with the exception of open water-11 and barren-31. Filtering the canopy pixels greater than 40% suggests that canopy would be associated with the vegetated (i.e., rural) categories. In this fashion canopy is already counted in undeveloped, light residential and agriculture land uses (defined as rural), and is not associated with the urban categories of 23 & 24. Therefore, use of canopy and impervious surface provide no additional differentiation between urban or rural land uses.

Population Density Method

Section 7.2.1.1 of the EPA's Guideline on Air Quality Models, Appendix W to 40 CFR Part 51, recommends that the land use classification be determined by use of either the land use procedure discussed above or the population density procedure. The population density procedure is utilized with the following methodology:

1. Compute the average population density (p) per square kilometer within a 3 km radius of the site; and
2. If (p) is greater than 750 people per square kilometer, use urban dispersion coefficients; otherwise use appropriate rural dispersion coefficients.

The population density within a 3-kilometer radius of the Project site was calculated to be 840 people per square kilometer, based on an analysis of the block groups within 3 kilometers of the site utilizing U.S. Census block group data for New Jersey. As such, the population density is slightly above (12%) of the established population density threshold for classification of the area as urban.

However, as indicated in Appendix W to 40 CFR Part 51, the land use procedure is considered the more definitive of the two procedures, and thus, the selection of a rural land use utilizing the land use procedure above is more definitive and accurate to the Project site. Thus, the selection of rural land use is consistent with Appendix W to 40 CRF Part 51 and was utilized in the modeling assessment.

5.4.2 Good Engineering Practice Stack Height

Section 123 of the Clean Air Act (CAA) required the United States Environmental Protection Agency (U.S. EPA) to promulgate regulations to assure that the degree of emission limitation for the control of any air pollutant under an applicable State Implementation Plan (SIP) was not affected by (1) stack heights that exceed GEP or (2) any other dispersion technique. The U.S. EPA provides specific guidance for determining GEP stack height and for determining whether building downwash will occur in the Guidance for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations), (U.S. EPA, 1985). GEP is defined as "...the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes that may be created by the source itself, or nearby structures, or nearby terrain "obstacles"."

The GEP definition is based on the observed phenomenon of atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) are avoided. The U.S. EPA GEP stack height regulations (40 CFR 51.100) specify that the GEP stack height (H_{GEP}) be calculated in the following manner:

$$H_{GEP} = H_B + 1.5L$$

Where: H_B = the height of adjacent or nearby structures at ground elevation, and

L = the lesser dimension (height or projected width of the adjacent or nearby structures).

A general arrangement site plan of the proposed Keasbey Energy Center and the existing Woodbridge Energy Center is provided as Figure 5-4. A GEP stack height analysis has been conducted using the U.S. EPA approved Building Profile Input Program with PRIME (BPIPPRM, version 04274). GEP analysis tables can be found in Tables 5-2a and 5-2b. The controlling structure is the HRSG at a height of 94 feet above ground surface grade, resulting in a formula GEP height of 235 feet above grade. It should be noted that blocks or outlines exist on the general arrangement site plan in Figure 5-4 which may be interpreted as being physical "structures" which may affect the building downwash calculations. This is not a correct interpretation of the site plan, and generally, such outlines represent the locations of open pads or equipment enclosures. Where not otherwise specified on the general arrangement site plan, any such "structures" would be less than 35 feet above grade and are not of sufficient height to affect the BPIPPRM calculations for the emission units being assessed. Further, this statement is included as Note 10 in the legend of the general arrangement site plan in Figure 5-4.

Since a non-GEP stack is proposed, direction-specific downwash parameters for the combustion turbine exhaust stack were determined using BPIPPRM, version 04274. Direction-specific downwash parameters for the additional Keasbey auxiliary equipment exhaust stacks that were modeled (i.e., auxiliary boiler, emergency equipment, and cooling tower) were also determined using BPIPPRM, version 04274. Further, direction-specific downwash parameters for the two (2) existing combustion turbines, auxiliary boiler, emergency equipment, and cooling tower at Woodbridge Energy Center were also determined using BPIPPRM, version 04274. Direction-specific building downwash parameters were input to the PSD modeling analysis.

5.4.3 Model Selection

The U.S. EPA has compiled a set of preferred and alternative computer models for the calculation of pollutant impacts. The selection of a model depends on the characteristics of the source, as well as the nature of the surrounding study area. Of the four classes of models available, the Gaussian type model is the most widely used technique for estimating the impacts of nonreactive pollutants.

The AERMOD model was designed for assessing pollutant concentrations from a wide variety of sources (point, area, and volume). AERMOD is currently recommended for modeling studies in rural or urban areas, flat or complex terrain, and transport distances less than 50 kilometers, with one hour to annual averaging times.

AERMOD (version 19191) was used for the PSD modeling of the proposed and existing facilities potential emissions to determine the maximum ambient air concentrations. The regulatory default option was used in the dispersion modeling analyses.

5.4.4 Meteorological Data

Five (5) years (2013 – 2017) of concurrent meteorological data collected from a meteorological tower at Newark Liberty International Airport, approximately 22 km north-northeast of the proposed facility and from radiosondes launched from Brookhaven National Labs, New York, approximately 127 kilometers to the east of the proposed facility were used to create the meteorological dataset (using AERMOD's meteorological processor, AERMET/AERMINUTE version 18081) required for the modeling analyses. The profile base elevation (PROFBASE) in AERMOD has been set to 3.0 meters, which, per the Department, corresponds to the base elevation of the anemometer of the meteorological tower at Newark Liberty International Airport. A wind rose displaying the composite wind rose for all five (5) years of wind speed and wind direction for the Newark Liberty International Airport is shown in Figure 5-5.

5.5 Receptor Grid

Part of the AERMOD package, the receptor-generating program, AERMAP (version 11103) was used to develop a complete 20 km (east-west) x 20 km (north-south) rectangular (i.e., Cartesian) receptor grid (e.g., fine grid receptors $\leq$ 100 meters), centered on the proposed facility, to assess the air quality impact. AERMOD requires receptor data consisting of location coordinates and ground-level elevations. AERMAP uses digital elevation model (DEM) or the National Elevation Dataset (NED) data obtained from the USGS. The preferred elevation dataset based on NED data was used in AERMAP to process the receptor grid. This is currently the preferred data to be used with AERMAP as indicated in the U.S. EPA AERMOD Implementation Guide published on August 3, 2015. AERMAP was run to determine the representative elevation for each receptor using 1/3 arc second NED files that were obtained for an area covering at least 10 kilometers in all directions from the proposed facility. The NED data were obtained through the Multi-Resolution Land Characteristic Consortium (MRLC) link at http://www.mrlc.gov/viewerjs/.

The following rectangular (i.e. Cartesian) receptors were used to assess the air quality impact of the proposed facility:

- Fine grid receptors (100 meter spacing) for a 20 km (east-west) x 20 km (north-south) grid centered on the proposed facility site (see Figure 5-6).

Receptors were also placed along the facility fence line or property boundary every 25 meters. Ambient air is defined as the area at and beyond the fence. Receptors within the fenced plant property were excluded from the grid since public access will be restricted in this area. At the NJDEP's request, additional model runs were executed with additional receptors with a spacing of 50 meters placed in the area of maximum impacts, unless the area of maximum impact was located among the more refined 25-meter spaced fence line receptors. It should be noted that specifically for the purpose of determining the area of impact for 1-hour NO_2 during startup/shutdown operations, two additional receptor grids were created. Figure 5-7 illustrates the 250-meter spaced receptors out to 25 km and Figure 5-8 illustrates the 500-meter spaced receptors out to 50 km.

At the Department's request, elevated receptors were placed at the Fresh Kills Landfill on Staten Island, New York. Data from the New York City Department of City Planning was used to accurately define elevations in this area. A total of 29 receptors within the current modeling domain were adjusted to reflect the final contours of the landfill piles, while 6 additional receptors were added corresponding to the highest point at each of the 6 major landfill piles. For these 35 receptors, it was necessary to adjust the "scale height" parameter, as AERMOD will not accept a receptor with a "scale height" value that is less than the elevation of the receptor. As such, the "scale height" parameter was set equal to the receptor elevation for these receptors. A list of the 35 Fresh Kills Landfill receptors is provided in Table 5-2c.

5.6 Source Parameters, Worst Case Load, and Operating Scenario Determination

The Keasbey Energy Center will consist of one (1) General Electric (GE) 7HA.02 combustion turbine at the proposed facility site. The maximum heat input for this turbine firing natural gas (BACT assumes sulfur in fuel is 0.75 grains/100 SCF at 1,024 Btu/SCF) at -8 degrees Fahrenheit (deg F) is 3,664 million British Thermal Units per hour (mmBTU/hr), Higher Heating Value (HHV). Hot exhaust gases from the combustion turbine will flow into an adjacent heat recovery steam generator (HRSG) that will be equipped with a natural gas fired duct burner. The maximum duct burner heat input capacity firing natural gas is 850 million British thermal units per hour (MMBtu/hr) based on the Higher Heating Value (HHV). The HRSG will produce steam to be used in the steam turbine. Upon leaving the HRSG, the turbine exhaust gases will be directed to one (1) exhaust stack. Other ancillary equipment at the proposed facility will include a gas-fired auxiliary boiler, an emergency diesel fire pump, an emergency diesel generator, and a wet mechanical draft cooling tower. The auxiliary boiler is sized up to 72.3 mmBtu/hr, will fire natural gas exclusively, and operate for up to 4,000 hours per year. The emergency diesel fire pump is sized up to 2.3 mmBtu/hr (305 hp), will fire ULSD, and operate up to 100 hours per year for testing and maintenance. The emergency diesel generator is sized up to 14.4 mmBtu/hr, will fire ULSD, and operate up to 100 hours per year for testing and maintenance.

CPV Keasbey is proposing to utilize natural gas as the primary fuel for the combustion turbine at Keasbey Energy Center. The natural gas is assumed to have a HHV of 1,024 Btu/standard cubic foot (scf) and an estimated sulfur content of 0.75 grains per 100 scf. Natural gas sulfur content data was reviewed for the TETCO and TRANSCO gas suppliers. The TETCO data spans from October 1, 2013 to October 18, 2016, a period slightly more than three years. The TRANSCO data spans June 1, 2014 through June 7, 2016, a period slightly more than two years. This data also supplements the TRANSCO sulfur content data previously provided to the Bureau of Stationary Sources. The CPV Keasbey facility proposes to use either TRANSCO or TETCO gas supply.

The maximum daily sulfur content for either data is 0.55 grains/100 SCF, which is consistent with the maximum value of 0.75 grains/100 SCF used for the Keasbey Energy Center facility permitting. The period average is about 0.2 grains/100 SCF. However, there are notable spikes in sulfur content throughout the period, namely 0.63 grains/100 SCF presented in a prior set of data (provided to the Department), and at 0.55, 0.49, 0.385, and 0.372 in the current data sets. This demonstrates that spikes in sulfur content can and do occur within the gas supply and must be accounted for in the permitting process. As such, 0.75 is selected as the worst case sulfur content for short term sulfur dioxide emissions and for the combustion turbine performance. Note that while 0.75 grains S/100 SCF is the design basis sulfur content based on historical data, the actual natural gas sulfur content for gas to be supplied to the facility is wholly out of the control of CPV Keasbey.

Emissions from the combined cycle unit will be controlled by the use of dry low-NO_x burner technology and SCR for NO_x control; an oxidation catalyst for CO and VOC control; and the use of a clean low-sulfur fuel (i.e., natural gas) to minimize emissions of SO_2, PM/PM-10/PM-2.5, and H_2SO_4. Steam from the steam turbine will be sent to a condenser where it will be cooled to a liquid state and returned to the HRSG. Waste heat from the condenser will be dissipated through the wet mechanical draft cooling tower.

The existing Woodbridge Energy Center consists of two (2) General Electric (GE) 7FA.05 combustion turbines. The maximum heat input for each turbine firing natural gas is 2,307 million British Thermal Units per hour (mmBTU/hr), Higher Heating Value (HHV). Hot exhaust gases from each of the combustion turbines flow into adjacent heat recovery steam generators (HRSGs) that are equipped with natural gas fired duct burners. The maximum duct burner heat input capacity firing natural gas (for each duct burner) is 500 million British thermal units per hour (MMBtu/hr) based on the Higher Heating Value (HHV). The HRSGs produce steam to be used in the steam turbine. Upon leaving the HRSGs, the turbine exhaust gases are directed to two (2) exhaust stacks. Other ancillary equipment at the existing Woodbridge Energy Center includes a gas-fired auxiliary boiler, an emergency diesel fire pump, an emergency diesel generator, and a wet mechanical draft cooling tower. The auxiliary boiler is sized to 91.6 mmBtu/hr, fires natural gas exclusively, and operates for up to 2,000 hours per year. The emergency diesel fire pump is sized to 2.1 mmBtu/hr, fires ULSD, and operates up to 100 hours per year for testing and maintenance. The emergency diesel generator is sized to 13.5 mmBtu/hr, fires ULSD, and operates up to 100 hours per year for testing and maintenance.

Emissions from the combined cycle units are controlled by the use of dry low-NO_x burner technology (during natural gas firing) and SCR for NO_x control; an oxidation catalyst for CO and VOC control; and the use of a clean low-sulfur fuel (i.e., natural gas) to minimize emissions of SO_2, PM/PM-10/PM-2.5, and H_2SO_4. Steam from the steam turbine is sent to a condenser where it is cooled to a liquid state and returned to the HRSGs. Waste heat from the condensers is dissipated through the 14-cell wet mechanical draft cooling tower.

5.6.1 Modeling Emission Parameters (Keasbey Energy Center)

Exhaust characteristics of the turbine/heat recovery steam generator stack during different operating scenarios are provided in Table 5-3. Exhaust parameters are presented for gas firing at three (3) ambient temperatures (-8 degrees Fahrenheit, 59 degrees Fahrenheit, and 105 degrees Fahrenheit), five (5) loads (30%, 46%, 50%, 75%, and 100%), and operating conditions for HRSG duct firing. Table 5-4 presents the potential emission rates for each of the operating scenarios. In addition, emission rates and stack parameters are presented for evaporative cooling during natural gas operation at 100% load. Thus, emission rates and stack parameters for sixteen (16) ambient temperatures and load combinations were used to determine the "worst-case" operating scenario for the turbine.

Tables 5-5 to 5-7 present the stack parameters and emission rates for the auxiliary boiler, emergency diesel fire pump, and emergency diesel generator, respectively. For the proposed emergency diesel generator and emergency diesel fire pump at the Keasbey Energy Center, CPV is proposing to operate each unit up to 100 hours per year, the same conditions that exist for the emergency diesel generator and emergency diesel fire pump at the Woodbridge Energy Center. The emergency diesel generator and emergency diesel fire pump are not expected to be tested more than once per week (with test durations expected to be limited by permit condition to no more than 30 minutes).

Additionally, Table 5-8 presents the stack parameters and PM-10/PM-2.5 emission rates for the wet mechanical draft cooling tower at the proposed Keasbey Energy Center. According to NJDEP guidance found in the Technical Manual 1002: Guidance on Preparing an Air Quality Modeling Protocol (NJDEP, December), the mechanical draft cooling towers at both Woodbridge and Keasbey were included in the modeling analysis for PM-10/PM-2.5 standards compliance since the total PM-10/PM-2.5 emission rate from the towers are greater than 1.0 pound per hour. Since the total combined PM-10 emission rate from both towers is greater than 1.0 pound per hour, both cooling towers were included in the modeling analysis for PM-10 standards compliance. Further, since the total combined PM-2.5 emission rate from both towers is also greater than 1.0 pound per hour, both cooling towers were included in the modeling analysis for PM-2.5 standards compliance. Table 5-9 presents the location coordinates for the proposed wet mechanical draft cooling tower at Keasbey. Additionally, Tables 5-10 and 5-11 present the exhaust parameters, particulate emission rates, and location coordinates for the existing wet mechanical draft cooling tower at the Woodbridge Energy Center.

The air permit application assumes that the Process Water Supply will come from treated effluent from the Middlesex County Utilities Authority (MCUA) and will be the source of the cooling tower water. The particulate matter emissions from the cooling tower are calculated using AP-42 emission factors which includes the circulating water rate, quantity of liquid water drift and the concentration of total dissolved solids (TDS) within the circulating water. Note that there will be no dissolved organic compounds within the effluent and as such there will be no VOC emissions anticipated from the cooling tower. The TDS concentration within the cooling tower circulating water is managed operationally using conductivity as a surrogate for TDS and by increasing or decreasing the cooling tower blowdown rate. This is controlled automatically based on the level set by the control room operator. Tower blowdown is a side-stream of the circulating water that is directed to the wastewater discharge. Increasing the blowdown rate will cause a decrease in the circulating water TDS concentration since a greater flow of lower TDS makeup water is added to the tower. While the makeup water has a fairly low TDS, it is not entirely constant and, as such, monitoring the circulating water TDS and controlling the blowdown rate provide a reliable method for maintaining a constant circulating water TDS.

In order to minimize makeup water flow, the circulating water TDS set point can be set high, which causes a lower blowdown rate. Conversely, in order to minimize tower drift particulate, the circulating water TDS can be set lower, causing the makeup water rate to be increased to a level that will balance the reduced particulate emissions. The tradeoff is with the operating cost of increased makeup water usage.

Since AP-42 does not account for PM-2.5 emissions, the total particulate matter emission rate is separated into PM-10 and PM-2.5 fractions using a droplet size distribution representative of a wet cooling tower using a high-efficiency drift eliminator. The droplet size distribution represents the total liquid drift from the tower, of which, when the droplets evaporate (assumed to be essentially immediately), will form total suspended particulate (TSP). The fractions of PM-10 and PM-2.5 were estimated using the calculation method posited by Reisman and Frisbie (Reisman, J., and Frisbie, G. 2002, Calculating Realistic PM10 Emissions from Cooling Towers, Abstract No. 216 presented at the 2001 94th Annual Air and Waste Management Association Conference and Exhibition in Orlando, Florida, June 25th to 28th). The particle size calculation methodology is based on the Reisman and Frisbie formulas. Note that this method of particulate matter fractionation is endorsed by many regulatory agencies and is included in certain agency air quality modeling guidance documents. As can be demonstrated in the worksheet, the PM-10 and PM-2.5 fractions are calculated using a linear interpolation of the evaporated drift droplet particulates. For reference purposes, the particle size calculation worksheet and the droplet size distribution for an industry standard high efficiency drift eliminator is included in Appendix D.

5.6.2 Modeling Emission Parameters (Woodbridge Energy Center)

The equipment from the existing Woodbridge Energy Center that was included in the air dispersion modeling demonstration included the two (2) combustion turbines, the auxiliary boiler, the emergency diesel fire pump, the emergency diesel generator, and the 14-cell wet mechanical draft cooling tower. The coordinates of the Woodbridge emission units reflect their true "as-built" locations which are presented on the General Arrangement Site Plan in Figure 5-4. Exhaust characteristics of the turbine/heat recovery steam generator stacks during different operating scenarios are provided in Table 5-12. Exhaust parameters are presented for natural gas firing at three (3) ambient temperatures (-8 degrees Fahrenheit, 56 degrees Fahrenheit, and 105 degrees Fahrenheit), three (3) loads (50%, 75%, and 100%), and operating conditions for HRSG duct firing. Table 5-13 presents the potential emission rates for each of the operating scenarios. In addition, emission rates and stack parameters are presented for evaporative cooling during natural gas operation. Thus, emission rates and stack parameters for fourteen (14) ambient temperatures and load combinations were used to determine the "worst-case" operating scenario for the turbines.

Table 5-10 provides exhaust parameters and particulate matter emission rates for the existing wet mechanical draft cooling tower. Exhaust parameters and emissions rates for the existing auxiliary boiler stack are provided in Table 5-14. Tables 5-15 and 5-16 provide exhaust parameters and emission rates for the existing emergency diesel fire pump and existing emergency diesel generator, respectively. The existing emergency diesel generator and emergency diesel fire pump at the Woodbridge Energy Center are each permitted to operate up to 100 hours per year. These permit conditions will remain the same. The emergency diesel generator and emergency diesel fire pump are not tested more than once per week (with test durations limited by permit condition to no more than 30 minutes).

5.6.3 NO_2 Modeling

The air quality modeling analysis for the 1-hour NO_2 NAAQS was performed consistent with the guidance and procedures established in the revised "Guideline on Air Quality Models" (January 17, 2017), the September 30, 2014 guidance memorandum titled "Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 NAAQS", and the March 1, 2011 guidance memorandum from Tyler Fox (EPA OAQPS) titled "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 NAAQS" (Memorandums). Based upon the discussion in the memorandums regarding the treatment of intermittent sources, the only equipment or operating scenarios that "are continuous or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations" were included in the 1-hour NO_2 modeling analysis.

This methodology, per the examples provided in the Memorandums, would exempt any facility equipment or operating scenarios from 1-hour NO_2 compliance modeling that does not operate on a normal daily or routine schedule. For example, the emergency diesel generators and emergency diesel fire pumps are not expected to be tested more than once per week (with test durations limited by permit condition to no more than 30 minutes) and are not expected to contribute significantly to the annual distribution of maximum 1-hour concentrations. For these reasons, and consistent with the Memorandums, the 1-hour NO_2 modeling did not include the emergency diesel generators and emergency diesel fire pumps.

Further, the emergency diesel generators and emergency diesel fire pumps at both Woodbridge and Keasbey were not included in the 1-hour SO_2 and 1-hour NO_2 modeling analyses, per the exemption as defined in the July 29, 2011 policy memorandum issued by NJDEP exempting emergency generator and fire pump NO_x and SO_2 emissions from 1-hour NO_2 and SO_2 air quality modeling at combined cycle turbine facilities. CPV has already agreed to the permit conditions contained in the aforementioned July 29, 2011 policy memorandum for the emergency diesel fire pump and emergency diesel generator at the existing Woodbridge Energy Center and proposes to agree to the same conditions for the Keasbey Energy Center. It should be noted that these permit conditions do not allow for the simultaneous testing of emergency generators and/or fire pumps and limit the durations of the test operations to no more than 30 minutes. Readiness testing of emergency equipment generally occurs approximately once per week.

The other combustion sources at Woodbridge (combustion turbines and auxiliary boiler) and Keasbey (combustion turbine and auxiliary boiler) were included in the 1-hour NO_2 modeling analyses. As previously discussed, startup and shutdown conditions that are expected to contribute to the annual distribution of daily maximum concentrations due to their frequency on a yearly basis were included in the air quality modeling analysis for the 1-hour NO_2 standard.

The following screening options were applied for the various analyses per the guidance specified in the "Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter", published final in the Federal Register on January 17, 2017, and the U.S. EPA Memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" section entitled Approval and Application of Tiering Approach for NO_2 (found on pages 5 through 8 of the memorandum).

Section 5.2.4 of the EPA's Guideline on Air Quality Models, Appendix W to 40 CFR Part 51, recommends a three-tiered screening approach to estimate ambient concentrations of NO_2:

- Tier 1 – assume complete conversion of all emitted NO to NO_2
- Tier 2 – multiply Tier 1 results by a representative equilibrium NO_2/NO_x ratio
- Tier 3 – perform a detailed analysis on a case-by-case basis.

The 1-hour NO2 modeling analysis utilized the U.S. EPA Tier 3 modeling approach for 1-hour NO_2 modeling assessment results using the AERMOD Plume Volume Molar Ratio Method (PVMRM) that adjusts NOx emissions to estimate more realistic ambient NO_2 concentrations by modeling the conversion of NO_x to NO_2. Note that the Tier 2 screening approach using the Ambient Ratio Method 2 (ARM2) is too conservative for this Project.

PVMRM incorporates three sets of data into the calculation of 1-hour NO_2 concentrations. Those are source-specific in-stack NO_2/NO_x emission rate ratios, an ambient NO_2/NO_x concentration ratio, and hourly average background ozone concentrations.

The PVMRM option for modeling conversion of NO to NO_2 incorporated a default NO_2/NO_x ambient equilibrium concentration ratio of 0.90.

5.6.4 In Stack NO2/NOx Concentration Ratio

NO_x consists primarily of nitric oxide (NO) and NO_2, plus small amounts of other compounds. Combustion sources produce NOx by the following three mechanisms:

1. Thermal NOx is produced by the thermal dissociation and subsequent reaction of nitrogen and oxygen (O2) molecules in the combustion air;

2. Fuel NOx is produced by the reaction of fuel-bound nitrogen compounds with O2 molecules in the combustion air; and,
3. Prompt NOx is produced by the formation of hydrogen cyanide (HCN) via the reaction of nitrogen radicals and hydrocarbons (HC), followed by the oxidation of HCN to NO.

NO_2 is produced by the oxidation of NO by O2. This oxidation reaction is favored by a high O2 concentration. Since the reaction is exothermic, NO_2 formation is also favored by low temperature. Hence, rapid cooling of combustion products in the presence of a high O2 concentration will promote conversion of NO to NO_2. Essentially all of the NO_x formed by natural gas and distillate oil combustion sources is thermal NOx because these fuels have little or no chemically bound fuel nitrogen. NOx from fuel combustion typically consists of 90 to 95 percent NO. The balance is primarily NO_2.

The modeling analysis for the facility equipment conservatively utilized the national default in-stack NO_2/NO_x ratio of 0.5.

5.6.5 1-hour NO_2 Background Concentrations

Pollutant background concentrations are required to appropriately assess the ambient air quality concentrations that may contribute to the total ambient pollutant concentrations. Background concentrations are added to model-predicted concentrations to calculate the total concentrations for comparison to the NAAQS. Criteria pollutant background concentration values are derived from ambient air quality data monitored at stations that are determined to be representative of expected background concentrations at the proposed source location and potential impact area. In order to conduct cumulative impact analyses, background values must be combined with modeled results to compare to the 1-hour NO_2 NAAQS.

Based on review of the locations of NJDEP ambient air quality monitoring sites, the closest “regional” NJDEP monitoring site were used to represent the current background NO_2 air quality in the site area. Background data for NO_2 from 2016 – 2018 was obtained from a monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 11 km west-southwest of the Proposed Facility.

The monitor is located at the Rutgers University (Veg. Research Farm #3 on Ryders Lane) in an agricultural/rural area with proximate commercial uses (i.e., Route 1 and Interstate 95). This monitor’s close proximity to the Project site qualifies it to be representative of the ambient air quality within the project area.

It should be noted that the 2017 – 2019 time period was initially examined. However, due to poor data capture in 2019 per review of the NJDEP provided data for the monitoring station, this year was not used. Therefore, the time period of 2016 – 2018 was used. Seasonal data availability for NO_2 at Rutgers University from 2016 – 2018 was as follows:

- Winter: 2016 (97.6%), 2017 (98.1%), 2018 (97.7%)
- Spring: 2016 (97.7%), 2017 (97.3%), 2018 (98.1%)
- Summer: 2016 (97.9%), 2017 (98.1%), 2018 (98.1%)
- Fall: 2016 (97.8%), 2017 (97.7%), 2018 (96.9%)

The March 1, 2011 Fox memorandum provides guidance for incorporating background concentrations in the impact assessment for the 1-hour NO2 standard.

> *"We believe that an appropriate methodology for incorporating background concentrations in the cumulative impact assessment for the 1-hour NO2 standard would be to use multiyear average of the 98th-percentile of the available background concentrations by season and hour-of-day…"*

> *"…we recommend that background values by season and hour-of-day used in the context should be based on the 3rd highest values for each season and hour of day combination…"*

This seasonal and hour of day methodology was used. The background values were first divided by season for each year. Those seasonal groups were further binned into 24-hour groups for a total of 96 bins of values (product of 4 seasons and 24 hours) for each year (2016, 2017, and 2018). The 3rd highest value from each bin was found per year. Finally, to obtain the values to be summed with the modeled concentrations, the average of those 3rd highest values was taken over three (3) years. This results in 96 values proposed to be used in the modeling analysis. The AERMOD model option (keyword BACKGROUND) was used to sum each modeled concentration with the background concentration that was calculated for that season and hour-of-day.

5.6.6 Hourly Average Background Ozone Concentrations

Based on review of the locations of NJDEP ambient air quality monitoring sites, the closest "regional" NJDEP monitoring site was used to represent the current background ozone air quality in the site area. Representative hourly average background ozone concentrations were input to AERMOD. The ozone monitors closest to the Proposed Facility site have been identified. After reviewing their locations and periods of record, a Middlesex County monitor was chosen to represent the ozone background values during the five (5) year period 2013 –

2017, concurrent with the five (5) years of surface meteorological data. This monitor is listed below.

- Middlesex County – Rutgers University (Veg. Research Farm #3), approximately 11 km west-southwest, EPA AIRData # 34-023-0011.

Ozone data availability at the Rutgers University monitor during each of the aforementioned years is as follows:

- 2013: 99%
- 2014: 98%
- 2015: 78%
- 2016: 94%
- 2017: 92%

The Rutgers University monitor was also used to represent background NO_2 concentrations. Since both datasets were used in the NO_2 air quality analysis, this monitor is preferable and appropriate to use for ozone background representation. When ozone data was missing from the Rutgers University monitor, missing hours will be substituted using the monitor hierarchy below. This hierarchy favored proximity to the Proposed Facility site, high capture rate monitors, and monitors with "general/background" or "population exposure" monitoring objectives.

- Hudson County – Bayonne, approximately 22 km away, EPA AIRData # 34-017-0006.
  - Ozone data availability at the Bayonne monitor during each of the aforementioned years is as follows:
    - 2013: 55%; 2014: 98%; 2015: 99%; 2016: 99%; 2017: 98%
- Essex County – Newark Firehouse, approximately 24 km away, EPA AIRData # 34-013-0003.
  - Ozone data availability at the Newark Firehouse monitor during each of the aforementioned years is as follows:
    - 2013: 98%; 2014: 98%; 2015: 99%; 2016: 97%; 2017: 98%
- Hunterdon County – Flemington, approximately 41 km away, EPA AIRData # 34-019-0001.
  - Ozone data availability at the Flemington monitor during each of the aforementioned years is as follows:
    - 2013: 99%; 2014: 99%; 2015: 98%; 2016: 91%; 2017: 91%
- Mercer County – Rider University, approximately 45 km away, EPA AIRData # 34-021-0005.

- Ozone data availability at the Rider University monitor during each of the aforementioned years is as follows:
  - 2013: 99%; 2014: 99%; 2015: 97%; 2016: 95%; 2017: 94%

5.6.7 Secondary Formation of PM-2.5

PM-2.5 is emitted directly from the Project emissions sources and formed in the atmosphere from Project PM-2.5 precursor emissions (NO_x and SO_2). Therefore, to account for the total air quality impact of PM-2.5, the modeled concentrations of primary PM-2.5 from the Project sources should be summed with a conservative concentration representative of PM-2.5 formed from Project PM-2.5 precursor emissions. Appropriate secondary PM-2.5 concentrations were determined based on the Project emissions and the air quality modeling results included in the U.S. EPA's Modeled Emission Rates for Precursors (MERPs) guidance (April 30, 2019), as described in the following paragraphs.

For the 24-hour averaging period, the PM-2.5 impacts from secondary formation were based on the daily 24-hour impact from a hypothetical NO_x source and a hypothetical SO_2 source that were identified from multiple model simulation results contained in the U.S. EPA MERPs guidance. For NO_x, the eastern US (EUS) hypothetical source located at Bronx County, New York (source #5) with a surface release (L), annual NO_x emissions of 500 tons per year (tpy), and a maximum impact of 0.02 $\mu g/m^3$ was used.

Data showing the effects of primary NOx and SOx gaseous releases on secondary particulate formation downwind from a hypothetical source located in the Bronx, in the Greater New York area, were obtained from U.S. EPA (https://www.epa.gov/scram/merps-view-qlik). The Bronx hypothetical source is in an urban area within the Greater New York City area (the Bronx) and is the most representative of secondary formation expected from the facility compared to other available hypothetical sources in the Eastern U.S.

The Bronx, NY source is located approximately 48 km to the northeast of the facility in an area that is proximate to urban levels of air pollution due to industrial, commercial, and mobile sources of air pollution within the Greater New York City area. The next closest hypothetical source to the proposed project site is located in Warren, NJ at a distance of approximately 80 km to the northwest. This source is located in a rural area with significantly lower levels of industrial, commercial, and mobile source air emissions than the proposed project site. In addition, the base elevation and meteorological conditions at the Bronx, NY source location are more representative of the Project site than the conditions at the Warren, NJ source. The Bronx, NY source is located at 65 feet above MSL with proximity to the Atlantic Ocean influences while the Warren, NJ source location is located at 843 feet above MSL in elevated terrain without the influences of the Atlantic Ocean on the local meteorological conditions.

The proposed facility site is located along the northwestern edge of the Atlantic Coastal Plain Province in New Jersey, and the elevation of the proposed facility site is approximately 22.5 feet above MSL. The topography in the immediate area is generally flat, with elevations at sea level on the Raritan River and elevations rising upwards of and exceeding 200 feet in Fords, New Jersey. As such, the meteorological conditions, base elevation, regional emissions, and background concentrations at the Bronx, NY source location are the most representative of the proposed facility site for the hypothetical sources provided by U.S. EPA.

Therefore, the estimated impact on the 24-hour secondary PM-2.5 formation from the Project's (Keasbey Energy Center) NO_x emissions was determined as follows:

(143.2 tpy NO_x from Project/500 tpy NO_x) × 0.02 μg/m^3 = 0.006 μg/m^3 PM-2.5 concentration

The estimated impact on the 24-hour secondary PM-2.5 formation from the Project's (Keasbey Energy Center and Woodbridge Energy Center combined) NO_x emissions was determined as follows:

(291.1 tpy NO_x from Project/500 tpy NO_x) × 0.02 μg/m^3 = 0.011 μg/m^3 PM-2.5 concentration

For SO_2, the EUS hypothetical source located at Bronx County, New York (source #5) with a surface release (L), annual SO_2 emissions of 500 tpy, and a maximum impact of 0.15 μg/m^3 was used. Therefore, the estimated impact on the 24-hour secondary PM-2.5 formation from the Project's (Keasbey Energy Center) SO_2 emissions was determined as follows:

(40.5 tpy SO_2 from Project/500 tpy SO_2) × 0.15 μg/m^3 = 0.0125 μg/m^3 PM-2.5 concentration

The estimated impact on the 24-hour secondary PM-2.5 formation from the Project's (Keasbey Energy Center and Woodbridge Energy Center combined) SO_2 emissions was determined as follows:

(51.7 tpy SO_2 from Project/500 tpy SO_2) × 0.15 μg/m^3 = 0.0155 μg/m^3 PM-2.5 concentration

As a result, the estimated total impact on the 24-hour secondary PM-2.5 formation is based on the combined concentrations from NO_x and SO_2 secondary formation. This concentration of 0.019 ug/m^3 was added to the Keasbey Energy Center 24-hour PM-2.5 model results in order to accurately capture the total PM-2.5 impacts from the Project. The concentration of 0.027 ug/m^3 was added to the Keasbey Energy Center and Woodbridge Energy center combined 24-hour PM-2.5 model results in order to accurately capture the total PM-2.5 impacts from the Project.

For the annual averaging period, this analysis was based on the annual average impact from a hypothetical NO_x source and a hypothetical SO_2 source that were identified from multiple model simulation results contained in the U.S. EPA MERPs guidance. For NO_x, the eastern US (EUS) hypothetical source located at Bronx County, New York (source #5) with a surface release (L), annual NO_x emissions of 500 tpy, and a maximum impact of 0.001 $\mu g/m^3$ was used. Therefore, the estimated impact on the annual secondary PM-2.5 formation from the Project's (Keasbey Energy Center) NO_x emissions was determined as follows:

(143.2 tpy NO_x from Project/500 tpy NO_x) × 0.001 $\mu g/m^3$ = 0.0003 $\mu g/m^3$ PM-2.5 concentration

The estimated impact on the annual secondary PM-2.5 formation from the Project's (Keasbey Energy Center and Woodbridge Energy Center combined) NO_x emissions was determined as follows:

(291.1 tpy NO_x from Project/500 tpy NO_x) × 0.001 $\mu g/m^3$ = 0.0006 $\mu g/m^3$ PM-2.5 concentration

For SO_2, the EUS hypothetical source located at Bronx County, New York (source #5) with a surface release (L), annual SO_2 emissions of 500 tpy, and a maximum impact of 0.008 $\mu g/m^3$ was used. Therefore, the estimated impact on the annual secondary PM-2.5 formation from the Project's (Keasbey Energy Center) SO_2 emissions was determined as follows:

(40.5 tpy SO_2 from Project/500 tpy SO_2) × 0.008 $\mu g/m^3$ = 0.0006 $\mu g/m^3$ PM-2.5 concentration

The estimated impact on the annual secondary PM-2.5 formation from the Project's (Keasbey Energy Center and Woodbridge Energy Center combined) SO_2 emissions was determined as follows:

(51.7 tpy SO_2 from Project/500 tpy SO_2) × 0.008 $\mu g/m^3$ = 0.0008 $\mu g/m^3$ PM-2.5 concentration

As a result, the estimated total impact on the annual secondary PM-2.5 formation is based on the combined concentrations from NO_x and SO_2 secondary formation. This concentration of 0.0009 ug/m^3 was added to the Keasbey Energy Center annual PM-2.5 model results in order to accurately capture the total PM-2.5 impacts from the Project. The concentration of 0.0014 ug/m^3 was added to the Keasbey Energy Center and Woodbridge Energy center combined annual PM-2.5 model results in order to accurately capture the total PM-2.5 impacts from the Project.

5.6.8 Combustion Turbine Load Screening Modeling Analysis (Keasbey Energy Center)

To determine the worst case operating scenarios for the proposed combustion turbine at the Keasbey Energy Center, a detailed load screening analysis was performed. As previously discussed, sixteen (16) combinations of load conditions and ambient operating temperatures were calculated. The turbine load screening analysis results can be found in Table 5-17.

Of the sixteen (16) operating scenarios previously described for the Keasbey Energy Center, the worst case operating scenarios (i.e., operating scenarios which yielded the maximum modeled concentrations) were:

- Case 11 (all pollutants and averaging periods)

For the purposes of conducting the load screening analysis, gas firing was assumed to occur for 8,760 hours (i.e., the most gas firing hours possible in one year). When the annual facility modeling was conducted (and as noted in the modeling input file comments), combustion turbine gas firing was assumed to occur for 8,760 hours.

5.6.9 Combustion Turbine Load Screening Modeling Analysis (Woodbridge Energy Center)

To determine the worst case operating scenarios for the existing combustion turbines at the Woodbridge Energy Center, a detailed load screening analysis was performed. As previously discussed, fourteen (14) combinations of load conditions and ambient operating temperatures were calculated. The turbine load screening analysis results can be found in Table 5-18.

Of the fourteen (14) operating scenarios previously described for the Woodbridge Energy Center, the worst case operating scenarios (i.e., operating scenarios which yielded the maximum modeled concentrations) were:

- Case 4 (8-hour CO and 24-hour SO_2);
- Case 7 (1-hour CO, 1-hour and 3-hour SO_2, and, 1-hour NO_2); and,
- Case 9 (24-hour PM-10, annual NO_2, annual PM-10, annual SO_2, 24-hour PM-2.5, and annual PM-2.5)

When the annual facility modeling was conducted (and as noted in the modeling input file comments), combustion turbine gas firing was assumed to occur for 8,760 hours.

5.6.10 Start-Up and Shutdown Scenarios (Keasbey Energy Center)

Startup is a short-term, transitional mode of operation for the combined cycle unit. In combined cycle operation, where the exhaust gases are directed through a HRSG to produce steam for a steam turbine generator, additional startup time is necessary in order to reduce thermal shock and excessive wear in both the HRSG and the steam turbine. Emission rates of some pollutants may be higher during startup operations because emissions controls may not become fully effective until a minimum threshold operating load and/or control device temperature is attained. The need for additional modeling to account for predicted short-term project impacts during startup of the combined cycle unit was assessed for criteria pollutants for which a short-term NAAQS or PSD increment has been defined. Furthermore, in order to facilitate startup of the CTG and steam turbine generator, as well as for maintenance purposes, the auxiliary boiler was modeled as operating simultaneously with the combustion turbine. The GE 7HA.02 combustion turbine can startup in a rapid response mode, which takes less time than a conventional start. The basic approach for rapid response mode is to thermodynamically decouple the gas turbine from the bottoming cycle, thereby allowing the gas turbine to start without the hold times needed to allow the HRSG and steam turbine to heat up. In other words, the rapid response start allows the plant to startup significantly faster than a conventional combined cycle plant by decoupling the steam turbine as the gas turbine ramps up and comes online.

A gas-fired rapid start requires 60 minutes. The combustion turbine also requires a 30 minute shutdown period. Startup emissions and associated stack parameters for the natural gas rapid response scenario for the proposed Keasbey Energy Center have been estimated based on vendor data and are shown in Table 5-19. During the operational year, CPV Keasbey, LLC is proposing 262 gas fired rapid starts. Gas fired rapid starts were evaluated for the requisite averaging periods for CO, NO_2, SO_2, PM-10, and PM-2.5.

Because the startup/shutdown durations will be shorter than some of the averaging periods modeled, the modeled concentrations for these averaging periods that extend beyond the start-up duration were determined based on the combination of the startup conditions for the appropriate amount of time and the worst case pollutant and averaging period specific operating scenario determined in the combustion turbine load analysis.

A description of the worst case modeling scenarios for 1-hour NO_2 natural gas startup for the Keasbey Energy Center is as follows:

NG start = 250.7 lb/hr (31.59 g/s) over 1 hour.

NG "Shutdown" = 17.5 lb/hr (2.21 g/s) over 30 minutes.
"Case11sd" (worst case gas fired operating scenario) = 3.80 g/s ▪ (30 min/60 min) = 1.90 g/s for remaining 30 minutes.

A description of the worst case modeling scenarios for 1-hour CO natural gas startup for the Keasbey Energy Center is as follows:

NG start = 225.3 lb/hr (28.39 g/s) over 1 hour.

NG “Shutdown” = 312.5 lb/hr (39.38 g/s) over 30 minutes.
“Case11sd” (worst case gas fired operating scenario) = 2.31 g/s ▪ (30 min/60 min) = 1.16 g/s for remaining 30 minutes.

A description of the worst case modeling scenarios for 8-hour CO natural gas startup for the Keasbey Energy Center is as follows:

NG start = 225.3 lb/8 hrs = 3.55 g/s over 1 hour.
“Case11c” (worst case gas fired operating scenario) = 2.31 g/s ▪ (7 hrs/8 hrs) = 2.02 g/s for remaining 7 hours.

NG “Shutdown” = 312.5 lb/8 hrs = 4.92 g/s per turbine over 0.50 hours.
“Case11sd” (worst case gas fired operating scenario) = 2.31 g/s ▪ (7.5 hrs/8 hrs) = 2.17 g/s for remaining 7.5 hours.

A description of the worst case modeling scenarios for 1-hour SO_2 natural gas startup for the Keasbey Energy Center is as follows:

NG start = 3.00 lb/hr = 0.38 g/s over 1-hour.

NG “Shutdown” = 0.73 lb/hr = 0.09 g/s over 30 minutes.
“Case11ks” (worst case gas fired operating scenario) = 1.11 g/s ▪ (30 min/60 min) = 0.56 g/s for remaining 30 minutes.

A description of the worst case modeling scenarios for 3-hour SO_2 natural gas startup for the Keasbey Energy Center is as follows:

NG start = 3 lbs/3 hrs = 0.13 g/s over 1 hour.
“Case11c” (worst case gas fired operating scenario) = 1.11 g/s ▪ (2 hrs/3 hrs) = 0.74 g/s for remaining 2 hrs.

NG “Shutdown” = 0.73 lbs/3 hrs =0.03 g/s over 0.5 hours.
“Case11ks” (worst case gas fired operating scenario) = 1.11 g/s ▪ (2.5 hrs/3 hrs) = 0.93 g/s for remaining 2.5 hours.

A description of the worst case modeling scenarios for 24-hour SO_2 natural gas startup for the Keasbey Energy Center is as follows:

NG start = 3 lbs/24 hrs =0.016 g/s over 1 hour.
"Case11c" (worst case gas fired operating scenario) = 1.11 g/s ▪ (23 hrs/24 hrs) = 1.06 g/s for remaining 23 hrs.

NG "Shutdown" = 0.73 lbs/24 hrs = 0.004 g/s over 0.5 hours.
"Case11sd" (worst case gas fired operating scenario) = 1.11 g/s ▪ (23.5 hrs/24 hrs) = 1.09 g/s for remaining 23.5 hours.

A description of the worst case modeling scenarios for 24-hour PM-10 and PM-2.5 natural gas startup for the Keasbey Energy Center is as follows:

NG start = 10.4 lbs/24 hrs = 0.055 g/s over 1 hour.
"Case11c" (worst case gas fired operating scenario) = 2.98 g/s ▪ (23 hrs/24 hrs) = 2.86 g/s for remaining 23 hrs.

NG "Shutdown" = 5.3 lbs/24 hrs = 0.028 g/s over 0.5 hours.
"Case11sd" (worst case gas fired operating scenario) = 2.98 g/s ▪ (23.5 hrs/24 hrs) = 2.92 g/s for remaining 23.5 hours.

A summary table presenting the emissions for the Keasbey Energy Center startup and shutdown modeling methodology is included as Table 5-20.

5.6.11 Start-Up and Shutdown Scenarios (Woodbridge Energy Center)

For the existing Woodbridge Energy Center, startups are defined in the permit as "the period of time from initiation of combustion turbine operation until it achieves steady-state emissions compliance, less than or equal to 3.4 hours". Further, shutdowns are defined in the permit as "the period of time from initiation of lowering combustion turbine power output with the intent to cease generation of electrical output and concludes with the cessation of the combustion turbine operation, less than or equal to 30 minutes".

Permitted startup and shutdown emissions and associated stack parameters for the existing Woodbridge Energy Center are shown in Table 5-21.

Because the shutdown duration is shorter than the averaging periods modeled, the modeled concentrations for these averaging periods that extend beyond the start-up duration were determined based on the combination of the shutdown conditions for the appropriate amount of time and the worst-case pollutant-and averaging period-specific operating scenario determined in the combustion turbine load analysis.

A description of the worst case modeling scenarios for 1-hour NO_2 natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 112 lb/hr (14.11 g/s) for turbine “a” over 3.4 hours.
“Startbw” (worst case gas fired operating scenario) = 2.31 g/s ▪ (60 min/60 min) = 2.31 g/s for turbine “b”.

NG “Shutdown” = 68.5 lb/hr (8.63 g/s) per turbine over 30 minutes.
“Case7sd” (worst case gas fired operating scenario) = 2.31 g/s ▪ (30 min/60 min) = 1.16 g/s per turbine for remaining 30 minutes.

A description of the worst case modeling scenarios for 1-hour CO natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 941 lb/hr (118.57 g/s) per turbine over 3.4 hours.

NG “Shutdown” = 618.4 lb/hr (77.92 g/s) per turbine over 30 minutes.
“Case7sd” (worst case gas fired operating scenario) = 1.41 g/s ▪ (30 min/60 min) = 0.71 g/s per turbine for remaining 30 minutes.

A description of the worst case modeling scenarios for 8-hour CO natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 941 lb/hr ▪ (3.4 hrs/8 hrs) ▪ (0.126 g/s / lb/hr) = 50.39 g/s per turbine.
“Case4su” (worst case gas fired operating scenario) = 0.82 g/s ▪ (4.6 hrs/8 hrs) = 0.47 g/s per turbine for remaining 4.6 hours.

It should be noted that although startup emissions account for only 3.4 hours of the 8-hour averaging period, 50.39 g/s of CO was modeled for each hour to represent a startup emission rate over the 8-hour period, and a CO emission rate of 0.47 g/s was modeled for each hour to represent operation of the turbine under steady-state conditions for the remaining 4.6 hours of the 8-hour averaging period for CO.

NG “Shutdown” = 618.4 lb/hr ▪ (0.5 hrs/8 hrs) ▪ (0.126 g/s / lb/hr) = 4.87 g/s per turbine.

"Case4sd" (worst case gas fired operating scenario) = 0.82 g/s ▪ (7.5 hrs/8 hrs) = 0.77 g/s per turbine for remaining 7.5 hours.

A description of the worst case modeling scenarios for 1-hour SO_2 natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 2.6 lb/hr (0.33 g/s) per turbine over 3.4 hours.

NG "Shutdown" = 2.6 lb/hr (0.33 g/s) per turbine over 30 minutes.
"Case7sd" (worst case gas fired operating scenario) = 0.57 g/s ▪ (30 min/60 min) = 0.29 g/s per turbine for remaining 30 minutes.

A description of the worst case modeling scenarios for 3-hour SO_2 natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 2.6 lb/hr (0.33 g/s) per turbine over 3.4 hours.

NG "Shutdown" = 2.6 lb/3 hrs (0.11 g/s) over 0.5 hours.
"Case7sd" (worst case gas fired operating scenario) = 0.57 g/s ▪ (2.5 hrs/3 hrs) = 0.48 g/s per turbine for remaining 2.5 hours.

A description of the worst case modeling scenarios for 24-hour SO_2 natural gas startup for the Woodbridge Energy Center is as follows:

NG start = 2.6 lb/hr ▪ (3.4 hrs/24 hrs) ▪ (0.126 g/s / lb/hr) = 0.05 g/s per turbine.
"Case4su" (worst case gas fired operating scenario) = 0.33 g/s ▪ (20.6 hrs/24 hrs) = 0.28 g/s per turbine for remaining 20.6 hours.

NG "Shutdown" = 2.6 lb/hr ▪ (0.5 hrs/24 hrs) ▪ (0.126 g/s / lb/hr) = 0.007 g/s per turbine.
"Case4sd" (worst case gas fired operating scenario) = 0.33 g/s ▪ (23.5 hrs/24 hrs) = 0.32 g/s per turbine for remaining 23.5 hours.

A summary table presenting the emissions for the Woodbridge Energy Center startup and shutdown modeling methodology is included as Table 5-22.

5.6.12 Combined Startups/Shutdowns (Keasbey Energy Center and Woodbridge Energy Center)

During the operational year, CPV Keasbey, LLC is proposing 262 natural gas fired rapid starts. Woodbridge Energy Center's existing permit does not place limits on the number or types of startups and shutdowns that can occur.

For the purposes of this modeling analysis, the following was used to evaluate the combined startups and shutdowns at Keasbey and Woodbridge:

- Natural gas fired startups and shutdowns at Keasbey and the permitted startups and shutdowns at Woodbridge.

Note that the startup modeling for 1-hour NO_2 included simultaneous operation of one (1) existing combustion turbine, auxiliary boiler, and emergency equipment at Woodbridge Energy Center as well as the proposed combustion turbine, auxiliary boiler, and emergency equipment at Keasbey Energy Center. As discussed in Section 5.7 of the Keasbey Energy Center Air Quality Modeling Protocol, the U.S. EPA guidance (September 30, 2014 and March 1, 2011 guidance memorandums, respectively) indicates that intermittent operations such as startup scenarios are to be treated differently than normal operations. The guidance recommends that "...compliance demonstrations for the 1-hour NO_2 NAAQS can be limited to those emissions that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations". Based on U.S. EPA guidance, excluding startup/shutdown emissions from consideration, on the basis that they are intermittent, is acceptable if the emissions are infrequent enough so that they would not be expected to affect the daily max 1-hour emissions more than 7 calendar days per year, since the form of the standard is the 8th highest daily max. It is expected that rarely the two (2) combustion turbines at the Woodbridge Energy Center and the proposed combustion turbine at the Keasbey Energy Center would startup in the same hour. Thus, it is expected that startup operation of all three combustion turbines within the same hour will occur less than 8 days per year. As such, the 1-hour NO_2 modeling analysis did not include an operating scenario with simultaneous startup operation of the two (2) combustion turbines at the Woodbridge Energy Center and the proposed combustion turbine at the Keasbey Energy Center as these events are intermittent per U.S. EPA guidance.

This operating scenario can be included in the operating permit with a permit condition as shown below that indicates that the Keasbey Energy Center startup scenario cannot occur simultaneously with Woodbridge Energy Center startup of both combustion turbines for more than 7 days per year.

Draft permit condition:

The KEC OS4 E201 Firing NG - Rapid Response Start-Up cannot occur simultaneously more than 7 days per year with the combined WEC OS3 Turbine 1 Start-up Operation and OS7 Turbine 2 Start-up Operation. [N.J.A.C. 7:27-22.8(b)(3)]

5.6.13 Annual Modeling Analysis

Annual modeling for the facility was accomplished by assessing the total facility emissions using the worst case combustion turbine modeling condition for the Woodbridge Energy Center and Keasbey Energy Center, respectively. Table 5-23 provides a summary of the annual emissions used in the annual modeling which include both the steady state (normal operation) emissions plus the startup and shutdown emissions.

5.6.14 Startup/Shutdown Modeling Analysis

The results of the startup/shutdown modeling analysis are summarized in Table 5-24 for the total combined concentrations of both facilities. Likewise, the maximum modeled impacts are compared to the NAAQS/NJAAQS in Table 5-25. As shown in Table 5-24, the maximum modeled combined facility concentrations resulting from startups/shutdowns exceed the applicable SICs for 1-hour NO_2, annual NO_2, annual PM-2.5, 24-hour PM-10, and 24-hour PM-2.5. Additionally, none of the pollutants, when combined with a representative background concentration, exceed any applicable NAAQS/NJAAQS (see Table 5-25). Note that the startup/shutdown modeling included simultaneous operation of the two existing combustion turbines, auxiliary boiler, and emergency equipment at Woodbridge Energy Center as well as the proposed combustion turbine, auxiliary boiler, and emergency equipment at Keasbey Energy Center. It should be noted that modeling results for Keasbey Energy Center and Woodbridge Energy Center as independent operations can be found in Appendix J.

5.6.15 Maximum Modeled Facility Concentrations

Table 5-26 presents the maximum modeled air quality concentrations during normal operations as calculated by AERMOD for the total combined concentrations of both facilities. Likewise, for these facilities the maximum modeled normal operations impacts are compared to the NAAQS/NJAAQS in Table 5-27. As shown in Table 5-26, the maximum concentrations for the combined facilities exceed the applicable SICs for 1-hour and annual NO_2, 24-hour PM-10, 24-hour PM-2.5, and annual PM-2.5. Further, Table 5-27 shows that none of the pollutants, when combined with a representative background concentration, exceed any applicable NAAQS/NJAAQS.

Under longstanding U.S. EPA guidance and interpretations, the SICs are used to determine if a source makes or could make a significant contribution to a predicted violation of a NAAQS or

PSD increment. If a source is predicted to have maximum impacts that are below the SICs, then a cumulative (or "full") impact analysis that includes other facilities is not required, and the impacts of the project are considered to be *de minimis* or insignificant. By showing that maximum predicted Project impacts will be below the corresponding SICs for CO and SO_2, the Project is exempt from the requirement to conduct any additional analyses to demonstrate compliance with the NAAQS for these pollutants.

5.6.16 Area of Impact Determination

Under PSD regulations, an air quality dispersion modeling analysis is required to ensure that CO, PM-10, PM-2.5, SO_2, and NO_2 emissions from the proposed facility will be compliant with NAAQS and applicable PSD increments. Note that per U.S. EPA PM-2.5 modeling guidance, the emissions of PM-2.5 should account for NO_2 and SO_2 precursor emissions (U.S. EPA, 2013).

Concentrations of 24-hour PM-10, 24-hour PM-2.5, 1-hour NO_2, annual NO_2, and annual PM-2.5 have been determined to be significant. Therefore, they are the only pollutants/averaging periods determined to have an area of impact (AOI), thus requiring additional impact assessments.

The areas of impact for the aforementioned pollutants under normal operations are as follows:

- 24-hour PM-10 AOI = 897 meters;
- 24-hour PM-2.5 AOI = 2,160 meters;
- 1-hour NO_2 AOI = 1,266 meters;
- Annual NO_2 AOI = 266 meters; and
- Annual PM-2.5 AOI = 764 meters.

Table 5-28 summarizes the normal operations information above by providing the pollutant, averaging time, SIL, maximum modeled concentration, and area of impact.

The areas of impact for the aforementioned pollutants under startup/shutdown operations are as follows:

- 24-hour PM-10 AOI = 897 meters;
- 24-hour PM-2.5 AOI = 2,598 meters;
- 1-hour NO_2 AOI = 50,000 meters;
- Annual NO_2 AOI = 266 meters; and
- Annual PM-2.5 AOI = 809 meters.

Table 5-29 summarizes the startup/shutdown operations information above by providing the pollutant, averaging time, SIL, maximum modeled concentration, and area of impact.

The additional impact assessment required for these pollutants and averaging periods is a multiple source NAAQS and PSD Class II increment modeling assessment. A multisource air quality modeling protocol will be submitted under separate cover for approval by the NJDEP after a list of offsite sources to be included in the NAAQS analyses is provided by the NJDEP. The multisource protocol will discuss the applicable modeling methodology to be used in the NAAQS and PSD Class II increment analyses along with appropriate offsite source emissions.

5.7 Class I Impacts

The only Class I area within 300 km of the proposed facility is the Brigantine Wilderness area in New Jersey. This area is located approximately 108 km south of the proposed facility. The Federal Land Manager (FLM) for this Class I area was notified on July 12, 2016 to determine if assessments of impacts in the Class I area would be required. The FLM has reviewed the proposed facility's details and related correspondence and has confirmed in a July 13, 2016 email that a Class I AQRV analysis for the proposed facility is not required (see Appendix A of the Air Quality Modeling Protocol). However, at the Department's request, the applicant re-contacted the FLM of the combined emissions of the proposed Keasbey Energy Center and the existing Woodbridge Energy Center. The FLM has reviewed the revised submittal and has confirmed in a December 13, 2016 email that a Class I AQRV analysis for the proposed facility is not required (see Appendix D).

Air quality concentrations of NO_x, SO_2, and PM-10/PM-2.5 in the Brigantine Wilderness Area were determined using the AERMOD model. Class I screening receptors were developed first by placing a ring of receptors at 50 kilometers from the Facility site. Actual Class I receptors and heights for the Brigantine Wilderness Area were obtained from the National Park Service. Screening receptors (50-kilometers from the Facility) within an arc subtended by the minimum and maximum angular directions to the Brigantine Wilderness Area were assigned all of the heights within that Class I area in order to develop a set of representative screening receptors at 50 kilometers. Maximum concentrations were then compared to the PSD Class I SILs and increments for the total concentrations of the combined facilities and can be found in Table 5-30.

The results of the modeling indicate that the combined facility impacts are lower than the PSD Class I SILs and increments for all pollutants and averaging periods. It should be noted that the modeling results are highly conservative since they reflect the concentrations at a distance of 50 kilometers from the Facility rather than the nearest Class I area that is actually at a distance of approximately 108 km. Furthermore, it should be noted that modeling was performed at a distance of 50 kilometers based upon the spatial limitations of the AERMOD model.

5.8 NJDEP Ambient Air Quality Standards Analysis

The NJAAQS are presented in Table 5-31. The maximum modeled concentrations for normal operation are presented in Table 5-32 for the total concentrations of the combined facilities. As shown in Table 5-32, the combined facility impacts, plus background, do not exceed or threaten to exceed the NJAAQS.

5.9 Graphical Presentation of Maximum Concentrations relative to SILs

The maximum concentrations and associated SILs are presented graphically on satellite imagery for the study area around the facility site. The concentrations represent the total combined impacts from both the CPV Keasbey and CPV Shore (Woodbridge Energy Center) emission units. The locations of maximum concentrations and the distribution of concentrations are depicted on the following figures.

- Figure 5-9: 24-Hour PM-10 Maximum Modeled Concentration Isopleths (ug/m^3) – Normal Operations
- Figure 5-10: 24-Hour PM-2.5 Maximum Modeled Concentration Isopleths (ug/m^3) – Normal Operations
- Figure 5-11: 1-Hour NO_2 Maximum Modeled Concentration Isopleths (ug/m^3) – Normal Operations
- Figure 5-12: Annual NO_2 Maximum Modeled Concentration Isopleths (ug/m^3) – Normal Operations
- Figure 5-13: Annual PM-2.5 Maximum Modeled Concentration Isopleths (ug/m^3) – Normal Operations
- Figure 5-14: 24-Hour PM-10 Maximum Modeled Concentration Isopleths (ug/m^3) – Includes SUSD Operations
- Figure 5-15: 24-Hour PM-2.5 Maximum Modeled Concentration Isopleths (ug/m^3) – Includes SUSD Operations
- Figure 5-16: 1-Hour NO_2 Maximum Modeled Concentration Isopleths (ug/m^3) – Includes SUSD Operations
- Figure 5-17: Annual NO_2 Maximum Modeled Concentration Isopleths (ug/m^3) – Includes SUSD Operations
- Figure 5-18: Annual PM-2.5 Maximum Modeled Concentration Isopleths (ug/m^3) – Includes SUSD Operations

The following figures represent the maximum concentrations and comparison to SILs for the combined operation of the CPV Keasbey and CPV Woodbridge facilities during normal operations conditions. Figure 5-9 illustrates the maximum PM-10 concentration of 9.6 ug/m^3 with associated contours indicating the significant impact level of 5 ug/m^3. As shown, the maximum concentration occurs immediately off the property, with the three areas of impacts are located a few hundred meters, east, southeast and southwest of the site. The maximum area of impact (AOI) is 897 meters.

Figure 5-10 illustrates the maximum 24-hour PM-2.5 concentration of 7.4 ug/m^3 with associated contours indicating the significant impact level of 1.2 ug/m^3. The maximum concentration occurs immediately on the property line, with the area of impact extending beyond 2 kilometers around the facility site. The larger area of impact for PM-2.5 relative to PM-10 is predominantly due to the much lower SIL of 1.2 ug/m^3 as compared to 5 ug/m^3 for PM-10. The AOI is 2,160 meters.

Figure 5-11 illustrates the maximum 1-hour NO_2 concentration of 23.1 ug/m^3 under normal operation of the combustion turbines and ancillary equipment with associated contours indicating the significant impact level of 7.5 ug/m^3. As shown, the maximum concentration occurs immediately off the property towards the southwest, with the area of impact as two lobes east and west of the site. The significant concentrations extend about one kilometer to the east and west. The AOI is 1,266 meters.

Figure 5-12 illustrates the maximum annual NO_2 concentration of 1.3 ug/m^3 under normal operation of the combustion turbines and ancillary equipment. The maximum concentration occurs on the property line, and only 1 receptor exceeded the significant impact level of 1 ug/m^3. There are insufficient receptors to produce a valid contour level for the SIL.

Figure 5-13 illustrates the maximum annual PM-2.5 concentration of 0.4 ug/m^3 under normal operation of the combustion turbines and ancillary equipment. The maximum concentration occurs a few hundred meters southeast of the facility. A contour of the significant impact level of 0.3 ug/m^3 is depicted around the maximum and extends about a half kilometer towards the southeast of the facility. The AOI is 764 meters.

The following figures represent the maximum concentrations and comparison to SILs for combined operation of the CPV Keasbey and CPV Woodbridge facilities during and including startup and shutdown conditions. The reader should note that the results presented are extremely conservative in the respect that the modeling methodology assumes that the three combustion turbines and two auxiliary boilers will experience a simultaneous start for every hour for the five-year period of meteorology, with the exception of 1-hour NO2 modeling as discussed earlier. In reality, this will be impossible to occur during actual operation, since it does not reflect the downtime associated with the facilities.

Figure 5-14 illustrates the maximum PM-10 concentration of 9.6 ug/m^3 with associated contours indicating the significant impact level of 5 ug/m^3. As shown, the maximum concentration occurs immediately off the property, with the three areas of impacts are located a few hundred meters, east, southeast, and southwest of the site. This figure is nearly identical to Figure 5-9, with the AOI at 897 meters.

Figure 5-15 illustrates the maximum 24-hour PM-2.5 concentration of 7.4 ug/m^3 with associated contour indicating the significant impact level of 1.2 ug/m^3. The maximum concentration occurs immediately on the property line, with the area of impact extending just short of 3 kilometers around the facility site. The larger area of impact for PM-2.5 relative to PM-10 is predominantly due to the much lower SIL of 1.2 ug/m^3 as compared to 5 ug/m^3 for PM-10. This figure is similar to Figure 5-10 with a slightly larger AOI of 2,598 meters.

Figure 5-16 illustrates the maximum 1-hour NO_2 concentration of 74.4 ug/m^3 under startup conditions of the combustion turbines and ancillary equipment with associated contours indicating the significant impact level of 7.5 ug/m^3. As shown, the maximum concentration occurs at a distance of approximately 0.6 kilometers towards the northeast of the facility. The associated significant impact area for 1-hour NO_2 concentrations during facility startup conditions extends to 50 kilometers, which is the extent of the AERMOD modeling receptors.

Figure 5-17 illustrates the maximum annual NO_2 concentration of 1.3 ug/m^3 including startup operations and includes the startup emissions of the combustion turbines and ancillary equipment. The maximum concentration occurs on the property line and only 1 receptor exceeded the significant impact level of 1.0 ug/m^3. There are insufficient receptors to produce a valid contour level for the SIL.

Figure 5-18 illustrates the maximum annual PM-2.5 concentration of 0.4 ug/m^3 including startup conditions of the combustion turbines and ancillary equipment. The maximum concentration occurs a few hundred meters east of the facility. A contour of the significant impact level of 0.3 ug/m^3 is depicted around the maximum and extends about a half kilometer towards the southeast of the facility. This figure is essentially identical to Figure 5-13 with the AOI at 809 meters.

5.10 NJDEP Air Toxics Risk Analysis

The receptor-point concentrations of toxic substances identified by the NJDEP as Hazardous Air Pollutants (HAP) that could potentially be emitted by a piece of equipment from the existing Woodbridge and proposed Keasbey facilities (and that also exceeded a NJDEP Reporting Threshold) were assessed in order to evaluate the potential health risk to the public beyond the property line of the facilities. This was done by considering each individual HAP emission that contributes to the evaluation as well as by considering the cumulative effects of the HAPs that contribute to the evaluation for the total facility.

To assess the potential for offsite public health threats, the NJDEP Technical Manual 1003: Guidance on Preparing a Risk Assessment for Air Contaminant Emissions (Revised) (NJDEP, 2018) was used. The NJDEP has prescribed and provided a methodology to ascertain the potential health effects from facilities seeking permits to emit air toxics. The modeling methodology for assessment used the maximum (worst case) short term emissions (in lb/hr) and annual emissions (in tons/year) with the worst case combustion turbine short term and annual operating cases as determined by the worst case scenarios identified for the criteria pollutants. Only the combustion turbines that have specified permit limits are included in the risk assessment. The auxiliary boilers, emergency diesel generators, and emergency diesel fire pumps do not have air toxics emissions above reportable thresholds.

In order to provide the most conservative calculation for the Air Toxics Risk Assessment, the maximum air toxics emission rates are based on the highest heat input of the combustion turbine, recognizing that the calculation method is based on AP-42 air emission factors times the heat input. The highest air toxics emission rates are used with the worst case combustion turbine scenarios identified for the criteria pollutants. The worst case combustion turbine scenarios identified for the criteria pollutants are presented in Sections 5.6.4 and 5.6.5. For Keasbey Energy Center, these worst case operating conditions are represented by case 11 (1-hour, 24-hour and annual), respectively. For Woodbridge Energy Center, these worst case operating conditions are represented by case 7 (1-hour) and case 9 (24-hour and annual), respectively.

The 1-hour and annual concentrations from the Woodbridge Energy Center as well as the proposed Keasbey Energy Center were determined by modeling the air toxic emission rates found in Table 5-33. Maximum modeled 1-hour and annual concentrations were compared to the reference concentrations and unit risk factors identified in Technical Manual 1003 and risk screening worksheet. The total facility cumulative risk for all applicable air toxic emissions are presented in Table 5-34. It should be noted that benzo(a)pyrene emissions include emissions of all pollutants listed as "polycyclic organic matter" and that lead was modeled for a 24-hour averaging period. The worst-case modeling parameters used for each piece of equipment/averaging period combination for this analysis are included in Table 5-33a.

As demonstrated in Table 5-34, the cumulative risk from the emissions from the permitted air toxic emissions are below the risk thresholds and are negligible. For Long-Term Carcinogenic and Non-carcinogenic Effects and Short-Term Effects, the long-term Cancer Risk for each individual HAP is less than 10 in a million (1.00E-5). Further, the long-term Cancer Risk for the cumulative effects of all the HAPs (8.1E-7) is also less than 10 in a million (1.00E-5). Total facility-wide cancer risk that is less than or equal to 10 in a million is considered negligible. The same is true for the long-term and short-term indices. The long-term index for each individual HAP is less than one and the long-term Hazard Index for the cumulative effects of all the HAPs (6.7E-2) is less than one. Further, the short-term index for each individual HAP is less than one and the short-term Hazard Index for the cumulative effects of all the HAPs (4.6E-2) is less than one. Based up on the above determinations, since the hazard quotients for each non-carcinogen is less than or equal to one, the risk from the total facility is considered negligible.
In the case of lead, it is also worth noting that the rolling 3-month period maximum was conservatively estimated from the maximum modeled 24-hour concentration to be 0.00108 $\mu g/m^3$, and substantially lower than the 0.15 $\mu g/m^3$ lead NAAQS.

5.11 PSD Additional Impacts Analyses

5.11.1 Impacts to Soil and Vegetation

A component of the PSD review includes an analysis to determine the potential air quality impacts on sensitive vegetation types that may be present in the vicinity of the proposed facility. The evaluation of potential impacts on vegetation was conducted in accordance with "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (U.S. EPA, 1980). Calculated emission concentrations of various constituents from the proposed and existing facilities were added to ambient background concentrations and compared to screening concentrations (levels at which change has been reported) to provide an assessment regarding the potential for adversely impacting vegetation with significant commercial and/or recreational value.

Screening concentrations used in this assessment represent the minimum ambient concentrations reported in the scientific literature for which adverse effects (e.g., visible damage or growth retardation) to plants have been reported. Of the pollutants emitted by the proposed facility that triggered PSD review, vegetative screening concentrations are available for CO, SO_2, and NO_2. Screening concentrations for particulate matter are not currently available.
Table 5-35 presents a comparison of maximum modeled concentrations from the proposed Keasbey and existing Woodbridge facilities (including ambient background levels) for the three constituent pollutants of concern (i.e., SO_2, NO_2, and CO) with their respective vegetation screening concentrations. This table demonstrates that modeled ground-level concentrations

from the combined facilities are well below levels at which even sensitive vegetation would be affected; thus, the proposed Keasbey facility in combination with the existing Woodbridge facility will not adversely impact vegetation in the site area.

5.11.2 Impact on Visibility

In order to assess the potential impact on regional visibility, the conservative Level–1 screening analysis using the VISCREEN model was conducted. At the Department's request, the scenic vista distance to Liberty State Park in Jersey City, New Jersey (3o km from the proposed facility site) was used. This value is less than the 40 km visual background range indicated on Figure 9 – Regional Background Values, in the visibility assessment procedure described in the "Workbook for Plume Visual Impact Screening and Analysis" (U.S. EPA, 1988). The screening procedure involves calculation of three plume contrast coefficients using emissions of NO_2, PM/PM-10, and sulfates (H_2SO_4). The Level-1 screening procedure determines the light scattering impacts of particulates, including sulfates and nitrates, with a mean diameter of two micrometers with a standard deviation of two micrometers. It was conducted assuming that all emitted particulate would be as PM-10, which results in a conservative assessment of visibility impact. These coefficients consider plume/sky contrast, plume/terrain contrast, and sky/terrain contrast.

A Level-1 screening analysis using the U.S. EPA VISCREEN (version 13190) model was performed for the calculated potential to emit (PTE) emissions for the existing Woodbridge and proposed Keasbey facilities. The visibility assessment was performed for an observer at the closer scenic vista distance of 30 kilometers from the proposed facility site. A neutral or "D" stability and the average wind speed at the Newark Liberty International Airport meteorological tower during the aforementioned five year period from 2010-2014 (4.39 meters per second) were used. The results of the analysis are presented in Table 5-36 which indicate that the combined facility will not impact visibility in the area surrounding the project site.

5.11.3 Impact on Industrial, Commercial, and Residential Growth

The operation of the proposed facility will generate tax revenue for the local, county, and state economies. Additionally, the proposed facility will produce electricity that will be transmitted for delivery to the Pennsylvania-Jersey-Maryland (PJM) Regional Transmission Grid. It is anticipated that 500-600 construction workers will be employed during the 30 month construction phase of the proposed facility. It is also anticipated that up to an additional six (6) full time jobs will be created for the combined facility operations with additional indirect ancillary service jobs being created to support the proposed facility.

Finally, since the air emissions from the proposed facility will not result in excessive PSD increment consumption, increment is available for new industry desiring to locate in the area.

Therefore, the proposed facility should have no effect on future industrial, commercial, or residential growth in the region.

5.12 Modeling Data Files

All modeling data files for the PSD modeling analyses to determine the maximum ambient ground-level concentrations from the proposed facility are included on DVD-ROM in Appendix H. The modeling files DVD contains a README.TXT file describing the files that are provided as well as a glossary of source ID and group name definitions.

5.13 References

NJDEP, 2018. Guidance on Preparing an Air Quality Modeling Protocol. Bureau of Air Quality Evaluation Technical Manual 1002, Trenton, New Jersey. https://www.state.nj.us/dep/aqpp/downloads/techman/1002.PDF

U.S. EPA, 2017. Revisions to the Guideline on Air Quality Models (Revised). Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter. Appendix W to Title 40 U.S. Code of Federal Regulations (CFR) Parts 51 and 52, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. January 17, 2017. https://www.epa.gov/sites/production/files/2020-09/documents/appw_17.pdf

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Air Quality Modeling Protocol, February 18, 2021 conditionally approved by NJDEP on April 19, 2021.

Table 5-1: Maximum Measured Ambient Air Quality Concentrations

Pollutant	Averaging Period	Maximum Ambient Concentrations (µg/m³)			NAAQS (µg/m³)	Monitor Location	SIL (ug/m³)	NAAQS – Background (ug/m³)	Is NAAQS – Background Greater than SIL? (Y/N)
		2017	**2018**	**2019**					
SO_2	1-Hour[a] 3-Hour 24-Hour Annual	7.9 7.9 2.6 0.3	17.8 **13.9** **5.5** 0.5	10.2 7.9 5.2 **0.8**	197 1,300 365 80	Elizabeth Lab, Union County, NJ, #34-039-0004	7.8 25 5 1	185 1,286 360 79	Y Y Y Y
NO_2	1-Hour[b] Annual	77.1 15.0	79.0 15.0	84.6 **16.9**	188 100	East Brunswick, Middlesex County, NJ, #34-023-0011	7.5 1	108 83	Y Y
CO	1-Hour 8-Hour	2,185 **1,495**	**2,415** 1,380	1,840 **1,495**	40,000 10,000	Elizabeth Lab, Union County, NJ, #34-039-0004	2,000 500	37,585 8,505	Y Y
PM-10	24-Hour	32	**33**	**33**	150	Jersey City, Hudson County, NJ, #34-017-1003	5	117	Y
PM-2.5[c]	24-Hour Annual	18.8 8.3	18.6 8.0	17.1 7.9	35 12	New Brunswick, Middlesex County, NJ, #34-023-0011	1.2 0.3	17 4	Y Y

[a]1-hour 3-year average 99th percentile value for SO_2 is **12.0** ug/m³.
[b]1-hour 3-year average 98th percentile value for NO_2 is **80.2** ug/m³.
[c]24-hour 3-year average 98th percentile value for PM-2.5 is **18.2** ug/m³; Annual 3-year average value for PM-2.5 is **8.1** ug/m³.
High second-high short term (1-, 3-, 8-, and 24-hour) and maximum annual average concentrations presented for all pollutants other than PM-2.5 and 1-hour SO_2 and NO_2.
Bold values represent the proposed background values for use in any necessary NAAQS analyses.
Monitored background concentrations obtained from the NJDEP NJ Air Quality Monitoring Report (2017-2019).

Table 5-2a: Keasbey GEP Analysis

Structure	Facility	Structure Height (ft)	Max Projected Width (ft)	5L Region of Influence Distance (ft)	Calculated GEP Stack Height (ft)	Distance to Keasbey Turbine Stack (ft)
Demin Water Tank	Keasbey	40.0	50.0	200.0	100.0	361.3
Cooling Tower Cell 01	Keasbey	54.0	28.0	140.0	96.0	201.1
Cooling Tower Cell 02	Keasbey	54.0	28.0	140.0	96.0	234.4
Cooling Tower Cell 03	Keasbey	54.0	28.0	140.0	96.0	160.4
Cooling Tower Cell 04	Keasbey	54.0	28.0	140.0	96.0	174.5
Cooling Tower Cell 05	Keasbey	54.0	28.0	140.0	96.0	200.4
Cooling Tower Cell 06	Keasbey	54.0	28.0	140.0	96.0	163.3
Cooling Tower Cell 07	Keasbey	54.0	28.0	140.0	96.0	128.5
Cooling Tower Cell 08	Keasbey	54.0	28.0	140.0	96.0	112.8
Cooling Tower Cell 09	Keasbey	54.0	28.0	140.0	96.0	118.4
Cooling Tower Cell 10	Keasbey	54.0	28.0	140.0	96.0	167.4
Cooling Tower Building	Keasbey	40.0	290.0	200.0	100.0	99.0
Combustion Turbine Bld	Keasbey	31.0	73.0	155.0	77.5	157.0
HRSG Tier 01	Keasbey	64.5	52.0	260.0	142.5	117.0
HRSG Tier 02	Keasbey	94.0	110.0	470.0	235.0	12.0
Steam Turbine Bld	Keasbey	46.0	129.0	230.0	115.0	238.0
Air Inlet Filter	Keasbey	44.0	66.0	220.0	110.0	214.0
Raw Water Tank	Keasbey	60.0	67.0	300.0	150.0	76.6
Combustion Turbine 01 Tier 01	Woodbridge	30.0	60.0	149.9	75.0	593.0
HRSG 01 Tier 01	Woodbridge	49.0	73.0	245.0	122.5	567.0
HRSG 01 Tier 02	Woodbridge	95.0	87.0	435.0	225.5	547.0
Combustion Turbine 01 Tier 02	Woodbridge	30.0	44.0	149.9	75.0	609.0
Air Inlet Filter 01	Woodbridge	81.8	56.0	280.0	165.8	621.0
Combustion Turbine 02 Tier 01	Woodbridge	30.0	60.0	149.9	75.0	718.0
HRSG 02 Tier 01	Woodbridge	49.0	73.0	245.0	122.5	695.0
HRSG 02 Tier 02	Woodbridge	95.0	87.0	435.0	225.5	677.0
Combustion Turbine 02 Tier 02	Woodbridge	30.0	44.0	149.9	75.0	732.0
Air Inlet Filter 02	Woodbridge	81.8	56.0	280.0	165.8	741.0
Steam Turbine Building	Woodbridge	44.0	121.0	220.0	110.0	476.0
Warehouse Building	Woodbridge	25.0	177.0	125.0	62.5	276.0
Demin Water Tank	Woodbridge	24.2	40.0	120.9	60.4	445.8
Cooling Tower Building	Woodbridge	41.9	351.0	209.3	104.7	413.0
Cooling Tower Cell 01	Woodbridge	55.0	30.0	150.0	100.0	710.2
Cooling Tower Cell 02	Woodbridge	55.0	30.0	150.0	100.0	718.3
Cooling Tower Cell 03	Woodbridge	55.0	30.0	150.0	100.0	663.2
Cooling Tower Cell 04	Woodbridge	55.0	30.0	150.0	100.0	671.7
Cooling Tower Cell 05	Woodbridge	55.0	30.0	150.0	100.0	616.3
Cooling Tower Cell 06	Woodbridge	55.0	30.0	150.0	100.0	625.3
Cooling Tower Cell 07	Woodbridge	55.0	30.0	150.0	100.0	569.2
Cooling Tower Cell 08	Woodbridge	55.0	30.0	150.0	100.0	579.2
Cooling Tower Cell 09	Woodbridge	55.0	30.0	150.0	100.0	522.7
Cooling Tower Cell 10	Woodbridge	55.0	30.0	150.0	100.0	533.3
Cooling Tower Cell 11	Woodbridge	55.0	30.0	150.0	100.0	476.0
Cooling Tower Cell 12	Woodbridge	55.0	30.0	150.0	100.0	487.4
Cooling Tower Cell 13	Woodbridge	55.0	30.0	150.0	100.0	429.8
Cooling Tower Cell 14	Woodbridge	55.0	30.0	150.0	100.0	442.4

Table 5-2b: Woodbridge GEP Analysis

Structure	Facility	Structure Height (ft)	Max Projected Width (ft)	5L Region of Influence Distance (ft)	Calculated GEP Stack Height (ft)	Distance to Woodbridge Turbine 01 Stack (ft)	Distance to Woodbridge Turbine 02 Stack (ft)
Demin Water Tank	Keasbey	40.0	50.0	200.0	100.0	382.0	493.5
Cooling Tower Cell 01	Keasbey	54.0	28.0	140.0	96.0	425.7	547.0
Cooling Tower Cell 02	Keasbey	54.0	28.0	140.0	96.0	450.0	566.4
Cooling Tower Cell 03	Keasbey	54.0	28.0	140.0	96.0	475.3	598.3
Cooling Tower Cell 04	Keasbey	54.0	28.0	140.0	96.0	544.9	665.5
Cooling Tower Cell 05	Keasbey	54.0	28.0	140.0	96.0	496.6	615.3
Cooling Tower Cell 06	Keasbey	54.0	28.0	140.0	96.0	594.9	717.0
Cooling Tower Cell 07	Keasbey	54.0	28.0	140.0	96.0	525.8	650.0
Cooling Tower Cell 08	Keasbey	54.0	28.0	140.0	96.0	577.3	702.5
Cooling Tower Cell 09	Keasbey	54.0	28.0	140.0	96.0	628.6	754.6
Cooling Tower Cell 10	Keasbey	54.0	28.0	140.0	96.0	644.7	768.0
Cooling Tower Building	Keasbey	40.0	290.0	200.0	100.0	405.0	527.0
Combustion Turbine Bld	Keasbey	31.0	73.0	155.0	77.5	569.0	698.0
HRSG Tier 01	Keasbey	64.5	52.0	260.0	142.5	559.0	690.0
HRSG Tier 02	Keasbey	94.0	110.0	470.0	235.0	556.0	688.0
Steam Turbine Bld	Keasbey	46.0	129.0	230.0	115.0	583.0	709.0
Air Inlet Filter	Keasbey	44.0	66.0	220.0	110.0	500.0	626.0
Raw Water Tank	Keasbey	60.0	67.0	300.0	150.0	649.6	780.1
Combustion Turbine 01 Tier 01	Woodbridge	30.0	60.0	149.9	75.0	143.0	183.0
HRSG 01 Tier 01	Woodbridge	49.0	73.0	245.0	122.5	79.0	132.0
HRSG 01 Tier 02	Woodbridge	95.0	87.0	435.0	225.5	18.0	99.0
Combustion Turbine 01 Tier 02	Woodbridge	30.0	44.0	149.9	75.0	197.0	226.0
Air Inlet Filter 01	Woodbridge	81.8	56.0	280.0	165.8	226.0	251.0
Combustion Turbine 02 Tier 01	Woodbridge	30.0	60.0	149.9	75.0	183.0	143.0
HRSG 02 Tier 01	Woodbridge	49.0	73.0	245.0	122.5	132.0	79.0
HRSG 02 Tier 02	Woodbridge	95.0	87.0	435.0	225.5	99.0	18.0
Combustion Turbine 02 Tier 02	Woodbridge	30.0	44.0	149.9	75.0	226.0	197.0
Air Inlet Filter 02	Woodbridge	81.8	56.0	280.0	165.8	251.0	226.0
Steam Turbine Building	Woodbridge	44.0	121.0	220.0	110.0	217.0	306.0
Warehouse Building	Woodbridge	25.0	177.0	125.0	62.5	164.0	294.0
Demin Water Tank	Woodbridge	24.2	40.0	120.9	60.4	114.8	240.0
Cooling Tower Building	Woodbridge	41.9	351.0	209.3	104.7	140.0	140.0
Cooling Tower Cell 01	Woodbridge	55.0	30.0	150.0	100.0	203.9	151.9
Cooling Tower Cell 02	Woodbridge	55.0	30.0	150.0	100.0	237.6	193.6
Cooling Tower Cell 03	Woodbridge	55.0	30.0	150.0	100.0	176.8	155.5
Cooling Tower Cell 04	Woodbridge	55.0	30.0	150.0	100.0	214.5	196.7
Cooling Tower Cell 05	Woodbridge	55.0	30.0	150.0	100.0	159.1	172.5
Cooling Tower Cell 06	Woodbridge	55.0	30.0	150.0	100.0	200.0	210.6
Cooling Tower Cell 07	Woodbridge	55.0	30.0	150.0	100.0	153.3	198.5
Cooling Tower Cell 08	Woodbridge	55.0	30.0	150.0	100.0	195.3	232.7
Cooling Tower Cell 09	Woodbridge	55.0	30.0	150.0	100.0	160.8	231.3
Cooling Tower Cell 10	Woodbridge	55.0	30.0	150.0	100.0	201.2	261.3
Cooling Tower Cell 11	Woodbridge	55.0	30.0	150.0	100.0	180.3	268.6
Cooling Tower Cell 12	Woodbridge	55.0	30.0	150.0	100.0	217.6	295.4
Cooling Tower Cell 13	Woodbridge	55.0	30.0	150.0	100.0	208.4	308.5
Cooling Tower Cell 14	Woodbridge	55.0	30.0	150.0	100.0	241.4	331.8

Table 5-2c: Fresh Kills Landfill Receptors

UTM Easting (m), NAD83, Zone 18	UTM Northing (m), NAD83, Zone 18	Elevation (m)	Scale Height (m)
566,929	4,490,761	17.5	17.5
566,929	4,490,511	24.0	24.0
566,929	4,490,261	41.2	41.2
566,929	4,490,011	36.3	36.3
567,179	4,491,011	26.7	26.7
567,179	4,490,761	42.2	42.2
567,179	4,490,511	51.1	51.1
567,179	4,490,261	52.6	52.6
567,179	4,490,011	38.8	38.8
567,429	4,491,011	36.6	36.6
567,429	4,490,761	53.1	53.1
567,429	4,490,511	60.4	60.4
567,429	4,490,261	48.3	48.3
567,429	4,490,011	27.4	27.4
569,929	4,493,011	21.4	21.4
567,679	4,491,011	38.1	38.1
567,679	4,490,761	45.2	45.2
567,679	4,490,511	30.8	30.8
567,679	4,490,261	21.8	21.8
568,679	4,491,511	22.7	22.7
568,679	4,492,261	15.0	15.0
568,679	4,492,511	26.8	26.8
568,679	4,492,761	19.4	19.4
568,929	4,492,261	10.8	10.8
568,929	4,492,511	29.4	29.4
568,929	4,492,761	18.3	18.3
569,429	4,491,011	22.0	22.0
569,929	4,492,011	15.2	15.2
569,929	4,492,511	27.7	27.7
568,810	4,492,555	38.1	38.1
569,800	4,492,620	38.1	38.1
569,740	4,491,690	27.4	27.4
568,680	4,491,530	27.4	27.4
569,300	4,490,985	30.5	30.5
567,325	4,490,535	68.6	68.6

Table 5-3: Keasbey Energy Center Combustion Turbine/HRSG Source Parameters

Operating Case	Fuel	Ambient Temperature (F)	Operating Load (%)	Duct Firing (On/Off)	Evaporative Cooler Operation (On/Off)	Modeling Stack Parameters		
						Exhaust Temperature (K)	Exhaust Velocity (m/s)[a]	Exhaust Flow (acfm)
Case1	Gas	-8	100	On	Off	335.37	22.23	1,663,088
Case2	Gas	-8	100	Off	Off	345.37	22.66	1,695,786
Case3	Gas	-8	75	Off	Off	342.59	17.98	1,345,657
Case4	Gas	-8	46	Off	Off	341.48	14.07	1,053,192
Case5	Gas	59	100	On	Off	337.04	21.93	1,640,987
Case6	Gas	59	100	Off	Off	345.93	22.29	1,667,946
Case7	Gas	59	75	Off	Off	341.48	17.14	1,282,564
Case8	Gas	59	30	Off	Off	337.59	11.05	827,022
Case9	Gas	105	100	On	On	339.26	21.04	1,574,584
Case10	Gas	105	100	Off	On	349.82	21.47	1,606,470
Case11	Gas	105	100	On	Off	337.04	19.20	1,436,816
Case12	Gas	105	100	Off	Off	347.59	19.58	1,464,813
Case13	Gas	105	75	Off	Off	345.93	16.10	1,205,008
Case14	Gas	105	50	Off	Off	344.82	13.26	992,066
Case15	Gas	-8	100	On	Off	343.71	22.58	1,689,282
Case16	Gas	59	100	On	On	337.59	22.31	1,669,789

[a]Based on a stack diameter of 22 feet.

UTM coordinates of proposed 160 foot above grade combustion turbine/HRSG stack are 557,515 meters Easting, 4,485,100 meters Northing, NAD83, Zone 18 at a base elevation of 22.5 feet above mean sea level.

Sample Exhaust Velocity (m/s) Calculation: Case #1

Exhaust Velocity (m/s) = (ft^3/min * min/sec * m^3/ft^3) / Pi * (($diameter^2$)/4)

Exhaust Velocity (m/s) = (1,663,088 ft^3/min * 1 min/60 sec * 1 m^3/35.3145 ft^3) / Pi * ((6.7056 m^2)/4)

Exhaust Velocity = 22.23 m/s

Table 5-4: Keasbey Energy Center Combustion Turbine/HRSG Emission Rates

Operating Case	Modeled Emission Rate (g/s)			
	NO_x	CO	PM-10/PM-2.5	SO_2
Case1	4.11	2.51	2.91	1.20
Case2	3.33	2.03	1.76	0.97
Case3	2.65	1.61	1.65	0.77
Case4	1.90	1.16	1.52	0.55
Case5	4.03	2.46	2.86	1.17
Case6	3.28	1.99	1.75	0.96
Case7	2.56	1.55	1.63	0.75
Case8	1.42	0.87	1.44	0.42
Case9	3.87	2.36	2.87	1.13
Case10	3.09	1.88	1.73	0.90
Case11	3.80	2.31	2.98	1.11
Case12	2.82	1.71	1.68	0.82
Case13	2.23	1.36	1.58	0.65
Case14	1.70	1.04	1.49	0.50
Case15	3.41	2.08	2.78	0.99
Case16	4.13	2.52	2.92	1.21

Table 5-5: Keasbey Energy Center Auxiliary Boiler Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	0.72
CO	2.68
PM-10/PM-2.5	0.51
SO_2	0.15
Exhaust Parameter	
Exhaust Height (ft above grade)	40
Exhaust Height (m above grade)	12.19
Exhaust Temperature (deg F)	300
Exhaust Flow (acfm)	22,250
Exhaust Velocity (ft/sec)	52.46
Exhaust Velocity (m/sec)	15.99
Inner Diameter (ft)	3
Inner Diameter (m)	0.91
Stack Base Elevation (ft)	22.5
UTM Easting (m), NAD83, Zone 18	557,541
UTM Northing (m), NAD83, Zone 18	4,485,141

Modeled Emission Rates (g/s)

1-hour CO = 0.34 g/s
1-hour SO_2 = 0.02 g/s
24-hour PM-10/PM-2.5 = 0.06 g/s
1-hour NO_2 = 0.09 g/s
3-hour SO_2 = 0.02 g/s
8-hour CO = 0.34 g/s
24-hour SO_2 = 0.02 g/s
Annual NO_2 = 0.09 g/s x (4000 hours/8760 hours) = 0.041 g/s
Annual PM-10/PM-2.5 = 0.06 g/s x (4000 hours/8760 hours) = 0.027 g/s
Annual SO_2 = 0.02 g/s x (4000 hours x 8760 hours) = 0.009 g/s

Table 5-6: Keasbey Energy Center Emergency Diesel Fire Pump Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	1.81
CO	0.95
PM-10/PM-2.5	0.08
SO_2	0.003
Exhaust Parameter	
Exhaust Height (ft above grade)	26
Exhaust Height (m above grade)	7.92
Exhaust Temperature (deg F)	1,076
Exhaust Flow (acfm)	1,900
Exhaust Velocity (ft/sec)	90.72
Exhaust Velocity (m/sec)	27.65
Inner Diameter (ft)	0.67
Inner Diameter (m)	0.20
Stack Base Elevation (ft)	22.5
UTM Easting (m), NAD83, Zone 18	557,482
UTM Northing (m), NAD83, Zone 18	4,485,119

Modeled Emission Rates (g/s)

[b]1-hour NO_2 = 0.23 g/s x (100 hours/8760 hours) = 2.63E-3 g/s
1-hour CO = 0.12 g/s
[b]1-hour SO_2 = 0.0004 g/s x (100 hours/8760 hours) = 4.57E-6 g/s
3-hour SO_2 = 0.0004 g/s x (1 hour/3 hours) = 1.33E-4 g/s
8-hour CO = 0.12 g/s x (1 hour/8 hours) = 0.015 g/s
24-hour PM-10/PM-2.5 = 0.01 g/s x (1 hour/24 hours) = 4.17E-4 g/s
24-hour SO_2 = 0.0004 g/s x (1 hour/24 hours) = 1.67E-5 g/s
Annual NO_2 = 0.23 g/s x (100 hours/8760 hours) = 2.63E-3 g/s
Annual PM-10-PM-2.5 = 0.01 g/s x (100 hours/8760 hours) = 1.14E-4 g/s
Annual SO_2 = 0.0004 g/s x (100 hours/8760 hours) = 4.57E-6 g/s

[b]Average hourly emission rate determined by multiplying the maximum hourly emission rate times 100 hours/8760 hours, per the March 1, 2011 guidance memorandum from Tyler Fox (EPA OAQPS) titled "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 NAAQS".

Table 5-7: Keasbey Energy Center Emergency Diesel Generator Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	17.10
CO	9.64
PM-10/PM-2.5	0.55
SO_2	0.037
Exhaust Parameter	
Exhaust Height (ft above grade)	20
Exhaust Height (m above grade)	6.10
Exhaust Temperature (deg F)	759
Exhaust Flow (acfm)	10,908.7
Exhaust Velocity (ft/sec)	231.49
Exhaust Velocity (m/sec)	70.56
Inner Diameter (ft)	1
Inner Diameter (m)	0.30
Stack Base Elevation (ft)	22.5
UTM Easting (m), NAD83, Zone 18	557,564
UTM Northing (m), NAD83, Zone 18	4,485,151

Modeled Emission Rates (g/s)

[b]1-hour NO_2 = 2.15 g/s x (100 hours/8760 hours) = 0.025 g/s
1-hour CO = 1.21 g/s
[b]1-hour SO_2 = 0.0047 g/s x (100 hours/8760 hours) = 5.37E-5 g/s
3-hour SO_2 = 0.0047 g/s x (1 hour/3 hours) = 1.57E-3 g/s
8-hour CO = 1.21 g/s x (1 hour/8 hours) = 0.15 g/s
24-hour PM-10/PM-2.5 = 0.07 g/s x (1 hour/24 hours) = 2.92E-3 g/s
24-hour SO_2 = 0.0047 g/s x (1 hour/24 hours) = 1.96E-4 g/s
Annual NO_2 = 2.15 g/s x (100 hours/8760 hours) = 0.025 g/s
Annual PM-10/PM-2.5 = 0.07 g/s x (100 hours/8760 hours) = 7.99E-4 g/s
Annual SO_2 = 0.0047 g/s x (100 hours/8760 hours) = 5.37E-5 g/s

[b]Average hourly emission rate determined by multiplying the maximum hourly emission rate times 100 hours/8760 hours, per the March 1, 2011 guidance memorandum from Tyler Fox (EPA OAQPS) titled "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 NAAQS".

Table 5-8: Keasbey Energy Center Cooling Tower Exhaust Characteristics and PM-10/PM-2.5 Emission Rates

Emissions Parameter	
Number of Cells (up to)	10
Maximum Total Air Flow Rate (acfm) (Each Cell)	1,448,000
Maximum Water Flow Rate (gpm) (Total Tower)	153,000
Maximum Drift Rate	0.0005%
Total Solids in Circulating Water (ppm)	6,240
10-cell Total TSP Emission Rate (lb/hr) (Total Tower)	2.39
1-cell TSP Emission Rate (g/s)	0.030
10-cell Total PM-10 Emission Rate (lb/hr) (Total Tower)	1.55
1-cell PM-10 Emission Rate (g/s)	0.020
10-cell Total PM-2.5 Emission Rate (lb/hr) (Total Tower)	0.58
1-cell PM-2.5 Emission Rate (g/s)	0.007
10-cell Total TSP Annual Emission Rate (ton/yr) (Total Tower)	10.46
10-cell Total PM-10 Annual Emission Rate (ton/yr) (Total Tower)	6.81
10-cell Total PM-2.5 Annual Emission Rate (ton/yr) (Total Tower)	2.56
Exhaust Parameter	
Exhaust Height (ft above grade)	54
Exhaust Height (m above grade)	16.46
Collar Height (ft above grade)	40
Collar Height (m above grade)	12.19
Exhaust Temperature (deg F)	80
Exhaust Velocity (ft/sec)	40.63
Exhaust Velocity (m/sec)	12.38
Inner Diameter (ft)	27.5
Inner Diameter (m)	8.38
Base elevation (ft)	22.5

Table 5-9: Keasbey Energy Center Cooling Tower Cell Location Coordinates

Cooling Tower Cell #	UTM Easting, Zone 18, NAD83 (m)	UTM Northing, Zone 18, NAD83 (m)
1	557,510	4,485,061
2	557,527	4,485,064
3	557,543	4,485,067
4	557,559	4,485,071
5	557,575	4,485,074
6	557,514	4,485,045
7	557,530	4,485,049
8	557,546	4,485,052
9	557,562	4,485,056
10	557,578	44,85,059

Table 5-10: Woodbridge Energy Center Cooling Tower Exhaust Characteristics and PM-10/PM-2.5 Emission Rates

Emissions Parameter	
Number of Cells	14
Maximum Total Air Flow Rate (acfm) (Each Cell)	1,341,000
Maximum Water Flow Rate (gpm) (Total Tower)	148,000
Maximum Drift Rate	0.0005%
Total Solids in Circulating Water (ppm)	6,240
14-cell Total TSP Emission Rate (lb/hr) (Total Tower)	2.31
1-cell TSP Emission Rate (g/s)	0.021
14-cell Total PM-10 Emission Rate (lb/hr) (Total Tower)	1.5
1-cell PM-10 Emission Rate (g/s)	0.014
14-cell Total PM-2.5 Emission Rate (lb/hr) (Total Tower)	0.56
1-cell PM-2.5 Emission Rate (g/s)	0.005
14-cell Total TSP Annual Emission Rate (ton/yr) (Total Tower)	10.12
14-cell Total PM-10 Annual Emission Rate (ton/yr) (Total Tower)	6.58
14-cell Total PM-2.5 Annual Emission Rate (ton/yr) (Total Tower)	2.43
Exhaust Parameter	
Exhaust Height (ft above grade)	55
Exhaust Height (m above grade)	16.76
Collar Height (ft above grade)	41.85
Collar Height (m above grade)	12.76
Exhaust Temperature (deg F)	85
Exhaust Velocity (ft/sec)	31.62
Exhaust Velocity (m/sec)	9.64
Inner Diameter (ft)	30
Inner Diameter (m)	9.14
Base elevation (ft)	19.5

Table 5-11: Woodbridge Energy Center Cooling Tower Cell Location Coordinates

Cooling Tower Cell #	UTM Easting, Zone 18, NAD83 (m)	UTM Northing, Zone 18, NAD83 (m)
1	557,650	4,485,094
2	557,665	4,485,097
3	557,679	4,485,100
4	557,693	4,485,103
5	557,708	4,485,107
6	557,722	4,485,110
7	557,736	4,485,113
8	557,653	4,485,082
9	557,667	4,485,085
10	557,682	4,485,088
11	557,696	4,485,091
12	557,710	4,485,094
13	557,725	4,485,097
14	557,739	4,485,100

Table 5-12: Woodbridge Energy Center Combustion Turbine/HRSG Source Parameters

Operating Case	Fuel	Ambient Temperature (F)	Operating Load (%)	Duct Firing (On/Off)	Evaporative Cooler Operation (On/Off)	Modeling Stack Parameters		
						Exhaust Temperature (K)	Exhaust Velocity (m/s)[a]	Exhaust Flow (acfm)
Case1	Gas	-8	100	Off	Off	360.2	20.00	1,237,051
Case2	Gas	-8	100	On	Off	353.0	19.74	1,220,716
Case3	Gas	-8	75	Off	Off	353.9	15.93	985,177
Case4	Gas	-8	50	Off	Off	346.5	12.47	771,092
Case5	Gas	56	100	Off	Off	357.6	18.30	1,131,842
Case6	Gas	56	100	On	Off	351.4	18.12	1,120,712
Case7	Gas	59	100	On	Off	351.4	18.03	1,115,284
Case8	Gas	56	75	Off	Off	349.4	14.17	876,317
Case9	Gas	59	50	Off	Off	345.5	11.85	732,549
Case10	Gas	105	100	Off	On	362.4	17.94	1,109,399
Case11	Gas	105	100	On	On	357.6	17.77	1,098,857
Case12	Gas	105	100	On	On	356.0	17.77	1,099,012
Case13	Gas	105	75	Off	Off	352.8	13.50	834,647
Case14	Gas	105	50	Off	Off	351.0	12.19	753,867

[a]Based on a stack diameter of 20 feet.
UTM coordinates of two (2) 145 foot combustion turbine stacks are 557,683 meters Easting, 4,485,153 meters Northing, and 557,722 meters Easting, 4,485,161 meters Northing, NAD83, Zone 18 at a base elevation of 19.5 feet above mean sea level.

Table 5-13: Woodbridge Energy Center Combustion Turbine/HRSG Emission Rates

Operating Case	Modeled Emission Rate (g/s) – per turbine			
	NO_x	CO	PM-10/PM-2.5	SO_2
Case1	2.12	1.29	1.52	0.52
Case2	2.49	1.52	2.12	0.62
Case3	1.68	1.02	1.45	0.42
Case4	1.34	0.82	1.39	0.33
Case5	1.92	1.17	1.49	0.47
Case6	2.29	1.40	2.08	0.55
Case7	2.31	1.41	2.41	0.57
Case8	1.55	0.95	1.42	0.38
Case9	1.22	0.74	1.36	0.30
Case10	1.81	1.11	1.47	0.44
Case11	2.02	1.22	1.76	0.49
Case12	2.23	1.36	2.39	0.54
Case13	1.41	0.86	1.40	0.34
Case14	1.17	0.72	1.35	0.29

Table 5-14: Woodbridge Energy Center Auxiliary Boiler Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	0.92
CO	3.44
PM-10/PM-2.5	0.46
SO_2	0.16
Exhaust Parameter	
Exhaust Height (ft above grade)	40
Exhaust Height (m above grade)	12.19
Exhaust Temperature (deg F)	310
Exhaust Velocity (ft/sec)	57.3
Exhaust Velocity (m/sec)	17.5
Inner Diameter (ft)	3.3
Inner Diameter (m)	0.99
Stack Base Elevation (ft)	19.5
UTM Easting (m), NAD83, Zone 18	557,636
UTM Northing (m), NAD83, Zone 18	4,485,176

Modeled Emission Rates (g/s)

1-hour CO = 0.43 g/s
1-hour SO_2 = 0.02 g/s
24-hour PM-10/PM-2.5 = 0.06 g/s
1-hour NO_2 = 0.12 g/s
3-hour SO_2 = 0.02 g/s
8-hour CO = 0.43 g/s
24-hour SO_2 = 0.02 g/s
Annual NO_2 = 0.12 g/s x (2000 hours/8760 hours) = 0.027 g/s
Annual SO_2 = 0.02 g/s x (2000 hours/8760 hours) = 0.005 g/s
Annual PM-10/PM-2.5 = 0.06 g/s x (2000 hours/8760 hours) = 0.014 g/s

Table 5-15: Woodbridge Energy Center Emergency Diesel Fire Pump Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	1.93
CO	1.81
PM-10/PM-2.5	0.10
SO_2	0.003
Exhaust Parameter	
Exhaust Height (ft above grade)	20
Exhaust Height (m above grade)	6.10
Exhaust Temperature (deg F)	961
Exhaust Velocity (ft/sec)	171.1
Exhaust Velocity (m/sec)	52.2
Inner Diameter (ft)	0.4
Inner Diameter (m)	0.13
Stack Base Elevation (ft)	19.5
UTM Easting (m), NAD83, Zone 18	557,604
UTM Northing (m), NAD83, Zone 18	4,485,216

Modeled Emission Rates (g/s)

[b]1-hour NO_2 = 0.24 g/s x (100 hours/8760 hours) = 2.74E-3 g/s
1-hour CO = 0.23 g/s
[b]1-hour SO_2 = 0.0004 g/s x (100 hours/8760 hours) = 4.57E-6 g/s
3-hour SO_2 = 0.0004 g/s x (1 hour/3 hours) = 1.33E-4 g/s
8-hour CO = 0.23 g/s x (1 hour/8 hours) = 0.029 g/s
24-hour PM-10/PM-2.5 = 0.01 g/s x (1 hour/24 hours) = 4.17E-4 g/s
24-hour SO_2 = 0.0004 g/s x (1 hour/24 hours) = 1.67E-5 g/s
Annual NO_2 = 0.24 g/s x (100 hours/8760 hours) = 2.74E-3 g/s
Annual PM-10/PM-2.5 = 0.01 g/s x (100 hours/8760 hours) = 1.14E-4 g/s
Annual SO_2 = 0.0004 g/s x (100 hours/8760 hours) = 4.57E-6 g/s

[b]Average hourly emission rate determined by multiplying the maximum hourly emission rate times 100 hours/8760 hours, per the March 1, 2011 guidance memorandum from Tyler Fox (EPA OAQPS) titled “Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 NAAQS”.

Table 5-16: Woodbridge Energy Center Emergency Diesel Generator Exhaust Characteristics and Emissions

Emission Parameter	
Pollutant	**lb/hr**
NO_x	21.16
CO	1.99
PM-10/PM-2.5	0.13
SO_2	0.0208
Exhaust Parameter	
Exhaust Height (ft above grade)	30
Exhaust Height (m above grade)	9.14
Exhaust Temperature (deg F)	763.5
Exhaust Velocity (ft/sec)	528.1
Exhaust Velocity (m/sec)	161.0
Inner Diameter (ft)	0.7
Inner Diameter (m)	0.20
Stack Base Elevation (ft)	19.5
UTM Easting (m), NAD83, Zone 18	557,679
UTM Northing (m), NAD83, Zone 18	4,485,227

Modeled Emission Rates (g/s)

[b]1-hour NO_2 = 2.67 g/s x (100 hours/8760 hours) = 0.03 g/s
1-hour CO = 0.25 g/s
[b]1-hour SO_2 = 0.003 g/s x (100 hours/8760 hours) = 3.42E-5 g/s
3-hour SO_2 = 0.003 g/s x (1 hour/3 hours) = 0.001 g/s
8-hour CO = 0.25 g/s x (1 hour/8 hours) = 0.03 g/s
24-hour PM-10/PM-2.5 = 0.02 g/s x (1 hour/24 hours) = 8.33E-4 g/s
24-hour SO_2 = 0.003 g/s x (1 hour/24 hours) = 1.25E-4 g/s
Annual NO_2 = 2.67 g/s x (100 hours/8760 hours) = 0.03 g/s
Annual PM-10-PM-2.5 = 0.02 g/s x (100 hours/8760 hours) = 2.28E-4 g/s
Annual SO_2 = 0.003 g/s x (100 hours/8760 hours) = 3.42E-5 g/s

[b]Average hourly emission rate determined by multiplying the maximum hourly emission rate times 100 hours/8760 hours, per the March 1, 2011 guidance memorandum from Tyler Fox (EPA OAQPS) titled “Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 NAAQS”.

Table 5-16a: Season and Hour of Day Background NO_2 Concentrations Used in AERMOD

Hour	Winter	Spring	Summer	Fall
1	71.4	49.4	29.5	46.4
2	69.0	43.8	26.9	45.7
3	65.2	46.4	30.1	47.0
4	64.5	55.8	28.8	43.8
5	64.5	59.6	28.8	42.7
6	66.4	58.3	32.5	48.3
7	65.8	61.5	36.5	52.6
8	65.2	62.6	42.7	50.8
9	68.2	55.8	37.6	59.6
10	65.8	51.3	32.5	54.5
11	65.8	43.2	27.6	47.0
12	61.5	37.0	26.9	41.4
13	57.0	41.4	22.0	38.9
14	57.0	34.4	19.4	32.0
15	60.2	43.2	20.1	33.3
16	62.0	42.7	17.5	34.4
17	67.7	38.9	19.4	45.1
18	67.7	38.2	16.9	54.0
19	69.6	44.6	18.8	54.0
20	72.0	42.7	20.7	54.0
21	71.4	44.6	22.0	51.3
22	71.4	52.6	23.9	50.8
23	70.9	51.3	24.4	48.3
24	68.2	48.3	24.8	47.0

Note: Concentrations are in ug/m^3.

Table 5-17: Keasbey Energy Center Summary of Load Analysis Modeling Results

Table 5-17
Keasbey Combustion Turbine Load Analysis

Keasbey Energy Center - One (1) GE 7HA.02 Combined Cycle Combustion Turbine - One (1) Stack (160 feet above grade)

1-Hour	MAX XOQ	yymmddhh	UTMX (m)	UTMY (m)	ELEV (m)	NOx (ug/m^3)	CO (ug/m^3)	PM10 (ug/m^3)	PM2.5 (ug/m^3)	SO2 (ug/m^3)	Distance	Direction
CASE01	1.09504	13052907	557,817	4,482,198	8.2	4.50	2.75	NA	NA	1.31	2918	174
CASE02	0.95774	16030909	556,917	4,486,098	22.2	3.19	1.94	NA	NA	0.93	1163	329
CASE03	1.16552	13052907	557,817	4,482,298	4.9	3.09	1.88	NA	NA	0.90	2818	174
CASE04	1.47884	13013103	557,517	4,485,798	7.8	2.81	1.72	NA	NA	0.81	698	0
CASE05	1.08094	13052907	557,817	4,482,198	8.2	4.36	2.66	NA	NA	1.26	2918	174
CASE06	0.96293	16030909	556,917	4,486,098	22.2	3.16	1.92	NA	NA	0.92	1163	329
CASE07	1.22045	13052907	557,817	4,482,298	4.9	3.12	1.89	NA	NA	0.92	2818	174
CASE08	1.94212	13052907	557,717	4,483,398	0.0	2.76	1.69	NA	NA	0.82	1714	173
CASE09	1.0825	13052907	557,817	4,482,198	8.2	4.19	2.55	NA	NA	1.22	2918	174
CASE10	0.95516	16030909	556,917	4,486,098	22.2	2.95	1.80	NA	NA	0.86	1163	329
CASE11	1.19008	13052907	557,817	4,482,298	4.9	4.52	2.75	NA	NA	1.32	2818	174
CASE12	1.03422	13052907	557,817	4,482,198	8.2	2.92	1.77	NA	NA	0.85	2918	174
CASE13	1.23554	13013103	557,517	4,485,898	9.2	2.76	1.68	NA	NA	0.80	798	0
CASE14	1.52395	13013103	557,517	4,485,798	7.8	2.59	1.58	NA	NA	0.76	698	0
CASE15	0.97332	16030909	556,917	4,486,098	22.2	3.32	2.02	NA	NA	0.96	1163	329
CASE16	1.05907	13052907	557,817	4,482,198	8.2	4.37	2.67	NA	NA	1.28	2918	174
3-Hour	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m^3)**	**CO (ug/m^3)**	**PM10 (ug/m^3)**	**PM2.5 (ug/m^3)**	**SO2 (ug/m^3)**	**Distance**	**Direction**
CASE01	0.82452	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.99	707	45
CASE02	0.74269	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.72	707	45
CASE03	0.90474	14070712	557,917	4,485,498	4.9	NA	NA	NA	NA	0.70	566	45
CASE04	1.09143	14083112	557,917	4,485,498	4.9	NA	NA	NA	NA	0.60	566	45
CASE05	0.81995	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.96	707	45
CASE06	0.74908	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.72	707	45
CASE07	0.94522	14070712	557,917	4,485,498	4.9	NA	NA	NA	NA	0.71	566	45
CASE08	1.39994	14070712	557,917	4,485,498	4.9	NA	NA	NA	NA	0.59	566	45
CASE09	0.83442	13030621	557,117	4,484,098	1.9	NA	NA	NA	NA	0.94	1078	202
CASE10	0.75271	13030621	557,117	4,484,098	1.9	NA	NA	NA	NA	0.68	1078	202
CASE11	0.95493	13030621	557,217	4,484,298	2.5	NA	NA	NA	NA	1.06	856	200
CASE12	0.84608	13030621	557,117	4,484,098	1.9	NA	NA	NA	NA	0.69	1078	202
CASE13	0.95312	14070712	557,917	4,485,498	4.9	NA	NA	NA	NA	0.62	566	45
CASE14	1.10739	14070712	557,917	4,485,498	4.9	NA	NA	NA	NA	0.55	566	45
CASE15	0.7555	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.75	707	45
CASE16	0.8052	14070712	558,017	4,485,598	5.3	NA	NA	NA	NA	0.97	707	45

Table 5-17
Keasbey Combustion Turbine Load Analysis

8-Hour	MAX XOQ	yymmddhh	UTMX (m)	UTMY (m)	ELEV (m)	NOx (ug/m^3)	CO (ug/m^3)	PM10 (ug/m^3)	PM2.5 (ug/m^3)	SO2 (ug/m^3)	Distance	Direction
CASE01	0.74119	16072216	558,117	4,485,498	4.7	NA	1.86	NA	NA	NA	722	57
CASE02	0.66548	16072216	558,117	4,485,498	4.7	NA	1.35	NA	NA	NA	722	57
CASE03	0.8077	16072216	558,117	4,485,498	4.7	NA	1.30	NA	NA	NA	722	57
CASE04	0.97477	16072216	558,017	4,485,398	4.3	NA	1.13	NA	NA	NA	584	59
CASE05	0.73668	16072216	558,117	4,485,498	4.7	NA	1.81	NA	NA	NA	722	57
CASE06	0.67093	16072216	558,117	4,485,498	4.7	NA	1.34	NA	NA	NA	722	57
CASE07	0.84211	16072216	558,117	4,485,498	4.7	NA	1.31	NA	NA	NA	722	57
CASE08	1.29176	16072216	558,017	4,485,398	4.3	NA	1.12	NA	NA	NA	584	59
CASE09	0.74418	16072216	558,117	4,485,498	4.7	NA	1.76	NA	NA	NA	722	57
CASE10	0.6689	16072216	558,117	4,485,498	4.7	NA	1.26	NA	NA	NA	722	57
CASE11	0.81223	16072216	558,117	4,485,498	4.7	NA	1.88	NA	NA	NA	722	57
CASE12	0.72941	16072216	558,117	4,485,498	4.7	NA	1.25	NA	NA	NA	722	57
CASE13	0.84454	16072216	558,117	4,485,498	4.7	NA	1.15	NA	NA	NA	722	57
CASE14	1.00546	16072216	558,017	4,485,398	4.3	NA	1.05	NA	NA	NA	584	59
CASE15	0.67702	16072216	558,117	4,485,498	4.7	NA	1.41	NA	NA	NA	722	57
CASE16	0.7231	16072216	558,117	4,485,498	4.7	NA	1.82	NA	NA	NA	722	57
24-Hour	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m^3)**	**CO (ug/m^3)**	**PM10 (ug/m^3)**	**PM2.5 (ug/m^3)**	**SO2 (ug/m^3)**	**Distance**	**Direction**
CASE01	0.35009	13060224	558,017	4,485,698	6.8	NA	NA	1.02	1.02	0.42	781	40
CASE02	0.30974	13060224	558,017	4,485,698	6.8	NA	NA	0.55	0.55	0.30	781	40
CASE03	0.38553	13060224	558,017	4,485,698	6.8	NA	NA	0.64	0.64	0.30	781	40
CASE04	0.47684	14070724	558,017	4,485,598	5.3	NA	NA	0.72	0.72	0.26	707	45
CASE05	0.34759	13060224	558,017	4,485,698	6.8	NA	NA	0.99	0.99	0.41	781	40
CASE06	0.31258	13060224	558,017	4,485,698	6.8	NA	NA	0.55	0.55	0.30	781	40
CASE07	0.40479	13060224	558,017	4,485,698	6.8	NA	NA	0.66	0.66	0.30	781	40
CASE08	0.65442	14031324	558,117	4,484,698	1.5	NA	NA	0.94	0.94	0.27	724	124
CASE09	0.35151	13060224	558,017	4,485,698	6.8	NA	NA	1.01	1.01	0.40	781	40
CASE10	0.3115	13060224	558,017	4,485,698	6.8	NA	NA	0.54	0.54	0.28	781	40
CASE11	0.38797	13060224	558,017	4,485,698	6.8	NA	NA	1.16	1.16	0.43	781	40
CASE12	0.34351	13060224	558,017	4,485,698	6.8	NA	NA	0.58	0.58	0.28	781	40
CASE13	0.40756	13060224	558,017	4,485,698	6.8	NA	NA	0.64	0.64	0.26	781	40
CASE14	0.49119	14031324	558,117	4,484,698	1.5	NA	NA	0.73	0.73	0.25	724	124
CASE15	0.31582	13060224	558,017	4,485,698	6.8	NA	NA	0.88	0.88	0.31	781	40
CASE16	0.34034	13060224	558,017	4,485,698	6.8	NA	NA	0.99	0.99	0.41	781	40
Annual	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m^3)**	**CO (ug/m^3)**	**PM10 (ug/m^3)**	**PM2.5 (ug/m^3)**	**SO2 (ug/m^3)**	**Distance**	**Direction**
CASE01	0.02618	2013	558,117	4,485,498	4.7	0.1076	NA	0.0762	0.0762	0.0314	722	57
CASE02	0.02252	2013	558,117	4,485,498	4.7	0.0750	NA	0.0396	0.0396	0.0218	722	57
CASE03	0.02932	2013	558,117	4,485,498	4.7	0.0777	NA	0.0484	0.0484	0.0226	722	57
CASE04	0.03727	2013	558,117	4,485,498	4.7	0.0708	NA	0.0567	0.0567	0.0205	722	57
CASE05	0.02593	2013	558,117	4,485,498	4.7	0.1045	NA	0.0742	0.0742	0.0303	722	57
CASE06	0.02276	2013	558,117	4,485,498	4.7	0.0747	NA	0.0398	0.0398	0.0218	722	57
CASE07	0.03108	2013	558,117	4,485,498	4.7	0.0796	NA	0.0507	0.0507	0.0233	722	57
CASE08	0.04929	2013	558,017	4,485,398	4.3	0.0700	NA	0.0710	0.0710	0.0207	584	59
CASE09	0.02624	2013	558,117	4,485,498	4.7	0.1015	NA	0.0753	0.0753	0.0297	722	57
CASE10	0.02262	2013	558,117	4,485,498	4.7	0.0699	NA	0.0391	0.0391	0.0204	722	57
CASE11	0.02958	2013	558,117	4,485,498	4.7	0.1124	NA	0.0881	0.0881	0.0328	722	57
CASE12	0.02545	2013	558,117	4,485,498	4.7	0.0718	NA	0.0428	0.0428	0.0209	722	57
CASE13	0.03128	2013	558,117	4,485,498	4.7	0.0698	NA	0.0494	0.0494	0.0203	722	57
CASE14	0.03784	2013	558,117	4,485,498	4.7	0.0643	NA	0.0564	0.0564	0.01892	722	57
CASE15	0.02307	2013	558,117	4,485,498	4.7	0.0787	NA	0.0641	0.0641	0.02284	722	57
CASE16	0.02528	2013	558,117	4,485,498	4.7	0.1044	NA	0.0738	0.0738	0.03059	722	57

Table 5-18: Woodbridge Energy Center Summary of Load Analysis Modeling Results

Table 5-18
Woodbridge Combustion Turbine Load Analysis

Woodbridge Energy Center - Two (2) GE 7FA.05 Combined Cycle Combustion Turbines - Two (2) Stacks (145 feet above grade)

1-Hour	MAX XOQ	yymmddhh	UTMX (m)	UTMY (m)	ELEV (m)	NOx (ug/m³)	CO (ug/m³)	PM10 (ug/m³)	PM2.5 (ug/m³)	SO2 (ug/m³)	Distance	Direction
CASE01	4.81214	17021317	557,917	4,484,898	2.3	10.20	6.21	NA	NA	2.50	346	137
CASE02	5.01736	16111119	557,917	4,484,898	2.3	12.49	7.63	NA	NA	3.11	346	137
CASE03	6.83661	16111119	557,917	4,484,898	2.3	11.49	6.97	NA	NA	2.87	346	137
CASE04	9.1413	15051222	557,917	4,484,898	2.3	12.25	7.50	NA	NA	3.02	346	137
CASE05	5.59785	16111119	557,917	4,484,898	2.3	10.75	6.55	NA	NA	2.63	346	137
CASE06	5.78755	16111119	557,917	4,484,898	2.3	13.25	8.10	NA	NA	3.18	346	137
CASE07	5.81324	16111119	557,917	4,484,898	2.3	13.43	8.20	NA	NA	3.31	346	137
CASE08	7.88731	16111119	557,917	4,484,898	2.3	12.23	7.49	NA	NA	3.00	346	137
CASE09	9.57411	15051222	557,917	4,484,898	2.3	11.68	7.08	NA	NA	2.87	346	137
CASE10	5.6046	17021317	557,917	4,484,898	2.3	10.14	6.22	NA	NA	2.47	346	137
CASE11	5.80707	16111119	557,917	4,484,898	2.3	11.73	7.08	NA	NA	2.85	346	137
CASE12	5.84293	16111119	557,917	4,484,898	2.3	13.03	7.95	NA	NA	3.16	346	137
CASE13	8.16088	15051222	557,917	4,484,898	2.3	11.51	7.02	NA	NA	2.77	346	137
CASE14	9.17233	15051222	557,917	4,484,898	2.3	10.73	6.60	NA	NA	2.66	346	137
3-Hour	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m³)**	**CO (ug/m³)**	**PM10 (ug/m³)**	**PM2.5 (ug/m³)**	**SO2 (ug/m³)**	**Distance**	**Direction**
CASE01	3.80875	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	1.98	213	197
CASE02	3.98136	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.47	213	197
CASE03	5.86528	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.46	213	197
CASE04	8.00655	15031521	557,917	4,484,898	2.3	NA	NA	NA	NA	2.64	346	137
CASE05	4.61229	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.17	213	197
CASE06	4.73708	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.61	213	197
CASE07	4.7913	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.73	213	197
CASE08	6.93155	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.63	213	197
CASE09	8.51666	15031521	557,917	4,484,898	2.3	NA	NA	NA	NA	2.55	346	137
CASE10	4.74442	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.09	213	197
CASE11	4.84432	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.37	213	197
CASE12	4.86537	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.63	213	197
CASE13	7.16771	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.44	213	197
CASE14	8.10024	13030621	557,622	4,484,949	3.0	NA	NA	NA	NA	2.35	213	197

Table 5-18
Woodbridge Combustion Turbine Load Analysis

8-Hour	MAX XOQ	yymmddhh	UTMX (m)	UTMY (m)	ELEV (m)	NOx (ug/m^3)	CO (ug/m^3)	PM10 (ug/m^3)	PM2.5 (ug/m^3)	SO2 (ug/m^3)	Distance	Direction
CASE01	3.0427	13030624	557,622	4,484,949	3.0	NA	3.93	NA	NA	NA	213	197
CASE02	3.19746	13030624	557,622	4,484,949	3.0	NA	4.86	NA	NA	NA	213	197
CASE03	4.93965	13030624	557,622	4,484,949	3.0	NA	5.04	NA	NA	NA	213	197
CASE04	7.08414	13030624	557,622	4,484,949	3.0	NA	5.81	NA	NA	NA	213	197
CASE05	3.7363	13030624	557,622	4,484,949	3.0	NA	4.37	NA	NA	NA	213	197
CASE06	3.87164	13030624	557,622	4,484,949	3.0	NA	5.42	NA	NA	NA	213	197
CASE07	3.93467	13030624	557,622	4,484,949	3.0	NA	5.55	NA	NA	NA	213	197
CASE08	6.02871	13030624	557,622	4,484,949	3.0	NA	5.73	NA	NA	NA	213	197
CASE09	7.53041	13030624	557,622	4,484,949	3.0	NA	5.57	NA	NA	NA	213	197
CASE10	3.84415	13030624	557,622	4,484,949	3.0	NA	4.27	NA	NA	NA	213	197
CASE11	3.94762	13030624	557,622	4,484,949	3.0	NA	4.82	NA	NA	NA	213	197
CASE12	3.96915	13030624	557,622	4,484,949	3.0	NA	5.40	NA	NA	NA	213	197
CASE13	6.31143	13030624	557,622	4,484,949	3.0	NA	5.43	NA	NA	NA	213	197
CASE14	7.21953	13030624	557,622	4,484,949	3.0	NA	5.20	NA	NA	NA	213	197
24-Hour	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m^3)**	**CO (ug/m^3)**	**PM10 (ug/m^3)**	**PM2.5 (ug/m^3)**	**SO2 (ug/m^3)**	**Distance**	**Direction**
CASE01	2.07463	15021524	558,017	4,484,898	2.3	NA	NA	3.15	3.15	1.08	420	127
CASE02	2.22303	15021524	558,017	4,484,898	2.3	NA	NA	4.71	4.71	1.38	420	127
CASE03	3.53098	15021524	557,917	4,484,998	2.8	NA	NA	5.12	5.12	1.48	281	124
CASE04	5.70258	15021524	557,917	4,484,998	2.8	NA	NA	7.93	7.93	1.88	281	124
CASE05	2.51937	15021524	558,017	4,484,898	2.3	NA	NA	3.75	3.75	1.18	420	127
CASE06	2.6577	15021524	558,017	4,484,898	2.3	NA	NA	5.53	5.53	1.46	420	127
CASE07	2.68452	15021524	558,017	4,484,898	2.3	NA	NA	6.47	6.47	1.53	420	127
CASE08	4.58549	15021524	557,917	4,484,998	2.8	NA	NA	6.51	6.51	1.74	281	124
CASE09	6.12208	15021524	557,917	4,484,998	2.8	NA	NA	8.33	8.33	1.84	281	124
CASE10	2.55789	15021524	557,917	4,484,998	2.8	NA	NA	3.76	3.76	1.13	281	124
CASE11	2.6771	15021524	557,917	4,484,998	2.8	NA	NA	4.71	4.71	1.31	281	124
CASE12	2.69625	15021524	557,917	4,484,998	2.8	NA	NA	6.44	6.44	1.46	281	124
CASE13	4.91979	15021524	557,917	4,484,998	2.8	NA	NA	6.89	6.89	1.67	281	124
CASE14	5.79104	15021524	557,917	4,484,998	2.8	NA	NA	7.82	7.82	1.68	281	124
Annual	**MAX XOQ**	**yymmddhh**	**UTMX (m)**	**UTMY (m)**	**ELEV (m)**	**NOx (ug/m^3)**	**CO (ug/m^3)**	**PM10 (ug/m^3)**	**PM2.5 (ug/m^3)**	**SO2 (ug/m^3)**	**Distance**	**Direction**
CASE01	0.07687	2013	558,117	4,484,798	1.8	0.1630	NA	0.1168	0.1168	0.0400	561	129
CASE02	0.08457	2013	558,117	4,484,798	1.8	0.2106	NA	0.1793	0.1793	0.0524	561	129
CASE03	0.12458	2015	558,017	4,484,898	2.3	0.2093	NA	0.1806	0.1806	0.0523	420	127
CASE04	0.21086	2013	558,017	4,484,898	2.3	0.2826	NA	0.2931	0.2931	0.0696	420	127
CASE05	0.09148	2013	558,117	4,484,798	1.8	0.1756	NA	0.1363	0.1363	0.0430	561	129
CASE06	0.09971	2013	558,117	4,484,798	1.8	0.2283	NA	0.2074	0.2074	0.0548	561	129
CASE07	0.10055	2015	558,017	4,484,898	2.3	0.2323	NA	0.2423	0.2423	0.0573	420	127
CASE08	0.16188	2013	558,017	4,484,898	2.3	0.2509	NA	0.2299	0.2299	0.0615	420	127
CASE09	0.23253	2013	558,017	4,484,898	2.3	0.2837	NA	0.3162	0.3162	0.0698	420	127
CASE10	0.0907	2015	558,017	4,484,898	2.3	0.1642	NA	0.1333	0.1333	0.0399	420	127
CASE11	0.09706	2015	558,017	4,484,898	2.3	0.1961	NA	0.1708	0.1708	0.0476	420	127
CASE12	0.09858	2015	558,017	4,484,898	2.3	0.2198	NA	0.2356	0.2356	0.0532	420	127
CASE13	0.16998	2013	558,017	4,484,898	2.3	0.2397	NA	0.2380	0.2380	0.0578	420	127
CASE14	0.20753	2013	558,017	4,484,898	2.3	0.2428	NA	0.2802	0.2802	0.06018	420	127

Table 5-19: Keasbey Energy Center Combustion Turbine Start-up and Shutdown Emission Rates and Stack Parameters

Combustion Turbine Startup/Shutdown Parameters – Rapid Response (Natural Gas Fired)									
Event	**Elapsed Time (hr)**	**Stack NO_x (Max lb/hr)**	**Stack CO (Max lb/hr)**	**Stack SO_2 (Max lb/hr)**	**Stack PM-10 (Max lb/hr)**	**Stack PM-2.5 (Max lb/hr)[a]**	**Stack Exhaust Flow (acfm)**	**Stack Exhaust Velocity (m/s)**	**Stack Exhaust Temperature (Degrees F)**
Startup	1	250.7	225.3	3.00	10.4	10.4	671,086	8.97	160
Shutdown	0.50	17.5	312.5	0.73	5.3	5.3	671,086	8.97	160

	Type of Startup or Shutdown Event	
	Startup	Shutdown
Duration of Turbine at 0% load prior to Start-up (hours)	8	-
Maximum Duration of Start-up or Shut-down Event (hours)	1	0.5
Maximum Number per Year	262	262

Table 5-20: Keasbey Energy Center Combustion Turbine Start-up and Shutdown Modeling Methodology

Transient Condition	Normal Operation Worst Case	Duration	Averaging Period	NO_x		CO		SO_2		PM-10		PM-2.5	
		Hours		lb/hr	g/s	lb//hr	g/s	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
NG Startup	-	1	1-hour	251	31.6	225	28.4	3.0	0.38	-	-	-	-
NG Shutdown	-	0.5	1-hour	17.5	2.21	313	39.4	0.73	0.09	-	-	-	-
	Case11sd	0.5	1-hour	15.1	1.90	9.2	1.16	4.44	0.56	-	-	-	-
NG Startup	-	1	8-hour	-	-	28.2	3.55	-	-	-	-	-	-
	Case11c	7	8-hour	-	-	16	2.02	-	-	-	-	-	-
NG Shutdown	-	0.5	8-hour	-	-	39.1	4.92	-	-	-	-	-	-
	Case11sd	7.5	8-hour	-	-	17.2	2.17	-	-	-	-	-	-
NG Startup	-	1	3-hour	-	-	-	-	1.0	0.13	-	-	-	-
	Case11c	2	3-hour	-	-	-	-	5.87	0.74	-	-	-	-
NG Shutdown	-	0.5	3-hour	-	-	-	-	0.24	0.03	-	-	-	-
	Case11sd	2.5	3-hour	-	-	-	-	7.34	0.93	-	-	-	-
NG Startup	-	1	24-hour	-	-	-	-	0.13	0.02	0.43	0.06	0.43	0.06
	Case11c	23	24-hour	-	-	-	-	8.44	1.06	22.7	2.86	22.7	2.86
NG Shutdown	-	0.5	24-hour	-	-	-	-	0.03	0.004	0.22	0.03	0.22	0.03
	Case11sd	23.5	24-hour	-	-	-	-	8.6	1.09	23.2	2.92	23.2	2.92

Table 5-21: Woodbridge Energy Center Combustion Turbine Start-up and Shutdown Emission Rates and Stack Parameters (Natural Gas Fired)

GE 7FA.05 Combustion Turbine Start-up/Shutdown Parameters							
Event	**Elapsed Time (hr)**	**Stack NOx (lb/hr)**	**Stack CO (lb/hr)**	**Stack SO_2 (lb/hr)**	**Average Stack Exhaust Flow (acfm)**	**Average Stack Exhaust Velocity (m/s)**	**Average Stack Exhaust Temperature (Degrees F)**
Startup – Per Turbine	3.4	112	941	2.6	550,000	8.89	160
Shutdown – Per Turbine	0.5	68.5	618.4	2.6	550,000	8.89	160

Table 5-22: Woodbridge Energy Center Combustion Turbine Start-up and Shutdown Modeling Methodology

Transient Condition	Normal operation worst case	Duration	Averaging Period	NO_x		CO		SO_2	
		Hours		lb/hr	g/s	lb/hr	g/s	lb/hr	g/s
NG Startup	-	3.4	1-hour	112	14.1	941	119	2.6	0.33
NG Shutdown	-	0.5	1-hour	68.5	8.63	618	77.9	2.6	0.33
	Case7sd	0.5	1-hour	9.2	1.16	5.6	0.71	2.3	0.29
NG Startup	-	3.4	8-hour	-	-	399.93	50.39	-	-
	Case4su	4.6	8-hour	-	-	3.73	0.47	-	-
NG Shutdown	-	0.5	8-hour	-	-	38.65	4.87	-	-
	Case4sd	7.5	8-hour	-	-	6.1	0.77	-	-
NG Startup	-	3.4	3-hour	-	-	-	-	2.6	0.33
NG Shutdown	-	0.5	3-hour	-	-	-	-	0.87	0.11
	Case7sd	2.5	3-hour	-	-	-	-	3.77	0.48
NG Startup	-	3.4	24-hour	-	-	-	-	0.37	0.05
	Case4su	20.6	24-hour	-	-	-	-	2.25	0.28
NG Shutdown	-	0.5	24-hour	-	-	-	-	0.05	0.007
	Case4sd	23.5	24-hour	-	-	-	-	2.56	0.32

Table 5-23: Keasbey and Woodbridge Energy Centers – Annual Emission Rates

	KEC Emissions[a]		WEC Emissions[b]	
Air Contaminant	**TPY**	**g/s**	**TPY**	**g/s**
SO_2	40.2	1.16	11.3	0.165
NO_2	140.8	4.05	145.9	2.1
PM-10	96.3	2.77	92.0	1.32
PM-2.5	96.3	2.77	92.0	1.32

[a] Emissions for the single combustion turbine
[b] TPY Emissions are total, g/s emissions per combustion turbine

Table 5-24: Maximum Modeled Total Facility Concentrations During Startup/Shutdown Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
CO	1-Hour	2,000	1,459.2[c]
	8-Hour	500	498.9[c]
NO_2	1-Hour	7.5	74.4[a,b,f]
	Annual	1	1.28[a,c]
SO_2	1-Hour	7.8	5.3[b]
	3-Hour	25	4.2[c]
	24-Hour	5	2.8[c]
	Annual	1	0.11[c]
PM-10	24-Hour	5	9.6[c]
PM-2.5	24-Hour	1.2	7.4[e]
	Annual	0.3	0.40[d]

Note:
[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.
[f]Maximum modeled 1-hour NO_2 concentration located 0.6 km from the proposed facility.

For Keasbey Energy Center
1-hr and 8-hr CO, 3-hr SO_2 includes CT, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes CT, AB
Annual NO_2 and SO_2 includes CT, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower

For Woodbridge Energy Center
1-hr and 8-hr CO, 3-hr SO_2 includes 2CTs, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes 2CTs, AB
Annual NO_2 and SO_2 includes 2CTs, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower

Table 5-25: Maximum Modeled Total Facility Concentrations During Startup/Shutdown Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS ($\mu g/m^3$)	Maximum Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)
CO	1-Hour	40,000	1,459.2[d]	2,415	3,874.2
	8-Hour	10,000	498.9[d]	1,495	1,993.9
NO_2	1-Hour	188	58.1[a]	57.0[b]	115.1
	Annual	100	1.28[d]	16.9	18.2[c]
SO_2	1-Hour	196	5.3[e]	12.0	17.3
	3-Hour	1,300	4.2[d]	13.9	18.1
	24-Hour	-/365	2.8[d]	5.5	8.3
	Annual	-/80	0.11[d]	0.8	0.9
PM-10	24-Hour	150	9.6[d]	33	42.6
PM-2.5	24-Hour	35	4.7[f]	18.2	22.9
	Annual	12	0.48[g]	8.1	8.6

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[b]Background concentration that was calculated for the season and hour-of-day.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 4th highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Table 5-26: Total Facility Maximum Modeled Concentrations Due to Normal Operations Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
CO	1-Hour	2,000	447.1[c]
	8-Hour	500	86.2[c]
SO_2	1-Hour	7.8	4.3[b]
	3-Hour	25	4.2[c]
	24-Hour	5	2.8[c]
	Annual	1	0.11[c]
PM-10	24-Hour	5	**9.6[c]**
PM-2.5	24-Hour	1.2	**7.4[e]**
	Annual	0.3	**0.41[d]**
NO_2	1-Hour	7.5	**23.1[a,b]**
	Annual	1	**1.28[a,c]**

Note:
[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

<u>For Keasbey Energy Center</u>
1-hr and 8-hr CO, 3-hr SO_2 includes CT, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes CT, AB, DFP, EDG
Annual NO_2 and SO_2 includes CT, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes CT, AB, DFP, cooling tower

<u>For Woodbridge Energy Center</u>
1-hr and 8-hr CO, 3-hr SO_2 includes 2CTs, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes 2CTs, AB, DFP, EDG
Annual NO_2 and SO_2 includes 2CTs, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower

Table 5-27: Total Facility Maximum Modeled Concentrations Due to Normal Operations Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Concentration (μg/m³)
CO	1-Hour	40,000	447.1[d]	2,415	2,862.1
	8-Hour	10,000	86.2[d]	1,495	1,581.2
SO_2	1-Hour	196	4.3[e]	12.0	16.3
	3-Hour	1,300	4.2[d]	13.9	18.1
	24-Hour	-/365	2.8[d]	5.5	8.3
	Annual	-/80	0.11[d]	0.8	0.9
PM-10	24-Hour	150	9.6[d]	33	42.6
PM-2.5	24-Hour	35	4.7[f]	18.2	22.9
	Annual	12	0.41[g]	8.1	8.5
NO_2	1-Hour	188	20.3[c]	72.0	92.3[c]
	Annual	100	1.28[c,d]	16.9	18.2[c]

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[b]Background concentration that was calculated for the season and hour-of-day.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Table 5-28: Total Facility Areas of Impact Due to Normal Operation

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)	Significant Impact Area (meters)
PM-2.5	24-Hour	1.2	7.4[e]	2,160
	Annual	0.3	0.41[d]	764
PM-10	24-Hour	5.0	9.6[c]	897
NO_2	1-hour	7.5	23.1[a,b]	1,266
	Annual	1	1.28[a,c]	266

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Table 5-29: Total Facility Areas of Impact Due to Startup/Shutdown Operation

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)	Significant Impact Area (meters)
PM-2.5	24-Hour	1.2	7.4[e]	2,598
	Annual	0.3	0.40[d]	809
PM-10	24-Hour	5.0	9.6[c]	897
NO_2	1-hour	7.5	74.4[a,b]	50,000+
	Annual	1	1.28[a,c]	266

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Table 5-30: Total Facility Maximum Modeled Class I Concentrations

Pollutant	Averaging Period	Class I Significant Impact Concentration (μg/m³)	Class I PSD Increment Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
SO_2	3-Hour	1.0	25	0.112[c]
	24-Hour	0.2	5	0.032[c]
	Annual	0.1	2	0.002[c]
PM-2.5	24-Hour	0.27[a]	2	0.109[c]
	Annual	0.06	1	0.008[c]
PM-10	24-Hour	0.3	8	0.116[c]
	Annual	0.2	4	0.008[c]
NO_2	Annual	0.1	2.5	0.007[b,c]

[a]A revised 24-hour PM-2.5 Class I SIL of 0.27 μg/m³ was proposed on August 18, 2016.
[b]Includes use of PVMRM.
[c]Maximum modeled concentration.

Notes:
U.S. EPA's proposed Class I SILs for NO_2, PM-10, and SO_2 were published in the July 23, 1996, Federal Register (61 FR 38249).
U.S. EPA's PM-2.5 Class I SILs codified in 40 CFR 52.21(k)(2) were vacated.
U.S. EPA's proposed Option 3 PM-2.5 Class I SILs were published in the September 21, 2007, Federal Register (72 FR 54112).

Table 5-31: New Jersey Ambient Air Quality Standards (NJAAQS)

Pollutant	Averaging Period	Primary NJAAQS	Secondary NJAAQS
NO_2	12-Month	100 µg/m³ (0.05 ppm)	100 µg/m³ (0.05 ppm)
CO	1-hour	40,000 µg/m³ (35 ppm)	40 mg/m³ (35 ppm)
	8-hour	10,000 µg/m³ (9 ppm)	10 mg/m³ (9 ppm)
SO_2	3-hour	---	1,300 µg/m³ (0.5 ppm)
	24-hour	365 µg/m³ (0.14 ppm)	260 µg/m³ (0.10 ppm)
	12-Month	80 µg/m³ (0.03 ppm)	60 µg/m³ (0.02 ppm)
TSP	24-hour	260 µg/m³	150 µg/m³
	12-Month	75 µg/m³	60 µg/m³
Ozone	1-hour	235 µg/m³ (0.12 ppm)	157 µg/m³ (0.08 ppm)
Lead	3-month	1.5 µg/m³	1.5 µg/m³
Source: NJDEP Technical Manual 1002			

Table 5-32: Total Facility Impact on NJAAQS

Pollutant	Averaging Period	Primary NJAAQS (ug/m³)	Maximum Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)
NO_2	12-Month	100	1.28[b,d]	16.9	18.2
CO	1-hour	40,000	447.1[d]	2,415	2,862.1
	8-hour	10,000	86.2[d]	1,495	1,581.2
SO_2	3-hour	---	4.2[d]	13.9	18.1
	24-hour	365	2.8[d]	5.5	8.3
	12-Month	80	0.11[d]	0.8	0.9
TSP[a]	24-hour	260	9.6[d]	33	42.6
	12-Month	75	0.47[d]	-	0.47
Lead	3-month	1.5	0.00108[d]	-	0.00108

[a]PM10 as TSP
[b]Includes use of PVMRM.
[d]Maximum modeled concentration.

Table 5-33: Keasbey and Woodbridge Energy Centers - Air Toxics Assessment Emission Rates and Maximum Concentration

	KEC Emissions[e]		WEC Emissions[f]		Total Facility Concentrations (ug/m³)	
Air Toxic Constituent	**lb/hr**	**tpy**	**lb/hr[b]**	**tpy[a]**	**1-Hour**	**Annual**
Acrolein	1.17E-02	0.0506	1.48E-2	0.1294	1.08E-2	4.0E-4
Ammonia	2.79E+01	122.4	15.5	126	11.34	4.6E-1
Arsenic	8.82E-04	0.00373	4.68E-4	0.0041	3.40E-4	1.0E-5
Cadmium	4.85E-03	0.0205	2.55E-3	0.0223	1.87E-3	8.0E-5
Formaldehyde	4.29E-01	1.827	3.37E-1	2.663	2.47E-1	9.3E-3
H_2SO_4	6.20E+00	26.1	3.4	7.7	2.49	3.7E-2
Hexane	7.47E-01	3.00	-[c]	-[c]	1.12E-1	2.1E-3
Lead[g]	2.20E-03	0.0093	1.40E-3	0.0102	1.08E-3[d]	3.3E-4
Mercury	1.15E-03	0.0049	7.00E-4	0.0053	5.10E-4	2.0E-5
Total POM	8.20E-03	0.0348	5.09E-3	0.0446	3.73E-3	1.6E-4
Toluene	2.40E-01	1.021	0.30	2.629	2.20E-1	8.8E-3

Notes
[a]Total Woodbridge facility tons per year.
[b]Expressed as pounds/hour per turbine.
[c]None.
[d]24-hour concentration.
[e]KEC: For 1-hour modeling, Case 11 exhaust parameters were used. For annual modeling, Cass 11 exhaust parameters were used. These cases correspond to the worst cases identified for the criteria pollutant load analysis.
[f]WEC: For 1-hour modeling, Case 7 exhaust parameters were used. For annual modeling, Case 9 exhaust parameters were used. These cases correspond to the worst cases identified for the criteria pollutant load analysis.
[g]KEC: For lead 24-hour and annual modeling, Case 11 exhaust parameters were used. WEC: For lead 24-hour and annual modeling, Case 9 exhaust parameters were used. These cases correspond to the worst cases identified for the criteria pollutant load analysis.

Table 5-33a: Keasbey and Woodbridge Energy Centers - Air Toxics Assessment Worst-Case Modeling Emissions Parameters

Averaging Period/Facility	Operating Case[a]	Amb. Temp[b] (F)	Load (%)	W/WO DB[c]	Exh. Temp[d] (K)	Exh Vel[d] (m/s)
1-hour						
Keasbey EC	Case 11	105	100	W	337.0	19.20
Woodbridge EC	Case 7	59	100	W	351.4	18.03
Annual						
Keasbey EC	Case 11	105	100	W	337.0	19.20
Woodbridge EC	Case 9	59	50	WO	345.5	11.85
Lead: 24hr & annual						
Keasbey EC	Case 11	105	100	W	337.0	19.20
Woodbridge EC	Case 9	59	50	WO	345.5	11.85

Notes:
[a] Represents worst-case operating conditions from the combustion turbine criteria pollutant load analysis.
[b] Ambient operating temperature associated with worst case.
[c] With or Without supplemental firing (duct firing) in the HRSG.
[d] Modeling exhaust temperature and exhaust outlet velocity (from the exhaust stack(s)).

Table 5-34: Total Facility Risk for Short-Term Non-Carcinogenic and Long Term Carcinogenic Effects

CAS No.	Air Toxic	Short Term Cst (ug/m³)	RfCst (ug/m³)	HQst	Rslt	Avg Period
107-02-8	Acrolein	1.08E-02	2.5	4.32E-03	**Negl.**	**1-hr**
7664-41-7	Ammonia	11.34	3200	3.54E-03	**Negl.**	**1-hr**
7440-38-2	Arsenic (inorganic)	3.40E-04	0.2	1.70E-03	**Negl.**	**1-hr**
50-32-8	Benzo(a)pyrene (as POM)	3.73E-03				**1-hr**
7440-43-9	Cadmium	1.87E-03				**1-hr**
50-00-0	Formaldehyde	2.47E-01	55	4.49E-03	**Negl.**	**1-hr**
110-54-3	Hexane (N-)	1.12E-01				**1-hr**
7439-92-1	Lead	1.08E-03	0.1	1.08E-02	**Negl.**	**24-hr**
7439-97-6	Mercury (elemental)	5.10E-04				**1-hr**
7664-93-9	Sulfuric acid	2.49	120	2.08E-02	**Negl.**	**1-hr**
108-88-3	Toluene	2.20E-01	37000	5.95E-06	**Negl.**	**1-hr**
	Total Facility			**4.6E-02**	**Negl.**	

CAS No.	Air Toxic	Clt (ug/m³)	Long Term URF [1/(ug/m³)]	IR	Rslt	Avg Period	RfC (ug/m³)	HQ	Rslt
107-02-8	Acrolein	4.0E-04				Annual	0.02	2.00E-02	**Negl.**
7664-41-7	Ammonia	4.6E-01				Annual	100	4.60E-03	**Negl.**
7440-38-2	Arsenic (inorganic)	1.0E-05	4.3E-03	4.30E-08	**Negl.**	Annual	0.015	6.67E-04	**Negl.**
50-32-8	Benzo(a)pyrene (as POM)	1.6E-04	1.1E-03	1.76E-07	**Negl.**	Annual			
7440-43-9	Cadmium	8.0E-05	4.2E-03	3.36E-07	**Negl.**	Annual	0.02	4.00E-03	**Negl.**
50-00-0	Formaldehyde	9.3E-03	1.3E-05	1.21E-07	**Negl.**	Annual	9	1.03E-03	**Negl.**
110-54-3	Hexane (N-)	2.1E-03				Annual	700	3.00E-06	**Negl.**
7439-92-1	Lead	3.3E-04	1.2E-05	3.96E-09	**Negl.**	Annual			
7439-97-6	Mercury (elemental)	2.0E-05				Annual	0.3	6.67E-05	**Negl.**
7664-93-9	Sulfuric acid	3.7E-02				Annual	1	3.70E-02	**Negl.**
108-88-3	Toluene	8.8E-03				Annual	5000	1.76E-06	**Negl.**
	Total Facility			**6.8E-07**	**Negl.**			**6.7E-02**	**Negl.**

Table 5-34: Total Facility Risk for Short-Term Non-Carcinogenic and Long Term Carcinogenic Effects (continued)

Notes:	
Clt =	Total Facility maximum 5-year average ambient air concentration
URF =	Unit risk factor (for carcinogenic risk)
IR =	C x URF = Incremental risk (for carcinogen)
RfC =	Reference concentration (for noncarcinogenic effects)
HQ =	C/RfC = Hazard quotient (for noncarcinogenic risk)
Rslt =	The result of comparing the IR or HQ to the negligible threshold (FER if > threshold, Negl. if <= threshold)
Cst =	Short-term maximum 1-hour ambient air concentration
RfCst =	Short-term reference concentration (for noncarcinogenic effects)
HQst =	Cst/RfCst = Hazard quotient for short-term noncarcinogenic effects
Rslt =	The result of comparing the HQst to the negligible threshold (FER if > threshold, Negl. if <= threshold)
Negl. =	Negligible risk

Table 5-35: Total Facility Comparison of Maximum Modeled Concentrations of Pollutants to Vegetation Screening Concentrations

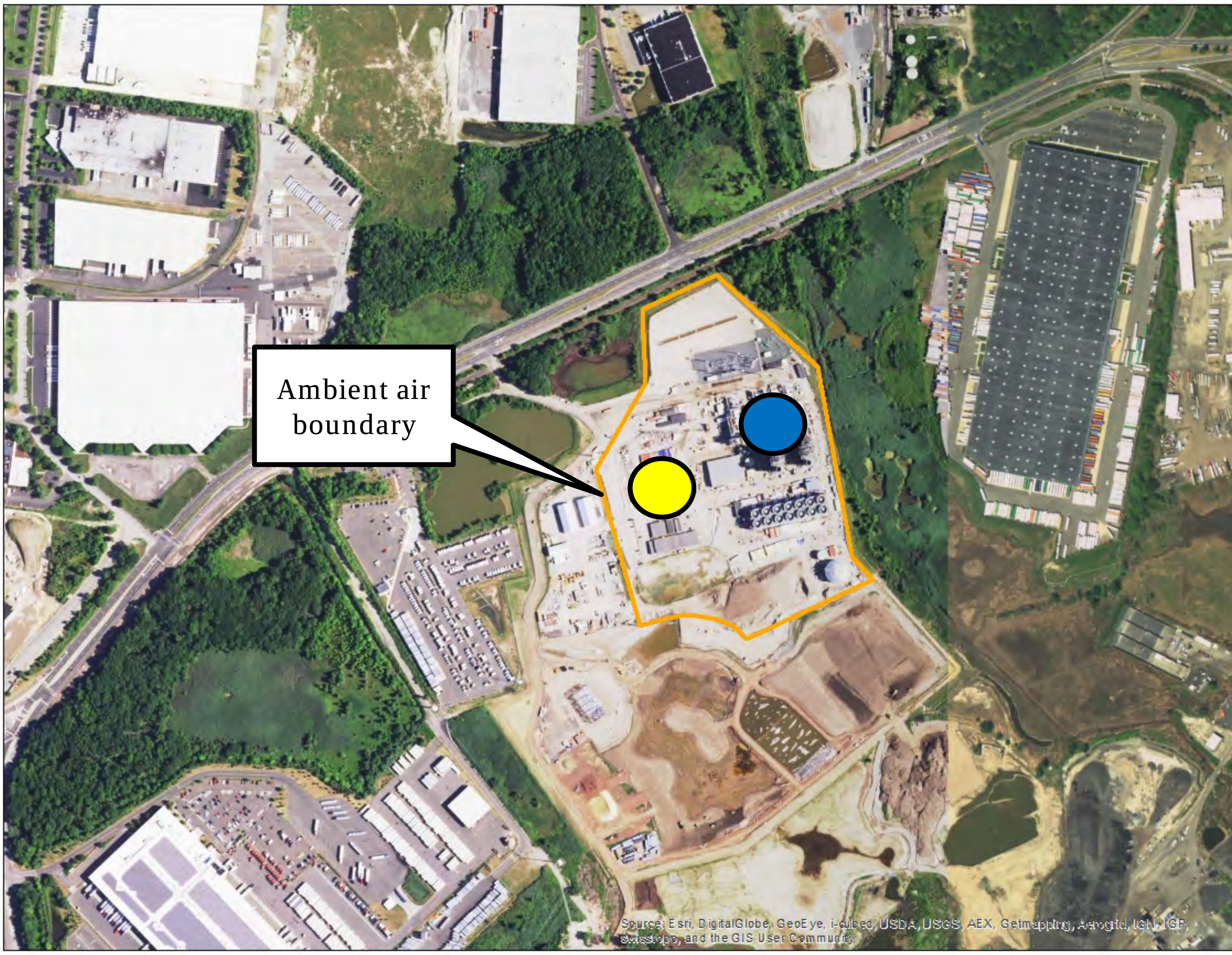
Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration[a] (µg/m³)	Vegetation Screening Concentrations[f] (µg/m³)		
					Sensitive	Intermediate	Resistant
SO_2	1-Hour	4.3	12.0	16.3	917	-	-
	3-Hour	4.2	13.9	18.1	786	2,096	13,100
	Annual	0.11	0.8	0.9	-	18	-
NO_2	4-Hour	23.1[b,g]	72.0	95.1	3,760	9,400	16,920
	8-Hour	23.1[b,g]	72.0[c]	95.1	3,760	7,520	15,040
	Annual	1.28[g]	16.9	18.2	-	94	-
CO	1-Week	86.2[e]	1,495[d]	1,581.2	1,800,000	-	18,000,000

[a]Total concentration = maximum modeled facility concentration + background concentration.
[b]Maximum modeled concentration conservatively based on 1-hour averaging period.
[c]Maximum background concentration conservatively based on 1-hour averaging period.
[d]Maximum background concentration conservatively based on 8-hour averaging period.
[e]Maximum modeled concentration conservatively based on 8-hour averaging period.
[f]Screening concentrations found in Table 3.1 of "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA, 1980).
gIncludes use of PVMRM.
(-) No screening concentration available.

Table 5-36: Total Facility VISCREEN Analysis Results

Background	Theta (degrees)	Azimuth (degrees)	Distance (km)	Alpha (degrees)	Delta E[a]		Contrast[b]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10.	84.	30.0	84.	3.79	0.072	0.06	0.001
Sky	140.	84.	30.0	84.	2.00	0.028	0.06	-0.001
Terrain	10	84.	30.0	84.	3.51	0.087	0.06	0.001
Terrain	140.	84.	30.0	84.	2.00	0.017	0.06	0.001
Outside Surrounding Area								
Sky	10.	0.	1.0	168.	2.00	0.166	0.05	0.002
Sky	140.	0.	1.0	168.	2.00	0.032	0.05	-0.002
Terrain	10.	0.	1.0	168.	2.00	0.315	0.05	0.003
Terrain	140.	0.	1.0	168.	2.00	0.090	0.05	0.003

[a]Color difference parameter (dimensionless).
[b]Visual contrast against background parameter (dimensionless).



Keasbey Energy Center Location

Woodbridge Energy Center Location

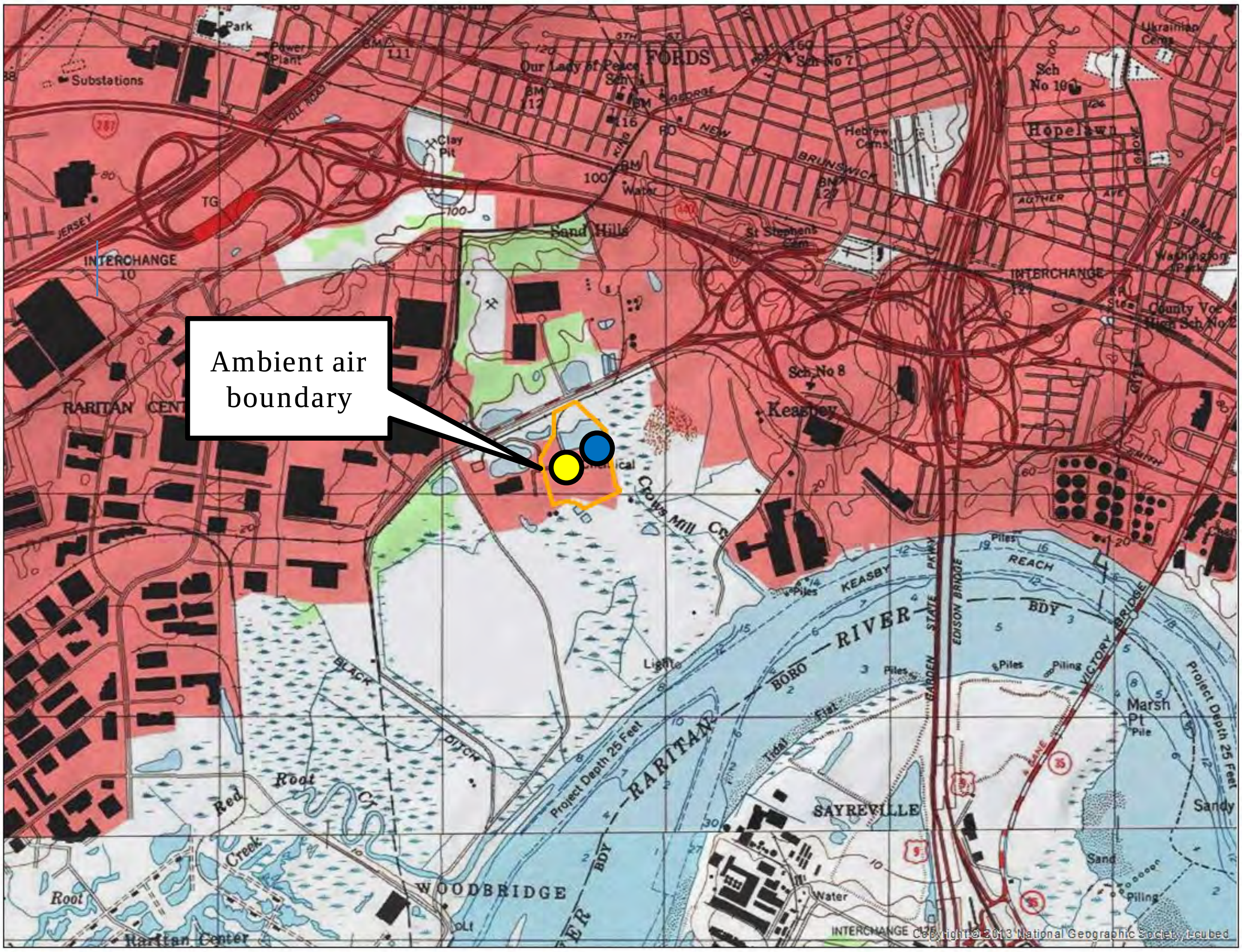
TRC
1099 Wall St. West, Suite 250B
Lyndhurst, NJ 07071
201-933-5541

SITE LOCATION MAP

MAP OF THE KEASBEY ENERGY CENTER SITE

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-1	**JANUARY 2021**



Note: The red regions denote developed areas of medium intensity (i.e., single family housing units) and high intensity (i.e., apartments, row houses, and commercial/industrial).

Keasbey Energy Center Location

Woodbridge Energy Center Location

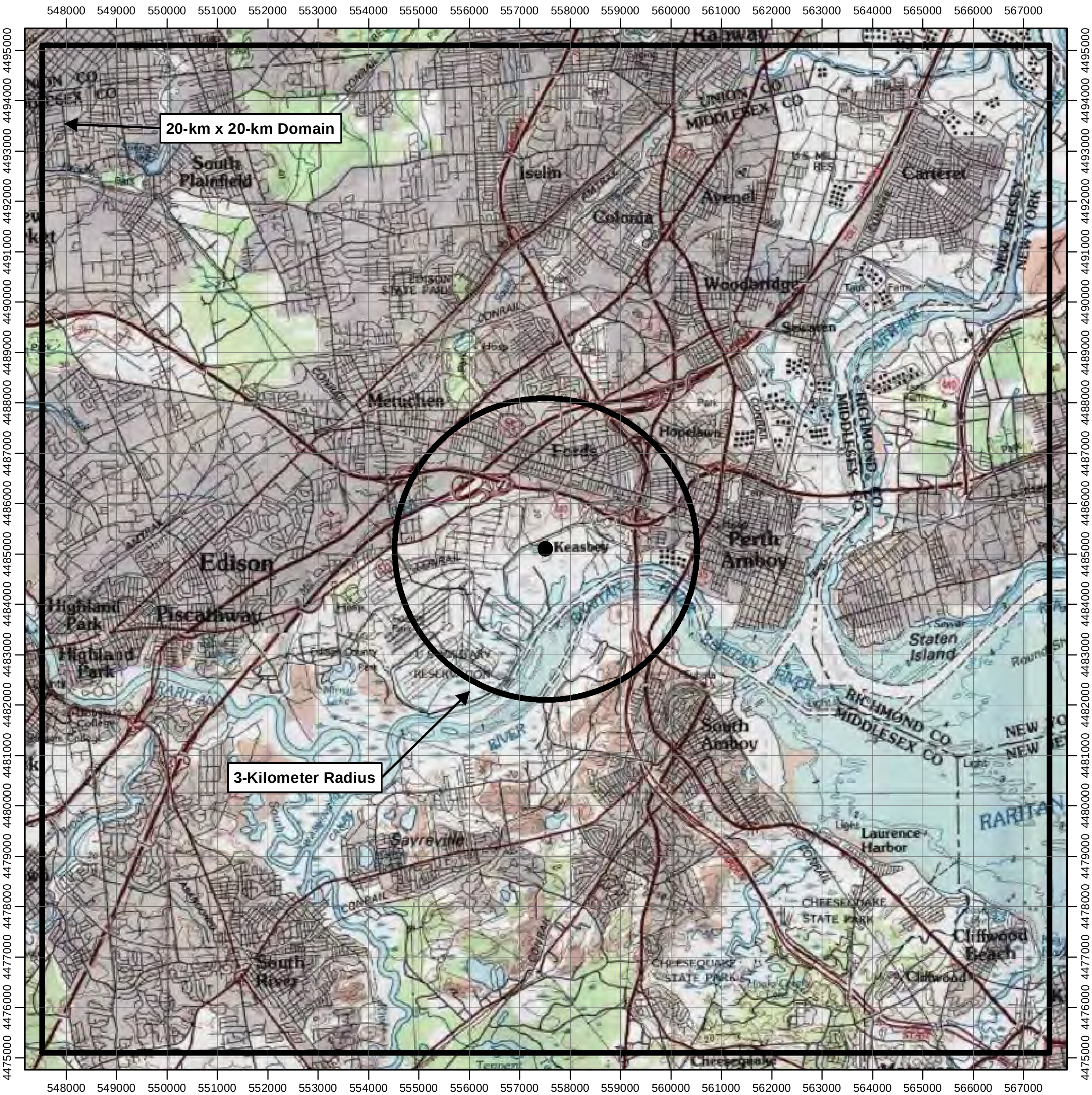
TRC
1099 Wall St. West, Suite 250B
Lyndhurst, NJ 07071
201-933-5541

SITE LOCATION MAP

MAP OF THE KEASBEY ENERGY CENTER SITE

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-2	JANUARY 2021



● Site Location

N

0 1,000 2,000 Meters

Base Map: USGS

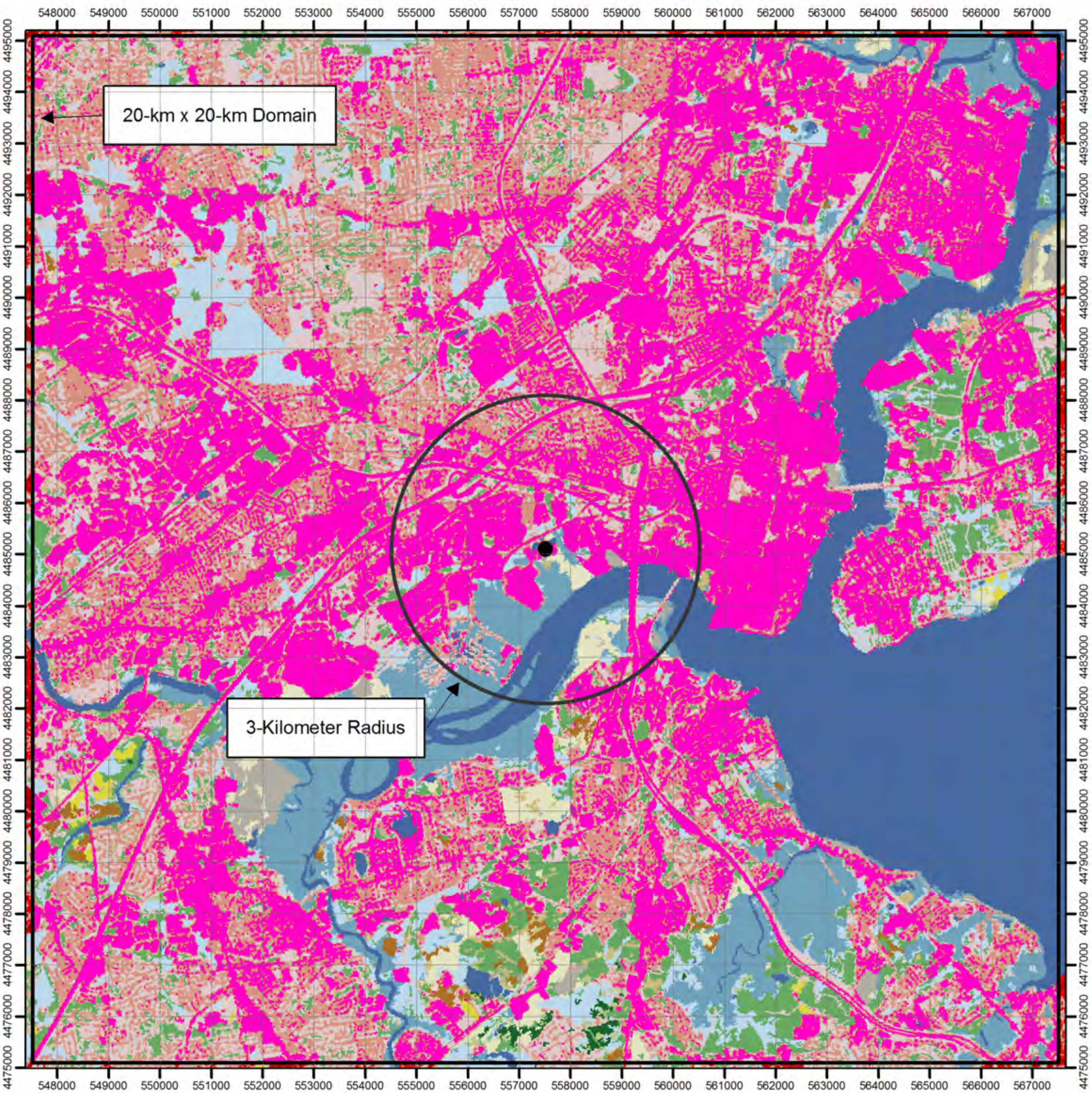
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

FULL MODELING DOMAIN AND 3-KM RADIUS AROUND THE PROJECT SITE

KEASBEY ENERGY CENTER WOODBRIDGE, NEW JERSEY

FIGURE 5-3a	**July 2016**

R:\Projects\GIS_2016\252973_Keasbey_Energy\mxd\Fig5-1_Keasbey_20km_Topo_20160705.mxd



● Site Location

2011 NLCD Cat23 + Cat24

- 11 - Open Water
- 21 - Developed, Open Space
- 22 - Developed, Low Intensity
- 23 - Developed, Medium Intensity
- 24 - Developed, High Intensity
- 31 - Barren Land
- 41 - Deciduous Forest
- 42 - Evergreen Forest
- 43 - Mixed Forest
- 52 - Shrub/Scrub
- 71 - Grassland/Herbaceous
- 81 - Pasture/Hay
- 82 - Cultivated Crops
- 90 - Woody Wetlands
- 95 - Emergent Herbaceous Wetlan

N

0 1,000 2,000 Meters

Base Map: USGS

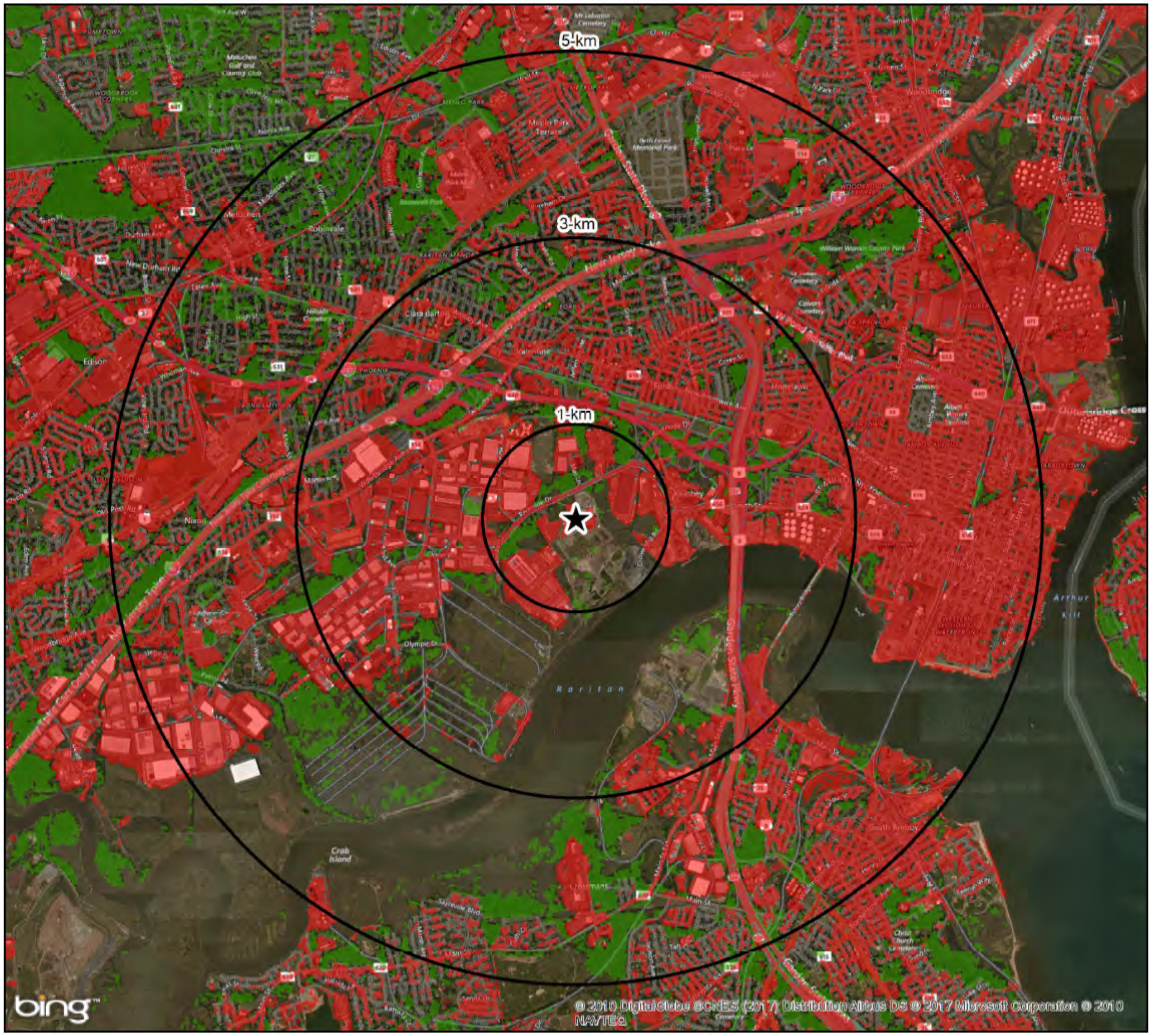
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

FULL MODELING DOMAIN AND 3-KM RADIUS AROUND THE PROJECT SITE

KEASBEY ENERGY CENTER WOODBRIDGE, NEW JERSEY

FIGURE 5-3b	**November 2016**

R:\Projects\GIS_2016\252973_Keasbey_Energy\mxd\Fig5-1_Keasbey_20km_Topo_20160705.mxd



★ CPV Keasbey

Impervious

Value

0 - 49.999

49.99900001 - 999

Canopy

Value

0 - 39.9999

39.99990001 - 999,999

Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 5-3c. Percent Impervious Surface and Canopy

Source: NLCD 2011

TRC

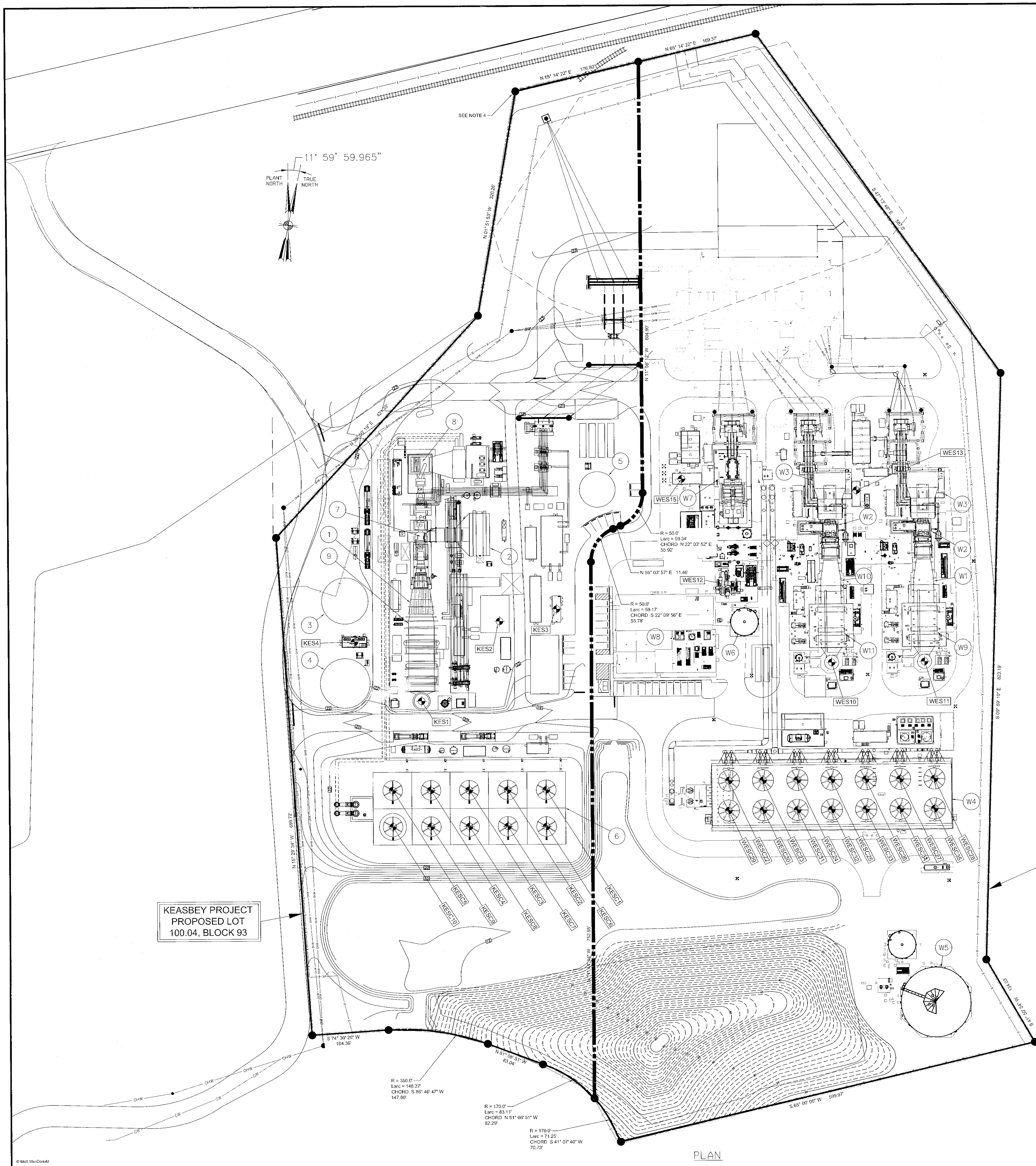


Figure 5-4: General Arrangement Plan

KEASBEY EMISSION SOURCE (KES)					
POINT	EQUIPMENT	DATA (US FEET)		UTM NAD 83 ZONE 18 (US FEET)	
		HEIGHT	BASE ELEVATION	N	E
KES1	HRSG STACK	160	22.5	14,714,866.903	1,829,113.551
KES2	AUX BOILER	40	22.5	14,714,998.975	1,829,198.173
KES3	DIESEL GENERATOR	20	22.5	14,715,031.968	1,829,272.732
KES4	DIESEL FIRE PUMP	26	22.5	14,714,928.742	1,829,004.280
KESC1	COOLING TOWER	54	22.5	14714780.809	1829310.162
KESC2	COOLING TOWER	54	22.5	14714769.583	1829257.356
KESC3	COOLING TOWER	54	22.5	14714758.358	1829204.550
KESC4	COOLING TOWER	54	22.5	14714747.132	1829151.744
KESC5	COOLING TOWER	54	22.5	14714735.907	1829098.938
KESC6	COOLING TOWER	54	22.5	14714730.494	1829320.858
KESC7	COOLING TOWER	54	22.5	14714719.711	1829267.958
KESC8	COOLING TOWER	54	22.5	14714708.486	1829215.152
KESC9	COOLING TOWER	54	22.5	14714697.260	1829162.346
KESC10	COOLING TOWER	54	22.5	14714686.034	1829109.540

WOODBRIDGE EMISSION SOURCE (WES)					
POINT	EQUIPMENT	DATA (US FEET)		UTM NAD 83 ZONE 18 (US FEET)	
		HEIGHT	GRADE ELEVATION	N	E
WES10	HRSG STACK	145	19.5	14,715,037.516	1,829,665.792
WES11	HRSG STACK	145	19.5	14,715,065.289	1,829,792.754
WES12	AUX BOILER	40	19.5	14,715,113.663	1,829,509.953
WES13	EMERGENCY DIESEL GENERATOR	30	19.5	14,715,280.831	1,829,650.533
WES15	DIESEL FIRE PUMP	20	19.5	14,715,246.385	1,829,407.111
WESC22	COOLING TOWER	55	19.5	14,714,845.665	1,829,558.343
WESC23	COOLING TOWER	55	19.5	14,714,855.920	1,829,605.222
WESC24	COOLING TOWER	55	19.5	14,714,866.176	1,829,652.103
WESC25	COOLING TOWER	55	19.5	14,714,876.428	1,829,698.981
WESC26	COOLING TOWER	55	19.5	14,714,886.684	1,829,745.860
WESC27	COOLING TOWER	55	19.5	14,714,896.940	1,829,792.740
WESC28	COOLING TOWER	55	19.5	14,714,907.193	1,829,839.618
WESC29	COOLING TOWER	55	19.5	14,714,804.557	1,829,566.900
WESC30	COOLING TOWER	55	19.5	14,714,814.752	1,829,614.195
WESC31	COOLING TOWER	55	19.5	14,714,825.156	1,829,661.075
WESC32	COOLING TOWER	55	19.5	14,714,835.411	1,829,707.954
WESC33	COOLING TOWER	55	19.5	14,714,845.664	1,829,754.832
WESC34	COOLING TOWER	55	19.5	14,714,855.920	1,829,801.712
WESC35	COOLING TOWER	55	19.5	14,714,866.175	1,829,848.591

KEASBEY BPIP STRUCTURE DIMENSIONS
(SEE NOTE 9 + 10)

MARK		LENGTH (FT)	WIDTH (FT)	DIAMETER (FT)	HEIGHT (FT)
1	HRSG TIER 1	104	40	-	64.5
2	INLET AIR FILTER	60	29	-	44
3	OIL TANK	-	-	65	50
4	RECLAIM WATER TANK	-	-	70	60
5	DEMIN WATER TANK	-	-	50	40
6	COOLING TOWER STRUCTURE	102	271	-	40
7	CT	79	30	-	31
8	ST ENCLOSURE	55	54	-	46
9	HRSG TIER 2	104	37	-	94

WOODBRIDGE BPIP STRUCTURE DIMENSIONS

MARK		LENGTH (FT)	WIDTH (FT)	DIAMETER (FT)	HEIGHT (FT)
W1	HRSG 1 TIER 1	61	62	-	49
W2	CT	56	25	-	30
W3	INLET AIR FILTER	44	25	-	81.75
W4	COOLING TOWER STRUCTURE	90	336	-	41.85
W5	RECLAIM WATER TANK	-	-	89	37
W6	DEMIN WATER TANK	-	-	39	24.18
W7	ST ENCLOSURE	99	39	-	44
W8	WAREHOUSE	110	140	-	25
W9	HRSG 1 TIER 2	61	62	-	95
W10	HRSG 2 TIER 1	61	62	-	49
W11	HRSG 2 TIER 2	61	62	-	95

Notes

1. UNLESS NOTED OTHERWISE, ALL EXISTING SITE DATA, AND PROPOSED KEASBEY SITE GRADING DATA SHOWN, HERE-IN IS BASED ON THE SITE SURVEY FILES AND PRELIMINARY SITE LAYOUT DRAWINGS PREPARED BY CME ASSOCIATES, PARLIN, NEW JERSEY, RECEIVED DECEMBER 2016.
2. THE PROPERTY DATA SHOWN FOR THE KEASBEY SITE IS BASED ON THE DESCRIPTION OF PROPOSED LOT 100.04, BLOCK 93, BEING A PORTION OF LOT 100.02, PREPARED BY CME ASSOCIATES, PARLIN, NEW JERSEY DATED, PRELIMINARY 2016, AND REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE BEARING SYSTEM NAD83.
3. THE PROPERTY DATA SHOWN FOR THE WOODBRIDGE SITE IS BASED ON THE DESCRIPTION OF PROPOSED LOT 100.03, BLOCK 93, BEING A PORTION OF LOT 100.02, PREPARED BY CME ASSOCIATES, PARLIN, NEW JERSEY DATED, PRELIMINARY 2016, AND REFERENCED TO THE NEW JERSEY STATE PLANE COORDINATE BEARING SYSTEM NAD83.
4. THE PROJECT PROPERTY BOUNDARY LOCATION IN THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD83 IS BASED ON THE N 613,295.1994 AND E 541,827.8174 COORDINATES SHOWN AT THE NORTH WEST CORNER OF THE SITE BOUNDARY ON THE SURVEY & MINOR SUBDIVISION SKETCH THROUGH LOTS 2 & 3, BLOCK 62, & LOT 100, BLOCK 93, N/F EPEC POLYMERS INC, FILE NO. PYRO5293.02, DRAWING NO. 03-T, REV 6 MARCH 20, 2013, PREPARED BY CME ASSOCIATES, PARLIN, NEW JERSEY.
5. COORDINATES FOR EMISSION SOURCES AND STRUCTURES SHOWN HERE-IN ARE REFERENCED TO UTM [NAD83] ZONE 18 IN US FEET.
6. THE 11° 59' 59.965" OFFSET BETWEEN TRUE NORTH AND PLANT NORTH IS BASED ON THE CONSTRUCTION SURVEY CONTROL PLAN, DRAWING 2013-012-CT-001, REV 1, DATED MARCH 6, 2014, PREPARED BY KIEWIT POWER FOR THE ADJACENT SHORE WOODBRIDGE PROJECT.
7. GRADE ELEVATIONS SHOWN ARE IN FEET AND REFERENCED TO NAVD 88.
8. THE COORDINATES FOR THE KEASBEY AND WOODBRIDGE EMISSION SOURCES ARE BASED ON THE GRAPHICAL LOCATION SHOWN IN THE ELECTRONIC CME FILES; AND CONVERTED FROM NEW JERSEY STATE PLANE NAD83 TO UTM ZONE 18 NAD83 IN FEET.
9. STRUCTURAL AND EQUIPMENT DIMENSIONS FOR THE KEASBEY PROJECT ARE APPROXIMATE.
10. THE STRUCTURES IDENTIFIED ON THE DRAWING WITH THEIR RESPECTIVE DIMENSIONS ARE INCLUDED IN THE BPIP ANALYSIS. ITEMS NOT IDENTIFIED ON THE DRAWING ARE ANTICIPATED TO BE NO TALLER THAN 35 FEET AND AS SUCH WOULD NOT IMPACT THE BPIP BUILDING DOWNWASH CALCULATIONS.

Legend

PROPERTY LINE
FENCE
ROADS
PROPOSED GRADES
EXISTING GRADES
STRUCTURES
4 STRUCTURE MARK
KES1 KEASBEY EMISSION SOURCE
WES1 WOODBRIDGE EMISSION SOURCE
ES LOCATION

Reference Drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
D	04/04/17	AF	FOR AIR PERMIT	MFL	--
C	02-24-17	AF	FOR CLIENT REVIEW	MFL	--
B	02-16-17	DSP	FOR CLIENT REVIEW	MFL	--
A	02-08-17	DSP	FOR CLIENT REVIEW	MFL	--

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One University Avenue
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Westwood, MA 02090
United States
T +1 (781) 915-0015
F +1 (781) 915-0001
W www.mottmac.com

Client
Competitive Power Ventures, Inc.

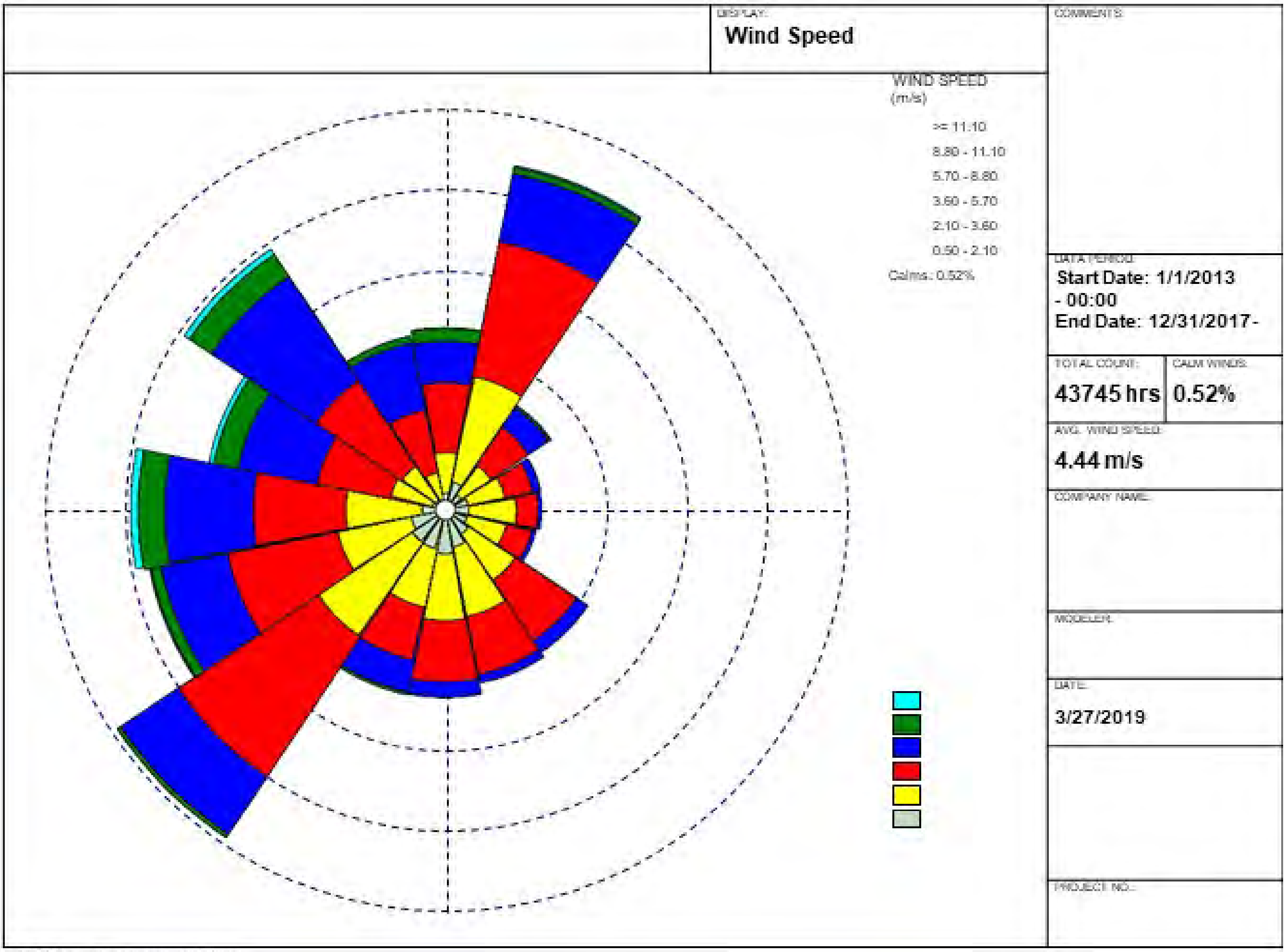
Title
KEASBEY / WOODBRIDGE
NEW JERSEY
SITE ARRANGEMENT
EMISSION SOURCE

4-4-2017

Designed	MFL	Eng check	MFL
Drawn	DSP	Approved	SEK
Dwg check	MFL	Project Mngr	KP
Scale at ANSI E: 1" = 50'-0"		Date: 01/03/17	Rev: D

Drawing Number
324698-ES-702

P:\CPV Woodbridge\Woodbridge2\CPV-WOODBRIDGE-LAYOUT1.dwg Apr 4, 2017 - 9:24AM FED77076



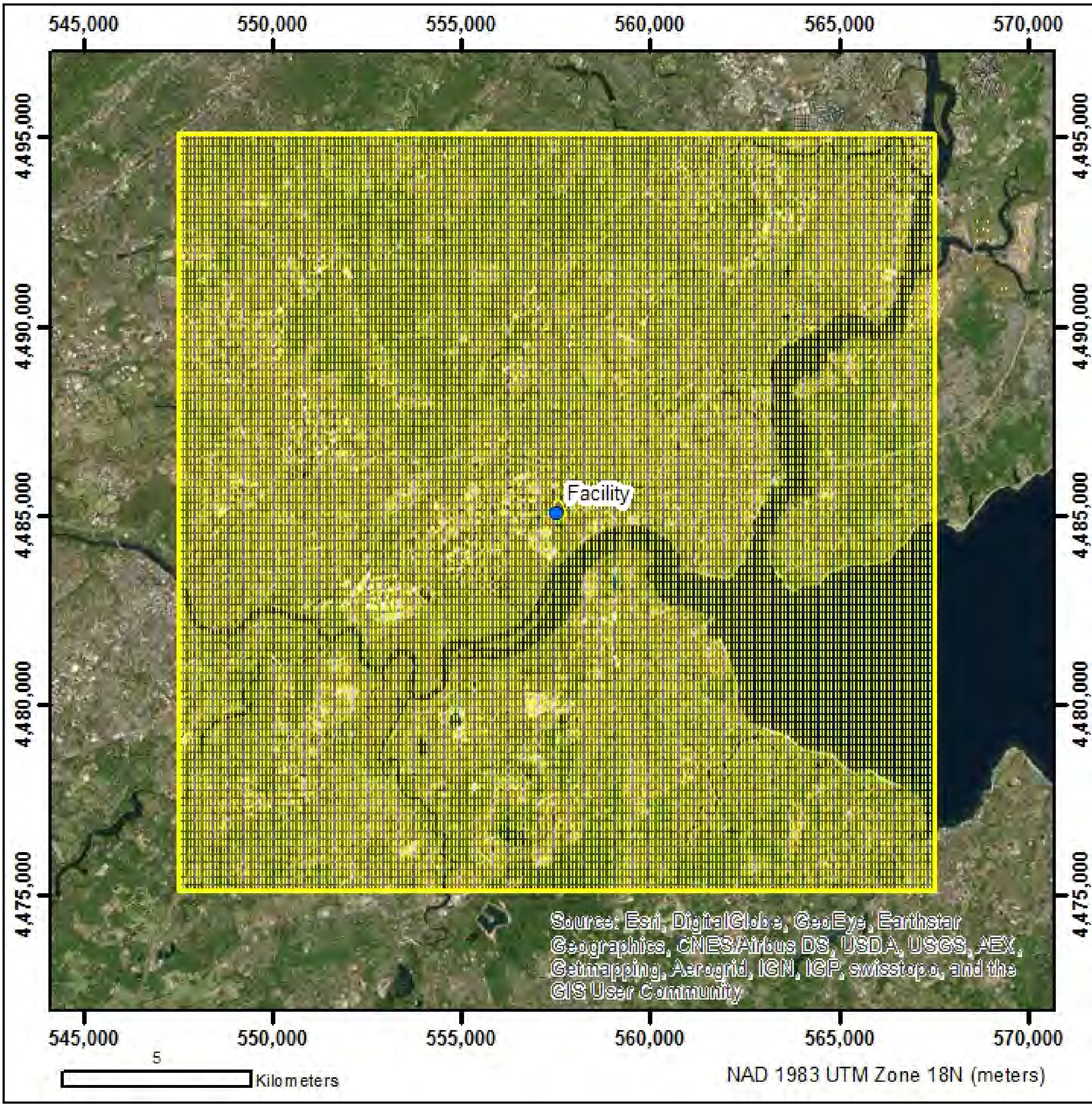
WRPLOT View - Lakes Environmental Software

TRC
1099 Wall St. West, Suite 250B
Lyndhurst, NJ 07071
201-933-5541

WIND ROSE FOR NEWARK LIBERTY INTERNATIONAL AIRPORT (2013 – 2017)

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-5	JANUARY 2021



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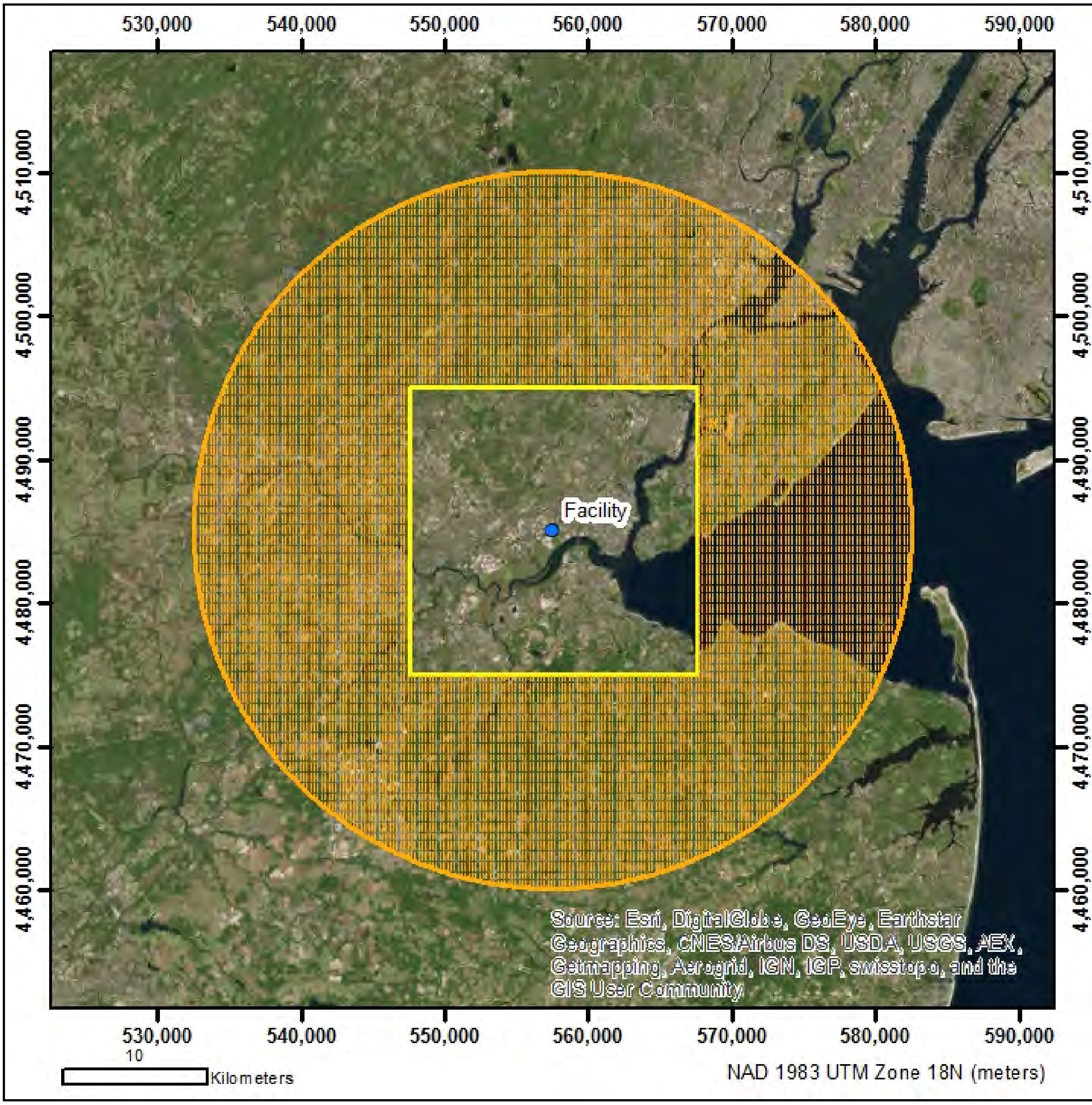
201-933-5541

20 KM X 20 CARTESIAN RECEPTOR GRID (100 METER SPACING)

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-6	MAY 2021



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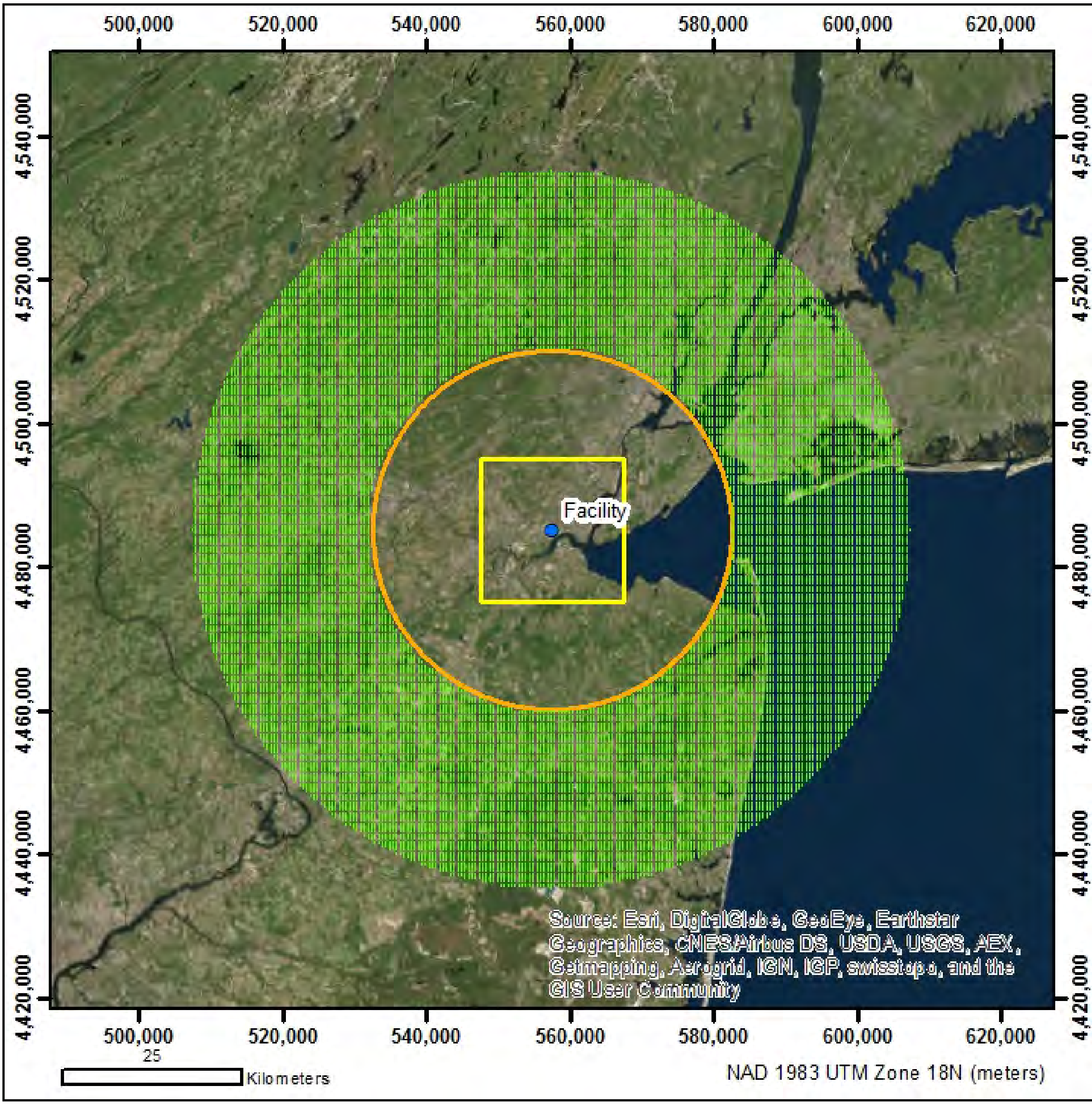
RECEPTOR GRID (250 METER SPACING) OUT TO 25 KM

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-7	**MAY 2021**



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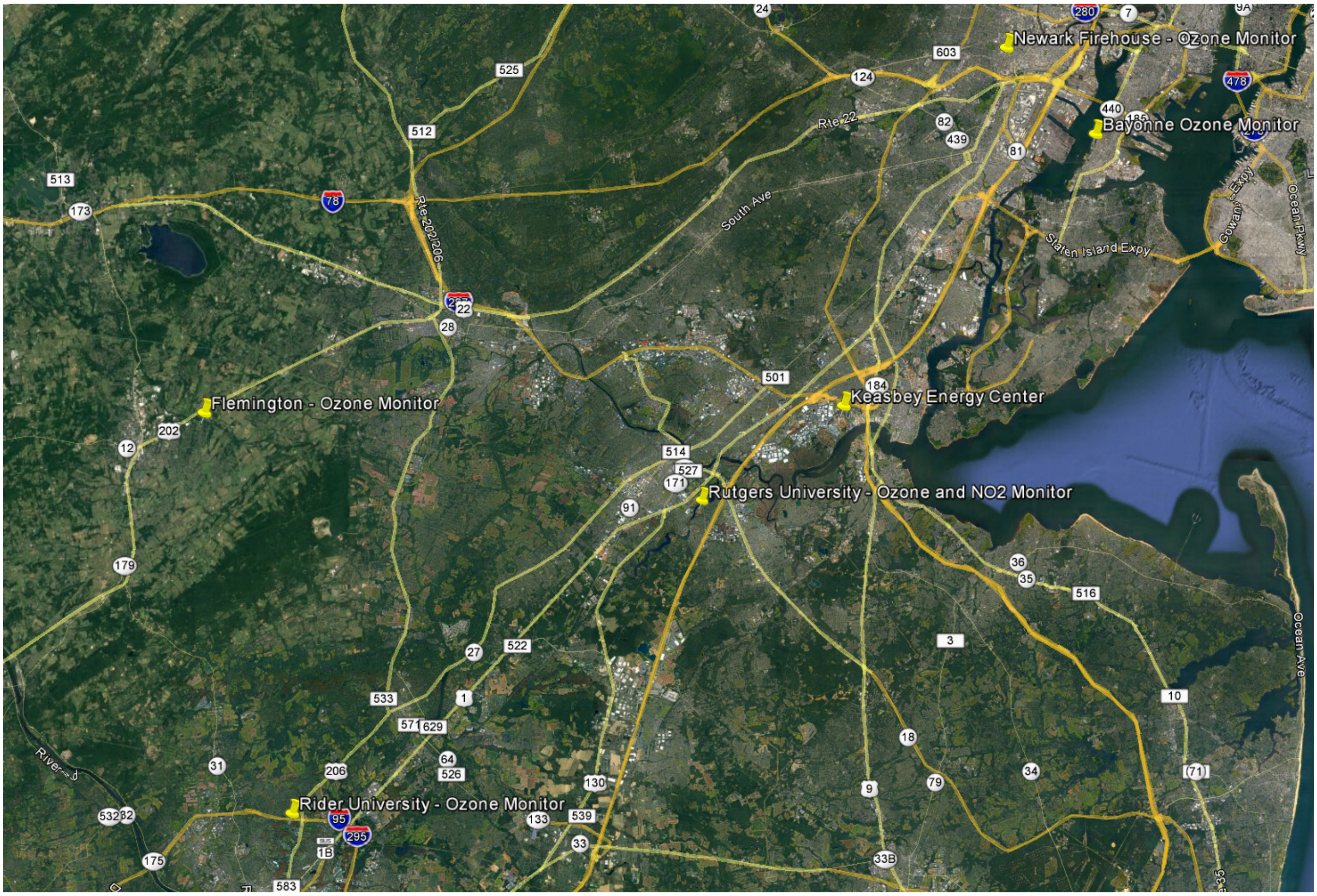
201-933-5541

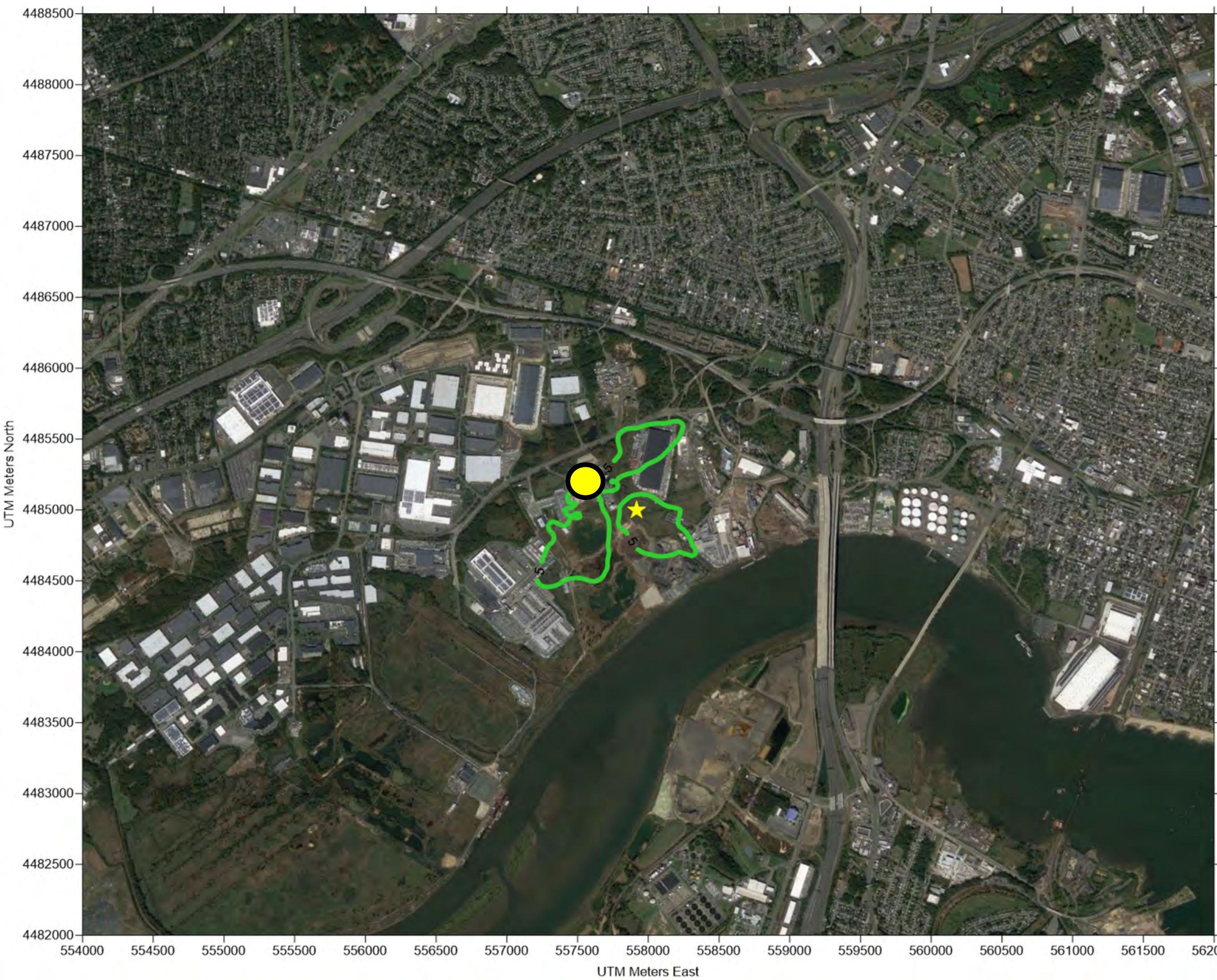
RECEPTOR GRID (500 METER SPACING) OUT TO 50 KM

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-8	MAY 2021

Figure 5-8a: Background NO_2 and Ozone Monitor Locations





Keasbey Energy Center Location

Maximum Modeled Concentration (9.6 ug/m^3)

Concentration > 5 ug/m^3

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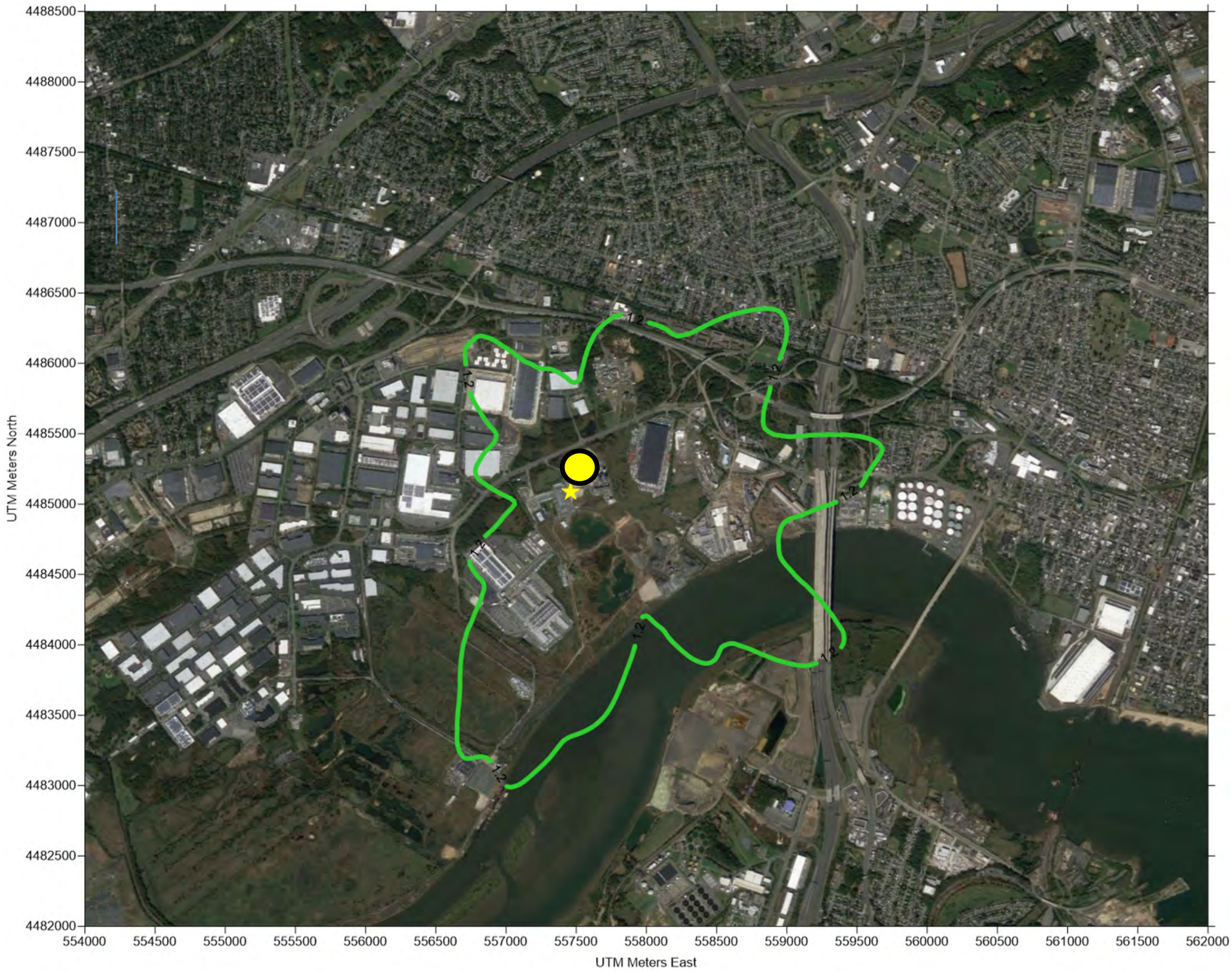
201-933-5541

24-HOUR PM-10 MAXIMUM MODELED CONCENTRATION ISOPLETHS – NORMAL OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-9 | **MAY 2021**



Keasbey Energy Center Location

Maximum Modeled Concentration (7.4 ug/m^3)

Concentration > 1.2 ug/m^3

TRC
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Lyndhurst, NJ 07071
201-933-5541

24-HOUR PM-2.5 MAXIMUM MODELED CONCENTRATION ISOPLETHS – NORMAL OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-10	**MAY 2021**

Keasbey Energy Center Location

Maximum Modeled Concentration (23.1 ug/m^3)

Concentration > 7.5 ug/m^3

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201-933-5541

1-HOUR NO2 MAXIMUM MODELED CONCENTRATION ISOPLETHS – NORMAL OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-11	**MAY 2021**

Keasbey Energy Center Location

Maximum Modeled Concentration ($1.3\ ug/m^3$)

Concentration > $1\ ug/m^3$

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201-933-5541

ANNUAL NO2 MAXIMUM MODELED CONCENTRATION ISOPLETHS – NORMAL OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-12	**MAY 2021**

Keasbey Energy Center Location

Maximum Modeled Concentration (0.4 ug/m^3)

Concentration > 0.3 ug/m^3

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201-933-5541

ANNUAL PM-2.5 MAXIMUM MODELED CONCENTRATION ISOPLETHS – NORMAL OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-13	MAY 2021

Keasbey Energy Center Location

Maximum Modeled Concentration (9.6 ug/m³)

Concentration > 5 ug/m³

TRC
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Lyndhurst, NJ 07071
201-933-5541

24-HOUR PM-10 MAXIMUM MODELED CONCENTRATION ISOPLETHS – INCLUDES SUSD OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-14	**MAY 2021**

Keasbey Energy Center Location

Maximum Modeled Concentration (7.4 ug/m^3)

Concentration > 1.2 ug/m^3

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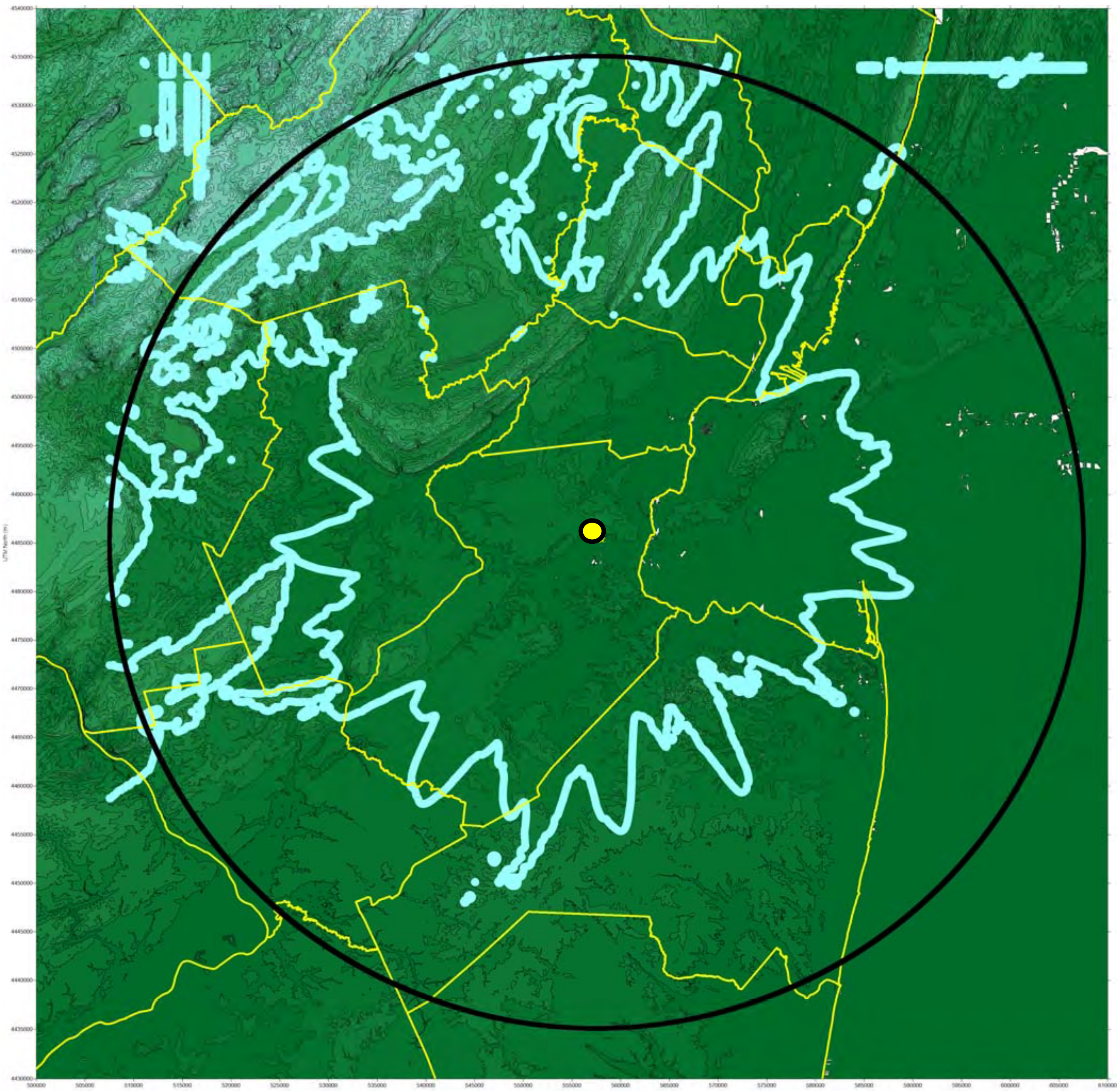
Lyndhurst, NJ 07071
201-933-5541

24-HOUR PM-10 MAXIMUM MODELED CONCENTRATION ISOPLETHS – INCLUDES SUSD OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-15	**MAY 2021**



Keasbey Energy Center Location

Maximum Modeled Concentration (74.4 ug/m^3)

Concentration > 7.5 ug/m^3

TRC
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201-933-5541

1-HOUR NO2 MAXIMUM MODELED CONCENTRATION ISOPLETHS – INCLUDES SUSD OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-16	MAY 2021

Keasbey Energy Center Location

Maximum Modeled Concentration (1.3 ug/m^3)

Concentration > 1 ug/m^3

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201-933-5541

ANNUAL NO2 MAXIMUM MODELED CONCENTRATION ISOPLETHS – INCLUDES SUSD OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-17	MAY 2021

Keasbey Energy Center Location

Maximum Modeled Concentration (0.4 ug/m³)

Concentration > 0.3 ug/m³

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201-933-5541

ANNUAL PM-2.5 MAXIMUM MODELED CONCENTRATION ISOPLETHS – INCLUDES SUSD OPERATIONS

CPV KEASBEY, LLC
WOODBRIDGE, NEW JERSEY

FIGURE 5-18	MAY 2021

APPENDIX D

AGENCY CORRESPONDENCE

State of New Jersey
Department of Environmental Protection
Air Quality, Energy and Sustainability
Division of Air Quality
Bureau of Evaluation and Planning
401 E. State Street, 2nd Floor, P.O. Box 420, Mail Code 401-02
Trenton, NJ 08625-0420

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

April 19, 2021

Mr. Darin Ometz
Senior Air Quality Project Manager
TRC
1099 Wall Street West, Suite 250B
Lyndhurst, NJ 07071

SUBJECT: CPV Keasbey, LLC
Approval of Air Quality Modeling Protocol (Revision 3, dated February 2021)
Woodbridge, Middlesex County, New Jersey
PI# 18940, BOP#160004

Dear Mr. Ometz,

The NJDEP Bureau of Evaluation and Planning (BEP) in collaboration with USEPA Region 2 has completed its review of the above referenced document. The protocol is conditionally approved provided the attached comments are properly addressed in the air quality modeling report. If you have any questions, please contact me at Yiling.Zhang@dep.nj.gov, or Greg John at Greg.John@dep.nj.gov.

Sincerely,

Yiling Zhang
Research Scientist

c: J. Leon, BSS
D. Owen, BSS
A. Khan, BSS
G. John, BEP
A. Colecchia, EPA-R2
N. Sareen, EPA-R2
Darin Ometz, TRC
Michael Keller (TRC)

General Comment

1. A general recommendation is to include links to guidance that are cited in the protocol and future reports.

Section 3.2 Fuels

2. Per BEP Comment Q3 of December 8, 2016, Keasbey added two paragraphs on how natural gas sulfur content was determined in its March 2017 modeling protocol. These two paragraphs were removed from the February 2021 protocol Revision 3 and should be added back to this updated modeling protocol.

BEP acknowledges that the proposed pipeline sulfur content has been revised from 0.63 to 0.75 grain per 100 scf.

Section 3.3 Operation

3. It has been established during the previous protocol review that Keasbey's air quality impact analysis will include PSD Class I increments. This section only referred to Class II increments.

Section 3.4 Selection of Sources for Modeling

4. This section states that "*The emergency equipment may operate for up to one hour per day for readiness testing and maintenance purposes.*"

Other sections of the protocol referred to testing the emergency equipment not more than once per week (with test durations limited by permit condition to no more than 30 minutes) and 100 hours per year per equipment.

Section 3.5 Exhaust Stack Configuration and Emission Parameters (Keasbey Energy Center)

5. In Table 3-2 and subsequent tables, there is a missing footnote for the "a" next to PM-10/PM-2.5.

6. Section 3.5.3: For the MERPS analysis, please justify the use of the hypothetical source in Bronx, NY instead of the more rural source in Warren, NJ.

Information that could be used to describe the comparability of two different geographic areas include: nearby local and regional sources of pollutants and their emissions (e.g., other industry, mobile, biogenics), rural or urban nature of the area, terrain, ambient concentrations of relevant pollutants where available, average and peak temperatures, humidity.

From Section 4 of the MERPS guidance:
The permit applicant should provide the appropriate permitting authority with a technically credible justification that the source characteristics (e.g., stack height, emissions rate) of the specific project source described in a permit application and the chemical and physical environment (e.g., meteorology, background pollutant concentrations, and regional/local emissions) near that project source are adequately represented by the selected hypothetical source(s).

Section 4.1.3 Preconstruction Ambient Air Quality Monitoring Exemption

7. For the preconstruction monitoring waiver, it is recommended that the applicant include a note if there has been any additional activity in the area since the approved waiver in 2016.

Section 4.2 New Jersey Department of Environmental Protection Regulations

8. The applicant can remove ULSD from the 1st bullet and remove combustion turbine from the list of equipment.

Section 5.1 Model Selection

9. A new AERMOD version is expected to be released later this Spring. The new model version should be used unless the applicant can discuss that the new model version will not affect any of the modeling scenarios or results.

Section 5.2 Surrounding Area and Land Use

10. Please include the version of AERSURFACE and the land use years used. Please include a population density evaluation to support the selection of rural dispersion coefficients.

Section 5.6 Startups/Shutdowns (Keasbey Energy Center) & Table 5-1

11. In the Keasbey's March 2017 protocol, three rapid response startup scenarios were proposed for cold startups (10 times), warm startups (52 times) and hot startups (200 times) with emission rates and stack parameters provided for each startup type (Table 5-1). The current revised protocol only provided information for one rapid response startup scenario (262 times, Table 5-1). Please clarify these differences and outline the number and type of startups and shutdowns for each of the combustion turbines where applicable.

12. Section 5.6.2: In the following sentence, "As such, the 1-hour NO2 modeling analysis will not include an operating scenario with simultaneous operation of the two (2) combustion…" Did the applicant mean to say, "simultaneous **startup** operation"?

13. Section 5.6.2: In the following sentence, "This operating scenario can be included in the operating permit with a permit condition as shown below that indicates that the Woodbridge Energy Center startup scenario cannot occur simultaneously with Woodbridge Energy Center startup of both combustion turbines for more than 7 days per year." Please correct one of the instances of Woodbridge to say Keasbey.

Section 5.7 1-Hour NO_2 Modeling

14. Please ensure that the ozone concentration units used with PVMRM are correctly interpolated to model results in $\mu g/m^3$.

15. The air quality modeling report should include correspondence regarding the use of PVMRM, such as the CPV Keasbey request letter, dated June 21, 2017, and the Department's comment/approval letter, dated July 19, 2017. In addition, document all updates and variations from the previously approve approach.

Section 5.8 NJDEP Air Toxics Risk Analysis

16. This section stated that, for HAPs exceeding reporting thresholds, the 24-hour and annual concentrations will be modeled. However, many HAPs' short-term reference concentrations are 1-hour average based. Please model with the appropriate average time. Also, add "and unit risk factors" to the sentence "*The combined concentrations from Keasbey and Woodbridge will be evaluated against the reference concentrations found in the NJDEP Risk Technical Manual 1003 and risk screening worksheet*".

17. Add a table listing the HAPs to be modeled, including short-term and long-term average emission rates and toxicity thresholds.

Section 5.12 PSD Increment Analysis

18. Please specify the pollutants for the following minor source baseline dates:

Nov. 3, 1977 is for SO_2
Nov. 15, 1978 is for PM_{10}

Section 5.15.4 Impacts on Class I Areas

19. Since it has been close to five years since first corresponding with the Federal Land Manager (FLM) regarding this project, the BEP suggests contacting the FLM again to confirm the FLM's 2016 response.

TRC
1099 Wall St. West
Suite 250B
Lyndhurst, NJ 07071
T 201.933.5541
TRCcompanies.com

February 18, 2021

Mr. Greg John
Division of Air Quality, Bureau of Evaluation and Planning
New Jersey Department of Environmental Protection
401 E. State Street, 2nd Floor
Trenton, New Jersey 08625

Re: Technical Deficiencies: Title V Signification Modification
Woodbridge Energy Center (Keasbey Energy Center Project)
Permit Activity Number: BOP160004 / Program Interest Number: 18940
Submittal of Revised Air Quality Modeling Protocol (Revision 3)

Dear Mr. John:

TRC Environmental Corporation (TRC) is submitting the enclosed revised Air Quality Modeling Protocol (Revision 3) for the Keasbey Energy Center Project (Facility ID 18940, Permit Activity BOP160004) in response to the Department's October 29, 2020 notice of technical deficiency. As you are aware and were a participant to, the NJDEP and CPV Keasbey had a virtual meeting on November 17, 2020 to discuss the Department's expectations with regards to updating the air dispersion modeling protocol, analysis, and report.

As requested, the revised Air Quality Modeling protocol includes the necessary updates to the U.S. EPA dispersion model versions, updates to the meteorological and background monitoring concentration data, and updates to the facility emissions and design details that were provided in the single source air quality modeling analysis report (September 2017) and approved on November 20, 2017. To facilitate the Department's review of the changes incorporated in the revised Air Quality Modeling Protocol (Revision 3 – February 2021) from the approved Air Quality Modeling Protocol (Revision 2 – March 2017), the following sections have been updated. Brief descriptions of the requested updates are also provided for your consideration.

Updates to the revised Air Quality Modeling Protocol (Revision 3 – February 2021)

- Section 3.0 – Removed fuel oil combustion from the proposed GE 7HA combustion turbine operating scenarios for consistency with the approved single source air quality modeling analysis (September 2017)

- Section 3.0 – Updated the emission rates and stack parameters as provided in Tables 3-1 through 3-11 to reflect the most recent single source modeling analysis (September 2017) and pre-draft permit (February 2018)

- Section 3.5.3 – Revised the methodology for calculating impacts for secondary PM2.5 formation based on the most recent U.S. EPA methodology Modeled Emission Rates for Precursors (MERPs) guidance (April 30, 2019)

- Section 4.0 – Updated Table 4-1 (Facility Emission Rates) to reflect the most recent single source modeling analysis (September 2017) and pre-draft permit (February 2018)

- Section 5.0 – Updated references to the 2018 version of NJDEP TM1002 and references to AERMOD model version 19191
- Section 5.3 and Figure 5-3 - Updated meteorological data from Newark Liberty International Airport for the five (5) year period from 2013-2017, which was processed by NJDEP using AERMOD's meteorological processor, AERMET (version 18081) for use in the revised modeling analysis
- Section 5.5 - Removed fuel oil combustion from the proposed GE 7HA combustion turbine operating scenarios for consistency with the approved single source air quality modeling analysis (September 2017)
- Section 5.6.2 – Added a discussion regarding the evaluation of simultaneous operation of the Keasbey Energy Center and Woodbridge Energy Center combustion turbine startup operating scenarios for 1-hour NO_2
- Section 5.7.2 – Updated background monitoring concentrations for NO_2 by season and hour of day for the most recent 3-year period with acceptable data capture rates
- Section 5.7.3 – Updated hourly ozone data for years 2013-2017, concurrent with the five (5) years of meteorological data for use in the AERMOD model
- Section 5.9 – Updated references to AERMAP version 18081 for processing the receptor grid
- Section 5.10 and Table 5-3 – Updated background monitoring concentrations for the most recent 3- year period (2017-2019)
- Tables 5-1 and 5-2 - Updated the emission rates and stack parameters to reflect the most recent single source modeling analysis (September 2017) and pre-draft permit (February 2018)

If you have any questions concerning the attached air quality modeling protocol, please feel free to call me at (201) 508-6964. We look forward to receiving the Department's review comments/approval, as well as the opportunity to continue working with you on this project.

Sincerely,

TRC

Darin Ometz

Darin Ometz
Senior Air Quality Project Manager

CC: A. Urquhart, CPV (via email)
D. Owen, NJDEP (via email)

TRC

A. Khan, NJDEP (via email)
J. Leon, NJDEP (via email)
Y. Zhang, NJDEP (via email)
M. Keller, TRC (via email)

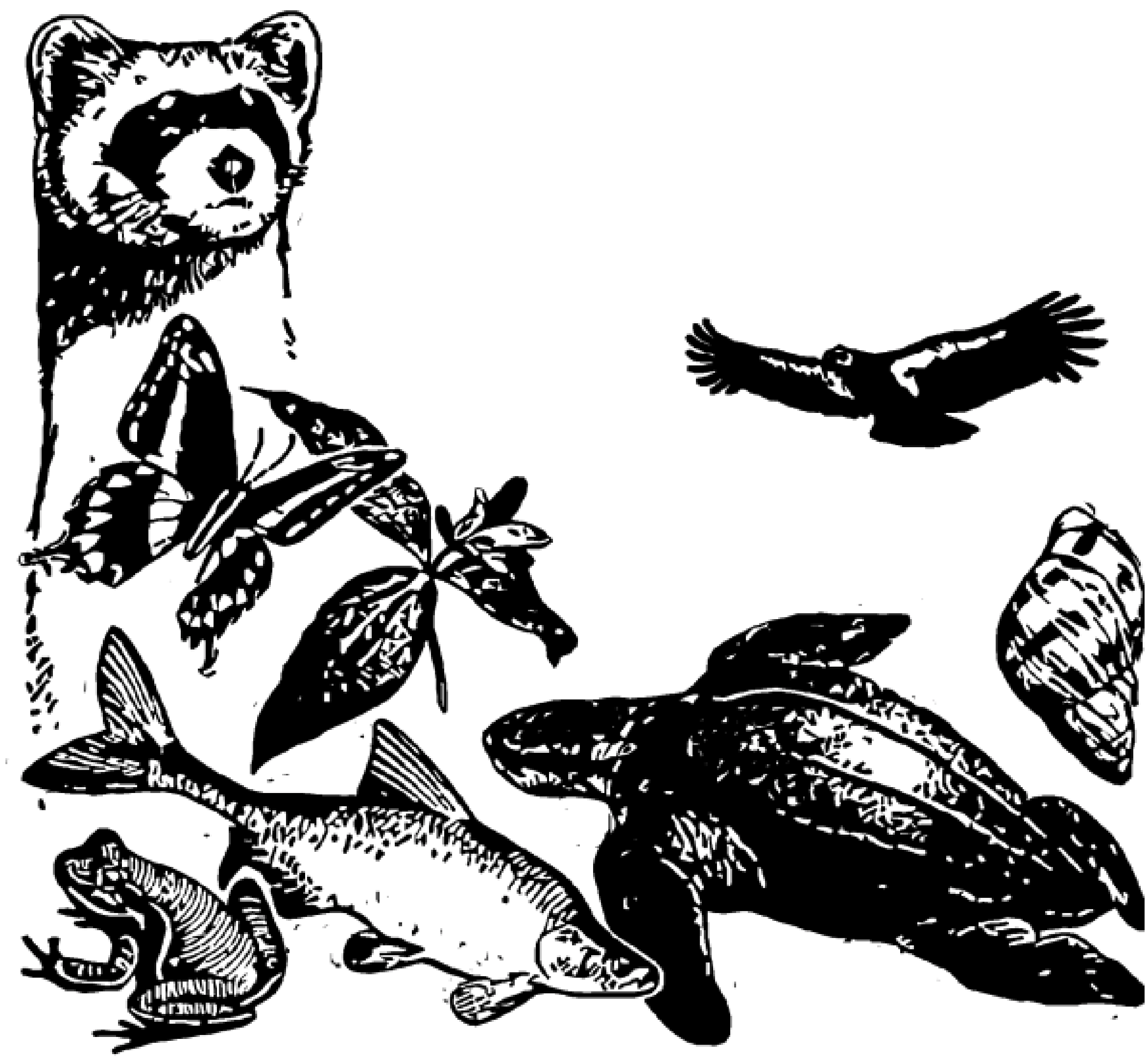
U.S. Fish & Wildlife Service

Keasbey Energy Center

IPaC Trust Resources Report

Generated July 05, 2016 11:17 AM MDT, IPaC v3.0.8

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.



IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

Table of Contents

U.S. Fish & Wildlife Service

IPaC Trust Resources Report

NAME

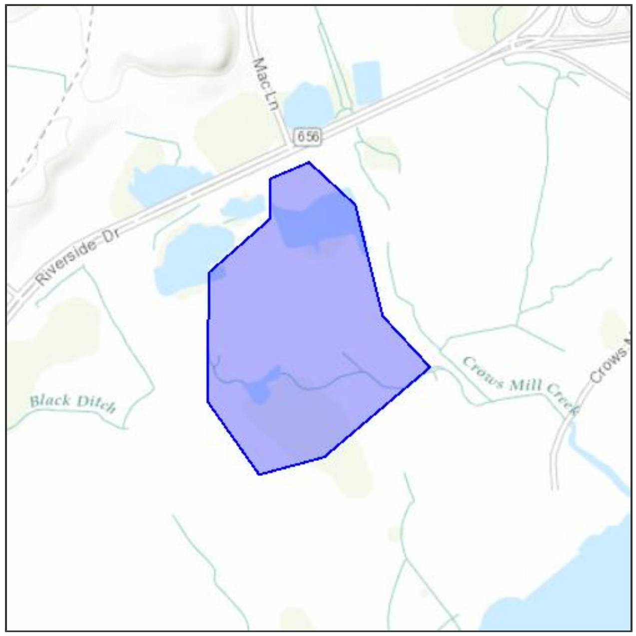
Keasbey Energy Center

LOCATION

Middlesex County, New Jersey

IPAC LINK

https://ecos.fws.gov/ipac/project/OKGMU-W3E4B-HWRMA-OGQWT-O47LWY



U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

New Jersey Ecological Services Field Office
927 North Main Street, Building D
Pleasantville, NJ 08232-1454
(609) 646-9310

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.

There are no endangered species in this location

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.[1] There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

---

1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The following species of migratory birds could potentially be affected by activities in this location:

American Oystercatcher Haematopus palliatus — Bird of conservation concern
On Land Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0G8

American Bittern Botaurus lentiginosus — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F3

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
On Land Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Black Skimmer Rynchops niger — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EO

Black-billed Cuckoo Coccyzus erythropthalmus — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HI

Blue-winged Warbler Vermivora pinus — Bird of conservation concern
On Land Season: Breeding

Canada Warbler Wilsonia canadensis — Bird of conservation concern
On Land Season: Breeding

Fox Sparrow Passerella iliaca — Bird of conservation concern
On Land Season: Wintering

Golden-winged Warbler Vermivora chrysoptera — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0G4

Gull-billed Tern Gelochelidon nilotica — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JV

Hudsonian Godwit Limosa haemastica — Bird of conservation concern
At Sea Season: Migrating

Kentucky Warbler Oporornis formosus — Bird of conservation concern
On Land Season: Breeding

Least Bittern Ixobrychus exilis
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B092

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
On Land Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Peregrine Falcon Falco peregrinus — Bird of conservation concern
On Land Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Pied-billed Grebe Podilymbus podiceps — Bird of conservation concern
On Land Season: Year-round

Prairie Warbler Dendroica discolor — Bird of conservation concern
On Land Season: Breeding

Purple Sandpiper Calidris maritima — Bird of conservation concern
On Land Season: Wintering

Red Knot Calidris canutus rufa — Bird of conservation concern
On Land Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DM

Rusty Blackbird Euphagus carolinus — Bird of conservation concern
On Land Season: Wintering

Saltmarsh Sparrow Ammodramus caudacutus — Bird of conservation concern
On Land Season: Breeding

Seaside Sparrow Ammodramus maritimus — Bird of conservation concern
On Land Season: Year-round

Short-eared Owl Asio flammeus — Bird of conservation concern
On Land Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Snowy Egret Egretta thula — Bird of conservation concern
On Land Season: Breeding

Upland Sandpiper Bartramia longicauda — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HC

Willow Flycatcher Empidonax traillii — Bird of conservation concern
On Land Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F6

Wood Thrush Hylocichla mustelina — Bird of conservation concern
On Land Season: Breeding

Worm Eating Warbler Helmitheros vermivorum — Bird of conservation concern
On Land Season: Breeding

Wildlife refuges and fish hatcheries

There are no refuges or fish hatcheries in this location

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

This location overlaps all or part of the following wetlands:

Estuarine And Marine Wetland

E2EM1Pd
E2EM5/1Pd

Freshwater Emergent Wetland

PEM1E
PEM5R

Freshwater Forested/shrub Wetland

PSS1R

Freshwater Pond

PUBHx
PUBV

Riverine

R4SBC
R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website: http://107.20.228.18/decoders/wetlands.aspx

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
PHONE: (609)646-9310 FAX: (609)646-0352
URL: www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Consultation Code: 05E2NJ00-2016-SLI-0627 July 05, 2016
Event Code: 05E2NJ00-2016-E-00480
Project Name: Keasbey Energy Center

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species that may occur in your proposed action area and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*)

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment

Official Species List

Provided by:

New Jersey Ecological Services Field Office
927 NORTH MAIN STREET, BUILDING D
PLEASANTVILLE, NJ 08232
(609) 646-9310
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

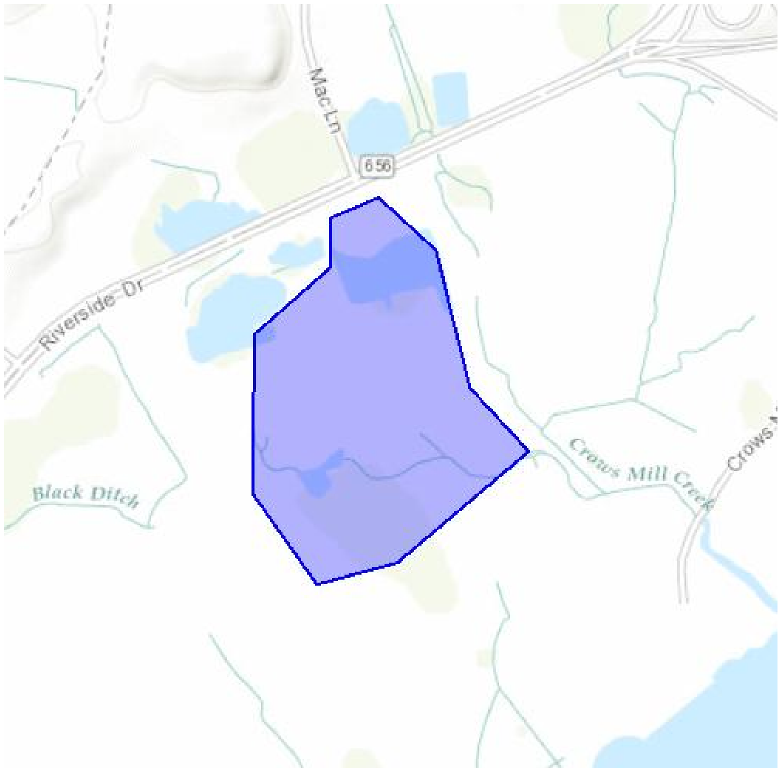
Consultation Code: 05E2NJ00-2016-SLI-0627
Event Code: 05E2NJ00-2016-E-00480

Project Type: POWER GENERATION

Project Name: Keasbey Energy Center
Project Description: CPV Keasbey, LLC is proposing to construct a combined cycle power facility on a parcel of land controlled by CPV that borders the existing Woodbridge Energy Center in the Township of Woodbridge, Middlesex County, New Jersey.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-74.32002067565918 40.51729008578551, -74.32117938995361 40.51693121343741, -74.32117938995361 40.516034024163, -74.3229818344116 40.51482687783199, -74.32302474975586 40.51340763745765, -74.32302474975586 40.511906798865034, -74.3215012550354 40.5102917285085, -74.3195915222168 40.51068326428807, -74.31648015975952 40.51270616273139, -74.31787490844727 40.513848094581704, -74.3186902999878 40.51634396363333, -74.32002067565918 40.51729008578551)))

Project Counties: Middlesex, NJ

United States Department of Interior
Fish and Wildlife Service

Project name: Keasbey Energy Center

Endangered Species Act Species List

There are a total of 0 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

There are no listed species identified for the vicinity of your project.

Critical habitats that lie within your project area

There are no critical habitats within your project area.

1200 Wall Street West
5th Floor
Lyndhurst, NJ 07071

201.933.5541 PHONE
201.933.5601 FAX

www.trcsolutions.com

July 12, 2016

Mr. Greg John
New Jersey Department of Environmental Protection
Division of Air Quality, Bureau of Technical Services
401 East State Street, 2nd Floor
Trenton, New Jersey 08625

Subject: **CPV Keasbey, LLC**
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Request for Waiver from Pre-Construction Ambient Air Quality Monitoring

Dear Mr. John:

This letter serves as a request on behalf of CPV Keasbey, LLC (CPV Keasbey) to the New Jersey Department of Environmental Protection ("NJDEP") for a waiver from the requirement to perform one year of pre-application ambient air quality monitoring for the proposed combined cycle power facility (to be known as the Keasbey Energy Center) to be located in the Township of Woodbridge, Middlesex County, New Jersey (see Figure 1) in accordance with Prevention of Significant Deterioration (PSD) of Air Quality regulations.

These regulations state that major new or modified facilities having annual emissions of regulated air contaminants in excess of significant emission rates (SER) must provide an analysis of air quality data in the area of the proposed facility that, in general, consist of continuous air quality monitoring data gathered over a year preceding receipt of the application. As fully described below, this request is for a waiver from the pre-application ambient monitoring data requirement for the air contaminants: carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter with an aerodynamic diameter less than 10 micrometers (µm) (PM-10), and less than 2.5 micrometers (PM-2.5).

Pursuant to the PSD regulations codified in 40 CFR 51.166 and 40 CFR 52.21, U.S. EPA may exempt a proposed PSD source, otherwise subject to the one-year pre-construction ambient monitoring requirement, if either:

(1) representative existing ambient air monitoring data exists in the affected area and is of the quality and nature which demonstrates the current conditions of the area's air quality; or

(2) representative ambient air monitoring data exists from a prior time period which can be demonstrated to be conservative (i.e., higher) in establishing the current conditions of the area's air quality.

See also, 40 CFR 52.21.1670 (approved Part 231 at 75 Fed. Reg. 70, 140 (Nov. 17, 2010)) ("applicant makes an acceptable showing that representative existing ambient monitoring data exists in the affected area of the quality and nature which demonstrates the current conditions of the air quality of the area"); New Source Review Workshop Manual (Draft, October 1990) at C.18 ("To be acceptable, such data must be judged by the permitting agency to be representative of the air quality for the area in which the proposed project would be constructed and operated"). As shown below, representative data satisfying these requirements exists.

CPV Keasbey is also requesting an exemption from the pre-application ambient monitoring requirement for lead (Pb) because it will be emitted in amounts less than its SER; for fluorides, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds because they are not anticipated as a product of natural gas combustion (i.e., from the combustion turbine and auxiliary boiler) and fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump); and for sulfuric acid (H_2SO_4) mist because there is no approved monitoring technique available.

Project Description

CPV Keasbey, LLC is proposing to construct a nominal 630-megawatt (MW) 1-on-1 combined cycle power facility (to be known as the Keasbey Energy Center) on a parcel of land in the Township of Woodbridge, Middlesex County, New Jersey. The combustion turbine will be primarily fueled by natural gas but will be capable of firing ultra-low sulfur diesel (ULSD) for up to 720 hours per year.

The Keasbey Energy Center will consist of one (1) General Electric (GE) 7HA.02 combustion turbine at the proposed facility site. Hot exhaust gases from the combustion turbine will flow into one (1) heat recovery steam generator (HRSG). The HRSG will produce steam to be used in the steam turbine and will be equipped with a natural gas fired duct burner. Upon leaving the HRSG, the turbine exhaust gases will be directed to one (1) exhaust stack. Other ancillary equipment at the proposed facility will include one (1) gas fired auxiliary boiler, one (1) emergency diesel fire pump, one (1) emergency diesel generator, and a wet mechanical draft cooling tower.

Emissions from the combined cycle unit will be controlled by the use of dry low-NO_x burner technology (during natural gas firing), water injection (during ULSD firing), and selective catalytic reduction (SCR) for NO_x control, an oxidation catalyst for CO and volatile organic compounds (VOCs) control, and the use of clean low-sulfur fuels (i.e., natural gas and ULSD) to minimize emissions of SO_2, PM/PM-10/PM-2.5, and H_2SO_4. Exhaust gases from the combined cycle unit after emission controls will be dispersed to the atmosphere via one (1) stack. Steam from the steam turbine will be sent to a condenser where it will be cooled to a liquid state and returned to the HRSG. Waste heat from the condenser will be dissipated through a wet mechanical draft cooling tower.

Facility Emissions

The proposed facility (as a significant modification to a major source) is located in an attainment area for SO_2, NO_2, CO, PM-10, and PM-2.5. The proposed facility will potentially emit more than the SERs for several air pollutants, and will be subject to PSD permitting for these constituents. Under PSD regulations, an air quality dispersion modeling analysis is required to ensure that CO, PM-10, PM-2.5, SO_2, and NO_2 emissions from the proposed facility will be compliant with NAAQS and applicable PSD Class II increments.

Table 1 presents projected facility emission rates and the pollutant specific significant emission rates (SERs) defined in the PSD regulations. The proposed facility is projected to have annual emissions in excess of PSD SERs for CO, NO_2, particulates (PM/PM-10/PM-2.5), and H_2SO4. The emissions of SO_2 and lead are below their SERs.

Existing Background Ambient Air Quality Data

Based on a review of the locations of NJDEP ambient air quality monitoring sites, the closest "regional" NJDEP monitoring sites will be used to represent the current background air quality in the site area.

Background data for CO was obtained from a New Jersey monitoring station located in Union County (EPA AIRData #34-039-0004). The monitor is located at Interchange 13 on the New Jersey Turnpike (Elizabeth Lab), approximately 17 km northeast of the proposed facility. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for PM-10 was obtained from a Jersey City monitoring station located in Hudson County, New Jersey (EPA AIRData # 34-017-1003), approximately 32 km northeast of the proposed facility. The monitor is located at 355 Newark Avenue in a commercial/urban area. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for NO_2 was obtained from an East Brunswick monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 11 km west-southwest of the proposed facility. The monitor is located at Rutgers University (Veg. Research Farm #3 on Ryders Lane) in an agricultural/rural area with proximate commercial uses (i.e., Route 1 and Interstate 95). This monitor's close proximity to the Project site would qualify it to be representative of the ambient air quality within the project area.

Background data for PM-2.5 was obtained from a New Brunswick Township monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0006), approximately 10 km west-southwest of the proposed facility. The monitor is located at Rutgers University's Cook College (Log Cabin Road) in an agricultural/rural area with proximate commercial uses. This monitor's close proximity would qualify it to be representative of the ambient air quality within the project area.

The monitoring data for the most recent three years (2013-2015) are presented in Table 2 while Figure 2 displays the locations of the aforementioned air quality monitors in relation to the proposed facility.

Monitoring Waiver Request

In summary, CPV Keasbey, LLC is requesting a waiver from the requirement to perform pre-application ambient air quality monitoring for CO, NO_2, PM-10, and PM-2.5 because there exists acceptable quality assured ambient air quality data from alternate locations that satisfy the requirements of 40 CFR 52.21.1670. Further, CPV Keasbey is requesting an exemption from the requirement to perform pre-application ambient monitoring for SO_2 and lead because they will be emitted in amounts less than their SERs; for fluorides, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds because they are not anticipated as a product of natural gas combustion (i.e., from the combustion turbine, and auxiliary boiler) and fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump); and for H_2SO_4 because there is no approved monitoring technique available.

Please feel free to contact me (201) 508-6960 or tmain@trcsolutions.com should you have any questions regarding this monitoring exemption request.

Sincerely,

TRC

Theodore Main
Principal Consulting Meteorologist

cc: A. Colecchia, U.S. EPA Region II
J. Donovan, CPV
A. Urquhart, CPV
M. Keller, TRC
TRC Project File 252973

Table 1
Comparison of Projected Facility Emissions to PSD Significant Emission Rates

Pollutant	Projected Emission Rate (tons per year)	Significant Emission Rate (tons per year)
Carbon Monoxide	110.0	100
Sulfur Dioxide	39.3	40
Particulate Matter (PM)	77.6	25
Particulate Matter less than 10 microns (PM-10)	123.6	15
Particulate Matter less than 2.5 microns (PM-2.5)	119.3	10
Nitrogen Oxides	148.9	40
Lead	0.03	0.6
Fluorides	[a]	3
Sulfuric Acid Mist[b]	25.1	7
Hydrogen Sulfide	[a]	10
Total Reduced Sulfur (including H_2S)	[a]	10
Reduced Sulfur Compounds (including H_2S)	[a]	10

[a]Not anticipated as a product of natural gas (i.e., from the combustion turbine and auxiliary boiler) or fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump), and assumed zero.

[b]No acceptable monitoring techniques exist for this pollutant.

Table 2
Ambient Concentrations of Criteria Pollutants
Proposed to be Used to Represent Site Conditions

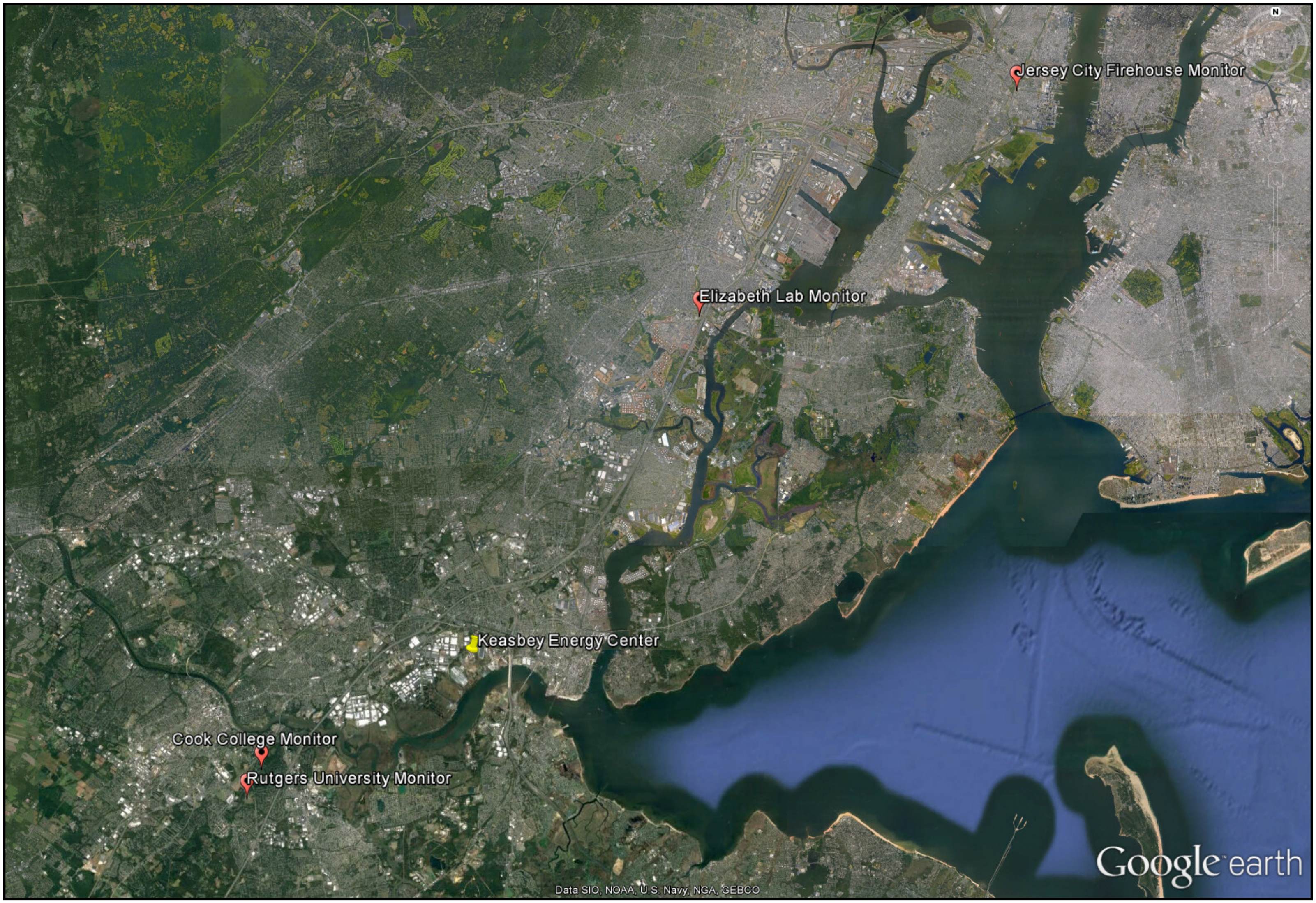
Pollutant	Averaging Period	Maximum Ambient Concentrations ($\mu g/m^3$)		
		2013	2014	2015
NO_2	1-Hour[a]	75.2	88.4	90.2
	Annual	18.8	16.9	19.3
CO	1-Hour	2,300	2,530	2,760
	8-Hour	1,495	2,070	1,840
PM-10	24-Hour	43	37	44
PM-2.5[b]	24-Hour	19.1	20	20
	Annual	8.0	8.2	7.9

[a]1-hour 3-year average 98th percentile value for NO_2 is **84.6** ug/m3.
[b]24-hour 3-year average 98th percentile value for PM-2.5 is **19.7** ug/m3; Annual 3-year average value for PM-2.5 is **8.0** ug/m3.
High second-high short term (1-, 8-, and 24-hour) and maximum annual average concentrations presented for all pollutants other than PM-2.5 and 1-hour NO_2.
Monitored background concentrations obtained from the U.S. EPA AIRData, AirExplorer and Air Quality System (AQS) websites.

Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 1. Site Location Aerial Photograph

Source: Google Earth, 2016.



Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 2. Background Ambient Air Quality Monitors

Source: Google Earth, 2016.

TRC
Results you can rely on

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July 12, 2016

Ms. Jill Webster
Environmental Scientist
United States Department of the Interior
U.S. Fish & Wildlife Service
National Wildlife Refuge System
7333 W. Jefferson Ave., Suite 375
Lakewood, Colorado 80235-2017

Subject: CPV Keasbey, LLC
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Need for Class I Area Air Quality and Air Quality Related Values (AQRV) Analyses for the Brigantine Wilderness Class I Area

Dear Ms. Webster:

TRC has been retained by CPV Keasbey, LLC (CPV Keasbey) to prepare a Prevention of Significant Deterioration (PSD) permit application for a proposed nominal 630-megawatt (MW) combined cycle power facility (to be known as the Keasbey Energy Center) to be constructed in the Township of Woodbridge, Middlesex County, New Jersey. The approximate Universal Transverse Mercator (UTM) coordinates of the Keasbey Energy Center are 557,517 meters Easting, 4,485,098 meters Northing, in Zone 18, NAD83.

The Keasbey Energy Center project design reflects the planned installation of one (1) General Electric (GE) 7HA.02 combustion turbine at the facility. The combustion turbine will be primarily natural gas-fired but will be capable of utilizing ultra-low sulfur diesel (ULSD) for up to 720 hours per year. Dry low NO_x burners (during natural gas firing), water injection (during ULSD firing), and Selective Catalytic Reduction (SCR) will be used to reduce nitrogen oxides (NO_x) emissions from the combustion turbine. The firing of natural gas and ULSD will minimize emissions of particulate matter with an aerodynamic diameter less than 10 microns (PM-10), sulfur dioxide (SO_2) and sulfuric acid mist (H_2SO_4). Additionally, an oxidation catalyst will be installed to control the emissions of carbon monoxide (CO) and volatile organic compounds (VOC).

Exhaust gases from the combustion turbine will flow into an adjacent heat recovery steam generator (HRSG). The HRSG will produce steam to be used in the steam turbine generator and will be equipped with a natural gas fired duct burner. Combustion products will be discharged through one (1) exhaust stack. Supporting auxiliary equipment includes a gas fired auxiliary boiler, one (1) emergency diesel generator, one (1) emergency diesel fire pump, and a wet mechanical draft cooling tower.

Estimated potential short-term (24-hour) maximum emissions and annual emissions are presented in Table 1. The PM-10 emission rates presented in Table 1 include filterable and condensable particulates.

Table 1: Estimated Potential Emissions

Pollutant	Combustion Turbine Maximum Short-Term Emissions (lb/hr)		Annual Emissions[1] (tpy)	Annual Emissions[2] (tpy)
	Natural Gas Fired	ULSD Fired		
Nitrogen Oxides (NO_x)	32.8	56.1	152.1	246
Sulfur Dioxide (SO_2)	9.6	6.6	41.0	29
Particulate Matter with an aerodynamic diameter less than 10 microns (PM-10)	23.4	64.6	117.3	283
Sulfuric Acid Mist (H_2SO_4)	6.1	4.3	26.1	19

[1]Annual emissions based on one (1) GE 7HA.02 combustion turbine operating 8,040 hours per year on natural gas and 720 hours per year on ULSD at the respective maximum short-term emission rates.
[2]Annual emissions based on one (1) GE 7HA.02 combustion turbine hypothetically operating 8,760 hours per year on ULSD at the ULSD short-term emission rate (solely for comparison to FLAG Q/D guidance, and not for permitting).

The Brigantine Wilderness Class I area located in the Edwin B. Forsythe National Wildlife Refuge in New Jersey is approximately 108 km south of the proposed facility. Following the Draft Revised FLAG guidance (2010), TRC believes that the proposed facility may be eligible for an exemption from the requirement to perform a Class I area modeling analysis because of its inherent low emissions and distance to the Class I area. We understand that the maximum short-term emission rates are used in the exemption analysis. Assuming full year operation (8,760 hours) of the combined cycle combustion turbine (firing ULSD) yields a (emission in tpy)/(distance in km) ratio (577 tons per year/108 km) of approximately 5.3. It should be noted that this assumption is conservative since the combustion turbine will be capable of firing ULSD for up to 720 hours per year. It is our understanding that according to the Q/D test, the FLM should consider this source (which is located greater than 50 km from the Brigantine Wilderness Class I area) and has a ratio of annual equivalent emissions (Q in tons per year) divided by distance (D in km) from the Brigantine Wilderness Class I area (km) < 10, as having negligible impacts with respect to Class I visibility impacts and that there would not be any Class I visibility impact analyses required from this source.

With this letter, TRC, on behalf of CPV Keasbey, LLC, is formally requesting a determination that there is no need to perform a Class I area air quality and AQRV analysis for the Brigantine Wilderness Area as part of the facility's PSD Air Permit application. If you should require additional information on the proposed Project or have any questions, please feel free to contact me at (201) 508-6960 or tmain@trcsolutions.com.

Sincerely,

TRC

Theodore Main
Principal Consulting Meteorologist

cc: J. Donovan, CPV
A. Urquhart, CPV
M. Keller, TRC
TRC Project File 252973

Keller, Michael

From: Webster, Jill <jill_webster@fws.gov>
Sent: Wednesday, July 13, 2016 11:09 AM
To: Keller, Michael
Subject: Re: CPV Keasbey, LLC - Need for Class I AQ Analyses for Brigantine Wilderness Area

Mr. Keller,

Thank you for sending the information regarding CPV Keasbey, LLC located in Middlesex County, New Jersey. Based on the information contained in the letter dated July 12, 2016, the Fish and Wildlife Service anticipates that modeling would not show any significant additional impacts to air quality related values (AQRV) a the Brigantine Wilderness. Therefore, we are not requesting that a Class I analysis be included in the PSD permit application.

The state and/or EPA may have a different opinion regarding the need for a Class I increment analysis. Should the emissions or the nature of the project change significantly, please contact me directly so that we might re-evaluate the proposed project.

Thank you for keeping us informed and involving the Fish and Wildlife Service in the project review.

On Wed, Jul 13, 2016 at 5:43 AM, Keller, Michael <MKeller@trcsolutions.com> wrote:

> Ms. Webster,
>
> TRC, on behalf of CPV Keasbey, LLC, is formally requesting a determination (see attachment) that there is no need to perform a Class I area air quality and air quality related values analysis for the Brigantine Wilderness Class I area as part of the facility's PSD permit application.
>
> If you have any questions, please call or email.
>
> Thanks for your attention.
>
> Michael
>
> Michael D. Keller
> Senior Project Manager

1200 Wall Street West, 5th Floor, Lyndhurst, NJ 07071

T: 201.508.6954 | F: 201.933.5601 | MKeller@trcsolutions.com

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Jill Webster, Environmental Scientist
US Fish and Wildlife Service
National Wildlife Refuge System
Branch of Air and Water Resources
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JUL 2 6 2016

Theodore Main
Principal Consulting Meteorologist
TRC Consulting
1200 Wall Street West
Lyndhurst, New Jersey 07071

Re: Preconstruction Ambient Air Monitoring Waiver Request for the Keasbey Energy Center in Woodbridge, New Jersey.

Dear Mr. Main:

The U.S. Environmental Protection Agency reviewed the July 12, 2016 request for a preconstruction ambient air monitoring waiver for the proposed modification at the Keasbey Energy Center in Woodbridge, New Jersey. According to the proposal, the proposed modification project will be PSD effected for CO, NOx, PM10 and PM2.5. Should the emission estimates be revised, (e.g., the net emission increase of S02 are currently estimated to be 39.3 tons per year) then the monitoring waiver request will need to be re-evaluated.

We preliminarily agree that the project may be exempt from installing ambient air monitors since ambient air data already exists that may be used for this purpose. Depending on the pollutant, the existing data is either representative or conservative, and provides 3 years of current information. However, it is not noted whether the data was QA/QC'ed. This should be part of the request. Please verify that the data was QA/QC'ed such that we may provide final approval for the waiver.

Meanwhile, we noted the some language in the request that should be corrected. This includes the following:

- There are some incorrect citations to the regulations and mixes in regulatory text from the New York State regulations. These are akin to typos that should be corrected. For example: 40 CFR 52.21.1670 (approved Part 231 at 75 Fed. Reg. 70, 140 (Nov. 17, 2010) should simply be 40 CFR part 52.21.

- New Jersey implements the PSD program under delegated federal rules found in 40 CFR part 52.21. The reference to 40 CFR 51. 166 should be removed since this applies to States that implement the PSD program under their own SIP approved State rules.

- While we agree in part with the rational regarding certain criteria that may be used to exempt a source from preconstruction ambient monitoring requirements, the some language in the request is not actually in the regulatory text cited. In addition, it is not clear where the (2) bullet is found. Please correct these references. In particular, we are referring to the following excerpt:

"Pursuant to the PSD regulations codified in 40 CFR 51.166 and 40 CFR 52.21, U.S. EPA may exempt a proposed PSD source, otherwise subject to the one-year pre-construction ambient monitoring requirement, if either:

(1) representative existing ambient air monitoring data exists in the affected area and is of the quality and nature which demonstrates the current conditions of the area's air quality; or
(2) representative ambient air monitoring data exists from a prior time period which can be demonstrated to be conservative (i.e., higher) in establishing the current conditions of the area's air quality."

If you have any questions regarding this letter you may contact Annamaria Colecchia of my staff at (212) 637-4016.

Sincerely,

Steven C. Riva, Chief
Permitting Section, APB

cc: Greg John, NJDEP

DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY, ENERGY AND SUSTAINABILITY
DIVISION OF AIR QUALITY
P.O. Box 420 Mailcode 401-02
TRENTON, NJ 08625-0420
609 - 984 - 1484

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

MEMORANDUM

TO: Aliya Khan, Bureau of Stationary Sources

FROM: Jennifer Levy, Bureau of Evaluation and Planning

DATE: October 25, 2016

SUBJECT: CPV Keasbey, LLC
Air Quality Modeling Protocol (dated August 2016)
Woodbridge, Middlesex County, New Jersey
PI# 55824 BOP Application Number 160004

CPV Keasbey, LLC is proposing to construct and operate a new 630 MW combined cycle unit, identified as Keasbey Energy Center, directly adjacent to the 725 MW Woodbridge Energy Center, in Woodbridge, Middlesex County, New Jersey. The Keasbey Energy Center will consist of one dual fuel (natural gas or ultra-low sulfur diesel oil) General Electric 7HA.02 combustion turbine, one heat recovery steam generator, one natural gas-fired auxiliary boiler, one emergency diesel generator, one emergency diesel fire pump, a steam turbine generator, and a wet mechanical draft cooling tower. Control devices include dry low-NOx combustors, water injection, selective catalytic reduction (SRC), and oxidation catalyst.

The proposed project will be subject to PSD review for Greenhouse Gases(GHG), nitrogen oxides (NO_x), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns($PM_{2.5}$), carbon monoxide(CO), sulfuric acid mist (H_2SO_4), and sulfur dioxide (SO_2). The project will be subject to non- attainment new source review for NO_x and volatile organic compounds (VOC).

The Bureau of Evaluation and Planning (BEP) in collaboration with EPA Region II has completed its initial review of the above referenced document. The attached comments should be addressed in the form of a revised modeling protocol. If there are any questions regarding the attached comments, contact Jennifer Levy at (609) 633-8239.

cc:
Bachir Bouzid (BOsS)
Danny Wong (BEP)
Joel Leon (BEP)
Greg John (BEP)
Annamaria Colecchia (EPA- emailed)
Ted Main (TRC)
Michael Keller (TRC)

Bureau of Evaluation and Planning Comments on the CPV Keasbey, LLC Air Quality Modeling Protocol, Dated August, 2016

General comments

1) Pollutant emissions from both the Keasbey Energy Center and the Woodbridge Energy Center must be evaluated together and their combined impact must comply with all state and federal regulations. This is consistent with the department's policy for phased projects with less than two years of contemporaneous operation. The combined impact of both facilities operations will need to be assessed and compared to the applicable significant impact levels; this will require a major revision to the protocol.

2) CPV Keasbey needs to submit a site survey in accordance with the requirements set out in N.J.S.A. 45:8 et seq., N.J.A.C. 13:40-1.1 et seq., and the Bureau's Technical Manual 1002. The survey should clearly show the location of all emission points to be modeled, building structures, elevations at the facility, drawn to scale, not reduced, and indicating true north. This plot plan should include the Woodbridge Energy center and the Keasbey Energy Center.

3) What is the contractual limit for sulfur content in the natural gas provided by your suppliers? CPV must use the contractual maximum gas fuel sulfur content in the estimation of its sulfur derived emissions for modeling purposes unless permit limits exist to ensure that the assumed sulfur content is not exceeded by the actual sulfur content. If limits exist, provide a brief overview of them in the protocol. If they do not exist, revise the SO_2 emission rate along with any other pollutant emissions that would be impacted by the sulfur content.

4) Add a section to the protocol detailing how the $PM_{2.5}$ increment analysis for both Class I and II will be performed. The $PM_{2.5}$ SIL is no longer used to avoid a cumulative analysis of the increment except for the cases outlined in the guidance memorandum from *U.S. Environmental Protection Agency Guidance for $PM_{2.5}$ Permit Modeling*, May 20, 2014 and in the August 18, 2016 EPA draft guidance memorandum. Include a discussion which addresses this guidance and how this will affect the CPV Keasbey PSD permit application.

Section 1.0 Introduction

5) Page 1-1 states that the source is PSD affected for ozone (VOC). The area is nonattainment for ozone, thus subject to the nonattainment regulations with regard to ozone.

Section 3.1 Equipment/Fuels

6) List and detail the equipment from Woodbridge Energy Center that will be included in the air dispersion modeling demonstration.

Section 3.2 Operation

7) Provide details on the worst-case operating scenarios that will modeled for Keasbey Energy Center, the operating scenarios that were evaluated for Woodbridge Energy Center, and the worst-case operating scenarios from each of the power plants that may operate concurrently.

Section 3.3 Selection of Sources for Modeling

8) Calculations in Appendix B of the Keasbey Energy Center Combined Cycle Power Facility PSD Air Permit Application show that PM-10 emissions from the Keasbey Energy Center cooling tower will be greater than 1 lb/hr. The Department's Technical Manual 1002: Guideline on Air Quality Impact Modeling Analysis guidance states that cooling towers must be included in the air quality modeling when their PM-10 emissions exceed 1 lb/hr. Thus, it appears the PM-10 and PM-2.5 cooling tower emissions from both the Keasbey and Woodbridge power plants should be modeled.

9) Details on how the particulate emission rates are calculated and what assumptions are made for the cooling tower emissions, including vendor specifications, must be included in the modeling protocol and analysis. A professional journal from AWMA in 2002 is referenced as the source used to calculate the PM10/PM2.5 emissions from the cooling towers. The applicant should provide more updated literature search and also provide rational for not using AP42 emission factors. Confirm whether evaporative condensable emissions are considered from these units.

10) Please clarify the discrepancy between pages 3-2 and 3-5 regarding the modeling of the emergency generator and fire pump. To be clear, these units are not automatically exempt from modeling. Furthermore, the exemption given in the referenced EPA March 11, 2011 memo is only for the probabilistic 1-hour average NAAQS only. For example, it is not for carbon monoxide since carbon monoxide is not a probabilistic standard. It is also not for PM2.5 since this is a daily average. The reason some exemptions may be considered by the reviewing agencies is that the occurrence of that emission scenario is so infrequent and short duration that the likelihood of it occurring during the hour of the worst case meteorology is low. Therefore, it is not likely that the sporadic occurrence of that exempt emission scenario would lead to an exceedance of the NAAQS. In addition, the fact that it would be modeled as a continuous emission scenario for 8760 hours per year may be overly conservative. It was not clear that the applicant intended to show this low probability in the protocol. The same EPA March 11, 2011 guidance did not provide a blanket exemption, especially to testing and maintenance of these emergency equipment

where this activity may be scheduled and is routine. In this case the testing and maintenance proposed for 100 hours per year should still be examined further before granting the exemption. EPA also understands that NJDEP has developed guidance in this respect but provides this guidance in addition to the NJDEP guidance.

Section 3.4 Exhaust Stack Configuration and Emission Parameters

11) Provide explanation and units for the 2.06 value used in the SO_2 calculations and 0.8 and 1.74 values used in the NO_x calculations.

12) Move Woodbridge Energy Center Source parameter tables forward from Appendix B.

Section 3.5 GEP Analysis

13) Provide a table identifying all buildings on and off site with the potential to cause aerodynamic downwash of emissions from the stack. This analysis need only consider buildings within 0.8 kilometer or 5 L from the stack, whichever is lesser. For each stack, a table shall be provided with the following data for each building (or tier):

    a. Building height (relative to stack base elevation);
    b. Maximum projected building width;
    c. Distance from the stack;
    d. 5L distance; and
    e. Calculated formula GEP stack height.

Tables 3-1a and 3-1b

14) Will the facility operate in simple cycle mode?

15) The text suggest that these tables are the combined parameters for the combustion turbine and the HRSG. If that is correct, please modify the table name to reflect this.

16) Define the stack height in the footnote.

Table 3-3

17) Please add location coordinates and an elevation to the table for consistency.

18) Provide cooling tower parameters for Woodbridge Energy Center. See comment 12.

4.1.2 Prevention of Significant Deterioration

19) The text states that if the modeled concentrations are less than the SILs, then NAAQS and increments analyses are not required. Due to a court decision in 2013, this is not a blanket conclusion. More recent EPA guidance, such as the May 2014 PM2.5 guidance is recommended for other pollutants as well. It states that the applicant and reviewing agencies examine existing conditions to ensure that a NAAQS or increment could not be

exceeded even with de minimis impacts. Even recent draft guidance for O3/PM2.5 SILs reiterates that SILs are discretionary especially in areas with significant growth (August 18, 2016). The increment will need to be evaluated.

20) The interim SIL value of 10.0 ug/m^3 for the 1 hour NO_2 may be used for the initial impact analysis. However, should a violation be found, the proposed EPA SIL of 7.5 ug/m^3 should be used for the NAAQS analysis. The text needs clarification explaining where the interim value comes from and justification for the value (see "NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO2 NAAQS", Northeastern States for Coordinated Air Use Management, April 21, 2010). Please include this document in Appendix A.

21) Include both the Class I and II SILs and PSD Increments in the discussion.

22) The text states that NJDEP administers the PSD program under 40 CFR 51.166 and they received delegation in February 22, 1983. This should be corrected. NJDEP administers the PSD program under the federal rules of 40 CFR 52.21. The delegation agreement was updated on July 15, 2011.

4.1.3 Preconstruction Ambient Air Quality Monitoring Exemption

23) While not part of this modeling protocol, a response to EPA's July 26, 2016 comments on the preconstruction ambient monitoring waiver request remains outstanding. In addition, the request should be revised to include pertinent information regarding the Woodbridge power plant.

Table 4-1

24) Remove preliminary from the column name. Please be aware that should facility emission rates change, air dispersion modeling may have to be redone.

25) Include a column showing the emissions from just the Keasbey Energy Center and a column showing the total emissions when combining the Keasbey and Woodbridge power plant emissions.

26) Clarify in a footnote or the table title whether the emission rates presented refer to all equipment or a subset of the equipment.

Table 4-2

27) Please add Class I SIL and PSD values to this table.

28) BEP would prefer that the information in footnote a be presented in a separate table showing how the modeling results will be used to calculate the value for each pollutant and applicable averaging time to show compliance with NAAQS, SILs and NJAAQS. Please include information about the annual averaging times and about the lead assessment.

29) Typo in footnote "a": The 24-hour PM2.5 NAAQS is a 3 year average of the 98th percentile. The word "average" should be included (similar to the 1 hour NO2 or SO2.)

30) Footnote "b" should reference the NESCAUM recommendation. See "NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO2 NAAQS"; Northeastern States for Coordinated Air Use Management; April 21,2010. Include this document in appendix A.

Section 5.2 Surrounding Area and Land Use

31) BEP agrees that the rural land use option can be used. As discussed in the Air Quality Permitting Program's Technical Manual 1002 Section 6.4.1, the land use analysis should be based on the Auer Land Use Classification method using the latest available USGS topographic maps, the percentage of each land use type, and the total percentages of urban versus rural landscape should be provided.

Section 5.3 Meteorological Data

32) Provide a better justification for why Brookhaven upper air was chosen for the study. For example, "the next most proximate upper air station is XX ..."

Section 5.5 Load analysis

33) Add NJAAQS to the list of assessments

34) Provide details on the worst-case operating scenarios that will modeled for Keasbey Energy Center, the operating scenarios that were evaluated for Woodbridge Energy Center, and the worst-case operating scenarios from each of the power plants that may operate concurrently.

35) Please provide calculations of the exhaust velocity from Tables 3-1a and 3-1b, for the various operating loads.

Section 5.6 Startups/Shutdowns

36) Modeling analysis for the startup and shutdown conditions will need to evaluate emissions of all criteria pollutants with short-term NAAQS and all startup types (warm, hot, cold) for natural gas operations. Startup numbers should be based on combined operation of both power plants.

37) Will there be concurrent startups for both power plants? If so, please detail how the scenario(s) will be modeled. Emissions will need to include operations at the Woodbridge Energy Center and all operating scenarios listed in the Keasbey Permit application.

38) It is stated that the scenario will be modeled if the pollutant(s) has a higher emissions during startup and shutdown conditions when compared to normal operation. This is not acceptable since the impacts may be higher given the reduced stack flow and stack temperature. These impacts must be assessed.

39) Startup under ULSD are not proposed since they are limited to 10-20 (two power plants) of these startups per year and the applicant claims these could be considered transient. Perhaps this may be true for the probabilistic 1 hour NO_2 or 1 hour SO_2 NAAQS demonstrations but this is not true for the CO NAAQS since they are based on a different statistic.

40) Please clarify further what is meant on page 5-5, "Since SO2 emissions are strictly dependent upon fuel flow (and lower during startup than continuous operation), SO2 startups are not proposed to be evaluated."

Section 5.7 1-hour NO2 Modeling

41) It is unclear if the emergency diesel generator and emergency diesel fire pump are the only pieces of equipment CPV is proposing be exempt from the 1 hour NO_2 modeling requirement. Provide clarification. Additionally, include a reference to the NJDEP policy memorandum used to justify exemption from modeling requirements. Ensure that the proposal to not include the fire pump and emergency generator conforms to the Departments' policy memorandum dated July 2011 *Exempting Emergency Generator and Fire Pump Nitrogen Oxide(NO2) and Sulfur Dioxide (SO2) Emissions from 1-hour NO2 and SO2 Air Quality Modeling.* Provide information in the protocol about whether all conditions in the above referenced memo are met by permit conditions.

42) Include the auxiliary boiler in this section's discussion. In addition, provide details on the Woodbridge Energy Center sources that will be included in the 1-hour NO_2 NAAQS compliance demonstration.

43) The protocol should provide more information regarding how the 1 hour NO_2 modeling will be undertaken. The protocol simply states that the EPA guidance will be used including the September 30, 2014 guidance. This September guidance relates to the beta ARM2 technique which require more detail on how it will be implemented (e.g., in-stack ratios, and ambient ozone data). It is not clear if the applicant intends to use this technique or was simply listing guidance that is available. If the applicant proposes to use the beta ARM2 technique, they should send EPA Region 2 the proposal for approval. In either case, more details are needed for the 1 hour NO_2 modeling procedure.

Section 5.8 NJDEP Air Toxics Risk Analysis

44) Include all of the sources at the Keasbey and Woodbridge Energy Centers, including tanks, for comparison to air toxic substance unit risk factors and reference concentrations. The bureau recommends the use of AERMOD for a risk assessment rather than multiple and non-concurrent evaluations of risk using the Risk Screening Worksheet.

Section 5.9 Receptor Grid

45) Discuss placing elevated receptors at the Fresh Kills Landfill on Staten Island, New York.

46) As discussed in the Air Quality Permitting Program's Technical Manual 1002 Section 9.1, fine grids of 50m should be placed over the areas of maximum concentration to ensure that the true maximum concentration is identified.

5.11 NAAQS/NJAAQS Analysis

47) Please confirm that NAAQS/NJAAQS will be evaluated by showing that the impacts plus the ambient background are less than the NAAQS/NJAAQS values for applicable averaging periods, even if the impacts are less than the SIL.

48) Since the combined emissions from both power centers for SO_2 will be above the 40 tons/yr threshold, an air dispersion modeling demonstration for the 1 hour SO2 NAAQs and SO2 increments (3 hour, 24 hour and annual average) must be included.

5.12 PSD Increment Analysis.

49) Comparison to Significant Impact Levels does not determine whether demonstrating compliance with PSD increments is required. Since this project's total emissions trigger PSD review, the modeling analysis should compare Keasbey and Woodbridge Energy Centers combined impacts to PSD Class I and Class II Increments.

5.15.2 Assessment of Impacts on Soils and Vegetation

50) BEP recommends using compliance with NJAAQS and NAAQS combined with the screening criteria for SO_2 shown in the table below as an acceptable demonstration for protection of vegetation.

Table 1. Soils and Vegetation Screening Values

Pollutant	Averaging Period	Screening Value (μg/m)[a]
SO_2	3-hour	786
	Annual	18

a) The screening value is based on the sensitive vegetation screening value in *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals* (EPA document 450/2-81-078). This value should be compared to the maximum average ambient air concentration plus background for the specified averaging period.

5.15.3 Impact on Visibility

51) Provide a brief overview of the model, details on the methodology for running the model, and criteria that will be used to interpret the results from VISCREEN model. Visibility modeling should include emissions from the cooling towers.

5.15.4 Impacts on Class I Areas

52) It appears that the Federal Land Manager was notified of the Keasbey Energy Center without including information pertaining to the Woodbridge Energy Center. Please re-contact and notify the FLM of the combined emissions of the two power plants for their evaluation.

53) While the FLM provided a waiver to address the AQRV in Brigantine, the Class I increment must be considered since the source is only 108 km distance.

54) For comparison of Class I SILs and PSD Increments, predicted impact concentrations at receptors at distance of 50 km from the Keasbey/Woodbridge site in the radial direction of the Class I Area located at the Brigantine Edwin B. Forsythe National Wildlife Refuge will be required.

Tables 5.1 and 5.2

55) Startup event emissions and hourly emissions should not be identical as the startup emissions are proposed to be prorated to the duration of startup time.

Table 5.3

56) Add a column to the table specifying the monitoring stations used to provide ambient air concentrations.

57) The 2015 3-Hour SO_2 ambient air concentration at Elizabeth Lab is 55.0 ug/m^3. This 2015 value should be used as the background value for any NAAQS analysis.

58) In footnote b, the 1-hour 3-year average 98th percentile for NO_2 should be 84.91 ug/m^3.

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December 13, 2016

Ms. Jill Webster
Environmental Scientist
United States Department of the Interior
U.S. Fish & Wildlife Service
National Wildlife Refuge System
7333 W. Jefferson Ave., Suite 375
Lakewood, Colorado 80235-2017

Subject: CPV Keasbey, LLC
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
(REVISED) Need for Class I Area Air Quality Related Values (AQRV) Analyses for the Brigantine Wilderness Class I Area

Dear Ms. Webster:

In response to a comment from the NJDEP regarding the request for determination that there is no need to perform a Class I AQRV analysis for the Brigantine Wilderness Class I area that was submitted to your attention on July 12, 2016 (as part of the CPV Keasbey, LLC's PSD air permit application), TRC is submitting this revised request.

CPV Keasbey, LLC is proposing to construct a nominal 630-megawatt (MW) 1-on-1 combined cycle power facility (to be known as the Keasbey Energy Center) on a parcel of land directly adjacent the existing Woodbridge Energy Center in the Township of Woodbridge, Middlesex County, New Jersey. The approximate Universal Transverse Mercator (UTM) coordinates of the Keasbey Energy Center are 557,515 meters Easting, 4,485,100 meters Northing, in Zone 18, NAD83. The Keasbey Energy Center will represent a significant modification of the Woodbridge Energy Center. The NJDEP has requested the Project send you a revised notification that includes the combined emissions of the existing Woodbridge Energy Center and the proposed Keasbey Energy Center.

The Keasbey Energy Center project design reflects the planned installation of one (1) General Electric (GE) 7HA.02 combustion turbine at the facility. The combustion turbine will be primarily natural gas-fired but will be capable of utilizing ultra-low sulfur diesel (ULSD) for up to 720 hours per year. Dry low NO_x burners (during natural gas firing), water injection (during ULSD firing), and Selective Catalytic Reduction (SCR) will be used to reduce nitrogen oxides (NO_x) emissions from the combustion turbine. The firing of natural gas and ULSD will minimize emissions of particulate matter with an aerodynamic diameter less than 10 microns (PM-10), sulfur dioxide (SO_2) and sulfuric acid mist (H_2SO_4). Additionally, an oxidation catalyst will be installed to control the emissions of carbon monoxide (CO) and volatile organic compounds (VOC).

Exhaust gases from the combustion turbine will flow into an adjacent heat recovery steam generator (HRSG). The HRSG will produce steam to be used in the steam turbine generator and will be equipped with a natural gas fired duct burner. Combustion products will be discharged through one (1) exhaust stack. Supporting auxiliary equipment includes a gas fired auxiliary boiler, one (1) emergency diesel generator, one (1) emergency diesel fire pump, and a wet mechanical draft cooling tower.

Estimated potential short-term (24-hour) maximum emissions and annual emissions for the proposed combustion turbine at the Keasbey Energy Center are presented below in Table 1. The PM-10 emission rates presented in Table 1 include filterable and condensable particulates.

Table 1: Estimated Potential Emissions (Keasbey Energy Center)

Pollutant	Combustion Turbine Maximum Short-Term Emissions (lb/hr)		Annual Emissions[1] (tpy)	Annual Emissions[2] (tpy)
	Natural Gas Fired	ULSD Fired		
Nitrogen Oxides (NO_x)	32.8	57.7	153	253
Sulfur Dioxide (SO_2)	9.6	6.8	42	30
Particulate Matter with an aerodynamic diameter less than 10 microns (PM-10)	23.6	65.0	119	285
Sulfuric Acid Mist (H_2SO_4)	6.2	4.4	27	20

[1]Annual emissions based on one (1) GE 7HA.02 combustion turbine operating 8,040 hours per year on natural gas and 720 hours per year on ULSD at the respective maximum short-term emission rates.
[2]Annual emissions based on one (1) GE 7HA.02 combustion turbine hypothetically operating 8,760 hours per year on ULSD at the ULSD short-term emission rate (solely for comparison to FLAG Q/D guidance, and not for permitting).

Similarly, the existing Woodbridge Energy Center includes two (2) General Electric (GE) 7FA.05 combustion turbines that exclusively utilize natural gas as their fuel. The combustion turbines are equipped with natural gas fired duct burners for supplementary firing and a single steam turbine generator (STG). Dry low NO_x burners and Selective Catalytic Reduction (SCR) reduce nitrogen oxides (NO_x) emissions from the combustion turbines. Additionally, an oxidation catalyst controls the emissions of carbon monoxide (CO) and volatile organic compounds (VOC).

Potential short-term (24-hour) maximum emissions and annual emissions for the two (2) existing combustion turbines at the Woodbridge Energy Center are presented below in Table 2. The PM-10 emission rates presented in Table 1 include filterable and condensable particulates.

Table 2: Potential Emissions (Woodbridge Energy Center)

Pollutant	**Combustion Turbine/Duct Burner Maximum Short-Term Emissions[1] (lb/hr)**	**Annual Emissions[2] (tpy)**
	Natural Gas Fired	
Nitrogen Oxides (NO_x)	19.8	173.4
Sulfur Dioxide (SO_2)	4.9	42.9
Particulate Matter with an aerodynamic diameter less than 10 microns (PM-10)	19.1	167.3
Sulfuric Acid Mist (H_2SO_4)	3.4	29.8

[1]Maximum short-term emission rates based on one (1) GE 7FA.05 combustion turbine. Emission rates include maximum level of duct firing.
[2]Annual emissions based on two (2) GE 7FA.05 combustion turbines operating at 8,760 hours per year.

The Brigantine Wilderness Class I area located in the Edwin B. Forsythe National Wildlife Refuge in New Jersey is approximately 108 km south of the proposed facility. Following the Draft Revised FLAG guidance (2010), TRC believes that the proposed facility may be eligible for an exemption from the requirement to perform a Class I area AQRV modeling analysis because of its inherent low emissions and distance to the Class I area.

We understand that the maximum short-term emission rates are used in the exemption analysis. Assuming full year operation (8,760 hours) of the combined cycle combustion turbine at the Keasbey Energy Center (firing ULSD) yields a (emission in tpy)/(distance in km) "Q/D" ratio (588 tons per year/108 km) of approximately 5.4. It should be noted that this assumption is conservative since the combustion turbine will only be capable of firing ULSD for up to 720 hours per year.

Similarly, assuming full year operation (8,760 hours) of the two (2) combined cycle combustion turbines at the Woodbridge Energy Center yields a (emission in tpy)/(distance in km) ratio (413 tons per year/108 km) of approximately 3.8.

The resulting Q/D ratio after combining the emissions of the existing Woodbridge Energy Center and the proposed Keasbey Energy Center, would be given by (588 tons + 413 tons)/(108 km), or approximately 9.3.

It is our understanding that according to the Q/D test, the FLM should consider this source (which is located greater than 50 km from the Brigantine Wilderness Class I area) and has a ratio of annual equivalent emissions (Q in tons per year) divided by distance (D in km) from the Brigantine Wilderness Class I area (km) < 10, as having negligible impacts with respect to Class I visibility impacts and that there would not be any Class I AQRV impact analyses required from this source.

With this revised letter, TRC, on behalf of CPV Keasbey, LLC, is again requesting a determination that there is no need to perform a Class I area AQRV analysis for the Brigantine Wilderness Area as part of the facility's PSD Air Permit application. If you should require additional information on the proposed Project or have any questions, please feel free to contact me at (201) 508-6960 or tmain@trcsolutions.com.

Sincerely,

TRC

Theodore Main

Theodore Main
Principal Consulting Meteorologist

cc: J. Donovan, CPV
A. Urquhart, CPV
M. Keller, TRC
TRC Project File 252973

Keller, Michael

From: Webster, Jill <jill_webster@fws.gov>
Sent: Tuesday, December 13, 2016 7:21 PM
To: Keller, Michael
Subject: Re: CPV Keasbey, LLC - (REVISED) Need for Class I AQRV Analyses for Brigantine Wilderness Area

Mr. Keller,

Thank you for sending the revised information. Based on the modifications to the project and the revised emissions (as provided in your letter dated, December 13, 2016), the Fish and Wildlife Service anticipates that modeling would not show any significant additional impacts to the air quality related values (AQRV) at the Brigantine Wilderness. Therefore, we do not request that a Class I modeling analysis be included with the permit application.

The state and/or EPA may have a different opinion regarding the need for a Class I increment analysis. Should this project change significantly again, please contact me directly so that we might re-evaluate the revised project.

On Tue, Dec 13, 2016 at 3:11 PM, Keller, Michael <MKeller@trcsolutions.com> wrote:

> Ms. Webster,
>
> In response to a comment from the NJDEP regarding the request for determination that there is no need to perform a Class I AQRV analysis for the Brigantine Wilderness Class I area that was submitted to your attention on July 12, 2016, TRC, on behalf of CPV Keasbey, LLC, is submitting this revised request.
>
> The Keasbey Energy Center will represent a significant modification of the Woodbridge Energy Center.
>
> The NJDEP has requested the Project send you a revised notification that includes the combined emissions of the existing Woodbridge Energy Center and the proposed Keasbey Energy Center.
>
> If you have any questions, please call or email.
>
> Thanks for your attention.

Michael

Michael D. Keller
Principal – Power Generation and Air Quality

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December 8, 2016
mk038-16

Ms. Jennifer Levy
New Jersey Department of Environmental Protection
Division of Air Quality, Bureau of Evaluation and Planning
401 East State Street, 2nd Floor
Trenton, New Jersey 08625

Subject: CPV Keasbey, LLC
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Response to Comments on the Air Quality Modeling Protocol

Dear Ms. Levy:

In response to the Bureau of Evaluation and Planning's comment response letter issued by you on October 25, 2016 relative to the proposed CPV Keasbey, LLC's Keasbey Energy Center Air Quality Modeling Protocol, please find below responses to questions/comments that were made. For ease of reference, each comment/question from your October 25, 2016 comment letter has been restated in bold with a response to the comment/question following. Also, per your request, please find attached a revised Air Quality Modeling Protocol that addresses the Bureau's comments and incorporates the responses below.

General Comments

Q1. Pollutant emissions from both the Keasbey Energy Center and the Woodbridge Energy Center must be evaluated together and their combined impact must comply with all state and federal regulations. This is consistent with the department's policy for phased projects with less than two years of contemporaneous operation. The combined impact of both facilities operations will need to be assessed and compared to the applicable significant impact levels; this will require a major revision to the protocol.

A1. Woodbridge Energy Center and Keasbey Energy Center will be evaluated together and their combined impacts will be compared to the Significant Impact Levels, PSD Class II increments, and NAAQS/NJAAQS. These revisions have been made and are reflected in the revised protocol.

Q2. CPV Keasbey needs to submit a site survey in accordance with the requirements set out in N.J.S.A. 45:8 et seq., NJ.AC. 13:40-1.1 et seq., and the Bureau's Technical Manual 1002. The survey should clearly show the location of all emission points to be modeled, building structures, elevations at the facility, drawn to scale, not reduced, and indicating true north. This plot plan should include the Woodbridge Energy center and the Keasbey Energy Center.

A2. A general arrangement site plan that fulfills the requirements set out in the Bureau's Technical Manual 1002 will be included as part of the air quality modeling portion of the air permit application. At the Department's request, this general arrangement site plan will include both the proposed Keasbey Energy Center and the existing Woodbridge Energy Center.

Q3. What is the contractual limit for sulfur content in the natural gas provided by your suppliers? CPV must use the contractual maximum gas fuel sulfur content in the estimation of its sulfur derived emissions for modeling purposes unless permit limits exist to ensure that the assumed sulfur content is not exceeded by the actual sulfur content. If limits exist, provide a b1ief overview of them in the protocol. If they do not exist, revise the SO2 emission rate along with any other pollutant emissions that would be impacted by the sulfur content.

A3. Natural gas sulfur content data was reviewed for the TETCO and TRANSCO gas suppliers. The TETCO data spans from October 1, 2013 to October 18, 2016, a period slightly more than three years. The TRANSCO data spans June 1, 2014 through June 7, 2016, a period slightly more than two years. This data also supplements the TRANSCO sulfur content data previously provided to the Bureau of Stationary Sources. The CPV Keasbey facility proposes to use either TRANSCO or TETCO gas supply.

The maximum daily sulfur content for either data is 0.55 grains/100 SCF, which is consistent with the maximum value of 0.63 grains/100 SCF used for the CPV Woodbridge facility permitting and for the emissions and performance data developed by GE for the CPV Keasbey 7HA.02 combustion turbine. The period average is about 0.2 grains/100 SCF. However, there are notable spikes in sulfur content throughout the period, namely the 0.63 grains/100 SCF presented in a prior set of data (provided to the Department), and at 0.55, 0.49, 0.385, and 0.372 in the current data sets. This demonstrates that spikes in sulfur content can and do occur within the gas supply and must be accounted for in the permitting process. As such, 0.63 is selected as the worst case sulfur content for short term sulfur dioxide emissions and for the combustion turbine performance. Note that while 0.63 grains S/100 SCF is the design basis sulfur content based on historical data, the actual natural gas sulfur content for gas to be supplied to the facility is wholly out of the control of CPV Keasbey.

These revisions have been made and are reflected in the revised protocol in Section 3.2.

Q4. Add a section to the protocol detailing how the PM2.5 increment analysis for both Class I and II will be performed. The PM2.5 SIL is no longer used to avoid a cumulative analysis of the increment except for the cases outlined in the guidance memorandum from US Environmental Protection Agency Guidance for PM-2.5 Permit Modeling, May 20, 2014 and in the August 18, 2016 EPA draft guidance memorandum. Include a discussion which addresses this guidance and how this will affect the CPV Keasbey PSD permit application.

A4. CPV Keasbey will incorporate the draft modeling guidance as provided in the U.S. EPA guidance memoranda dated May 20, 2014 and August 18, 2016 as they pertain to the modeling of PM-2.5 PSD Class I and II increments. Specifically, CPV Keasbey will use the following baseline dates to identify major and minor sources which may be included in a cumulative PSD increment assessment.

- The major source baseline date was established October 20, 2010.
- The minor source baseline date was established February 1, 2016.
- The area was designated attainment for PM-2.5 on September 4, 2013.

CPV Keasbey will work with the Department to develop an appropriate modeling inventory. This revision has been made and is reflected in the revised protocol in Section 5.12.

Section 1.0 Introduction

Q5. Page 1-1 states that the source is PSD affected for ozone (VOC). The area is nonattainment for ozone, thus subject to the nonattainment regulations with regard to ozone.

A5. This revision has been made and is reflected in the revised protocol in Section 1.0.

Section 3.1 Equipment/Fuels

Q6. List and detail the equipment from Woodbridge Energy Center that will be included in the air dispersion modeling demonstration.

A6. The equipment from the Woodbridge Energy Center that will be included in the air dispersion modeling demonstration will include the two (2) combustion turbines, the auxiliary boiler, the emergency diesel fire pump, the emergency diesel generator, and the 14-cell wet mechanical draft cooling tower. This revision has been made and is reflected in the revised protocol in Section 3.1 and Section 3.5.1.

Section 3.2 Operation

Q7. Provide details on the worst-case operating scenarios that will modeled for Keasbey Energy Center, the operating scenarios that were evaluated for Woodbridge Energy Center, and the worst-case operating scenarios from each of the power plants that may operate concurrently.

A7. The equipment from the proposed Keasbey Energy Center that will be included in the air quality dispersion modeling analyses will include the combined cycle combustion turbine, the emergency diesel generator, the emergency diesel fire pump, the auxiliary boiler, and the wet mechanical draft cooling tower. The worst-case combustion turbine operating scenario for each pollutant and averaging period will be determined.

The equipment from the existing Woodbridge Energy Center that will be included in the air dispersion modeling demonstration will include the two (2) combustion turbines, the auxiliary boiler, the emergency diesel fire pump, the emergency diesel generator, and the 14-cell wet mechanical draft cooling tower. The exhaust parameters and emission rates of the worst case operating scenarios for the existing Woodbridge Energy Center combustion turbine/heat recovery generator stacks can be found in Tables 3-7 and 3-8, respectively.

The existing Woodbridge Energy Center and the proposed Keasbey Energy Center will be evaluated together since they can operate concurrently and their combined impacts will be compared to the Significant Impact Levels, PSD Class II increments, and NAAQS/NJAAQS. This revision has been made and is reflected in the revised protocol in Section 3.3.

Section 3.3 Selection of Sources for Modeling

Q8. Calculations in Appendix B of the Keasbey Energy Center Combined Cycle Power Facility PSD Air Permit Application show that PM-10 emissions from the Keasbey Energy Center cooling tower will be greater than 1 lb/hr. The Department's Technical Manual 1002: Guideline on Air Quality Impact Modeling Analysis guidance states that cooling towers must be included in the air quality modeling when their PM-10 emissions exceed 1 lb/hr. Thus, it appears the PM-10 and PM-2.5 cooling tower emissions from both the Keasbey and Woodbridge power plants should be modeled.

A8. After discussions with the Department, since the combined PM-10 and PM-2.5 emissions from the cooling towers at Woodbridge and Keasbey exceed 1 lb/hr, both cooling towers will be including in the modeling analyses for PM-10 and PM-2.5 emissions. This revision has been made and is reflected in the revised protocol in Section 3.4.

Q9. Details on how the particulate emission rates are calculated and what assumptions are made for the cooling tower emissions, including vendor specifications, must be included in the modeling protocol and analysis. A professional journal from AWMA in 2002 is referenced as the source used to calculate the PM10/PM2.5 emissions from the cooling towers. The applicant should provide more updated literature search and also provide rational for not using AP42 emission factors. Confirm whether evaporative condensable emissions are considered from these units.

A9. Details on how the cooling tower particulate emissions rates are calculated with assumptions including vendor specifications are included in Section 3.4 and Appendix A of the protocol. The particle size calculation worksheet and droplet size distribution for an industry standard high efficiency drift eliminator is included in Appendix A of the protocol. The method used to calculate the emissions of PM10/PM2.5 were based on the procedure described in "Calculating Realistic PM10 Emissions from Cooling Towers" AWMA Abstract No. 216 Session No. AM-1b, Authors Joel Reisman and Gordon Frisbie, Greystone Environmental Consultants, Inc., 650 University Avenue, Suite 100, Sacramento, California 95825. The Reisman & Frisbie method is offered as a calculation method in addition to AP-42 for several important reasons. The first reason is that AP-42 is inadequate for determining PM2.5 emissions since it only provides a calculation for generic PM10 emissions. AP-42 assumes that all of the dissolved solids within the circulating water liquid drift leaving the cooling tower evaporates to form PM10 particles. (Table 13.4-1 AP-42 Section 13.4 Wet Cooling Towers, January 1995.) Second, this approach yields very conservative estimates for PM2.5 since its emissions would be equal to PM10. A third reason is that AP-42 does not account for the drift droplet spectrum from the drift eliminator which ultimately contributes to the particulate size range of evaporated solid particles. As BACT for cooling towers has been driven to drift rates of 0.0005% (and even lower in some cases) of the circulating water, the emitted spray drift droplets have preferentially been reduced in size, primarily due to higher drift eliminator efficiency scavenging the larger spray droplets.

An updated literature search was performed which sought a more current calculation method for particulate matter emissions calculations from wet cooling towers. As a rule, where PM10 and PM2.5 speciation of particulate matter from cooling towers is included in permit applications, the 2002 Reisman & Frisbie method is cited. Various examples were found, which include:

- Cooling Tower Institute (CTI), http://water-cti.com/pdf/PRWCTI-2011-001.pdf.
- State agency source guidance and/or applications including New Mexico, Washington and Florida.
    - https://www.env.nm.gov/aqb/permit/documents/PermittingGuidanceforCoolingTowerParticulateEmissions.pdf
    - http://www.ecy.wa.gov/programs/air/quincydatacenter/docs/Columbia-Revised-NOC-Water.pdf
    - https://www.dep.state.fl.us/air/emission/bioenergy/gainesville/mEmissionRates.pdf
    - Canadian Environment and Climate Change guidance for Wet Cooling Towers (https://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=2ED8CFA7-1 April 2014).

The reason the Reisman & Frisbie method is a widespread accepted use is that it follows an easily auditable approach and employs a simple mathematical transformation of the water droplets to solid particles. The spray drift droplets from the cooling tower drift eliminator can be measured and placed into a drift droplet size distribution, which is provided by the cooling tower vendor. Knowing the total dissolved particulate concentration within the circulating water and assuming that the drift droplets totally evaporate, the remaining evaporated particle size distribution is equivalent to the drift droplet size distribution. The total mass of particulate matter is calculated using the AP-42 emission factor method, and the subsequent PM10 and PM2.5 fractions are calculated from the evaporated droplet size distribution. The updated literature search did not uncover any alternative cooling tower particulate emission calculation method, or an improvement over the 2002 Reisman & Frisbie method.

With regard to evaporative condensable particulate matter being considered in the proposed Keasbey wet cooling tower emissions, there will be no such particulate matter. By the calculation method employed (either using AP-42 emissions factors, or AP-42 emissions adjusted for PM10 and PM2.5 as is the case employed by Keasbey Energy Center), the emission calculation only considers the evaporation of the water within the drift droplets. There will be no emissions of volatile constituents that may subsequently condense (in the atmosphere) to form condensable particulate matter.

Q10. Please clarify the discrepancy between pages 3-2 and 3-5 regarding the modeling of the emergency generator and fire pump. To be clear, these units are not automatically exempt from modeling. Furthermore, the exemption given in the referenced EPA March 11, 2011 memo is only for the probabilistic 1-hour average NAAQS only. For example, it is not for carbon monoxide since carbon monoxide is not a probabilistic standard. It is also not for PM2.5 since this is a daily average. The reason some exemptions may be considered by the reviewing agencies is that the occurrence of that emission scenario is so infrequent and short duration that the likelihood of it occurring during the hour of the worst case meteorology is low. Therefore, it is not likely that the sporadic occurrence of that exempt emission scenario would lead to an exceedance of the NAAQS. In addition, the fact that it would be modeled as a continuous emission scenario for 8760 hours per year may be overly conservative. It was not clear that the applicant intended to show this low probability in the protocol. The same EPA March 11, 2011 guidance did not provide a blanket exemption, especially to testing and maintenance of these emergency equipment where this activity may be scheduled and is routine. In this case the testing and maintenance proposed for 100 hours per year should still be examined further before granting the exemption. EPA also understands that NJDEP has developed guidance in this respect but provides this guidance in addition to the NJDEP guidance.

A10. The emergency diesel generators and emergency diesel fire pumps at both Woodbridge and Keasbey will not be included in the 1-hour SO_2 and 1-hour NO_2 modeling analyses, per the exemption as defined in the July 29, 2011 policy memorandum issued by NJDEP exempting emergency generator and fire pump NO_x and SO_2 emissions from 1-hour NO_2 and SO_2 air quality modeling at combined cycle turbine facilities. CPV has already agreed to the permit conditions contained in the aforementioned policy memorandum for the emergency diesel fire pump and emergency diesel generator at Woodbridge and proposes to agree to the same conditions for Keasbey. The emergency diesel generators and emergency diesel fire pumps will be included in the modeling analyses for all other pollutants and averaging periods. This revision has been made and is reflected in the revised protocol in Section 3.5.

Section 3.4 Exhaust Stack Configuration and Emission Parameters

Q11. Provide explanation and units for the 2.06 value used in the SO2 calculations and 0.8 and 1.74 values used in the NOx calculations.

A11. For the SO_2 calculation, 2.06 = molecular weight of ammonium sulfate (132 g/mol) divided by the molecular weight of sulfur dioxide (64 g/mol). For the NO_2 calculation, 1.74 = molecular weight of ammonium nitrate (80 g/mol) divided by the molecular weight of nitrogen dioxide (46 g/mol); and, 0.8 = application of the ambient ratio method (Tier 2) NO to NO_2 conversion rate to the NO_x emission rate. These revisions have been made and are reflected in the revised protocol in Section 3.5.

Q12. Move Woodbridge Energy Center Source parameter tables forward from Appendix B.

A12. This revision has been made and is reflected in the revised protocol in Tables 3-3c, 3-3d, 3-7, 3-8, 3-9, 3-10, and 3-11 respectively.

Section 3.5 GEP Analysis

Q13. Provide a table identifying all buildings on and off site with the potential to cause aerodynamic downwash of emissions from the stack. This analysis need only consider buildings within 0.8 kilometer or 5 L from the stack, whichever is lesser. For each stack, a table shall be provided with the following data for each building (or tier):

a. Building height (relative to stack base elevation);
b. Maximum projected building width;
c. Distance from the stack;
d. 5L distance; and
e. Calculated formula GEP stack height.

A13. A GEP analysis table that provides the aforementioned data will be included as part of the air quality modeling portion of the air permit application.

Tables 3-1a and 3-1b

Q14. Will the facility operate in simple cycle mode?

A14. The proposed facility (Keasbey Energy Center) will <u>not</u> operate in simple cycle mode. This clarification has been made and is reflected in the revised protocol in Section 3.3.

Q15. The text suggest that these tables are the combined parameters for the combustion turbine and the HRSG. If that is correct, please modify the table name to reflect this.

A15. These revisions have been made and are reflected in the revised protocol in Tables 3-1a, 3-1b, and 3-2, respectively.

Q16. Define the stack height in the footnote.

A16. This revision has been made and is reflected in the revised protocol in Tables 3-1a and 3-1b, respectively.

Table 3-3

Q17. Please add location coordinates and an elevation to the table for consistency.

A17. This revision has been made and is reflected in the revised protocol in Tables 3-3a and 3-3b, respectively.

Q18. Provide cooling tower parameters for Woodbridge Energy Center. See comment 12.

A18. This revision has been made and is reflected in the revised protocol in Table 3-3c.

4.1.2 Prevention of Significant Deterioration

Q19. The text states that if the modeled concentrations are less than the SILs, then NAAQ S and increments analyses are not required. Due to a court decision in 2013, this is not a blanket conclusion. More recent EPA guidance, such as the May 2014 PM2.5 guidance is recommended for other pollutants as well. It states that the applicant and reviewing agencies examine existing conditions to ensure that a NAAQS or increment could not be exceeded even with de minimis impacts. Even recent draft guidance for O3/PM2.5 SILs reiterates that SILs are discretionary especially in areas with significant growth (August 18, 2016). The increment will need to be evaluated.

A19. CPV Keasbey, LLC recognizes the concern of the Department that simply achieving a SIL is not necessarily protective of the ambient standard. As such, Table 5-5 of the protocol has been revised to include the proposed representative background concentration, applicable ambient air quality standard, the SIL, and the delta between the AAQS and background concentration in order to demonstrate there is adequate margin between the AAQS and background concentrations to support the facility air quality impact if below the SIL.

Q20. The interim SIL value of 10.0 ug/m3 for the 1 hour NO2 may be used for the initial impact analysis. However, should a violation be found, the proposed EPA SIL of 7.5 ug/m3 should be used for the NAAQS analysis. The text needs clarification explaining where the interim value comes from and justification for the value (see "NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO2 NAAQS", Northeastern States for Coordinated Air Use Management, April 21, 2010). Please include this

document in Appendix A.

A20. While the Project understands the NESCAUM interim SIL of 10 ug/m^3 is allowed, in the interest of conservatism, the Project has assumed the more restrictive U.S. EPA Interim SIL of 7.5 ug/m^3 for the related air quality modeling analyses. Therefore, footnote "b" in Table 4-2c has been revised to reference "Proposed SIL of 7.5 ug/m^3 per June 29, 2010 memorandum "Guidance Concerning the Implementation of the 1-Hour NO_2 NAAQS for the PSD Program" from U.S. EPA".

Q21. Include both the Class I and II SILs and PSD Increments in the discussion.

A21. This revision has been made and is reflected in the revised protocol in Section 4.1.2 and Tables 4-2b, 4-2c, and 4-2d.

Q22. The text states that NJDEP administers the PSD program under 40 CFR 51.166 and they received delegation in February 22, 1983. This should be corrected. NJDEP administers the PSD program under the federal rules of 40 CPR 52.21. The delegation agreement was updated on July 15, 2011.

A22. This revision has been made and is reflected in the revised protocol in Section 4.1.2.

4.1.3 Preconstruction Ambient Air Quality Monitoring Exemption

Q23. While not part of this modeling protocol, a response to EPA's July 26, 2016 comments on the preconstruction ambient monitoring waiver request remains outstanding. In addition, the request should be revised to include pertinent information regarding the Woodbridge power plant.

A23. The applicant will provide a response to the U.S. EPA Regions II's July 26, 2016 comments on the July 12, 2016 preconstruction ambient monitoring waiver request under a separate cover. At the Department's request, the request will include the pertinent information regarding the Woodbridge Energy Center. This revision has been made and is reflected in the revised protocol in Section 4.1.3.

Table 4-1

Q24. Remove preliminary from the column name. Please be aware that should facility emission rates change, air dispersion modeling may have to be redone.

A24. This revision has been made and is reflected in the revised protocol in Table 4-1.

Q25. Include a column showing the emissions from just the Keasbey Energy Center and a column showing the total emissions when combining the Keasbey and Woodbridge power plant emissions.

A25. This revision has been made and is reflected in the revised protocol in Table 4-1.

Q26. Clarify in a footnote or the table title whether the emission rates presented refer to all equipment or a subset of the equipment.

A26. In Table 4-1, the emission rates in the columns “Keasbey Energy Center Emission Rate” and “Woodbridge Energy Center Emission Rate” refer to all equipment at each respective facility. This clarification has been made and is reflected in the revised protocol in a footnote in Table 4-1.

Table 4-2

Q27. Please add Class I SIL and PSD values to this table.

A27. Table 4-2d has been added in the revised protocol to show Class I SILs and Class I PSD increment values.

Q28. BEP would prefer that the information in footnote a be presented in a separate table showing how the modeling results will be used to calculate the value for each pollutant and applicable averaging time to show compliance with NAAQS, SILs and NJAAQS. Please include information about the annual averaging times and about the lead assessment.

A28. The footnote revisions have been made and are reflected in the revised protocol in Tables 4-2a, 4-2b, 4-2c, and 4-3. In the case of lead, the rolling 3-month period maximum will be conservatively estimated from the 24-hour concentration. This revision has been made and is reflected in the revised protocol in Section 5.8.

Q29. Typo in footnote "a": The 24-hour PM2.5 NAAQS is a 3 year average of the 98th percentile. The word "average" should be included (similar to the 1 hour NO2 or SO2.)

A29. This revision has been made and is reflected in the revised protocol in Table 4-2a.

Q30. Footnote "b" should reference the NESCAUM recommendation. See "NESCAUM Recommendations on the Use of an Interim Significant Impact Level (SIL) in Modeling the 1-Hour NO2 NAAQS"; Northeastern States for Coordinated Air Use Management; April 21, 2010. Include this document in appendix A.

A30. While the Project understands the NESCAUM interim SIL of 10 ug/m^3 is allowed, in the interest of conservatism, the Project has assumed the more restrictive U.S. EPA Interim SIL of 7.5 ug/m^3 for the related air quality modeling analyses. Therefore, footnote “b” in Table 4-2c has been revised to reference “Proposed SIL of 7.5 ug/m^3 per June 29, 2010 memorandum “Guidance concerning the Implementation of the 1-Hour NO_2 NAAQS for the PSD Program” from U.S. EPA”.

Section 5.2 Surrounding Area and Land Use

Q31. BEP agrees that the rural land use option can be used. As discussed in the Air Quality Permitting Program's Technical Manual 1002 Section 6.4.1, the land use analysis should be based on the Auer Land Use Classification method using the latest available USGS topographic maps, the percentage of each land use type, and the total percentages of urban versus rural landscape should be provided.

A31. This revision has been made and is reflected in the revised protocol in Section 5.2 and Figure 5-1b.

Section 5.3 Meteorological Data

Q32. Provide a better justification for why Brookhaven upper air was chosen for the study. For example, "the next most proximate upper air station is XX ..."

A32. This revision has been made and is reflected in the revised protocol in Section 5.3.

Section 5.5 Load analysis

Q33. Add NJAAQS to the list of assessments.

A33. This revision has been made and is reflected in the revised protocol in Section 5.5.

Q34. Provide details on the worst-case operating scenarios that will modeled for Keasbey Energy Center, the operating scenarios that were evaluated for Woodbridge Energy Center, and the worst-case operating scenarios from each of the power plants that may operate concurrently.

A34. The equipment from the proposed Keasbey Energy Center that will be included in the air quality dispersion modeling analyses are the combined cycle combustion turbine, the emergency diesel generator, the emergency diesel fire pump, the auxiliary boiler, and the wet mechanical draft cooling tower. The worst-case combustion turbine operating scenario for each pollutant and averaging period will be determined.

The equipment from the existing Woodbridge Energy Center that will be included in the air dispersion modeling demonstration are the two (2) combustion turbines, the auxiliary boiler, the emergency diesel fire pump, the emergency diesel generator, and the 14-cell wet mechanical draft cooling tower. The exhaust parameters and emission rates of the worst case operating scenarios for the existing Woodbridge Energy Center combustion turbine/heat recovery generator stacks can be found in Tables 3-7 and 3-8, respectively.

The existing Woodbridge Energy Center and the proposed Keasbey Energy Center will be evaluated together since they can operate concurrently and their combined impacts will be compared to the Significant Impact Levels, PSD Class II increments, and NAAQS/NJAAQS. This revision has been made and is reflected in the revised protocol in Section 3.3.

Q35. Please provide calculations of the exhaust velocity from Tables 3-1a and 3-1b, for the various operating loads.

A35. Sample calculations of the exhaust velocity are provided below Tables 3-1a and 3-1b, respectively.

Section 5.6 Startups/Shutdowns

Q36. Modeling analysis for the startup and shutdown conditions will need to evaluate emissions of all criteria pollutants with short-term NAAQS and all startup types (warm, hot, cold) for natural gas operations. Startup numbers should be based on combined operation of both power plants.

A36. These revisions have been made and are reflected in the revised protocol in Sections 5.6 (SUSD – Keasbey Energy Center) and 5.6.1 (SUSD – Woodbridge Energy Center), as well as in Tables 5-1, 5-2, 5-3, and 5-4. Concurrent startups at both Woodbridge and Keasbey could occur and will be modeled accordingly.

Q37. Will there be concurrent startups for both power plants? If so, please detail how the scenario(s) will be modeled. Emissions will need to include operations at the Woodbridge Energy Center and all operating scenarios listed in the Keasbey Permit application.

A37. Concurrent startups at both Woodbridge and Keasbey could occur and will be modeled accordingly. These revisions have been made and are reflected in the revised protocol in Sections 5.6 (SUSD – Keasbey Energy Center) and 5.6.1 (SUSD – Woodbridge Energy Center), as well as in Tables 5-1, 5-2, 5-3, and 5-4.

Q38. It is stated that the scenario will be modeled if the pollutant(s) has a higher emissions during startup and shutdown conditions when compared to normal operation. This is not acceptable since the impacts may be higher given the reduced stack flow and stack temperature. These impacts must be assessed.

A38. This revision has been made and is reflected in the revised protocol in Section 5.6. The need for additional modeling to account for predicted short-term project impacts during startup of the combined cycle unit will be assessed for criteria pollutants for which a short-term NAAQS or PSD increment has been defined.

Q39. Startup under ULSD are not proposed since they are limited to 10-20 (two power plants) of these startups per year and the applicant claims these could be considered transient. Perhaps this may be true for the probabilistic 1 hour NO2 or 1 hour SO2 NAAQS demonstrations but this is not true for the CO NAAQS since they are based on a different statistic.

A39. During the operational year, CPV Keasbey, LLC is proposing ten (10) ULSD fired rapid starts. ULSD fired rapid starts are not proposed to be evaluated for 1-hour NO_2 since the number of each (10) can be deemed to be transient events. ULSD fired rapid starts will be evaluated for 1-hour and 8-hour CO. These revisions have been made and are reflected in the revised protocol in Section 5.6.

Q40. Please clarify further what is meant on page 5-5, "Since SO2 emissions are strictly dependent upon fuel flow (and lower during startup than continuous operation), SO2 startups are not proposed to be evaluated."

A40. Unlike NO_x, CO, and VOC emissions which result from atypical combustion during the transient operating conditions that occur during the combustion turbine start and which are typically higher than during normal operation, the SO_2 emissions are only due to the quantity of sulfur compounds in the fuel and the amount of fuel combusted during the start. Since the fuel flow is lower during a start than during normal (or continuous) operation, the SO_2 emissions will likewise be lower and will be less than the emissions during the minimum operating load. Keasbey Energy Center proposes to assess SO_2 emissions at multiple operating loads including the minimum emissions compliance load (MECL). As such the SO_2 modeling of normal operation at minimum load will adequately assess the potential air quality impact due to SO_2 emissions at low loads including the startup conditions. This revision has been made and is reflected in the revised protocol in Section 5.6.

Section 5.7 1-hour NO2 Modeling

Q41. It is unclear if the emergency diesel generator and emergency diesel fire pump are the only pieces of equipment CPV is proposing be exempt from the 1 hour NO2 modeling requirement. Provide clarification. Additionally, include a reference to the NJDEP policy memorandum used to justify exemption from modeling requirements. Ensure that the proposal to not include the fire pump and emergency generator conforms to the Departments' policy memorandum dated July 2011 Exempting Emergency Generator and Fire Pump Nitrogen Oxide (NO2) and Sulfur Dioxide (SO2) Emissions from 1-hour NO2 and SO2 Air Quality Modeling. Provide information in the protocol about whether all conditions in the above referenced memo are met by permit conditions.

A41. The emergency diesel generators and emergency diesel fire pumps at both Woodbridge and Keasbey will not be included in the 1-hour SO_2 and 1-hour NO_2 modeling analyses, per the exemption as defined in the July 29, 2011 policy memorandum issued by NJDEP exempting emergency generator and fire pump NO_x and SO_2 emissions from 1-hour NO_2 and SO_2 air quality modeling at combined cycle turbine facilities. CPV has already agreed to the permit conditions contained in the aforementioned policy memorandum for the emergency diesel fire pump and emergency diesel generator at Woodbridge and proposes to agree to the same conditions for Keasbey. The other combustion sources at Woodbridge (combustion turbines and auxiliary boiler) and Keasbey (combustion turbine and auxiliary boiler) will be included in the 1-hour NO_2 modeling analyses. This revision has been made and is reflected in the revised protocol in Section 5.7.

Q42. Include the auxiliary boiler in this section's discussion. In addition, provide details on the Woodbridge Energy Center sources that will be included in the 1-hour NO2 NAAQS compliance demonstration.

A42. The only Woodbridge Energy Center sources that will not be included in the 1-hour NO_2 modeling analyses are the emergency diesel generator and emergency diesel fire pump. The other combustion sources at Woodbridge (combustion turbines and auxiliary boiler) will be included in the 1-hour NO_2 modeling analyses. This revision has been made and is reflected in the revised protocol in Section 5.7.

Q43. The protocol should provide more information regarding how the 1 hour NO2 modeling will be undertaken. The protocol simply states that the EPA guidance will be used including the September 30, 2014 guidance. This September guidance relates to the beta ARM2 technique which require more detail on how it will be implemented (e.g., in-stack ratios, and ambient ozone data). It is not clear if the applicant intends to use this technique or was simply listing guidance that is available. If the applicant proposes to use the beta ARM2 technique, they should send EPA Region 2 the proposal for approval. In either case, more details are needed for the 1 hour NO2 modeling procedure.

A43. The following tiered screening options will be applied for the various analyses per the guidance specified in the U.S. EPA Memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" section entitled Approval and Application of Tiering Approach for NO_2 (found on pages 5 through 8 of the memorandum). The applicant proposes to use the Tier 2 screening approach for initial modeling results with the default ambient ratios for 1-hour (0.8) and annual (0.75). This method will be applied to both the SIL and NAAQS/increment analyses, respectively for the 1-hour and annual averages. Note that the applicant may also propose the use of the Tier 3 screening approach applying PVMRM should the Tier 2 method prove too conservative. Should the applicant decide to propose this approach, approval for the use of Tier 3, using the default in-stack ratio of 0.5 and a default NO_2/NO_x ambient equivalent ratio of 0.9, will be requested from U.S. EPA Region 2. This method will be employed if the modeled Tier 2 concentration plus a representative background concentration exceeds the NAAQS. This revision has been made and is reflected in the revised protocol in Section 5.7.

Section 5.8 NJDEP Air Toxics Risk Analysis

Q44. Include all of the sources at the Keasbey and Woodbridge Energy Centers, including tanks, for comparison to air toxic substance unit risk factors and reference concentrations. The bureau recommends the use of AERMOD for a risk assessment rather than multiple and non-concurrent evaluations of risk using the Risk Screening Worksheet.

A44. To assess the potential for offsite public health threats, the NJDEP Technical

Manual 1003: Guidance on Preparing a Risk Assessment Protocol for Air Contaminant Emissions will be used. The NJDEP has prescribed and provided an Air Toxics Risk Screening Worksheet to ascertain the potential health effects from facilities seeking permits to emit air toxics. TRC proposes to model (using AERMOD) the 24-hour and annual concentrations from those HAPs which are above the Subchapter 22 reporting threshold emission rates. The combined concentrations from Keasbey and Woodbridge will be evaluated against the reference concentrations found in the NJDEP Risk Technical Manual 1003 and risk screening worksheet. This revision has been made and is reflected in the revised protocol in Section 5.8.

Section 5.9 Receptor Grid

Q45. Discuss placing elevated receptors at the Fresh Kills Landfill on Staten Island, New York.

A45. At the Department's request, elevated receptors were placed at the Fresh Kills Landfill on Staten Island, New York. Data from the New York City Department of City Planning was used to accurately define elevations in this area. A total of 29 receptors within the current modeling domain were adjusted to reflect the final contours of the piles, while 6 additional receptors were added corresponding to the highest point at each of the 6 major landfill piles. For these 35 receptors, it was necessary to adjust the "scale height" parameter, as AERMOD will not accept a receptor with a "scale height" value that is less than the elevation of the receptor. As such, the "scale height" parameter was set equal to the receptor elevation for these receptors. A list of the 35 Fresh Kills Landfill receptors is provided in Table 5-6. This revision has been made and is reflected in the revised protocol in Section 5.9.

Q46. As discussed in the Air Quality Permitting Program's Technical Manual 1002 Section 9.1, fine grids of 50 m should be placed over the areas of maximum concentration to ensure that the true maximum concentration is identified.

A46. At the NJDEP's request, an additional model run will be executed with additional receptors with a spacing of 50 meters placed in the area of maximum impacts. This revision has been made and is reflected in the revised protocol in Section 5.9.

5.11 NAAQS/NJAAQS Analysis

Q47. Please confirm that NAAQS/NJAAQS will be evaluated by showing that the impacts plus the ambient background are less than the NAAQS/NJAAQS values for applicable averaging periods, even if the impacts are less than the SIL.

A47. The NAAQS/NJAAQS will be evaluated by showing that the impact plus the ambient background are less than the NAAQS/NJAAQS values for applicable averaging periods. This revision has been made and is reflected in the revised protocol in Section 5.11.

Q48. Since the combined emissions from both power centers for SO2 will be above the 40 tons/yr threshold, an air dispersion modeling demonstration for the 1 hour SO2 NAAQs and SO2 increments (3 hour, 24 hour and annual average) must be included.

A48. An air quality modeling analysis will be performed to show that the combined impacts of the proposed facility (Keasbey Energy Center) and the existing Woodbridge Energy Center plus the ambient background are less than the 1-hour and 3-hour SO_2 NAAQS. Additionally, an air quality modeling analysis will also be performed to show that the combined impacts of the proposed facility (Keasbey Energy Center) and the existing Woodbridge Energy Center are less than the 3-hour, 24-hour, and annual SO_2 PSD Class II increments.

5.12 PSD Increment Analysis

Q49. Comparison to Significant Impact Levels does not determine whether demonstrating compliance with PSD increments is required. Since this project's total emissions trigger PSD review, the modeling analysis should compare Keasbey and Woodbridge Energy Centers combined impacts to PSD Class I and Class II Increments.

A49. This revision has been made and is reflected in the revised protocol in Section 5.12.

5.15.2 Assessment of Impacts on Soils and Vegetation

Q50. BEP recommends using compliance with NJAAQS and NAAQS combined with the screening criteria for SO2 shown in the table below as an acceptable demonstration for protection of vegetation.

a) The screening value is based on the sensitive vegetation screening value in A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA document 450/2-81-078). This value should be compared to the maximum average ambient air concentration plus background for the specified averaging period.

A50. This revision has been made and is reflected in the revised protocol and Table 5-7.

5.15.3 Impact on Visibility

Q51. Provide a brief overview of the model, details on the methodology for running the model, and criteria that will be used to interpret the results from VISCREEN model. Visibility modeling should include emissions from the cooling towers.

A51. This revision has been made and is reflected in the revised protocol in Section 5.15.3. This modeling will include emissions from the cooling towers.

5.15.4 Impacts on Class I Areas

Q52. It appears that the Federal Land Manager was notified of the Keasbey Energy Center without including information pertaining to the Woodbridge Energy Center. Please re-contact and notify the FLM of the combined emissions of the two power plants for their evaluation.

A52. At the Department's request, the applicant will notify the FLM of the combined emissions of Keasbey Energy Center and Woodbridge Energy Center. Correspondence by and between the applicant and the FLM will be submitted under a separate cover. This revision has been made and is reflected in the revised protocol in Section 5.15.4.

Q53. While the FLM provided a waiver to address the AQRV in Brigantine, the Class I increment must be considered since the source is only 108 km distance.

A53. This revision has been made and is reflected in the revised protocol in Section 5.15.4.

Q54. For comparison of Class I SILs and PSD Increments, predicted impact concentrations at receptors at distance of 50 km from the Keasbey/Woodbridge site in the radial direction of the Class I Area located at the Brigantine Edwin B. Forsythe National Wildlife Refuge will be required.

A54. This revision has been made and is reflected in the revised protocol in Section 5.15.4.

Tables 5.1 and 5.2

Q55. Startup event emissions and hourly emissions should not be identical as the startup emissions are proposed to be prorated to the duration of startup time.

A55. Since the startup pound per event emissions occur during a time period less than 1-hour, the pound per event value is the same as the pound per hour value, specifically for the 1-hour averaging period. For the remainder of the hour, the worst-case pollutant operating scenario emission rate is prorated. As previously stated in Section 5.6 of protocol, for those averaging periods that extend beyond the start-up duration (i.e., 8-hour), modeled concentrations will be determined based on the combination of the startup conditions for the appropriate amount of time and the worst-case pollutant and averaging period specific operating scenario prorated for the remainder of the averaging period. Please see the revised text in Section 5.6 that describes the worst-case modeling scenarios during startup and shutdown.

Table 5.3

Q56. Add a column to the table specifying the monitoring stations used to provide ambient air concentrations.

A56. This revision has been made and is reflected in the revised protocol in Table 5-5.

Q57. The 2015 3-Hour SO2 ambient air concentration at Elizabeth Lab is 55.0 ug/m3. This 2015 value should be used as the background value for any NAAQS analysis.

A57. This revision has been made and is reflected in the revised protocol in Table 5-5.

Q58. In footnote b, the 1-hour 3-year average 98th percentile for NO2 should be 84.91 ug/m3.

A58. This revision has been made and is reflected in the revised protocol in Table 5-5.

Please feel free to contact me at 201-508-6954 or Ted Main at 201-508-6960 should you have any additional questions. We look forward to continuing to work with you on this project.

Sincerely,

TRC

Michael D. Keller

Michael D. Keller
Principal – Power Generation and Air Quality

Attachment

cc: G. John, NJDEP
A. Colecchia, U.S. EPA Region II
J. Donovan, CPV
A. Urquhart, CPV
T. Main, TRC
TRC Project File 252973

mk038-16.ltr.doc

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY, ENERGY AND SUSTAINABILITY
DIVISION OF AIR QUALITY
P.O. Box 420 Mailcode 401-02
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609 - 984 - 1484

BOB MARTIN
Commissioner

MEMORANDUM

TO: Aliya Khan, Bureau of Stationary Sources

FROM: Jennifer Levy, Bureau of Evaluation and Planning

DATE: January 25, 2016

SUBJECT: CPV Keasbey, LLC
Air Quality Modeling Protocol dated August 2016
(revised December 2016)
Woodbridge, Middlesex County, New Jersey
PI# 55824 BOP Application Number 160004

CPV Keasbey, LLC is proposing to construct and operate a new 630 MW combined cycle unit, identified as Keasbey Energy Center, directly adjacent to the 725 MW Woodbridge Energy Center, in Woodbridge, Middlesex County, New Jersey. The Keasbey Energy Center will consist of one dual fuel (natural gas or ultra-low sulfur diesel oil) General Electric 7HA.02 combustion turbine, one heat recovery steam generator, one natural gas-fired auxiliary boiler, one emergency diesel generator, one emergency diesel fire pump, a steam turbine generator, and a wet mechanical draft cooling tower. Control devices include dry low-NOx combustors, water injection, selective catalytic reduction (SRC), and oxidation catalyst.

The proposed project will be subject to PSD review for Greenhouse Gases(GHG), nitrogen oxides (NO_x), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns($PM_{2.5}$), carbon monoxide(CO), sulfuric acid mist (H_2SO_4), and sulfur dioxide (SO_2). The project will be subject to non- attainment new source review for NO_x and volatile organic compounds (VOC).

The Bureau of Evaluation and Planning (BEP) in collaboration with EPA Region II has completed its initial review of the above referenced document. The attached comments should be addressed in the form of a revised modeling protocol. If there are any questions regarding the attached comments, contact Jennifer Levy at (609) 633-8239.

cc:
Bachir Bouzid (BOsS)
Danny Wong (BEP)
Joel Leon (BEP)
Greg John (BEP)
Annamaria Colecchia (EPA- emailed)
Ted Main (TRC)
Michael Keller (TRC)

Bureau of Evaluation and Planning Comments on the CPV Keasbey, LLC Air Quality Modeling Protocol, Dated August, 2016 (Revised December 16)

General comments

1) CPV Keasbey needs to submit a site survey in accordance with the requirements set out in N.J.S.A. 45:8 et seq., N.J.A.C. 13:40-1.1 et seq., and the Bureau's Technical Manual 1002. The survey should clearly show the location of all emission points to be modeled, building structures, elevations at the facility, drawn to scale, not reduced, and indicating true north. This plot plan should include the Woodbridge Energy center and the Keasbey Energy Center.

2) All maps should clearly identify the Keasbey and Woodbridge Energy Centers and should present the ambient air boundary around the combined facility.

Section 1.0 Introduction

1) Modeling for Woodbridge Energy Center cannot be based on the previous modeling from 2012. Modeling must be completed using the current version of AERMOD (version 16216), the current version of AERMET (version 16216), and the current meteorological dataset (2010-2014). All permitted operating scenarios must be evaluated for Woodbridge Energy Center.

2) Add NOx to the pollutant list subject to PSD permitting.

3) Provide clarification to the statement that NO_x modeling is required due to NO_x being an ozone precursor on page 1-2. NO_x has to be modeled because it is above PSD Significant Emission Rates.

Section 2.0 Area Description

4) For figure 2-1, show the location of Woodbridge Energy Center.

5) For figure 2-2, identify the location of Woodbridge Energy Center and add a legend to clarify what the red regions represent.

Section 3.2 Fuels

6) Provide a description of the fuel types used at Woodbridge Energy Center. In this section and the previous section, please provide more details for Woodbridge Energy Center.

Section 3.3 Operation

7) Provide details on the operation restrictions for Woodbridge Energy Center, similar to the description for the Keasbey Energy Center.

Section 3.5.1 Exhaust and Emission parameters (Woodbridge Energy Center)

8) Provide details on all operating scenarios to be evaluated for Woodbridge Energy Center and comment on the operating scenarios from each of the power plants that may operate concurrently. See comment #1.

9) Add a section to the protocol describing how the operating scenarios from both Keasbey Energy Center and Woodbridge Energy Center will be selected for the combined modeling of both facilities.

10) For figure 3-1, include Woodbridge Energy Facility on the map.

11) Replace tables 3-7 and 3-8 with tables similar to 3-1a, 3-1b, and 3-2 to detail the load analysis for Woodbridge Energy Center.

Section 3.6 GEP Analysis

12) Provide a table identifying all buildings on and off site with the potential to cause aerodynamic downwash of emissions from the Keasbey and Woodbridge stacks. This analysis need only consider buildings within 0.8 kilometer or 5 L from the stack, whichever is lesser. For each stack, a table shall be provided with the following data for each building (or tier):

a. Building height (relative to stack base elevation);
b. Maximum projected building width;
c. Distance from the stack;
d. 5L distance; and
e. Calculated formula GEP stack height.

4.1.2 Prevention of Significant Deterioration

13) The text states that if the modeled concentrations are less than the SILs, then NAAQS and increments analyses are not required. Due to a court decision in 2013, this is not a blanket conclusion. More recent EPA guidance, such as the May 2014 PM2.5 guidance is recommended for other pollutants as well. It states that the applicant and reviewing agencies examine existing conditions to ensure that a NAAQS or increment could not be exceeded even with de minimis impacts. Even recent draft guidance for O3/PM2.5 SILs reiterates that SILs are discretionary especially in areas with significant growth (August 18, 2016). Compliance with $PM_{2.5}$ increment will need to be addressed.

Update the text to reflect the current EPA guidance and provide a discussion to support your argument that NAAQS and increment could not be exceeded even with de minimis impacts. The information in Table 5-5 can be used to support the NAAQS argument but does not address the increment.

Table 4-2a

14) The 8-hour ozone NAAQS value is incorrect. Revise it to reflect the 0.07 ppm standard.

15) Typo in footnote "d": The 24-hour PM2.5 NAAQS is a 3 year average of the 98th percentile.

16) Footnote "h: the modeled concentration should be conservatively estimate from the maximum 24-hour concentration. Please insert the word "maximum".

17) Please add a footnote saying that the 24-hour and annual SO_2 averaging periods will be modeled for comparison to the SILs and NJAAQS.

Table 4-2c

18) Please include the proposed ozone SIL of 1 ppb to this table.

Section 5.5 Load analysis

19) A load analysis for all permitted operating scenarios must be evaluated for Woodbridge Energy Center as well as Keasbey Energy Center. Provide details for the operating scenarios that will be evaluated for the Woodbridge Energy Center. See comment #1.

20) The "worst-case" loads for Keasbey and Woodbridge Energy centers may not produce the "worst-case" scenario for their combined operation. Assessment of air quality standards must be based on the combined "worst-case" operations of the facilities.

When presenting the modeling results, provide a matrix showing the worst case air concentrations for each pollutant, averaging time, and operating scenario for both facilities. This should include continuous operations and startup/shutdown scenarios. If scenarios operate for 3 hours or less, then they do not need to be evaluated for longer averaging times (ex. Startup and Shutdown). The results should be used to determine the operating scenarios from each of the power plants that will be modeled concurrently to identify the "worst-case" combined operation. The results for the individual operating scenarios should be discussed with BEP to identify the operating scenarios that will be modeled to assess the combined air impact.

Section 5.6 and 5.6.1 Startups/Shutdowns

21) Startup and Shutdown events need to be based on the combined operation of both power plants. The combined startup/shutdown operation of both power plants are not presented in this proposal. Any discussion of the 1-hr NO_2 modeling exemption due to transient events must refer to the combined operations of both power plants. Revise any reference to the "transient events" from individual facilities to ensure that the combined operation is being discussed.

22) Tables 5-1, 5-2, and 5-3. Remove the secondary "Type of Start-up or Shutdown Event" table from the page. Create one table presenting the numbers for the types of startup and shutdown events at Woodbridge Energy Center, Keasbey Energy Center, and the combined operations for both Keasbey and Woodbridge Energy Centers. For Woodbridge Energy center, present the permitted numbers for the conventional and rapid-response modes individually. Refer to the combined operations from this table when discussing the modeling and modeling exemptions related to the startup and shutdown operations for the facility.

23) For table 5-3. Add a footnote explaining why the Cold Start -Lead CTG has an elapsed time of 3.08 hours and a NO_x emission rate of 112 lb/hr yet the NO_x emission is only 187 lbs/event.

24) Modeling analysis for the startup and shutdown conditions will need to evaluate emissions of all criteria pollutants with a 3-hr or less averaging time for NAAQS and all startup types (warm, hot, cold) for natural gas operations. This includes SO_2 emissions. Although fuel flow will be reduced during startups, impacts may be higher given the reduced stack flow and stack temperature.

25) The discussion states "For annual averaging periods, start-ups will only be included in the modeling analysis if the potential to emit for the facility increases due to the inclusion of start-ups into the annual potential to emit calculation". Please provide how annual emissions are calculated for each piece of equipment and all criteria pollutants.

26) For startup/shutdown durations that are shorter than the averaging periods modeled at Woodbridge Energy Center, the additional prorated time should be based on the revised load analysis, not necessarily operating scenario Case 7. See comment #1.

Section 5.7 1-hour NO2 Modeling

27) The protocol should provide more information regarding how the 1 hour NO_2 modeling will be undertaken. With the promulgation of Appendix W on December 20, 2016, ARM was replaced by ARM2 for the 1 hour NO_2 Tier II modeling.

28) Is it Woodbridge and Keasbey's intention to have the emergency generators and the emergency fire pumps have a cumulative restriction of 100 hours per year for each category as described in the NJDEP July 29,2011 policy memorandum guidance?

5.11 NAAQS/NJAAQS Analysis

29) Please confirm in the text that NAAQS/NJAAQS will be evaluated by showing that the impacts plus the ambient background are less than the NAAQS/NJAAQS values for applicable averaging periods, even if the impacts are less than the SIL.

5.15.4 Impacts on Class I Areas

30) While the AQRV still needs to be resolved with FLM, Class I increment may have to be considered since the source is only 108 km in distance from the Class I area at the Brigantine Division of the Edwin B. Forsythe National Wildlife Refuge.

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March 2, 2017
mk006-17

Ms. Jennifer Levy
New Jersey Department of Environmental Protection
Division of Air Quality, Bureau of Evaluation and Planning
401 East State Street, 2nd Floor
Trenton, New Jersey 08625

Subject: CPV Keasbey, LLC
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Response to Comments on the Air Quality Modeling Protocol

Dear Ms. Levy:

In response to the Bureau of Evaluation and Planning's comment response letter issued by you on January 25, 2017 relative to the proposed CPV Keasbey, LLC's Keasbey Energy Center Revised Air Quality Modeling Protocol, please find below responses to questions/comments that were made. For ease of reference, each comment/question from your January 25, 2017 comment letter has been restated in bold with a response to the comment/question following. Also, per your request, please find attached a revised Air Quality Modeling Protocol that addresses the Bureau's comments and incorporates the responses below.

General Comments

Q1. CPV Keasbey needs to submit a site survey in accordance with the requirements set out in N.J.S.A. 45:8 et seq., N.J.A.C. 13:40-1.1 et seq., and the Bureau's Technical Manual 1002. The survey should clearly show the location of all emission points to be modeled, building structures, elevations at the facility, drawn to scale, not reduced, and indicating true north. This plot plan should include the Woodbridge Energy center and the Keasbey Energy Center.

A1. A general arrangement site plan that fulfills the requirements set out in the Bureau's Technical Manual 1002 is included as Figure 3-1. At the Department's request, this general arrangement site plan includes both the proposed Keasbey Energy Center and the existing Woodbridge Energy Center.

Q2. All maps should clearly identify the Keasbey and Woodbridge Energy Centers and should present the ambient air boundary around the combined facility.

A2. Figures 2-1 and 2-2 clearly identify the proposed location of the Keasbey Energy Center and the existing location of the Woodbridge Energy Center. Figures 2-1 and 2-2 also present the ambient air boundary around the combined facility.

Section 1.0 Introduction

Q1. Modeling for Woodbridge Energy Center cannot be based on the previous modeling from 2012. Modeling must be completed using the current version of AERMOD (version 16216), the current version of AERMET (version 16216), and the current meteorological dataset (2010-2014). All permitted operating scenarios must be evaluated for Woodbridge Energy Center.

A1. This revision has been made and is reflected in the revised protocol on page 1-2. Modeling for Woodbridge Energy Center will be completed using the current version of AERMOD (16216r) (see Section 5.1), with the current meteorological dataset (2010-2014) processed by the Department using AERMET (16216) (see Section 5.3), and provided by the Department for use on this project on February 15, 2017.

Q2. Add NO_x to the pollutant list subject to PSD permitting.

A2. This revision has been made and is reflected in the revised protocol on page 1-1.

Q3. Provide clarification to the statement that NOx modeling is required due to NOx being an ozone precursor on page 1-2. NOx has to be modeled because it is above PSD Significant Emission Rates.

A3. This revision has been made and is reflected in the revised protocol on page 1-2.

Section 2.0 Introduction

Q4. For figure 2-1, show the location of Woodbridge Energy Center.

A4. This revision has been made and is reflected on Figure 2-1.

Q5. For figure 2-2, identify the location of Woodbridge Energy Center and add a legend to clarify what the red regions represent.

A5. This revision has been made and is reflected on Figure 2-2. The red regions denote developed areas of medium intensity (i.e., single family housing units) and high intensity (i.e., apartments, row houses, and commercial/industrial).

Section 3.2 Fuels

Q6. Provide a description of the fuel types used at Woodbridge Energy Center. In this section and the previous section, please provide more details for Woodbridge Energy Center.

A6. This revision has been made and is reflected in Sections 3.1 and 3.2, respectively.

Section 3.3 Operation

Q7. Provide details on the operation restrictions for Woodbridge Energy Center, similar to the description for the Keasbey Energy Center.

A7. This revision has been made and is reflected in Sections 3.3.

Section 3.5.1 Exhaust and Emission parameters (Woodbridge Energy Center)

Q8. Provide details on all operating scenarios to be evaluated for Woodbridge Energy Center and comment on the operating scenarios from each of the power plants that may operate concurrently. See comment #1.

A8. This revision has been made and is reflected in Sections 3.5.1 and 3.5.2. Any and all operating scenarios at the proposed Keasbey Energy Center can operate concurrently with any and all operating scenarios at the Woodbridge Energy Center.

Q9. Add a section to the protocol describing how the operating scenarios from both Keasbey Energy Center and Woodbridge Energy Center will be selected for the combined modeling of both facilities.

A9. This revision has been made and is reflected in Sections 3.5.2.

Q10. For figure 3-1, include Woodbridge Energy Facility on the map.

A10. This revision has been made and is reflected on Figure 3-1.

Q11. Replace tables 3-7 and 3-8 with tables similar to 3-1a, 3-1b, and 3-2 to detail the load analysis for Woodbridge Energy Center.

A11. Tables 3-7 and 3-8 have been revised accordingly for the existing Woodbridge Energy Center.

Section 3.6 GEP Analysis

Q12. Provide a table identifying all buildings on and off site with the potential to cause aerodynamic downwash of emissions from the Keasbey and Woodbridge stacks. This analysis need only consider buildings within 0.8 kilometer or 5 L from the stack, whichever is lesser. For each stack, a table shall be provided with the following data for each building (or tier):

a. Building height (relative to stack base elevation);
b. Maximum projected building width;
c. Distance from the stack;
d. SL distance; and
e. Calculated formula GEP stack height.

A12. This revision has been made and is reflected in Section 3.6 and Tables 3-12 and 3-13, respectively.

4.1.2 Prevention of Significant Deterioration

Q13. The text states that if the modeled concentrations are less than the SILs, then NAAQS and increments analyses are not required. Due to a court decision in 2013, this is not a blanket conclusion. More recent EPA guidance, such as the May 2014 PM2.5 guidance is recommended for other pollutants as well. It states that the applicant and reviewing agencies examine existing conditions to ensure that a NAAQS or increment could not be exceeded even with de minimis impacts. Even recent draft guidance for O3/PM2.5 SILs reiterates that SILs are discretionary especially in areas with significant growth (August 18, 2016). Compliance with PM2.5 increment will need to be addressed.

Update the text to reflect the current EPA guidance and provide a discussion to support your argument that NAAQS and increment could not be exceeded even with de minimis impacts. The information in Table 5-5 can be used to support the NAAQS argument but does not address the increment.

A13. This revision has been made and is reflected in Section 4.1.2.

Table 4-2a

Q14. The 8-hour ozone NAAQS value is incorrect. Revise it to reflect the 0.07 ppm standard.

A14. This revision has been made (137.2 ug/m^3) and is reflected in Table 4-2a.

Q15. Typo in footnote "d": The 24-hour PM2.5 NAAQS is a 3 year average of the 98th percentile.

A15. This revision has been made and is reflected in Table 4-2a.

Q16. Footnote "h: the modeled concentration should be conservatively estimate from the maximum 24-hour concentration. Please insert the word "maximum".

A16. This revision has been made and is reflected in Table 4-2a.

Q17. Please add a footnote saying that the 24-hour and annual SO2 averaging periods will be modeled for comparison to the SILs and NJAAQS.

A17. This revision has been made and is reflected in Table 4-2a.

Table 4-2c

Q18. Please include the proposed ozone SIL of 1 ppb to this table.

A18. This revision has been made (1.96 ug/m^3) and is reflected in Table 4-2c.

Section 5.5 Load Analysis

Q19. A load analysis for all permitted operating scenarios must be evaluated for Woodbridge Energy Center as well as Keasbey Energy Center. Provide details for the operating scenarios that will be evaluated for the Woodbridge Energy Center. See comment #1.

A19. This revision has been made and is reflected in Section 5.5.

Q20. The "worst-case" loads for Keasbey and Woodbridge Energy centers may not produce the "worst-case" scenario for their combined operation. Assessment of air quality standards must be based on the combined "worst-case" operations of the facilities.

When presenting the modeling results, provide a matrix showing the worst case air concentrations for each pollutant, averaging time, and operating scenario for both facilities. This should include continuous operations and startup/shutdown scenarios. If scenarios operate for 3 hours or less, then they do not need to be evaluated for longer averaging times (ex. Startup and Shutdown). The results should be used to determine the operating scenarios from each of the power plants that will be modeled concurrently to identify the "worst-case" combined operation. The results for the individual operating scenarios should be discussed with BEP to identify the operating scenarios that will be modeled to assess the combined air impact.

A20. As discussed with the Department, the modeling analysis will model each operating case for both Keasbey and Woodbridge Energy centers emission units and develop source groups that individually and collectively identify the worst case air quality concentrations. Likewise, summary tables will be prepared presenting these concentrations, both for each energy center sources, individually and collectively, to demonstrate compliance with the PSD increment and ambient air quality standards. This methodology is discussed in Section 5.5.

Section 5.6 and 5.6.1 Startups/Shutdowns

Q21. Startup and Shutdown events need to be based on the combined operation of both power plants. The combined startup/shutdown operation of both power plants are not presented in this proposal. Any discussion of the 1-hr NO2 modeling exemption due to transient events must refer to the combined operations of both power plants. Revise any reference to the "transient events" from individual facilities to ensure that the combined operation is being discussed.

A21. This revision has been made and is reflected in Section 5.6.2.

Q22. Tables 5-1, 5-2, and 5-3. Remove the secondary "Type of Start-up or Shutdown Event" table from the page. Create one table presenting the numbers for the types of startup and shutdown events at Woodbridge Energy Center, Keasbey Energy Center, and the combined operations for both Keasbey and Woodbridge Energy Centers. For Woodbridge Energy center, present the permitted numbers for the conventional and rapid-response modes individually. Refer to the combined operations from this table when discussing the modeling and modeling exemptions related to the startup and shutdown operations for the facility.

A22. Permitted startup and shutdown emissions and associated stack parameters for the existing Woodbridge Energy Center are shown in Table 5-3. The combined startups and shutdowns at Keasbey and Woodbridge are discussed in Section 5.6.2. Tables 5-1 and 5-2 have not been revised because it needs to be understood (from a modeling perspective) how Keasbey is proposing to startup and shutdown on both natural gas and ULSD, and that this will have no impact on how Woodbridge is currently permitted to startup and shutdown, as seen in Table 5-3. Woodbridge Energy Center's existing permit does not place limits on the number or types of startups and shutdowns that can occur.

Q23. For table 5-3. Add a footnote explaining why the Cold Start -Lead CTG has an elapsed time of 3.08 hours and a NOx emission rate of 112 lb/hr yet the NOx emission is only 187 lbs/event.

A23. Note that the 3.08 hours should actually be 3.4 hours, consistent with the existing permit. This revision has been made and is reflected in in Table 5-3. During the 3.4 hours allotted for the startup event per the permit, the permitted NO_x emission limit is 112 lb/hr.

Q24. Modeling analysis for the startup and shutdown conditions will need to evaluate emissions of all criteria pollutants with a 3-hr or less averaging time for NAAQS and all startup types (warm, hot, cold) for natural gas operations. This includes SO2 emissions. Although fuel flow will be reduced during startups, impacts may be higher given the reduced stack flow and stack temperature.

A24. Per the Department's request, 1-hour and 3-hour SO_2 concentrations will be modeled for all startup and shutdown types. These revisions have been made and are reflected in Sections 5.6, 5.6.1, and 5.6.2.

Q25. The discussion states "For annual averaging periods, start-ups will only be included in the modeling analysis if the potential to emit for the facility increases due to the inclusion of start-ups into the annual potential to emit calculation". Please provide how annual emissions are calculated for each piece of equipment and all criteria pollutants.

A25. Please refer to the emission calculations in Appendix B of the Technical Support Document that were provided to Aliya Khan of the Bureau of Stationary Sources for each piece of equipment and all criteria pollutants.

Q26. For startup/shutdown durations that are shorter than the averaging periods modeled at Woodbridge Energy Center, the additional prorated time should be based on the revised load analysis, not necessarily operating scenario Case 7. See comment # 1.

A26. For startup/shutdown durations that are shorter than the averaging periods modeled at Woodbridge Energy Center, the additional prorated time will be based on the revised load analysis. This revision has been made and is reflected in Section 5.6.1.

Section 5.7 1-hour NO2 Modeling

Q27. The protocol should provide more information regarding how the 1 hour NO2 modeling will be undertaken. With the promulgation of Appendix W on December 20, 2016, ARM was replaced by ARM2 for the 1 hour NO2 Tier II modeling.

A27. This revision has been made and is reflected in Section 5.7.

Q28. Is it Woodbridge and Keasbey's intention to have the emergency generators and the emergency fire pumps have a cumulative restriction of 100 hours per year for each category as described in the NJDEP July 29,2011 policy memorandum guidance?

A28. The existing emergency diesel generator and emergency diesel fire pump at the Woodbridge Energy Center are each permitted to operate up to 100 hours per year. These permit conditions will remain the same. For the proposed emergency diesel generator and emergency diesel fire pump at the Keasbey Energy Center, CPV is proposing to operate each unit up to 100 hours per year, the same conditions that exist for the emergency diesel generator and emergency diesel fire pump at the Woodbridge Energy Center. CPV does not intend to have a cumulative restriction of 100 hours per year applied. CPV has already agreed to the permit conditions contained in the aforementioned policy memorandum for the emergency diesel fire pump and emergency diesel generator at the existing Woodbridge Energy Center and proposes to agree to the same conditions for the emergency diesel generator and emergency diesel fire pump at the proposed Keasbey Energy Center.

The emergency diesel generators and emergency diesel fire pumps are not expected to be tested more than once per week (with test durations limited by permit condition to no more than 30 minutes) and are not expected to contribute significantly to the annual distribution of maximum 1-hour concentrations. Therefore, it is proposed that 1-hour NO_2 modeling will not include the emergency diesel generators and emergency diesel fire pumps. Further, the emergency diesel generators and emergency diesel fire pumps will not be included in the 1-hour

NO_2 and SO_2 modeling analyses, per the exemption as defined in the July 29, 2011 policy memorandum issued by NJDEP exemption emergency generator and fire pump NO_x and SO_2 emissions from 1-hour NO_2 and SO_2 air quality modeling at combined cycle turbine facilities. This response is incorporated in Section 5.7.

Section 5.11 NAAQS/NJAAQS

Q29. Please confirm in the text that NAAQS/NJAAQS will be evaluated by showing that the impacts plus the ambient background are less than the NAAQS/NJAAQS values for applicable averaging periods, even if the impacts are less than the SIL.

A29. This revision has been made and is reflected in Section 5.11.

5.15.4 Impacts on Class I Areas

Q30. While the AQRV still needs to be resolved with FLM, Class I increment may have to be considered since the source is only 108 km in distance from the Class I area at the Brigantine Division of the Edwin B. Forsythe National Wildlife Refuge.

A30. This revision has been made and is reflected in Section 5.15.4. The protocol states that Class I increment will be examined.

Please feel free to contact me at 201-508-6954 or Ted Main at 201-508-6960 should you have any additional questions. We look forward to continuing to work with you on this project.

Sincerely,

TRC

Michael D. Keller

Michael D. Keller
Principal – Power Generation and Air Quality

Attachment

cc: G. John, NJDEP
A. Colecchia, U.S. EPA Region II
J. Donovan, CPV
A. Urquhart, CPV
T. Main, TRC
TRC Project File 252973

mk006-17.ltr.doc

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DIVISION OF AIR QUALITY
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609 - 984 - 1484

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

MEMORANDUM

TO: Aliya Khan, Bureau of Stationary Sources

FROM: Jennifer Levy, Bureau of Evaluation and Planning

DATE: March 28, 2017

SUBJECT: CPV Keasbey, LLC
Air Quality Modeling Protocol dated August 2016
(revised March 2017)
Woodbridge, Middlesex County, New Jersey
PI# 55824 BOP Application Number 160004

CPV Keasbey, LLC is proposing to construct and operate a new 630 MW combined cycle unit, identified as Keasbey Energy Center, directly adjacent to the 725 MW Woodbridge Energy Center, in Woodbridge, Middlesex County, New Jersey. The Keasbey Energy Center will consist of one dual fuel (natural gas or ultra-low sulfur diesel oil) General Electric 7HA.02 combustion turbine, one heat recovery steam generator, one natural gas-fired auxiliary boiler, one emergency diesel generator, one emergency diesel fire pump, a steam turbine generator, and a wet mechanical draft cooling tower. Control devices include dry low-NOx combustors, water injection, selective catalytic reduction (SRC), and oxidation catalyst.

The proposed project will be subject to PSD review for Greenhouse Gases (GHG), nitrogen oxides (NO_x), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), carbon monoxide (CO), sulfuric acid mist (H_2SO_4), and sulfur dioxide (SO_2). The project will be subject to non- attainment new source review for NO_x and volatile organic compounds (VOC).

The Bureau of Evaluation and Planning (BEP) in collaboration with EPA Region II has completed its review of the above referenced document. BEP is granting a conditional approval to conduct the air quality dispersion modeling. The conditional approval is dependent on fully addressing the attached comments. If there are any questions regarding the comments, contact Jennifer Levy at (609) 633-8239.

cc:
Bachir Bouzid (BOsS)
Danny Wong (BEP)
Joel Leon (BEP)
Greg John (BEP)
Annamaria Colecchia (EPA- emailed)
Ted Main (TRC)
Michael Keller (TRC)

Bureau of Evaluation and Planning Comments on the CPV Keasbey, LLC Air Quality Modeling Protocol, Dated August, 2016 (Revised March 2017)

General comments

1) CPV Keasbey needs to submit a site survey **with a raised seal** in accordance with the requirements set out in N.J.S.A. 45:8 et seq., N.J.A.C. 13:40-1.1 et seq., and the Bureau's Technical Manual 1002. The survey should include the Woodbridge Energy Center and the Keasbey Energy Center.

2) Please note that the results from the load analysis for all operating scenarios should be discussed with BEP prior to modeling the combined impact. BEP will provide guidance on the scenarios that need to be evaluated for the combined impact assessment. Additionally, the results from the load analysis for all operating scenarios should be presented in the modeling results document.

Section 3.2 Fuels

3) Should the natural gas sulfur content change in subsequent permitting decisions, the modeling must reflect the updated sulfur content.

Section 3.5 Exhaust Stack Configuration and Emission Parameters (Keasbey Energy Center)

4) The text refers to the site plan as a "general arrangement site plan" and the emission rates as "preliminary potential emission rates". This terminology suggests that the building arrangement and emission rates may be subject to change. Please note that if the information presented in this document changes, the modeling analysis will need to reflect the changes.

5) The Department recognizes that operation of the emergency generators and fire pumps will meet the modeling exemption defined in the July 29, 2011 policy memorandum. However, since the air modeling quality evaluation is for a PSD Permit, the impact evaluation must demonstrate compliance with the 1-hour NO_2 and 1-hour SO_2 National Air Quality Standards incorporating guidance outlined in the March 1, 2011 U.S. EPA Memorandum titled, *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard.*

Section 3.5.2 Combined Modeling of Keasbey Energy Center and Woodbridge Energy Center

6) Refer to general comment 2.

7) Refer to comment 4.

Section 3.6 GEP Analysis

8) BEP is providing a conditional approval to begin modeling, with the condition that additional information must be provided. For example, tables 3-12 and 3-13 create tiered structures for the HRSG while the plot plan does not list this information. Additionally, there are several buildings for Keasbey Energy Center that are not identified on the plot plan and not included in the GEP analysis. The revised plot plan (per comment 1) must include and label all structures and the downwash analysis must be revised to reflect these buildings.

Table 4-2a

9) Typo in footnote "d": It should be noted that the design value for the 24-hour averaging period is based on the 3-year average of the 24-hr 98th percentile.

Section 5.6 and 5.6.2 Startups/Shutdowns

10) All short-term averaging time air quality standards (1-hr, 3-hr, 8-hr, 24-hr) must be modeled for startup and shutdown events.

11) The 1-hr NO_2 modeling exemption due to transient events must refer to the combined operations of both power plants. The request to exempt 1-hr NO_2 modeling for cold gas fired rapid starts and for cold ULSD fired rapid starts is based only on Keasbey's operations, and, therefore does not apply to the combined facility. Since Woodbridge does not have ULSD operation, the 1-hr NO_2 modeling can be considered transient for the facility. However, the 1-hr NO_2 natural gas fired cold startups at Keasbey must be included in the combined facility modeling.

12) If there are no permit limits for Woodbridge startups and shutdowns, the annual modeling must assume continuous startup emissions and stack parameters. For example, previous modeling for Woodbridge assumed 10 cold starts, 200 hot starts, and 52 warm starts.

13) Startup emissions must be included in the annual averaging modeling for all relevant criteria pollutants.

14) Add a section to the protocol providing details for how annual emissions are calculated for all relevant criteria pollutants. Note that all supporting calculations pertaining to the modeling analysis must be included in the modeling protocol. Additionally, the statement, "For annual averaging periods, start-ups will only be included in the modeling analysis if the potential to emit for the facility increases due to the inclusion of start-ups into the annual potential to emit calculation" is not valid. The annual potential to emit calculation must include startups and shutdown emissions.

Section 5.7 1-hour NO2 Modeling

15) See comment 4.

Section 5.8 NJDEP Air Toxics Risk Analysis

16) A table containing all HAPs, their emission rates, the source, the reference concentrations, and the unit risk factors must be provided. Additionally, a table containing the cancer risk, short term non-cancer risk and long term non-cancer risk results from the facility should be provided in the modeling results document. Should the maximum modeled short or long term risk exceed the threshold value for any pollutant, a map depicting all areas exceeding the threshold should be provided to show the spatial and quantitative extent of the impact.

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March 30, 2017

Mr. Greg John
New Jersey Department of Environmental Protection
Division of Air Quality, Bureau of Technical Services
401 East State Street, 2nd Floor
Trenton, New Jersey 08625

Subject: CPV Keasbey, LLC
Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Revised Request for Waiver from Pre-Construction Ambient Air Quality Monitoring

Dear Mr. John:

This letter is in response to U.S. EPA Region II's comment letter issued by Steven Riva on July 26, 2016 regarding the July 12, 2016 request for waiver from preconstruction ambient air quality monitoring for the CPV Keasbey, LLC proposed combined cycle power facility (to be known as the Keasbey Energy Center) to be located in the Township of Woodbridge, Middlesex County, New Jersey (see Figure 1) in accordance with Prevention of Significant Deterioration (PSD) of Air Quality regulations.

The Keasbey Energy Center will represent a significant modification of the Woodbridge Energy Center. Since the Keasbey Energy Center, as a significant modification will potentially emit more than the Significant Emission Rates (SERs) of several air pollutants, it is subject to PSD permitting. These regulations state that major new or modified facilities having annual emissions of regulated air contaminants in excess of significant emission rates (SER) must provide an analysis of air quality data in the area of the proposed facility that, in general, consist of continuous air quality monitoring data gathered over a year preceding receipt of the application. As fully described below, this request is for a waiver from the pre-application ambient monitoring data requirement for the air contaminants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) particulate matter with an aerodynamic diameter less than 10 micrometers (µm) (PM-10), and less than 2.5 micrometers (PM-2.5).

Pursuant to the PSD regulations codified in 40 CFR 52.21, and in accordance with U.S. EPA guidance "Ambient Monitoring Guidelines for PSD" (EPA-450/4-87-007) and elsewhere, the PSD pre-construction monitoring requirement may be satisfied with existing monitoring data if these data can be shown to be representative of air quality in the area of the proposed facility.

CPV Keasbey is also requesting an exemption from the pre-application ambient monitoring requirement for lead (Pb) because it will be emitted in amounts less than its SER; for fluorides, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds because they are not anticipated as a product of natural gas combustion (i.e., from the combustion turbine and auxiliary boiler) and fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump); and for sulfuric acid (H_2SO_4) mist because there is no approved monitoring technique available.

Project Description

CPV Keasbey, LLC is proposing to construct a nominal 630-megawatt (MW) 1-on-1 combined cycle power facility (to be known as the Keasbey Energy Center) on a parcel of land directly adjacent the existing Woodbridge Energy Center in the Township of Woodbridge, Middlesex County, New Jersey. The combustion turbine will be primarily fueled by natural gas but will be capable of firing ultra-low sulfur diesel (ULSD) for up to 720 hours per year.

The Keasbey Energy Center will consist of one (1) General Electric (GE) 7HA.02 combustion turbine at the proposed facility site. Hot exhaust gases from the combustion turbine will flow into one (1) heat recovery steam generator (HRSG). The HRSG will produce steam to be used in the steam turbine and will be equipped with a natural gas fired duct burner. Upon leaving the HRSG, the turbine exhaust gases will be directed to one (1) exhaust stack. Other ancillary equipment at the proposed facility will include one (1) gas fired auxiliary boiler, one (1) emergency diesel fire pump, one (1) emergency diesel generator, and a wet mechanical draft cooling tower.

Emissions from the combined cycle unit will be controlled by the use of dry low-NO_x burner technology (during natural gas firing), water injection (during ULSD firing), and selective catalytic reduction (SCR) for NO_x control, an oxidation catalyst for CO and volatile organic compounds (VOCs) control, and the use of clean low-sulfur fuels (i.e., natural gas and ULSD) to minimize emissions of SO_2, PM/PM-10/PM-2.5, and H_2SO_4. Exhaust gases from the combined cycle unit after emission controls will be dispersed to the atmosphere via one (1) stack. Steam from the steam turbine will be sent to a condenser where it will be cooled to a liquid state and returned to the HRSG. Waste heat from the condenser will be dissipated through a wet mechanical draft cooling tower.

Facility Emissions

The proposed facility (as a significant modification to a major source) is located in an attainment area for SO_2, NO_2, CO, PM-10, and PM-2.5. The proposed facility will potentially emit more than the SERs for several air pollutants, and will be subject to PSD permitting for these constituents. Under PSD regulations, an air quality dispersion modeling analysis is required to ensure that CO, PM-10, PM-2.5, SO_2, and NO_2 emissions from the proposed facility will be compliant with NAAQS and applicable PSD Class II increments.

Table 1 presents projected facility emission rates and the pollutant specific significant emission rates (SERs) defined in the PSD regulations. The proposed facility is projected to have annual emissions in excess of PSD SERs for CO, NO_2, SO_2, particulates (PM/PM-10/PM-2.5), and H_2SO4. The emissions of lead are below its SER.

Existing Background Ambient Air Quality Data

Based on a review of the locations of NJDEP ambient air quality monitoring sites, the closest "regional" NJDEP monitoring sites will be used to represent the current background air quality in the site area. These monitors have been designed, sited, and operated in accordance with U.S. EPA monitoring guidelines in terms of quality assurance and quality control of the data collection and the reliability of the data itself which are outlined at the EPA's Report on the Environment website https://cfpub.epa.gov/roe/technical-documentation.cfm. This website documents the QA/QC components of the data collection process as follows:

> ***9. Quality Assurance and Quality Control***
>
> *The quality assurance/quality control (QA/QC) of the national air monitoring program has several major components: (1) the data quality objective (DQO) process; (2) reference and equivalent methods program; (3) EPA's National Performance Audit Program (NPAP); (4) system audits; and (5) network reviews (http://www.epa.gov/ttn/amtic/netamap.html). To ensure quality data, the SLAMS are also required to meet the following QA/QC criteria: (1) each site must meet network design and site criteria; (2) each site must provide adequate QA assessment, control, and corrective action functions according to minimum program requirements; (3) acceptable data validation and record keeping procedures must be followed; and (4) data from SLAMS must be reported annually to EPA. Finally, there are system audits that regularly review the overall air quality data collection activity for any needed changes or corrections.*

Background data for CO and SO_2 was obtained from a New Jersey monitoring station located in Union County (EPA AIRData #34-039-0004). The monitor is located at Interchange 13 on the New Jersey Turnpike (Elizabeth Lab), approximately 17 km northeast of the proposed facility. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for PM-10 was obtained from a Jersey City monitoring station located in Hudson County, New Jersey (EPA AIRData # 34-017-1003), approximately 32 km northeast of the proposed facility. The monitor is located at 355 Newark Avenue in a commercial/urban area. This monitor is located in an area with a greater amount of mobile and point sources of air emissions as compared to the project area. Thus, this monitor would be considered to conservatively represent the ambient air quality within the project area.

Background data for NO_2 was obtained from an East Brunswick monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 11 km west-southwest of the proposed facility. The monitor is located at Rutgers University (Veg. Research Farm #3 on Ryders Lane) in an agricultural/rural area with proximate commercial uses (i.e., Route 1 and Interstate 95). This monitor's close proximity to the Project site would qualify it to be representative of the ambient air quality within the project area.

Background data for PM-2.5 was obtained from a New Brunswick Township monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0006), approximately 10 km west-southwest of the proposed facility. The monitor is located at Rutgers University's Cook College (Log Cabin Road) in an agricultural/rural area with proximate commercial uses. This monitor's close proximity would qualify it to be representative of the ambient air quality within the project area.

The monitoring data for the most recent three years (2013-2015) are presented in Table 2 while Figure 2 displays the locations of the aforementioned air quality monitors in relation to the proposed facility.

Monitoring Waiver Request

In summary, CPV Keasbey, LLC is requesting a waiver from the requirement to perform pre-application ambient air quality monitoring for CO, NO_2, SO_2, PM-10, and PM-2.5 because there exists acceptable quality assured ambient air quality data from alternate locations that satisfy the requirements of 40 CFR 52.21. Further, CPV Keasbey is requesting an exemption from the requirement to perform pre-application ambient monitoring for lead because it will be emitted in amounts less than its SER; for fluorides, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds because they are not anticipated as a product of natural gas combustion (i.e., from the combustion turbine, and auxiliary boiler) and fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump); and for H_2SO_4 because there is no approved monitoring technique available.

Please feel free to contact me (201) 508-6960 or tmain@trcsolutions.com should you have any questions regarding this monitoring exemption request.

Sincerely,

TRC

Theodore Main
Principal Consulting Meteorologist

cc: A. Colecchia, U.S. EPA Region II
J. Donovan, CPV
A. Urquhart, CPV
M. Keller, TRC
TRC Project File 252973

Table 1
Comparison of Projected Facility Emissions to PSD Significant Emission Rates

Pollutant	Keasbey Energy Center Projected Emission Rate (tons per year)	Significant Emission Rate (tons per year)
Carbon Monoxide	111.6	100
Sulfur Dioxide	40.8	40
Particulate Matter (PM)	72.0	25
Particulate Matter less than 10 microns (PM-10)	122.5	15
Particulate Matter less than 2.5 microns (PM-2.5)	118.3	10
Nitrogen Oxides	151.9	40
Lead	0.03	0.6
Fluorides	[a]	3
Sulfuric Acid Mist[b]	25.7	7
Hydrogen Sulfide	[a]	10
Total Reduced Sulfur (including H_2S)	[a]	10
Reduced Sulfur Compounds (including H_2S)	[a]	10

[a]Not anticipated as a product of natural gas (i.e., from the combustion turbine and auxiliary boiler) or fuel oil combustion (i.e., from the combustion turbine, emergency diesel generator, and emergency diesel fire pump), and assumed zero.

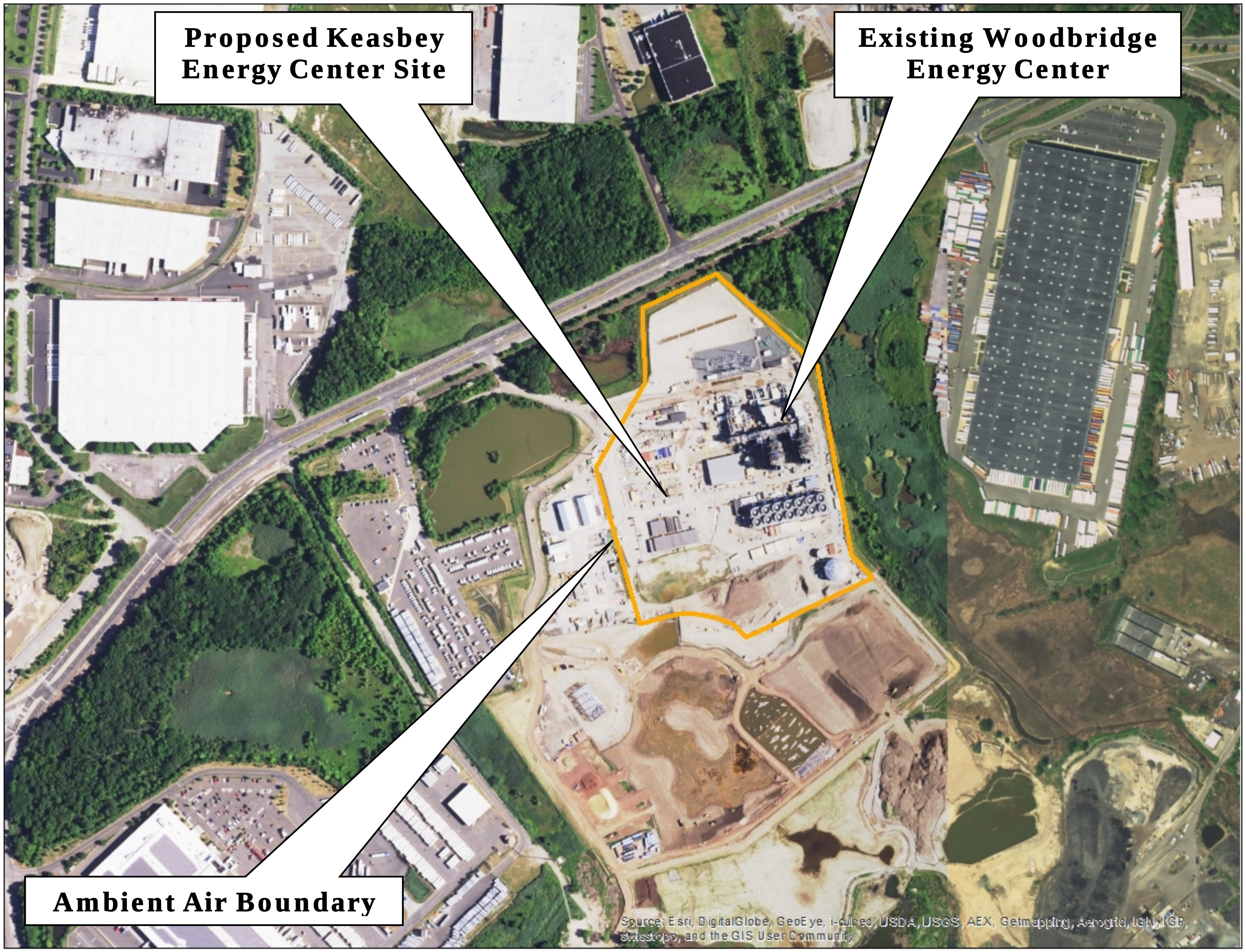
[b]No acceptable monitoring techniques exist for this pollutant.

Table 2
Ambient Concentrations of Criteria Pollutants
Proposed to be Used to Represent Site Conditions

Pollutant	**Averaging Period**	**Maximum Ambient Concentrations (μg/m³)**		
		2013	**2014**	**2015**
SO_2	1-Hour[c]	36.7	34.1	39.3
	3-Hour	28.8	28.8	55.0
	24-Hour	15.7	13.1	11.8
	Annual	2.6	2.6	--
NO_2	1-Hour[a] Annual	75.2 18.8	88.4 16.9	90.2 19.3
CO	1-Hour 8-Hour	2,300 1,495	2,530 2,070	2,760 1,840
PM-10	24-Hour	43	37	44
PM-2.5[b]	24-Hour Annual	19.1 8.0	20 8.2	20 7.9

[a]1-hour 3-year average 98th percentile value for NO_2 is **84.91** ug/m³.
[b]24-hour 3-year average 98th percentile value for PM-2.5 is **19.7** ug/m³; Annual 3-year average value for PM-2.5 is **8.0** ug/m³.
[c]1-hour 3-year average 99th percentile value for SO_2 is **36.7** ug/m³.

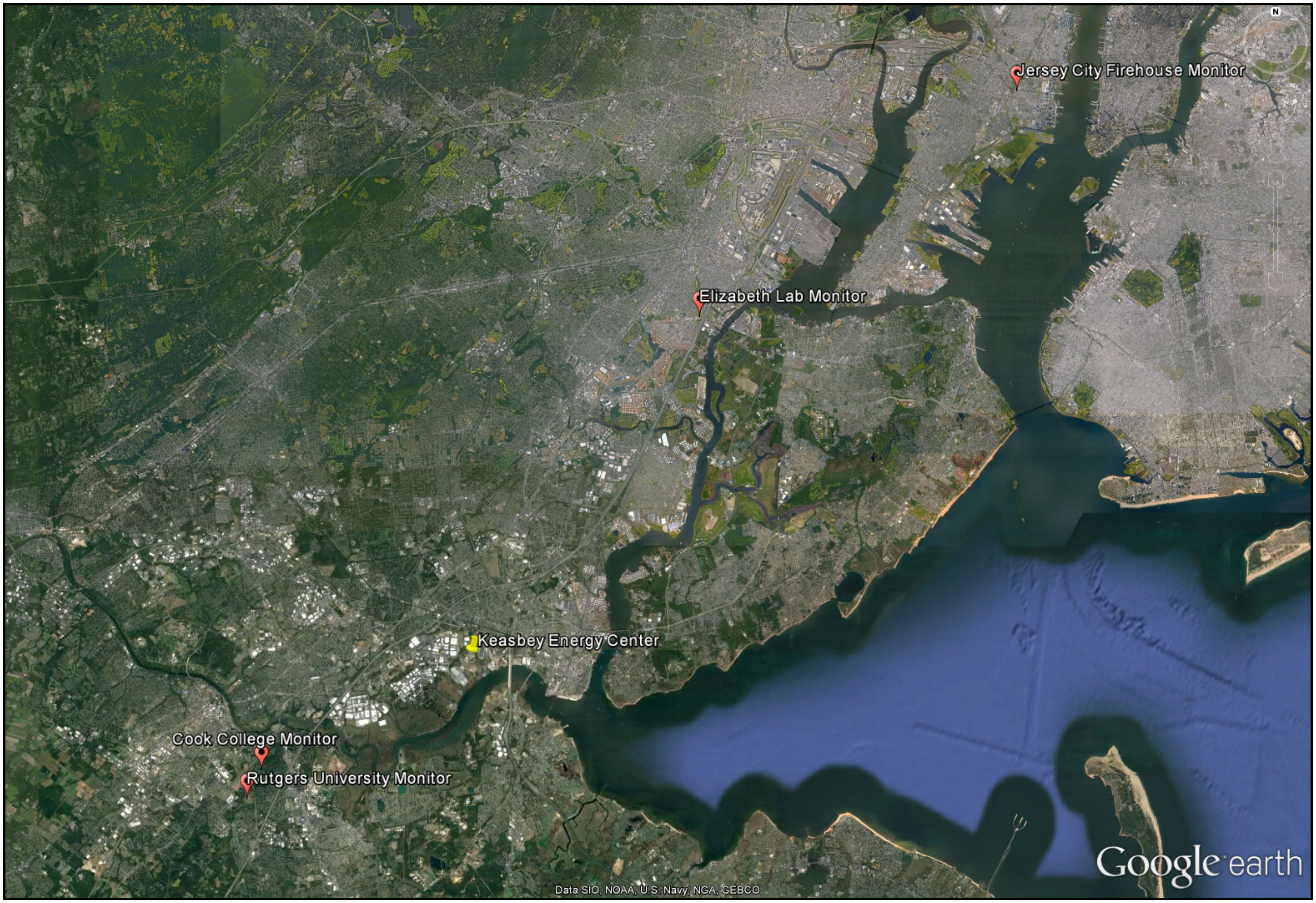
High second-high short term (1-, 8-, and 24-hour) and maximum annual average concentrations presented for all pollutants other than PM-2.5 and 1-hour NO_2.
Monitored background concentrations obtained from the U.S. EPA AIRData, AirExplorer, and Air Quality System (AQS) websites.



Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 1. Site Location Aerial Photograph

Source: Esri, Digital Globe, GeoEye, 2017.



Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 2. Background Ambient Air Quality Monitors

Source: Google Earth, 2016.

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June 21, 2017
mk016-17

Ms. Annamaria Colecchia
U.S. EPA Region II – Air Programs Branch
290 Broadway – 25th Floor
New York, New York 10007-1866

Subject: CPV Keasbey, LLC Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey
Request for Use of PVMRM Method in AERMOD

Dear Ms. Colecchia:

TRC, on behalf of CPV Keasbey, LLC, prepared and submitted a Prevention of Significant Deterioration (PSD) permit application for a proposed 630-megawatt (MW) (nominal) combined cycle power facility (to be known as Keasbey Energy Center) to be constructed in the Township of Woodbridge, Middlesex County, New Jersey. The approximate Universal Transverse Mercator (UTM) coordinates of the Proposed Facility are 557,515 meters Easting, 4,485,100 meters Northing, in Zone 18, NAD83 (see Figure 1).

The Keasbey Energy Center will represent a significant modification of the Woodbridge Energy Center. Since the Keasbey Energy Center, as a major modification, will potentially emit more than the Significant Emission Rates (SERs) of several air pollutants, it is subject to PSD permitting.

The Keasbey Energy Center will consist of one (1) combustion turbine generator (General Electric (GE) 7HA.02) with a heat recovery steam generator (HRSG) equipped with a natural gas fired duct burner that will be tied to one (1) steam generator. The proposed facility will be fueled exclusively by natural gas since CPV Keasbey, LLC has decided to eliminate ultra-low sulfur diesel (ULSD) as a fuel for the combustion turbine. A dry low NO_x burner and Selective Catalytic Reduction (SCR) will be used to reduce nitrogen oxides (NO_x) emissions from the combustion turbine. The firing of natural gas in the combustion turbine will minimize emissions of particulate matter with an aerodynamic diameter less than 10 microns (PM-10), particulate matter with an aerodynamic diameter less than 2.5 microns (PM-2.5), sulfur dioxide (SO_2), and sulfuric acid mist (H_2SO_4). Additionally, an oxidation catalyst will be installed to control the emissions of carbon monoxide (CO) and volatile organic compounds (VOC).

Combustion products from the Power Island (i.e., combustion turbine/duct burner) will be discharged through one (1) exhaust stack. Supporting auxiliary equipment includes a gas fired auxiliary boiler, an emergency diesel generator, an emergency diesel fire pump, and a wet mechanical draft cooling tower.

TRC, on behalf of CPV Keasbey, LLC, is proposing to use the Plume Volume Molar Ratio Method (PVMRM), one of U.S. EPA's Tier 3 screening methods, to model NO_2 emissions. The use of PVMRM as a Tier 3 screening method requires consultation with U.S. EPA for a project triggering federal permitting requirements, which this project does.

PVMRM adjusts NO_x emissions to estimate more realistic ambient NO_2 concentrations by modeling the conversion of NO_x to NO_2. Additional information needed to use PVMRM includes the NO_2/NO_x ratio within each NO_2 emitting stack, the ambient NO_2/NO_x ratio, and background ozone concentrations.

The "Revisions to the Guideline on Air Quality Models: Enhancement to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter", published final in the Federal Register on January 17, 2017, the U.S. EPA memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS" dated March 1, 2011, and the U.S. EPA memorandum "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS" dated June 28, 2010, provide suggested procedures for the application of the methods available in AERMOD for Tier 3 refinements, as summarized below:

- Tier 1 assumes total conversion of NO to NO_2;
- Tier 2 assumes ambient equilibrium between NO and NO_2; and,
- Tier 3 provides "detailed screening methods" that account for ambient ozone and the relative amount of NO and NO_2 emitted from the source.

For the purpose of this request, implementation of this tiered approach to demonstrate compliance with the 1-hour NO_2 NAAQS is proposed. Should the results of the Tier 1 and Tier 2 analyses indicate that further refinement of the predicted impacts are necessary, use of the PVMRM Tier 3 detailed screening option available in the AERMOD model (version 16216r) is proposed. Based on the information provided in this request, refined modeling analyses are proposed to demonstrate compliance with the 1-hour average NO_2 NAAQS.

PVMRM Input Data

PVMRM incorporates three sets of data into the calculation of 1-hour NO_2 concentrations. Those are source-specific in-stack NO_2/NO_x emission rate ratios, an ambient NO_2/NO_x concentration ratio, and hourly average background ozone concentrations.

Instead of source-specific in-stack NO_2/NO_x emission rate ratios, a value of 0.50 is proposed for input to the PVMRM option. The March 1, 2011 Fox memo[1] outlines the "general acceptance of 0.50 as a default in-stack ratio of NO_2/NO_x for input to the PVMRM and OLM options within AERMOD, in the absence of more appropriate source-specific information on in-stack ratios".

[1] Additional Clarification Regarding Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS, Tyler Fox, OAQPS, March 1, 2011.

The PVMRM option for modeling conversion of NO to NO_2 incorporates a default NO_2/NO_x ambient equilibrium ratio of 0.90. This value is proposed to be used in AERMOD.

Hourly Average Background NO_2 Concentrations

Pollutant background concentrations are required to appropriately assess the ambient air quality concentrations that may contribute to the total ambient pollutant concentrations. Background concentrations are added to model-predicted concentrations to calculate the total concentrations for comparison to the NAAQS. Criteria pollutant background concentration values are derived from ambient air quality data monitored at stations that are determined to be representative of expected background concentrations at the proposed source location and potential impact area. In order to conduct cumulative impact analyses, background values must be combined with modeled results to compare to the 1-hour NO_2 NAAQS.

Based on review of the locations of NJDEP ambient air quality monitoring sites, the closest "regional" NJDEP monitoring site will be used to represent the current background NO_2 air quality in the site area. Background data for NO_2 from 2012 – 2014 was obtained from a monitoring station located in Middlesex County, New Jersey (EPA AIRData # 34-023-0011), approximately 11 km west-southwest of the Proposed Facility (see Figure 2).

The monitor is located at the Rutgers University (Veg. Research Farm #3 on Ryders Lane) in an agricultural/rural area with proximate commercial uses (i.e., Route 1 and Interstate 95). This monitor's close proximity to the Project site would qualify it to be representative of the ambient air quality within the project area.

It should be noted that the 2013 – 2015 time period was initially examined. However, due to poor data capture in the spring and summer months of 2015, the time period of 2012 – 2014 was used instead. Seasonal data availability for NO_2 at Rutgers University from 2012 – 2014 was as follows:

- Winter: 2012 (87.9%), 2013 (98.6%), 2014 (98.6%)
- Spring: 2012 (95.2%), 2013 (96.8%), 2014 (97.4%)
- Summer: 2012 (98.8%), 2013 (98.3%), 2014 (97.5%)
- Fall: 2012 (91.8%), 2013 (98.2%), 2014 (98.4%)

The March 1, 2011 Fox memorandum provides guidance for incorporating background concentrations in the impact assessment for the 1-hour NO_2 standard.

> "We believe that an appropriate methodology for incorporating background concentrations in the cumulative impact assessment for the 1-hour NO_2 standard would be to use multiyear average of the 98^{th}-percentile of the available background concentrations by season and hour-of-day..."
>
> "...we recommend that background values by season and hour-of-day used in the context should be based on the 3^{rd} highest values for each season and hour of day combination..."

This seasonal and hour of day methodology is proposed to be used. The background values will first be divided by season for each year. Those seasonal groups will be further binned into 24-hour groups for a total of 96 bins of values (product of 4 seasons and 24 hours) for each year (2012, 2013, and 2014). The 3rd highest value from each bin will be found per year. Finally, to obtain the values to be summed with the modeled concentrations, the average of those 3rd highest values will be taken over three (3) years. This will result in 96 values being used in the modeling analysis (see Table 1). The AERMOD model option (keyword BACKGROUND) will be used to sum each modeled concentration with the background concentration that was calculated for that season and hour-of-day.

Hourly Average Background Ozone Concentrations

The determination of representative hourly average background ozone concentrations for input to AERMOD is proposed. The ozone monitors closest to the Proposed Facility site have been identified. After reviewing their locations and periods of record, a Middlesex County monitor is proposed to represent the ozone background values during the five (5) year period 2010 – 2014, concurrent with the five (5) years of surface meteorological data. This monitor is listed below and its location can be seen in Figure 2.

- Middlesex County – Rutgers University (Veg. Research Farm #3), approximately 11 km west-southwest, EPA AIRData # 34-023-0011.

Ozone data availability at the Rutgers University monitor during each of the aforementioned years is as follows:

- 2010: 96%
- 2011: 99%
- 2012: 96%
- 2013: 99%
- 2014: 98%

The Rutgers University monitor is also proposed to represent background NO_2 concentrations. Since both datasets will be used in the NO_2 air quality analysis, this monitor is preferable and appropriate to use for ozone background representation. When ozone data was missing from the Rutgers University monitor, missing hours were substituted using the monitor hierarchy below. This hierarchy favored proximity to the Proposed Facility site, high capture rate monitors, and monitors with "general/background" or "population exposure" monitoring objectives.

- Hudson County – Bayonne, approximately 22 km away, EPA AIRData # 34-017-0006.
  - Ozone data availability at the Bayonne monitor during each of the aforementioned years is as follows:
    - 2010: 96%; 2011: 97%; 2012: 81%; 2013: 55%; 2014: 98%
- Essex County – Newark Firehouse, approximately 24 km away, EPA AIRData # 34-013-0003.
  - Ozone data availability at the Newark Firehouse monitor during each of the aforementioned years is as follows:
    - 2010: 95%; 2011: 96%; 2012: 97%; 2013: 98%; 2014: 98%

- Hunterdon County – Flemington, approximately 41 km away, EPA AIRData # 34-019-0001.
    - Ozone data availability at the Flemington monitor during each of the aforementioned years is as follows:
        - 2010: 99%; 2011: 99%; 2012: 98%; 2013: 99%; 2014: 99%
- Mercer County – Rider University, approximately 45 km away, EPA AIRData # 34-021-0005.
    - Ozone data availability at the Rider University monitor during each of the aforementioned years is as follows:
        - 2010: 99%; 2011: 99%; 2012: 98%; 2013: 98%; 2014: 88%

References

Revisions to the Guideline on Air Quality Models (Revised). Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter. Appendix W to Title 40 U.S. Code of Federal Regulations (CFR) Parts 51 and 52, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. January 17, 2017.

Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 NAAQS, U.S. EPA, September 30, 2014.

Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, to the Regional Air Division Directors from Tyler Fox, Leader of the EPA Air Quality Modeling Group, EPA Office of Air Quality Planning and Standards, March 1, 2011.

Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, to the Regional Air Division Directors from Tyler Fox, Leader of the EPA Air Quality Modeling Group, EPA Office of Air Quality Planning and Standards, June 28, 2010.

We believe the information contained in this request provides appropriate justification for the use of the PVMRM method in AERMOD. Please feel free to contact me or Ted Main at 201-508-6954 or 201-508-6960, respectively, should you have any questions regarding the enclosed request.

Sincerely,

TRC

Michael D. Keller
Principal – Power Generation and Air Quality

cc: J. Levy, NJDEP
G. John, NJDEP
A. Urquhart, CPV
T. Main, TRC
TRC Project File 252973

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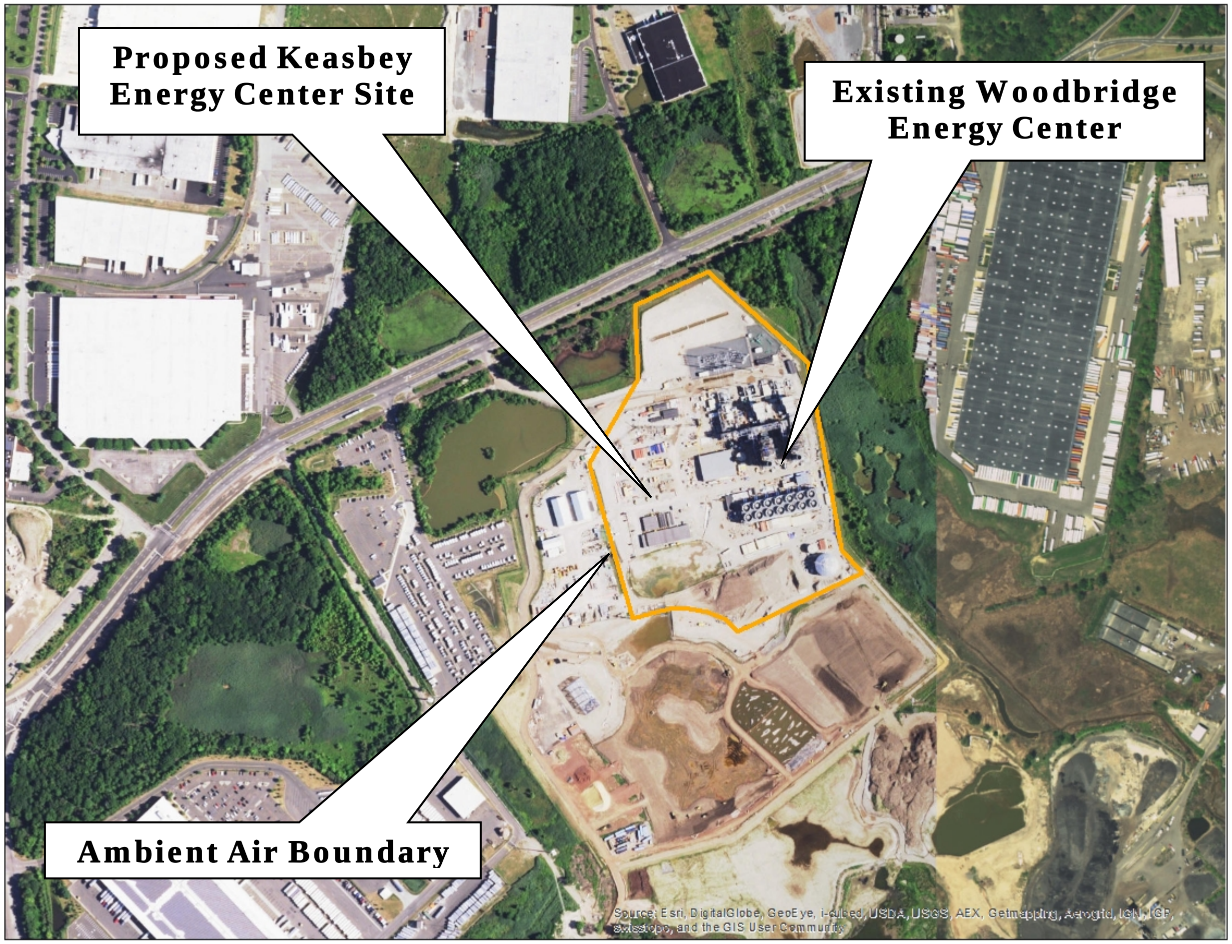
Table 1
Season and Hour of Day
Background NO_2 Concentrations
Proposed to be Used in AERMOD

Hour	Winter	Spring	Summer	Fall
1	39.0	31.7	18.0	28.0
2	38.3	31.0	15.3	29.0
3	39.0	31.3	16.3	28.3
4	38.7	30.3	17.0	26.7
5	39.7	31.0	16.3	27.3
6	38.3	33.0	17.3	26.7
7	41.0	32.3	17.7	28.0
8	42.7	35.3	20.7	27.3
9	40.7	29.0	23.3	29.3
10	41.3	25.0	19.7	27.7
11	37.7	20.7	16.7	25.0
12	36.0	17.7	15.7	23.3
13	35.7	19.3	13.0	23.3
14	34.3	17.7	11.3	23.7
15	39.7	17.3	13.0	24.0
16	37.3	16.0	12.3	24.0
17	35.3	18.3	10.0	28.0
18	36.3	20.3	10.7	33.3
19	40.3	27.0	13.0	32.0
20	39.0	29.0	13.7	32.0
21	39.7	29.0	14.3	30.7
22	39.7	29.0	14.7	30.7
23	38.7	33.0	15.7	30.3
24	40.3	30.0	16.3	29.7

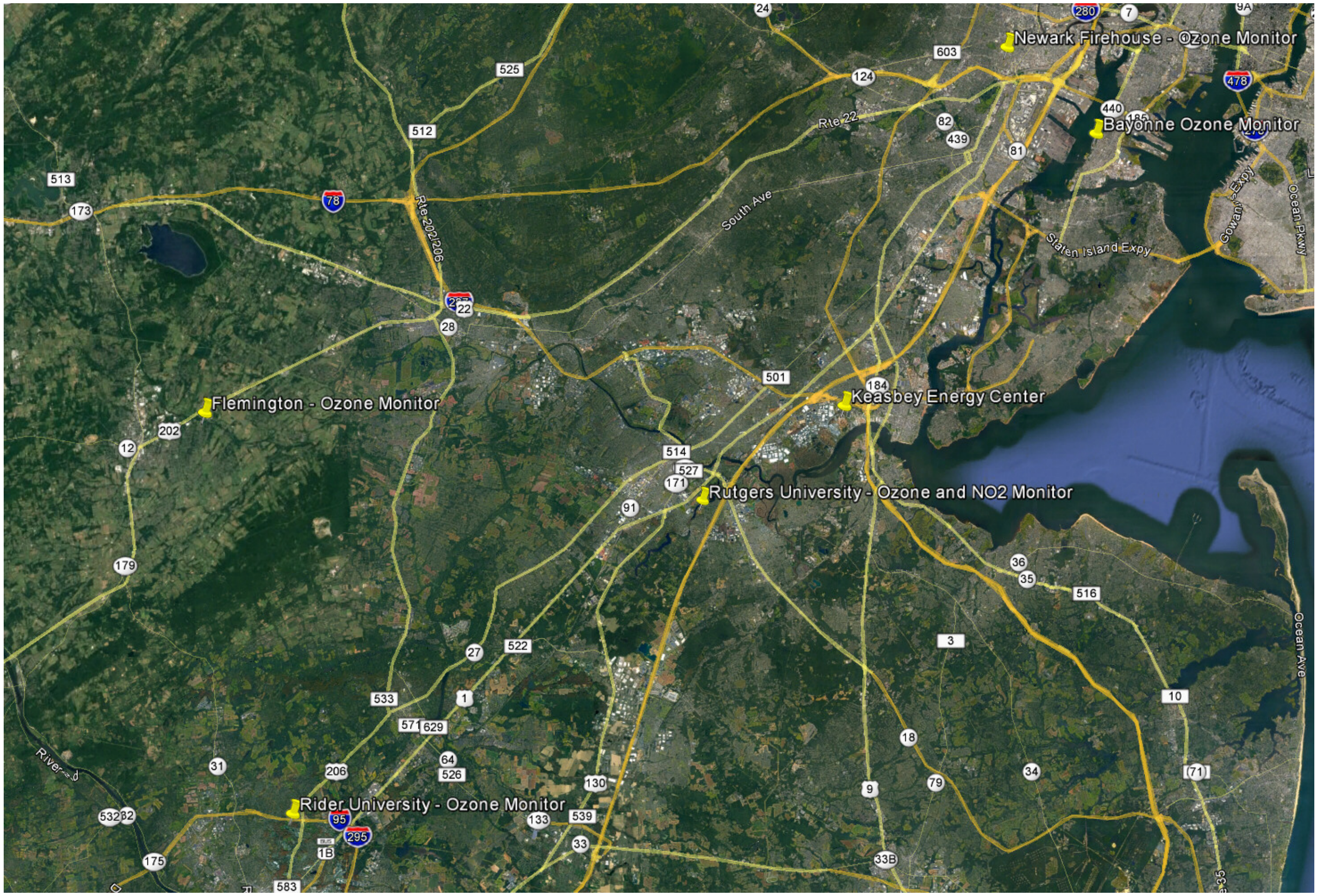
Note: Concentrations are in ppb.



Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 1. Site Location Aerial Photograph

Source: Esri, Digital Globe, GeoEye, 2017.



Keasbey Energy Center
Proposed Combined Cycle Power Facility
Township of Woodbridge, Middlesex County, New Jersey

Figure 2. Background NO_2 and Ozone Monitor Locations

Source: Google Earth, 2017.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY, ENERGY AND SUSTAINABILITY
Division of Air Quality
PO Box 420 Mail Code 401-02
TRENTON, NJ 08625
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CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

July 19, 2017

Michael D. Keller
TRC
1200 Wall Street West, 5th Floor
Lyndhurst, NJ 07071

SUBJECT: CPV Keasbey, LLC Combined Cycle Power Plant
Township of Woodbridge, Middlesex County
Program Interest ID 18940, BOP Application Number 16-0007

Dear Mr. Keller:

In conference with U.S. EPA Region II Air Programs Branch, the Bureau of Evaluation and Planning (BEP) has reviewed your letter, dated June 21, 2017 requesting the use of the Plume Volume Molar Ratio Method (PVMRM) in AERMOD as a Tier 3 screening method to model NO_2 emissions for the CPV Keasbey Energy Center. The use of PVMRM will assist in demonstrating compliance with the 1-hour average NO_2 National Ambient Air Quality Standard (NAAQS).

The methodology outlined in the letter includes the use of an in-stack NO_2/NOx emission ratio of 0.50, 1-hour NO_2 background data from the NJDEP's monitor station located at Rutgers University in Middlesex County (EPA AIRData #34-023-001) averaged by season and hour of day for a total of 96 different values, and hourly background ozone concentrations measured at the same Rutgers University monitoring station, as inputs to AERMOD. U.S. EPA Region II and the BEP agree with the approach described and make the following recommendations:

1. Convert the NO_2 background data in the letter's Table 1 from ppb to μg/m3 using standard conditions (i.e., 25°C, 101.325 kPa).
2. Accurately pair hourly ozone concentrations with concurrent meteorological data.
3. Provide output using both max daily (MAXDCONT) and max daily by year (MXDYBYYR) options.

Furthermore, the discussion associated with the Tier 3 screening method should provide more detail on why the 2015 monitoring data was not used, and specify how the results of the 1-hour NO_2 dispersion modeling with PVMRM is being applied (i.e., comparison with the 1-hour NO_2 Significant Impact Level (SIL) of 7.5 $\mu g/m^3$, compliance with the 1-hour NO_2 NAAQS). Finally, include how the annual NO_2 impacts will be modeled for comparison to the annual SIL, NAAQS, and Prevention of Significant Deterioration Increment.

If you have any questions, please contact me at (609) 633-1106, or Jennifer Levy at (609) 633-8239.

Sincerely,

Gregory John
Research Scientist
Bureau of Evaluation and Planning

C: Joel Leon
Jennifer Levy
Annamaria Colecchia, USEPA, Region II
Neha Sareen, USEPA, Region II
Ted Main, TRC

PM-2.5 & PM-10 Cooling Tower Particulate Fractions Based on SPX TU-12 High Efficiency Drift Eliminator*

Drop Diameter (micrometers)	Mass Fraction	Particle size after evaporation (micrometers)	volume droplet	volume particle	particle diameter	CumMass
5	0	0.6	6.54E+01	1.39E-01	0.6	0
10	0.12	1.3	5.24E+02	1.12E+00	1.3	0.12
15	0.08	1.9	1.77E+03	3.76E+00	1.9	0.2
35	0.2	4.5	2.24E+04	4.78E+01	4.5	0.4
65	0.2	8.4	1.44E+05	3.06E+02	8.4	0.6
115	0.2	14.8	7.96E+05	1.70E+03	14.8	0.8
170	0.1	21.9	2.57E+06	5.48E+03	21.9	0.9
230	0.05	29.6	6.37E+06	1.36E+04	29.6	0.95
375	0.04	48.2	2.76E+07	5.88E+04	48.2	0.99
525	0.008	67.5	7.58E+07	1.61E+05	67.5	0.998
1000	0.002	128.7	5.24E+08	1.12E+06	128.7	1

6240 ppm TDS**
2.93 g/g salt density

** Keasbey Energy Center cooling tower TDS

24% PM2.5 Mass Fraction
65% PM10 Mass Fraction

2.17 **NaCl**
2.93 **CaCO3**

*Based on "Calculating Realistic PM10 Emissions from Cooling Towers"
Abstract No. 216 Session No. AM-1b
Joel Reisman and Gordon Frisbie
Greystone Environmental Consultants, Inc., 650 University Avenue, Suite 100, Sacramento, California 95825

Methodology:

1. Calculate evaporated solid particle size diameters based on TU-12 droplet distribution.
2. Determine cumulative mass distribution for all particle sizes.
3. Determine PM2.5 and PM10 cumulative mass distributions using linear interpolation between particle diameters.

Reisman, J., and Frisbie, G. 2002. Calculating Realistic PM10 Emissions from Cooling Towers. Abstract No. 216 presented at the 2001 94th Annual Air and Waste Management Association Conference and Exhibition in Orlando, Florida, June 25 to 28.

SPX Cooling Technologies

Balcke | Hamon Dry Cooling | Marley

COOLING TOWER DRIFT MASS DISTRIBUTION
TU12 Excel Drift Eliminators

The following table represents the predicted mass distribution of drift particle size for cooling tower drift dispersed from Marley TU12 Excel Drift Eliminators.

Mass in Particles (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

How to read table: Example – 0.2% of the drift will have particle sizes larger than 525 microns.

APPENDIX H

MODELING INPUT AND OUTPUT FILES

(Not included in every copy)

APPENDIX J

MODELING RESULTS FOR KEASBEY AND WOODBRIDGE AS INDEPENDENT OPERATIONS

Keasbey Facility Maximum Modeled Concentrations Due to Normal Operations Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
CO	1-Hour	2,000	377.6[c]
	8-Hour	500	77.1[c]
SO_2	1-Hour	7.8	3.9[b]
	3-Hour	25	4.0[c]
	24-Hour	5	2.6[c]
	Annual	1	0.07[c]
PM-10	24-Hour	5	8.2[c]
PM-2.5	24-Hour	1.2	5.5[e]
	Annual	0.3	0.19[d]
NO_2	1-Hour	7.5	21.1[a,b]
	Annual	1	0.50[a,c]

Note:
1-hr and 8-hr CO, 3-hr SO_2 includes CT, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes CT, AB, DFP, EDG
Annual NO_2 and SO_2 includes CT, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Woodbridge Facility Maximum Modeled Concentrations Due to Normal Operations Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration ($\mu g/m^3$)	Maximum Modeled Concentration ($\mu g/m^3$)
CO	1-Hour	2,000	154.6[c]
	8-Hour	500	56.8[c]
SO_2	1-Hour	7.8	3.2[b]
	3-Hour	25	3.3[c]
	24-Hour	5	2.1[c]
	Annual	1	0.07[c]
PM-10	24-Hour	5	9.4[c]
PM-2.5	24-Hour	1.2	4.7[e]
	Annual	0.3	0.33[d]
NO_2	1-Hour	7.5	18.6[a,b]
	Annual	1	0.98[a,c]

Note:
1-hr and 8-hr CO, 3-hr SO_2 includes 2CTs, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes 2CTs, AB, DFP, EDG
Annual NO_2 and SO_2 includes 2CTs, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Maximum Modeled Keasbey Facility Concentrations During Startup/Shutdown Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
CO	1-Hour	2,000	377.6[c]
	8-Hour	500	77.1[c]
NO_2	1-Hour	7.5	47.7[a,b]
	Annual	1	0.50[a,c]
SO_2	1-Hour	7.8	3.9[b]
	3-Hour	25	4.0[c]
	24-Hour	5	2.6[c]
	Annual	1	0.07[c]
PM-10	24-Hour	5	8.2[c]
PM-2.5	24-Hour	1.2	6.7[e]
	Annual	0.3	0.19[d]

Note:
1-hr and 8-hr CO, 3-hr SO_2 includes CT, AB, DFP, EDG
24-hr PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes CT, AB
Annual NO_2 and SO_2 includes CT, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes CT, AB, DFP, EDG, cooling tower

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Maximum Modeled Woodbridge Facility Concentrations During Startup/Shutdown Compared to Significant Impact Levels (SILs)

Pollutant	Averaging Period	Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
CO	1-Hour	2,000	1,428.5[c]
	8-Hour	500	498.4[c]
NO_2	1-Hour	7.5	72.4[a,b]
	Annual	1	0.99[a,c]
SO_2	1-Hour	7.8	5.3[b]
	3-Hour	25	3.8[c]
	24-Hour	5	2.2[c]
	Annual	1	0.07[c]
PM-10	24-Hour	5	9.4[c]
PM-2.5	24-Hour	1.2	6.5[e]
	Annual	0.3	0.32[d]

Note:
1-hr and 8-hr CO, 3-hr SO_2 includes 2CTs, AB, DFP, EDG
24-hr PM-10 & PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower
1-hr SO_2 and 1-hr NO_2 includes 2CTs, AB
Annual NO_2 and SO_2 includes 2CTs, AB, DFP, EDG
Annual PM-10 and PM-2.5 includes 2CTs, AB, DFP, EDG, cooling tower

[a]Includes use of PVMRM.
[b]Based upon maximum 1st highest maximum daily 1-hour results averaged over 5-years.
[c]Maximum modeled concentration.
[d]Maximum annual results averaged over 5-years.
[e]Based upon maximum 1st highest 24-hour results averaged over 5-years.

Maximum Modeled Keasbey Facility Concentrations During Startup/Shutdown Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Concentration (μg/m³)
CO	1-Hour	40,000	439.2[d]	2,415	2,854.2
	8-Hour	10,000	76.1[d]	1,495	1,571.1
NO_2	1-Hour	188	37.2[a]	71.4	112.7[c]
	Annual	100	0.38[d]	16.9	17.3[c]
SO_2	1-Hour	196	8.9[e]	12.0	20.9
	3-Hour	1,300	9.5[d]	13.9	23.4
	24-Hour	-/365	6.4[d]	5.5	11.9
	Annual	-/80	0.15[d]	0.8	0.95
PM-10	24-Hour	150	8.2[d]	33	41.2
PM-2.5	24-Hour	35	4.5[f]	18.2	22.7
	Annual	12	0.23[g]	8.1	8.3

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 4th highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Maximum Modeled Woodbridge Facility Concentrations During Startup/Shutdown Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Concentration (μg/m³)
CO	1-Hour	40,000	1,428.5[d]	2,415	3,843.5
	8-Hour	10,000	498.4[d]	1,495	1,993.4
NO_2	1-Hour	188	58.0[a]	72.0	130.0[c]
	Annual	100	0.99[d]	16.9	17.9[c]
SO_2	1-Hour	196	4.7[e]	12.0	16.7
	3-Hour	1,300	3.8[d]	13.9	17.7
	24-Hour	-/365	2.2[d]	5.5	7.7
	Annual	-/80	0.07[d]	0.8	0.9
PM-10	24-Hour	150	9.4[d]	33	42.4
PM-2.5	24-Hour	35	3.8[f]	18.2	22.0
	Annual	12	0.32[g]	8.1	8.4

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 4th highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Keasbey Facility Maximum Modeled Concentrations Due to Normal Operations Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS (μg/m3)	Maximum Modeled Concentration (μg/m3)	Background Concentration (μg/m3)	Total Concentration (μg/m3)
CO	1-Hour	40,000	377.6[d]	2,415	2,792.6
	8-Hour	10,000	77.1[d]	1,495	1,572.1
SO_2	1-Hour	196	3.6[e]	12.0	15.6
	3-Hour	1,300	4.0[d]	13.9	17.9
	24-Hour	-/365	2.6[d]	5.5	8.1
	Annual	-/80	0.07[d]	0.8	0.9
PM-10	24-Hour	150	8.2[d]	33	41.2
PM-2.5	24-Hour	35	3.7[f]	18.2	21.9
	Annual	12	0.19[g]	8.1	8.3
NO_2	1-Hour	188	18.9[a]	72.0	90.9[c]
	Annual	100	0.50[d]	16.9	17.4[c]

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 4th highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Woodbridge Facility Maximum Modeled Concentrations Due to Normal Operations Compared to NAAQS/NJAAQS

Pollutant	Averaging Period	NAAQS/ NJAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Concentration (μg/m³)
CO	1-Hour	40,000	154.6[d]	2,415	2,569.6
	8-Hour	10,000	56.8[d]	1,495	1,551.8
SO_2	1-Hour	196	3.4[e]	12.0	15.4
	3-Hour	1,300	3.2[d]	13.9	17.1
	24-Hour	-/365	2.1[d]	5.5	7.6
	Annual	-/80	0.07[d]	0.8	0.9
PM-10	24-Hour	150	9.4[d]	33	42.4
PM-2.5	24-Hour	35	3.8[f]	18.2	22.0
	Annual	12	0.33[g]	8.1	8.4
NO_2	1-Hour	188	17.9[a]	72.0	89.9[c]
	Annual	100	0.98[d]	16.9	17.0[c]

[a]Maximum 8th highest maximum daily 1-hour results averaged over 5-years.
[c]Includes use of PVMRM.
[d]Maximum modeled concentration.
[e]Maximum 4th highest maximum daily 1-hour results averaged over 5-years.
[f]Maximum 8th highest maximum daily 24-hour results averaged over 5-years.
[g]Maximum annual results averaged over 5-years.

Keasbey Facility Maximum Modeled Class I Concentrations

Pollutant	Averaging Period	Class I Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
SO_2	3-Hour	1.0	0.055[c]
	24-Hour	0.2	0.015[c]
	Annual	0.1	0.001[c]
PM-2.5	24-Hour	0.27[a]	0.037[c]
	Annual	0.06	0.004[c]
PM-10	24-Hour	0.3	0.042[c]
	Annual	0.2	0.003[c]
NO_2	Annual	0.1	0.003[b,c]

[a]A revised 24-hour PM-2.5 Class I SIL of 0.27 μg/m³ was proposed on August 18, 2016.
[b]Includes use of PVMRM.
[c]Maximum modeled concentration.

Notes:
U.S. EPA's proposed Class I SILs for NO_2, PM-10, and SO_2 were published in the July 23, 1996, Federal Register (61 FR 38249).
U.S. EPA's PM-2.5 Class I SILs codified in 40 CFR 52.21(k)(2) were vacated.
U.S. EPA's proposed Option 3 PM-2.5 Class I SILs were published in the September 21, 2007, Federal Register (72 FR 54112).

Woodbridge Facility Maximum Modeled Class I Concentrations

Pollutant	Averaging Period	Class I Significant Impact Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)
SO_2	3-Hour	1.0	0.058[c]
	24-Hour	0.2	0.017[c]
	Annual	0.1	0.001[c]
PM-2.5	24-Hour	0.27[a]	0.037[c]
	Annual	0.06	0.005[c]
PM-10	24-Hour	0.3	0.074[c]
	Annual	0.2	0.005[c]
NO_2	Annual	0.1	0.004[b,c]

[a]A revised 24-hour PM-2.5 Class I SIL of 0.27 μg/m³ was proposed on August 18, 2016.
[b]Includes use of PVMRM.
[c]Maximum modeled concentration.

Notes:
U.S. EPA's proposed Class I SILs for NO_2, PM-10, and SO_2 were published in the July 23, 1996, Federal Register (61 FR 38249).
U.S. EPA's PM-2.5 Class I SILs codified in 40 CFR 52.21(k)(2) were vacated.
U.S. EPA's proposed Option 3 PM-2.5 Class I SILs were published in the September 21, 2007, Federal Register (72 FR 54112).

Keasbey Facility Impact on NJAAQS

Pollutant	Averaging Period	Primary NJAAQS (ug/m3)	Maximum Modeled Concentration (μg/m3)	Background Concentration (μg/m3)	Total Concentration (μg/m3)
NO_2	12-Month	100	0.50[b,d]	16.9	17.4
CO	1-hour	40,000	377.6[d]	2,415	2,792.6
	8-hour	10,000	77.1[d]	1,495	1,572.1
SO_2	3-hour	---	4.0[d]	12.0	16.0
	24-hour	365	2.6[d]	13.9	16.5
	12-Month	80	0.07[d]	0.8	0.9
TSP[a]	24-hour	260	8.2[d]	33	41.2
	12-Month	75	0.23[d]	-	0.23
Lead	3-month	1.5	trace[d]	-	0.0001

[a]PM10 as TSP
[b]Includes use of PVMRM.
[d]Maximum modeled concentration.

Woodbridge Facility Impact on NJAAQS

Pollutant	Averaging Period	Primary NJAAQS (ug/m3)	Maximum Modeled Concentration (μg/m3)	Background Concentration (μg/m3)	Total Concentration (μg/m3)
NO_2	12-Month	100	1.0[b,d]	16.9	17.9
CO	1-hour	40,000	154.6[d]	2,415	2,569.6
	8-hour	10,000	56.8[d]	1,495	1,551.8
SO_2	3-hour	---	3.2[d]	12.0	15.2
	24-hour	365	2.1[d]	13.9	16.1
	12-Month	80	0.07[d]	0.8	0.9
TSP[a]	24-hour	260	9.4[d]	33	42.4
	12-Month	75	0.37[d]	-	0.37
Lead	3-month	1.5	trace[d]	-	trace

[a]PM10 as TSP
[b]Includes use of PVMRM.
[d]Maximum modeled concentration.

Keasbey Facility Comparison of Maximum Modeled Concentrations of Pollutants to Vegetation Screening Concentrations

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m3)	Background Concentration (µg/m3)	Total Concentration[a] (µg/m3)	Vegetation Screening Concentrations[f] (µg/m3)		
					Sensitive	Intermediate	Resistant
SO_2	1-Hour	3.9	12.0	15.9	917	-	-
	3-Hour	4.0	13.9	17.9	786	2,096	13,100
	Annual	0.07	0.8	0.9	-	18	-
NO_2	4-Hour	21.1[b]	72.0[c]	93.1	3,760	9,400	16,920
	8-Hour	21.1[b]	72.0[c]	93.1	3,760	7,520	15,040
	Annual	0.50	16.9	17.4	-	94	-
CO	1-Week	77.1[e]	1,495[d]	1,572.1	1,800,000	-	18,000,000

[a]Total concentration = maximum modeled facility concentration + background concentration.
[b]Maximum modeled concentration conservatively based on 1-hour averaging period.
[c]Maximum background concentration conservatively based on 1-hour averaging period.
[d]Maximum background concentration conservatively based on 8-hour averaging period.
[e]Maximum modeled concentration conservatively based on 8-hour averaging period.
[f]Screening concentrations found in Table 3.1 of "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA, 1980).
(-) No screening concentration available.

Woodbridge Facility Comparison of Maximum Modeled Concentrations of Pollutants to Vegetation Screening Concentrations

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration[a] (µg/m³)	Vegetation Screening Concentrations[f] (µg/m³)		
					Sensitive	Intermediate	Resistant
SO_2	1-Hour	3.4	12.0	15.4	917	-	-
	3-Hour	3.2	13.9	17.1	786	2,096	13,100
	Annual	0.07	0.8	0.9	-	18	-
NO_2	4-Hour	18.6[b]	72.0[c]	90.6	3,760	9,400	16,920
	8-Hour	18.6[b]	72.0[c]	90.6	3,760	7,520	15,040
	Annual	1.0	16.9	17.9	-	94	-
CO	1-Week	56.8[e]	1,495[d]	1,551.8	1,800,000	-	18,000,000

[a]Total concentration = maximum modeled facility concentration + background concentration.
[b]Maximum modeled concentration conservatively based on 1-hour averaging period.
[c]Maximum background concentration conservatively based on 1-hour averaging period.
[d]Maximum background concentration conservatively based on 8-hour averaging period.
[e]Maximum modeled concentration conservatively based on 8-hour averaging period.
[f]Screening concentrations found in Table 3.1 of "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA, 1980).
(-) No screening concentration available.

Keasbey Facility VISCREEN Analysis Results

Background	Theta (degrees)	Azimuth (degrees)	Distance (km)	Alpha (degrees)	Delta E[a]		Contrast[b]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10.	84.	30.0	84.	3.79	0.035	0.06	0.000
Sky	140.	84.	30.0	84.	2.00	0.015	0.06	0.000
Terrain	10	84.	30.0	84.	3.51	0.052	0.06	0.001
Terrain	140.	84.	30.0	84.	2.00	0.010	0.06	0.000
Outside Surrounding Area								
Sky	10.	0.	1.0	168.	2.00	0.091	0.05	0.001
Sky	140.	0.	1.0	168.	2.00	0.020	0.05	-0.001
Terrain	10.	0.	1.0	168.	2.00	0.198	0.05	0.002
Terrain	140.	0.	1.0	168.	2.00	0.057	0.05	0.002

[a]Color difference parameter (dimensionless).
[b]Visual contrast against background parameter (dimensionless).

Woodbridge Facility VISCREEN Analysis Results

Background	Theta (degrees)	Azimuth (degrees)	Distance (km)	Alpha (degrees)	Delta E[a]		Contrast[b]	
					Criteria	Plume	Criteria	Plume
Inside Surrounding Area								
Sky	10.	84.	30.0	84.	3.79	0.037	0.06	0.000
Sky	140.	84.	30.0	84.	2.00	0.013	0.06	0.000
Terrain	10	84.	30.0	84.	3.51	0.035	0.06	0.000
Terrain	140.	84.	30.0	84.	2.00	0.006	0.06	0.000
Outside Surrounding Area								
Sky	10.	0.	1.0	168.	2.00	0.082	0.05	0.001
Sky	140.	0.	1.0	168.	2.00	0.014	0.05	-0.001
Terrain	10.	0.	1.0	168.	2.00	0.128	0.05	0.001
Terrain	140.	0.	1.0	168.	2.00	0.036	0.05	0.001

[a]Color difference parameter (dimensionless).
[b]Visual contrast against background parameter (dimensionless).