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MEMORANDUM

TO: Joel Leon, Section Chief
Bureau of Stationary Sources

FROM: Nicholle Worland, Environmental Specialist 3
Bureau of Evaluation and Planning

SUBJECT: Facility-Wide Refined Risk Assessment Modeling Review
Rutgers University Newark Campus
PI #: 08242 BOP #: 200001

DATE: February 8, 2023

The Bureau of Evaluation and Planning (BEP) has completed its review of the Rutgers University Newark Campus facility-wide refined risk assessment. The risk assessment evaluated arsenic, cadmium, cobalt, dimethylbenz(a)anthracene(7,12-), and formaldehyde emitted from twelve (12) boilers (U1, U4, and U5) vented to three (3) stacks (PT8, PT1, and PT1001). The air dispersion modeling and health risk assessment of these pollutants indicate negligible risk. The table shown below indicates the maximum off-site risk assessment results for each pollutant evaluated. Hazard quotients less than 1, and cancer risks less than ten in a million, are considered to present a negligible health risk.

Cancer and Non-Cancer Risks from Rutgers University Newark Campus

Pollutant	Maximum Predicted Cancer Risk	Maximum Long-Term Hazard Quotient	Maximum Short-Term Hazard Quotient
Arsenic	0.00E+00	0.00E+00	9.00E-04
Cadmium[1]	4.20E-08	5.00E-04	-
Cobalt[1]	0.00E+00	0.00E+00	-
Dimethylbenz(a)anthracene(7,12-)[1,2]	0.00E+00	-	-
Formaldehyde	8.06E-09	6.89E-05	1.22E-03

[1] There are no short-term reference concentrations for cadmium, cobalt, and dimethylbenz(a)anthracene(7,12-)
[2] There is no long-term reference concentration for dimethylbenz(a)anthracene(7,12-)

Attached is a summary of the air dispersion modeling and health risk assessment. If you have any questions, please contact either me at (609) 633-1153, or Claudia Pukropski at (609) 984-7284.

cc:
S. Davis (BEP)
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Bureau of Evaluation and Planning
Summary of the Facility-Wide Refined Risk Assessment
Rutgers University Newark Campus – Borough of Newark, Essex County, New Jersey

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Facility Description and Location

Rutgers, The State University of New Jersey, is an urban college campus in the borough of Newark, Essex County, NJ, with three emission units that emit HAPs above the reporting thresholds in N.J.A.C. 7:27-17.9. Emission Unit 1 has one (1) boiler vented to a single stack (PT8), Emission Unit 4 has three (3) boilers vented to a single stack (PT1), and Emission Unit 5 has eight (8) HydroTherm boilers vented to a single stack (PT1001), all firing natural gas. The facility is located 2 miles east of the Garden State Parkway and about a mile west of the Passaic River. AERSURFACE (version 20060) was executed to determine land use in the vicinity of the Rutgers University Newark Campus. The surrounding area is a combination of developed medium and high intensity space. Due to more than 50% of the area defined by a 3-kilometer radius from the facility being classified as urban land use, urban dispersion coefficients were used in the modeling analysis. The 2019 estimated Census population of Newark (281,054) was used as the urban population.

Stack Parameters and Emission Rates

Arsenic, cadmium, cobalt, dimethylbenz(a)anthracene(7,12-), and formaldehyde emitted from the facility's boilers were modeled in the analysis. All emission rates were verified by the facility and assumed to reflect the appropriate hours of operation.

The boilers in Emission Units U1 (PT8), U4 (PT1), and U5 (PT1001) have varying stack parameters and emission rates. Table 1 lists the stack parameters modeled, and Table 2 lists the modeled emission rates for Emission Units 1, 4, and 5.

Table 1. Modeled Stack Parameters

Parameter	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term	Long-Term
Emission Point ID	**PT1**		**PT8**		**PT1001**	
Release Type	Vertical		Vertical		Capped	
UTM X-coordinate (m)	569505.37		569800.93		570023.77	
UTM Y-coordinate (m)	4510351.05		4510271.84		4510799.67	
Stack Height (ft)	95	95	88	88	222	222
Stack Temperature(˚F)	300	350	140	160	300	350
Stack Diameter (in)	48	48	24	24	24	24
Exhaust Velocity (fps)	45.1	47.7	21.2	23.9	21.2	63.7
Exhaust Flow Rate (acfm)	34,000	36,000	4,000	4,500	4,000	12,000

Table 2. Modeled Emission Rates

Parameter	Short-Term[2]			Long-Term		
Emission Point ID	**PT1**	**PT8**	**PT1001**	**PT1**	**PT8**	**PT1001**
Arsenic	2.69E-05	9.07E-07	2.42E-06	4.10E-05	1.06E-06	1.94E-06
Cadmium[1]	-	-	-	1.70E-04	5.81E-06	1.10E-05
Cobalt[1]	-	-	-	1.20E-05	4.43E-07	8.10E-07
Dimethylbenz(a)anthracene(7,12-)[1]	-	-	-	2.30E-06	8.44E-08	1.55E-07
Formaldehyde	1.02E-02	3.42E-04	9.12E-04	1.20E-02	3.98E-04	7.30E-04

[1] Short-term emissions were not modeled for cadmium, cobalt, or dimethylbenz(a)anthracene(7,12-), as there are no short-term reference concentrations for these pollutants.
[2] The short-term arsenic and formaldehyde emission rates used in the modeling analysis for PT1 and PT1001 were the grouped emission unit emission rates provided in the protocol in order to demonstrate the worst-case scenario.

Modeling Methodology

Modeling was performed using the AERMOD model (version 22112) in urban mode to evaluate emissions of the five pollutants individually. The BEP's preprocessed 2016-2020 meteorological surface data from Newark Liberty International Airport (WBAN 14734), along with concurrent upper air data from the Brookhaven, NY Station (WBAN 94703) was used in the analysis. The EPA's Building Profile Input Program (BPIP-PRIME-version 04274) was used to evaluate aerodynamic downwash potential from various buildings on and around the facility property.

A Cartesian receptor grid was used in the analysis. Since the facility is publicly accessible, receptors were placed throughout the campus with a spacing of 25 meters (m). The grid was centered around the facility with 50 meters (m) spacing from the campus boundary out to 0.5 kilometers (km), 100 m spacing to 1.5 km, 250 m spacing to 3 km, and 500 m spacing to 5 km. Receptor elevations were determined with the use of AERMAP (version 18081).

Modeling Results

A risk assessment was performed to evaluate the worst-case risk associated with exposure to arsenic, cadmium, cobalt, dimethylbenz(a)anthracene(7,12-), and formaldehyde. The risk assessment only evaluated health risks associated with the inhalation pathway. Three types of risk were assessed 1) long-term cancer risk 2) long-term non-cancer risk and 3) short-term non-cancer risk. Facility-wide cancer risks less than ten-in-a-million, and hazard quotients less than 1, are both considered negligible risks. The results from the modeling analysis and health risk assessment have predicted negligible risk at all receptors. The results can be found below in Tables 3, 4, & 5.

Table 3. Long-Term Cancer Risk Assessment

Pollutant	Maximum Long-Term Concentration (µg/m3)	Unit Risk Factor (µg/m3)-1	Incremental Cancer Risk	Results
Arsenic	0.00E+00	4.30E-03	0.00E+00	Negligible
Cadmium	1.00E-05	4.20E-03	4.20E-08	Negligible
Cobalt	0.00E+00	9.00E-03	0.00E+00	Negligible
Dimethylbenz(a)anthracene(7,12-)	0.00E+00	7.10E-02	0.00E+00	Negligible
Formaldehyde	6.20E-04	1.30E-05	8.06E-09	Negligible

Table 4. Long-Term Non-Cancer Risk Assessment

Pollutant	Maximum Long-Term Concentration (µg/m3)	Long-Term Reference Concentration (µg/m3)	Hazard Quotient	Result
Arsenic	0.00E+00	0.015	0.00E+00	Negligible
Cadmium	1.00E-05	0.02	5.00E-04	Negligible
Cobalt	0.00E+00	0.006	0.00E+00	Negligible
Dimethylbenz(a)anthracene(7,12-)[1]	-	-	-	-
Formaldehyde	6.20E-04	9	6.89E-05	Negligible

[1] There is no long-term reference concentration for dimethylbenz(a)anthracene(7,12-)

Table 5. Short-Term Non-Cancer Risk Assessment

Pollutant	Maximum Short-Term Concentration (µg/m3)	Short-Term Reference Concentration (µg/m3)	Hazard Quotient	Result
Arsenic	1.80E-04	0.2	9.00E-04	Negligible
Cadmium[1]	-	-	-	-
Cobalt[1]	-	-	-	-
Dimethylbenz(a)anthracene(7,12-)[1]	-	-	-	-
Formaldehyde	6.73E-02	55	1.22E-03	Negligible

[1] There are no short-term reference concentrations for cadmium, cobalt, and dimethylbenz(a)anthracene(7,12-)