

Appendix H
Air Quality Technical Analysis

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AIR QUALITY TECHNICAL ANALYSIS

For the proposed Living with the Bay (LWTB) Stormwater Project, the Clean Air Act general conformity applies to emissions of pollutants and precursor pollutants for which Nassau County is designated as nonattainment or maintenance. Nassau County is a serious nonattainment area for the 2008 8-hour ozone standard, moderate nonattainment for the 2015 8-hour ozone standard, and a maintenance area for the 1971 maximum carbon monoxide (CO) and 2006 24-hour average PM_{2.5} standards (USEPA 2017). Nassau County is an attainment area for the remaining criteria pollutants; therefore, general conformity requirements do not apply to other criteria pollutants in the study area and a *de minimis* evaluation is not necessary.

Table 1 shows the applicable *de minimis* thresholds for each pollutant (the term “precursor” in the table refers to the pollutants). A general conformity determination would not be required if an applicability analysis shows the emissions of the LWTB Stormwater Project during construction and operation would not exceed the *de minimis* thresholds.

Table 1: Applicable General Conformity *de minimis* Thresholds (for Pollutants for which Nassau County is Designated as Nonattainment or Maintenance)

Pollutant	Type	<i>De minimis</i> Threshold (tons/year)	Nassau County Attainment Status
Carbon monoxide	Direct emissions of CO	100	Maintenance area for 1971 1-hour and 8-hour standards
Volatile organic compounds	Ozone precursor	50	Non-attainment for 2008 and 2015 8-hour ozone standards
Nitrogen oxide	Ozone precursor and PM _{2.5} precursor	100	
PM _{2.5}	Direct emissions of PM _{2.5}	100	Maintenance area for 2006 24-hour average PM _{2.5} standard
Sulfur dioxide	PM _{2.5} precursor	100	

CONSTRUCTION

Construction activities would result in short-term emissions of criteria pollutants from off-road, heavy-duty construction equipment (e.g., backhoes, excavators, off-road trucks, graders), haul trucks, construction worker commutes, boat operation (for Smith Pond mechanical invasive species removal), and fugitive dust. Based on the attainment status of Nassau County, a general conformity emissions analysis was prepared for nitrogen oxide (NO_x), volatile organic compounds (VOC), and PM_{2.5}. Diesel equipment and vehicles emit substantially less sulfur dioxide (SO₂) when compared to direct PM_{2.5} emissions, and consequently, the PM_{2.5} precursor SO₂ was not analyzed. As shown in the Table 2, USEPA’s National Emissions Inventory data for New York State show that SO₂ emissions from highway vehicles are 22 percent of PM_{2.5} emissions from highway vehicles (USEPA 2014). Therefore, if the general conformity *de minimis* threshold is not exceeded for PM_{2.5} direct emissions, it cannot be exceeded for SO₂.

Table 2: New York State Highway Vehicle Emissions

Pollutant	Emissions in Tons
PM _{2.5}	6,806.86
Sulfur Dioxide	1,486.49

Emissions were quantified using the Motor Vehicle Emission Simulator (MOVES2014b) model for haul truck and worker commute emissions, the NONROAD model for off-road equipment, and USEPA AP-42 procedures for quantifying fugitive dust emissions (EPA 1995).¹ Assumptions regarding equipment requirements, workers, truck trips, and the quantity of soil to be moved were developed for the analysis.

Table 3 summarizes the construction emission analysis results. The general conformity *de minimis* thresholds would not be exceeded.

Table 3: 2021 Peak Construction Year Emissions Summary (Tons)

	CO	NO _x	VOC	PM _{2.5}
Off-road heavy equipment	10.6	59.1	2.3	1.7
On-road haul trucks and worker commutes	0.9	3.8	0.2	0.2
Fugitive dust	NA	NA	NA	0.3
Barge Tug	0.4	1.6	0.2	0.1
Total	11.9	64.5	2.6	2.2
General conformity <i>de minimis</i> threshold	100.0	100.0	50.0	100.0
<i>De minimis</i> threshold exceeded?	No	No	No	No

Note: The construction impact analysis incorporates 2018 emissions factors. 2020 emissions factors would be lower, because vehicle fleet mix and equipment incrementally improve each year. As such, use of 2018 emissions factors presents a conservative analysis.

OPERATION

Mobile Sources

The LWTB Stormwater Project would not result in substantial new vehicle trips or result in changes to traffic patterns. Therefore, a mobile source air quality impact analysis for the direct impacts of the Proposed Action is not necessary.

¹ To present a conservative assessment of auto emissions, haul truck emission factors were used.

Standby Backup Generator

For purposes of this analysis, one 350-kilowatt (335 horsepower) diesel backup generator is assumed for the diversion station. Although backup diesel generators could be smaller, assumption of this larger generator presents a conservative analysis.

The annual emissions of backup power generator, based on up to 500 hours of operation (up to approximately 20 days of power outages plus 2 hours of testing each month), were estimated based on their approximate horsepower, fuel type, and USEPA's AP-42. The results of the emergency generator analysis and demonstrated emissions would be below the general conformity de minimis criteria.

Table 4: Emergency Backup Generator – Emissions Estimate

Pollutant	Emission Factor (lbs/hp-hr)	Source	Emissions at 500 hrs/year (lbs)	Annual Emissions in Metric Tons
Nitrogen Oxide	0.031	AP-42 Table 3.3-1	1,843	0.84
Volatile Organic Compounds	0.0025141	AP-42 Table 3.3-1 (TOC-exhaust plus crankcase)	421	0.19
Sulfur Dioxide	0.00205	AP-42 Table 3.3-1	343	0.16
Particulate Matter	0.0022	AP-42 Table 3.3-1	369	0.17
Carbon Monoxide	0.00668	AP-42 Table 3.3-1	1,119	0.51
Carbon Dioxide	1.15	AP-42 Table 3.3-1	192,625	87.37

REFERENCES

U.S. Environmental Protection Agency (USEPA)

- 2017 Green Book: New York Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Available at https://www3.epa.gov/airquality/greenbook/anayo_ny.html. Accessed February 26, 2020.
- 2014 National Emissions Inventory (NEI) Data. Data Query, Tier 1 Summary: New York State--SO2 and PM2.5 Highway. Available at <https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>. Accessed March 21, 2020.
- 1995 EPA Compilation of Air Pollutant Emission Factors (AP-42), Section 4.3 Waste Water Collection, Treatment and Storage. Available at <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>.

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Stormwater Project EA

2021 Peak Construction Year Emissions Summary (tons)

	CO (tons)	NOx (tons)	VOC (tons)	PM2.5 (tons)	CO2 (metric tons)
Off-Road Heavy Equipment	10.6	59.1	2.3	1.7	18,146.39
On-Road Haul Trucks and Worker Commutes	0.9	3.8	0.2	0.2	922.66
Fugitive Dust	NA	NA	NA	0.3	NA
Tender	0.4	1.6	0.2	0.1	59.03
Total	11.9	64.5	2.6	2.2	19128.1
de minimis threshold	100.0	100.0	50.0	100.0	

Assume 1/2 emissions of peak year in off-peak years 9,564.04

Off-peak emissions for one year 9,564.04

Total Construction period CO2 emissions 28,692.12

Off-Road Equipment	Total Operating Hours	HP	Load Factor	Type	Emission Factors (g/hp-hr)				
					2	3	87	90	110
					CO	Nox	VOC	CO2	PM2.5
Front-End Loader	4,972	230	0.59	Diesel	2.731342358	3.096777062	0.55161565	664.4466167	0.397769925
Excavator	4,720	233	0.59	Diesel	0.209644165	0.65384558	0.034214275	541.8551235	0.04040322
Roller	1,608	132	0.59	Diesel	0.485934029	1.317019732	0.077824105	559.5062445	0.075945997
Chainsaw	592	7	0.70	Gasoline	261.57832	1.641606606	73.15775896	733.0984329	8.751274705
Air Compressors	3,380	82	0.43	Diesel	0.725668418	2.201627146	0.126106382	574.0116596	0.114301885
Grader	4,304	231	0.59	Diesel	0.211558588	0.57323504	0.035852119	537.6089794	0.042295081
Construction Generator	3,124	33	0.43	Diesel	1.460667365	3.601461825	0.346672415	568.2839336	0.243974107
Truck	21,856	2424	0.59	Diesel	0.205447965	1.596785849	0.044930899	536.7034	0.035274
Concrete Mixer	1,120	126	0.59	Diesel	0.948643036	1.921910664	0.134511197	537.4517355	0.136857813
Vibratory Hammer	252	126	0.59	Diesel	0.948643036	1.921910664	0.134511197	537.4517355	0.136857813
Mobile Crane	1,172	115	0.47	Diesel	0.357348404	1.243858605	0.080619924	533.118769	0.060935084
Total Emissions (grams)					9,616,102.94	53,630,782.09	2,091,260.47	18,146,394,069.09	1,499,314.22
Total Emissions (tons)					10.60	59.12	2.31	20,002.97	1.65

Load Factor Source:

Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling

<https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081RV.pdf>

Horsepower Source

Nonroad Engine Population Estimates- selected typical HP based on population by HP information

<https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10081T6.pdf>

On-Road Trucks		2	3	87	90	1.1	116	117
		CO	NOx	VOC	CO2	PM2.5 Exhaust	PM2.5 Brakewear	PM2.5 Tirewear
Haul Truck	grams/VMT	1.4473477	6.21224313	0.266955	1672.61	0.2507804	0.0127824	0.004824
Auto	grams/VMT	1.4473477	6.21224313	0.266955	1672.61	0.2507804	0.0127824	0.004824
	Total Grams	798,400	3,426,857	147,260	922,661,235	138,338	7,051	2,661
	Total Tons	0.88008	3.77746	0.16233	1,017.05962	0.15249	0.00777	0.00293

<i>Peak Annual Haul Truck Trips (Roundtrips)</i>	593
<i>Ave. Roundtrip Distance (miles)</i>	50
<i>Peak Annual Haul Truck VMT</i>	29,630
<i>Peak Annual Employee Commutes (Roundtrips)</i>	10,440
<i>Ave. Roundtrip Distance (miles)</i>	50
<i>Peak Annual Employee Commute VMT</i>	522,000

Fugitive Dust

AP 42 13.2.4 Loading and Unloading Material into trucks

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

	Assumptions	
	K	
	PM10	PM25
	0.35	0.053
Wind Speed (mph)	5	
Moisture Content	12.00%	
Silt Content	8.50%	

grams/lb
453.592

Truck Loading

Emission Factor in lbs/ton

PM10 0.05751833
PM2.5 0.00870992

where:

- E = emission factor
- k = particle size multiplier (dimensionless)
- U = mean wind speed, meters per second (m/s) (miles per hour [mph])
- M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 μm	< 15 μm	< 10 μm	< 5 μm	< 2.5 μm
0.74	0.48	0.35	0.20	0.053 ^a

^a Multiplier for < 2.5 μm taken from Reference 14.

Annual Truck Trips 593

Cubic Yards per Truck 12.5

tons 7,407

PM2.5 lbs - Loading 64.5179157

PM2.5 lbs - Loading and Unloading 129.035831

PM2.5 Tons- Uncontrolled 0.06451792

Tender - Main (Propulsion)

Horsepower	Load Factor	Activity Hours	Emission factors (g/bhp-hr)	Emissions - grams	Emissions- Short Tons	
920	0.38	252				
			N2O	0.02	1761.984	0.00
			CH4	0.15	13214.88	0.01
			NOx	16.34	1439540.928	1.59
			PM10	0.68	59907.456	0.07
			PM2.5	0.63	55502.496	0.06
			VOC	1.67	147125.664	0.16
			CO	3.86	340062.912	0.37
			SO2	0.01	880.992	0.00
			CO2	670	59026464	65.07

source (Jeanette C Tender):

Port of Oakland 2012 Seaport Emissions Inventory

http://www.portoakland.com/files/pdf/environment/maqip_emissions_inventory.pdf

Note: VOC assumed equivalent to ROG