APPENDIX C

Air Quality Supplementary Information

Appendix C. Project Consistency with Scoping Plan GHG Emission Reduction Strategies

Scoping Plan Measure	Measure Number	Project Consistency
Transportation Sector		
Advanced Clean Cars	T-1	*Consistent*. The project's workers would purchase vehicles in compliance with CARB vehicle standards that are in effect at the time of vehicle purchase.
Low Carbon Fuel Standard	T-2	*Consistent*. Motor vehicles driven by the project's workers would use compliant fuels.
Regional Transportation-Related GHG Targets	T-3	*Not applicable.*
Vehicle Efficiency Measures 1. Tire Pressure 2. Fuel Efficiency Tire Program 3. Low-Friction Oil 4. Solar-Reflective Automotive Paint and Window Glazing	T-4	*Consistent*. Motor vehicles driven by the project's workers would maintain proper tire pressure when their vehicles are serviced. The project's workers would replace tires in compliance with CARB vehicle standards that are in effect at the time of vehicle purchase. Motor vehicles driven by the project's workers would use low-friction oils when their vehicles are serviced. The project's workers would purchase vehicles in compliance with CARB vehicle standards that are in effect at the time of vehicle purchase.
Ship Electrification at Ports (Shore Power)	T-5	*Not applicable.*
Goods Movement Efficiency Measures 1. Port Drayage Trucks 2. Transport Refrigeration Units Cold Storage Prohibition 3. Cargo Handling Equipment, Anti-Idling, Hybrid, Electrification 4. Goods Movement Systemwide Efficiency Improvements 5. Commercial Harbor Craft Maintenance and Design Efficiency 6. Clean Ships 7. Vessel Speed Reduction	T-6	*Consistent*. Project marine vessels would comply with applicable goods movement efficiency measures including the vessel speed reduction requirements per the applicable jurisdiction.

Appendix C. Project Consistency with Scoping Plan GHG Emission Reduction Strategies

Scoping Plan Measure	Measure Number	Project Consistency
Heavy-Duty Vehicle GHG Emission Reduction 1. Tractor-Trailer GHG Regulation 2. Heavy-Duty GHG Standards for New Vehicle and Engines (Phase 1)	T-7	*Not applicable.*
Medium- and Heavy-Duty Vehicle Hybridization Voucher Incentive Project	T-8	*Not applicable.*
High-Speed Rail	T-9	*Not applicable.*
Electricity and Natural Gas Sector		
Energy Efficiency Measures (Electricity)	E-1	*Not applicable.*
Energy Efficiency (Natural Gas)	CR-1	*Not applicable.*
Solar Water Heating (California Solar Initiative Thermal Program)	CR-2	*Not applicable.*
Combined Heat and Power	E-2	*Not applicable.*
Renewable Portfolios Standard (33% by 2020)	E-3	*Not applicable.*
SB 1 Million Solar Roofs (California Solar Initiative, New Solar Home Partnership, Public Utility Programs) and Earlier Solar Programs	E-4	*Not applicable.*
Water Sector		
Water Use Efficiency	W-1	*Not applicable.*
Water Recycling	W-2	*Not applicable.*
Water System Energy Efficiency	W-3	*Not applicable.*
Reuse Urban Runoff	W-4	*Not applicable.*
Renewable Energy Production	W-5	*Not applicable.*
Green Buildings		
1. State Green Building Initiative: Leading the Way with State Buildings (Greening New and Existing State Buildings)	GB-1	*Not applicable.*
2. Green Building Standards Code (Greening New Public Schools, Residential and Commercial Buildings)	GB-1	*Not applicable.*
3. Beyond Code: Voluntary Programs at the Local Level (Greening New Public Schools, Residential and Commercial Buildings)	GB-1	*Not applicable.*

Appendix C. Project Consistency with Scoping Plan GHG Emission Reduction Strategies

Scoping Plan Measure	Measure Number	Project Consistency
4. Greening Existing Buildings (Greening Existing Homes and Commercial Buildings)	GB-1	*Not applicable.*
Industry Sector		
Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	I-1	*Not applicable.*
Oil and Gas Extraction GHG Emission Reduction	I-2	*Not applicable.*
GHG Emissions Reduction from Natural Gas Transmission and Distribution	I-3	*Not applicable.*
Refinery Flare Recovery Process Improvements	I-4	*Not applicable.*
Work with the local air districts to evaluate amendments to their existing leak detection and repair rules for industrial facilities to include methane leaks	I-5	*Not applicable.*
Recycling and Waste Management Sector		
Landfill Methane Control Measure	RW-1	*Not applicable.*
Increasing the Efficiency of Landfill Methane Capture	RW-2	*Not applicable.*
Mandatory Commercial Recycling	RW-3	*Not applicable.*
Increase Production and Markets for Compost and Other Organics	RW-3	*Not applicable.*
Anaerobic/Aerobic Digestion	RW-3	*Not applicable.*
Extended Producer Responsibility	RW-3	*Not applicable.*
Environmentally Preferable Purchasing	RW-3	*Not applicable.*
Forests Sector		
Sustainable Forest Target	F-1	*Not applicable.*
High GWP Gases Sector		
Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing	H-1	*Consistent.* The workers would be prohibited from performing air conditioning repairs and would be required to use professional servicing.
SF_6 Limits in Non-Utility and Non-Semiconductor Applications	H-2	*Not applicable.*

Appendix C. Project Consistency with Scoping Plan GHG Emission Reduction Strategies

Scoping Plan Measure	Measure Number	Project Consistency
Reduction of Perfluorocarbons in Semiconductor Manufacturing	H-3	*Not applicable.*
Limit High GWP Use in Consumer Products	H-4	*Not applicable.*
Air Conditioning Refrigerant Leak Test During Vehicle Smog Check	H-5	*Consistent.* Motor vehicles driven by the project's workers would comply with the leak test requirements during smog checks.
Stationary Equipment Refrigerant Management Program – Refrigerant Tracking/Reporting/Repair Program	H-6	*Not applicable.*
Stationary Equipment Refrigerant Management Program – Specifications for Commercial and Industrial Refrigeration	H-6	*Not applicable.*
SF_6 Leak Reduction Gas Insulated Switchgear	H-6	*Not applicable.*
Agriculture Sector		
Methane Capture at Large Dairies	A-1	*Not applicable.*

Source: CARB 2010.

Notes: CARB = California Air Resources Board; CCR = California Code of Regulations; GHG = greenhouse gas; GWP = global warming potential; SB = Senate Bill; SF_6 = sulfur hexafluoride

Wheeler North Reef Expansion Project
Emissions Summary

Construction Emissions - 2019

Source Category	NOX	CO	PM10	PM2.5
	(lb/day)			
Marine Vessel	74.99	7.86	1.86	1.71
Off-Road	16.16	7.12	0.50	0.49
Total	**91.15**	**14.98**	**2.36**	**2.20**
				Amortized Construction Emissions

Wheeler North Reef Expansion Project
Construction - Marine Emissions

Marine Emission Estimates - 2019

Boat Classification	Phase	Engine	Engine Tier	Fuel	# Engines	Engine Rating (hp)	Engine Rating (kW)	Load Factor	Operation (hr/day)	Operation (days/yr)	Emission Factors VOC (g/kW-hr)	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N20	Daily Emissions VOC (lb/day)	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N20	Annual Emissions CO2 (MT/yr)	CH4	N20	CO2E
Tugboat	Transit	Propulsion	3	0.1%S	2	1,200	895	0.50	11.00	6	0.500	2.60	1.1	0.40	0.26	0.24	649	0.010	0.029	10.85	56.42	23.87	8.68	5.64	5.21	14,084	0.63	0.22	38.33	0.00	0.00	38.55
Tugboat	Transit	Auxiliary	3	0.1%S	2	50	37	0.31	11.00	6	0.400	2.6	1.1	0.5	0.26	0.24	686	0.008	0.029	0.22	1.46	0.62	0.28	0.15	0.13	385	0.02	0.00	1.05	0.00	0.00	1.05
Tugboat	Maneuvering	Propulsion	3	0.1%S	2	1,200	895	0.50	1	6	0.500	2.60	1.1	0.40	0.26	0.24	649	0.010	0.029	0.99	5.13	2.17	0.79	0.51	0.47	1,280	0.06	0.02	3.48	0.00	0.00	3.50
Tugboat	Maneuvering	Auxiliary	3	0.1%S	2	50	37	0.31	1	6	0.400	2.6	1.1	0.500	0.26	0.24	686	0.008	0.029	0.02	0.13	0.06	0.03	0.01	0.01	35	0.00	0.00	0.10	0.00	0.00	0.10
Emission Subtotals																				**12.08**	**63.14**	**26.71**	**9.78**	**6.31**	**5.83**	**15,783.57**	**0.70**	**0.24**	**42.96**	**0.00**	**0.00**	**43.20**

Emission Factors

Marine Propulsion

Engine Type	Model	Tier	Fuel	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O
				(g/kW-hr)								
Slow Speed Diesel	<=1999	Tier 0	0.1%S	0.600	17.00	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	<=1999	Tier 0	0.1%S	0.500	13.20	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2000-2010	Tier 1	0.1%S	0.600	16.00	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2000-2010	Tier 1	0.1%S	0.500	12.20	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2011-2015	Tier 2	0.1%S	0.600	14.40	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2011-2015	Tier 2	0.1%S	0.500	10.50	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2016+	Tier 3	0.1%S	0.600	3.40	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2016+	Tier 3	0.1%S	0.500	2.60	1.1	0.40	0.26	0.24	649	0.010	0.029

Notes:
Emission factors from Table 2.13 of the 2014 Port of Long Beach Air Emission Inventory
Load factors for propulsion engines based on Table II-3 of the CARB Commercial Harbor Craft Regulatory Activities, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Marine Auxiliary

Engine Type	Model	Tier	Fuel	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O
				(g/kW-hr)								
Aux High Speed Diesel	<=1999	Tier 0	0.1%S	0.400	10.9	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	<=1999	Tier 0	0.1%S	0.400	13.8	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2000-2010	Tier 1	0.1%S	0.400	9.8	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2000-2010	Tier 1	0.1%S	0.400	12.2	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2011-2015	Tier 2	0.1%S	0.400	7.7	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2011-2015	Tier 2	0.1%S	0.400	10.5	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2011-2015	Tier 3	0.1%S	0.400	2	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2011-2015	Tier 3	0.1%S	0.400	2.6	1.1	0.5	0.26	0.24	686	0.008	0.029

Notes:
Emission factors from Table 2.14 of the 2014 Port of Long Beach Air Emission Inventory
Load factors for auxiliary engines based on Table II-3 of the CARB Commercial Harbor Craft Regulatory Activities, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Marine exhaust emissions were calculated using the following equation:

$$Emissions_{diesel} = \Sigma\, EF_i \times Eng_i \times AvgHP \times Load_i \times Activity_i$$

Where:

EF	=	*Emission factor in grams per horse-power hour*
Eng	=	*Number of engines*
AvgHP	=	*Maximum rated average horsepower*
Load	=	*Load factor*
Activity	=	*Hours of operation*
i	=	*Equipment type*

Wheeler North Reef Expansion Project
Construction - Marine Emissions

Marine Emission Estimates - 2019

Boat Classification	Phase	Engine	Engine Tier	Fuel	# Engines	Engine Rating (hp)	Engine Rating (kW)	Load Factor	Operation (hr/day)	Operation (days/yr)	Emission Factors VOC (g/kW-hr)	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N20	Daily Emissions VOC (lb/day)	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N20	Annual Emissions CO2 (MT/yr)	CH4	N20	CO2E
Tugboat	Transit	Propulsion	2	0.1%S	2	1,200	895	0.50	13.00	12	0.500	10.50	1.1	0.40	0.26	0.24	649	0.010	0.029	12.82	269.28	28.21	10.26	6.67	6.16	16,644	0.74	0.26	90.60	0.00	0.00	91.11
Tugboat	Transit	Auxiliary	2	0.1%S	2	50	37	0.31	13.00	12	0.400	10.5	1.1	0.5	0.26	0.24	686	0.008	0.029	0.27	6.96	0.73	0.33	0.17	0.16	454	0.02	0.01	2.47	0.00	0.00	2.49
Tugboat	Maneuvering	Propulsion	2	0.1%S	2	1,200	895	0.50	1.00	12	0.500	10.50	1.1	0.40	0.26	0.24	649	0.010	0.029	0.99	20.71	2.17	0.79	0.51	0.47	1,280	0.06	0.02	6.97	0.00	0.00	7.01
Tugboat	Maneuvering	Auxiliary	2	0.1%S	2	50	37	0.31	1.00	12	0.400	10.5	1.1	0.500	0.26	0.24	686	0.008	0.029	0.02	0.54	0.06	0.03	0.01	0.01	35	0.00	0.00	0.19	0.00	0.00	0.19
Tugboat	Hotelling	Auxiliary	2	0.1%S	2	50	37	0.31	1.00	12	0.400	10.5	1.1	0.5	0.26	0.24	686	0.008	0.029	0.02	0.54	0.06	0.03	0.01	0.01	34.96	0.00	0.00	0.19	0.00	0.00	0.19
Emission Subtotals																				**14.12**	**298.03**	**31.22**	**11.43**	**7.38**	**6.81**	**18,449.13**	**0.82**	**0.28**	**100.42**	**0.00**	**0.00**	**100.99**

Emission Factors

Marine Propulsion

Engine Type	Model	Tier	Fuel	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O
				(g/kW-hr)								
Slow Speed Diesel	<=1999	Tier 0	0.1%S	0.600	17.00	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	<=1999	Tier 0	0.1%S	0.500	13.20	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2000-2010	Tier 1	0.1%S	0.600	16.00	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2000-2010	Tier 1	0.1%S	0.500	12.20	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2011-2015	Tier 2	0.1%S	0.600	14.40	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2011-2015	Tier 2	0.1%S	0.500	10.50	1.1	0.40	0.26	0.24	649	0.010	0.029
Slow Speed Diesel	2016+	Tier 3	0.1%S	0.600	3.40	1.4	0.40	0.26	0.24	589	0.012	0.029
Medium Speed Diesel	2016+	Tier 3	0.1%S	0.500	2.60	1.1	0.40	0.26	0.24	649	0.010	0.029

Notes:
Emission factors from Table 2.13 of the 2014 Port of Long Beach Air Emission Inventory
Load factors for propulsion engines based on Table II-3 of the CARB Commercial Harbor Craft Regulatory Activities, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Marine Auxiliary

Engine Type	Model	Tier	Fuel	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O
				(g/kW-hr)								
Aux High Speed Diesel	<=1999	Tier 0	0.1%S	0.400	10.9	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	<=1999	Tier 0	0.1%S	0.400	13.8	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2000-2010	Tier 1	0.1%S	0.400	9.8	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2000-2010	Tier 1	0.1%S	0.400	12.2	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2011-2015	Tier 2	0.1%S	0.400	7.7	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2011-2015	Tier 2	0.1%S	0.400	10.5	1.1	0.5	0.26	0.24	686	0.008	0.029
Aux High Speed Diesel	2011-2015	Tier 3	0.1%S	0.400	2	0.9	0.5	0.26	0.24	656	0.008	0.029
Aux Med Speed Diesel	2011-2015	Tier 3	0.1%S	0.400	2.6	1.1	0.5	0.26	0.24	686	0.008	0.029

Notes:
Emission factors from Table 2.14 of the 2014 Port of Long Beach Air Emission Inventory
Load factors for auxiliary engines based on Table II-3 of the CARB Commercial Harbor Craft Regulatory Activities, Appendix B: Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Marine exhaust emissions were calculated using the following equation:

$$Emissions_{diesel} = \sum EF_i \times Eng_i \times AvgHP \times Load_i \times Activity_i$$

Where:

EF	=	*Emission factor in grams per horse-power hour*
Eng	=	*Number of engines*
AvgHP	=	*Maximum rated average horsepower*
Load	=	*Load factor*
Activity	=	*Hours of operation*
i	=	*Equipment type*

Wheeler North Reef Expansion Project
Emissions Summary - San Diego Air Basin

Construction Emissions

Source Category	VOC	NOX	CO	SOX	PM10	PM2.5	CO2E
	(lb/day)						MT/yr
Marine Vessel	12.08	63.14	26.71	9.78	6.31	5.83	43.20
						Amortized Construction Emissions	**1.44**
SDAPCD Significance Threshold	75	250	550	250	100	55	900
Significant?	**No**	**No**	**No**	**No**	**No**	**No**	**No**

Wheeler North Reef Expansion Project
Emissions Summary - San Diego Air Basin

Construction Emissions

Source Category	VOC	NOX	CO	SOX	PM10	PM2.5	CO2E
	(lb/day)						MT/yr
Marine Vessel	14.09	297.49	31.17	11.40	7.37	6.80	100.80
						Amortized Construction Emissions	**3.36**
SDAPCD Significance Threshold	75	250	550	250	100	55	900
Significant?	**No**	**Yes**	**No**	**No**	**No**	**No**	**No**

Wheeler North Reef Expansion Project
Emissions Summary

Construction Emissions - 2019

Source Category	VOC	NOX	CO	SOX	PM10	PM2.5	CO2E
	(lb/day)						MT/yr
Marine Vessel	17.95	97.81	40.03	14.80	9.46	8.73	778.62
Off-Road	1.46	16.16	7.12	0.03	0.50	0.49	212.16
Mobile Source	0.02	0.06	0.83	0.00	0.28	0.08	14.47
Total	**19.42**	**114.03**	**47.98**	**14.84**	**10.25**	**9.30**	**1,005.24**
						Amortized Construction Emissions	**33.51**
SCAQMD Significance Threshold	75	100	550	150	100	100	3,000
Significant?	**No**	**Yes**	**No**	**No**	**No**	**No**	**No**

Wheeler North Reef Expansion Project

Construction - Land - Mobile Source Emissions

Mobile Source Emission Estimates - 2019

Equipment/Activity	EMFAC Vehicle Category	Workers	Miles/Day	Daily VMT	Days per Year	Annual VMT	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O	CO2	CH4	N2O	CO2E
							lb/day									MT/yr			
Worker commute vehicle	LDA/LDT1 Aggregate	15	25.0	375	130	48,750	0.02	0.06	0.83	0.00	0.28	0.08	243.25	0.02	0.01	14.34	0.00	0.00	14.47
						Total	**0.02**	**0.06**	**0.83**	**0.00**	**0.28**	**0.08**	**243.25**	**0.02**	**0.01**	**14.34**	**0.00**	**0.00**	**14.47**

Notes:

Emission Factors based on EMFAC 2018 aggregate emissions. Worker vehicles assumed to be aggregate of LDA and LDT1.

CH4 and N2O emission factors from the Climate Registry 2017 Default Emission Factors, Table 13.4.

Emission Factors

EMFAC2017 (v1.0.2) Emission Rates
Region Type: Air District
Region: SOUTH COAST AQMD
Calendar Year: 2019
Season: Annual
Vehicle Classification: EMFAC2007 Categories

	VOC	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O
	Pounds per Mile								
Exhaust Emission Rates	0.00005	0.00015	0.00222	0.00001	0.000005	0.000004	0.64868	0.00005	0.00001
Tire Wear	-	-	-	-	0.00002	0.000004	-	-	-
Break Wear	-	-	-	-	0.00008	0.00003	-	-	-
Road Dust	-	-	-	-	0.00065	0.00016	-	-	-

Vehicle emissions were calculated using the following equation:

$$Emissions_{pollutant} = VMT \times EF_{running,pollutant}$$

Where:

$Emissions_{pollutant}$	=	*Emissions from vehicle running for each pollutant*
VMT	=	*Vehicle miles traveled*
$EF_{running,pollutant}$	=	*Emission factor for running emissions and break wear or tire wear*

Paved Road Dust Calculations (EPA AP-42 13.2.1, equation 2)

E = (k*(sL)^0.91*(W)^1.02)*(1-P/4N)

	PM10	PM2.5	
E =			emission factor
k =	0.0022	0.00054	particle size multiplier (lb/vmt)
sL =	0.1	0.1	surface silt loading
W worker =	2.4	2.4	average vehicle weight (tons) (based on EMFAC2014 User's Guide Appendix 4: Vehicle Categories)
P =	35	35	Number of days per year with >0.01 inches of rain (Source: WRCC data for Laguna Beach, https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca4647)
N =	365	365	Days per period

lb/vmt

Vehicle Type	PM10 Emission Factor	PM2.5 Emissions Factor
Worker	0.00065	0.00016