Preliminary Determination Summary

Corpus Christi Liquefaction, LLC
Permit Numbers 139479, PSDTX1496M1, and GHGPSDTX157M1

I. Applicant

Corpus Christi Liquefaction LLC
700 Milam Street, Suite 1900
Houston, TX 77002-2835

II. Project Location

Corpus Christi Liquefaction Stage 3
622 Highway 35
San Patricio County
Gregory, Texas 78359

III. Project Description

Corpus Christi Liquefaction, LLC (CCL), a subsidiary of Cheniere Energy, Inc, owns and operates the liquefied natural gas (LNG) Terminal near Gregory, in San Patricio and Nueces Counties, Texas. CCL submitted the amendment to authorize the updates to representations that reflect final design of the Stage 3 Project and to authorize two additional liquefaction trains. No Permit by Rule (PBR) or Standard Permit (SP) requires incorporation during this permitting action. Maintenance, startup, and shutdown (MSS) emissions are authorized under this permit.

IV. Emissions

Air Contaminant	Proposed Allowable Emission Rates (tpy)
VOC	349.94
NO_x	313.10
SO_2	15.30
CO	1,670.02
$PM/PM_{10}/PM_{2.5}$	17.85/17.85/17.85
H_2S	0.21
CO2 Equivalents (CO2e)	1,447,590.00

CO2e - carbon dioxide equivalents based on global warming potentials of CH4 = 25, N2O = 298, SF6=22,800.

V. Federal Applicability

The following chart illustrates the annual project emissions for each pollutant and whether this pollutant triggers PSD or Nonattainment (NA) review.

Pollutant	Project Emissions (tpy)	Major Mod Trigger (tpy)	NA Triggered Y/N	PSD Triggered Y/N

VOC	358.41	25 for NA 40 for PSD	N/A	Y
NO_x	349.35	25 for NA 40 for PSD	N/A	Y
SO_2	15.33	40	N/A	N
CO	1,862.38	100	N/A	Y
PM	18.26	25	N/A	Y
PM_{10}	18.26	15	N/A	Y
$PM_{2.5}$	18.26	10	N/A	Y
H_2SO_4	N/A	7	N/A	N/A
H_2S	0.22	10	N/A	N

The proposed project triggers PSD review for non-GHG NSR regulated pollutants. As shown in the table below, because the project increase is more than 75,000 tpy of CO_{2e}, PSD review is triggered for GHG emissions.

Pollutant	Project Emissions (tpy)	Major Source or Major Mod Trigger Level (tpy)	PSD Triggered Y/N
CO_{2e}	1,506,655.00	75,000	Y

VI. Control Technology Review

Control technology is consistent with PSD BACT for PSD pollutants (VOC, NO_X, CO, PM, PM_{10}, $PM_{2.5}$, and GHG) and state minor NSR BACT for SO_2 and H_2S. A control technology review was conducted for all pollutants. The controls described in this section were determined to satisfy BACT requirements based on a review of recently issued permits from Texas and other states, and consideration of the RACT/BACT/LAER Clearinghouse (RBLC) data provided by the applicant. A more detailed description of the control technology review is included in the permit file.

Hot Oil Furnaces
Emissions of NO_X are minimized through the use of low NO_X burners. The permit limits NO_X emissions to 0.03 lb/MMBtu fuel fired (HHV basis) on a 1-hr average. Emissions of CO are limited to 50 ppmvd (3% O_2 basis) on a 1-hr average. Emissions of PM and VOC are limited through good combustion practices and the use of gaseous fuel. GHGs are limited through use of low carbon fuels and good operation and maintenance.

Thermal Oxidizers
The thermal oxidizers must achieve 99.9% destruction efficiency. This is to be demonstrated through initial stack sampling and by maintaining the firebox temperature at or above the temperature demonstrated during the stack test during subsequent operations. Prior to the initial

stack test, the firebox temperature must be maintained at or above 1400°F. Collateral NO_X emissions are limited to 0.06 lb/MMBtu, based on the higher heating value of the waste gas. Good combustion practices will limit CO and PM. GHGs from the thermal oxidizer will be limited through good thermal oxidizer design and best operational practices.

Ground Flares
Pressure-assisted (high-pressure) multi-point flares stages will achieve at least 99% destruction/removal efficiency (DRE) by adoption of a work practice standard coinciding with the operational requirements of 40 CFR Part 63, Subparts YY (Generic) and FFFF applicable to pressure-assisted multi-point flares. Subparts YY and FFFF are the National Emission Standards for Hazardous Air Pollutants for Generic Maximum Achievable Control Technology Standards and Miscellaneous Organic Chemical Manufacturing, respectively. Low-pressure stages will comply with 40 CFR 60.18 requirements and achieve at least 99% DRE for C1-C3 compounds and 98% DRE for C4+. CO and NO_X are limited through good combustion practices. GHGs are limited through the use of gaseous fuel and minimization of flaring.

Emergency Generators
The emergency generator is limited to those satisfying EPA Tier 2 requirements for VOC, PM, CO, and NO_X. The engines are limited to 100 hours per year of non-emergency operation. GHGs from the emergency engines will be limited through engine design and certification in accordance with standards, limited operational hours, and proper operation and maintenance.

Fugitives
Implementation of the 28VHP and 28M LDAR programs for the VOC and GHG emissions.

Fixed Roof Tanks
The diesel tanks each have a capacity less than 1,000 gallons and the vapor pressure for diesel is less than 0.5 psia. The tanks will be white, fixed-roof tanks equipped with a submerge fill mechanism.

Uncontrolled Vents
The analyzer vent has a low concentration of VOC and GHG and cannot be routed to a control device. The NRU process vent is greater than 98% nitrogen and cannot be routed to a control device. This is consistent with other analyzer vents with intermittent venting frequency and low VOC and H_2S concentration in recently issued permits.

VII. Air Quality Analysis

The air quality analysis (AQA) is acceptable for all review types and pollutants. The results are summarized below.

This is an as-built amendment to NSR Project 287392. This analysis is to expand the Stage 3 Project by adding two additional trains and update representations to reflect final design of the Stage 3 project. The applicant evaluated the project from the beginning and incorporated the proposed new and modified sources that are part of the Stage 3 project.

A. De Minimis Analysis

A De Minimis analysis was initially conducted to determine if a full impacts analysis would be required. The De Minimis analysis modeling results indicate that 1-hr NO_2 exceeds the respective de minimis concentration and requires a full impacts analysis. The De Minimis analysis modeling results for CO, $PM_{2.5}$, PM_{10} and annual NO_2 indicate that the project is below the respective de minimis concentrations and no further analysis is required.

The justification for selecting the EPA's interim 1-hr NO_2 De Minimis level is based on the assumptions underlying EPA's development of the 1-hr NO_2 De Minimis level. As explained in EPA guidance memoranda[1], the EPA believes it is reasonable as an interim approach to use a De Minimis level that represents 4% of the 1-hr NO_2 NAAQS.

The $PM_{2.5}$ and ozone De Minimis levels are the EPA recommended De Minimis levels. The use of the EPA recommended De Minimis levels is sufficient to conclude that a proposed source will not cause or contribute to a violation of an ozone and $PM_{2.5}$ NAAQS or $PM_{2.5}$ PSD increments based on the analyses documented in EPA guidance and policy memoranda[2].

While the De Minimis levels for both the NAAQS and increment are identical for $PM_{2.5}$ in the table below, the procedures to determine significance (that is, predicted concentrations to compare to the De Minimis levels) are different. This difference occurs because the NAAQS for $PM_{2.5}$ are statistically-based, but the corresponding increments are exceedance-based.

Table 1. Modeling Results for PSD De Minimis Analysis in Micrograms Per Cubic Meter (µg/m³)

Pollutant	Averaging Time	GLCmax (µg/m³)	De Minimis (µg/m³)
PM_{10}	24-hr	1	5
PM_{10}	Annual	0.2	1
$PM_{2.5}$ (NAAQS)	24-hr	0.9	1.2
$PM_{2.5}$ (NAAQS)	Annual	0.11	0.2
$PM_{2.5}$ (Increment)	24-hr	1	1.2
$PM_{2.5}$ (Increment)	Annual	0.12	0.2
NO_2	1-hr	10	7.5
NO_2	Annual	0.8	1
CO	1-hr	168	2000
CO	8-hr	91	500

The 24-hr and annual $PM_{2.5}$ (NAAQS) and 1-hr NO_2 GLCmax are based on the highest five-year averages of the maximum predicted concentrations determined for each receptor.

The GLCmax for all other pollutants and averaging times represent the maximum predicted concentrations over five years of meteorological data.

[1] www.tceq.texas.gov/assets/public/permitting/air/memos/guidance_1hr_no2naaqs.pdf
[2] www.tceq.texas.gov/permitting/air/modeling/epa-mod-guidance.html

EPA intermittent guidance was relied on for 1-hr NO_2 PSD De Minimis analyses. Refer to the Modeling Emissions Inventory section for details.

To evaluate secondary $PM_{2.5}$ impacts, the applicant provided an analysis based on a Tier 1 demonstration approach consistent with the EPA's Guideline on Air Quality Models (GAQM). Specifically, the applicant used a Tier 1 demonstration tool developed by the EPA referred to as Modeled Emission Rates for Precursors (MERPs). The basic idea behind the MERPs is to use technically credible air quality modeling to relate precursor emissions and peak secondary pollutants impacts from a source. Using data associated with the Harris County source, the applicant estimated 24-hr and annual secondary $PM_{2.5}$ concentrations of 0.131 µg/m^3 and 0.008 µg/m^3, respectively. When these estimates are added to the GLCmax listed in the Table 1 above, the results are less than the De Minimis levels.

The revised annual $PM_{2.5}$ SIL of 0.13 µg/m^3 will be effective May 6, 2024. When the annual secondary $PM_{2.5}$ concentration of 0.008 µg/m^3 is added to the GLCmax listed in the Table 1 above, the results are less than the revised De Minimis levels.

Table 2. Modeling Results for Ozone PSD De Minimis Analysis in Parts per Billion (ppb)

Pollutant	Averaging Time	GLCmax (ppb)	De Minimis (ppb)
O_3	8-hr	0.64	1

The applicant performed an O_3 analysis as part of the PSD AQA. The applicant evaluated project emissions of O_3 precursor emissions (NO_x and VOC). For the project NO_x and VOC emissions, the applicant provided an analysis based on a Tier 1 demonstration approach consistent with the EPA's GAQM. Specifically, the applicant used a Tier 1 demonstration tool developed by the EPA referred to as MERPs. Using data associated with the Harris County source, the applicant estimated an 8-hr O_3 concentration of 0.64 ppb. When the estimates of ozone concentrations from the project emissions are added together, the results are less than the De Minimis level.

B. Air Quality Monitoring

The De Minimis analysis modeling results indicate that all pollutants and averaging times are below their respective monitoring significance level.

Table 3. Modeling Results for PSD Monitoring Significance Levels

Pollutant	Averaging Time	GLCmax (µg/m^3)	Significance (µg/m^3)
PM_{10}	24-hr	1	10
NO_2	Annual	0.8	14
CO	8-hr	91	575

The GLCmax represent the maximum predicted concentrations over five years of meteorological data.

The applicant evaluated ambient $PM_{2.5}$ monitoring data to satisfy the requirements for the pre-application air quality analysis.

Background concentrations for $PM_{2.5}$ were obtained from the EPA AIRS monitor 483550034 located at 5707 Up River Rd., Corpus Christi, Nueces County. The three-year average (2021-2023) of the 98th percentile of the annual distribution of the 24-hr concentrations was used for the 24-hr value (23 µg/m^3). The three-year average (2021-2023) of the annual concentrations was used for the annual value (8.8 µg/m^3). The use of this monitor is reasonable based on the ADMT's quantitative review of emissions sources in the surrounding area of the monitor site relative to the project site.

Since the project has a net emissions increase of 100 tpy or more of VOC or NO_X, the applicant evaluated ambient O_3 monitoring data to satisfy the requirements for the pre-application air quality analysis.

A background concentration for ozone was obtained from the EPA AIRS monitor 483550025 located at 902 Airport Blvd., Corpus Christi, Nueces County. A three-year average (2020-2022) of the annual fourth highest daily maximum 8-hr concentrations was used in the analysis (62 ppb). The applicant did not consider 2023 monitoring data, however, ADMT reviewed 2023 monitoring data and verified the applicant's approach will not affect the overall analysis conclusion. The use of this monitor is reasonable based on the ADMT's quantitative review of emissions sources in the surrounding area of the monitor site relative to the project site.

C. National Ambient Air Quality Standards (NAAQS) Analysis

The De Minimis analysis modeling results indicate that 1-hr NO_2 exceeds the respective de minimis concentration and requires a full impacts analysis. The full NAAQS modeling results indicate the total predicted concentrations will not result in an exceedance of the NAAQS.

Table 4. Total Concentrations for PSD NAAQS (Concentrations > De Minimis)

Pollutant	Averaging Time	GLCmax (µg/m^3)	Background (µg/m^3)	Total Conc. = [Background + GLCmax] (µg/m^3)	Standard (µg/m^3)
NO_2	1-hr	136	34	170	188

The 1-hr NO_2 GLCmax is the highest five-year average of the 98th percentile of the annual distribution of predicted daily maximum 1-hr concentrations determined for each receptor.

A background concentration for NO_2 was obtained from the EPA AIRS monitor 480391016 located at 109B Brazoria Hwy 332 West, Lake Jackson, Brazoria County. The three-year average (2021-2023) of the 98th percentile of the annual distribution of the maximum daily 1-hr concentrations was used for the 1-hr value. Monitoring data from the third quarter of 2023 is incomplete. ADMT performed the EPA substitution test and validated the use of 2023 monitoring data. The use of the monitor is reasonable based on the applicant's review of land use, county population, county emissions, and a quantitative review of emissions surrounding the area of the monitor site relative to the project site.

D. Increment Analysis

The De Minimis analysis modeling results indicate that all pollutants and averaging times are below the respective de minimis concentration and no further analysis is required.

E. Additional Impacts Analysis

The applicant performed an Additional Impacts Analysis as part of the PSD AQA. The applicant conducted a growth analysis and determined that population will not significantly increase as a result of the proposed project. The applicant conducted a soils and vegetation analysis and determined that all evaluated criteria pollutant concentrations are below their respective secondary NAAQS. The applicant meets the Class II visibility analysis requirement by complying with the opacity requirements of 30 TAC Chapter 111. The Additional Impacts Analyses are reasonable and possible adverse impacts from this project are not expected.

The ADMT evaluated predicted concentrations from the proposed site to determine if emissions could adversely affect a Class I area. The nearest Class I area, Big Bend National Park, is located approximately 570 kilometers (km) from the proposed site.

The predicted concentrations of PM_{10}, $PM_{2.5}$, NO_2, and SO_2 for all averaging times, are all less than De Minimis levels at a distance of 6 km from the proposed sources in the direction of Big Bend National Park Class I area. Big Bend National Park is an additional 564 km from the location where the predicted concentrations of PM_{10}, $PM_{2.5}$, NO_2, and SO_2 for all averaging times are less than De Minimis. Therefore, emissions from the proposed project are not expected to adversely affect the Big Bend National Park Class I area.

F. Minor Source NSR and Air Toxics Review

Table 5. Project-Related Modeling Results for State Property Line

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr	1.6	20.4
H_2S	1-hr	0.9	2.16

Table 6. Modeling Results for Minor NSR De Minimis

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr	1	7.8
SO_2	3-hr	1	25

The 1-hr SO_2 GLCmax is based on the highest five-year average of the maximum predicted concentrations determined for each receptor.

The 3-hr SO_2 GLCmax is based on the maximum predicted concentration over five years of meteorological data.

The justification for selecting the EPA's interim 1-hr SO_2 De Minimis level was based on the assumptions underlying EPA's development of the 1-hr SO_2 De Minimis level. As explained

in EPA guidance memoranda[3] , the EPA believes it is reasonable as an interim approach to use a De Minimis level that represents 4% of the 1-hr SO_2 NAAQS.

Table 7. Minor NSR Site-wide Modeling Results for Health Effects

Pollutant	CAS#	Averaging Time	GLCmax ($\mu g/m^3$)	GLCmax Location	ESL ($\mu g/m^3$)
Ethylene	74-85-1	1-hr	150	Northern Property Line	1400

The GLCmax location is listed in Table 7 above.

G. Greenhouse Gases

EPA has stated that unlike the criteria pollutants for which EPA has historically issued PSD permits, there is no National Ambient Air Quality Standard (NAAQS) for GHGs, including no PSD increment. The global climate-change inducing effects of GHG emissions, according to the "Endangerment and Cause or Contribute Finding", are far-reaching and multi-dimensional (75 FR 66497). Climate change modeling and evaluations of risks and impacts are typically conducted for changes in emissions that are orders of magnitude larger than the emissions from individual projects that might be analyzed in PSD permit reviews. Quantifying the exact impacts attributable to a specific GHG source obtaining a permit in specific places and points would not be possible [EPA's PSD and Title V Permitting Guidance for GHGs at 48]. Thus, EPA has concluded in other GHG PSD permitting actions it would not be meaningful to evaluate impacts of GHG emissions on a local community in the context of a single permit.

The TCEQ has determined that an air quality analysis would provide no meaningful data and has not required the applicant to perform one. As stated in the preamble to TCEQ's adoption of the GHG PSD program, the impacts review for individual air contaminants will continue to be addressed, as applicable, in the state's traditional minor and major NSR permits program per 30 TAC Chapter 116.

VIII. Conclusion

As described above, the applicant has demonstrated that the project meets all applicable rules, regulations and requirements of the Texas and Federal Clean Air Acts. The Executive Director's preliminary determination is that the permits should be issued.

[3] www.epa.gov/sites/production/files/2015-07/documents/appwso2.pdf