ENGINEERING EVALUATION
Facility ID No. 203657
Royal SSF LLC
1140 San Mateo Avenue, South San Francicso, CA 94080
Application No. 712182

Background

Royal SSF LLC ("facility" hereafter) is applying for an Authority to Construct/Permit to Operate for the following equipment:

S-1 Firetube Boiler, Make: Cleaver-Brooks, Model CBEX-E700-250-150, Maximum Firing Rate: 10.206 MMBtu/hr

Royal SSF LLC has proposed to operate the new natural gas-fired boiler for 12 hours/day, 7 days/week, and 52 weeks/year with a maximum heat input of 10.206 MMBtu/hr.

The criteria pollutants associated with S-1 are nitrogen oxides (NO_x), precursor organic compounds (POC), particulate matter (PM_{10}, $PM_{2.5}$), sulfur dioxide (SO_2), and carbon monoxide (CO). The natural gas combustion will also release some toxic air contaminants (TACs).

Emissions Summary

Potential to emit (PTE) emission rate calculations are based on the manufacturer guaranteed emission factors for NO_x and CO. Emission factors for POC, PM_{10}, $PM_{2.5}$, and SO_2 were obtained from Table 1.4-2 of AP-42 Chapter 1.4 for Natural Gas Combustion. Annual emission rates are based on the maximum fuel consumption, assuming an operating schedule of 4,368 hours per year. The manufacturer guaranteed emission factors for NO_x and CO are provided as part per million (ppm) corrected to 3% oxygen (O_2). The emission factors were converted from ppm at 3% O_2 to lb/MMscf, as shown below.

$$ppm\ (3\%) = ppm_{measured} * [(21-3)/(21-\%O_{2\ measured})]$$

To convert ppm to lb/MMscf:

$$lb/MMscf = ppm_{measured} * [(21-0)/(21-\%O_{2\ measured})] * (MW) * F_d / V_M * \text{heating value of natural gas}$$

Where:

Molecular Weight (MW) of Pollutant:	46.01 lb NO_2/mole or 28.01 lb CO/mole
Molar Volume (V_M):	385.3 dscf/mole
F_d Factor, Natural Gas:	8,710 dscf/MMBtu

The emission factor for SO_2 in pipeline natural gas was calculated using AP-42 Chapter 1.4, Table 1.4-2 and PG&E Gas Rule 21, Section C. AP-42 states an SO_2 emission factor of 0.6 lb/MMscf, assuming pipeline sulfur concentration of 2,000 gr/MMscf, while

PG&E states a maximum allowable pipeline sulfur concentration of 10,000 gr/MMscf in Gas Rule 21, Section C. Footnote (d) of AP-42 Table 1.4-2 states that the SO_2 emission factor should be multiplied by the ratio of actual pipeline sulfur concentration to the assumed concentration in AP-42 Table 1.4-2. Therefore, the SO_2 emission factor for pipeline natural gas is assumed to be 3.0 lb/MMscf. It is assumed that all H_2S will be converted to SO_2 during combustion according to the following equation:

$$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$$

The following provides a summary of the boiler information, used to determine PTE calculations:

S-1

- Maximum Firing Rating: 10.206 MMBtu/hr
- Heat Capacity of Natural Gas: 1,050 MMBtu/MMscf
- Operation Hours: (12 hrs/day) x (7 days/week) x (52 weeks/year) = 4,368 hr/yr
- Maximum Fuel Consumption:
  Hourly: 0.00972 MMscf/hr
  Annual: 42.46 MMscf/yr

Table 1. Emissions of Criteria Pollutants for S-1

Pollutant	Emission Factors[1,2]		Daily Emissions[3]	Annual Emissions Total	
	ppm at 3% O_2	(lb/MMscf)	(lb/day)	(lb/yr)	(tpy)
NOx	15	19.11	4.46	811.2	0.406
POC		5.5	1.29	234.6	0.117
CO	25	19.38	4.52	823.0	0.412
PM_{10}		7.6	1.77	322.7	0.161
$PM_{2.5}$[4]		7.6	1.77	322.7	0.161
SO_2		3.0	0.70	127.4	0.064

1. The CBEX firetube boiler will meet permit limits of 15 ppm NO_X at 3% O_2 and 25 ppm CO at 3% O_2.
2. Emission factors per AP-42, Tables 1.4-1 and 1.4-2, Small Boilers (<100 MMBtu/hr) Uncontrolled.
3. Daily emissions are based on a 24-hour day.
4. $PM_{2.5}$ emissions are assumed to be the same as PM_{10}.

Toxic Emissions for Health Risk Assessment (HRA)

The TAC emission factors were obtained from the latest version of the BAAQMD TAC Emission Factor Guidelines, Appendix A, *Default TAC Emission Factors for Specific Source Categories (August 2020).* Hourly and annual emission rates are based on the maximum firing rate and annual emissions assume an operating schedule of 4,380 hours per year.

Table 2. TAC Emissions for S-1

TAC	Emission Factor (lb/MMscf)	Acute Emissions (lb/hr)	Acute Trigger Level (lb/hr)	Chronic Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRA Triggered?	
						Acute	Chronic
Acetaldehyde	4.30E-03	4.18E-05	2.10E-01	1.83E-01	2.90E+01	No	No
Acrolein	2.70E-03	2.63E-05	1.10E-03	1.15E-01	1.40E+01	No	No
Arsenic	2.00E-04	1.94E-06	8.80E-05	8.49E-03	1.60E-03	No	Yes
Benzene	8.00E-03	7.77E-05	1.20E-02	3.40E-01	2.90E+00	No	No
Beryllium	6.00E-06	5.83E-08	None	2.55E-04	3.40E-02	No	No
Cadmium	1.10E-03	1.07E-05	None	4.68E-02	1.90E-02	No	Yes
Copper	8.50E-04	8.26E-06	None	3.61E-02	None	No	No
Ethylbenzene	9.50E-03	9.23E-05	4.40E-02	4.03E-01	3.30E+01	No	No
Formaldehyde	2.21E-01	2.15E-03	None	9.40E+00	1.40E+01	No	No
n-Hexane	6.30E-03	6.13E-05	2.40E-02	2.68E-01	2.70E+05	No	No
Lead	5.00E-04	4.86E-06	None	2.12E-02	2.90E-01	No	No
Manganese	3.80E-04	3.70E-06	None	1.62E-02	3.53E+00	No	No
Mercury	2.60E-04	2.53E-06	None	1.10E-02	2.10E-01	No	No
Naphthalene	6.10E-04	5.93E-06	2.70E-04	2.59E-02	None	No	No
Nickel	2.10E-03	2.04E-05	None	8.92E-02	3.10E-01	No	No
PAH (as benzo(a)pyrene-equiv.)	6.73E-06	6.54E-08	8.80E-05	2.86E-04	3.30E-03	No	No
Propylene	7.31E-01	7.11E-03	None	3.11E+01	1.20E+05	No	No
Selenium	1.20E-05	1.17E-07	None	5.11E-04	8.00E+00	No	No
Toluene	3.66E-02	3.56E-04	2.20E+00	1.55E+00	1.60E+04	No	No
Vanadium	2.30E-03	2.23E-05	1.30E-02	9.74E-02	none	No	No
Xylenes	2.72E-02	2.65E-04	9.70E+00	1.16E+00	2.70E+04	No	No

As shown in Table 2, TAC emissions from S-1 exceed the chronic trigger limits in Regulation 2, Rule 5. Therefore, an HRA is required. For the purposes of Regulation 2-5, a project includes TAC emissions from all new or modified sources permitted within a 5-year period. There were no related projects within the last five years.

Plant Cumulative Increase

The project located at 1140 San Mateo Avenue, South San Francisco, CA 94080 is a new facility. Therefore, there are no existing emissions at the facility. Table 3 summarizes the cumulative increase in criteria pollutant emissions that will result from this application.

Table 3. Plant Cumulative Emissions Increase, Post 4/5/91

Pollutant	Existing Emissions Post 4/5/91 (tons/yr)	S-1 Emissions (tons/yr)	Cumulative Emissions (tons/yr)
NOx	0.000	0.406	0.406
POC	0.000	0.117	0.117
CO	0.000	0.412	0.412
PM_{10}	0.000	0.161	0.161
$PM_{2.5}$	0.000	0.161	0.161
SO_2	0.000	0.064	0.064

Statement of Compliance

The owner/operator is expected to comply with all applicable requirements. Key requirements are listed below:

District Rules

Regulation 1-301 – Public Nuisance

The facility is subject to Regulation 1, Section 301, which prohibits discharge of air contaminants resulting in public nuisance.

Regulation 2, Rule 1 – Permits, General Requirements

California Environmental Quality Act (CEQA Compliance): This permit application is not subject to CEQA because the evaluation is a ministerial action (Public Resources Code Section 21080(b)(1) and CEQA Guidelines Section 15268(a)) conducted using the fixed standards and objective measurements outlined in standard air permitting/engineering reference materials including, but not limited to: permitting handbooks, permitting manuals, permitting guidance documents, source test/lab sampling results, and emissions factor clearinghouses. Therefore, the applicant was not required to submit any CEQA-related information.

Public Notification: The public notification requirements of Regulation 2-1-412 apply to applications which result in any increase in TACs or hazardous air contaminant emissions at facilities within, either 1,000 feet of the boundary of a K-12 school, or located in an Overburdened Community and requires an HRA. The project is not within 1,000 feet from the nearest school. The facility is located within an Overburdened Community and does

trigger an HRA. Therefore, the project is subject to the public notification requirements of Regulation 2-1-412. A public notice was prepared and distributed on 10/17/2025.

Regulation 2, Rule 2 – Permits, New Source Review (NSR)
Best Available Control Technology (BACT): Per Regulation 2, Rule 2, Section 301 BACT is required for new or modified sources with potential emissions of 10.0 pounds per day or more of POC, NPOC, NO_X, PM_{10}, or SO_2. Referencing Table 1, the boiler, S-1, will not emit more than 10 lbs/day of any criteria pollutant, and therefore, is not subject to BACT requirements.

Offsets: Air District Regulation 2-2-302 requires offsets for new or modified sources at a facility that has the potential to emit 10 tpy or more of POC and NOx. Regulation 2-2-303 requires offsets for new or modified sources at a facility that has the potential to emit 100 tpy or more of $PM_{2.5}$, PM_{10}, and SO_2. The facility will not exceed 10 tpy of POC or NOx and 100 tpy of $PM_{2.5}$, PM_{10}, or SO_2 and, therefore, is not subject to offsets.

Prevention of Significant Deterioration (PSD): This facility will not have the potential to emit more than 100 tpy of any criteria pollutant, therefore this facility is not a "Major Facility" as defined in the Air District Regulation 2-2-217 and is not subject to PSD permitting requirements under Regulation 2-2-304.

Regulation 2, Rule 5 – New Source Review of Toxic Air Contaminants
Rule 2-5 applies to new or modified sources of TACs for which an application is submitted on or after July 1, 2005. All TAC emissions from new and modified sources are subject to risk assessment if emissions of any individual TAC exceed the trigger thresholds specified in Table 2-5-1 of Rule 2-5. Pursuant to Regulation 2-5-110, a project shall not be subject to this rule if, for each TAC, the total project emissions are below the acute and chronic trigger levels listed in Table 2-5-1 of this regulation.

As presented in Tables 2, arsenic and cadmium emissions exceed the chronic trigger levels. Therefore, an HRA is required.

The Air District's Risk Assessment and Reduction Team completed the HRA on August 5, 2025. Results show that the maximum cancer risk is 0.17 in a million, the acute hazard index (HI) is 0.011 and the chronic HI is 0.046. In accordance with the Air District's Regulation 2-5-301, the proposed new source (S-1) does not require TBACT because the estimated source risk does not exceed a cancer risk of 1.0 in a million, and/or chronic HI of 0.20. Since the estimated project cancer risk does not exceed 6.0 in a million, and project HIs do not exceed 1.0, this proposed project complies with Regulation 2-5-302 project risk requirements, for projects located in an Overburdened Community, as defined in Regulation 2-1-243.

Thus, the project meets the project risk limits of Regulation 2-5-302.

Regulation 6, Rule 1 – Particulate Matter, General Requirements

Ringelmann No. 1 and Opacity Limitation: Section 301 and 302 states a person shall not emit from any source for a period or aggregate periods of more than 3 minutes in any hour, a visible emission that is as dark or darker than No. 1 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree and/or an emission equal to or greater than 20% opacity as perceived by an opacity sensing device, where such a device is required by Air District regulations. The facility is expected to comply with this standard.

Visible Particles: Section 305 prohibits emissions of visible particles from the operator's property causing a nuisance on another property. The facility is expected to comply with this standard.

Total Suspended Particulate (TSP) Concentration Limits: Section 310.1 limits TSP from any source in excess of 343 mg per dscm (0.15 gr/dscf) of exhaust gas volume. TSP is considered equivalent to $PM_{10}/PM_{2.5}$ for this purpose.

Grain Loading Rate Basis:
S-1

- Operating Hours: 4,368 hr/yr
- Boiler Exhaust Flow rate at the Emission Point: 1,500 dscfm

$$PM\ Emissions = \left(7.6\frac{lb}{MMscf}\right) \times \left(0.0097\frac{MMscf}{hr}\right) = \mathbf{0.074\ lb/hr}$$

$$Grain\ Loading = \left(0.074\frac{lb\ PM_{10}}{hr}\right) \times \left(7{,}000\frac{gr}{lb}\right) \div \left(60\frac{min}{hr}\right) \div (1{,}500\ dscfm) = \mathbf{0.0057\ gr/dscf}$$

As shown above S-1 does not emit more than 0.15 gr/dscf of exhaust PM and complies with Regulation 6-1-310.1.

Section 310.2 and 311.2 are applicable to sources with TSP greater than 1,000 kg/yr. Neither section is applicable because the TSP potential to emit for S-1 is below 1,000 kg/yr.

Regulation 9, Rule 1– Sulfur Dioxide

Limitations on Ground Level Concentrations: Section 301 states a person shall not emit from any source, other than a ship, SO_2 in quantities which result in ground level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. The boiler is expected to meet these requirements because it will use pipeline quality natural gas which is inherently low in sulfur.

General Emission Limitation: Section 302 states a person shall not emit from any source, other than a ship, a gas stream containing SO_2 in excess of 300 ppm (dry). The boiler is expected to meet this requirement.

Fuel Burning (liquid and Solid Fuels): Section 304 states a person shall not burn any liquid fuel having a sulfur content in excess of 0.5% by weight, or solid fuel of such sulfur content as would result in the emission of a gas stream containing more than 300 ppm (dry) of SO_2. S-1 uses only natural gas as fuel. Combustion of natural gas is expected to produce SO_2 concentration of 1.69 ppmv of SO_2[1].

Regulation 9, Rule 7– NO_x and CO Emissions from Industrial, Institutional, and Commercial, Boilers, Steam Generators and Process Heaters)

Final Emission Limits: Pursuant to Regulation 9-7-307, S-1 is required to meet the emission limitations for NO_x (15 ppmv at 3% O_2) and CO (400 ppmv at 3% O_2) based on the rated heat input of 10.206 MMBtu/hr. As per the manufacturer's guaranteed emission rates, S-1will emit 15 ppm of NO_x and 25 ppm of CO, both at 3% O_2. Thus, S-1 meets the requirements of this regulation.

S-1 will not be subject to the heat-input weighted average limit of Regulation 9-7-307.9. S-1 will meet the NO_x and CO volumetric concentration limits of Regulation 9-7-307.3.

Insulation Requirements: Pursuant to Regulation 9-7-311, no person shall operate a boiler or steam generator unless the exposed, external surface of the device, including all pipes and ducts heated by the device, does not exceed a temperature of 120ºF. This requirement shall not apply to any of the following:

- Any device that meets the definition of a high-temperature water boiler in California Code of Regulations, Title 8.
- Any surface or appurtenance that must remain un-insulated for safety or operational reasons.
- Any surface that has at least one inch of insulation.
- Any surface heated by a source other than the boiler or steam generator, including sunlight.
- Any exhaust stack surface.

The boiler will be insulated, except for surfaces that must remain exposed due to safety reasons, and therefore meets this requirement.

Stack Gas Temperature Limits: Pursuant to Regulation 9-7-312, no person shall operate a boiler or steam generator with a stack temperature that exceeds 100 ºF over saturated steam temperature and 250ºF over the combustion air temperature. However, the aforementioned gas temperature requirements do not apply to devices certified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI) as having a thermal efficiency of 80% or more. The boiler has a certified thermal efficiency of 85%.

Initial Demonstration of Compliance: Pursuant to Regulation 9-7-403, an initial demonstration of compliance is required. The initial demonstration specifies that a source test be performed to determine compliance with the limitations of Regulation 9-7-307,

[1] SO_2 = [(0.0028 lb/MMBtu)x(385.3 ft^3 SO_2/lb mol SO_2)]/[(1 ft^3 $SO_2/10^6$ $sdft^3$ flue)x (20.9/(20.9-3)) x (64.0588 lb SO_2/lb mole SO_2) x (8,710 $sdft^3$ flue/MMBtu)] = 1.69 ppmv @ 3% O_2

unless the device has an input heat rating less than 10 MMBtu/hr; at which point a portable analyzer may be used. S-1 has an input heat rating greater than 10 MMBtu/hr. Therefore, source testing is required. Furthermore, S-1 will be subject to annual source testing pursuant to Regulation 9-7-506 and quarterly testing using a portable analyzer pursuant to Regulation 9-7-506.

New Source Performance Standards (NSPS)
The following NSPS may apply to S-1.

40 CFR Part 60 Subpart D: Pursuant to §60.40, an affected facility is each fossil fuel-fired steam generating unit of more than 73 megawatts (MW) (250 MMBtu/hr). S-1 is a steam generating unit. However, the maximum firing rate of S-1 is less than 250 MMBtu/hr. Therefore, S-1 is not subject to the requirements of this subpart.

40 CFR Part 60 Subpart Da: Pursuant to §60.40Da, an affected facility is each electric utility steam generating unit that is capable of more than 250 MMBtu/hr, which was constructed, modified, or reconstructed after September 18, 1978. Since S-1 does not provide steam for the generation of electricity of a utility power distribution system for sale, S-1 is not considered electric utility steam generating unit. Furthermore, the input heat rating of S-1 is less than 250 MMBtu/hr. Therefore, S-1 is not subject to the requirements of this subpart.

40 CFR Part 60 Subpart Db: Pursuant to §60.40b(a), an affected facility is each steam generating unit that commenced construction, modification, or reconstruction after June 19, 1984 and has a heat input capacity of 100 MMBtu/hr. S-1 is less than 100 MMBtu/hr. Therefore, S-1 is not subject to the requirements of this subpart.

40 CFR Part 60 Subpart Dc: Pursuant to §60.40c(a), an affected facility is each steam generating unit that commenced construction, modification, or reconstruction after June 9, 1989 and has a heat input capacity in between 10 MMBtu/hr to 100 MMBtu/hr. S-1 is a steam generating unit, constructed after June 9, 1989, with a heat input capacity of 10.206 MMBtu/hr. Therefore, S-1 is subject to this subpart.

However, this subpart contains SO_2 emission standards for coal, mixture of coal and other fuels, oil, or mixture of oil and other fuels. This subpart does not contain a SO_2 emission standard for natural gas combustion.

In addition, this subpart contains PM emission standards for coal, mixture of coal and other fuels, oil, mixture of oil and other fuels, wood, or mixture of wood and other fuels. This subpart does not contain a PM emission standard for natural gas combustion.

This subpart does not have applicable standards for natural gas combustion. Therefore, S-1 meets the requirements of this subpart.

National Emissions Standards for Hazardous Air Pollutants (NESHAP)
The following NESHAP may apply to S-1.

40 CFR Part 63 Subpart DDDDD: Pursuant to §63.7485, industrial, commercial, and institutional boilers or process heaters, which are located at a major source of hazardous air pollutants (HAPs), are subject to the requirements of this regulation. The facility is not major for HAPs. Therefore, S-1 is not subject to this subpart.

40 CFR Part 63 Subpart JJJJJJ: Pursuant to §63.11193, industrial, commercial, and institutional boilers, which are located at an area source of HAPs, are subject to the requirements of this regulation. The facility is an area source of HAPs. Therefore, S-1 is subject to this subpart.

However, S-1 is a gas-fired boiler. Pursuant to §63.11195(e), gas-fired boilers are not subject to the requirements of this subpart. Therefore, S-1 is not subject to this subpart.

Permit Conditions

Permit Condition # 100472

1. The owner/operator of S-1 shall operate this source on natural gas fuel exclusively. (Basis: Cumulative Increase)

2. The owner/operator shall not use more than 445,798 Therms of natural gas fuel at S-1 in any consecutive twelve-month period. (Basis: Cumulative Increase)

3. The owner/operator shall not exceed the following emission factors when operating using natural gas as a fuel:

   NOx = 15 ppmv @ 3% O_2, when firing natural gas.
   CO = 25 ppmv @ 3% O_2, when firing natural gas
   (Basis: Regulation 9-7-307, Cumulative Increase)

4. Within 60 days from the startup of S-1, and with a frequency of no less than once every 12 consecutive months after each subsequent source test thereafter, the owner/operator of S-1 shall conduct an Air District approved source test to determine compliance with the limits in Part 3 of this condition. The owner/operator shall submit the source test results to the Air District's Source Test Section no later than 60 days after the source test is completed. (Basis: Regulation 2-1-403 and Regulation 9-7-403)

5. The owner/operator of S-1 shall comply with all applicable testing requirements as specified in Volume IV of the Air District's Manual of Procedures. The owner/operator shall notify the Air District's Source Test Section, in writing, of the source test protocols and projected test dates at least 30 days prior to testing. (Basis: Regulation 9-7-600)

6. The owner/operator of S-1 shall equip S-1 with a non-resettable totalizing fuel flow meter that measures fuel usage for the boiler. (Basis: Cumulative Increase)

7. The owner/operator of S-1 shall observe the exhaust of S-1 for visible smoke during all periods of operation. If persistent smoke is detected, the owner/operator of the source shall take the necessary corrective actions to stop the emissions. (Basis: Regulation 6-1-301, 6-1-302, and 2-1-403)

8. The owner/operator of S-1 shall use a portable analyzer to measure NO_x and CO concentrations to verify compliance with all applicable emission limits, including but not limited to Part 3, at least once every calendar quarter. (Basis: Regulation 9-7-506)

9. The owner/operator of S-1 shall maintain the following records for a minimum of two (2) years and shall be made available to the Air District upon request. These record-keeping requirements shall not replace the record-keeping requirements contained in any applicable Air District or state regulations.

    a. The owner/operator shall record both the monthly and total consecutive 12-month records for natural gas consumption.
    b. Date of quarterly monitoring conducted per Part 8 and the measured NO_x and CO concentrations and the correction at 3% by O_2 concentration.
    c. All source test data for S-1.
    d. Source test results required by Part 4 of this condition.

    [Basis: Regulation 2-1-403]

End of Conditions

Recommendation

The Air District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of Air District, state and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed source will be located within an overburden community and has triggered an HRA which in turn triggers the public notification requirements of Air District Regulation 2-1-412. After the comments are received and reviewed, the Air District will make a final determination on the permit.

I recommend that the Air District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct for the following:

S-1 Firetube Boiler, Make: Cleaver-Brooks, Model CBEX-E700-250-150, Maximum Firing Rate: 10.206 MMBtu/hr

Prepared By: Emily Schwartz, Air Quality Engineer I