

## Title V Permit Evaluation

**Site Number:** B1670

**Site Name:** Gas Recovery Systems, Inc.

**Site Address:** 1804 Dixon Landing Road, San Jose, CA 95134

### Background:

Gas Recovery Systems, Inc. (GRS) operates several facilities in the Bay Area. This facility, located on Dixon Landing Road in San Jose, includes four rich burn internal combustion engines (S-2, S-3, S-4, and S-5), three lean burn internal combustion engines (S-8, S-9, and S-11), and two storage tanks (S-18 and S-21). The engines are fired on landfill gas exclusively and are used to control some of the landfill gas generated by International Disposal Corporation's Newby Island Landfill. International Disposal Corporation (Facility # A9013) is also subject to Title V permitting requirements because it is a designated facility under the Emission Guidelines (EG) requirements for Municipal Solid Waste Landfills (40 CFR Part 60, Subpart Cc). International Disposal Corporation submitted Major Facility Review Application # 2611 on April 6, 2001. The District is currently evaluating this application.

In accordance with the Federal Plan for Municipal Solid Waste Landfills (40 CFR Part 62, Subpart GGG), the Newby Island Landfill will be required to meet the EG control requirements by October 6, 2002. Since GRS's seven engines (S-2, S-3, S-4, S-5, S-8, S-9, and S-11) are being used to control landfill gas from an EG landfill, these engines will also be required to comply with all applicable EG requirements on the same schedule as the Newby Island Landfill. The District's revised Regulation 8, Rule 34 requirements, which are at least as stringent as the EG requirements, have an earlier compliance date of July 1, 2002.

### Periodic Monitoring:

#### Summary Table(s)

#### Particulate Matter: S-2, S-3, S-4, S-5, S-8, S-9 and S-11

S# & Description	Federally Enforceable Emission Limit Citation	Federally Enforceable Emission Limit	Potential to Emit: tpy	Monitoring
S-2 Rich Burn Internal Combustion Engines	BAAQMD 6-301	Ringelmann 1 and 0.15 grains/dscf	1.42 TPY	Not Recommended
S-3 Rich Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	1.42 TPY	Not Recommended

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S-4 Rich Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	1.42 TPY	Not Recommended
S-5 Rich Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	1.42 TPY	Not Recommended
S-8 Lean Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	2.84 TPY	Not Recommended
S-9 Lean Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	2.84 TPY	Not Recommended
S-11 Lean Burn Internal Combustion Engines	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	2.84 TPY	Not Recommended
All Engines Combined (S-2, S-3, S-4, S-5, S-8, S-9 and S-11)	BAAQMD 6-310	Ringelmann 1 and 0.15 grains/dscf	14.2 TPY	Not Recommended

Sulfur Dioxide: S-2, S-3, S-4, S-5, S-8, S-9 and S-11

<b>S# &amp; Description</b>	<b>Federally Enforceable Emission Limit Citation</b>	<b>Federally Enforceable Emission Limit</b>	<b>Potential to Emit: tpy</b>	<b>Monitoring</b>
S-2 Rich Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits $\leq 0.50$ ppm for 3 minutes $\leq 0.25$ ppm for 60 minutes $\leq 0.05$ ppm for 24 hours	4.35 TPY	Not Recommended

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S-3 Rich Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	4.35 TPY	Not Recommended
S-4 Rich Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	4.35 TPY	Not Recommended
S-5 Rich Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	4.35 TPY	Not Recommended
S-8 Lean Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	8.71 TPY	Not Recommended
S-9 Lean Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	8.71 TPY	Not Recommended
S-11 Lean Burn Internal Combustion Engines	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	8.71 TPY	Not Recommended
All Engines Combined (S-2, S-3, S-4, S-5, S-8, S-9 and S-11)	BAAQMD 9-1-301	Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours	43.53 TPY	Not Recommended

The tables above contain only the limits for which there is no monitoring.

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Discussion

**S-2, S-3, S-4, S-5, S-8, S-9 and S-11: Internal Combustion Engines**

PM: Particulate emissions from internal combustion engines fired on landfill gas are expected to be similar to engines burning natural gas. As with natural gas combustion, visible emissions are not normally associated with the proper combustion of landfill gas. Therefore, periodic monitoring for Ringelmann limits would not be appropriate for these engines.

Using the AP-42 emission factor for landfill gas combustion and a worst case landfill gas heat content of 450 BTU/scf, the particulate emission rate from the engines is expected to be 0.034 gr/dscf at 0% oxygen. The BAAQMD Regulation 6-310 of 0.15 gr/dscf is far above any expected PM emissions. It would therefore not be appropriate to add periodic monitoring for this standard.

SO<sub>2</sub>: This facility will be subject to a federally enforceable limit of 1300 ppmv of total reduced sulfur (TRS) compounds in the landfill gas. This limit will ensure compliance with the BAAQMD and SIP Regulation 9-1-302 emission limit of 300 ppmv of SO<sub>2</sub> in the engine exhaust. Staff has proposed permit conditions that require the landfill gas to be monitored for total reduced sulfur content (on a weekly basis, initially) to ensure compliance with this limit. Sources complying with the 9-1-302 limit are not expected to exceed the ground level concentration limits listed in BAAQMD Regulation 9-1-301. Furthermore, a District source test indicated that the actual concentration of total reduced sulfur compounds in this facility's landfill gas was only 21 ppmv. At 21 ppmv of TRS, maximum SO<sub>2</sub> emissions are 0.23 tons/year and 0.46 tons/year of SO<sub>2</sub> from each rich burn and lean burn engine respectively. Total emissions are 2.30 tons/year of SO<sub>2</sub> from all seven engines combined. Monitoring for ground level SO<sub>2</sub> concentrations in addition to the proposed landfill gas monitoring would not be appropriate for such low levels of SO<sub>2</sub> emissions.

**Permit Shield:**

The applicant requested a permit shield from the area monitoring requirements of Regulation 9, Rule 2. (Regulation 9, Rule 2 is not included in the State Implementation Plan.) The District rule has been revised since the application was submitted and the monitoring that was previously required by Regulation 9-2-501 is no longer required. Therefore, the request is not necessary.

**Alternate Operating Scenario:**

No alternative operating scenarios were requested, and none have been included in the proposed permit.

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**Compliance Status:**

On October 20, 1995, Gas Recovery Systems, Inc. certified that all equipment was operating in compliance. No continuing non-compliance issues have been identified to date. The most current review of the compliance record for this facility is attached.

**Alignment of Information in Application and Proposed Permit:**

In the application, both Gas Recovery Systems, Inc. and the District staff identified numerous rules that apply to this facility. The District staff's findings are detailed in the Title V permit.

Landfill Gas Condensate Storage Tank (S-21) is not included in the Title V application because S-21 permit application was submitted after it. Based on the information provided by the applicant, S-21 is not subject to Regulation 8-5 because the true vapor pressures of the oil layer and water layer are less than 0.2 psia and 0.01 psia respectively. However the tank needs to be permitted because the VOC content is greater than 1% by weight. The tank is subject to Regulation 8-2. VOC emissions from the tank are 0.98 lb/yr and meet the emission requirement of Regulation 8-2-301.

**Emission Calculations:**

Worst case emissions will occur when landfill gas has a low methane content and low heat content. The following emission calculations assume that the landfill gas contains 45% methane and has a heat content of 450 BTU/scf of landfill gas. For landfill gas containing 45% methane, the amount of flue gas generated is estimated to be 4.3949 cubic feet of flue gas per cubic foot of landfill gas at 0% excess oxygen.

PM<sub>10</sub> from Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11)

Emissions Allowed by the Standard in Regulation 6-310

Rich Burn Engines (S-2, S-3, S-4 and S-5)

$$(6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (4.3949 \text{ ft}^3 \text{ flue/ft}^3 \text{ LFG}) *$$

$$(0.15 \text{ grains/ft}^3) / (7000 \text{ grain/lb}) * (24 \text{ hours/day})$$

$$= 33.90 \text{ lbs/day/engine} = 6.19 \text{ tons/year PM per engine}$$

$$(6.19 \text{ tons/year/engine}) * (4 \text{ engines}) = 24.76 \text{ tons/year PM from all rich burn engines combined}$$

Lean Burn Engines (S-8, S-9 and S-11)

$$(13.5 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (4.3949 \text{ ft}^3 \text{ flue/ft}^3 \text{ LFG}) *$$

$$(0.15 \text{ grains/ft}^3) / (7000 \text{ grain/lb}) * (24 \text{ hours/day})$$

$$= 67.81 \text{ lbs/day/engine} = 12.38 \text{ tons/year PM per engine}$$

$$(12.38 \text{ tons/year/engine}) * (3 \text{ engines}) = 37.14 \text{ tons/year PM from all engines combined}$$

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All PM emissions are assumed to be PM<sub>10</sub>.

Total Emissions Allowed from All Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11) = 61.90 tons/year PM<sub>10</sub>

Potential to Emit

From AP-42 Chapter 2.4, Table 2.4-5:

Engine: (48 lbs PM<sub>10</sub>/10<sup>6</sup> dscf methane) \* (0.45 scf methane/scf LFG) / (450 BTU/scf LFG)  
= 0.048 lbs PM<sub>10</sub>/MM BTU

Rich Burn Engines (S-2, S-3, S-4 and S-5)

(6.75 MM BTU/hour/engine)\*(0.048 lbs PM<sub>10</sub>/MM BTU)\*(24 hours/day)

= 7.78 lbs PM<sub>10</sub>/day/engine = 1.42 tons/year PM<sub>10</sub> per engine

(1.42 tons/yr/engine)\*(4 engines) = 5.68 tons/year PM<sub>10</sub> from all rich burn engines combined

Lean Burn Engines (S-8, S-9 and S-11)

(13.5 MM BTU/hour/engine)\*(0.048 lbs PM<sub>10</sub>/MM BTU)\*(24 hours/day)

= 15.55 lbs PM<sub>10</sub>/day/engine = 2.84 tons/year PM<sub>10</sub> per engine

(2.84 tons/yr/engine)\*(3 engines) = 8.52 tons/year PM<sub>10</sub> from all lean burn engines combined

Total Potential to Emit from All Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11) = 14.2 tons/year PM<sub>10</sub>

The ratio of allowable emissions to potential emissions is 4.4 to 1. Therefore, the margin of compliance is high. While it is true that the quality of the AP-42 emission factor is "E", it is presumed that the emission factor contains condensable particulate, while the District standard does not. Therefore, the margin of compliance is higher by an unknown quantity.

SO<sub>2</sub> from Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11)

Emissions Allowed by the Standard in Regulation 9-1-302

As shown below, the federally enforceable emission limit of 300 ppmv of SO<sub>2</sub> in the exhaust gas (BAAQMD Regulation 9-1-302) is equivalent to a total reduced sulfur concentration of 1318 ppmv in the landfill gas. This concentration was rounded down to 1300 ppmv of TRS to establish a federally enforceable concentration limit.

(300 E-6 ft<sup>3</sup> SO<sub>2</sub>/ft<sup>3</sup> flue gas)\*(4.3949 ft<sup>3</sup> flue/ft<sup>3</sup> LFG)\*(1 ft<sup>3</sup> S/1 ft<sup>3</sup> SO<sub>2</sub>)\*(1 ft<sup>3</sup> H<sub>2</sub>S/1 ft<sup>3</sup> S)\*(10<sup>6</sup>)  
= 1318.5 ppmv of total reduced sulfur (TRS) as H<sub>2</sub>S in landfill gas

A concentration limit of 1300 ppmv TRS in the landfill gas will be used as a surrogate for the 300 ppmv SO<sub>2</sub> limit in the combustion gases.

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Rich Burn Engines (S-2, S-3, S-4 and S-5)

$$\begin{aligned} & (6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (1300 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 77.51 \text{ pounds/day SO}_2 \text{ per engine} = 14.15 \text{ tons/year SO}_2 \text{ per engine} \\ & (14.15 \text{ tons/year/engine}) * (4 \text{ engines}) = 56.60 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Lean Burn Engines (S-8, S-9 and S-11)

$$\begin{aligned} & (13.5 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (1300 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 155.02 \text{ pounds/day SO}_2 \text{ per engine} = 28.29 \text{ tons/year SO}_2 \text{ per engine} \\ & (28.29 \text{ tons/year/engine}) * (3 \text{ engines}) = 84.87 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Total Emissions Allowed from All Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11) = 141.47 tons/year SO<sub>2</sub>

Potential to Emit

Although the federally enforceable concentration limit is 1300 ppmv of TRS, the maximum amount of TRS detected in any Bay Area landfill to date is 350 ppmv. Using a statistical analysis on the available data, Bay Area landfill gas is determined to contain no more than 400 ppmv of TRS. This worst case concentration (400 ppmv of TRS) will be used to calculate the maximum potential sulfur dioxide emissions, instead of the federally enforceable concentration limit (1300 ppmv of TRS).

Rich Burn Engines (S-2, S-3, S-4 and S-5)

$$\begin{aligned} & (6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (400 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 23.85 \text{ pounds/day SO}_2 \text{ per engine} = 4.35 \text{ tons/year SO}_2 \text{ per engine} \\ & (4.35 \text{ tons/year/engine}) * (4 \text{ engines}) = 17.40 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Lean Burn Engines (S-8, S-9 and S-11)

$$\begin{aligned} & (13.5 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (400 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 47.70 \text{ pounds/day SO}_2 \text{ per engine} = 8.71 \text{ tons/year SO}_2 \text{ per engine} \\ & (8.71 \text{ tons/year/engine}) * (3 \text{ engines}) = 26.13 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Total Potential to Emit from All Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11) = 43.53 tons/year

The ratio of allowable emissions to potential emissions is 3.25 to 1. Therefore, the margin of compliance is high.

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### Expected Emissions

District source tests indicated a maximum landfill gas sulfur content of 21 ppmv of TRS for this facility.

Rich Burn Engines (S-2, S-3, S-4 and S-5)

$$\begin{aligned} & (6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (21 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 1.26 \text{ pounds/day SO}_2 \text{ per engine} \quad = \quad 0.23 \text{ tons/year SO}_2 \text{ per engine} \\ & (0.23 \text{ tons/year/engine}) * (4 \text{ engines}) \quad = \quad 0.92 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Lean Burn Engines (S-8, S-9 and S-11)

$$\begin{aligned} & (13.5 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (21 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 2.52 \text{ pounds/day SO}_2 \text{ per engine} \quad = \quad 0.46 \text{ tons/year SO}_2 \text{ per engine} \\ & (0.46 \text{ tons/year/engine}) * (3 \text{ engines}) \quad = \quad 1.38 \text{ tons/year SO}_2 \text{ from all engines combined} \end{aligned}$$

Total Potential to Emit from All Engines (S-2, S-3, S-4, S-5, S-8, S-9 and S-11) = 2.30 tons/year

The ratio of allowable emissions to expected emissions is 61.5 to 1. Therefore, the margin of compliance is very high.