

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Socioeconomic Impact Assessment for Proposed Rule 1118.1 – Control of Emissions from Non-Refinery Flares

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EXECUTIVE SUMMARY

A socioeconomic analysis was conducted to assess the potential impacts of Proposed Rule (PR) 1118.1 on the four-county region of Los Angeles, Orange, Riverside, and San Bernardino. A summary of the analysis and findings is presented below.

<p>Elements of Proposed Amendments</p>	<p>PR 1118.1 - Control of Emissions from Non-Refinery Flares will implement, in part, the SCAQMD 2016 AQMP control measure CMB-03 – Emission Reductions from Non-Refinery Flares, and RACT/RACM requirements (see staff report). PR 1118.1 will also facilitate the transition of the NOx RECLAIM program to a command-and-control regulatory structure.</p> <p>PR 1118.1 applies to RECLAIM and non-RECLAIM facilities that flare produced gas, digester gas, landfill gas, and other combustible gases or vapors. PR 1118.1 establishes NOx, CO, and VOC emission limits and provides implementation timeframes while encouraging beneficial use of the combustible gases or vapors. The provisions in PR 1118.1 establish NOx, CO, and VOC emission limits for new and existing flares flaring digester gas, landfill gas, produced gas, and other flare gas.</p> <p>PR 1118.1 focuses on routine flaring by setting flare capacity thresholds and requiring facilities to take action if their flare throughput exceeds these flare capacity thresholds. The provisions in PR 1118.1 promote beneficial use of combustible gases or vapors by allowing existing non-refinery flares to not meet the emission limits required by PR 1118.1 if their usage is reduced below a capacity threshold, respective to the gas being flared.</p> <p>Additionally, PR 1118.1 establishes provisions for monitoring, reporting, and recordkeeping, including requirements for source testing and fuel meters. PR 1118.1 establishes exemptions for closed landfills, along with a few other facilities. PR 1118.1 is expected to reduce 0.18 tons of NOx per day from 2024 onwards.</p>						
<p>Potentially Affected Facilities and Industries</p>	<p style="text-align: center;">PR 1118.1 Facility Counts (Flare Counts)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">All Permitted Non-Refinery Facilities & Flares in SCAQMD</td> <td style="text-align: center;">154 (294)</td> </tr> <tr> <td style="text-align: center;">Not Affected by PR 1118.1</td> <td style="text-align: center;">72 (113)</td> </tr> <tr> <td style="text-align: center;">Potentially Affected by PR 1118.1</td> <td style="text-align: center;">82 (181)</td> </tr> </table> <p>There are 294 flares at 154 facilities subject to PR 1118.1. These 154 facilities are classified under many NAICS codes, with the majority in 211111 (Crude Petroleum and Natural Gas Extraction), 221320 (Sewage Treatment Facilities), 562212 (Solid Waste Landfill). Of these 154 facilities, 79 are located in Los Angeles County, 30 in Orange County, 25 in Riverside</p>	All Permitted Non-Refinery Facilities & Flares in SCAQMD	154 (294)	Not Affected by PR 1118.1	72 (113)	Potentially Affected by PR 1118.1	82 (181)
All Permitted Non-Refinery Facilities & Flares in SCAQMD	154 (294)						
Not Affected by PR 1118.1	72 (113)						
Potentially Affected by PR 1118.1	82 (181)						

	<p>County, and 20 facilities in San Bernardino County. 21 facilities are currently in the NOx RECLAIM program.</p> <p>Of the 154 facilities subject to PR 1118.1, 72 were identified as not needing to take any action to comply with PR 1118.1, because their flares or flare stations meet one of the following conditions in the proposed rule:</p> <ol style="list-style-type: none"> 1) Operate in landfills collecting less than 2,000 MMscf of landfill gas per calendar year and has either stopped accepting waste or is classified by CalRecycle as an Inert Waste Disposal Site or an Asbestos Contaminated Waste Disposal Site; or 2) Are flares with various-location permits; or 3) Combust regeneration gas; or 4) Combust only propane or butane or a combination of propane or butane; or 5) Are classified as facilities flaring gas other than landfill, digester, or produced gas; or 6) Already meet PR 1118.1 emission limits and operate at Title-V facilities which already perform source testing needed to prove meeting PR 1118.1 emission limits. <p>Thus 82 of the 154 facilities subject to PR 1118.1 are facilities staff expects may be affected by adoption of PR 1118.1, with a total of 181 flares possibly affected in some way by adoption of PR 1118.1.</p>								
<p>Assumptions of Analysis</p>	<p style="text-align: center;">PR 1118.1 Potentially Affected Flares by Expected Compliance Method</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Flare Replacement</td> <td style="text-align: center;">23</td> </tr> <tr> <td style="text-align: center;">Fuel Meter Install</td> <td style="text-align: center;">149</td> </tr> <tr> <td style="text-align: center;">Source Testing</td> <td style="text-align: center;">9</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">181</td> </tr> </table> <p>Replacement flares There are 23 flares at 16 facilities which SCAQMD staff expects to be replaced or install beneficial use to comply with PR 1118.1. Equipment and installation costs are expected to result in a one-time cost of \$960,000 on average for each flare.</p> <p>Fuel meters Of the 181 flares affected by PR 1118.1, there are at most 149 flares which SCAQMD staff expects to install fuel meters as a result of PR 1118.1. These fuel meters would be installed to assist in demonstrating their respective flares meet the PR 1118.1 capacity-threshold requirement, allowing the flare to not need replacement as stipulated in PR 1118.1. Fuel meter costs vary widely based upon flare specifications and generally have a base price around \$3,500. Staff conservatively used an average price of</p>	Flare Replacement	23	Fuel Meter Install	149	Source Testing	9	Total	181
Flare Replacement	23								
Fuel Meter Install	149								
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\$7,000 per fuel meter, resulting in the addition of fuel meters as a result of PR 1118.1 costing \$1,043,000.

Source tests
 There are at most seven facilities which SCAQMD staff expects to only perform additional source tests due to adoption of PR 1118.1. These costs come from facilities with flares meeting PR 1118.1 emission limits. These additional source tests will be performed at earliest upon PR 1118.1 adoption and subsequently every five years to ensure the flare is meeting PR 1118.1 emission limits. Each source test is conservatively assumed to cost around \$12,000, resulting in an additional cost of \$84,000 starting in 2019, and every five years thereafter.

Monitoring, reporting, and recordkeeping
 Beyond installation of fuel meters, and performing source testing, staff believes additional costs of monitoring, reporting, and recordkeeping due to PR 1118.1 to be negligible (e.g. labor cost to record fuel-meter data, and maintain and report recorded data).

Permitting
 Facilities replacing their flares to comply with PR 1118.1 are likely to incur increased permitting expenses. Staff believes additional permitting costs due to PR 1118.1 are already included in the one-time and annual costs of operating a new flare, as costs provided to SCAQMD by facilities operating a PR 1118.1 compliant flare list permitting costs.

Compliance Costs

PR 1118.1 Expected Compliance Costs (2019-2045)

Cost Scenario	Total cost if all expenses made in 2018 (millions)	Annualized cost (millions)
High-cost scenario (4% interest rate)	\$74,054,000	\$4.7
Low-cost scenario (1% interest rate)	\$97,478,000	\$4.2

PR 1118.1’s overall compliance cost is expected to be incurred by the landfill, oil and gas, and wastewater treatment sectors. PR 1118.1’s total annualized compliance cost from 2019 - 2045 is expected to range from \$4.2 - \$4.7 million for the low- (1% real interest rate) and high- (4% real interest rate) cost scenarios respectively.

Based on the high-cost scenario, about 98% of the costs of PR 1118.1 stem from purchasing, engineering, installing etc. of new flares. The remaining costs of PR 1118.1 stem from fuel meters and source testing. Additional costs of monitoring, reporting, and recordkeeping and permit modifications are expected to be negligible.

<p>Jobs and Other Socioeconomic Impacts</p>	<p>PR 1118.1 Expected Annual Foregone Jobs (2019-2045)</p>						
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 60%;">Cost Scenario</th> <th style="width: 40%;">Annual foregone jobs (% of SCAB jobs)</th> </tr> </thead> <tbody> <tr> <td>High-cost scenario (4% interest rate)</td> <td>39 (0.0003%)</td> </tr> <tr> <td>Low-cost scenario (1% interest rate)</td> <td>35 (0.0003%)</td> </tr> </tbody> </table>	Cost Scenario	Annual foregone jobs (% of SCAB jobs)	High-cost scenario (4% interest rate)	39 (0.0003%)	Low-cost scenario (1% interest rate)	35 (0.0003%)
Cost Scenario	Annual foregone jobs (% of SCAB jobs)						
High-cost scenario (4% interest rate)	39 (0.0003%)						
Low-cost scenario (1% interest rate)	35 (0.0003%)						
<p>Competitiveness</p>	<p>Based on the above assumptions, the compliance cost of PR 1118.1, and the application of the Regional Economic Models, Inc. (REMI) model, it is projected 35 - 39 jobs will be forgone on average annually from 2019 - 2045 in total across all SCAQMD industries. The projected job forgone impacts represent about 0.0003% of total employment in the four-county region for both the low- and high-cost scenarios. Jobs foregone can come from current jobs lost, or potential future created jobs no longer being created.</p> <p>The landfill, oil and gas, and wastewater treatment facilities industries are expected to forego five jobs annually from 2019 - 2045 as a result of PR 1118.1 being adopted.</p> <p>Due to most expenditures from PR 1118.1 expected to be made outside the South Coast Air Basin, PR 1118.1 is expected to reduce disposable income in the local economy, dampening the demand for goods and services in the local economy. These inter-region effects are expected to result in jobs forgone projected in sectors such as construction (NAICS 23), food services and drinking places (NAICS 722), and state and local government (NAICS 92). The remainder of the projected reduction in employment would be across all major sectors of the economy due to secondary and induced impacts of PR 1118.1.</p> <p>As a result of PR 1118.1 being approved, it is projected the landfill, oil and gas, and wastewater treatment sectors would experience a rise in their relative costs of production of 0.082% - 0.093%, 0.008% - 0.009%, and 0.039% - 0.043% in 2025 for the low and high cost scenarios, respectively. The landfill, oil and gas, and wastewater treatment sectors are also expected to experience an increase in their delivered prices by 0.062% - 0.070%, 0.002% - 0.002%, and 0.015% - 0.016% in 2025 for the low and high cost scenarios. These price and cost increases are very small relative to average inflation of industrial equipment costs, which was 2.3% from 1999-2018.</p> <p>Delivered prices that a facility may charge for specific goods or services may increase at a greater rate than this, allowing incurred costs to be passed through to downstream industries and end-users. The remaining sectors considered unaffected by PR 1118.1 are likely to experience increases in the relative cost of production and relative delivered price with respect to their counterparts in the rest of the U.S.</p>						
<p>RECLAIM: Potential NOx</p>	<p>There are 21 facilities potentially affected by PR 1118.1 in the NOx RECLAIM trading program. If PR 1118.1 is adopted, none of the 21 potentially affected facilities are expected to receive an initial determination</p>						

RTC Market Impacts	notification. These facilities have additional permitted RECLAIM NO _x source equipment subject to command-and-control rules planned for future adoption or amendment.
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INTRODUCTION

Proposed Rule 1118.1 (PR 1118.1) - Control of Emissions from Non-Refinery Flares will implement, in part, the South Coast Air Quality Management District (SCAQMD) 2016 Air Quality Management Plan (AQMP) control measure CMB-03 – Emission Reductions from Non-Refinery Flares, and RACT/RACM requirements (see staff report). PR 1118.1 will also facilitate the transition of the nitrogen oxide (NO_x) RECLAIM program to a command-and-control regulatory structure.¹ PR 1118.1 applies to RECLAIM and non-RECLAIM non-refinery facilities, primarily landfills, oil and gas facilities, and wastewater-treatment facilities.

RACT/RACM requirements

PR 1118.1 establishes NO_x, carbon monoxide (CO), and volatile organic compound (VOC) emission limits for non-refinery flares. Additionally, PR 1118.1 establishes provisions for monitoring, reporting, and recordkeeping, including requirements for source testing and installing fuel meters. PR 1118.1 establishes several exemptions, including one covering most closed landfills, and others for flares that emit less than 30 lbs. of NO_x per month or operate less than 200 hours per calendar year.

PR 1118.1 is expected to reduce 0.18 tons of NO_x per day from 2024 onwards.

LEGISLATIVE MANDATES

The socioeconomic impact assessments at SCAQMD have evolved over time to reflect the benefits and costs of regulations. The legal mandates directly related to the assessment of the proposed amended rule include a SCAQMD Governing Board resolution and various sections of the California Health & Safety Code, summarized below.

SCAQMD Governing Board Resolution

On March 17, 1989 the SCAQMD Governing Board adopted a resolution that calls for an economic analysis of regulatory impacts that includes the following elements:

- Affected industries
- Range of probable costs
- Cost-effectiveness of control alternatives
- Public health benefits

Health & Safety Code Requirements

The state legislature adopted legislation that reinforces and expands the Governing Board resolutions for socioeconomic impact assessments. Health and Safety Code sections 40440.8(a) and (b), which became effective on January 1, 1991, require a socioeconomic analysis be prepared

¹ Whenever RECLAIM is mentioned in this report, the nitrogen oxide (NO_x) RECLAIM program is meant, and does not include the sulfur oxide (SO_x) RECLAIM program.

for any proposed rule or rule amendment that "will significantly affect air quality or emissions limitations."

Specifically, the scope of the analysis should include:

- Type of affected industries
- Impact on employment and the regional economy
- Range of probable costs, including those to industry
- Availability and cost-effectiveness of alternatives to the rule
- Emission reduction potential
- Necessity of adopting, amending or repealing the rule in order to attain state and federal ambient air quality standards

Health and Safety Code section 40728.5, which became effective on January 1, 1992, requires the SCAQMD Governing Board to actively consider the socioeconomic impacts of regulations and make a good faith effort to minimize adverse socioeconomic impacts. It also expands socioeconomic impact assessments to include small business impacts, specifically:

- Type of industries or business affected, including small businesses
- Range of probable costs, including costs to industry or business, including small business

Finally, Health and Safety Code section 40920.6, which became effective on January 1, 1996, requires incremental cost-effectiveness be performed for a proposed rule or amendment that imposes Best Available Retrofit Control Technology or "all feasible measures" requirements relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors.

Incremental cost-effectiveness is defined as the difference in costs divided by the difference in emission reductions between a control alternative and the next more stringent control alternative. The necessity analysis and the analysis of control alternatives and their incremental cost-effectiveness are presented in the PR 1118.1 Staff Report prepared for this proposed rule. All other elements for socioeconomic analyses required for PR 1118.1 described above are included in this assessment.

AFFECTED INDUSTRIES

Of the 154 facilities subject to PR 1118.1 there are 20 open landfills, 39 closed landfills, 29 wastewater treatment facilities, 36 oil and gas facilities, and 30 other facilities providing various services subject to PR 1118.1. The majority of PR 1118.1 facilities are classified under North American Industry Classification System (NAICS) codes 211111 (Crude Petroleum and Natural Gas Extraction), 221320 (Sewage Treatment Facilities), 562212 (Solid Waste Landfill).² Of these 154 facilities, 79 are located in Los Angeles County, 30 in Orange County, 25 in Riverside County,

² NAICS codes used in this report are from the 2012 coding system.

and 20 in San Bernardino County. Of the 154 affected facilities, 21 facilities are currently in the NO_x RECLAIM program.

Of the 154 facilities with 294 flares subject to PR 1118.1, 80 flares at 45 facilities are expected to be exempt as described in the bullets below:

- Seventy flares at 37 closed landfills expected to collect less than 2,000 MMscf of landfill gas per calendar year.
- One flare at one open landfill classified by CalRecycle as an Inert Waste Disposal Site or an Asbestos Contaminated Waste Disposal Site.
- Four flares at three with various-location permits.
- Five flares at four facilities combusting regeneration gas not already exempted due to being closed landfills.

Of the remaining 214 flares at 110 facilities subject to PR 1118.1,³ 24 facilities are expected to incur no additional costs from 25 flares due to being classified as facilities flaring gas other than digester, landfill, or produced gas. An additional seven facilities have in total eight flares from which they are expected to incur no additional costs from PR 1118.1 adoption due to already meeting PR 1118.1 emission requirements and already perform source testing required by PR 1118.1 due to being Title-V facilities.

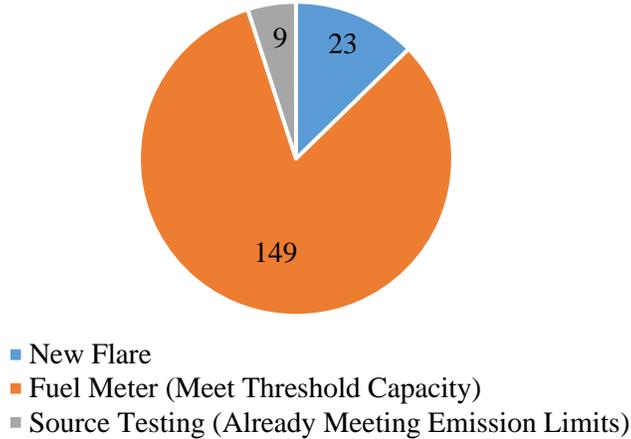
For the duration of this report the remaining 181 flares at 82 facilities are considered “potentially affected flares” and “potentially affected facilities” respectively.⁴ Potentially affected facilities are expected to comply with PR 1118.1 in the manner described below (also displayed in Figure 1):

- **Flare installation:** Twenty-three flares are expected to be replaced at 16 facilities incurring a one-time cost of purchasing and installing the flare, along with annual operation and maintenance costs.
- **Fuel meters (monitoring):** One-hundred-forty-nine flares at 67 facilities are expected to have fuel meters installed to prove their flares meet the PR 1118.1 capacity thresholds incurring one-time costs of purchase and installation of a fuel meter.
- **Source testing (monitoring):** Two flares at two facilities are expected to comply with the PR 1118.1 low-pollution exemption, incurring an additional source-test cost every five years beginning upon date of PR 1118.1 adoption. Additionally, seven flares at five facilities are expected to require additional source testing due to those flares meeting the Table 1 emission limits, but the facilities are assumed to not already be performing source testing due to not being Title-V facilities.

³ Forty-four facilities have only exempt flares. One facility has some exempt and non-exempt flares.

⁴ Facility counts not simply reduced as some facilities have flares potentially unaffected and potentially affected by PR 1118.1.

Figure 1: Distribution of Potentially Affected Flares by PR 1118.1 Compliance Method



Any additional reporting, and recordkeeping requirements imposed by PR 1118.1 are expected to impose negligible costs. Any potential administrative burden from these requirements is also lessened because all 82 potentially affected facilities are eligible for extensions for flare throughput reduction or flare replacement submitted to and reviewed by the SCAQMD Executive Officer.

Figure 2 presents the 82 potentially affected facilities of PR 1118.1 by process. As seen in Figure 2, 34 operate in the oil & gas sector (about 41%) and flare produced gas, 26 operate in the wastewater treatment sector (about 32%) and flare digester gas, 16 operate as landfills (about 20%) and flare landfill gas, and six operate in various sectors (about 7%) and flare digester gas.

Figure 2: Distribution of Potentially Affected Facilities by Process

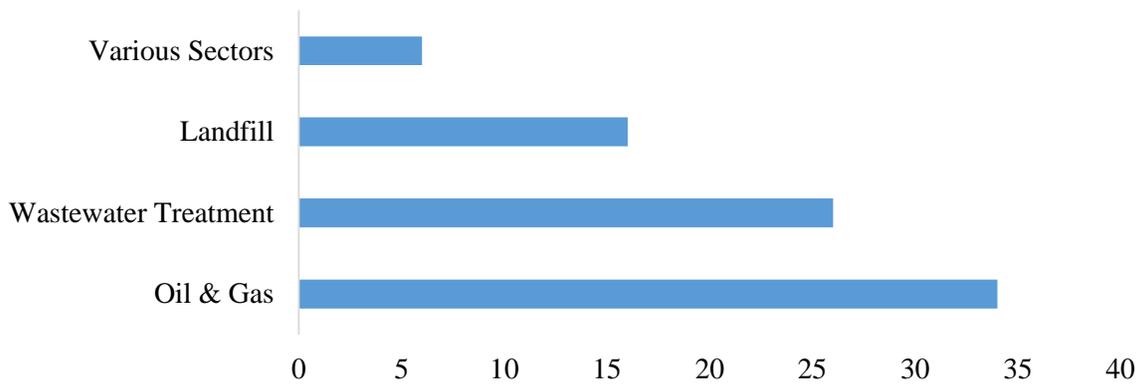


Table 1 presents the 82 potentially affected facilities of PR 1118.1 by NAICS code. As seen in Table 1, 33 (about 40%) are classified under crude petroleum and natural gas extraction (NAICS 211111), 25 (about 30%) under sewage treatment (NAICS 221320), 15 (about 18%) under solid-waste landfills, and the remaining nine (about 11%) are classified as other industries.

Small Businesses

SCAQMD defines a “small business” in Rule 102, for purposes of fees, as one which employs 10 or fewer persons and which earns less than \$500,000 in gross annual receipts. SCAQMD also

defines “small business” for the purpose of qualifying for access to services from SCAQMD’s Small Business Assistance Office as a business with an annual receipt of \$5 million or less, or with 100 or fewer employees. In addition to SCAQMD’s definition of a small business, the federal Clean Air Act Amendments (CAAA) of 1990 and the federal Small Business Administration (SBA) also provide definitions of a small business.

The CAAA classifies a business as a “small business stationary source” if it: (1) employs 100 or fewer employees, (2) emits less than 10 tons per year of any single pollutant and less than 20 tons per year of all pollutants, and (3) is a small business as defined under the federal Small Business Act ([15 U.S.C. Sec. 631, et seq.](#)). The SBA definitions of small businesses vary by six-digit North American Industrial Classification System (NAICS) codes. In general terms, a small business must have no more than 500 employees for most manufacturing industries, and no more than \$7 million in average annual receipts for most nonmanufacturing industries.⁵

Table 1: PR 1118.1 Potentially Affected Facilities by Industry

NAICS	Facility Count	Industry Description
211111	33	Crude Petroleum and Natural Gas Extraction
221320	25	Sewage Treatment Facilities
562212	15	Solid Waste Landfill
312120	2	Breweries
562219	2	Other Nonhazardous Waste Treatment and Disposal
213111	1	Drilling Oil and Gas Wells
221112	1	Fossil Fuel Electric Power Generation
311920	1	Coffee and Tea Manufacturing
311991	1	Perishable Prepared Food Manufacturing
445110	1	Supermarkets and Other Grocery (except Convenience) Stores
Total	82	

Facilities meeting the following categories are considered small businesses by SBA:

- In landfill industry (NAICS 562212) earning less than \$38.5 million average annual revenue.
- In oil and gas industry (NAICS 211111) with fewer than 1,250 employees.
- In wastewater treatment industry (NAICS 221320) earning less than \$20.5 million average annual revenue.

Of the affected landfill, oil and gas, and wastewater treatment facilities potentially affected by PR 1118.1, staff believes 20 to be public utilities. Information on sales and employees for 57 of the remaining 62 facilities were available in the 2018 Dun and Bradstreet Enterprise Database, and their small business status was determined as follows:

⁵ The latest SBA definition of small businesses by industry can be found at: <http://www.sba.gov/content/table-small-business-size-standards>.

- Under SCAQMD’s definition of small business in Rule 102, staff estimates 20 small businesses affected by PR 1118.1.
- Under the SBA definitions of small business, staff estimates 42 small businesses affected by PR 1118.1.
- Under the CAAA definition of small business, staff estimates 41 small businesses affected by PR 1118.1.

COMPLIANCE COST

Methods and Sources of Data

To estimate meaningful costs associated with any rule, one must decide on a relevant time horizon over which to estimate the rule’s costs. This analysis considers the cost of this rule, PR 1118.1, from 2019-2045, as some facilities are expected to install new flares due to PR 1118.1 by 2021 at the earliest, and those flares are expected to have a 25-year life expectancy.

The main requirements of PR 1118.1 having cost impacts for potentially affected facilities include one-time costs and annual recurring costs. The one-time costs include capital and installation costs for flares and fuel meters. Annual recurring costs of PR 1118.1 include additional source testing for new flares and also to determine the heating value needed to demonstrate compliance with the low-emission exemption (less than 30 lbs. NOx per month) in PR 1118.1.

Staff used the following sources to estimate costs of capital, installation, and operating and maintenance of flares and fuel meters, as well as source testing:

- 1) Actual and quoted costs from facilities within the PR 1118.1 universe (used to estimate all costs considered).
- 2) Vendor cost estimates for source tests and fuel meters (used to verify source-test and fuel-meter costs used in this report are conservative estimates).

Costs for New Flare Installations

Of the 82 potentially affected facilities, only 16 were identified as candidates for installing new flares to comply with PR 1118.1. Required modifications (and associated costs) to flaring units in order to meet the NOx, CO, and VOC concentration limits in PR 1118.1 are detailed below. There are 23 flares located at 16 facilities that are expected to be replaced in order to comply with PR 1118.1.

Based on equipment and installation costs of flares that comply with PR 1118.1 provided to the SCAQMD by PR 1118.1 universe facilities, each replaced flare is expected to result in a one-time capital cost of \$1.5 million on average.⁶ Installation of new flares is expected to raise a facility’s average annual cost, but is hard to estimate. Annual costs to operate flares complying with PR 1118.1 emissions limits were provided by several facilities within the PR 1118.1 universe, but not

⁶ This includes costs for flare purchase, installation, engineering, source testing, permitting, etc. One-time capital cost estimates provided to SCAQMD ranged from around \$230,000 to \$2,573,000.

all were broken down by specific cost (e.g. electricity, permitting, calibration, etc.). To provide conservative annual cost estimates of replacing a flare due to adoption of PR 1118.1, it is assumed the flare being replaced had an annual operating cost of \$0. Therefore each replaced flare is expected to increase a facility's average annual cost around \$120,000.⁷

Some facilities assumed to replace an existing flare might be exempt from doing so under the PR 1118.1 low-use exemption (flare used less than 200 hours per year). Since timed flare usage has historically not been reported to SCAQMD, nor was it gathered in development of PR 1118.1, this report assumes no facility meets this exemption. This further amplifies the conservative nature of this report's cost estimates.

Costs for Source Testing and Fuel Meters

There are nine flares at seven facilities expected to comply with PR 1118.1 through source testing to either prove they meet the low-emission exemption (emit less than 30 lbs. NO_x per month) or prove they meet PR 1118.1 Table-1 emission limits.⁸ To do so, each facility is expected to perform source testing every five years beginning in the year of PR 1118.1 adoption. Source testing is conservatively estimated to cost \$12,000 per flare.⁹

There are 149 flares at 67 facilities expected to comply with PR 1118.1 by meeting their industry's respective flare capacity threshold. In order to prove a flare meets its respective PR 1118.1 capacity threshold, its facility must provide the SCAQMD with flow readings from an installed fuel meter for each flare or flare station. To be conservative, it is assumed all 149 flares are individual flares and do not have a fuel meter as of rule adoption. Purchase and installation of each fuel meter is expected to cost \$7,000 on average.¹⁰

Miscellaneous Costs

Facilities replacing their flares to comply with PR 1118.1 are likely to incur increased permitting expenses. Staff believes additional permitting costs due to PR 1118.1 are already included in the one-time and annual costs of operating a new flare, as costs provided to SCAQMD by facilities operating a PR 1118.1 compliant flare list permitting costs.

Six flares at six facilities in the oil and gas industry are expected to install new flares due to PR 1118.1 adoption. PR 1118.1 requires annual usage to be no greater than 10% of their prior two-year average for any modified, replaced, or relocated flare at oil and gas facilities with estimated annual emissions of four tons or more of sulfur oxides, VOCs, NO_x, specific organics, or particulate matter, or emissions of 100 tons per year or more of carbon monoxide. Staff believes this requirement, and its subsequent recordkeeping requirements, imposes no additional costs as the facilities affected by it already report annual usage to the SCAQMD.

⁷ Annual cost estimates of new flare operation provided to SCAQMD ranged from around \$19,000 to \$306,000.

⁸ This source testing is assumed to be additional due to PR 1118.1 as staff believes non-Title-V facilities with flares meeting the PR 1118.1 Table-1 emission limits are not required to perform source testing.

⁹ SCAQMD reached out to several vendors for cost estimates on source testing. On average, source testing required to comply with the low-emissions exemption costs around \$5,000. \$12,000 is used as a conservative source-testing cost estimate, and was provided to SCAQMD by one facility expected to comply with PR 1118.1.

¹⁰ This value comes from a quote provided to the SCAQMD from the City of Riverside. Staff research of fuel meters currently sold show base prices for fuel meters around \$3,500.

Cost Summary

Table 2 presents the distribution of overall predicted costs of PR 1118.1 by select cost categories. The majority of predicted costs, about \$2.6 million annually, is attributed to annual operation and maintenance of replaced flares. The one-time costs associated with flares, e.g. flare purchase, engineering, installation, etc., is estimated to be \$1.5 - \$2.0 million annually for the low- and high-cost scenarios respectively. The low-cost scenario assumes a real interest rate of 1%, while the high-cost scenario assumes a 4% real interest rate.¹¹ The remaining costs associated with fuel meters is estimated at about \$39,000 annually. The average annual cost of PR 1118.1 is estimated to be \$4.2 - \$4.7 million between 2019 and 2045, for the low- and high-cost scenarios respectively.

Table 3 presents total and average annual compliance costs of PR 1118.1 by industry types. The majority of the cost is expected to be incurred by landfills (\$3.7-\$4.2 million or 88% - 89% for the low- and high-cost scenarios respectively). The majority of the remaining cost is expected to be incurred by oil and gas facilities (\$355,000 - \$420,000 or 8.5% - 8.9% for the low- and high-cost scenarios) and wastewater treatment facilities (\$136,000 - \$146,000 or about 3% for both low- and high-cost scenarios).¹²

Table 4 presents the cost-effectiveness of PR 1118.1, estimated at \$45,000-\$59,000 based on the discount cash flow (DCF) method.

Table 2: Total and Average Annual Cost of PR 1118.1 by Cost Category

Cost Categories	Present Worth Value (2018)		Annual Average (2019-2045)	
	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
One-Time Cost				
Flare replacement (includes all associated costs, e.g. flare, engineering, installation, construction, permitting, source testing, etc.)	\$34,441,000	\$31,545,000	\$1,477,000	\$2,022,000
Fuel meters	\$1,033,000	\$1,003,000	\$39,000	\$39,000
Recurring Costs				
Additional operation and maintenance of replaced flares	\$61,413,000	\$41,086,000	\$2,634,000	\$2,634,000
Additional source testing	\$591,000	\$419,000	\$25,000	\$25,000
Total	\$97,478,000	\$74,054,000	\$4,175,000	\$4,720,000

Note: Values rounded to nearest thousand dollars.

¹¹ Higher real interest rates increase the annualized value of one-time expenses by assuming payments made for capital after its purchase are increasingly less valuable relative to a payment made in the capital's purchase year.

¹² Percentages do not add to 100%. The remaining costs are borne by other industries listed in Table 1.

Table 3: Projected Total and Average Annual Compliance Costs by Industry for Potentially Affected Facilities

Industry description	NAICS Codes	Present Worth Value (2018)		Average Annual Costs (2019-2045)	
		1% Discount Rate	4% Discount Rate	1% Discount Rate	4% Discount Rate
Oil and gas extraction	2111	\$8,318,000	\$6,669,000	\$355,000	\$420,000
Support activities for mining	2131	\$7,000	\$7,000	< \$500	< \$500
Water, sewage, and other systems	2213	\$3,221,000	\$2,423,000	\$136,000	\$146,000
Other food manufacturing	3119	\$14,000	\$13,000	\$1,000	\$1,000
Beverage manufacturing	3121	\$14,000	\$13,000	\$1,000	\$1,000
Retail trade	4451	\$7,000	\$7,000	< \$500	< \$500
Waste management and remediation services	5622	\$85,897,000	\$64,922,000	\$3,682,000	\$4,152,000
Total		\$97,478,000	\$74,054,000	\$4,175,000	\$4,720,000

Note: Adding all industry values may not add to total amount due to rounding. “< \$500” indicates the estimated value is less than \$500.

Table 4: Cost-Effectiveness

Cost scenario	DCF (\$/ton)
4% discount and real interest rate	\$45,000
1% discount and real interest rate	\$59,000

JOBS AND OTHER SOCIOECONOMIC IMPACTS

The REMI model (PI+ v2.2.8) was used to assess the total socioeconomic impacts of the regulatory change from PR 1118.1.¹³ The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino, and for each county, it is comprised of five interrelated blocks: (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares.¹⁴

The assessment herein is performed relative to a baseline (“business as usual”) where PR 1118.1 would not be implemented. Adoption of PR 1118.1 would create a regulatory scenario under which

¹³ Regional Economic Modeling Inc. (REMI). Policy Insight® for the South Coast Area (160-sector model). Version 2.2.8, 2018.

¹⁴ Within each county, producers are made up of 156 private non-farm industries and sectors, three government sectors, and a farm sector. Trade flows are captured between sectors as well as across the four counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration. (For details, please refer to REMI online documentation at <http://www.remi.com/products/pi>.)

the potentially affected facilities would incur average annual compliance costs totaling \$3.9 - \$4.5 million for low- and high-cost scenarios respectively. Direct effects of proposed rules/amendments must be estimated and used as inputs into the REMI PI+ model in order for the model to assess secondary and induced impacts for all actors in the four-county economy on an annual basis and across a user-defined horizon (2019 - 2045). Direct effects of PR 1118.1 include additional costs to the potentially affected facilities and additional sales by local vendors of equipment, devices, or services supplying the necessary goods/services to help the potentially affected facilities meet the proposed requirements of PR 1118.1.

While compliance expenditures may increase the cost of doing business for affected facilities, the purchase and installation of additional equipment combined with spending on operating and maintenance, may increase sales in other sectors. Table 5 lists the industry sectors modeled in REMI PI+ that would either incur a cost or benefit from the compliance expenditures.¹⁵

Table 5: Industries Incurring Costs or Benefits from PR 1118.1 Compliance

Source of Compliance Costs	REMI Industries Incurring Compliance Costs (NAICS)	REMI Industries Benefitting from Compliance Spending (NAICS)
Flare Replacement	Landfills (562); Oil and Gas (211); Wastewater Treatment (2213);	<i>One-time Capital Cost:</i> Retail (44-45), Wholesale (42)
Fuel meters		<i>One-time Capital Cost:</i> Retail (44-45), Wholesale (42)
Source testing		<i>Recurring Cost:</i> Management, scientific, and technical consulting services (5416)
Operation and maintenance of replaced flares		<i>Recurring Cost:</i> Retail (44-45), Wholesale (42)

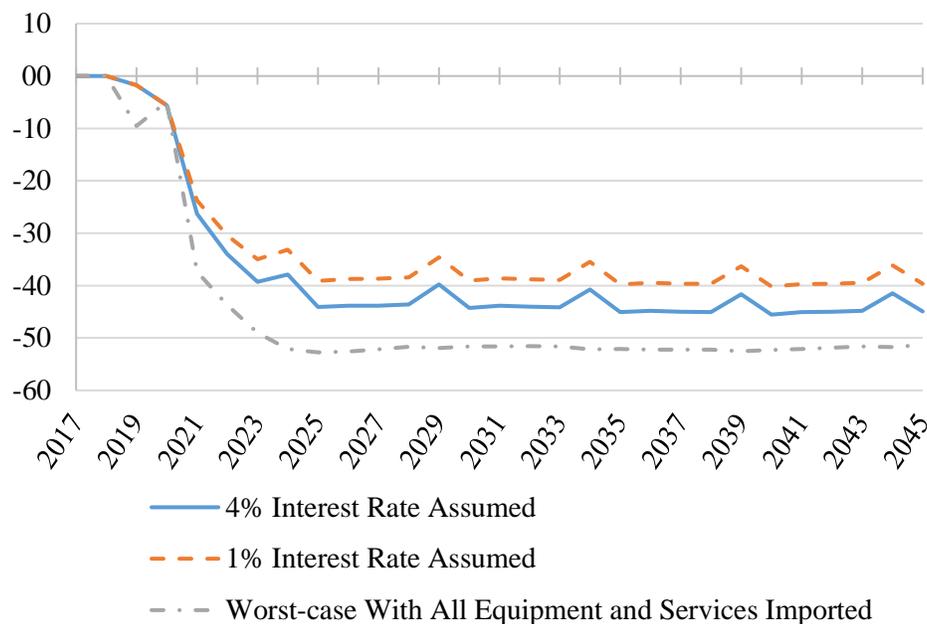
Given the nature of data provided to SCAQMD from PR 1118.1 facilities, it is hard to distinguish the specific costs associated with flare replacement and annual operation and maintenance of replaced flares. Moreover, many flare-making and fuel-meter companies are headquartered outside

¹⁵ Improved public health due to reduced air pollution emissions may also result in a positive effect on worker productivity and other economic factors. However, public health benefit assessment requires the modeling of air quality improvements. Current air-quality modeling employed by SCAQMD performs poorly with “small” changes in air pollution, e.g. less than 10 tons per day, in that such air-pollution changes are hard to distinguish from random variation in the model.

the SCAQMD.¹⁶ Therefore, it is assumed 100% of source-testing costs are supplied by professional service companies within the SCAQMD, and 8% of all flare and fuel-meter expenses are attributed to retail and wholesale companies within the SCAQMD to account for local installation and engineering costs (for 16% total).

As presented in Figure 3, PR 1118.1 is expected to result in an average of 35 - 39 jobs foregone annually from 2019 - 2045 for the low- and high-cost scenarios respectively. The projected job impacts represent about 0.0003% of total employment in the four-county region for both the low- and high-cost scenarios. A “worst-case” scenario, where all purchases made due to PR 1118.1 went to suppliers outside the four-county region, resulted in approximately 48 jobs on average expected to be foregone annually from 2019 - 2045. Reductions in foregone jobs are expected every five years starting in 2019 due to additional source testing.¹⁷

Figure 3: Projected Regional Foregone Jobs, 2019 - 2045



Jobs foregone can come from currently existing jobs or future new jobs. Figure 4 plots predicted foregone jobs, baseline jobs, and total jobs following adoption of PR 1118.1 from 2017 – 2045 for the high-cost scenario. Figure 4 makes clear the predicted job impacts from PR 1118.1 are small relative to the total predicted jobs, and that jobs can be foregone without someone currently employed losing their job.

¹⁶ Information from SCAQMD staff familiar with industries covered by PR 1118.1. Some examples confirming this are flares from Aereon (Princeton, NJ) and John Zink (Tulsa, OK), and fuel meters from GE (headquarters in Boston, MA) and Emerson (headquarters in St. Louis, MO).

¹⁷ Source testing would be necessary for facilities proving their flares meet PR 1118.1 emission rate requirements. Some facilities may delay source testing due to having performed one within five years prior to PR 1118.1 adoption. To be conservative, all facilities expected to perform source testing due so upon rule adoption.

Figure 4: Projected Regional Job Impact, 2017 – 2045 (High-Cost Scenario)

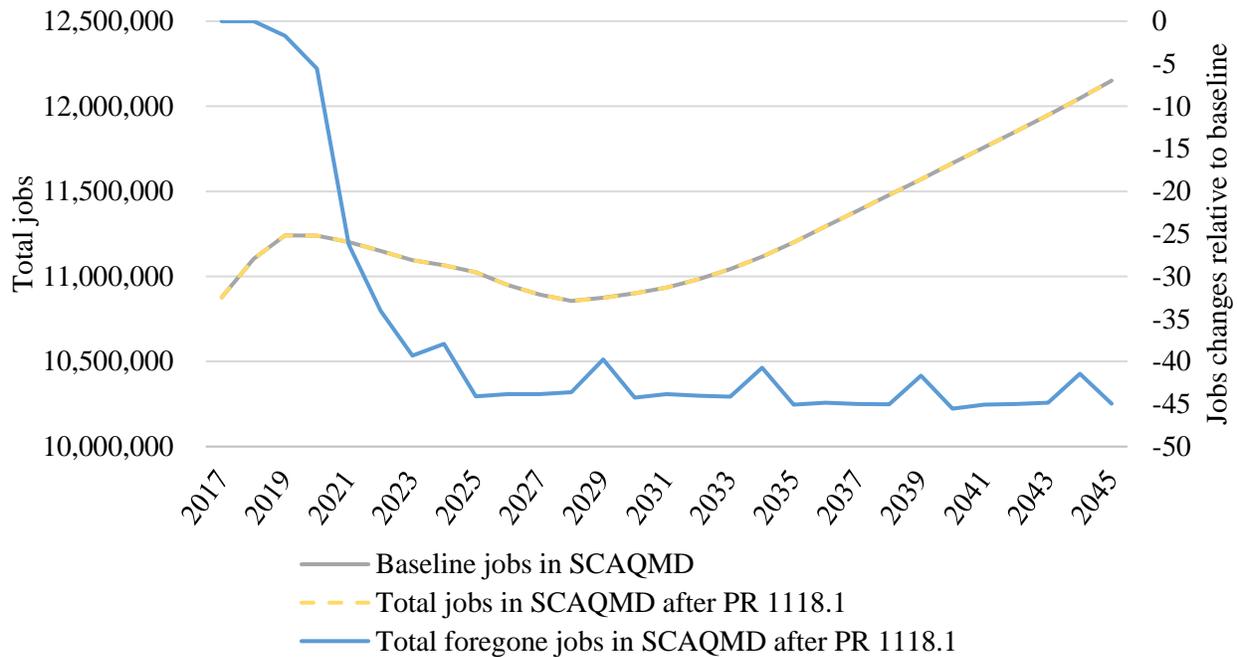


Table 6 presents expected job impacts of PR 1118.1 for the top 10 industries with negative job impacts, one industry with expected positive job impacts, and the remaining industries grouped together. Jobs are expected to be foregone in the overall economy throughout the time period considered (2019 - 2045). Years 2024 and 2029 are displayed to make clear the every-five-year positive job impacts from year of adoption of PR 1118.1 in the management, scientific, and technical consulting services sector (NAICS 5416) due to additional source testing.

Although the landfill, oil and gas, and wastewater treatment sectors would bear most of the estimated total compliance costs of PR 1118.1, the job impacts projected for these industries are relatively small, with an estimated average of six jobs foregone annually between 2019 and 2045. Staff believes this to be reasonable, as the landfill, oil and gas, and wastewater treatment sectors are likely more capital intensive than many other industries in the four-county region. The remainder of the projected reduction in employment would be across all major sectors of the economy from secondary and induced impacts of PR 1118.1.¹⁸

Competitiveness

The additional cost brought on by PR 1118.1 would increase the cost of services rendered by the affected industries in the region. The magnitude of the impact depends on the size, diversification, and infrastructure in a local economy as well as interactions among industries. A large, diversified, and resourceful economy would absorb the impact described above with relative ease.

¹⁸ Secondary impacts on jobs are changes in jobs to supplying industries of the affected industries, while induced impacts on jobs are changes in jobs due to overall disposable income changes in the SCAQMD economy.

Table 6: Job Impacts of PR 1118.1 (High-Cost Scenario)

Industries (NAICS)	2019	2024	2029	2035	2045	Average Annual Job Changes (2019 - 2045)	Average Annual Baseline (2019 - 2045)	% Change from Baseline Jobs
Construction (23)	-2	-8	-5	-4	-3	-5	472,000	-0.0010%
Waste management and remediation services (562)	0	-3	-4	-4	-4	-4	22,000	-0.0167%
State and Local Government (92)	0	-3	-3	-3	-3	-3	908,000	-0.0003%
Food services and drinking places (722)	0	-2	-3	-3	-3	-3	731,000	-0.0004%
Real estate (531)	0	-2	-2	-2	-2	-2	576,000	-0.0003%
Retail trade (44-45)	0	-1	-1	-2	-2	-1	986,000	-0.0001%
Oil and gas extraction (211)	0	-1	-2	-2	-2	-1	23,000	-0.0060%
Offices of health practitioners (6211-6213)	0	-1	-1	-2	-2	-1	428,000	-0.0003%
Transit and ground passenger transportation (485)	0	-1	-2	-2	-2	-1	103,000	-0.0014%
Individual and family services; Community and vocational rehabilitation services (6241-6243)	0	-1	-1	-1	-1	-1	396,000	-0.0003%
Management, scientific, and technical consulting services (5416)	2	2	2	-1	-1	0	137,000	0.0000%
Other industries	-2	-16	-17	-20	-20	-17	6,511,000	-0.0003%
Total	-02	-38	-40	-45	-45	-39	11,294,000	-0.0003%

Note: Adding all industry values may not add to total amount due to rounding.

Changes in production/service costs would affect prices of goods produced locally. The relative delivered price of a good is based on its production cost and the transportation cost of delivering the good to where it is consumed or used. The average price of a good at the place of use reflects prices of the good produced locally and imported elsewhere.

It is projected that the landfill, oil and gas, and wastewater treatment sectors, which contain most of the affected facilities, would experience a rise in their relative costs of production of 0.082% - 0.093%, 0.008% - 0.009%, and 0.039% - 0.043% in 2025 for the low- and high-cost scenarios,

respectively. The landfill, oil and gas, and wastewater treatment sectors are also expected to experience an increase in their delivered prices by 0.062% - 0.070%, 0.002% - 0.002%, and 0.015% - 0.016% in 2025 for the low- and high-cost scenarios respectively.

Delivered prices a facility may charge for specific goods or services may increase at a greater rate than predicted, allowing incurred costs to be passed through to downstream industries and end-users. Due to the increased costs imposed by PR 1118.1, the remaining sectors are also likely to experience increases in the relative cost of production and relative delivered price with respect to their counterparts in the rest of the U.S.

Potential NOx RTC Market Impacts

There are 21 facilities potentially affected by PR 1118.1 in the NOx RECLAIM trading program. If PR 1118.1 is adopted, none of the 21 potentially affected facilities are expected to receive an initial determination notification. These facilities have additional permitted RECLAIM NOx source equipment subject to command-and-control rules planned for future adoption or amendment.