Proposed Amended Rule 1173 - *Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants*

PUBLIC WORKSHOP
JULY 26, 2024 – 11:00 AM

Zoom Meeting: https://scaqmd.zoom.us/j/95683547797
Meeting ID: 956 8354 7797

Agenda

- Background
- Proposed Amended Rule (PAR) 1173
- Impact Assessments
- Next Steps

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Background

Source: https://www.hpc-industrial.com

Source: https://flir.com

- Rule development was initiated in response to:
  - Objectives in the Wilmington, Carson, West Long Beach (WCWLB) Community Emission Reduction Plan (CERP)
  - Partially implement control measure FUG-01 – *Improved Leak Detection and Repair (VOC)* in the 2022 Air Quality Management Plan (AQMP)
- The WCWLB CERP and 2022 AQMP identify and commit improved leak detection requirements in South Coast AQMD rules

Contingency Measures

- Partially satisfy Clear Air Act contingency requirements for applicable ozone National Ambient Air Quality Standards (NAAQS) in the South Coast AQMD's jurisdiction
- Contingency measures (CMs) implemented if U.S. EPA determines that South Coast AQMD has failed:
  - To meet a reasonable further progress (RFP) milestone, or
  - To attain an ozone NAAQS

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Subdivision (a) *Purpose* & Throughout

Subdivision (a) *Purpose*

- Updated to incorporate reference to contingency measures

Throughout the Rule

- Updated to align with current rulewriting style

Additions and Deletions to (c) *Definitions*

- **10 new definitions added**
  - *Atmospheric Process PRD*
  - *Compressor Seal*
  - *Connector*
  - *Contingency Measure (CM)*
  - *Flange*
  - *Optical Gas Imaging (OGI)*
  - *Pump Seal*
  - *South Coast Air Basin*
  - *Visible Leak*
  - *Visible Vapors*

- **Three (3) definitions deleted**
  - *Facility*
  - *Field Gas*
  - *Process PRD*

Key Modifications to (c) *Definitions*

Key changes:

- Updated facility type definitions from older SIC codes to newer NAICS references
- Defined *Inspection* more thoroughly by including audio-visual-olfactory (AVO), OGI, and Analyzer inspection types
- Revised *Refinery* definition to ensure all refining operations including biofuels and other refining activity
- Updated *Repair* definition to include a variety of maintenance activity and replacement of components

Subdivision (d)
South Coast AQMD Inspection Procedures

- Before October 1, 2025:

Component Type	Violation Standard
Light liquid and gas/vapor service	50,000 ppm
Heavy liquid service	500 ppm

- Beginning October 1, 2025

Component Type	Violation Standard
Light liquid and gas/vapor service	**10,000 ppm**
Heavy liquid service	500 ppm

Key changes:

- Deleted former Table 1 – Leak Thresholds
- Updated light liquid and gas/vapor service component violation standard from 50,000 ppm to **10,000 ppm**
- Also beginning October 1, 2025, violation if visible vapors are detected by South Coast AQMD via OGI unless demonstrated to be below violation standard at time of visible vapors

Subdivision (f)
Self Inspection Requirements

Key changes:

- AVO inspections to occur once per shift, not to exceed 12 hours, instead of every 8 hours
- AVO inspections for unmanned facilities to be required weekly
- Monthly OGI inspection, beginning October 1, 2025

Subdivision (g)
Leak Standards

- Before October 1, 2025:

Component Type	Leak Standard
Compressor or Pump (Light Liquid)	500 ppm
Pressure Relief Device (PRD)	200 ppm
Pump (Heavy Liquid)	100 ppm
Valve, Fitting, Other	500 ppm

- Beginning October 1, 2025

Component Type	Leak Standard
Compressor or Pump (Light Liquid)	**400 ppm**
Pressure Relief Device (PRD)	200 ppm
Pump (Heavy Liquid)	100 ppm
Valve, Fitting, Other	**100 ppm**

Key changes:

- Interim leak standards, consistent with current levels, before October 1, 2025
- Thereafter, lower leak standards:
  - From 500 ppm to **400** ppm for compressors and Light Liquid pumps
  - From 500 ppm to **100** ppm for valves, fittings, and others

Subdivision (g)
Repair Timeline for Leaks Detected by Analyzer

- Leak detected above leak standard but below violation standard:

- Leak detected above violation standard

Subdivision (g)
Repair Timeline for Visible Leaks

Accessible Components:

Inaccessible Components:

Visible Leak

- More than 3 drops of VOC per minute

Subdivision (g)
Repair Timeline for Visible Vapors

Accessible Components:

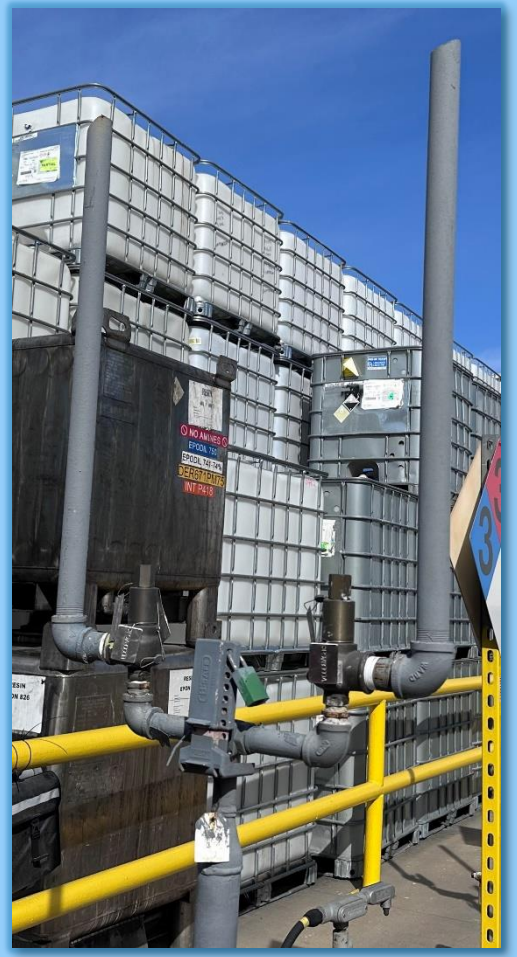
Inaccessible Components:

Visible Vapors

- Vapors detected using an OGI device

Note: Requirements do not apply until October 1, 2025

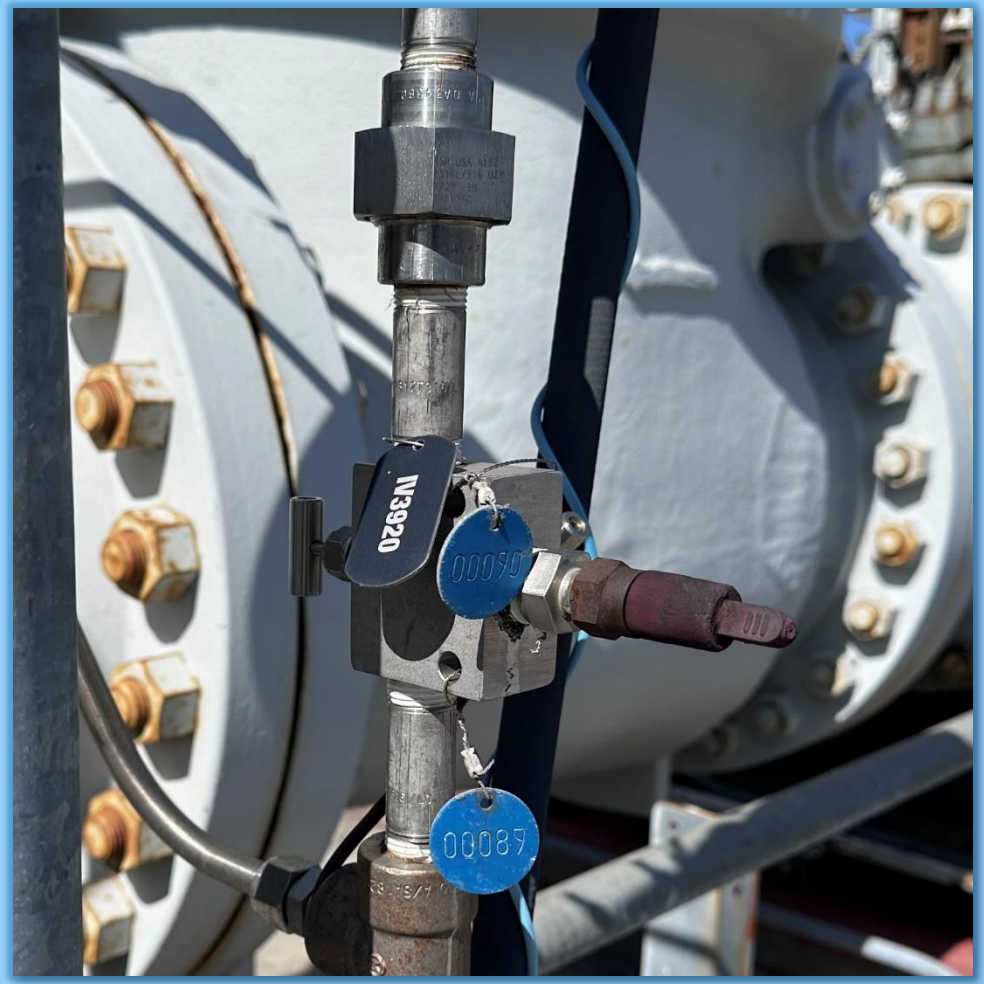
Subdivision (h)
Atmospheric Process PRD Requirements



Key changes:

- Remove obsolete rule language
- Removal of 500 lbs VOC threshold for releases before performing failure analysis
- Update mitigation fee from $350,000 to $625,000 to account for inflation

Subdivision (i)
Recordkeeping and Reporting Requirements



Key changes:

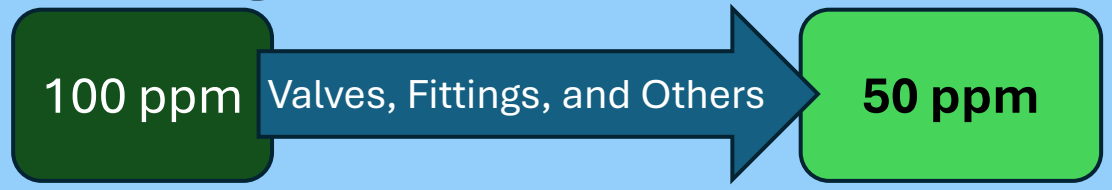
- Electronic records submission required
- Standardized record retention for five (5) years

Subdivision (k)
Ozone Contingency Measures

- Stage 1 CM

- Stage 2 CM

- Stage 3 CM



- Measures found to be cost-effective but not incrementally cost-effective considered for CMs
- CMs to be implemented sequentially in order of increasing total annual cost
- Triggered from final determinations by U.S. EPA of ozone non-attainment or lack of reasonable further progress (RFP)

Subdivision (l)
Exemptions

Key addition:

- Exemption for OGI inspection on days with unsafe conditions, such as for inclement weather or other unforeseen situations

Subdivision (m)
Interim Procedures and Requirements

In effect until October 1, 2025

- Interim violation standards and interim leak standards reflect existing Rule 1173 standards

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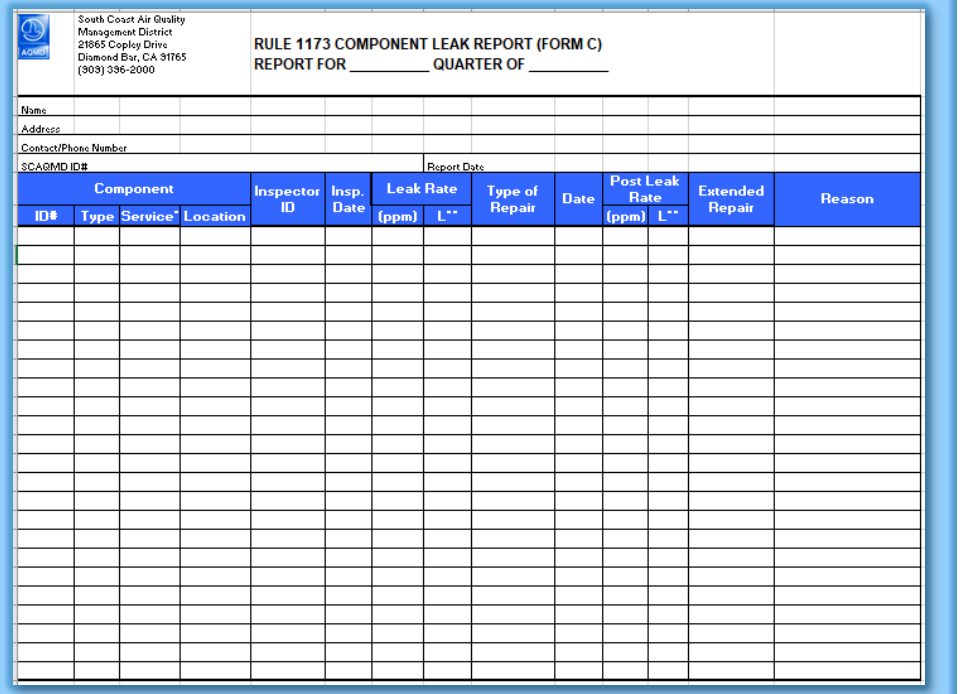
Leak Standard BARCT Assessment (from Working Group Meeting #3)




Project	Valves & Fittings (Connectors/Flanges)	Others	Pumps & Compressors	Pressure Relief Devices (PRDs)
PAR 1173	**100 ppm**		**400 ppm**	200 ppm (unchanged)
Rule 1173	500 ppm			200 ppm
BACT/LAER	200 ppm		Defers to Rule 1173	
Rule 8-18	100 ppm		500 ppm	
Rule 4409	500 ppm			L: 200 ppm G/V: 400 ppm
Rule 4455	L: 200 ppm G/V: 400 ppm	L: 500 ppm G/V: 1,000 ppm		L: 100 ppm G/V: 200 ppm
BACT	100 ppm			
Rule 331	1,000 ppm			
BACT	100 ppm			

Approach to Forecasting Leak Counts



South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
(909) 396-2000

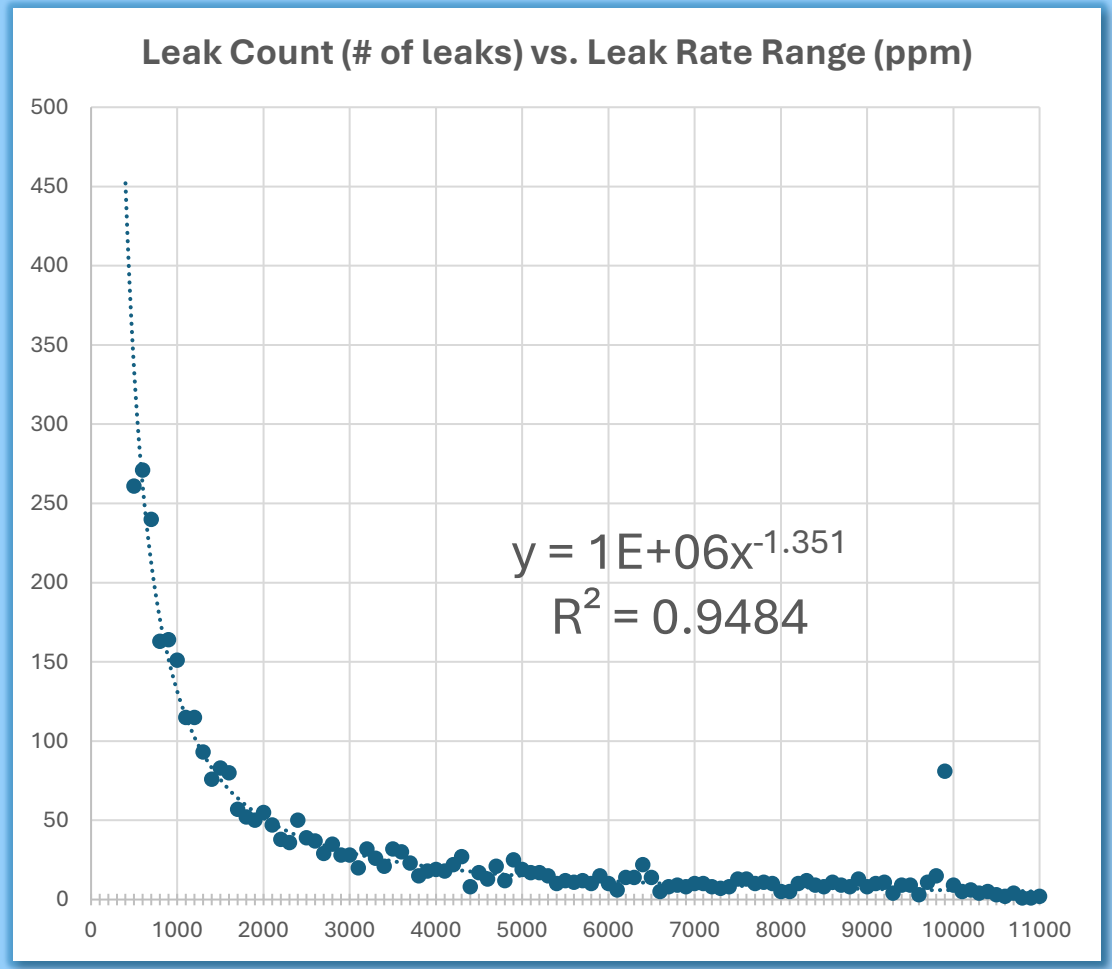
RULE 1173 COMPONENT LEAK REPORT (FORM C)
REPORT FOR _____ QUARTER OF _____

Name
Address
Contact/Phone Number
SCAQMD ID#
Report Date

Component				Inspector ID	Insp. Date	Leak Rate		Type of Repair	Date	Post Leak Rate		Extended Repair	Reason
ID#	Type	Service*	Location			(ppm)	L**			(ppm)	L**		

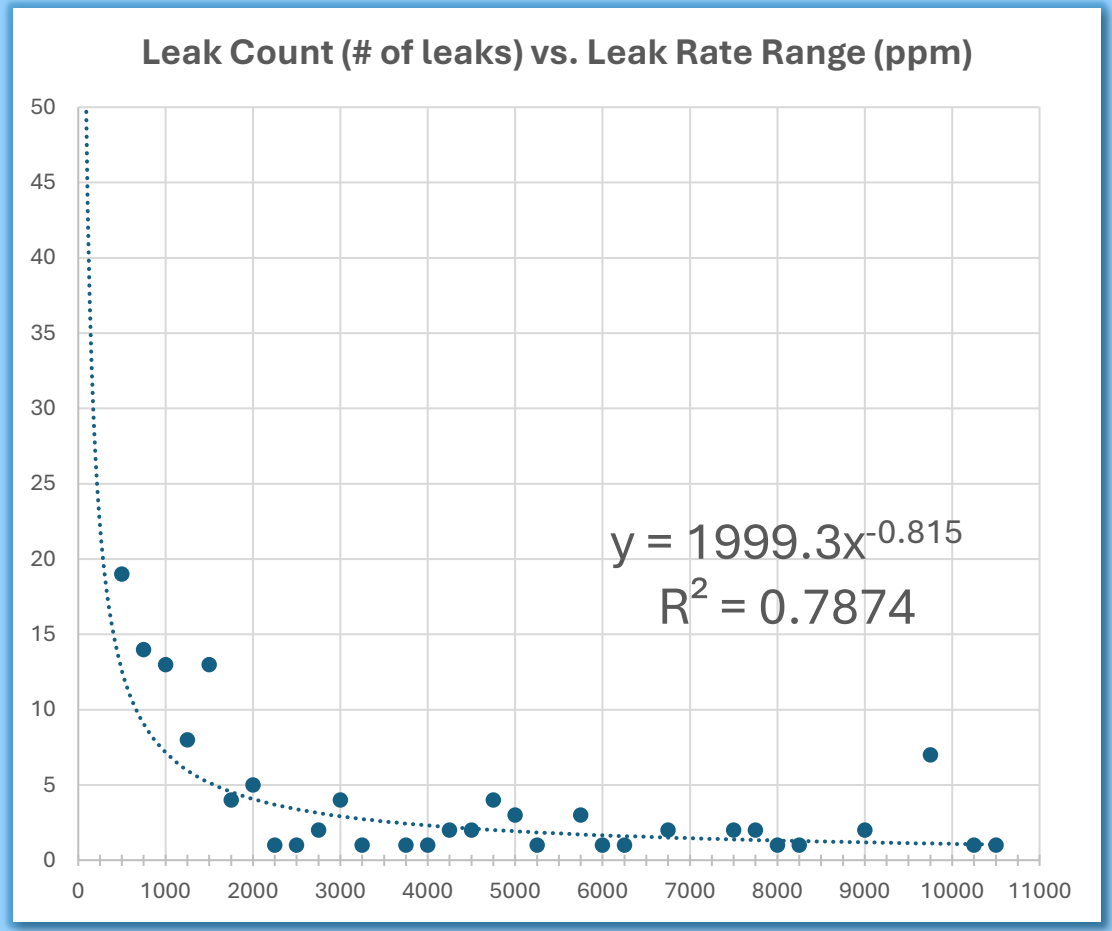
- Examined over 200 leak reports submitted for the reporting period 2023 Q4 and grouped data together by component type and leak rate
- Observed power trendline in all three groups of components studied:
  - R^2 values were as high as 0.9484
  - High confidence in trendline
- Using trendline generated from data, the number of additional leaks detected can be estimated

Data Analysis and Forecasted Leak Counts
Fittings, Valves, and "Others"



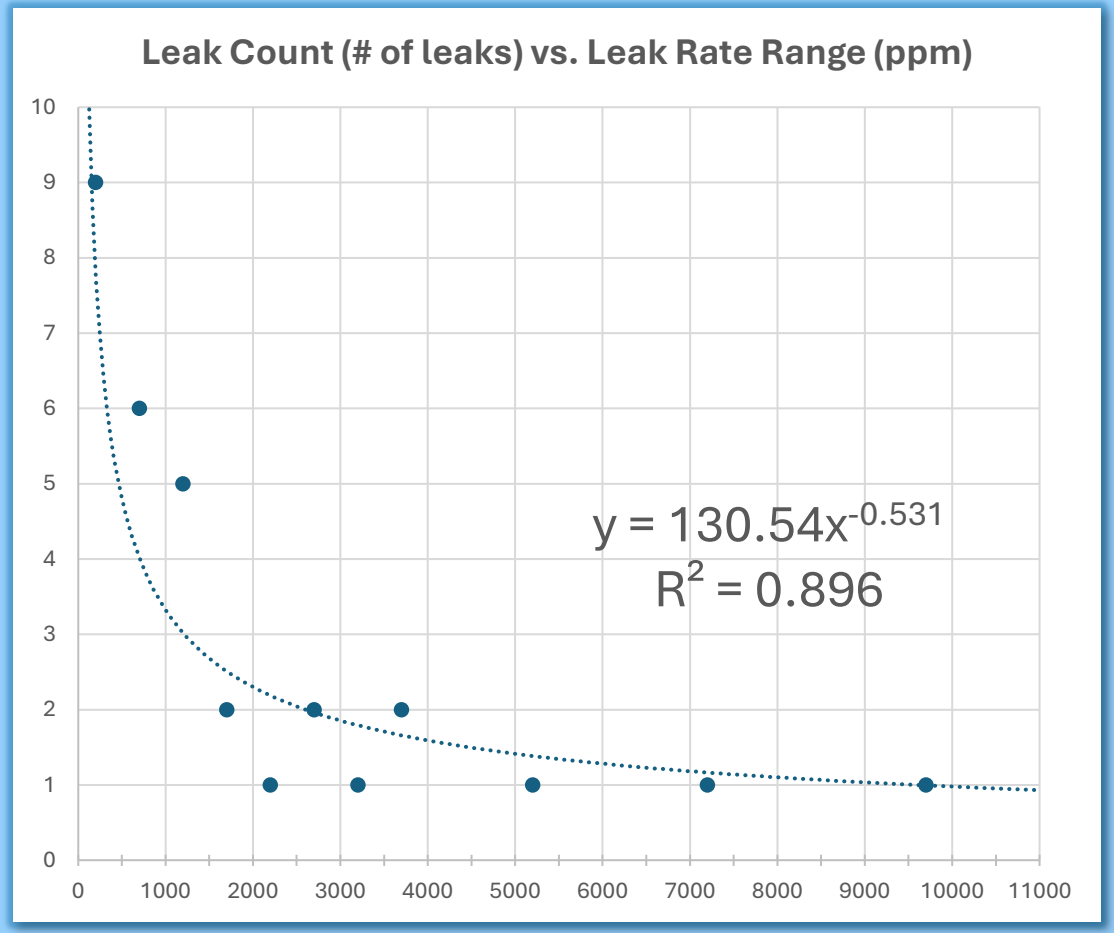
Value (ppm)	Estimated Additional Quarterly Leaks	Estimated Additional Leaks Annually	Estimated Leak Ratio
500	*Current leak standard*		*0.16%*
400	305	1,220	0.17%
300	755	3,020	0.19%
200	1,534	6,136	0.22%
100	3,520	14,080	0.31%
50	8,586	34,344	0.53%

Data Analysis and Forecasted Leak Counts
Pumps and Compressors



Value (ppm)	Estimated Additional Quarterly Leaks	Estimated Additional Leaks Annually	Estimated Leak Ratio
500	*Current leak standard*		*1.77%*
400	15	60	1.94%
300	34	136	2.16%
200	61	244	2.48%
100	108	432	3.02%
50	190	760	3.98%

Data Analysis and Forecasted Leak Counts
PRDs



Value (ppm)	Estimated Additional Quarterly Leaks	Estimated Additional Leaks Annually	Estimated Leak Ratio
200	*Current leak standard*		*0.55%*
100	11	44	0.72%
50	19	76	0.98%

Estimating Cost of Repair

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

FINAL DRAFT STAFF REPORT

Proposed Amendments to Rule 4401 (Steam-Enhanced Crude Oil Production Wells)

Proposed Amendments to Rule 4409 (Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities)

Proposed Amendments to Rule 4455 (Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants)

Proposed Amendments to Rule 4623 (Storage of Organic Liquids)

Proposed Amendments to Rule 4624 (Transfer of Organic Liquid)

June 15, 2023

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San Joaquin Valley UNIFIED AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING

- The 2023 San Joaquin Valley APCD Staff Report for their VOC rule amendments contains Table C-4: *Constant in Quantifying Repairing and Replacing Components*
  - Itemized component replacement costs, percentage needing repair versus replacement, repair labor costs, and average repair or replacement times

https://ww2.valleyair.org/media/vptf4eg2/gb-item.pdf

- Applying the SJVAPCD method to the distribution of leaks detected in South Coast AQMD for 2023 Q4 yields:

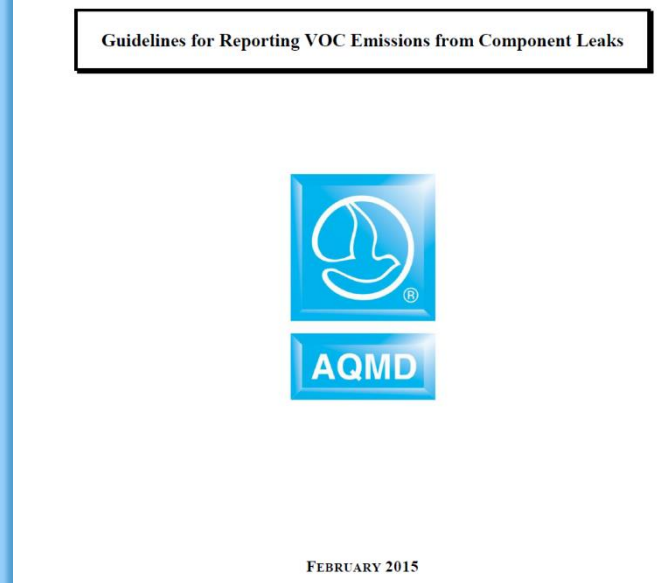
Valves, Fittings, and "Others"	Pumps and Compressors	PRDs
$697.25	$5,486.10	$5,541.40

Annual Additional Repair Cost Estimates

Cost estimates rounded to nearest thousand	**Valves, Fittings, and "Others"**	**Pumps & Compressors**	**PRDs**
500 ppm	*Current Leak Standard*	*Current Leak Standard*	
400 ppm	$851,000	$329,000	
300 ppm	$2,106,000	$746,000	
200 ppm	$4,278,000	$1,339,000	*Current Leak Standard*
100 ppm	$9,817,000	$2,370,000	$244,000
50 ppm	$23,946,000	$4,169,000	$598,000

- Calculated by applying the estimated cost of repair multiplied by the expected number of additional repairs for each leak standard in a year

Baseline VOC Emissions


Guidelines for Reporting VOC Emissions from Component Leaks

AQMD

FEBRUARY 2015

- Estimated using South Coast AQMD Annual Emission Reporting (AER) document *Guidelines for Reporting VOC Emissions from Component Leaks*, revised February 2015
  - Method 2 – Correlation Equation Method
  - Based on CAPCOA-revised 1995 U.S. EPA equations
  - Provides specific correlation equations based on component type and screening value
- Developed more refined predicted emission rates based on weighted average of predicted leak counts

Baseline Annual VOC Emissions: *Fittings, Valves, and "Others" Components*

- Component counts from 2023 Q4 leak reports
  - 1,720,410 fittings (assumed 90% threaded connectors and 10% flanges)
  - 498,644 valves
  - 122,390 others

Leak Standard (ppm)	Calculated Emission Rate (ppm)	Baseline VOC Emissions (tons per year)	VOC Emission Reduction (tons per year)
500	112	1,529.2	*Current leak standard*
400	101	1,419.3	**109.9**
300	90	1,306.0	**223.2**
200	78	1,177.0	**351.2**
100	64	1,021.4	**507.8**
50	50	855.0	**674.2**

Baseline Annual VOC Emissions: *Pumps and Compressors*

Leak Standard (ppm)	Calculated Emission Rate (ppm)	Baseline VOC Emissions (tons per year)	VOC Emission Reduction (tons per year)
500	169	96.3	*Current leak standard*
400	136	84.1	**12.2**
300	114	75.4	**20.9**
200	91	65.5	**30.8**
100	68	54.7	**41.6**
50	50	45.1	**51.2**

- Component counts from 2023 Q4 leak reports
  - 7,954 pumps in light liquid service
  - 644 compressors

Baseline Annual VOC Emissions: *PRDs*

- Component counts from 2023 Q4 leak reports
  - 6,348 PRDs, including atmospheric process PRDs

Leak Standard (ppm)	Calculated Emission Rate (ppm)	Baseline VOC Emissions (tons per year)	VOC Emission Reduction (tons per year)
200	103	10.5	*Current leak standard*
100	70	8.2	**2.3**
50	50	6.6	**3.9**

Cost-Effectiveness:
Fittings, Valves, and "Others" Components

	400 ppm	300 ppm	200 ppm	100 ppm	50 ppm
Estimated cost per year	$851,000	$2,106,000	$4,278,000	$9,817,000	$23,946,000
VOC Emission Reduction (tons per year)	109.9	223.2	351.2	507.8	674.2
Cost-Effectiveness (per ton VOC)	**$7,700**	**$9,400**	**$12,200**	**$19,300**	**$35,500**
Incremental Cost-Effectiveness (per ton VOC)		**$11,100**	**$17,000**	**$35,400**	**$84,900**

Cost-Effectiveness threshold: $40,168/ton VOC

Cost-Effectiveness:
Pumps and Compressors

	400 ppm	300 ppm	200 ppm	100 ppm	50 ppm
Estimated cost per year	$329,000	$746,000	$1,339,000	$2,370,000	$4,169,000
VOC Emission Reduction (tons per year)	12.2	20.9	30.8	41.6	51.2
Cost-Effectiveness (per ton VOC)	**$27,000**	**$35,600**	**$43,500**	**$56,900**	**$81,500**
Incremental Cost-Effectiveness (per ton VOC)		**$47,700**	**$60,100**	**$94,900**	**$189,000**

Cost-Effectiveness threshold: $40,168/ton VOC

Cost-Effectiveness: *PRDs*

	100 ppm	50 ppm
Estimated cost per year	$244,000	$598,000
VOC Emission Reduction (tons per year)	2.3	3.9
Cost-Effectiveness (per ton VOC)	**$106,500**	**$154,200**
Incremental Cost-Effectiveness (per ton VOC)		**$223,100**

Cost-Effectiveness threshold: $40,168/ton VOC

OGI BARCT Assessment (from Working Group Meetings #3 & #4)

Rule	Applicability	Inspection Frequency *(Proposed in italics)*
PAR 1173	Refineries, chemical plants, re-refiners, marine terminals, oil & gas sites, natural gas plants, pipeline transfer stations	***Monthly***
Rule 1178	Storage tanks located at petroleum facilities that have emitted more than 20 tons of VOC per year	Weekly
Rule 463	All organic liquid storage tanks located above certain size or potential to emit thresholds	Every two weeks
PAR 1148.1	Wellheads, well cellars, and product handling at oil and gas production facilities	*Monthly*

OGI Cost Assumptions

- Capital cost of camera at **$120,000** with estimated life of equipment of 10 years
  - Review of current OGI retail pricing, consistent with costs used for Rules 1178 (2023) and 463 (2024)
- Assuming **5,000** components evaluated per day per camera
  - Per manufacturers, OGI cameras are capable of evaluating more than 10,000 components per day
  - 2,358,596 components within South Coast AQMD
- Operating and maintenance cost is **$4,874** per year per camera
  - Received documentation demonstrating actual costs as well as insured shipping for annual maintenance
- Labor cost is **$413.88** per operating day
  - Includes inflation adjustment to value of $400 per day used in 2023 rulemaking for Rule 1178

Discounted Cash Flow (DCF)

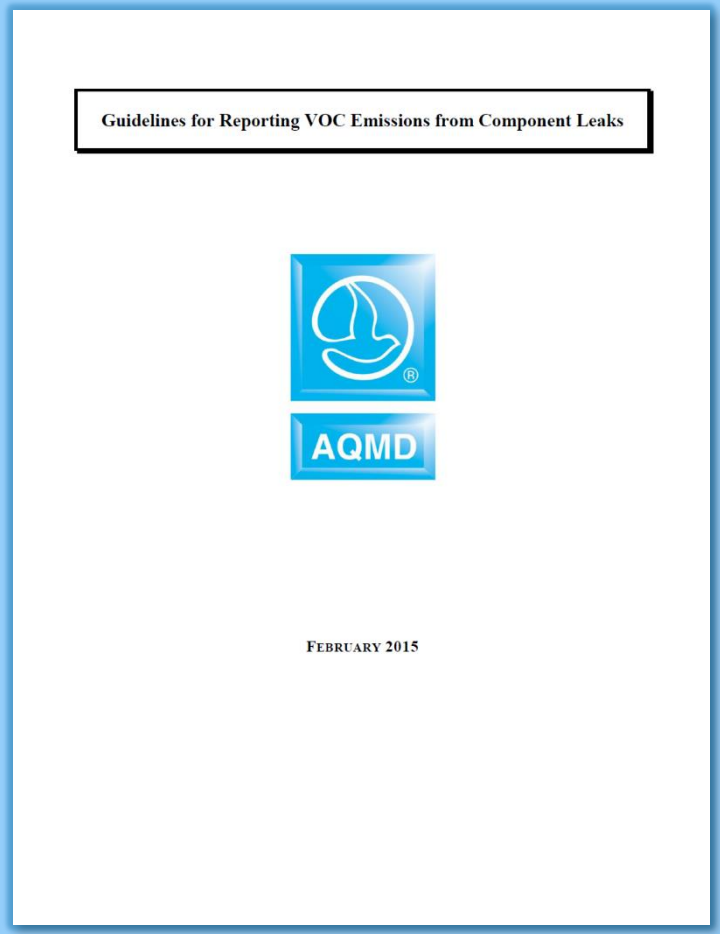
- South Coast AQMD uses the Discounted Cash Flow method to account for capital costs
- Present Value = Capital Costs + (Annual Operating Costs * Present Value Factor)
- Present Value Factor = $(1 - \frac{1}{(1+r)^n})/r$
  - Interest rate (r) of 4%
  - Life of equipment (n) of 10 years
  - $PVF_{(4,10)} = 8.11$
- Present Value of each OGI camera used over 10 years calculated at **$949,745**

OGI Inspection Frequency Costs

Rounded to the nearest thousand	Every Two Months	Monthly	Every Two Weeks	Weekly
OGI cameras required	11	23	48	95
Total cost over 10 years ($)	$11,282,000	$23,126,000	$49,552,000	$98,071,000
Annual cost ($)	$1,128,000	$2,313,000	$4,955,000	$9,807,000

- Total cost calculated by multiplying the Present Value of each OGI camera by the number of OGI cameras needed for implementation
- Annual cost calculated by dividing the total cost of each implementation schedule by the estimated life of the OGI camera

Estimating VOC Emissions from Leaks



- Estimated using AER guidelines:
  - Method 2 – Correlation Equation Method
  - Based on CAPCOA-revised 1995 U.S. EPA pegged factor
  - Provides specific leak emission factors based on component type
- Utilized the lower, more conservative leak emission factors
  - Valves → 0.141 lb/hr
  - Pump seals → 0.196 lb/hr
  - Connectors → 0.066 lb/hr
  - Flanges → 0.209 lb/hr
  - Others → 0.181 lb/hr
    - Includes compressors and PRDs

Estimating VOC Emissions (continued)

	Connectors	Flanges	Valves	Pump Seals	Other	Compressors	PRDs
Annual Leaks	2,286	254	928	100	436	44	28
Emission Factor (lb/hr)	0.066	0.209	0.141	0.196	0.181	0.181	0.181
Emissions (tons/year)	81.5	28.7	70.7	10.6	42.6	4.3	2.7

- Leak counts extrapolated from 2023 Q4 leak reports
  - Identified leaks greater than 5,000 ppm per OGI camera capabilities
- Assumes leaks persist for one-half of the time between inspections, or 45 days
  - Current Method 21-based LDAR inspection frequency is quarterly (every 90 days)
- Total fugitive VOC emissions associated with leaks greater than 5,000 ppm estimated at **241.0 tons/year**

Estimating Emission Reductions with OGI

Current fugitive VOC emissions due to leaks: **241.0 tons/year**

	Every Two Months	Monthly	Every Two Weeks	Weekly
Leak Emissions (tons/year)	160.7	80.3	37.5	18.8
Emission Reduction (tons/year)	80.3	160.7	203.5	222.3
Incremental Reduction (tons/year)		80.3	42.8	18.8

OGI Cost-Effectiveness

	Every Two Months	Monthly	Every Two Weeks	Weekly
Annual Cost ($)	$1,128,000	$2,313,000	$4,955,000	$9,807,000
Annual emission reductions (tons per year)	80.3	160.7	203.5	222.3
Cost-Effectiveness ($/ton)	$14,000	$14,400	$24,300	$44,100
Incremental Cost-Effectiveness ($/ton)		$28,800	$115,600	$523,100

- Cost-Effectiveness Threshold: $40,168/ton VOC
- Monthly OGI inspection is **both Cost-Effective and Incrementally Cost-Effective**
- OGI inspection every two weeks is Cost-Effective but is **not Incrementally Cost-Effective**

Emission Reductions

- PAR 1173 impacts approximately 2,350,000 components at approximately 203 facilities
- PAR 1173 will reduce VOC emission by 1.86 tons per day through more stringent control and monitoring requirements
- 76% of emission reductions are from lower leak standards
- 24% of emission reductions are associated with OGI monitoring

Proposed Requirement	VOC Emission Reduction (tons per year)	VOC Emission Reduction (tons per day)
100 ppm standard (valve, fitting, other)	507.8	1.39
400 ppm standard (light liquid pump, compressor)	12.2	0.033
Monthly OGI Inspection	160.7	0.44
Overall	**680.7**	**1.86**

Cost-Effectiveness

Proposed Requirement	Cost-Effectiveness ($/ton VOC reduced)
100 ppm standard (valve, fitting, other)	$19,300
400 ppm standard (LL pump, compressor)	$27,000
Monthly OGI Inspection	$14,400
Overall	**$18,300**

- The 2022 AQMP established a cost-effectiveness threshold of $36,000 per ton of VOC reduced
  - After adjusting for inflation, the cost-effectiveness threshold is $40,170 per ton of VOC reduced
- Costs were obtained from 2023 PAR 1178, 2024 PAR 463, and 2023 San Joaquin Valley APCD VOC rule development projects as well as industry-supplied documentation

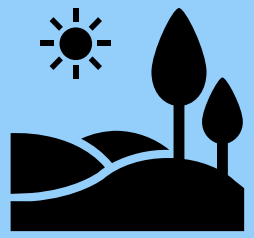
Incremental Cost-Effectiveness

- Incremental cost-effectiveness is the difference in costs divided by the difference in reductions between more stringent option to next less expensive option
- Incremental cost-effectiveness was analyzed for the next more stringent control measure
  - Each found not to be incrementally cost-effective
  - Included as contingency measures

Proposed Requirement	Incremental Cost-Effectiveness ($/ton VOC reduced)
100 → **50 ppm** standard (valve, fitting, other)	$84,900
400 → **300 ppm** standard (LL pump, compressor)	$47,700
Monthly → **Every two weeks** OGI Inspection	$115,600

California Environmental Quality Act (CEQA)

- PAR 1173 is subject to CEQA



- Staff is reviewing proposed project to determine any potential adverse environmental impacts

- Appropriate CEQA documentation will be prepared based on the analysis

Socioeconomic Impact Assessment

- Socioeconomic Impact Assessment for PAR 1173 is required due to potential for significantly affecting air quality or emission limitations (Health and Safety Code Section 40440.8)
- The analysis will consider:
  - Type of affected industries, including small businesses
  - Range of probable costs to industry or small businesses (Health and Safety Code Section 40728.5)
  - Impact on employment and regional economy
- Socioeconomic Impact Assessment will be made available at least 30 days prior to the Public Hearing on October 4, 2024 (subject to change)

Agenda

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Next Steps

Milestone	Projected Date
Stationary Source Committee	August 16, 2024
Set Hearing	September 6, 2024
Public Hearing	October 4, 2024

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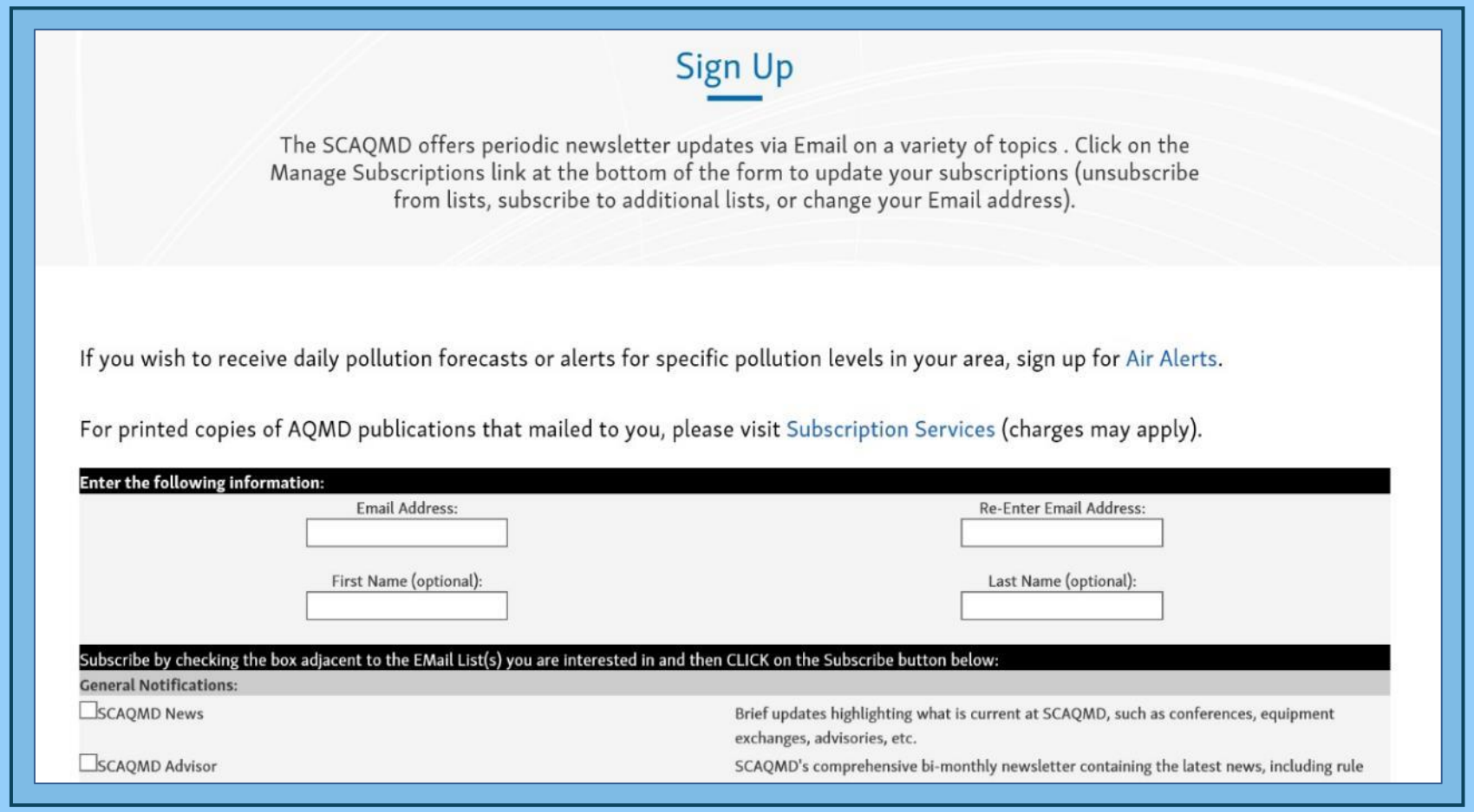

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