



U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF INSPECTOR GENERAL

Improving air quality

More Effective EPA Oversight Is Needed for Particulate Matter Emissions Compliance Testing

Report No. 19-P-0251

July 30, 2019



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Abbreviations

CAA	Clean Air Act
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
OAR	Office of Air and Radiation
OECA	Office of Enforcement and Compliance Assurance
OIG	Office of Inspector General

Cover Photo: A smokestack. (EPA photo)

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At a Glance

Why We Did This Project

We conducted this audit to determine the effectiveness of U.S. Environmental Protection Agency (EPA) oversight in assuring that emission stack tests are conducted in accordance with EPA regulation, policy and guidance.

The EPA estimates that there are approximately 14,700 major stationary sources of air emissions in the United States, such as refineries and power plants that typically release emissions via tall chimneys called *smokestacks* or *stacks*. Most of these facilities are subject to emission limits set by state-issued construction or operating permits. If there are no other means to demonstrate compliance with permit limits, as is typically the case with particulate matter emissions, stack emissions must be determined using EPA-approved test methods. If stack testers do not follow applicable EPA methods, test results are subject to greater variability and uncertainty. Accurate stack tests and reports are needed to verify that excess emissions do not negatively impact human health and the environment.

This report addresses the following:

- *Improving air quality.*

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More Effective EPA Oversight Is Needed for Particulate Matter Emissions Compliance Testing

What We Found

Our audit of 30 stack test reports from state and local agencies in Washington state found numerous examples of nonadherence to EPA test methods and inadequate supporting documentation to assess data quality. These problems were not identified by state and local regulatory agencies responsible for implementing Clean Air Act permitting programs in Washington state.

Effective EPA oversight of stack testing improves data quality for compliance determinations and other uses.

We also found that some state and local agencies rarely observe stack tests to verify that EPA methods are properly followed. Several agencies told us that they needed additional training and tools from the EPA to help them conduct oversight of stack testing and reporting.

Some stack testing problems that we identified could impact the reliability of stack test results and the resulting determination of whether a facility complies with its permit limits. Effective reviews of stack test reports to identify any errors in the implementation of stack test methods are particularly important when a facility's emissions are near or at the permit limit. Errors in such instances have a higher likelihood of affecting the reliability of the final compliance determination.

While state and local agencies have been delegated responsibility for implementing Clean Air Act programs in Washington state, EPA Region 10 maintains responsibility and accountability for program compliance with federal statutes and regulations. Region 10 should improve its oversight activities to provide reasonable assurance that stack testing programs conducted in Washington state meet federal requirements. Although we only reviewed stack test reports from Washington state in EPA Region 10, EPA managers and staff responsible for overseeing the Clean Air Act program at the national level told us that they had observed similar problems in other states and EPA regions.

Recommendations and Planned Agency Corrective Actions

We made four recommendations to the Assistant Administrator for Air and Radiation and the Assistant Administrator for Enforcement and Compliance Assurance, including to develop and implement a plan for improving the consistency of stack test reviews across EPA regions and delegated agencies, as well as to provide additional training and tools to improve stack test report reviews. We made two recommendations to the Regional Administrator of Region 10 to communicate the EPA's requirements and guidance for stack testing oversight to delegated agencies and to develop internal controls to verify that delegated agencies are performing effective oversight of stack testing and reporting. The agency agreed with our recommendations and provided acceptable corrective actions.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

July 30, 2019

MEMORANDUM

SUBJECT: More Effective EPA Oversight Is Needed for Particulate Matter Emissions
Compliance Testing
Report No. 19-P-0251

FROM: Charles J. Sheehan, Deputy Inspector General

A handwritten signature in blue ink that reads "Charles J. Sheehan".

TO: Ann Idsal, Acting Assistant Administrator
Office of Air and Radiation

Susan Bodine, Assistant Administrator
Office of Enforcement and Compliance Assurance

Chris Hladick, Regional Administrator
Region 10

This is our report on the subject audit conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). The project number for this audit was OA&E-FY18-0186. This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

The EPA offices with primary responsibility for the issues evaluated in this report are the Office of Air and Radiation's Office of Air Quality Planning and Standards, the Office of Enforcement and Compliance Assurance's Air Enforcement Division, and EPA Region 10.

In accordance with EPA Manual 2750, your office provided acceptable corrective actions and milestone dates in response to OIG recommendations. All recommendations are resolved, and no final response to this report is required. However, if you submit a response, it will be posted on the OIG's website, along with our memorandum commenting on your response. Your response should be provided as an Adobe PDF file that complies with the accessibility requirements of Section 508 of the Rehabilitation Act of 1973, as amended. The final response should not contain data that you do not want to be released to the public; if your response contains such data, you should identify the data for redaction or removal along with corresponding justification.

We will post this report to our website at www.epa.gov/oig.

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Chapter 1

Introduction

Purpose

The Office of Inspector General (OIG) for the U.S. Environmental Protection Agency (EPA) conducted this audit to determine the effectiveness of EPA oversight in assuring that emission stack tests are conducted in accordance with EPA regulation, policy and guidance. The OIG initiated this assignment because an air quality contractor was concerned about the adequacy of stack testing in Washington state and the effectiveness of EPA oversight, and that person brought those concerns to the EPA and the OIG.

Background

According to an EPA database, there are approximately 14,700 major stationary sources of air emissions in the United States—such as refineries and power plants—that release, among other types of emissions, particulate matter via chimneys known as *smokestacks* or *stacks*. Washington state has about 130 of these major sources. The Clean Air Act (CAA) requires that the EPA establish standards with an “adequate margin of safety” for six principal pollutants, also known as *criteria pollutants*. Particulate matter is one of these six criteria pollutants for which the EPA sets National Ambient Air Quality Standards.

An emissions stack test is a procedure for sampling a gas stream from a single sampling location at a facility, unit or pollution control device. Also referred to in EPA regulations as a *performance* or *source test*, a stack test measures the amount of a regulated pollutant, such as particulate matter; demonstrates the efficiency of a capture system; or determines the destruction or removal efficiency of a control device used to reduce emissions at facilities subject to the requirements of the CAA.

Health impacts of exposure to particulate matter

According to the EPA, scientific studies have linked particle pollution exposure to a variety of human health concerns, including:

- Premature death in people with heart or lung disease.
- Nonfatal heart attacks.
- Irregular heartbeat.
- Aggravated asthma.
- Decreased lung function.
- Increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

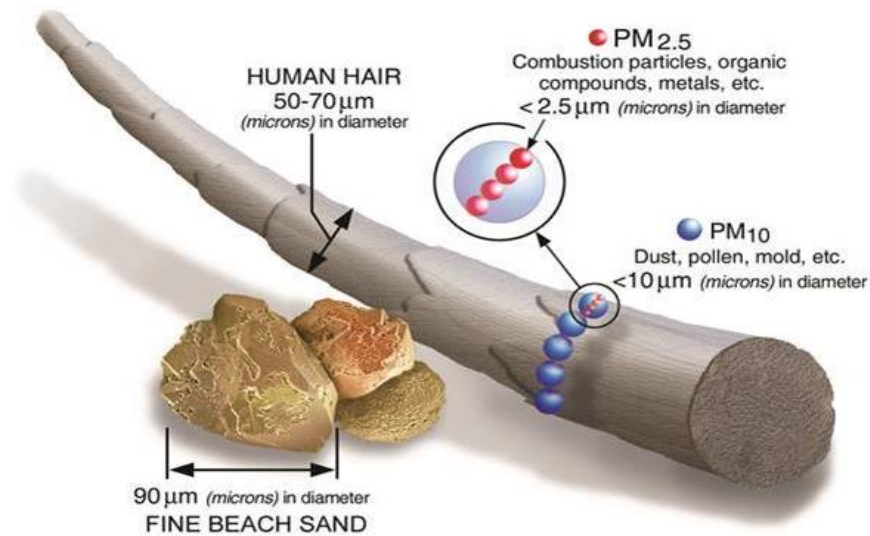
Stack tests should be conducted in accordance with sampling and analytical procedures approved by the EPA for the pollutant and/or systems being tested. If the stack tester submits a test plan for review before the stack test is conducted, that provides better assurance that the testing requirements are interpreted correctly. Ultimately, having the stack test plan reviewed and approved before the test is conducted reduces the number of retests required.

Stack testing is an important tool used to determine a facility’s compliance with emission standards established

by the EPA and implemented through state-issued construction and operating permits. Stack testing is typically required when a facility does not have a continuous emission monitoring system or other means of determining compliance for the pollutant in question, as is often the case with particulate matter.

The size of particles is directly linked to their potential for causing health problems (Figure 1). Small particles less than or equal to 2.5 micrometers in diameter, also known as *fine particles* or $PM_{2.5}$, pose the greatest health risks for humans. People with heart or lung diseases, children and older adults are most likely to be affected by particle pollution exposure.

Figure 1: Size comparisons for particulate matter particles



Source: EPA.

Note: μm = micrometer.

Many facilities that are required to conduct particulate matter stack tests are major stationary sources. Major source facilities emit 100 tons or more of an air pollutant per year. Most of these facilities operate under state-issued, federally enforceable permits that contain emission limits. Stack tests are typically conducted by independent stack-testing companies contracted by the facility. If the stack tester does not follow applicable EPA methods to conduct the test correctly and calculate the emissions accurately, the facility and the regulating agency may not be able to determine whether the facility is in compliance with permitted emission limits. Noncompliance could potentially go undetected. Thorough and accurate stack tests are critical to prevent excess emissions from major sources from negatively impacting the health and well-being of nearby communities.

It is the EPA's responsibility to oversee delegated state and local agency¹ reviews of stack testing to assess whether facilities are following federal requirements and

¹ The EPA delegates authority to state, local and tribal agencies to implement federal environmental programs. These agencies are known as *delegated agencies*.

complying with permitted emission limits. As part of the EPA’s oversight responsibilities, the EPA may observe stack tests whenever the agency deems appropriate. The agency also will review stack test plans and reports as needed to verify that the tests are conducted properly and that the results are accurately interpreted and reported by state and local agencies.

Stack Testing and Reporting Methods

The EPA has approved over 130 test methods for use in measuring air pollutants. About 120 of these methods are directly cited by specific CAA regulations to determine compliance under 40 CFR Parts 60, 61 and 63, and sources may apply the regulations and the method without further EPA approval. Methods 1, 2 and 5—which were issued in 1971 and codified in 40 CFR Part 60, Appendix A—are the primary test methods used to determine compliance with particulate matter emission limits at stationary sources. Table 1 describes these three EPA methods.

Table 1: EPA methods used for particulate matter stack testing

Method	Description
1	Used to select sampling locations in a stack to obtain a representative measurement of pollutant emissions or air flow in the stack.
2	Used to determine the average velocity and flow rate of gas streams based on the sampling described in Method 1.
5	Used to determine particulate matter emissions. The accuracy of this method is dependent on proper application of Methods 1 and 2.

Source: OIG analysis.

For Method 5 testing, stack testers calculate particulate matter concentration and emission rates to compare with permit limits. These calculations require that the stack tester first collect many individual measurements, each of which introduces uncertainty due to a range of variables, such as the tester’s competence and the equipment used. However, the EPA developed procedures to minimize the amount of uncertainty that such variables introduce into stack testing. For example, Method 5’s sampling equipment calibration procedures were designed by the EPA to accurately measure stack gas flow rate and sample volume, both of which directly influence subsequent calculations for particulate matter emissions. If a facility’s calculated emissions rate is near or at the permit limit, equipment calibration can be the difference between a determination of compliance or noncompliance. Further, increased variability or bias in stack testing data may negatively impact using the data for overarching purposes, such as emission factor development, understanding emission control technologies and the development of emission limits, and inventory and regulation development.

EPA test methods

The EPA has developed and promulgated via the Federal Register over 130 test methods for air emissions measurement, including methods for stack testing. Facilities and the stack test companies with whom they may contract to conduct stack tests are required to comply with these methods.

Stack Testing and Reporting Guidance

The EPA has developed both general and method-specific guidance for stack testing and reporting to determine both initial and ongoing compliance with CAA requirements.

CAA National Stack Testing Guidance and CAA Stationary Source Compliance Monitoring Strategy

The EPA's 2009 [CAA National Stack Testing Guidance](#) aims to improve uniformity in how stack tests are conducted to determine and demonstrate compliance with the New Source Performance Standards (40 CFR Part 60), National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61) and Maximum Achievable Control Technology Standards (40 CFR Part 63). The 2009 guidance also aims to improve coordination between the EPA and state and local agencies and to enhance EPA oversight of state and local programs. Further, the 2009 guidance states that while there is no requirement that delegated agencies be present to observe all stack tests, trained staff from delegated agencies should observe stack tests whenever possible. When observing a stack test, staff should be present for the duration of a stack test to assess whether regulatory testing requirements are being met, the test is conducted properly, and the results are accurately recorded and reported.

The EPA's 2016 [CAA Stationary Source Compliance Monitoring Strategy](#) provides guidance to delegated state, local, tribal and U.S. territory CAA agencies. The strategy recognizes that a stack test is one tool available to evaluate compliance with permit limits. The *Compliance Monitoring Strategy* also recommends a minimum frequency for full compliance evaluations² at major sources required to obtain permits under Title V of the CAA. Typically, a full compliance evaluation includes an on-site visit. In those limited circumstances where it is determined that an on-site visit is not necessary to complete the evaluation, the strategy states that an on-site visit should be conducted, at a minimum, once every 5 federal fiscal years to maintain a compliance presence in the field and to assess control devices and process operating conditions.

EPA Guideline Document 43—*Preparation and Review of Emission Test Reports*

EPA Guideline Document 43—[Preparation and Review of Emission Test Reports](#) (1998)—provides a standard format for preparing a stack test report. It guides stack testers to include a summary of the test program, a description of plant and sampling locations, a summary and discussion of the test results,

² A *full compliance evaluation* is a comprehensive evaluation to assess compliance of the facility with all applicable CAA requirements. It results in a compliance determination and addresses all regulated pollutants at all regulated emission units.

information on sampling and analytical procedures, and internal quality assurance and quality control activities. The document was created to promote consistency when preparing and reviewing stack test reports for emissions test programs performed by the EPA, state and local agencies, and private-sector interests. EPA Guideline Document 43 is broadly applicable to all stack test reports and is not method-specific.

EPA's Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III, Stationary Source-Specific Methods

The EPA's *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III, Stationary Source-Specific Methods* (1977 and 1994 versions) provides method-specific guidance as a supplement to the test methods and procedures codified in the Code of Federal Regulations. The handbook provides information needed to properly conduct and assess the quality of stack tests, including field, calibration, quality control and laboratory procedures (as applicable) for EPA Methods 1, 2 and 5. The handbook also provides (1) data sheets that identify essential information to collect when using EPA Methods 1, 2 and 5 for regulatory purposes, including a checklist for completeness, legibility, accuracy and reasonableness of the test data and (2) summary sheets that tie all of the procedures together for a test method and provide equations for calculating stack test results.

The EPA's *Quality Assurance Handbook* recommends that the "responsible control agency" conduct performance audits of Method 2 and 5 stack testing as an independent assessment of data quality. For Method 2, the performance audit should include an audit of the measurement phase of testing and data processing. For Method 5, the performance audit should include an audit of the sampling train volumetric flow measuring device to determine its accuracy and to audit its processing of data. The audit of data processing includes an assessment of the data recorded on the field and laboratory forms to check for calculation errors. The *Quality Assurance Handbook* further recommends an initial systems audit (i.e., an on-site qualitative inspection and review of the total measurement system) for each enforcement source test.

The *Quality Assurance Handbook* states that when the quality control specifications of EPA test methods are not met, the stack tester must either (1) stop the test run, correct the problem and continue the test run or (2) invalidate the test run data and repeat the test run following corrections to the measurement system. Testers should provide complete and accurate records of all data collected and any problems encountered during testing to demonstrate that testing conformed to the prescribed test procedures.

Implementation of CAA Compliance Programs

The EPA and state, local and tribal agencies share responsibility for protecting human health and the environment. Delegated agencies have the authority to issue permits, make compliance determinations and initiate enforcement. The EPA is responsible for the oversight and regular monitoring of delegated agencies to assess the implementation of compliance and enforcement programs. In Washington state, the delegated agencies for air quality management are seven local air agencies and the Washington State Department of Ecology.

EPA Region 10 Oversight Activities

EPA Region 10 maintains responsibility for ensuring that Washington state and local agencies are adequately implementing their delegated programs. Region 10 conducts activities to oversee state implementation of CAA programs. Region 10 also conducts some oversight of stack testing. The region's stack testing oversight activities include:

- Reviewing stack tests for sources in Indian Country where permitting authority has not been delegated from the EPA to the tribes.
- Ordering and reviewing stack tests under consent decrees³ and for sources that are not yet delegated to state or local agencies.
- Observing stack tests and reviewing stack test reports for delegated agencies when EPA expertise is requested or could provide benefit.
- Conducting limited reviews of regular and routine stack test reports that are delegated to state or local agencies.
- Addressing questions that arise from state and local agencies.
- Participating in a monthly teleconference with the EPA's Office of Air Quality Planning and Standards staff responsible for developing EPA methods. Several state and local agency staff also attend.

Responsible Offices

Within the EPA's Office of Enforcement and Compliance Assurance (OECA), the Office of Compliance and the Office of Civil Enforcement share responsibility for ensuring compliance with our nation's laws. These offices also help assure that industry meets its environmental obligations, including complying with applicable permit conditions. Within the Office of Air and Radiation (OAR), the Office of Air Quality Planning and Standards is responsible for developing regulations to

³ *Consent decrees* are settlements that are signed by all parties to the action and filed in the appropriate court.

limit and reduce air pollution, developing test methods to assess compliance with regulations, and assisting states and local agencies with monitoring and controlling air pollutant emissions. EPA Region 10 provides oversight to the Washington State Department of Ecology and seven local clean air agencies in the state of Washington.

Scope and Methodology

We conducted our performance audit from May 2018 through May 2019 in accordance with generally accepted government auditing standards. Those standards require that we obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our objective. We believe the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

To address our objective, we interviewed Office of Air Quality Planning and Standards staff about EPA methods and databases that we could use to obtain stack testing information; OECA staff about stack test reporting guidance, oversight responsibilities and databases that are used to track stack test results; and Region 10 staff about oversight of stack testing in the region. We also interviewed staff from the Washington State Department of Ecology's Central and Eastern Regional offices and Industrial Section, as well as five local clean air agencies from the state of Washington, about their oversight of stack testing and review of stack test reports. The five local air agencies that we interviewed were the Northwest Clean Air Agency, the Southwest Clean Air Agency, the Olympic Region Clean Air Agency, the Spokane Regional Clean Air Agency and the Puget Sound Clean Air Agency.⁴

To assess internal controls, we reviewed EPA regulations, policies and guidance:

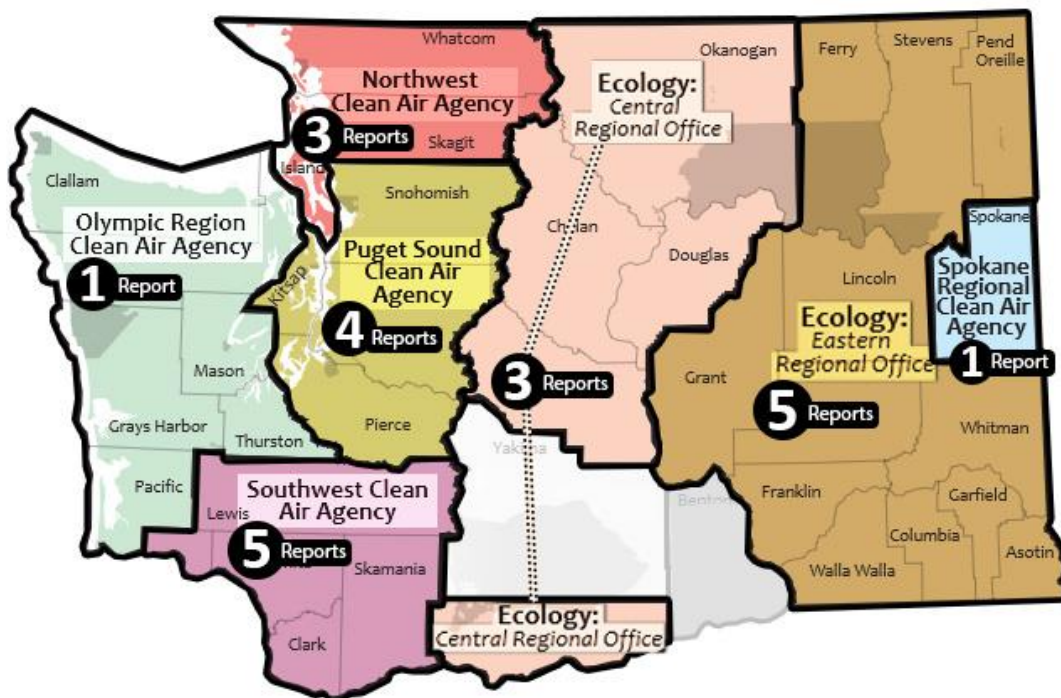
- 40 CFR Parts 60, 61, 63, 72 and 75.
- Methods 1, 2 and 5.
- *CAA National Stack Testing Guidance* (2009).
- *CAA Stationary Source Compliance Monitoring Strategy* (2016).
- *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III (Stationary Source-Specific Methods)* (1977 and 1994 versions).
- Guideline Document 22 (GD-022R4)—*Requests for Approval of Alternatives/Modifications to Test Methods and Testing Procedures* (2014).
- Guideline Document 43 (GD-043)—*Preparation and Review of Emission Test Reports* (1998).

The team selected EPA Methods 1, 2 and 5 for review. We selected these methods because they are the primary test methods used to determine compliance with

⁴ We did not interview managers and staff from the Benton Clean Air Agency or the Yakima Regional Clean Air Agency because facilities in those regions did not conduct any Method 5 stack tests in 2016 and 2017.

particulate matter emission limits at stationary sources. We developed a checklist of key test procedures and documentation needs for these methods. The checklist then was sent to the Office of Air Quality Planning and Standards and to EPA Region 10 managers and staff for review and comment. The team incorporated the comments received into the checklist and used it to analyze 30 stack test reports⁵ from Washington state and local clean air agencies (Figure 2). The team checked selected calculations provided by the stack testing companies for at least one test run per stack test to evaluate the accuracy of emissions calculations. We did not use our checklist analyses to assess whether the compliance determinations for specific facilities were appropriate.

Figure 2: Stack test reports reviewed per delegated agency in Washington state *



Source: Washington State Department of Ecology, modified by the OIG.

* In addition to the 22 reports detailed in this map, we reviewed eight reports from the Washington State Department of Ecology’s Industrial Section. See Figure 3.

To select stack test reports from the local clean air agencies, we requested a list of stack test reports for major stationary source facilities that used EPA Method 5 during calendar years 2016 and 2017.⁶ The five clean air agencies that used EPA Method 5 in 2016 and 2017 provided lists of their reports. The universe of local agency stack test reports using EPA Method 5 for 2016 and 2017 was 66. The team used cluster random sampling to select and review at least one Method 5 stack test report for each of the five local agencies. The team selected 14 stack test reports from local clean air agencies.

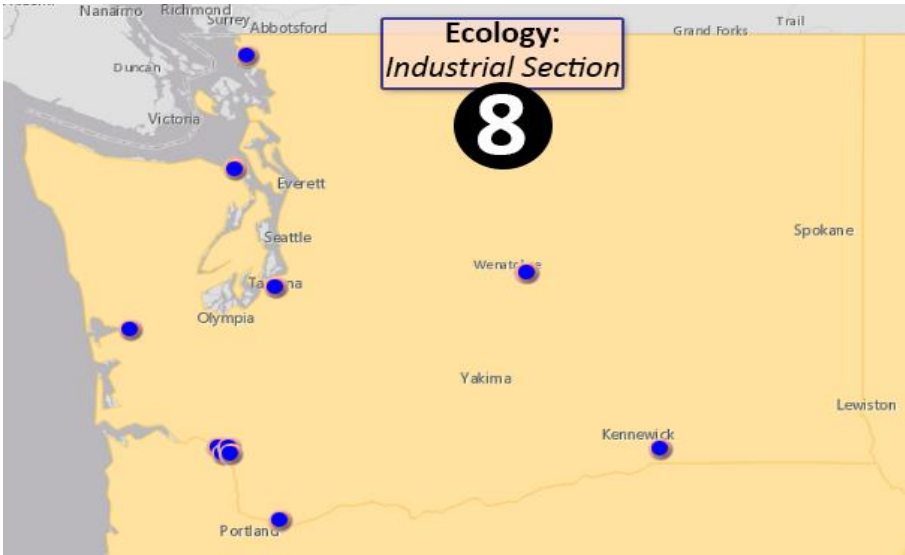
⁵ Of the 30 stack test reports that we reviewed, 29 tests used EPA Methods 1, 2 and 5. One test used EPA Methods 1, 2 and 5D (Determination of Particulate Matter Emissions from Positive Pressure Fabric Filters).

⁶ Testers conducting Method 5 tests must also follow Method 1 and 2 procedures.

We could not use random sampling to select facilities for review that were under the jurisdiction of the Washington State Department of Ecology because the state agency was unable to provide us with a universe of facilities that use EPA Method 5 during stack tests. The Washington State Department of Ecology’s Central and Eastern Regional offices and Industrial Section were unable to provide us with a list of facilities because they do not track which facilities conduct particulate matter testing. Instead, the three offices provided us with the major source permits that they issued, and we reviewed the permits to determine which facilities were required to conduct EPA Method 5 stack tests.

We then requested the stack test reports for calendar years 2016 and 2017 for those facilities. We selected 16 stack test reports for review, including five from the Eastern Regional Office, three from the Central Regional Office and eight from the Industrial Section. Three of the eight stack reports chosen for the Industrial Section were summary stack test reports. We selected these summary reports to determine what information the Industrial Section was receiving from facilities and whether the stack tester adhered to EPA Method 5. Figure 3 shows the location of Industrial Section facilities and the number of reports reviewed.

Figure 3: Washington State Department of Ecology’s Industrial Section facilities, sites and stack tests reviewed



Source: Washington State Department of Ecology’s Industrial Section facility data, modified by the OIG.

After we reviewed the 30 stack test reports, we met with managers and staff from the five local clean air agencies and the three Washington State Department of Ecology offices to discuss issues that we found during our stack test report review.

Prior Evaluation and Audit Coverage

We previously reported on the EPA's oversight of stack testing in EPA OIG Report No. [2000-P-00019](#), *Report of EPA's Oversight of State Stack Testing Programs*, issued September 11, 2000. The OIG found that the EPA had not issued comprehensive national guidance in this area and had not provided sufficient oversight of state and local stack testing programs. The OIG concluded that this lack of guidance and oversight had an adverse effect on the use of stack testing as a tool for determining compliance. The OIG recommended that the EPA develop national guidance to address issues such as proper test procedures and how to report stack test results. In addition to national guidance, the OIG recommended that the EPA enhance its oversight program. To address the concerns of the audit, the EPA issued the *CAA National Stack Testing Guidance* in 2005. The agency revised the guidance in 2009.

Chapter 2

Improved Oversight Is Needed to Assess Accuracy of Compliance Testing for Particulate Matter Emissions

Stack testers did not always follow EPA test methods or properly document their procedures in stack test reports submitted to facilities and regulatory agencies in Washington state. We identified errors in the application of test methods in over half of the 30 reports reviewed, and we found that data were missing in most reports. These errors or omissions were not identified during the delegated agency's review of the reports. Two agencies in Washington state did not thoroughly review stack test reports to identify potentially significant errors and omissions. These two agencies also did not observe any stack tests in 2017, which could have helped identify stack testing errors. Further, staff from three local agencies told us that they needed training and tools, such as stack test report checklists, to assist them in reviewing reports. Region 10 had allocated limited resources to overseeing stack test activities but did not use these limited resources to assess the adequacy of delegated agencies' reviews of stack test reports. In the absence of more effective oversight and control activities, Region 10 does not have reasonable assurance that state and local agencies are adequately reviewing stack test reports to verify their reliability for making accurate compliance determinations.

EPA Methods 1, 2 and 5 Used to Calculate Particulate Matter Emissions

As detailed in Chapter 1, EPA Methods 1 and 2 describe the procedures for sampling and calculating values, such as stack flow rates and velocities, which are then used in Method 5 to estimate particulate matter emissions. Method 5 stack testing requirements can be infrequent. Depending on the facility, stack testing can occur as a one-time test at the time of permitting or every 5 years for synthetic minor facilities. Limited or no oversight of stack testing and reporting increases the chances that a facility will be noncompliant with a permit limit for a year or more before that noncompliance is detected.

Delegated Agencies' Stack Test Report Reviews Did Not Identify Errors or Reporting Omissions

We reviewed 30 stack test reports and found errors in applying EPA test methods in 17 of 30 stack test reports, which affect the reliability of the particulate matter emission estimate and thus could impact the reliability of that facility's compliance determination. We also found that data and documentation were missing in 29 of the 30 stack test reports. State and local agencies responsible for reviewing facility-submitted stack test reports had not identified errors in the

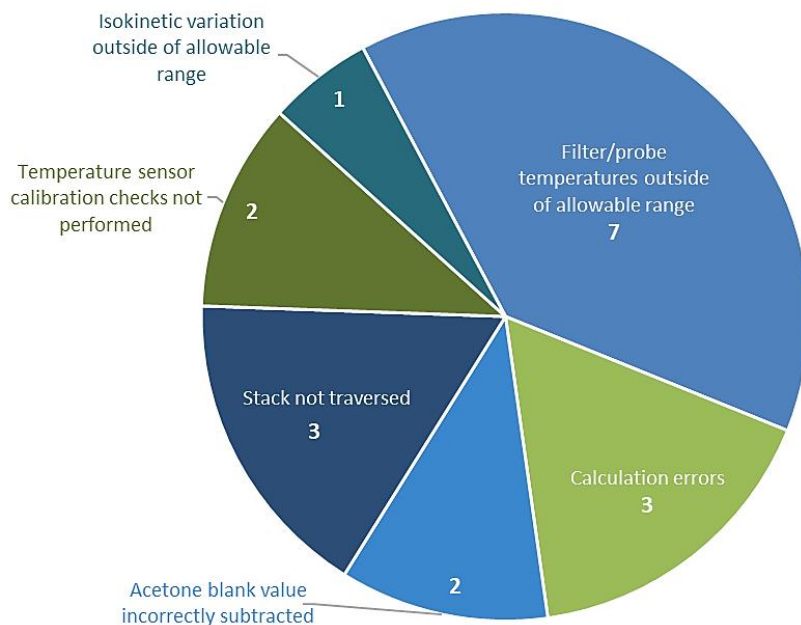
application of test methods or omissions in stack test reports that we identified during our audit.

While the scope of our work was limited to stack test reports from Washington state, EPA OAR staff told us that based on their experience, some of the problems that we found were not limited to one state or region in the country. OECA agreed with the OAR’s perspective that these problems should be addressed on a national level. Thus, while this report discusses the results of our audit in Washington state and EPA Region 10, four of our recommendations are national in scope.

Delegated Agencies in Washington State Did Not Identify Nonadherence to EPA Test Methods

Stack testers did not always adhere to procedures for EPA Methods 1, 2 and 5 as required by 40 CFR Part 60.⁷ Neither Washington state nor local agencies⁸ identified these problems during either their stack test observations (if conducted) or their stack test report reviews. We found 18 errors—which were made across seven of the eight delegated agencies we reviewed—in applying EPA test methods; these errors could impact calculated particulate matter emission rates and compliance determinations. Figure 4 summarizes the types of EPA method errors we found.

Figure 4: EPA method errors (out of 30 stack tests reviewed) *



Source: OIG analysis of 30 stack test reports from Washington State Department of Ecology and five local clean air agencies.

* Errors are described in detail below.

⁷ Per 40 CFR Part 60, performance tests (e.g., stack tests) shall be conducted in accordance with the promulgated test methods and procedures.

⁸ We sampled three offices from the Washington State Department of Ecology and five local clean air agencies. Figures 2 and 3 of this report provide more information.

The following list describes the errors depicted in Figure 4:

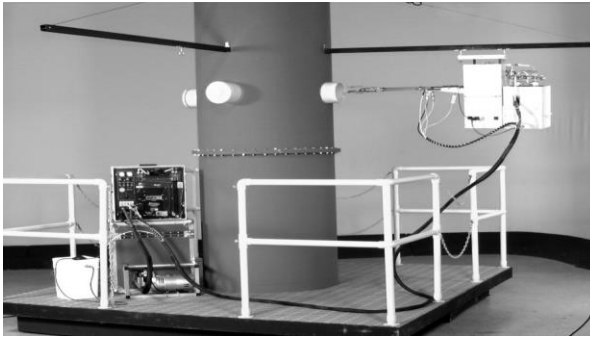
- **Filter/probe temperatures outside of allowable range (or not included in the report).** We found issues with filter and probe temperatures in seven of the 30 stack test reports reviewed. In one stack test report, the stack tester began Method 5 sampling before sufficiently heating the equipment, which caused the filter temperatures at the first traverse point to be lower than required by Method 5. In another stack test report, the filter temperature for one test run was below the range specified by Method 5. A third stack test report had test runs with probe temperatures that were both above and below the Method 5 allowable range. Sampling at lower-than-specified temperatures can cause the test to overestimate emissions, while sampling at higher-than-specified temperatures can cause the test to underestimate emissions. We also found five stack test reports that did not include the probe temperature.
- **Calculation errors.** Using the equations provided in Methods 2 and 5 and in the EPA's *Quality Assurance Handbook for Air Pollution Measurement Systems*, we spot-checked reported calculations by performing our own calculations. We found discrepancies in three of 30 stack test reports reviewed. For example:
 - In one stack test report, there was about a 38-percent discrepancy between the reported Method 5 volumetric flow rates and our calculated Method 5 volumetric flow rates for Runs 1, 2 and 3.
 - In one stack test report, the reported average stack velocities for Runs 1 and 3 were approximately 10 percent below our calculated velocities.

Some calculated data points from Method 2 and 5 tests are inputs into subsequent calculations. For example, average stack gas velocity is an input into the volumetric flow rate and the percent isokinetic equations. Incorrect input data would introduce errors into the volumetric flow rate and isokinetic calculations, which in turn could result in unreliable emission estimates.

- **Acetone blank value incorrectly subtracted.**⁹ In two of the 30 stack test reports, we found that an acetone blank value of greater than 0.001 percent of the weight of the acetone was subtracted from the sample weight. This subtraction is not allowed per Method 5 because such subtractions directly impact particulate matter emission calculations. In 21 stack test reports, we found that the tester did not save at least 200 milliliters of acetone to be tested to determine the blank value, as required by Method 5.

⁹Acetone blanks are analyzed to detect and adjust for any contamination that may impact calculations and estimates.

- **Stack not traversed.** In one stack test report, we found that the stack tester did not sample from all equal areas of the stack, as required by Method 1. This stack test included one Method 5 test run at 12 different stacks. The stack tester failed to obtain a representative sample at five of the 12 stacks due to port blockages. In another stack test report, we found



Example of a properly constructed support system for traversing a stack during stack testing. (EPA photo)

that the facility only sampled at 12 traverse points when it should have sampled at 20 points based on the stack parameters and Method 1 requirements. Similarly, a third report showed that the tester only sampled at 12 traverse points in two of the stacks tested, when the stack tester should have sampled at 24 points. In the same report, the sampling port on one of the stacks tested was too close to the upstream flow disturbance to meet Method 1 specifications. In this situation, Method 1 requires the tester to make gas flow angle determinations at 40 or more traverse points before determining next steps. There is no evidence in the report that the tester performed such determinations. All three reports lacked documentation that a method deviation was requested.

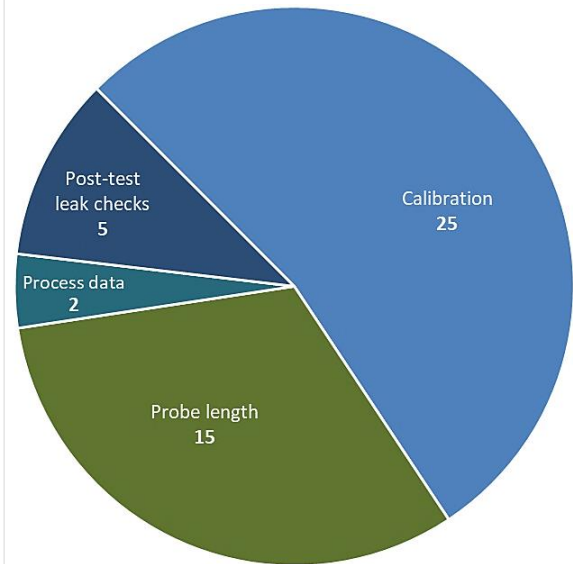
- **Temperature sensor calibration checks not performed.** In two stack test reports, we found that the stack tester did not perform post-test, temperature-sensor calibration checks as required by Method 2. Temperature sensors must be calibrated to provide accurate stack temperature measurements, which are direct inputs into stack velocity and volumetric flow rate equations. Method 2 states that the temperatures of the stack thermometer and reference thermometer shall agree within ± 1.5 percent.
- **Isokinetic variation outside of allowable range.** In one stack test report, we found isokinetic variation averaged about 138 percent for three test runs. True isokinetic sampling is 100 percent. Method 5 allows for 10-percent isokinetic variation. If sampling is conducted at less than 90-percent isokinetic, too little particulate matter is extracted. If sampling is conducted at greater than 110-percent isokinetic, too much particulate is extracted. This type of method deviation can impact particulate matter emission calculations, and thus final compliance determinations, particularly if the facility's emissions rate is near or at the permit limit.

It is important that oversight of stack testing and reporting is effective in identifying such errors and that regulatory agencies request clarifications and/or retesting when the validity of a compliance determination is in question.

Key Data and Documentation Missing in Stack Test Reports

Stack testers did not always document key information in their reports to facilities and regulatory agencies. EPA test methods and supplemental guidance describe how stack testers should properly document the equipment, supplies, sampling and analytical steps used in testing. A reviewer needs this documentation to fully assess stack test data quality and whether the test demonstrated compliance. We found that, of the 30 stack test reports from all eight state and local agencies, 29 were missing data and documentation, and 13 were missing more than one category of information. Figure 5 summarizes the number of stack test reports missing information. The following list describes the types of data and documentation missing as depicted in Figure 5:

Figure 5: Missing data and documentation (out of 30 stack tests reviewed) *



Source: OIG analysis of 30 stack test reports from Washington State Department of Ecology and five local clean air agencies.

* Missing data are described in detail below.

- **Calibration.** We found that 25 of 30 stack test reports were missing at least one element of calibration information (e.g., documentation of equipment calibration). The accuracy of each measurement or set of measurements is determined through calibration against reference standards defined within the test methods, so it is important for the stack test report reviewer to understand whether calibrations were conducted.

The EPA's *Quality Assurance Handbook* states that calibration of the Method 5 sampling apparatus is one of the most important functions in maintaining data quality. Furthermore, the EPA's *Air Pollution Training Institute Course 450: Source Sampling for Pollutants Student Guide* states that stack test results are meaningless without calibration of the equipment. Method 5 states that the tester must maintain a log of all calibrations.

- **Probe length.** We found that half (15 of 30) of the stack test reports reviewed did not contain probe length information. Method 5 requires stack testers to record probe length on field data sheets.
- **Process data.** We found that two of 30 stack test reports lacked the process data needed to assess whether applicable operating conditions

were met during the Method 5 test(s). According to 40 CFR § 60.8, stack test reports shall include a record of process operating conditions that demonstrates applicable test conditions were met.

- **Post-test leak checks.** We found that five of 30 stack test reports did not include information about post-test leak checks for pitot tubes.¹⁰ One local agency discussed this issue with the test company. The test company has since implemented corrective action measures to confirm that all field data are checked before leaving the test site. Method 5 states that sampling the equipment leak check and calibration ensures the accurate measurement of stack gas flow rate and sample volume. Leak checks are necessary to verify that the sample has not been biased low by dilution air.

State and local agency staff who review stack test reports need the above data and documentation to fully assess stack test data quality and compliance determination. The EPA's test methods and *Quality Assurance Handbook* emphasize adherence to the methods and proper documentation of the testing procedures followed and the equipment and supplies used. Without such documentation, state and local agencies have less assurance that stack test results and compliance determinations are accurate and reliable. State and local agencies need this information to provide effective oversight.

Other Problems Identified During Our Audit of Stack Test Reports

Three stack test reports that we reviewed contained different types of errors, including inconsistent information in different sections within the same report, which made it difficult to understand how the test was conducted. These reports included the following inconsistencies:

- Different test run start/stop times documented in the stack test report.
- Different numbers of sampling points listed in the stack test report (e.g., one page listed 24 points and another page listed 12 points).
- Different stack upstream duct diameters listed in the stack test report.

In one instance, we found that the stack tester had not adhered to the agreed-upon test protocol. The stack tester performed 60-minute test runs when the stack test plan called for 90-minute test runs. However, none of these problems were identified during the applicable regulatory authority's review of the stack test report. Therefore, agencies did not follow up with stack testers for clarification or additional information prior to our audit.

¹⁰ A pitot tube is a type of stainless-steel tube used to determine average gas velocity in a stack.

EPA Region 10 Lacks Internal Controls to Assess Oversight of State and Local Agency Stack Test Compliance Activities

For the past 5 years, Region 10 has allocated less than half of a full-time equivalent employee (spread across its five air enforcement staff) per year to oversee stack testing and reporting activities in the region's four states and 271 federally recognized tribes. Oversight of stack test report review has not been a point of emphasis for the region, and there were few controls to provide a reasonable level of confidence that state and local agencies were fulfilling their delegated responsibilities.

For stack tests that are delegated to the state or local agency, Region 10 staff typically receive notifications when stack test reports have been completed, but regional staff conduct only a limited review. The review focuses on the facility's operating conditions during the test and its compliance with permitted emission limits. According to one Region 10 staff person, a review typically does not include a stack test report's appendices, which contain calibration records, raw data sheets for field sampling, raw data sheets for field and laboratory analyses, and example calculations for reported results. However, that information is what allows the reviewer to assess the stack tester's adherence to EPA methods, the overall quality of the test and the quality of the review by delegated agencies.

According to the EPA's 2009 CAA *National Stack Testing Guidance*, as part of the EPA's oversight responsibilities:

EPA may observe stack tests whenever the Agency deems appropriate. The Agency also will review test reports as needed to verify that the tests are being conducted properly, and that the results are being accurately interpreted and reported by state/local agencies.

According to a Region 10 manager, staff observed three stack tests in fiscal year 2016 and four in fiscal year 2017. While Region 10 observes a limited number of stack tests and reviews a limited number of stack test reports, it does not have internal controls in place to regularly assess the work of state and local agencies or otherwise verify that important oversight tasks are conducted. For example, Region 10 does not assess whether delegated agencies are (1) observing stack tests or conducting prior review of test plans or (2) reviewing stack test reports to determine data quality and adherence to test requirements, as discussed in EPA guidance. The next section discusses the variability in stack testing oversight activities that exists among delegated agencies in Washington state.

Delegated Agencies Vary in Their Stack Testing Oversight

State and local agencies vary in how they conduct stack testing oversight, such as stack test observations and stack test report review. While flexibility is needed for

state and local agencies to set priorities for their agencies, state and local agencies need to assess whether stack testers use the required EPA methods and follow EPA guidance to promote consistent stack testing oversight. Based on our interpretation of the *CAA National Stack Testing Guidance* and the *Quality Assurance Handbook*, stack testing observations and report reviews are the two key oversight activities used to assess data quality and the reliability of compliance determinations.

Stack Test Observations

Staff from one Washington state local agency, the Olympic Region Clean Air Agency, stated that their agency observes almost all stack tests conducted within its jurisdiction. Similarly, staff from the Washington State Department of Ecology’s Eastern Regional Office stated that they observe about 80 percent of the stack tests conducted in the office’s region. Conversely, other agencies rarely observe stack tests. The Northwest Clean Air Agency observes only 10 percent of its stack tests, while the Washington State Department of Ecology’s Industrial Section and Central Regional Office did not observe even one Method 5 stack test in 2017. Also, some state and local agencies’ staff stated that they usually observe only a few hours of each stack test, although these tests can take days to complete. Table 2 shows the number of Method 5 stack tests observed by other state and local agencies.

Table 2: Percentage of Method 5 stack test observations by Washington state and local agencies

State and local clean air agencies	Percent of stack test observations *
Olympic Region Clean Air Agency	Close to 100% each year
Washington State Department of Ecology’s Eastern Regional Office	About 80% each year
Spokane Regional Clean Air Agency	About 75% each year
Southwest Clean Air Agency	About 60% each year
Puget Sound Clean Air Agency	About 25–30% each year
Northwest Clean Air Agency	About 10% each year
Washington State Department of Ecology’s Industrial Section	None observed in 2017
Washington State Department of Ecology’s Central Regional Office	None observed in 2017

Source: OIG interviews and correspondence with Washington State Department of Ecology offices and five local clean air agencies.

* As reported to the OIG by each agency and office or section.

According to the EPA’s *CAA National Stack Testing Guidance*, delegated agency staff should observe stack tests whenever possible to assess whether the regulatory testing requirements are met, the stack test plan is followed, and the results in the test report are accurate and complete. The guidance also states that the agencies should be present for the duration of the test to reduce the likelihood of testing errors. Most agencies we reviewed cited limited time and resources as constraints on stack test observations. However, EPA guidance indicates that the presence of an observer at the stack test could improve the quality of data used for compliance determinations.

Stack Test Report Reviews

Some state and local agencies conduct a thorough review of the stack test reports that they receive, while other agencies perform only a cursory review of the reports. For example, the Southwest Clean Air Agency has a multilevel internal review process that begins with staff review and ends with a secondary, high-level review by the Chief Engineer. Conversely, the Washington State Department of Ecology's Industrial Section and Central Regional Office staff may only review whether the stack test demonstrated compliance with emission limits. Additional report reviews only occur when time permits, and neither office has a multilevel review process.

Several of the Industrial Section's facilities do not submit full stack test reports to the Industrial Section. They submit only a summary of the stack test results. One summary that we reviewed was only six pages and lacked information on important aspects of Method 5 testing, such as calibrations for the probe nozzle, pitot tube and probe heater.

To assess a stack test report's data quality and to have confidence in the final compliance determination, regulatory agencies need to obtain the full stack test report (including calibration sheets, field data sheets, calculations, etc.) and then review key test parameters. When limited information is provided or when only a cursory review is performed, it is not possible to audit the stack test in the manner that EPA guidance recommends.

Delegated Agency Staff Need More Training and Tools to Assist with Reviewing Stack Test Plans and Reports

State and local regulatory agencies in Washington state had varying levels of stack testing knowledge, tools and use of EPA resources. EPA Region 10 and three delegated agencies indicated that additional training and resources for stack testing plan and report review would improve their oversight efforts.

According to state and local regulatory agencies in Washington state, staff have attended the following courses and conferences:

- Western States Air Resources Council's course on source test observation and review.
- The EPA's Air Pollution Training Institute Courses #450 (Source Sampling for Pollutants) and #468 (Monitoring Compliance Test and Source Test Observation).
- California Air Resources source observation course.

- Source Evaluation Society Annual Conference.
- Air and Waste Management Association Stack Test Training—Pacific Northwest International Section.

However, staff indicated that some of the courses were offered intermittently and that most of the courses focused on conducting the stack test rather than on how to review a stack test plan and/or report. Several of the agencies we reviewed had former stack testers on staff who can answer questions from other staff about reviewing stack test reports. Agencies that do not employ former stack testers typically assign stack test report reviews to engineers. Region 10 agreed that there is always a need for stack testing training, particularly as experienced reviewers retire.

Agencies also varied with respect to the internal development of stack testing tools, such as stack test report review checklists and guidance, and the use of EPA resources. For example, the Southwest and the Olympic Region clean air agencies have developed checklists that focus on the key test parameters in a stack test report. Other agencies we audited did not have checklists but indicated that such tools would improve their stack test report reviews. In our view, delegated state and local agencies should have access to checklists for the important and common EPA test methods. Such tools would allow staff to more quickly identify any significant errors or omissions in stack test reports and to request clarifications and/or retesting when the validity of a compliance determination is in question.

Further, two agencies that we reviewed had contacted the Office of Air Quality Planning and Standards and/or Region 10 staff when stack testing questions arose. Two local agency staff stated that they were not sure whom to contact in the EPA about stack testing questions. It is important for the EPA to inform state and local agencies about whom to contact with stack test questions.

Regulators Have Less Confidence in Reported Emissions When Stack Testers Do Not Adhere to EPA Test Methods

When stack testers do not adhere to applicable EPA test methods and when regulatory agencies do not promptly identify the errors and assess their importance, the EPA may not have confidence that reported emissions are accurate and that air quality is protected. Accurate stack testing data are important to the EPA, state and local regulators, and facilities for compliance determinations and other initiatives that protect human health and the environment. Incomplete adherence to EPA test methods increases the variability of results and reduces overall data quality (precision and accuracy), which is a combination of the individual measurement uncertainties.

Thus, it is imperative that delegated authorities closely monitor the competence of testers and how Method 5 is being applied in the field. If reviewers do not identify and work to correct significant problems that have occurred during stack tests or

the preparation of stack test reports, stack testers could continue to make similar errors. Some of the errors that we found, such as failing to traverse the stack and not properly calibrating equipment, can impact the determination of a facility's compliance with permit limits, particularly if the facility's emissions are near or at the permit limit.

As mentioned earlier in this report, Method 5 stack testing requirements can be infrequent. Limited or no oversight of stack testing and reporting increases the chances that a facility will be noncompliant with a permit limit for a year or more before the noncompliance is detected. Therefore, effective oversight of stack testing is critical for protecting human health and the environment in communities near major stationary source facilities.

Conclusions

Stack testing is an important tool used to determine a facility's compliance with emission limits. To provide accurate and reliable results, stack testers must adhere to EPA methods and document key information in stack test reports. Delegated state and local agencies have primary responsibility for monitoring and assessing the effectiveness of stack tests for facilities within their jurisdiction. In overseeing delegated programs, the EPA monitors program implementation to confirm that delegated programs and activities are meeting federal standards. Based on the results of our audit and because the EPA told us that similar conditions exist in other regions and states, the agency should take steps to address state and local stack testing oversight nationwide.

Recommendations

We recommend that the Assistant Administrator for Air and Radiation and the Assistant Administrator for Enforcement and Compliance Assurance:

1. Develop and implement a plan for improving the consistency of stack test reviews across EPA regions and delegated agencies.
2. Assess the training needs of EPA regions and state, local and tribal agencies concerning stack test plans and report reviews and EPA test methods, and develop and publish a plan to address any training shortfalls.
3. Develop stack test report checklists for EPA Method 5 and other frequently used EPA methods to assist state, local and tribal agencies in their reviews of stack test plans and reports.
4. Develop and publish on EPA regional websites a list of EPA contacts who can assist state, local and tribal agencies with stack test method issues or other stack test problems.

We recommend that the Regional Administrator, Region 10:

5. Develop a communication plan to make all state and local agencies within Region 10 aware of EPA requirements and guidance for conducting stack testing oversight.
6. Develop and implement controls to assess delegated agencies' stack testing oversight activities.

Agency Response and OIG Evaluation

The agency concurred with our recommendations and provided acceptable planned corrective actions and completion dates. To address Recommendations 1 and 4, OECA will develop and implement a plan to improve the consistency of stack test reviews across EPA regions and delegated agencies, so that stack testing is being sufficiently and properly used. Further, OECA will list on its public website the EPA regional stack testing contacts and a link to the OAR's directory of technical support staff for each of the test methods. Recommendations 1 and 4 are considered resolved with corrective actions pending.

To address Recommendations 2 and 3, the OAR will work with EPA regions and delegated agencies to review currently available stack testing materials and assess training needs with respect to approving stack test plans, reviewing stack test reports and conducting EPA test methods. The OAR then will work with EPA regions and delegated agencies to identify training shortfalls and develop a plan to address the shortfalls. Further, the OAR will work with EPA regions and delegated agencies to develop checklists for reviewing stack test reports for seven EPA methods. Recommendations 2 and 3 are considered resolved with corrective actions pending. See Appendix B for the OAR and OECA response to the draft report.

To address Recommendation 5, EPA Region 10 will distribute the EPA stack testing requirements and guidance to its state and local agencies in writing. The region also will present this information at the quarterly meetings with state and local agencies. When OECA and the OAR release new information related to Recommendations 1–4, Region 10 also will communicate this information to its state and local agencies in a meeting and in writing.

Regarding Recommendation 6, Region 10 agreed to conduct annual meetings with its state and local agencies to discuss their stack testing oversight activities. After OECA and the OAR have completed the corrective actions for Recommendations 1 and 3, Region 10 will meet with its state and local agencies to discuss and implement any new stack test oversight policies and guidance. Region 10's corrective action meets the intent of Recommendation 6. Recommendations 5 and 6 are considered resolved with corrective actions pending. See Appendix C for Region 10's response to the draft report.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS

Rec. No.	Page No.	Subject	Status ¹	Action Official	Planned Completion Date	Potential Monetary Benefits (in \$000s)
1	21	Develop and implement a plan for improving the consistency of stack test reviews across EPA regions and delegated agencies.	R	Assistant Administrator for Air and Radiation and Assistant Administrator for Enforcement and Compliance Assurance	3/31/22	
2	21	Assess the training needs of EPA regions and state, local and tribal agencies concerning stack test plans and report reviews and EPA test methods and develop and publish a plan to address any training shortfalls.	R	Assistant Administrator for Air and Radiation and Assistant Administrator for Enforcement and Compliance Assurance	3/31/22	
3	21	Develop stack test report checklists for EPA Method 5 and other frequently used EPA methods to assist state, local and tribal agencies in their review of stack test plans and reports.	R	Assistant Administrator for Air and Radiation and Assistant Administrator for Enforcement and Compliance Assurance	6/30/21	
4	21	Develop and publish on EPA regional websites a list of EPA contacts who can assist state, local and tribal agencies with stack test method issues or other stack test problems.	R	Assistant Administrator for Air and Radiation and Assistant Administrator for Enforcement and Compliance Assurance	12/31/19	
5	22	Develop a communication plan to make all state and local agencies within Region 10 aware of EPA requirements and guidance for conducting stack testing oversight.	R	Regional Administrator, Region 10	5/31/22	
6	22	Develop and implement controls to assess delegated agencies' stack testing oversight activities.	R	Regional Administrator, Region 10	3/31/22	

¹ C = Corrective action completed.

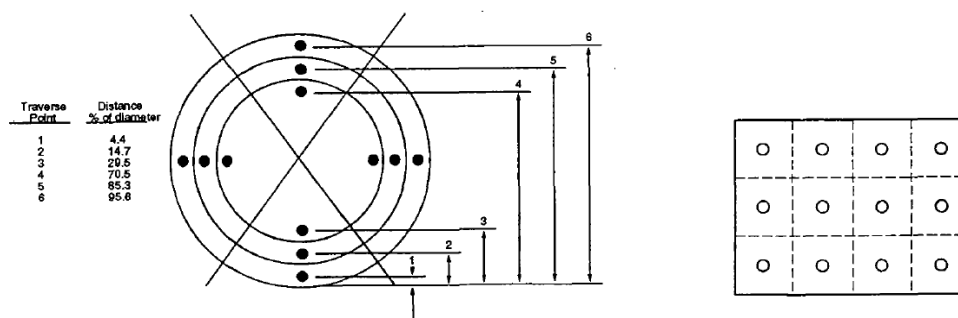
R = Recommendation resolved with corrective action pending.

U = Recommendation unresolved with resolution efforts in progress.

Description of EPA Methods 1, 2 and 5

- Method 1 is used to provide procedures for the selection of sampling ports and traverse points¹¹ where sampling for air pollutants will be performed. The method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source. A measurement site where the effluent stream is flowing in a known direction is selected, and the cross section of the stack is divided into an appropriate number of equal areas. Traverse points are then located within each of these equal areas, as shown below in Figure A-1 for circular (left) and rectangular (right) stacks.

Figure A-1: Examples of stack cross sections divided into 12 equal areas, with location of traverse points.



Source: EPA Method 1.

- Method 2 is used to determine the average velocity and the volumetric flow rate of a gas stream at sites that meet the criteria of Method 1. The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a stainless steel or quartz (Type S) pitot tube (see image to the right). The Type S pitot tube is the pitot tube most frequently used in conjunction with Method 5 because it is compact and easily attaches to the Method 5 probe assembly. (See Figure A-2 on the following page.)



Source: EPA.

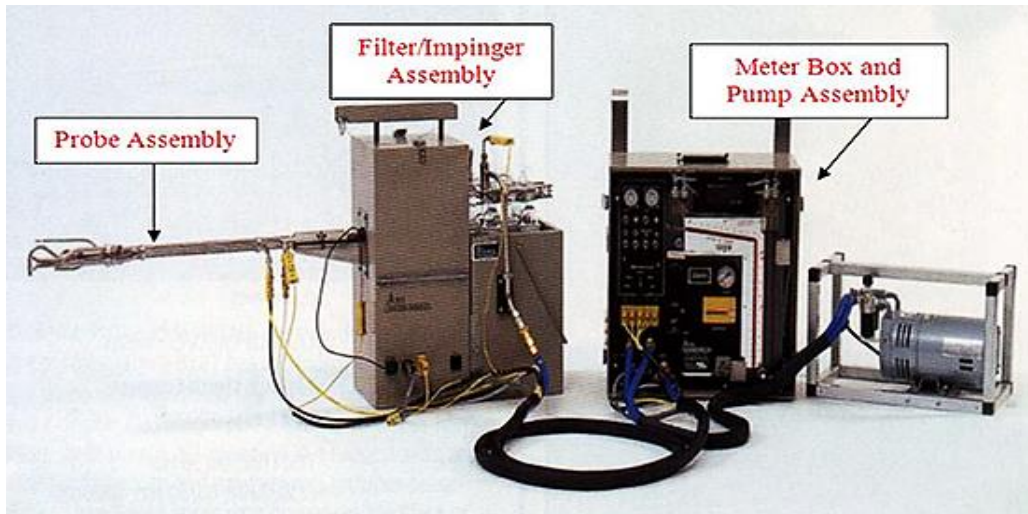
- Method 5 is used to determine particulate matter emissions from stationary sources. Using this method, a sample is isokinetically¹² withdrawn from the gas stream at traverse points determined using EPA Method 1. The particulate matter mass is collected on a glass fiber

¹¹ Traverse points are the actual sampling locations within the stack. Conditions in the stack are not uniform, so the cross section must be traversed to get a representative sampling for velocity and particulate concentration. If sampling ports are located on straighter lengths of stack or duct, stack flow is more uniform and fewer traverse points are needed to obtain a representative sample.

¹² Sampling is isokinetic when the stack gas is flowing into the probe nozzle at a rate that equals the gas velocity immediately around the probe.

filter maintained at a temperature of $248 \pm 25^\circ \text{F}$ and then determined gravimetrically¹³ after the removal of excess water. Method 5 requires the use of reagent grade (<0.001 percent residue) acetone for sample recovery rinses. The method does not allow the stack tester to subtract a blank value of greater than 0.001 percent of the weight of acetone from the sample weight. The EPA's Federal Reference Method 5 Sampling Train,¹⁴ as shown in Figure A-2, should be operated for the minimum total sampling time specified in the test procedures, such that the sample taken exceeds the required minimum total gas sample volume.

Figure A-2: Federal Reference Method 5 sampling train



Source: The EPA's *Air Pollution Training Institute Course 450: Source Sampling for Pollutants Student Guide*, p. 3–12.

¹³ Gravimetric analysis of particulate matter samples for Method 5 occurs in a laboratory setting. Particulate matter concentration is determined using a finely calibrated balance or scale to compare the post-sampling weight of the particulate matter filter to the weight of the filter prior to sampling.

¹⁴ The Federal Reference Method 5 Sampling Train is composed of three components: the probe assembly, the filter/impinger assembly, and the meter box and pump assembly. Each assembly contains various measurement components that must be calibrated.

OAR's and OECA's Response to Draft Report





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

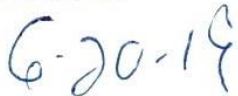
June 20, 2019

MEMORANDUM

SUBJECT: EPA Comments on Draft Report: "*More Effective EPA Oversight Is Needed for Particulate Matter Emissions Compliance Testing.*" Project No. OA&E-FY18-0186, May 15, 2019

FROM: Susan Parker Bodine 
Assistant Administrator
Office of Enforcement and Compliance Assurance

William L. Wehrum 
Assistant Administrator
Office of Air and Radiation

TO: Kevin Christensen 
Assistant Inspector General
Office of the Inspector General

EPA's Office of Enforcement and Compliance Assurance (OECA) and Office of Air and Radiation (OAR) appreciate the opportunity to provide the Office of the Inspector General (OIG) with comments on the draft report *More Effective EPA Oversight is Needed for Particulate Matter Emissions Compliance Testing*. We agree that thorough and accurate stack tests and test reports are needed to determine if a facility is in compliance with emission limits and whether excess emissions negatively impact human health and the environment. We also agree that such tests should be conducted in accordance with EPA regulation, policy and guidance. EPA appreciates the observations and recommendations provided in the draft report emphasizing the importance of state and local air agencies having the training and tools needed to conduct oversight of stack testing and reporting. We believe additional training and tools being made available to state and local agencies will improve their stack test compliance activities and overall oversight efforts in reviewing stack test plans and reports.

In addition, we understand that EPA has shared accountability in protecting human health and the environment with state and local agencies. We value these agencies as important partners. As the principal compliance monitoring and enforcement agencies, they have primary responsibility for implementing their delegated programs. Consistent with cooperative federalism principals, EPA has responsibility of federal oversight to ensure adequate program implementation. Therefore, in continuing to engage with these agencies to strengthen their ability through information sharing and training, we also agree with the OIG that EPA should sufficiently monitor program implementation to assess these agencies' stack testing oversight activities and ensure national consistency of stack test reviews.

We agree that implementation of the OIG recommendations directed to OAR and OECA would be beneficial. We provide below which office will implement the corrective action to address each recommendation along with an estimated timeframe for completion.

OIG Recommendation 1

Develop and implement a plan for improving the consistency of stack test reviews across EPA regions and state and local agencies.

EPA Response 1

OECA will implement the following corrective action.

OECA will develop and implement a plan for improving the consistency of stack test reviews across EPA regions and delegated agencies. Such enhanced compliance monitoring will help ensure the tool of stack testing is being sufficiently and properly utilized.

Planned Completion Date: December 31, 2019 to develop a plan. March 31, 2022 to implement the plan in coordination with OAR and consistent with the activities undertaken by OAR in addressing Recommendations 2–3.

OIG Response #1: The agency concurred with the recommendation and provided acceptable planned corrective actions and completion dates. Recommendation 1 is resolved.
--

OIG Recommendation 2

Assess the training needs of EPA regions and state, local, and tribal agencies concerning stack test plans and report reviews and EPA test methods and develop and publish a plan to address any training shortfalls.

EPA Response 2

OAR will implement the following corrective action. OAR's Office of Air Quality Planning and Standards (OAQPS) will work with the EPA regions and state, local and tribal air agencies to review currently available materials and assess training needs with respect to approval of stack test plans, review of stack test reports, and conduct of EPA test methods, with respect to particulate matter compliance testing. OAQPS will work with EPA regional, state, local and tribal agencies to identify current training shortfalls and develop a plan to address these shortfalls. We anticipate two and one-half years to assess the training needs, prepare a training plan, and begin enacting the plan.

Planned Completion Date: March 31, 2022 for finalization of the plan and to begin taking steps to enact the plan.

OIG Response #2: The agency concurred with the recommendation. When we discussed the proposed corrective action with the agency, OECA and the OAR representatives explained that the agency would provide the final training plan to EPA regions and delegated agencies. We agree with the agency's planned corrective actions and completion dates.

OIG Recommendation 3

Develop stack test report checklists for EPA Method 5 and other frequently used EPA methods to assist state, local, and tribal agencies in their review of stack test plans and reports.

EPA Response 3

OAR will implement the following corrective action.

OAQPS will work with EPA regions, state, local and tribal air agencies to develop checklists useful for review of stack test plans, and stack test reports for EPA Method 1, Method 2, Method 3, Method 4, Method 5, Method 7E, and Method 10. OAQPS will provide this content as informational and not to be used as official Regulatory Guidance. We anticipate that it will take approximately 18 months for these checklists to be finalized.

Planned Completion Date: June 30, 2021 for posting (online) and distribution of (.pdf format) the final checklists to regions, states, local and tribal air agencies.

OIG Response #3: The agency concurred with the recommendation and provided acceptable planned corrective actions and completion dates. Recommendation 3 is resolved.

OIG Recommendation 4

Develop and publish on EPA regional websites a list of EPA contacts who can assist state, local, and tribal agencies with stack test method issues or other stack test problems.

EPA Response 4

OECA will implement the following corrective action.

OECA will list on the OECA website the EPA regional stack testing contacts and a link to the OAQPS Air Emission Measurement Center that provides a directory of technical support staff for each of the test methods. The EPA regional offices will be able to link this webpage providing EPA contacts (headquarters and regional) to their regional websites. These contacts and link will reside on the webpage where the Clean Air Act National Stack Testing Guidance is available at <https://www.epa.gov/compliance/clean-air-act-national-stack-testing-guidance>.

Planned Completion Date: December 31, 2019 for updating the stack test guidance webpage to include a list of regional stack testing contacts and a link to the OAQPS Emission Measurement Center.

OIG Response #4: The agency concurred with the recommendation and provided acceptable planned corrective actions and completion dates. Recommendation 4 is resolved.

For your consideration, we also have attached Technical Comments to supplement this response.

If you have any questions regarding this response, please contact Gwendolyn Spriggs, OECA Audit Liaison, at (202) 564-2439 or Mike Jones, OAQPS/OAR Audit Liaison, at (919) 541-0528.

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Region 10's Response to Draft Report



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10

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OFFICE OF THE REGIONAL
ADMINISTRATOR

JUN 17 2019

MEMORANDUM

SUBJECT: Response to the Office of Inspector General Draft Report: "More Effective EPA Oversight Is Needed for Particulate Matter Emissions Compliance Testing" Dated May 15, 2019, Report No. OA&E-FY18-0186

FROM: Chris Hladick
Regional Administrator, Region 10

TO: James L. Hatfield, Director
Air Directorate
Office of Audit and Evaluations

Thank you for the opportunity to respond to the draft findings and recommendations presented in the Office of Inspector General Draft Report, "More Effective EPA Oversight is Needed for Particulate Matter Emissions Compliance Testing." Following is a summary of the comments from Region 10, followed by Region 10's position on each of the Report's recommendations specific to Region 10.

Background and Summary Comments:

Region 10 agrees that many source test reports have errors in the report data and in the test method. While the OIG may not have found written evidence identifying errors, it is Region 10's practice, and that of many of the agencies in Washington, to not create written records of errors which were determined to not affect the compliance determination. Given the focus of the report on the errors themselves rather than the review process, we recommend changing the title to: "Stack Test Reports Have Errors and Reporting Omissions."

Under the section entitled "Delegated Agencies Vary in Their Stack Testing Oversight," the OIG provides data on the number of tests reviewed, and states, "EPA guidance indicates that more frequent observation of stack testing would improve the quality of data used for compliance determinations." Region 10 agrees that there is value in observing stack tests but is unsure which guidance this sentence is referencing. With extremely limited resources in the Region and in the delegated Agencies, this oversight function is weighed against permitting obligations and enforcement of known violations. Region 10 technical staff believe that while observing a test may allow the observer to identify a problem earlier, it cannot necessarily guarantee the method is followed or reduce errors in the report itself. The potential for preventing a critical error that

wouldn't otherwise be observed by the testing firm is very small. We recommend removing this sentence.

In the "Stack Test Report Review" section, the OIG notes instances where key parameters, such as the probe length, are missing in the report. While the failure to include the probe length could be significant for sources that hire testing firms, sources that conduct the testing with their own equipment will have no variation in probe length from test to test and may not need to include the information for the local agency to determine compliance.

While the OIG has found errors in the stack test methods and reports, this Draft Report makes a correlation between errors and the confidence in compliance. Data errors do not necessarily prevent an accurate compliance determination. The compliance determination depends on the ability of trained staff to review the errors in context. We recommend more focus on the importance of these reviews in determining compliance.

Conclusions: As above, we recommend a focus on the importance of reviewing the tests rather than stating that accurate results are only achieved when EPA methods are adhered to and all information is documented.

Recommendation 5: Develop a communication plan to make sure all state and local agencies within Region 10 are aware of EPA requirements and guidance for conducting stack testing oversight.

Region 10 agrees with this recommendation. Region 10 will communicate information from OECA and OAR as it become available.

OIG Response #5: We met with Region 10 to clarify its response to the recommendation. We received correspondence from Region 10 after the meeting stating that Region 10 would distribute the current EPA requirements and guidance in writing to its state and local agencies and present this information at quarterly meetings with its state and local agencies. The planned completion date for this corrective action is December 31, 2019. When new information related to Recommendations 1, 2, 3 and 4 is released by the OAR and OECA, Region 10 committed to having a meeting to communicate the information to its state and local agencies and to distribute this information in writing. The planned completion date for this corrective action is May 31, 2022. We accept the EPA's corrective actions as meeting the intent of our recommendation. Recommendation 5 is resolved.

Recommendation 6: Develop and implement additional controls to assess delegated agencies' stack testing oversight activities.

We agree additional oversight would be useful, however, it is important that this be done at the national level to ensure consistency across the country. Therefore, we believe this should be a national recommendation rather than region-specific.

OIG Response #6: We met with Region 10 to clarify and discuss its response to the recommendation. We also received correspondence from Region 10 after the meeting documenting Region 10's planned corrective actions. As an alternative to implementing Region 10 oversight controls that could be inconsistent with future guidance from EPA headquarters, Region 10 agreed to conduct annual meetings with its state and local agencies to discuss their stack testing oversight activities. Region 10 committed to completing the first round of meetings with its state and local agencies by March 31, 2020, and committed to continuing those meetings through March 31, 2022. After OECA and the OAR have completed the corrective actions for Recommendations 1 and 3, Region 10 will meet with its state and local agencies to discuss and implement any new stack test oversight policies and guidance. Region 10's alternative corrective actions meet the intent of Recommendation 6. Recommendation 6 is resolved.

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