EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-034

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	See attached PWS

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW: Section 3.0

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

Work Plan due 4/29/19.

No work, including but not limited to preparation of the Work Plan, shall begin until 4/1/19.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee LOE:

Cumulative Approved: Cost/Fee LOE:

Work Assignment Manager Name Thomas Long (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3944 FAX Number:	
Project Officer Name Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement

WA Title: Mobile Source Emissions Measurement and Characterization

WA #: 4-034 WACOR: Long

Contract #: EP-C-15-008 Alternate WACOR: Baldauf

NOTE: This work assignment is a follow-on to work performed in Option Period 3 under Work Assignment # 3-034

PERIOD OF PERFORMANCE

The period of performance detailed in this Performance Work Statement (PWS) shall be from April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

Generate emissions data from two vehicles satisfying Office of Transportation and Air Quality requirements for new Motor Vehicle Emission Simulator (MOVES) data, TBD. Chassis dynamometer driving cycles will consist of one HD-UDDS Test Protocol (https://www.epa.gov/sites/production/files/2015-10/huddscol.txt) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid (see below) data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to 8 days of onroad testing (including set up and break down days).

BACKGROUND

This project directly addresses the air, climate, energy, and human health program areas, and supports other motor vehicle projects. While the two currently regulated "critical pollutants", particulate matter (0.01 grams per brake-horsepower-hour (g/bhp-hr)) and NOx (0.20 g/bhp-hr) impact air quality and related health issues, proposed new rules focus on two related areas with broader environmental and social effects: vehicle fuel economy and greenhouse gas (GHG) emissions. The two go hand-in-hand because burning carbon-based petroleum fuels creates carbon emissions, so improving fuel economy directly lowers an internal combustion engine's main GHG, carbon dioxide (CO2).

New vehicle rules are being phased in between 2014 and 2018 as part of an overall energy strategy that looks to reduce U.S. dependency on foreign energy supplies and lower CO2 creation to address global warming concerns.

It is estimated that commercial trucks consume more than 2-million barrels of oil every day and account for 20% of transportation-related GHGs. For example, the state of California estimates that diesel trucks are responsible for seven and a half percent of all of California's global warming pollution.

The call for truck rules does not come with specific target numbers, but requires EPA, with the aid of the National Highway Transportation Safety Administration (NHTSA) to set standards based on research data. Much of the guidance for determining the standards will come from a congressionally mandated report. Created under the auspices of the National Research Council (NRC), "Technologies and Approaches Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles" was put together by a 19-member panel that combined academic researchers, engineers, and technologists with backgrounds in truck and component manufacturing.

Given the size of the existing database for emissions from either Medium Heavy-Duty Trucks (MHDT) or gas direct injection (GDI) vehicles, this study hopes to provide insight into whether it is necessary to modify MOVES to improve these emission factors or to fill similar gaps in represented emission factors.

SCOPE

This Work Assignment (WA) has been designed to fill data gaps or improve existing emission factors for the use case of MHDT or GDI (or similar missing emission factors to be specified by OTAQ).

- Chassis dynamometer testing shall be conducted on two heavy-duty vehicles. The vehicles shall be tested at an ambient temperature of 70 °F (21 °C).

- Chassis dynamometer test cycles shall include a cold start CARB transient cycle, a warm start HD-UDDS, two World Harmonized Vehicle Cycles (WHVC) and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS) designed to generate data in each of the operating modes represented in the MOVES model.

- Core dynamometer bench measurements shall include Total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gas (NMOG), oxides of nitrogen (NOx), nitrogen dioxide (NO2), carbon monoxide (CO), carbon dioxide (CO2) and particulate matter (PM).

- Chassis dynamometer testing shall also generate speciated volatile organic compound (speciated VOC) data.

TECHNICAL APROACH/OBJECTIVES

Task 1 <Reserved>

Task 2 <Reserved>

Task 3 Test Fuels and Lubricants

The Contractor shall provide test fuel. Fuel shall conform to the requirements stated in each vehicle's operating manual and shall be procured from the distributor as a single batch. The Contractor shall provide speciated analyses of the fuels sampled before and after project emissions testing and speciated analysis of the lubricant sampled after project emissions testing.

Task 4 Vehicle Procurement and Preparation

The Contractor shall provide one of the three test vehicles. All three vehicles will be driven by government personnel.

Each vehicle to be tested shall undergo a thorough inspection before beginning the test preparation sequence. This includes inspection and documentation of the engine, transmission, axles, exhaust system and tires, and documentation of the ECM status if available on that vehicle. Descriptively titled photographs of the vehicles' exhaust systems, engine plates, and emission plates shall be taken and included as part of the progress and final reports. Photos from three angles of the vehicle mounted to the chassis dynamometer shall also be included. The Contractor shall collect and record vehicle information as described in the Quality Assurance Project Plan (QAPP). Preparation shall include assisting with the performance of on-road coastdowns.

Each vehicle shall then undergo initial crankcase oil, oil filter and air filter replacement. Oil and air filters shall be procured by the Contractor according to manufacturer's recommendations. Engine oil recommended in the owner's manual of each vehicle shall be used. The recommended grade of lubricant shall be purchased.

After the last test of each vehicle in the program, the Contractor shall record the lubricant level indicated on the dipstick before collecting a 0.25-quart oil sample for analysis.

If any of the vehicles are equipped with traction control, the Contractor shall ensure that the traction control is disabled either through an interior disable button or other method (remove power fuse to anti-lock brake system (ABS), and place a placard in the vehicle indicating the method of disabling traction control if driver input is required. The Contractor will be provided target road load coefficients and set road load coefficients for the test vehicles according to 40 CFR 1066.301 and 40 CFR 1066.310 (or the Contractor may propose and use an alternate method, subject to approval by EPA). For the purpose of this study, the agreed road load setting shall remain the same for all testing on a given vehicle.

The Contractor shall provide hardware and software for reading and archiving vehicle engine control module (ECM) data during emissions testing.

Task 5 Vehicle Testing

5.1 Basic Testing Protocol

The basic dynamometer testing protocol shall begin with a cold start CARB transient cycle, a HD-UDDS, and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS). While light-duty vehicle testing shall be conducted in compliance with CFR Part 86 Subpart C, CFR Part 1065, and CFR part 1066, for MHDT the HD-UDDS shall be conducted in compliance with CFR Part 86 Subpart N, and CFR Part 1065. This test sequence shall be repeated for each vehicle. For heavy-duty vehicles (HDVs), this test sequence shall be performed in both the laden and unladen conditions at an ambient temperature of 70 °F (20 °C). For light-duty vehicles (LDVs), this test sequence shall be performed at ambient temperatures of

72 °F (22 °C) and 20 °F (-7 °C). Each test condition shall be run on each vehicle at least five times. A sixth test may be run if necessary as described in 5.1.1. HDV tests shall be performed on the 72-inch single roll electric heavy-duty chassis dynamometer. Dynamometer testing for this task shall be completed in a 23 week period. The contractor shall be required to provide one person with test experience to provide technical support during sampling and general setup and tear down. LDV tests shall be performed on the 48-inch single roll electric light-duty chassis dynamometer. The EPA will provide the same driver to be used for all tests on a given vehicle.

The gaseous emissions to be measured and reported are THC, CH4, NOx, NO2, CO, and CO2. The Contractor shall use cleaned SUMMA cans (provided by the EPA) to collect sample from which the US EPA will speciate the VOCs. The Contractor shall speciate the oxygenates. The Contractor shall provide polyurethane foam (PUF) sorbent plugs or their equivalent as approved by the WACOR and collect samples on which the US EPA will conduct analyses. The Contractor shall provide teflon filters for the EPA to perform metals analysis on the runs made on the chassis dynamometer. The Contractor shall provide DNPH cartridges and collect samples on which the US EPA will conduct carbonyl analyses. The Contractor shall provide teflon filters on which the US EPA will collect samples and perform gravimetric analyses.

During all emission tests, the Contractor shall record all of the following ECM parameters available for the vehicle at the rate of 1 Hz using Contractor-supplied data acquisition equipment:

- RPM
- Vehicle speed
- Engine load
- MIL status
- Absolute throttle position
- Engine coolant temperature
- Short term fuel trim-bank 2
- Long term fuel trim-bank 2
- Fuel/air commanded equivalence ratio
- Alcohol fuel percent
- Manifold absolute pressure
- Spark advance
- PID Control Module Voltage
- Air Flow Rate From Mass Air Flow Sensor

The facilities for testing shall be maintained in conformance with the requirements of 40 CFR Part 86 Subparts C and N and 40 CFR Part 1066 as they apply to vehicle emissions testing. THC, CH4, NOx, NO2, CO, and CO2 emissions sampling and measurement shall be conducted as specified in 40 CFR 1065. The minimum detection limit for NO2, measurements shall be 5 ppb. If some aspect of testing shall be done in variance to the above specifications the Contractor shall describe why that is the case and how it may impact the test results. Variances shall be approved by the EPA WACOR before testing may begin.

The Contractor shall verify that the tunnel flow remained constant during the test. The CVS blower shall be kept on for ½ hour before the first emission test on a given day and continuously between emission tests to ensure tunnel stability.

The Contractor shall provide defined and maintained cooling fan placement and flow for each test vehicle on all the tests. The flow of air sweeping the vehicle in the test cell shall be consistent between tests.

The Contractor shall perform "blank" tests at a maximum of one month intervals or when test conditions change during this program. These tests shall involve running the full test sequence drawing only background air into the sampling system. All sampling systems shall be operated and measurements shall include:

- Phase level THC, CH4, CO, NOx, CO2, PM, NO2, VOCs (including alcohols and carbonyls)
- Continuous THC, CH4, CO, CO2 and NOx

The Contractor shall provide a technician to support 21 days of PEMS testing and 60 days of chassis dynamometer testing. The vehicle lease(s) shall span the duration from test preparation at the beginning of June 1, 2019 through the end of August 20, 2019 to allow for the vehicle(s) to be used for onroad testing by EPA personnel.

5.2 Speciation of Volatile Organic Compounds (VOCs), Dynamometer Tests

Sampling and analysis of alcohols shall be done using CARB method 1001, "Determination of Alcohols in Automotive Source Samples by Gas Chromatography" as modified by the MOP included in the QAPP. Sampling and analysis shall be completed by the Contractor.

Sampling and analysis of carbonyl compounds shall be done using TO-11a. Carbonyl sampling shall be performed by the Contractor. Carbonyl analysis will be performed by the EPA.

The Contractor shall seal and store alcohol samples at a temperature below 40 °F immediately following collection. The Contractor shall make every effort to analyze these samples on the day they are collected, but no later than within six calendar days or collection.

The Contractor shall provide segregated storage for alcohol and carbonyl samples to prevent their contamination.

No more than one vehicle shall be tested on the chassis dynamometer per test day, unless the Contractor can demonstrate that the total number of vehicles tested on that day and the timing of their tests shall not compromise the time limit requirements imposed on sample analyses.

5.3 (Reserved)

5.4 PM measurement and Analysis

For tests on the chassis dynamometer, PM shall be collected on a Teflon filter and quartz filter for mass determination and subsequent chemical analysis. The sampling method shall allow for the collection of sufficient sample for chemical analyses. PM mass shall be measured as specified in 40 CFR Part 1065. Two parallel filters shall also collect samples for each phase. Testing shall be conducted collecting PM samples in parallel. One set of filters shall be at the certification filter face velocity of 100 cm/s and the other shall be set to alternate speeds as specified by OTAQ. Other deviations from this method shall require approval from EPA.

Task 6 Coordination and Support of Non-regulated Emissions Measurements

6.1 UV-DOAS Instrument

(Reserved)

6.2 FTIR

Coordinate with Edgar Thompson as he conducts FTIR measurements from a probe into the dilution tunnel.

6.3 PAH

Coordinate with Michael Hays to provide sufficient media to sample PAH's for 3 of the five sample phases per test. This shall include use of alternate absorbents to polyurethane foam (PUF) or equivalent method to be approved by the EPA WACOR.

6.4 VOC

Coordinate with EPA WACOR or designee to use sufficient clean and prepared SUMMA cans for VOC analysis for all five sample phases per test.

6.5 Metals

Coordinate with Michael Hays to provide sufficient media for metals analysis on two of the five sample phases per test.

Task 7 Deliverables

7.1 Work Plan

The Contractor shall submit a work plan for this Work Assignment, in accordance with the WA cover page.

7.2 Infrastructure Support Allocation Report

The Contractor shall provide an interim and final report detailing the resources from this work assignment apportioned to support of Task 8. Each report shall not exceed one page of narrative providing the amount of ODC and LOE expended to support Task 8 and a brief statement of what was accomplished.

7.3 (Reserved)

7.4 Monthly Reports

The Contractor shall provide monthly progress reports and invoices in accordance with the contract.

Task 8 Mobile Source Dynamometer Research Laboratory Infrastructure Support

(to be priced separately)

In fulfillment of the objective of this task, the following Subtasks shall be performed by the Contractor, and throughout the course of performing these Subtasks, the Contractor shall comply with the most recent Mobile Source Emissions Measurement and Characterization Quality Assurance Project Plan (QAPP) and the SOP for the dynamometer or PEMS to be used that week.

8.1 Operational Support

The Contractor shall provide one person to assist in the preparation and operation the dynamometer, analytical bench, CVS sampling system and Portable Emissions Measurement Systems in accordance with the CFR and laboratory protocols established by the EPA. Variances are permitted only by technical direction and/or approval of the WACOR.

There shall be 27 weeks of baseline dynamometer testing in support of facility readiness. There shall be 6 weeks of onroad emissions testing to maintain readiness of the portable raw exhaust stack.

8.2 Instrument Evaluations and Repairs

The Contractor shall perform instrument/equipment evaluations and repairs as necessary to demonstrate and maintain proper operability and shall assist in facility/equipment problem resolution

8.3 Infrastructure Materials to Supply

The Contractor shall acquire supplies, consumables, and calibration/reference materials needed to assess regulated emissions, PM2.5, carbonyls, VOCs, SVOCs, MSATs, and oxygenates. Gas standards shall be procured from Scott Specialty Gases or a vendor whose compliance with EPA standards has been shown to be statistically equivalent.

8.4 Raw Data

The Contractor shall forward the raw data to the WACOR on the day the samples are taken.

8.5 QA Forms

Quality assurance forms provided by the WACOR to the Contractor shall be completed in accordance with WACOR technical direction. An electronic copy (PDF) shall be provided to the WACOR on the day of completion.

8.6 Protocol Prerequisite

Protocols will be provided to the Contractor by the WACOR prior to initiation of the technical work.

8.7 Infrastructure Sample Custody

The Contractor shall maintain a sample custody log of PM, DNPH, water impingers, passivated canisters, fuels, and bags submitted for sampling and/or received for analysis following sample collection. In the majority of cases, it may be necessary for a number of individual samples from a single source to be composited, thereby necessitating careful recording of the composited samples. The WACOR will also notify the Contractor of the analytical method they plan to apply prior to analyzing any sample set.

8.8 Waste

The Contractor shall provide for appropriate handling and disposal of all laboratory waste materials, including expired test fuels.

8.9 Instrumentation Support

The Contractor shall operate, maintain, modify, and calibrate analytical instrumentation and ancillary equipment in the EPA Mobile Source Emissions Measurement and Characterization Lab. The Contractor shall maintain a file of operating manuals for all equipment and instruments.

8.10 Inventory

The Contractor shall maintain a complete and up-to-date inventory for the MSEMC lab along with Material Safety Data Sheets for all chemicals and gases.

8.11 Infrastructure Periodic Deliverables

The Contractor shall supply to the WACOR on a monthly basis a written progress report that includes: (1) a list by run number of the dynamometer tests completed; (2) a list by identification number of the samples provided for analysis; (3) description of experimental procedure used and any observed anomalous behavior; (4) list of calibrations completed with the date of each instruments calibration respectively, and (5) a general description of laboratory operations. The Contractor shall also provide to the WACOR electronic copies of raw data sets.

8.12 Labor mix: To achieve the objectives of the WA the following labor mix shall be fulfilled:

A person with extensive (seven or more years) experience in operation of a dynamometer analysis bench. This technician shall have expertise in the area of wiring, plumbing, and trouble-shooting an analytical instrument bench. This requires a fundamental understanding of the principles of chemiluminescent detection, non-dispersive infrared detection, non-dispersive ultraviolet detection, and flame ionization detection. The technician shall be able to perform instrument calibrations, understand the principles behind these processes to properly assess corrective actions in the likely event of anomalous phenomena in the course of instrument calibrations. The technician is generally the first person to identify instrument malfunctions and bring this to the attention of the senior dynamometer technician. The technician shall be familiar with the operational software for the dynamometer. The technician shall understand and comply with the operational specifications for chassis dynamometers contained in the CFR. The technician shall have experience in and knowledge of automotive systems, research fuels handling, and basic refrigeration.

The technician shall be strong enough to move heavy equipment (in accordance with OSHA regulations). The technician shall assist the EPA's senior dynamometer technician in all technical functions. The technician shall help prepare sample media and operate sampling equipment to collect mobile source samples. The technician shall occasionally maintain the laboratory instrumentation, clean glassware and other laboratory consumables as required by quality assurance log samples as appropriate and other especially routine tasks. The technician shall pay special attention to detail as it relates to logging samples and recording substrate weights.

8.1.13 Provision of Spares, Parts, Equipment, and Instruments

These parts, components, equipment, and instruments shall be directly applicable to the function of the light-duty, heavy-duty, small engine, or portable dynamometers and their sample systems.

a. The Contractor shall provide adequate spares, parts, equipment, and instruments to perform the weekly dynamometer emissions tests.

WA SPECIFIC EQUIPMENT

The Contractor shall be required to provide one of the three test vehicles as specified in Task 4 above.

QUALITY ASSURANCE

Quality assurance forms provided by the WACOR to the Contractor shall be completed in accordance with WACOR technical direction. An electronic copy (PDF) shall be provided to the WACOR on the day of completion.

DELIVERABLES

The contractor shall supply a project work plan and an Infrastructure Support Allocation Report summarizing LOE and ODC associated with completion of Task 8 only.

SCHEDULE OF DELIVERABLES

Steps	**Completion Date**
Project work plan submission	In accordance with the WA cover page
Emissions Testing Start	June 1, 2019
Emissions Testing Complete	August 15, 2019
Infrastructure Support Allocation Interim Report	September 30, 2019
Infrastructure Support Allocation Report	March 31, 2020

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-034

☐ Other ☒ Amendment Number: 000001

Contract Number: EP-C-15-008

Contract Period: 04/01/2015 To 03/31/2020

Base Option Period Number: 4

Title of Work Assignment/SF Site Name:

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
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Comments:

The purpose of this Work Assignment Amendment is to revise the PWS, as attached.

Work Plan remains due on 4/29/19.

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Other Agency Official Name:
(Signature) (Date)
Branch/Mail Code:
Phone Number:
FAX Number:

Contracting Official Name: Keith Pfeffer
(Signature) (Date)
Branch/Mail Code:
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Performance Work Statement – Amendment 000001

All Amendment 000001 PWS additions are highlighted in yellow text; there are no deletions.

WA Title: Mobile Source Emissions Measurement and Characterization

WA #: 4-034 WACOR: Long

Contract #: EP-C-15-008 Alternate WACOR: Baldauf

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- Engine coolant temperature
- Short term fuel trim-bank 2
- Long term fuel trim-bank 2
- Fuel/air commanded equivalence ratio
- Alcohol fuel percent
- Manifold absolute pressure
- Spark advance
- PID Control Module Voltage
- Air Flow Rate From Mass Air Flow Sensor

The facilities for testing shall be maintained in conformance with the requirements of 40 CFR Part 86 Subparts C and N and 40 CFR Part 1066 as they apply to vehicle emissions testing. THC, CH4, NOx, NO2, CO, and CO2 emissions sampling and measurement shall be conducted as specified in 40 CFR 1065. The minimum detection limit for NO2, measurements shall be 5 ppb. If some aspect of testing shall be done in variance to the above specifications the Contractor shall describe why that is the case and how it may impact the test results. Variances shall be approved by the EPA WACOR before testing may begin.

The Contractor shall verify that the tunnel flow remained constant during the test. The CVS blower shall be kept on for ½ hour before the first emission test on a given day and continuously between emission tests to ensure tunnel stability.

The Contractor shall provide defined and maintained cooling fan placement and flow for each test vehicle on all the tests. The flow of air sweeping the vehicle in the test cell shall be consistent between tests.

The Contractor shall perform "blank" tests at a maximum of one month intervals or when test conditions change during this program. These tests shall involve running the full test sequence drawing only background air into the sampling system. All sampling systems shall be operated and measurements shall include:

- Phase level THC, CH4, CO, NOx, CO2, PM, NO2, VOCs (including alcohols and carbonyls)
- Continuous THC, CH4, CO, CO2 and NOx

The Contractor shall provide a technician to support 21 days of PEMS testing and 60 days of chassis dynamometer testing. The vehicle lease(s) shall span the duration from test preparation at the beginning of June 1, 2019 through the end of August 20, 2019 to allow for the vehicle(s) to be used for onroad testing by EPA personnel.

5.2 Speciation of Volatile Organic Compounds (VOCs), Dynamometer Tests

Sampling and analysis of alcohols shall be done using CARB method 1001, "Determination of Alcohols in Automotive Source Samples by Gas Chromatography" as modified by the MOP included in the QAPP. Sampling and analysis shall be completed by the Contractor.

Sampling and analysis of carbonyl compounds shall be done using TO-11a. Carbonyl sampling shall be performed by the Contractor. Carbonyl analysis will be performed by the EPA.

The Contractor shall seal and store alcohol samples at a temperature below 40 °F immediately following collection. The Contractor shall make every effort to analyze these samples on the day they are collected, but no later than within six calendar days or collection.

The Contractor shall provide EPA Method TO-15 analysis including ethylene-oxide (EtO) for 23 sample cans in accordance with the QAPP.

The Contractor shall provide segregated storage for alcohol and carbonyl samples to prevent their contamination.

No more than one vehicle shall be tested on the chassis dynamometer per test day, unless the Contractor can demonstrate that the total number of vehicles tested on that day and the timing of their tests shall not compromise the time limit requirements imposed on sample analyses.

5.3 (Reserved)

5.4 PM measurement and Analysis

For tests on the chassis dynamometer, PM shall be collected on a Teflon filter and quartz filter for mass determination and subsequent chemical analysis. The sampling method shall allow for the collection of sufficient sample for chemical analyses. PM mass shall be measured as specified in 40 CFR Part 1065. Two parallel filters shall also collect samples for each phase. Testing shall be conducted collecting PM samples in parallel. One set of filters shall be at the certification filter face velocity of 100 cm/s and the other shall be set to alternate speeds as specified by OTAQ. Other deviations from this method shall require approval from EPA.

Task 6 Coordination and Support of Non-regulated Emissions Measurements

6.1 UV-DOAS Instrument

(Reserved)

6.2 FTIR

Coordinate with Edgar Thompson as he conducts FTIR measurements from a probe into the dilution tunnel.

6.3 PAH

Coordinate with Michael Hays to provide sufficient media to sample PAH's for 3 of the five sample phases per test. This shall include use of alternate absorbents to polyurethane foam (PUF) or equivalent method to be approved by the EPA WACOR.

6.4 VOC

Coordinate with EPA WACOR or designee to use sufficient clean and prepared SUMMA cans for VOC analysis for all five sample phases per test.

6.5 Metals

Coordinate with Michael Hays to provide sufficient media for metals analysis on two of the five sample phases per test.

Task 7 Deliverables

7.1 Work Plan

The Contractor shall submit a work plan for this Work Assignment, in accordance with the WA cover page.

7.2 Infrastructure Support Allocation Report

The Contractor shall provide an interim and final report detailing the resources from this work assignment apportioned to support of Task 8. Each report shall not exceed one page of narrative providing the amount of ODC and LOE expended to support Task 8 and a brief statement of what was accomplished.

7.3 (Reserved)

7.4 Monthly Reports

The Contractor shall provide monthly progress reports and invoices in accordance with the contract.

Task 8 Mobile Source Dynamometer Research Laboratory Infrastructure Support

(to be priced separately)

In fulfillment of the objective of this task, the following Subtasks shall be performed by the Contractor, and throughout the course of performing these Subtasks, the Contractor shall comply with the most recent Mobile Source Emissions Measurement and Characterization Quality Assurance Project Plan (QAPP) and the SOP for the dynamometer or PEMS to be used that week.

8.1 Operational Support

The Contractor shall provide one person to assist in the preparation and operation the dynamometer, analytical bench, CVS sampling system and Portable Emissions Measurement Systems in accordance with the CFR and laboratory protocols established by the EPA. Variances are permitted only by technical direction and/or approval of the WACOR.

There shall be 27 weeks of baseline dynamometer testing in support of facility readiness. There shall be 6 weeks of onroad emissions testing to maintain readiness of the portable raw exhaust stack.

8.2 Instrument Evaluations and Repairs

The Contractor shall perform instrument/equipment evaluations and repairs as necessary to demonstrate and maintain proper operability and shall assist in facility/equipment problem resolution

8.3 Infrastructure Materials to Supply

The Contractor shall acquire supplies, consumables, and calibration/reference materials needed to assess regulated emissions, PM2.5, carbonyls, VOCs, SVOCs, MSATs, and oxygenates. Gas standards shall be procured from Scott Specialty Gases or a vendor whose compliance with EPA standards has been shown to be statistically equivalent.

8.4 Raw Data

The Contractor shall forward the raw data to the WACOR on the day the samples are taken.

8.5 QA Forms

Quality assurance forms provided by the WACOR to the Contractor shall be completed in accordance with WACOR technical direction. An electronic copy (PDF) shall be provided to the WACOR on the day of completion.

8.6 Protocol Prerequisite

Protocols will be provided to the Contractor by the WACOR prior to initiation of the technical work.

8.7 Infrastructure Sample Custody

The Contractor shall maintain a sample custody log of PM, DNPH, water impingers, passivated canisters, fuels, and bags submitted for sampling and/or received for analysis following sample collection. In the majority of cases, it may be necessary for a number of individual samples from a single source to be composited, thereby necessitating careful recording of the composited samples. The WACOR will also notify the Contractor of the analytical method they plan to apply prior to analyzing any sample set.

8.8 Waste

The Contractor shall provide for appropriate handling and disposal of all laboratory waste materials, including expired test fuels.

8.9 Instrumentation Support

The Contractor shall operate, maintain, modify, and calibrate analytical instrumentation and ancillary equipment in the EPA Mobile Source Emissions Measurement and Characterization Lab. The Contractor shall maintain a file of operating manuals for all equipment and instruments.

8.10 Inventory

The Contractor shall maintain a complete and up-to-date inventory for the MSEMC lab along with Material Safety Data Sheets for all chemicals and gases.

8.11 Infrastructure Periodic Deliverables

The Contractor shall supply to the WACOR on a monthly basis a written progress report that includes: (1) a list by run number of the dynamometer tests completed; (2) a list by identification number of the samples provided for analysis; (3) description of experimental procedure used and any observed anomalous behavior; (4) list of calibrations completed with the date of each instruments calibration respectively, and (5) a general description of laboratory operations. The Contractor shall also provide to the WACOR electronic copies of raw data sets.

8.12 Labor mix: To achieve the objectives of the WA the following labor mix shall be fulfilled:

A person with extensive (seven or more years) experience in operation of a dynamometer analysis bench. This technician shall have expertise in the area of wiring, plumbing, and trouble-shooting an analytical instrument bench. This requires a fundamental understanding of the principles of chemiluminescent detection, non-dispersive infrared detection, non-dispersive ultraviolet detection, and flame ionization detection. The technician shall be able to perform instrument calibrations, understand the principles behind these processes to properly assess corrective actions in the likely event of anomalous phenomena in the course of instrument calibrations. The technician is generally the first person to identify instrument malfunctions and bring this to the attention of the senior dynamometer technician. The technician shall be familiar with the operational software for the dynamometer. The technician shall understand and comply with the operational specifications for chassis dynamometers contained in the CFR. The technician shall have experience in and knowledge of automotive systems, research fuels handling, and basic refrigeration.

The technician shall be strong enough to move heavy equipment (in accordance with OSHA regulations). The technician shall assist the EPA's senior dynamometer technician in all technical functions. The technician shall help prepare sample media and operate sampling equipment to collect mobile source samples. The technician shall occasionally maintain the laboratory instrumentation, clean glassware and other laboratory consumables as required by quality assurance log samples as appropriate and other especially routine tasks. The technician shall pay special attention to detail as it relates to logging samples and recording substrate weights.

8.1.13 Provision of Spares, Parts, Equipment, and Instruments

These parts, components, equipment, and instruments shall be directly applicable to the function of the light-duty, heavy-duty, small engine, or portable dynamometers and their sample systems.

a. The Contractor shall provide adequate spares, parts, equipment, and instruments to perform the weekly dynamometer emissions tests.

WA SPECIFIC EQUIPMENT

The Contractor shall be required to provide one of the three test vehicles as specified in Task 4 above.

QUALITY ASSURANCE

Quality assurance forms provided by the WACOR to the Contractor shall be completed in accordance with WACOR technical direction. An electronic copy (PDF) shall be provided to the WACOR on the day of completion.

DELIVERABLES

The contractor shall supply a project work plan and an Infrastructure Support Allocation Report summarizing LOE and ODC associated with completion of Task 8 only.

SCHEDULE OF DELIVERABLES

Steps	**Completion Date**
Project work plan submission	In accordance with the WA cover page
Emissions Testing Start	June 1, 2019
Emissions Testing Complete	August 15, 2019
Infrastructure Support Allocation Interim Report	September 30, 2019
Infrastructure Support Allocation Report	March 31, 2020

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-034

☐ Other ☒ Amendment Number: 000002

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

The purpose of this Amendment (000002) is to revise the PWS, as attached.

A revised work plan is due within 20 calendar days.

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee — LOE:

Cumulative Approved: — Cost/Fee — LOE:

Work Assignment Manager Name: Thomas Long (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3944 FAX Number:	
Project Officer Name: Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name: Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement – Amendment 000002

All Amendment 000002 PWS additions are highlighted in yellow text; all deletions are marked with a black line through the deleted text.

WA Title: Mobile Source Emissions Measurement and Characterization

WA #: 4-034 WACOR: Long

Contract #: EP-C-15-008 Alternate WACOR: Baldauf

NOTE: This work assignment is a follow-on to work performed in Option Period 3 under Work Assignment # 3-034

PERIOD OF PERFORMANCE

The period of performance detailed in this Performance Work Statement (PWS) shall be from April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

Generate emissions data from two vehicles satisfying Office of Transportation and Air Quality requirements for new Motor Vehicle Emission Simulator (MOVES) data, TBD. Chassis dynamometer driving cycles will consist of one HD-UDDS Test Protocol (https://www.epa.gov/sites/production/files/2015-10/huddscol.txt) and three repetitions of a locally developed cycle which is approximately 20 minutes in duration. These driving cycles will be repeated until nine valid (see below) data sets are created for each vehicle. On road measurements with a portable emissions measurement system (PEMS) unit will be made over the road. Each of two routes is expected to be completed in two working days. This will require a total of up to 8 days of onroad testing (including set up and break down days).

BACKGROUND

This project directly addresses the air, climate, energy, and human health program areas, and supports other motor vehicle projects. While the two currently regulated "critical pollutants", particulate matter (0.01 grams per brake-horsepower-hour (g/bhp-hr)) and NOx (0.20 g/bhp-hr) impact air quality and related health issues, proposed new rules focus on two related areas with broader environmental and social effects: vehicle fuel economy and greenhouse gas (GHG) emissions. The two go hand-in-hand because burning carbon-based petroleum fuels creates carbon emissions, so improving fuel economy directly lowers an internal combustion engine's main GHG, carbon dioxide (CO2).

New vehicle rules are being phased in between 2014 and 2018 as part of an overall energy strategy that looks to reduce U.S. dependency on foreign energy supplies and lower CO2 creation to address global warming concerns.

It is estimated that commercial trucks consume more than 2-million barrels of oil every day and account for 20% of transportation-related GHGs. For example, the state of California estimates

that diesel trucks are responsible for seven and a half percent of all of California's global warming pollution.

The call for truck rules does not come with specific target numbers, but requires EPA, with the aid of the National Highway Transportation Safety Administration (NHTSA) to set standards based on research data. Much of the guidance for determining the standards will come from a congressionally mandated report. Created under the auspices of the National Research Council (NRC), "Technologies and Approaches Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles" was put together by a 19-member panel that combined academic researchers, engineers, and technologists with backgrounds in truck and component manufacturing.

Given the size of the existing database for emissions from either Medium Heavy-Duty Trucks (MHDT) or gas direct injection (GDI) vehicles, this study hopes to provide insight into whether it is necessary to modify MOVES to improve these emission factors or to fill similar gaps in represented emission factors.

SCOPE

This Work Assignment (WA) has been designed to fill data gaps or improve existing emission factors for the use case of MHDT or GDI (or similar missing emission factors to be specified by OTAQ).

- Chassis dynamometer testing shall be conducted on two heavy-duty vehicles. The vehicles shall be tested at an ambient temperature of 70 °F (21 °C).

- Chassis dynamometer test cycles shall include a cold start CARB transient cycle, a warm start HD-UDDS, two World Harmonized Vehicle Cycles (WHVC) and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS) designed to generate data in each of the operating modes represented in the MOVES model.

- Core dynamometer bench measurements shall include Total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gas (NMOG), oxides of nitrogen (NOx), nitrogen dioxide (NO2), carbon monoxide (CO), carbon dioxide (CO2) and particulate matter (PM).

- Chassis dynamometer testing shall also generate speciated volatile organic compound (speciated VOC) data.

TECHNICAL APROACH/OBJECTIVES

Task 1 <Reserved>

Task 2 <Reserved>

Task 3 Test Fuels and Lubricants

The Contractor shall provide test fuel. Fuel shall conform to the requirements stated in each vehicle's operating manual and shall be procured from the distributor as a single batch. The

Contractor shall provide speciated analyses of the fuels sampled before and after project emissions testing and speciated analysis of the lubricant sampled after project emissions testing.

Task 4 Vehicle Procurement and Preparation

The Contractor shall provide ~~one of the three~~ two of the five test vehicles. All three vehicles will be driven by government personnel.

Each vehicle to be tested shall undergo a thorough inspection before beginning the test preparation sequence. This includes inspection and documentation of the engine, transmission, axles, exhaust system and tires, and documentation of the ECM status if available on that vehicle. Descriptively titled photographs of the vehicles' exhaust systems, engine plates, and emission plates shall be taken and included as part of the progress and final reports. Photos from three angles of the vehicle mounted to the chassis dynamometer shall also be included. The Contractor shall collect and record vehicle information as described in the Quality Assurance Project Plan (QAPP). Preparation shall include assisting with the performance of on-road coastdowns.

Each vehicle shall then undergo initial crankcase oil, oil filter and air filter replacement. Oil and air filters shall be procured by the Contractor according to manufacturer's recommendations. Engine oil recommended in the owner's manual of each vehicle shall be used. The recommended grade of lubricant shall be purchased.

After the last test of each vehicle in the program, the Contractor shall record the lubricant level indicated on the dipstick before collecting a 0.25-quart oil sample for analysis.

If any of the vehicles are equipped with traction control, the Contractor shall ensure that the traction control is disabled either through an interior disable button or other method (remove power fuse to anti-lock brake system (ABS), and place a placard in the vehicle indicating the method of disabling traction control if driver input is required. The Contractor will be provided target road load coefficients and set road load coefficients for the test vehicles according to 40 CFR 1066.301 and 40 CFR 1066.310 (or the Contractor may propose and use an alternate method, subject to approval by EPA). For the purpose of this study, the agreed road load setting shall remain the same for all testing on a given vehicle.

The Contractor shall provide hardware and software for reading and archiving vehicle engine control module (ECM) data during emissions testing.

Task 5 Vehicle Testing

5.1 Basic Testing Protocol

The basic dynamometer testing protocol shall begin with a cold start CARB transient cycle, a HD-UDDS, and three warm start Mobile Source Distributed Power Driving Schedules (MSDPDS). While light-duty vehicle testing shall be conducted in compliance with CFR Part 86 Subpart C, CFR Part 1065, and CFR part 1066, for MHDT the HD-UDDS shall be conducted in compliance with CFR Part 86 Subpart N, and CFR Part 1065. This test sequence shall be repeated for each vehicle. For heavy-duty vehicles (HDVs), this test sequence shall be

performed in both the laden and unladen conditions at an ambient temperature of 70 °F (20 °C). For light-duty vehicles (LDVs), this test sequence shall be performed at ambient temperatures of 72 °F (22 °C) and 20 °F (-7 °C). Each test condition shall be run on each vehicle at least five times. A sixth test may be run if necessary as described in 5.1.1. HDV tests shall be performed on the 72-inch single roll electric heavy-duty chassis dynamometer. Dynamometer testing for this task shall be completed in a 23 week period. The contractor shall be required to provide one person with test experience to provide technical support during sampling and general setup and tear down. LDV tests shall be performed on the 48-inch single roll electric light-duty chassis dynamometer. The EPA will provide the same driver to be used for all tests on a given vehicle.

The gaseous emissions to be measured and reported are THC, CH4, NOx, NO2, CO, and CO2. The Contractor shall use cleaned SUMMA cans (provided by the EPA) to collect sample from which the US EPA will speciate the VOCs. The Contractor shall speciate the oxygenates. The Contractor shall provide polyurethane foam (PUF) sorbent plugs or their equivalent as approved by the WACOR and collect samples on which the US EPA will conduct analyses. The Contractor shall provide teflon filters for the EPA to perform metals analysis on the runs made on the chassis dynamometer. The Contractor shall provide DNPH cartridges and collect samples on which the US EPA will conduct carbonyl analyses. The Contractor shall provide teflon filters on which the US EPA will collect samples and perform gravimetric analyses.

During all emission tests, the Contractor shall record all of the following ECM parameters available for the vehicle at the rate of 1 Hz using Contractor-supplied data acquisition equipment:

- RPM
- Vehicle speed
- Engine load
- MIL status
- Absolute throttle position
- Engine coolant temperature
- Short term fuel trim-bank 2
- Long term fuel trim-bank 2
- Fuel/air commanded equivalence ratio
- Alcohol fuel percent
- Manifold absolute pressure
- Spark advance
- PID Control Module Voltage

- Air Flow Rate From Mass Air Flow Sensor

The facilities for testing shall be maintained in conformance with the requirements of 40 CFR Part 86 Subparts C and N and 40 CFR Part 1066 as they apply to vehicle emissions testing. THC, CH4, NOx, NO2, CO, and CO2 emissions sampling and measurement shall be conducted as specified in 40 CFR 1065. The minimum detection limit for NO2, measurements shall be 5 ppb. If some aspect of testing shall be done in variance to the above specifications the Contractor shall describe why that is the case and how it may impact the test results. Variances shall be approved by the EPA WACOR before testing may begin.

The Contractor shall verify that the tunnel flow remained constant during the test. The CVS blower shall be kept on for ½ hour before the first emission test on a given day and continuously between emission tests to ensure tunnel stability.

The Contractor shall provide defined and maintained cooling fan placement and flow for each test vehicle on all the tests. The flow of air sweeping the vehicle in the test cell shall be consistent between tests.

The Contractor shall perform "blank" tests at a maximum of one month intervals or when test conditions change during this program. These tests shall involve running the full test sequence drawing only background air into the sampling system. All sampling systems shall be operated and measurements shall include:

- Phase level THC, CH4, CO, NOx, CO2, PM, NO2, VOCs (including alcohols and carbonyls)

- Continuous THC, CH4, CO, CO2 and NOx

The Contractor shall provide a technician to support 21 days of PEMS testing and ~~60~~ 110 days of chassis dynamometer testing. The vehicle lease(s) shall span the duration from test preparation at the beginning of June 1, 2019 through the end of August 20, 2019 to allow for the vehicle(s) to be used for onroad testing by EPA personnel.

5.2 Speciation of Volatile Organic Compounds (VOCs), Dynamometer Tests

Sampling and analysis of alcohols shall be done using CARB method 1001, "Determination of Alcohols in Automotive Source Samples by Gas Chromatography" as modified by the MOP included in the QAPP. Sampling and analysis shall be completed by the Contractor.

Sampling and analysis of carbonyl compounds shall be done using TO-11a. Carbonyl sampling shall be performed by the Contractor. Carbonyl analysis will be performed by the EPA.

The Contractor shall seal and store alcohol samples at a temperature below 40 °F immediately following collection. The Contractor shall make every effort to analyze these samples on the day they are collected, but no later than within six calendar days or collection.

The Contractor shall provide EPA Method TO-15 analysis including ethylene-oxide (EtO) for ~~23~~ 101 sample cans in accordance with the QAPP.

The Contractor shall provide segregated storage for alcohol and carbonyl samples to prevent their contamination.

No more than one vehicle shall be tested on the chassis dynamometer per test day, unless the Contractor can demonstrate that the total number of vehicles tested on that day and the timing of their tests shall not compromise the time limit requirements imposed on sample analyses.

5.3 (Reserved)

5.4 PM measurement and Analysis

For tests on the chassis dynamometer, PM shall be collected on a Teflon filter and quartz filter for mass determination and subsequent chemical analysis. The sampling method shall allow for the collection of sufficient sample for chemical analyses. PM mass shall be measured as specified in 40 CFR Part 1065. Two parallel filters shall also collect samples for each phase. Testing shall be conducted collecting PM samples in parallel. One set of filters shall be at the certification filter face velocity of 100 cm/s and the other shall be set to alternate speeds as specified by OTAQ. Other deviations from this method shall require approval from EPA.

Task 6 Coordination and Support of Non-regulated Emissions Measurements

6.1 UV-DOAS Instrument

(Reserved)

6.2 FTIR

Coordinate with Edgar Thompson as he conducts FTIR measurements from a probe into the dilution tunnel.

6.3 PAH

Coordinate with Michael Hays to provide sufficient media to sample PAH's for 3 of the five sample phases per test. This shall include use of alternate absorbents to polyurethane foam (PUF) or equivalent method to be approved by the EPA WACOR.

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Coordinate with EPA WACOR or designee to use sufficient clean and prepared SUMMA cans for VOC analysis for all five sample phases per test.

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Task 7 Deliverables

7.1 Work Plan

The Contractor shall submit a work plan for this Work Assignment, in accordance with the WA cover page.

7.2 Infrastructure Support Allocation Report

The Contractor shall provide an interim and final report detailing the resources from this work assignment apportioned to support of Task 8. Each report shall not exceed one page of narrative providing the amount of ODC and LOE expended to support Task 8 and a brief statement of what was accomplished.

7.3 (Reserved)

7.4 Monthly Reports

The Contractor shall provide monthly progress reports and invoices in accordance with the contract.

Task 8 Mobile Source Dynamometer Research Laboratory Infrastructure Support

(to be priced separately)

In fulfillment of the objective of this task, the following Subtasks shall be performed by the Contractor, and throughout the course of performing these Subtasks, the Contractor shall comply with the most recent Mobile Source Emissions Measurement and Characterization Quality Assurance Project Plan (QAPP) and the SOP for the dynamometer or PEMS to be used that week.

8.1 Operational Support

The Contractor shall provide one person to assist in the preparation and operation the dynamometer, analytical bench, CVS sampling system and Portable Emissions Measurement Systems in accordance with the CFR and laboratory protocols established by the EPA. Variances are permitted only by technical direction and/or approval of the WACOR.

There shall be 27 weeks of baseline dynamometer testing in support of facility readiness. There shall be 6 weeks of onroad emissions testing to maintain readiness of the portable raw exhaust stack.

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The Contractor shall perform instrument/equipment evaluations and repairs as necessary to demonstrate and maintain proper operability and shall assist in facility/equipment problem resolution

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The Contractor shall acquire supplies, consumables, and calibration/reference materials needed to assess regulated emissions, PM2.5, carbonyls, VOCs, SVOCs, MSATs, and oxygenates. Gas standards shall be procured from Scott Specialty Gases or a vendor whose compliance with EPA standards has been shown to be statistically equivalent.

8.4 Raw Data

The Contractor shall forward the raw data to the WACOR on the day the samples are taken.

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Quality assurance forms provided by the WACOR to the Contractor shall be completed in accordance with WACOR technical direction. An electronic copy (PDF) shall be provided to the WACOR on the day of completion.

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Protocols will be provided to the Contractor by the WACOR prior to initiation of the technical work.

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The Contractor shall provide for appropriate handling and disposal of all laboratory waste materials, including expired test fuels.

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The Contractor shall supply to the WACOR on a monthly basis a written progress report that includes: (1) a list by run number of the dynamometer tests completed; (2) a list by identification number of the samples provided for analysis; (3) description of experimental procedure used and any observed anomalous behavior; (4) list of calibrations completed with the date of each instruments calibration respectively, and (5) a general description of laboratory operations. The Contractor shall also provide to the WACOR electronic copies of raw data sets.

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A person with extensive (seven or more years) experience in operation of a dynamometer analysis bench. This technician shall have expertise in the area of wiring, plumbing, and trouble-shooting an analytical instrument bench. This requires a fundamental understanding of the principles of chemiluminescent detection, non-dispersive infrared detection, non-dispersive ultraviolet detection, and flame ionization detection. The technician shall be able to perform instrument calibrations, understand the principles behind these processes to properly assess corrective actions in the likely event of anomalous phenomena in the course of instrument calibrations. The technician is generally the first person to identify instrument malfunctions and bring this to the attention of the senior dynamometer technician. The technician shall be familiar with the operational software for the dynamometer. The technician shall understand and comply with the operational specifications for chassis dynamometers contained in the CFR. The technician shall have experience in and knowledge of automotive systems, research fuels handling, and basic refrigeration.

The technician shall be strong enough to move heavy equipment (in accordance with OSHA regulations). The technician shall assist the EPA's senior dynamometer technician in all technical functions. The technician shall help prepare sample media and operate sampling equipment to collect mobile source samples. The technician shall occasionally maintain the laboratory instrumentation, clean glassware and other laboratory consumables as required by quality assurance log samples as appropriate and other especially routine tasks. The technician shall pay special attention to detail as it relates to logging samples and recording substrate weights.

8.1.13 Provision of Spares, Parts, Equipment, and Instruments

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a. The Contractor shall provide adequate spares, parts, equipment, and instruments to perform the weekly dynamometer emissions tests.

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The Contractor shall be required to provide one of the three test vehicles as specified in Task 4 above.

QUALITY ASSURANCE

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DELIVERABLES

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Emissions Testing Complete	August 15, 2019
Infrastructure Support Allocation Interim Report	September 30, 2019
Infrastructure Support Allocation Report	March 31, 2020

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-037

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	See attached PWS

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW: Section 7.0

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

Work Plan due 4/29/19.

No work, including but not limited to preparation of the Work Plan, shall begin until 4/1/19.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee LOE:

Cumulative Approved: Cost/Fee LOE:

Work Assignment Manager Name Eben Thoma (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7969 FAX Number:	
Project Officer Name Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement

WA Title: R8 Well Pad Studies

WA #: 4-037 WACOR: Eben Thoma

Contract #: EP-C-15-008 Alternate WACOR: Jason DeWees

PERIOD OF PERFORMANCE

The period of performance detailed in this Performance Work Statement (PWS) shall be from April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

This work assignment (WA) continues efforts under EP-C-15-008, WA 3-037 to improve information on oil and natural gas (ONG) well pad emissions and measurement methods, in collaboration with EPA R8 and other cooperators. An important aspect of environmentally responsible energy production is the development of cost effective techniques for rapid identification and assessment of fugitive emissions (leaks) and malfunctions of process equipment such as pneumatic controllers, emissions control devices, and pumps, etc.

The objectives of this WA are to continue optical gas imaging (OGI) of various forms and high-volume sampler (HVS) instrument and method development exercises initiated under WA 3-037. These objectives shall be achieved by preparing for, executing, and reporting on measurement field tests, instrument and method development and documentation activities, cooperative tests, and technology transfer activities conducted with R8 and other cooperators. The specific Contractor tasks for this WA with deliverables and timing are detailed in subsequent sections.

BACKGROUND

This WA is a continuation of EP-C-15-008, WA 3-037. The Contractor shall review the materials associated with the previous WA, the approved quality assurance project plan (QAPP) "Uinta Basin Well Pad Pneumatic Controller Emissions Research Study", G-APPCD-0030050-QP-1-0 (QAPP-1J16-019.R1, 12/9/16); journal article "Assessment of Uinta Basin oil and natural gas well pad pneumatic controller emissions". Journal of Environmental Protection, 8, 394-415, DOI: 10.4236/jep.2017.84029 and QAPP "Optical Gas Imaging Field Performance Studies Phase 1" G-AEMD-0031350-QP-1-0, 12/05/17, for background information on this project.

TECHNICAL APROACH/OBJECTIVES

Under the written technical direction of the EPA work assignment contracting officer's representative (WACOR), the Contractor shall execute the tasks described subsequently. The Contractor shall assume weekly meetings to review progress with the WACOR and EPA cooperating groups related to these efforts. The Contractor shall evaluate the potential need for outside consultants and/or laboratories with expertise in the various technical areas to meet deliverables and shall be responsible for defining, executing, and managing any subcontracts that may be required. The Contractor shall be responsible for arranging and executing any required equipment rentals or purchases, site access agreements, and related infrastructure needs (e.g., trailer

and equipment transport, land power drop, permits, etc.) as part of the execution of field campaigns or evaluations. The Contractor shall be responsible for all safety and health coordination for any field or laboratory operations. The Contractor shall revise instrument/method QA documentation, procure the necessary supplies and calibration standards, and conduct pre-deployment QA testing as described in the QAPPs, or on an as needed basis in order to complete the tasks.

The Contractor shall prepare a work plan (WP) that includes individual itemized cost and LOE estimates for each task set including anticipated other direct cost (ODC) components (e.g., subcontract, travel, laboratory analysis, equipment rental, etc.). The Contractor shall track expenditures for each task and update in monthly reports.

QUALITY ASSURANCE

Work involving collection of environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The Quality Assurance Project Plans (QAPPs) associated with these tasks shall be at a Category B (unless otherwise specified) and shall include all necessary elements as described in the referenced documentation (See Attachment 1). The NRMRL QAPP template for measurements shall be the basis of each QAPP but projects may also include use of secondary data at times and/or method development so the QAPPs shall incorporate elements of those QAPP requirements as needed.

All revised QAPPs and QAPP addendums shall be reviewed and approved by the Contractor's WA leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the Contractor's WA leader and QA officer to show that they have reviewed and approved the QAPP. The Contractor's WA leader shall document this process. Upon receipt of the signed QAPP, the EPA WACOR and QA manager will review and approve the QAPP and will add their signatures to the signature page. For work involving analysis by outside laboratories, the Contractor shall review and document all subcontractor quality management plan information as per current contract and EPA QA policy requirements.

DELIVERABLES

For all data analysis, instrument design, methods, and reporting deliverables, the Contractor shall provide materials in Microsoft Word™ and Excel™ formats along with all raw and processed files or videos in native formats unless otherwise specified.

All deliverables are due by no later than March 31, 2020 unless otherwise noted.

Task 1: Completion of WA 3-037 next generation HVS prototype

Continuing efforts from WA 3-037, the Contractor shall complete the development, preliminary laboratory and EPA test range testing, documentation, and safe operation certification of a prototype of a next generation high volume sampler (HVS) system for methane and VOC leak measurement applications. The contractor shall complete, document, and test one working prototype suitable for field work on oil and gas production sites. The Contractor shall produce a design document, build list, costing, and fabrication lead-time estimates to produce additional copies of the prototype HVS. The contractor shall document all laboratory and test range testing of the prototype HVS and produce standard operating procedures for the device. The contractor shall

incorporate all documentation, design, QA, information, certification, and testing results into a report that shall be delivered along with the prototype HVS device.

Deliverables: Prototype HVS and documentation report shall be complete before July 31, 2019

Task 2: Completion of WA 3-037 OGI Testing

The Contractor shall complete the OGI project tasked in WA 3-037. The contractor shall deliver a final journal article draft and complete QA and complete data package to EPA before the deliverable date.

Deliverables: Task 2 shall be complete before July 31, 2019

Task 3: Completion of WA 3-037 ECD Field Test Preparation

Under the written technical direction of the WACOR and with technical input from EPA R8 and other cooperators, the Contractor shall complete the development of a QAPP and deployment scenario/safety analysis for testing of enclosed combustor devices (ECDs) in Wyoming oil and gas fields using both direct sampling and best available optical remote sensing technologies. The field deployment analysis shall include site access and insurance factors for several deployment scenarios in locations in Wyoming (TBD). The contractor shall provide itemized cost estimates, including subcontracting charges, (if any) as part of the deployment scenario analysis for execution of 1 week (5 full test days), 2 weeks (10 full test days), and 3 weeks (15 full tests days), including data analysis and delivery of a draft data and QA package along with required lead times. The Contractor shall deliver an initial draft QAPP and deployment scenario analysis. EPA will provide comments on these documents to the Contractor. The Contractor shall respond to EPA comments and produce a final draft QAPP for submission to EPA QA review.

Deliverables:

Task 6.1: Initial draft QAPP and deployment scenario plan due no later than April 30, 2019.

Task 6.2: Revised draft QAPP complete by no later than May 31, 2019.

SCHEDULE OF DELIVERABLES

The schedule of deliverables is included in the previous section. All deliverables are due before March 31, 2020 unless otherwise noted.

ATTACHMENT #1
TO THE PERFORMANCE WORK STATEMENT (PWS)

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD:

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

☐ **Category A Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category B QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

X **QAPP Requirements for Secondary Data Projects**

QAPP Requirements for Research Model Development and Application Projects

QAPP Requirements for Software Development Projects

X QAPP Requirements for Method Development Projects

QAPP Requirements for Design, Construction, and Operation of Environmental Technology Projects

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5. MEASUREMENT PROCEDURES

5.1. Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2. If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. QUALITY METRICS (QA/QC CHECKS)

6.1. For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2. Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR SECONDARY DATA PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the secondary data needed to meet the project objective(s). Specify requirements relating to the type of data, the age of data, geographical representation, temporal representation, and technological representation, as applicable.
3.2 Identify the source(s) for the secondary data. Discuss the rationale for selecting the source(s) identified. If a hierarchy of sources exists for the gathering of secondary data, specify that hierarchy.

4. QUALITY METRICS

4.1 Specify the quality requirements of the secondary data. These requirements must be appropriate for the intended use of the data. Address accuracy, precision, representativeness, completeness, and comparability, if applicable.
4.2 Describe the procedures for determining the quality of the secondary data.
4.3 If no project-specific data quality requirements exist, state this in the QAPP. If the quality of the secondary data will not be evaluated by EPA, require that a disclaimer be added to any project deliverable to indicate that the quality of the secondary data has not been evaluated by EPA for this specific application. Provide the wording for the disclaimer.

5. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

5.1 Identify the data reporting requirements, including data reduction procedures specific

to the project and applicable calculations and equations.

5.2 Describe data validation procedures used to ensure the reporting of accurate project data.

5.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

5.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

5.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

5.4 Describe data storage requirements for both hard copy and electronic data.

6. REPORTING

6.1 List and describe the deliverables expected from each project participant.

6.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). Specify the source(s) of the secondary data in any deliverable.

7. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Provide a description of the situation that requires the generation of a new or modified method.

1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.

2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.

3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.

3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).

4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.

4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:

- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis

- describe procedures for packing and shipping samples, and provisions for maintaining chain-of-custody, as applicable

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.

4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). If a method/SOP will be developed, specify the required format.

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-041

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	See attached PWS

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW: Section 1, 2, 3 and 5

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

Work Plan due 4/29/19.

No work, including but not limited to preparation of the Work Plan, shall begin until 4/1/19.

[X] Superfund — Accounting and Appropriations Data — [ ] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee LOE:

Cumulative Approved: Cost/Fee LOE:

Work Assignment Manager Name Susan Thorneloe (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2709 FAX Number:	
Project Officer Name Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement

WA Title: LEAF for Organics Methods Development - Sample Analysis

WA #: 4-041 WACOR: S. Thorneloe

Contract #: EP-C-15-008 Alternate WACOR: E. Thoma

PERIOD OF PERFORMANCE

The period of performance detailed in this Performance Work Statement (PWS) shall be from April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

(1) ICP-MS analysis and other supporting analytical support for evaluating waste and materials that were collected as part of EPA's research to develop more science based leaching tests for determining partitioning of pollutants in the environment.

BACKGROUND

This work assignment is funded through superfund and complements work being conducted under WA 4-007 to implement the Leaching Environmental Assessment Framework (LEAF) for inorganics and to develop LEAF for organics. The funding for this work assignment is through Superfund and cannot be combined with WA 4-007. This effort is considered a major priority for EPA in advancing the science of leach testing for more accurate prediction of environmental release of constituents of potential concern to surface or ground water bodies. This is parallel to earlier work completed to develop LEAF for inorganics where the methods and guidance and posted in SW-846.

SCOPE

1. **Development/Modification/Compliance with QAPP**: The contractor shall develop quality assurance documentation as required in Appendices #1, 2, and 3 to this PWS. Any work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on the "Quality Assurance Review Form" included with this extramural activity.

   There is an existing QAPP for this research (Q-TRAK # 030117-QP-1-0/QT16023) which was updated and approved in November 2018. The QAPP shall be reviewed and updated as needed including the addendum that was completed last fall for the materials compatibility evaluation.

2. **Analysis of waste and materials collected for LEAF organics development**. Identify parameters and technologies to be used in evaluating waste and materials collected under WA 3-007. The evaluation is part of a materials compatability study that was documented in an existing QAPP developed under the previous option. The Contractor

shall provide documentation in a memo to the WACOR that documents the methods and results from testing.

3. Schedule of Deliverables

Task 1 - New or updated QAPPS as needed

Task 2 – Due by no later than 3/31/2020

ATTACHMENT #1 TO THE PWS

FOR SECONDARY DATA PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function; 07/14/08 A-2

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001
http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

□ **QAPP Requirements for Measurement Projects**

X **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/

EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR SECONDARY DATA PROJECTS

GENERAL REQUIREMENTS

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.

1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.

2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the secondary data needed to meet the project objective(s). Specify requirements relating to the type of data, the age of data, geographical representation, temporal representation, and technological representation, as applicable.

3.2 Identify the source(s) for the secondary data. Discuss the rationale for selecting the source(s) identified. If a hierarchy of sources exists for the gathering of secondary data, specify that hierarchy.

4. QUALITY METRICS

4.1 Specify the quality requirements of the secondary data. These requirements must be appropriate for the intended use of the data. Address accuracy, precision, representativeness, completeness, and comparability, if applicable.

4.2 Describe the procedures for determining the quality of the secondary data.

4.3 If no project-specific data quality requirements exist, state this in the QAPP. If the quality of the secondary data will not be evaluated by EPA, require that a disclaimer be added to any project deliverable to indicate that the quality of the secondary data has not been evaluated by EPA for this

specific application. Provide the wording for the disclaimer.

5. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

5.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

5.2 Describe data validation procedures used to ensure the reporting of accurate project data.

5.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

5.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

5.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

5.4 Describe data storage requirements for both hard copy and electronic data.

6. REPORTING

6.1 List and describe the deliverables expected from each project participant.

6.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). Specify the source(s) of the secondary data in any deliverable.

7. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

ATTACHMENT #2 TO THE PWS

FOR SOFTWARE DEVELOPMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function; 07/14/08 A-2

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001
http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

□ **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

X **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/

EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR SOFTWARE DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the software and its intended application.

1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.

2.2 Include a project schedule that includes key milestones.

3. FUNCTIONAL REQUIREMENTS

3.1 Provide a list of the most important functions that the software system must address.

3.2 Identify requirements for functionality, external interfaces (includes graphical user interfaces and interfaces which are needed for other programs to call subroutines from the software, as applicable), performance, and design constraints. Each requirement should be uniquely identified and defined such that its achievement is capable of being objectively verified and validated.

3.3 Specify computer hardware and operating system requirements.

4. SYSTEM DESIGN

4.1 Provide an overview of the system design (e.g., block diagrams showing relationships between major program modules, hardware devices, and data input/output).

4.2 Describe the components and subcomponents of the software design, including databases and internal interfaces. The description should link the software structure to the functional requirements.

4.3 Provide the rationale for selecting the proposed hardware and software tools

5. IMPLEMENTATION

5.1 Describe how a working software system is developed from the design specifications.

5.2 Describe how the requirements for functionality, external interfaces, performance, and design constraints will be verified and validated.

5.3 Describe how release and delivery of the product is managed, including versions for alpha and beta testing.

5.4 Describe the procedures for controlling, documenting, and archiving all significant changes to software and hardware.

5.5 Identify the archiving software used for controlling, documenting, saving, and recovering changes made to the source code.

6. VALIDATION, VERIFICATION, AND TESTING

6.1 Describe the testing strategy that will be used along with the procedures for each planned test. Testing may include individual module tests, integration tests, system testing, acceptance testing, and alpha and beta testing.

6.2 Describe the procedure for checking the correctness of outputs.

6.3 Describe how it will be determined if the developed software product conforms to requirements, and whether the software product fulfills the intended use and user expectations. This includes analysis, evaluation, review, inspection, assessment, and testing of the software product and the processes that produced the product.

7. DOCUMENTATION, MAINTENANCE, AND USER SUPPORT

7.1 Specify the requirements for project documentation (e.g., requirements and design document, configuration maintenance plan, operations manual, source code, user's guide).

7.2 Describe the procedures for maintenance and user support when software or data generated by the project will be distributed outside NRMRL.

7.3 Define the methods and facilities used to maintain, store, secure, and document controlled versions and related artifacts of the identified software during all phases of the software life cycle.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., software, user documentation, user interface).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

ATTACHMENT #3 TO THE PWS

FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function; 07/14/08 A-2

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001,

http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/

EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

2. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.

1.2 State the purpose of the project and list specific project objective(s).

3. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.

2.2 Include a project schedule that includes key milestones.

4. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.

3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.

3.3 Describe the general approach and the test conditions for each experimental phase.

5. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.

4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.

4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.

4.5 Describe the method for uniquely numbering each sample.

4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

TECHNICAL APROACH/OBJECTIVES

INSTRUMENTATION/EQUIPMENT EXPECTATIONS

QUALITY ASSURANCE

DELIVERABLES

SCHEDULE of DELIVERABLES

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-044

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	See attached PWS

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW: Section 1.0, 1.1, 1.2, 6.0 and 7.0

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

Work Plan due 4/29/19.

No work, including but not limited to preparation of the Work Plan, shall begin until 4/1/19.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee LOE:

Cumulative Approved: Cost/Fee LOE:

Work Assignment Manager Name Sue Kimbrough (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2612 FAX Number:	
Project Officer Name Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement

WA Title: KC-TRAQS

WA #: 4-044 WACOR: Sue Kimbrough

Contract #: EP-C-15-008 Alternate WACOR: Rachelle Duvall

PERIOD OF PERFORMANCE

The period of performance detailed in this Performance Work Statement (PWS) shall be from April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

This is a follow-on WA from Opt. Period II and Opt. Period III. The original work assignment (WA 2-044) focused on building sensor pods, deployment and logistical activities. Work assignment 3-044 focused on the field measurement campaign.

The key objectives of this work assignment are to provide 1) data reduction and data analysis support for the development of papers, reports and presentations that are reporting on the results of the study; 2) XRF analysis of Teflon filters collected during the study; and 3) complete documentation of P-POD and AirMapper builds.

BACKGROUND

In the past few years, concerns have been raised by regional environmental stakeholders regarding air quality in Southeast Kansas City, KS, with particular attention to the presence of a large railroad facility adjacent to a residential area in the Argentine, Turner, and Armourdale neighborhoods. The Burlington, Northern, Santa Fe (BNSF) facility is one of the largest in the nation and operates both a classification yard and a large locomotive maintenance workshop. The Argentine community has partnered with Global Community Monitor (http://www.GCMonitor.org) to characterize the local air quality by collecting $PM_{2.5}$ and black carbon (BC) samples near the rail yard. The exploratory monitoring by the community indicated some sporadic cases of higher BC concentrations near the rail yard, but not $PM_{2.5}$. EPA conducted a more comprehensive research study (Kansas City TRansportation and Local-scale Air Quality Study, KC-TRAQS) from October 2017 – October 2018 to understand the spatial and temporal variability of air pollution at a neighborhood-scale.

SCOPE

The scope of this work assignment is to characterize the spatial and temporal impact of local air pollution sources in and around the Argentine, KS community (including Armourdale and Turner communities) using data collected during the KC-TRAQS measurement campaign. The principal pollutants of interest are $PM_{2.5}$ and BC. Meteorological parameters of interest are wind speed, wind direction, relative humidity, temperature, and barometric pressure.

TECHNICAL APROACH/OBJECTIVES

Task 1: Data Processing/Data Reduction, and Development of papers, reports and presentations that are reporting on the results of the study.

The Contractor shall perform data analyses as directed by the WACOR. This includes (but is not limited to) data analyses of the Teflon/quartz filters, sensor data (P-PODS, PurpleAir sensors), E-BAMs, JFK NCore site data, meteorological and mobile measurement data. These analyses may take the form of descriptive statistics, inferential statistics, time series plots. Descriptive statistics include (but are not limited to) number of observations, mean, median, standard deviation, standard error, 95% confidence interval (CI), minimum, maximum, variance, quantiles, interquartile range, coefficient of variation, variance box plots, time series, distributions (histograms), bar charts, and bivariate plots (fit Y by X). Inferential statistics include (but are not limited to) regression modeling, ANOVA/ANCOVA, and multivariate analyses. Time series plots include (but are not limited to) 1-minute, 1-hour, 24-hour averaging of the data and comparison of these data to collocated regulatory measurements and/or nearby NCore data as an example.

The Contractor shall provide the WACOR with QA information relevant to these data analyses including the mobile measurement data (e.g., QA rules such as when a parameter is outside valid measurement boundaries). The Contractor shall provide recommendations to the WACOR as it relates to the mobile measurement data a list of data fields for inclusion into the final QA-completed mobile measurement data set(s).

The WACOR will prioritize the data analyses and journal article(s) under development.

Deliverable 1.1. The Contractor shall deliver these statistical data analysis results in an electronic format (i.e., comma-delimited), programming code that may have been necessary to complete the data processing, and graphical plots (e.g., PNG files).

Deliverable 1.2. The Contractor shall deliver QA rules and relevant parameters in an electronic form such as an MS Excel spreadsheet. The Contractor shall deliver recommendations to the WACOR as it relates to the mobile measurement data a list of data fields for inclusion into the final QA-completed mobile measurement data set(s) in an electronic form such as an email. The Contractor shall deliver these QA rules and recommended list of data fields within 10 days of work plan approval.

Deliverable 1.3. The contractor shall provide analyses to support journal articles, reports, presentations to characterize the spatial and temporal impact of local air pollution sources in and around the Argentine, KS community (including Armourdale and Turner communities) using data collected during the KC-TRAQS measurement campaign including Teflon/quartz filters, sensor data (P-PODS, PurpleAir sensors), E-BAMs, JFK NCore site data, meteorological and mobile measurement data. These specific journal articles (tentative titles) for this WA include: Characterizing Community Air Pollution Impacts Near Complex Sources: The Kansas City Transportation and Local-scale Air Quality Study (KC-TRAQS); KC-TRAQS Mobile Monitoring; Comparison of sensor performance and traditional measurement methods during the Kansas City Transportation and Local-scale Air Quality Study (KC-TRAQS); Evaluation of low-cost sensors in a near-source environment in Kansas City, Kansas; and Spatial variability of air pollutants in three

neighborhoods in Kansas City, KS impacted by highways, railyards and industry. Other journal articles may evolve from analytical results with required analyses and writing given by technical direction from the WACOR. The contractor shall provide input (i.e., data analyses) for 3-5 presentations and 1-2 EPA external reports.

Task 2: Analyze Teflon Filters with XRF Instrument

The Contractor shall analyze Teflon filters collected during the KC-TRAQS field campaign on the XRF instrument. The KC-TRAQS study collected approximately 750 Teflon filter samples. The WACOR will prioritize the Teflon filter analysis based on the gravimetric results of the filters in consideration of the cost estimate per filter for the XRF analysis as provided in the work plan.

Deliverable 2.1. As a part of the work plan the Contractor shall provide an estimate of the cost per filter for the XRF analysis.

Deliverable 2.2. As a part of the work plan the Contractor shall provide an estimate of the cost for a 2-day training session by PANanalytical, the instrument vendor.

Deliverable 2.3. The Contractor shall report results to the WACOR in an electronic form (e.g., MS Excel spreadsheet) within 120 days of work plan approval.

Task 3: Complete P-POD and AirMapper Documentation

The Contractor shall finalize the draft P-POD and AirMaper documentation. This includes incorporation of comments from the EPA WACOR on the draft document.

Deliverable 3.1 The Contractor shall deliver a final P-POD report and a final AirMapper report in the EPA report format ready to be submitted to EPA's internal review process within 45 days of work plan approval.

WA SPECIFIC EQUIPMENT

Not applicable.

QUALITY ASSURANCE/QUALITY CONTROL

There is an existing EPA-prepared and approved QAPP for this work titled Kansas City TRansportation and Local-scale Air Quality Study (KC-TRAQS) (G-APPCD-0030220) that will be provided to the contractor.

There is an existing approved QAPP for the XRF laboratory analysis.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 4-045

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-15-008	04/01/2015 To 03/31/2020 Base Option Period Number 4	See attached PWS

Contractor: JACOBS TECHNOLOGY INC.

Specify Section and paragraph of Contract SOW: Section 1-4

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2019 To 03/31/2020

Comments:

Work Plan due 4/29/19.

No work, including but not limited to preparation of the Work Plan, shall begin until 4/1/19.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (*Max 2*) ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2015 To 03/31/2020 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee LOE:

Cumulative Approved: Cost/Fee LOE:

Work Assignment Manager Name Amara Holder (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4635 FAX Number:	
Project Officer Name Robin S. Harris (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0955 FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	
Contracting Official Name Keith Pfeffer (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:	

Performance Work Statement

WA Title: Black Carbon Emissions from Residential Heating Appliances

WA #: 4-045 WACOR: Amara Holder

Contract #: EP-C-15-008 Alternate WACOR: Tiffany Yelverton

PERIOD OF PERFORMANCE

April 1, 2019 through March 31, 2020.

SUMMARY OF OBJECTIVES

The key objectives of this work assignment are to:

1. Maintain the residential wood combustion facility
2. Obtain residential wood combustion appliances
3. Conduct runs according to the test matrix and assemble results
4. Provide support in the maintenance of sampling equipment and logistics to support field sampling efforts by the WACOR

BACKGROUND

Residential combustion of wood or biomass for heating is a major source of particulate matter (PM) emissions to the atmosphere in cold climates. U. S. government policies and programs have focused on measures to reduce PM from these appliances for the benefit of air quality and health. Black carbon (BC) is a fraction of PM that can impact the radiative balance and snow melt, degrade visibility, and has been associated with adverse health impacts. Due to the focus on PM, rather than on any one PM constituent, the impact of PM reductions on BC emissions is not well understood. This lack of knowledge of BC emissions from residential wood combustion has limited EPA's ability to quantify the impact of the source on health and the environment in colder regions.

To address this knowledge gap ORD will undertake laboratory studies to investigate PM and BC emissions from residential wood heating appliances. The objective of these laboratory studies is to develop emission factors for PM and BC as well as gain an understanding of the extent to which wood burning efficiency, stove operation, and fuel preparation translates into reducing and/or eliminating PM and BC emissions.

SCOPE

The scope of this work assignment is to prepare and maintain the residential wood combustion facility and support the operation of the facility for emissions testing from residential wood heaters. This work assignment will cover all necessary modifications of current facilities to test residential wood stoves to determine PM and BC emission factors. Support of the facility will include obtaining residential wood combustion appliances and fuels, operating these appliances, and support for emissions measurements from these appliances. Additionally, this work

assignment shall support field sampling efforts to be carried out at an offsite residential wood combustion facility, if necessary. Each of these activities are described in detail below.

TECHNICAL APPROACH/OBJECTIVES

Task 1: Maintain the residential wood combustion facility

The Contractor shall be responsible for maintaining a residential wood combustion facility in EPA's high bay as specified by the WACOR. The facility shall be modified from the cookstove test facility as needed to operate residential wood combustion appliances and sample emissions from these appliances through a dilution tunnel while measuring/determining energy efficiency as specified in EPA's Method 28 – Certification and Auditing of Wood Heaters. The Contractor shall make modifications as necessary to existing equipment for the operation of each appliance.

Task 2: Obtain residential wood combustion appliances and fuels for testing

The Contractor shall obtain residential wood combustion appliances as specified by the WACOR. 2 appliances shall be obtained, and each shall be operated with 2 different fuels. The Contractor shall provide logistical support for the purchase, shipment, and installation of each device. Further, the Contractor shall provide logistical support for the purchase, shipment, and storage of fuel wood to operate each device for the duration of the WA. The Contractor shall also maintain wood storage room with controlled environmental conditions to maintain high moisture content in a portion of the fuels.

Deliverable 2.1. The Contractor shall provide the needed appliances and fuels for testing. At time of procurement of appliance(s) the Contractor shall give realistic estimates for date of arrival. The fuel shall be procured and delivered no later than two weeks after the WACOR makes a request.

Task 3: Conduct runs according to the test plan/matrix and assemble run data results in a usable data package

The Contractor shall operate each appliance as discussed with the WACOR. The operation shall adhere to EPA Method 28 modified for the use of cord wood and more realistic user operation. The Contractor shall manage the storage of fuels under controlled temperature and relative humidity to achieve desired fuel moisture. The Contractor shall prepare fuels for testing, including measurements of fuel moisture.

The Contractor shall provide support as necessary in the maintenance or modification of a continuous emissions measurement (CEM) bench and associated measurements of the facility to determine the energy efficiency of the devices. CEM modification/maintenance shall be carried out as needed. Technical direction as to the level of support will be provided at that time. Maintenance/modification of the CEM bench shall include, but not be limited to:

- Heated sample lines and controllers
- Heated filter and controller
- Heated sampling pump and controller

- Water removal system
- Carbon dioxide/carbon monoxide analyzer
- Total hydrocarbon analyzer
- Data acquisition system

The CEM bench shall be constructed from on-site materials provided by EPA and supplemented with necessary additional materials purchased by the Contractor.

The Contractor shall operate the bench during routine experimentation according to EPA measurement methods as provided by the WACOR. The Contractor shall purchase calibration gases as necessary to meet method requirements. Calibration gases remaining at the end of the project may be returned to the vendor.

Upon completion of tests, the Contractor shall assemble the run data (i.e., experimental conditions) and analytical results (when applicable) into formats that can be used or reported, as discussed with the WACOR. The Contractor shall work with the WACOR to ensure that the appropriate data formats are used. If needed, the Contractor shall write up a short summary report following each run and shall be prepared to further assemble the analytical data into table and plot formats if requested by the WACOR.

Deliverable 3.1. The Contractor shall provide the WACOR with a residential wood combustion appliance operator, needed test equipment, and support for sample collection for all schedule test days.

Deliverable 3.2. The Contractor shall provide analytical results and data package within three weeks of test completion.

Task 4: Provide support in the maintenance of sampling equipment and logistics to support field sampling efforts by the WACOR

The Contractor shall provide support as necessary in the maintenance of equipment used to sample in the field as well as logistics regarding purchase, delivery, and shipment of materials, equipment, and supplies. Support shall include the shipment of equipment and supplies to one field efforts within the continental U.S.

WA SPECIFIC MATERIALS

Tasks 1, 2, 3 and 4 may require procurement of materials to support the research efforts. Materials may include components to modify the facility as described in Task 1, fabricate the sampling apparatus and instrumentation as described in Task 3, and residential wood combustion appliances and fuel wood as described in Task 2.

QUALITY ASSURANCE

The Contractor shall adhere to and ensure that all applicable QA/QC and safety and health rules and requirements are met. Since this work covers measurements to determine emission factors, the Contractor shall document quality assurance/control data as required for Measurement Projects (see Attachment #1) to this Performance Work Statement (PWS).

A quality assurance project plan (QAPP) has been developed by EPA and was provided to and approved by the Contractor. Any modification or addendums to the QAPP will be provided to the Contractor. The modifications shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the Contractor's work assignment leader and QA officer to show that they have reviewed and approved the revised QAPP. The Contractor shall document this process.

Upon receipt of the signed QAPP, the EPA WACOR and QA manager will review and approve the QAPP and they will add their signatures to the signature page. Work involving environmental data shall not commence until the QAPP has received official approval from the EPA QA staff.

ATTACHMENT #1 TO THE PWS

NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

1. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

2. PROJECT DESCRIPTION AND OBJECTIVES

2.1 Describe the process and/or environmental system to be evaluated.
2.2 State the purpose of the project and list specific project objective(s).

3. ORGANIZATION AND RESPONSIBILITIES

3.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
3.2 Include a project schedule that includes key milestones.

4. SCIENTIFIC APPROACH

4.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
4.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
4.3 Describe the general approach and the test conditions for each experimental phase.

5. SAMPLING PROCEDURES