COORDINATING RESEARCH COUNCIL, INC.
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ATLANTA GA 30328
TEL: 678/795-0506
WWW.CRCAO.ORG

April 3rd, 2025
In reply, refer to:
CRC Project No. RW-125

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for "Remote Sensing Device (RSD) Summary Report 2007-2024" (CRC Project No. RW-125). A description of the project is presented in Exhibit A, "Statement of Work."

Please indicate your intention to bid at this link on or before **April 17th, 2025** if you or your organization intends to submit a written proposal for this research program. CRC will answer technical questions regarding the Request for Proposal if they are submitted in writing at least one week before the proposal submission deadline here: Q & A Link. CRC will then return written answers to all of the bidders, along with a copy of the original questions. Questions submitted within a week of the deadline may not be answered before the proposal submission deadline.

A CRC technical group composed of industry representatives will evaluate your proposal. CRC reserves the right to accept or reject any or all proposals.

The reporting requirements will be monthly progress reports and a summary technical report at the end of the contractual period. The reporting requirements are described in more detail in the attachment entitled "Reports" (Exhibit B).

The proposal must be submitted as two separate documents. The technical approach to the problem will be described in part one, and a cost breakdown that is priced by task will be described in part two. The cost proposal document should include all costs associated with conducting the proposed program. The technical proposal shall not be longer than 10 pages in length.

CRC expects to negotiate a cost-plus fixed fee or cost reimbursement contract for the research program.

Contract language for intellectual property and liability clauses is presented in Exhibit C and in Exhibit D, respectively.

Important selection factors to be taken into account are listed in Exhibit E. CRC evaluation procedures require the technical group to complete a thorough technical evaluation before considering costs. After developing a recommendation based on technical considerations, the costs are revealed and the recommendation is modified as needed.

Electronic copies of the technical and cost proposals should be submitted to:

Amber Leland
Coordinating Research Council
1 Concourse Parkway, Suite 800
Atlanta, GA, 30328

Phone: 678-795-0506
E-mail: aleland@crcao.org

The deadline for receipt of your proposal is **May 1st, 2025**

Yours truly,

Amber B. Leland
Deputy Director

EXHIBIT A

CRC Project Statement of Work
"Remote Sensing Device (RSD) Summary Report 2007-2024"

CRC Project Number: RW-125

Background

CRC performed many projects using Remote Sensing Devices (RSD) to perform roadside measurement of vehicle emissions at various locations over many years. These studies were valuable to establish a perspective of vehicle emissions for the on-road fleet in real-world driving conditions and how these emissions profiles changed as vehicles and fuels changed in response to changing vehicle emissions regulations. In 2007, CRC commissioned a report, CRC Report E-23, summarizing results of many CRC RSD studies that had been completed at that time (ref. 1). This report covered RSD emissions measurements performed in years 1996 to 2006. A list of pre-2007 studies included in the report are listed in on pages 8 and 30 of the E-23 report. Since that time, CRC has completed many more RSD studies. It is desirable to prepare another retrospective report to summarize RSD results so far.

Findings of previous CRC RSD studies indicated several trends: 1) Vehicle emissions steadily decreased over the years. 2) High-emitting vehicles comprise about 1% of the vehicle population but produce a majority of emissions. 3) There is little degradation of emissions aftertreatment systems even for vehicles beyond 15 years old. In other words, after 15 years, the vast majority of vehicles still perform at or near the vehicle certification emissions levels for when the vehicle was new. 4) Trends are consistent when measured repeatedly at the same location year after year. 5) Observed trends hold regardless of location, time of year, and presence/absence of regional Inspection and Maintenance programs. 6) As vehicle emissions certification levels have decreased with time, vehicle emissions levels have decreased to the point they approach or fall below the lower detection limits of RSD instruments in recent years.

Objective

Produce a report summarizing findings of CRC RSD studies focusing on studies performed after the last E-23 summary report in 2007.

Scope of Work

Produce a report summarizing findings of CRC RSD studies performed after the last E-23 summary report in 2007, including years 2007 to 2024. These reports are listed in the "References" section below. RSD data from Tulsa was left out of the E-23 Summary Report because only one or two years of data had been collected at the time. More studies have been performed at Tulsa since then, so we want to include RSD data from Tulsa collected since 2003 in this summary report. The CRC E-23 report included some RSD studies performed by entities besides CRC. For example, data from St. Louis was provided by Missouri Department of Natural Resources (DNR). And the E-23 report recommends considering data from locations including Texas, Colorado, and Los Angeles, California. The contractor is requested to propose what additional non-CRC data (if any) and sources thereof should be included in the summary report. If inclusion of additional data has a significant impact on cost, the contractor is requested to offer this as options with associated cost in the proposal. Although the focus of this report is on RSD studies since 2007, inclusion of data before 2007 is within scope if it is desirable to form a "complete picture" of emissions trends. For example, pre-2007 data may be necessary to demonstrate emissions trends across the transition in 2007 from the older summary report to the new summary report. Or pre-2007 data may be necessary to provide

a more complete data set for some measurement locations. The contractor is expected to propose what pre-2007 data (if any) should be included in the new summary report.

Evaluation of data trends includes effects geographic region, vehicle type, vehicle age, time of year, and other parameters as needed to form a broad picture of vehicle emissions trends over the time period of scope (2007-2024). Several cities had RSD studies on-going during significant restrictions of Covid-19. Please explain how this will be accounted for in the summary report.

Evaluate trends observed including those listed in the E-23 summary report and those mentioned in the Background statement above to see if they're still valid and whether any additional trends may be identified. Of particular interest is what RSD data indicates about the lifetime and robustness of vehicle aftertreatment systems in older vehicles, particularly how well emissions aftertreatment systems perform for older high-mileage vehicles compared to emissions performance for the same (or similar) vehicle when it was new. According to vehicle registration data, about 10% of passenger cars and passenger trucks are 23 years old or older. Therefore, information about performance of emissions control systems (compared with performance when vehicles were new) for vehicles as old as 23 years (and perhaps older) is of interest since there are significant numbers still in operation.

As discussed in the Background section above, vehicle emissions levels have decreased to the point they approach or fall below the lower detection limits of RSD instruments in recent years. Given this fact, analyses for this project should account for fractions of measurements below detection, including values for concentrations <= 0., how these fractions change over time, and how accounting for them affects estimates of emission levels. This point is especially important for tasks intended to characterize the lower portion of the fleet that remains "clean."

Provide an assessment of data quality, particularly if certain measurement techniques or systems provide significantly better or worse data quality than other comparable systems.

Another question of interest is what portion of observed vehicle emissions reductions over time are due to increasingly stringent vehicle emissions certification levels (regulatory action) compared to vehicle emissions reductions due to older high-emissions vehicles retiring from service and being replaced by newer vehicles (attrition). To perform this task, it may be useful to perform case studies comparing the assumption of regulatory action vs. a theoretical outcome from no regulatory action, all based on actual emissions data from vehicles of selected year models and ages. For example, the actual results of the transition from Tier 2 to Tier 3 emissions regulations could be compared to a theoretical case where actual emissions deterioration rates could be applied to Tier 2 vehicles to estimate what would have happened with fleet emissions rates had Tier 3 regulations not been implemented and the fleet remained at historical Tier 2 emissions levels. Please propose methods to distinguish effect of regulatory action given three concurrent trends and complicating factors:

- Increased vehicle durability
- Reduced gasoline fuel sulfur content
- During Tier 3 phase-in, it's not possible to distinguish Tier 2 from Tier 3 vehicles based only on model year and VIN.

Please quote the task described in the paragraph above (effect of regulatory action vs. effect of vehicle attrition) as an optional task with associated cost in the proposal.

Additional questions of interest arising from the data analysis may also be proposed by the contractor. If these additional questions have a significant impact on project cost, please offer them as options with associated cost in the proposal.

Schedule

Bidders are asked to propose a schedule.

Deliverables

Deliverables include a project kick-off call for CRC panel and contractor to discuss project scope and focus, brief monthly project status reports, monthly joint project panel/contractor calls to discuss project status, additional project panel calls if needed, and a written final report. The final report should be in normal CRC format (not presentation format) as a stand-alone document with no reference to project monthly reports or interim reports (it must of necessity refer to reports providing RSD data). Also include in the final report an analysis of literature evaluated (CRC reports and non-CRC reports if included). This analysis will culminate in an executive summary with a dashboard view (figures or tables) with a breakdown summary of status, major challenges and or gaps from the first CRC report on RSD to today. Data used to support findings or conclusions should be made available in a format accessible to CRC after the report is finalized, for example as appendices or an accompanying spreadsheet file in a common format like PDF or Excel. Final report preparation will follow normal CRC procedure, i.e. preparation of a draft final report, at least 30 days for report review by CRC, address review comments, issue final report, and publication of final report on the CRC website.

Develop an additional version of the report in the form of a presentation that the contractor may be asked to present during a future CRC Real-World Emissions Workshop. Please quote the cost to prepare and present the presentation as a separate optional task.

References

Most of these reports are available on the CRC website www.crcao.org.

CRC E-23 RSD Summary Report from 2007

1) Remote Sensing in Four Cities to Determine the Change in On-Road Vehicle Fleet Emissions Over Time, CRC Report E-23, Nov. 2007

CRC RSD Studies In-Scope – Tulsa

2) On-Road Remote Sensing of Automobile Emissions in the Tulsa Area: Year 1, September 2003, CRC Report E-23-8a, Jul. 2004, (test Sep. 2003, report Jul. 2004)
3) Tulsa 2005, This study was mentioned in the E-23 Summary report 2007, but I could not find it on the CRC website.
4) On-Road Remote Sensing of Automobile Emissions in the Tulsa Area: Fall 2013, CRC Report E-106, Jul. 2014, (test Sep.-Oct. 2013, report Jul. 2014)
5) On-Road Remote Sensing of Automobile Emissions in the Tulsa Area: Fall 2015, CRC Report E-106, Jun. 2016, (test Sep. 2015, report Jun. 2016)
6) On-Road Remote Sensing of Automobile Emissions in the Tulsa Area: Fall 2017, CRC Report E-123, Mar. 2018, (test Sep. 2017, report Mar. 2018)
7) On-Road Remote Sensing of Automobile Emissions in the Tulsa Area: Fall 2019, CRC Report E-123, Apr. 2020, (test Sep. 2019, report Apr. 2020)

CRC RSD Studies In-Scope – Chicago

8) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Fall 2014, CRC Report E-106, Jun. 2015, (test Sep. 2014, report Jun. 2015)
9) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Fall 2016, CRC Report E-106, Jun. 2017, (test Sep. 2016, report Jun. 2017)
10) G. Bishop, M. Haugen, The Story of Ever Diminishing Vehicle Tailpipe Emissions as Observed in the Chicago, Illinois Area, Environ. Sci. Technol. 2018, 52, 13, 7587-7593
11) On-Road Remote Sensing of Automobile Emissions in the Rolling Meadows Area: Fall 2016, CRC Report E-119, Jan. 2018, (test Sep. 2016, report Jan. 2018)
12) Fall 2016 On-Road Emission Measurements in the Chicago Area: Comparison of Two University of Denver Remote Sensing Datasets, CRC Report E-119a, Feb. 2018, (test Sep. 2016, report Feb. 2018)
13) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Fall 2018, CRC Report E-123, Jun. 2019, (test Sep. 2018, report Jun. 2019)
14) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Fall 2020, CRC Report E-123, Jun. 2021, (test Sep. 2020, report Jun. 2021)

CRC RSD Studies In-Scope – Denver

15) On-Road Remote Sensing of Automobile Emissions in the Denver Area: Winter 2017, CRC Report E-123, Aug. 2018, (test Dec. 2017-Jan. 2018, report Aug. 2018)
16) On-Road Remote Sensing of Automobile Emissions in the Denver Area: Winter 2020, CRC Report E-123, Jul. 2020, (test Jan.-Feb. 2020, report Jul. 2020)

CRC RSD Studies In-Scope – Lynwood

17) Revisit Lynwood, CA: On-Road Remote Sensing of Automobile Emissions in the Lynwood, CA Area: 2018, E-124, Jan. 2019, (test May 2018, report Jan. 2019)

CRC RSD Studies In-Scope – Fresno

18) On-Road Remote Sensing of Automobile Emissions in the Fresno, CA Area: Spring 2021, RW-117, Oct. 2021, (test Jun. 2021, report Oct. 2021)

CRC RSD Studies In-Scope – Phoenix

19) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Spring 2021, E-119-3 (DU), Mar. 2022, (test Apr. 2021, report Mar. 2022)
20) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Spring 2021, E-119-3 (Opus), Aug. 2022, (test Apr. 2021, report Aug. 2022)
21) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Spring 2021, E-119-3 (HEAT), Mar. 2022, (test Apr. 2021, report Mar. 2022)
22) Remote Sensing Device (RSD) Statistical Analysis, CRC Report E-119-3a, Apr. 2023 (testing Phoenix Apr. 2021, report Apr. 2023)
23) Roadside Measurement of Evaporative and PM Emissions, CRC Report RW-105, Apr. 2023 (test Phoenix Apr. 2021, report Apr. 2023)

CRC RSD Studies In-Scope – Others

24) Analysis of Remote Sensing Data to Determine Deterioration Rates for OBDII Equipped Vehicles, CRC Report No. E-23-8, Sep. 2006

25) Remote Sensing Measurements for the E-100a Longitudinal Emission Pilot Study, E-100a, Aug. 2011
26) Analyze Existing West Los Angeles Data Set for On-Road Evaporative Emissions, CRC Report No. E-123-3, Jul. 2019
27) G. Bishop, T. DeFries, J. Sidebottom, J. Kemper, Vehicle Exhaust Remote Sensing Device Method to Screen Vehicles for Evaporative Running Loss Emissions, Environ. Sci. Technol. 2020, 54, 22, 14627-14634
28) Hager Environmental and Atmospheric Technologies (HEAT) and Denver University (DU) Remote Sensing Device (RSD) Data Mining, E-119-2, Aug. 2018
29) Inspection and Maintenance Evaluation using Historical U.S. Remote Sensing Measurements, E-123-4, Aug. 2020
30) Re-locating the FEAT Data Repository to the University of Denver Library, RW-118, Nov. 2021

CRC RSD Studies already included in E-23 Summary Report in 2007. These reports are on the CRC website.

31) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Year 7, September 2006, E-23-9, Feb. 2007, (test Sep. 2006, report Feb. 2007)
32) On-Road Remote Sensing of Automobile Emissions in the Chicago Area: Year 4, August 2001, E-23-4, Aug. 2001, (test Sep. 2000, report Aug. 2001)
33) On-Road Remote Sensing of Automobile Emissions in the Denver Area: Year 4, January 2003, E-23-4, Jul. 2003, (test Dec. 2002-Jan. 2003, report Jul. 2003)
34) On-Road Remote Sensing of Automobile Emissions in the Denver Area: Year 3, January 2002, E-23-4, Jan. 2002, (test Jan. 2001, report Jan. 2002)
35) On-Road Remote Sensing of Automobile Emissions in the Denver Area: Year 2, February 2001, E-23-4, Jan. 2000, (test Dec. 1999-Jan. 2000, report Feb. 2001)
36) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 6, November 2006, E-23-9, Jul. 2007, (test Nov. 2006, report Jul. 2007)
37) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 3, May 2002, E-23-4, May 2002, (test Nov. 2000, report May 2002)
38) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 4, November 2002, E-23-4, Nov. 2003, (test Nov. 2002, report Nov. 2003)
39) On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 2, January 2001, E-23-4, Jan. 2001, (test Nov. 1999, report Jan. 2001)
40) On-Road Remote Sensing of Automobile Emissions in West Los Angeles: Year 4, October 2005, E-23-9, Apr. 2006, (test Oct. 2005, report Apr. 2006)
41) On-Road Remote Sensing of Automobile Emissions in the La Brea Area: Year 3, October 2003, E-23-4, May 2004, (test Oct. 2003, report May 2004)
42) On-Road Remote Sensing of Automobile Emissions in the La Brea Area: Year 2, February 2003, E-23-4, Feb. 2003, (test Oct. 2001, report Feb. 2003)
43) On-Road Remote Sensing of Automobile Emissions in the Los Angeles Riverside Area: Year 3, June 2002, E-23-4, Jun. 2002, (test Jun. 2001, report Jun. 2002)
44) On-Road Remote Sensing of Automobile Emissions in the Los Angeles Area: Year 2, March 2001, E-23-4, Mar. 2001, (test May-Jun. 2000, report Mar. 2001)
45) Remote Sensing Measurement of Real World Vehicle High-Exhaust Emitters, Interim Report, CRC Project E-23, Apr. 2002

Other reports listed in E-23 Summary Report 2007, but report is missing from CRC website. Contact CRC staff for copies of these reports.

46) Chicago Sep. 1997
47) Chicago Sep. 1998
48) Chicago Sep. 1999
49) Chicago Sep. 2002
50) Chicago Sep. 2004
51) Denver Jan. 1996
52) Denver Jan. 1997
53) Denver Jan. 1999
54) Denver Jan. 2005
55) Denver Jan. 2007
56) Omaha Sep. 2004
57) Los Angeles Riverside Jun. 1999
58) Los Angeles LaBrea Nov. 1999
59) Phoenix Site 1 Nov. 1998
60) Phoenix Site 2 Nov. 2004

Additional CRC RSD Studies Out-of-Scope

61) Remote Sensing Measurements of On-Road Heavy-Duty Diesel NOx and PM Emissions, CRC Project E-56, Jan. 2003
62) Measurement of Diesel Particulate Emissions by UV LIDAR Remote Sensing in Denver, CO, Report by Desert Research Institute, February 21-22, 2001, CRC Project E-56-1, Aug. 2002
63) Opacity Enhancement of the On-Road Remote Sensor for HC, CO and NO, Report by University of Denver, Final Report for CRC Project E-56-2, Feb. 2002

EXHIBIT B

REPORTS

MONTHLY TECHNICAL PROGRESS REPORTS

The contractor shall submit a monthly technical progress report covering work accomplished during each calendar month of the contract performance. An electronic Microsoft® Word compatible file (<1 MB) of the monthly technical progress report shall be distributed by the contractor within ten (10) calendar days after the end of each reporting period. The report shall contain a description of overall progress, plus a separate description for each task or other logical segment of work on which effort was expended during the reporting period.

FINAL REPORT

The contractor shall submit to or distribute for CRC an electronic (Microsoft Word) copy transmittable via email) of a rough draft of a final report within thirty (30) days after completion of the technical effort specified in the contract. The report shall document, in detail, the test program and all of the work performed under the contract. The report shall include tables, graphs, diagrams, curves, sketches, photographs and drawings in sufficient detail to comprehensively explain the test program and results achieved under the contract. The report shall be complete in itself and contain no reference, directly or indirectly, to the monthly report(s).

The draft report must have appropriate editorial review corrections made by the contractor prior to submission to CRC to avoid obvious formatting, grammar, and spelling errors. The report should be written in a formal technical style employing a format that best communicates the work conducted, results observed, and conclusions derived. Standard practice typically calls for a CRC Title Page, Disclaimer Statement, Foreword/Preface, Table of Contents, List of Figures, List of Tables, List of Acronyms and Abbreviations, Executive Summary, Background, Approach (including a full description of all experimental materials and methods), Results, Conclusions, List of References, and Appendices as appropriate for the scope of the study. Reports submitted to CRC shall be written with a degree of skill and care customarily required by professionals engaged in the same trade and /or profession.

Within thirty (30) days after receipt of the approved draft copy of the final report, the contractor shall make the requested changes and deliver to CRC ten (10) hardcopies including a reproducible master copy of the final report. The final report shall also be submitted as electronic copies in a pdf and Microsoft Word file format. The final report may be prepared using the contractor's standard format, acknowledging author and sponsors. An outside CRC cover page will be provided by CRC. The electronic copy will be made available for posting on the CRC website.

EXHIBIT C

INTELLECTUAL PROPERTY RIGHTS

Title to all inventions, improvements, and data, hereinafter, collectively referred to as ("Inventions"), whether or not patentable, resulting from the performance of work under this Agreement shall be assigned to CRC. Contractor X shall promptly disclose to CRC any Invention which is made or conceived by Contractor X, its employees, agents, or representatives, either alone or jointly with others, during the term of this agreement, which result from the performance of work under this agreement, or are a result of confidential information provided to Contractor X by CRC or its Participants. Contractor X agrees to assign to CRC the entire right, title, and interest in and to any and all such Inventions, and to execute and cause its employees or representatives to execute such documents as may be required to file applications and to obtain patents covering such Inventions in CRC's name or in the name of CRC's Participants or nominees. At CRC's expense, Contractor X shall provide reasonable assistance to CRC or its designee in obtaining patents on such Inventions.

To the extent that a CRC member makes available any of its intellectual property (including but not limited to patents, patent applications, copyrighted material, trade secrets, or trademarks) to Contractor X, Contractor X shall have only a limited license to such intellectual property for the sole purpose of performing work pursuant to this Agreement and shall have no other right or license, express or implied, or by estoppel. To the extent a CRC member contributes materials, tangible items, or information for use in the project, Contractor X acknowledges that it obtains only the right to use the materials, items, or information supplied for the purposes of performing the work provided for in this Agreement, and obtains no rights to copy, distribute, disclose, make, use, sell or offer to sell such materials or items outside of the performance of this Agreement.

EXHIBIT D

LIABILITY

It is agreed and understood that _____ is acting as an independent contractor in the performance of any and all work hereunder and, as such, has control over the performance of such work. _____ agrees to indemnify and defend CRC from and against any and all liabilities, claims, and expenses incident thereto (including, for example, reasonable attorneys' fees) which CRC may hereafter incur, become responsible for or pay out as a result of death or bodily injury to any person or destruction or damage to any property, caused, in whole or in part, by _____'s performance of, or failure to perform, the work hereunder or any other act of omission in connection therewith.

EXHIBIT E

PROPOSAL EVALUATION CRITERIA

1) Merits of proposed technical approach.
2) Previous performance on related research studies.
3) Personnel available for proposed study – related experience.
4) Timeliness of study completion.
5) Cost.