EPA Reference: RW-97-92434401-0

Dear Interagency Agreement (IA) Recipient:

Please find attached an electronically signed pdf of a new or amendment IA between EPA and your Federal Agency. **Please note a signature is needed by your authorizing official in box 41 of the EPA 1610 form for this IA to be obligated and legally binding.**

If you wish to accept the agreement, please have your authorizing official sign box 41 of the EPA 1610-1 form and return a signed copy within 3 weeks of this date.

Please return the signed IA using one of the following methods:

- Pdf scan to IA specialist smith.leon@epa.gov
- Fax 202-565-2470 (Attn: Leon Smith)
- EPA mailing address in box 38 of the EPA Form 1610-1

If you have questions, please contact the EPA Project Officer listed in box 14 or the IA Specialist listed in box 6 of the attached EPA 1610 form.

Sincerely,
Francis Roth, Chief
IASSC EAST
FISB/GIAMD

Enclosure

cc: Brian Gullett
matthew.w.seaman2.civ@mail.mil
**Interagency Agreement/Amendment**

**Part 1 - General Information**

7. Name and Address of EPA Organization
   US Environmental Protection Agency
   IASSC East
   1200 Pennsylvania Avenue, NW
   Mail code 3903R
   Washington, DC 20460

9. DUNS: 029128894

10. BETC: COLL

11. DUNS: DODW9027P

12. BETC: DISB

8. Name and Address of Other Agency
   Department of Defense
   PD Joint Services
   Building 1 Annex
   Picatinny Arsenal, NJ 22202

13. Project Title and Description
    Emission sampling at Radford Ammunition Depot
    Emissions from the open burning of ordnance will be sampled and characterized for composition and proportion to the ordnance.

14. EPA Project Officer (Name, Address, Telephone Number)
    Brian Gullett
    109 T.W. Alexander Drive (E343-04)
    Research Triangle Park, NC 27711
    919-541-1534
    E-Mail: gullett.brian@epa.gov
    FAX: 919-541-7885

15. Other Agency Project Officer (Name, Address, Telephone Number)
    Gabriela Dory
    Building 1 Annex
    Picatinny Arsenal, NJ 22202
    973-724-6746
    E-Mail: gabriela.a.dory.civ@mail.mil
    FAX: 973-724-7606

16. Project Period: 08/03/2015 to 02/28/2016

17. Budget Period: 08/03/2015 to 02/28/2016

24. Revise Reimbursable Funds and Direct Fund Cites (only complete if applicable)

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<tr>
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<th>Previous Amount</th>
<th>Amount This Action</th>
<th>Total Amount</th>
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</tr>
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<td>Direct Fund Cite (in-house)</td>
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<td>0.00</td>
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25. EPA Amount

26. EPA In-Kind Amount

27. Other Agency Amount
   $109,851.00

28. Other Agency In-Kind Amount
   $0.00

29. Total Project Cost
   $109,851.00

30. Fiscal Information

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<th>Appropriation</th>
<th>Budget Org</th>
<th>PRC</th>
<th>Object Class</th>
<th>Site/Project</th>
<th>Cost Org</th>
<th>Ob/De-Ob Amt</th>
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**EPA Form 1610-1 (Rev. 11-09): Previous editions are obsolete.**
### Part II - Approved Budget

<table>
<thead>
<tr>
<th>Budget Categories</th>
<th>Itemization of All Previous Actions</th>
<th>Itemization of This Action</th>
<th>In-Kind Itemization of This Action</th>
<th>Itemization of Total Project Cost to Date</th>
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<td></td>
<td>$44,139.00</td>
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<tr>
<td>(b) Fringe Benefits</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(c) Travel</td>
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<td>$10,820.00</td>
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<tr>
<td>(d) Equipment</td>
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</tr>
<tr>
<td>(e) Supplies</td>
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<tr>
<td>(f) Procurement / Assistance</td>
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<td>$21,715.00</td>
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<tr>
<td>(g) Construction</td>
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<td>$5,000.00</td>
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<tr>
<td>(h) Other</td>
<td>$0.00</td>
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<tr>
<td>(i) Total Direct Charges</td>
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<td>$93,754.00</td>
<td>$0.00</td>
<td>$93,754.00</td>
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<tr>
<td>(j) Indirect Costs</td>
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**Charged - Amount**

- **Rate:** 17.17%
- **Base:** $
- **Not Charged:**
- **Funds-In:** Not charged by EPA
- **Amount:** $

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<th>(EPA Share %)</th>
<th>(Other Agency Share %)</th>
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<td>$0.00</td>
<td>$109,851.00</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>$109,851.00</td>
</tr>
</tbody>
</table>

32. How was the IDC Base calculated?

33. Is equipment authorized to be furnished by EPA or leased, purchased, or rented with EPA funds?  [ ] Yes  [ ] No
   (Identify all equipment costing $1,000 or more)

34. Are any of these funds being used on Procure/Assistance agreements?  [ ] Yes  [ ] No

**Type of Procure/Assistance Agreement**

<table>
<thead>
<tr>
<th>Contractor/Recipient Name (if known)</th>
<th>Total Procure/Assistance Amount Under This Project</th>
<th>Percent Funded by EPA (if known)</th>
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</thead>
<tbody>
<tr>
<td>TBD</td>
<td>21715</td>
<td>0</td>
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<tr>
<td></td>
<td>Total $21,715.00</td>
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</tbody>
</table>

### Part III - Funding Methods and Billing Instructions

**Note:** EPA Agency Location Code (ALC) - 68010727

35. [ ] Disbursement Agreement
    Request for repayment of actual costs must be itemized on SF 1080 and submitted to the Financial Management Office, Cincinnati, OH 45268-7002:
    - [ ] Repayment
      - Monthly
      - Quarterly
      - Upon Completion of Work
    - [ ] Advance
      Only available for use by Federal agencies on working capital fund or with appropriate justification of need for this type of payment method. Unexpended funds at completion of work will be returned to EPA. Quarterly cost reports will be forwarded to the Financial Management Center, EPA, Cincinnati, OH 45268-7002.

- [ ] Allocation Transfer-Out
  Used to transfer obligational authority or transfer of function between Federal agencies. Must receive prior approval by the Office of Comptroller, Budget Division, Budget Formulation and Control Branch, EPA Hdqtrs. Forward appropriate reports to the Financial Reports and Analysis Branch, Financial Management Division, PM-226F, EPA, Washington, DC 20460.

36. [ ] Reimbursement Agreement
    - Repayment
    - [ ] Advance

**Other Agency’s Billing Instructions and Frequency**

Forward copies of the acceptance and all contract mods to
Matt Seaman: matthew.w.seaman2.civ@mail.mil

**Other Agency TAS** A2ABM
### Part IV - Acceptance Conditions

37. Terms and Conditions, when included, are located at the end of the 1610-1, or as an attachment.

### Part V - Offer and Acceptance

**Note:** A) For Fund-out actions, the agreement/amendment must be signed by the other agency official in duplicate and one original returned to the Grants and IA Management Division for Headquarters agreements or to the appropriate EPA Regional IA administration office within 3 calendar weeks after receipt or within any extension of time that may be granted by EPA. The agreement/amendment must be forwarded to the address cited in item 29 after acceptance signature.

Failure to return the properly executed document within the prescribed time may result in the withdrawal of offer by EPA. Any change to the agreement/amendment by the other agency after the document is signed by the EPA Award Official, which the Award Official determines to materially alter the agreement/amendment, shall void the agreement/amendment.

B) For Funds-In actions, the other agency will initiate the action and forward two original agreements/amendments to the appropriate EPA program office for signature. The agreements/amendments will then be forwarded to the appropriate EPA IA administration office for signature on behalf of the EPA. EPA will return one original copy after acceptance returned to the other agency after acceptance.

<table>
<thead>
<tr>
<th>EPA IA Administration Office (for administrative assistance)</th>
<th>EPA Program Office (for technical assistance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Environmental Protection Agency</td>
<td>US Environmental Protection Agency</td>
</tr>
<tr>
<td>IASSC East</td>
<td>ORD - Office of Research and Development</td>
</tr>
<tr>
<td>1200 Pennsylvania Avenue, NW Mail code 3903R</td>
<td>109 T.W. Alexander Drive</td>
</tr>
<tr>
<td>Washington, DC 20460</td>
<td>Research Triangle Park, NC 27711</td>
</tr>
</tbody>
</table>

**Award Official on Behalf of the Environment Protection Agency**

<table>
<thead>
<tr>
<th>40. Digital signature applied by EPA Award Official</th>
<th>FOR Frank N. Roth - Chief</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Michelle Messick - AO delegate</td>
</tr>
<tr>
<td></td>
<td>Date 07/30/2015</td>
</tr>
</tbody>
</table>

**Authorizing Official on Behalf of the Other Agency**

<table>
<thead>
<tr>
<th>41. Signature</th>
<th>Typed Name and Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELMASRI, BISHARA S.</td>
<td>Bishara Elmasri, Assistant Project Management Officer</td>
<td>7/30/2015</td>
</tr>
</tbody>
</table>

EPA Form 1610-1 (Rev. 11-09) Previous editions are obsolete.
**Administrative Conditions**

1. **Resolution of Disagreements**

   Should disagreements arise on the interpretation of the provisions of this agreement or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other party for consideration. If agreement or interpretation is not reached within 30 days, the parties shall forward the written presentation of the disagreement to respective higher officials for appropriate resolution.

   If a dispute related to funding remains unresolved for more than 30 calendar days after the parties have engaged in an escalation of the dispute, disputes will be resolved in accordance with instructions provided in the Treasury Financial Manual (TFM) Volume I, Part 2, Chapter 4700, Appendix 10, available at [http://www.fms.treas.gov/ftm/index.html](http://www.fms.treas.gov/ftm/index.html).

2. **Cost Collection Upon Cancellation**

   If the IA recipient cancels the agreement, the Environmental Protection Agency is authorized to collect costs incurred prior to the cancellation of the agreement, plus termination costs, up to the total payment amount provided for under the agreement.

**Programmatic Conditions**

Standard IATerms and Conditions
MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

1. PAGE 1 OF 2 PAGES

2. FSC: MILITARY INTERDEPARTMENTAL PURCHASE REQUEST
3. CONTROL SYMBOL NO.: 1
4. DATE PREPARED: 07 MAY 2015
5. MIPR NUMBER: 10697000
6. AMEND NO.: BASIC

7. TO: ENVIRONMENTAL PROTECTION AGENCY
26 MARTIN LUTHER KING DR
CINCINNATI, OH 45220-2242
Tel:

8. FROM: (agency, name, telephone number of originator)
PD JOINT SERVICES
ATTN: MATTHEW SEAMAN
BUILDING 1 ANNEX (W90Z7P)
Picatinny Arsenal, NJ 07806
Tel:

9. ITEMS [ ] ARE [ ] NOT INCLUDED IN THE INTERSERVICE SUPPLY SUPPORT PROGRAM AND REQUIRED INTERSERVICE SCREENING [ ] HAS [ ] NOT BEEN ACCOMPLISHED.

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
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<tbody>
<tr>
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<td>109,851.00</td>
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</table>

Funding provided to U.S. EPA’s Office of Research and Development to support air quality sampling of open burning at Radford Army Ammunition Plant (RFAAP) Copy of SOW provided under separate cover. Estimates for each cost item are:
- Supplies $12,080,
- Contract analyses $11,715,
- Travel $10,820,
- Fabrication $5,000,
- Contract support $10,000,
- In-house Fed labor $44,135,
- Indirect costs $16,097.

This Economy Act Order is issued IAW DFAS-IN-37-1 Chapter 12 and 31 USC 1535. Period of Performance ends 28 Feb 2016. Funds expire for obligation 0 Sep 2017. The interagency agreement is currently in draft; a signed copy will be provided to PD Joint Services. EPA Fin POCs: Francis Roth, 202-564-5311, Roth.francis@epa.gov; EPA Tech POC: Brian Gullett, 919-541-1534, gullett.brian@epa.gov; PD JS Tech POC: Gabriela Dory, 973-724-5746, gabriela.a.dory.civ@mail.mil; PD JS

THIS MIPR MUST BE ACCEPTED AS RECEIVED ELSE IT SHOULD BE REJECTED.

10. SEE ATTACHED PAGES FOR DELIVERY SCHEDULES, PRESERVATION AND PACKAGING INSTRUCTIONS, SHIPPING INSTRUCTIONS AND INSTRUCTIONS FOR DISTRIBUTION OF CONTRACTS AND RELATED DOCUMENTS.

11. GRAND TOTAL: 109,851.00

12. TRANSPORTATION ALLOTMENT (Used if FOB Contractor's plant)

13. MAIL INVOICE TO (Payment will be made by)
DFAS-INDY VP GFBB
8899 E 56TH STREET
INDIANAPOLIS IN 46249-3800
PAY OFFICE DODAAC

14. FUNDS FOR PROCUREMENT ARE PROPERLY CHARGEABLE TO THE ALLOTMENTS SET FORTH BELOW. THE AVAILABLE BALANCES OF WHICH ARE SUFFICIENT TO COVER THE ESTIMATED TOTAL PRICE.

<table>
<thead>
<tr>
<th>ACRE APPROPRIATION</th>
<th>LIMIT/ SUBHEAD</th>
<th>SUPPLEMENTAL ACCOUNTING CLASSIFICATION</th>
<th>ACCTG STA DODAAC</th>
<th>AMOUNT</th>
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</thead>
<tbody>
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<td>2034000</td>
<td>A5XBG EP1200GP04 253F 0010697000 A.0022230.1.19</td>
<td>021001</td>
<td>109,851.00</td>
</tr>
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</table>

15. AUTHORIZING OFFICER (Type name and title)
MATTHEW SEAMAN

16. SIGNATURE

17. DATE: 07 MAY 2015

DD Form 448, JUN 72 (EG)  PREVIOUS EDITION IS OBSOLETE
MILITARY INTERDEPARTMENTAL PURCHASE REQUEST

TO: ENVIRONMENTAL PROTECTION AGENCY
26 MARTIN LUTHER KING DR
CINCINNATI, OH 45220-2242
Tel: 8.

FROM: PD
ATTN: MATTHEW SEAMAN
BUILDING 1 ANNEX (W90Z7P)
Pocatillo Arsenal, NJ 07806
Tel:

ITEMS ☑ ARE ☑ ARE NOT INCLUDED IN THE INTERSERVICE SUPPLY SUPPORT PROGRAM AND REQUIRED INTERSERVICE
SCRENNING ☑ HAS ☑ HAS NOT BEEN ACCOMPLISHED.

<table>
<thead>
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<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
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<tr>
<td>a</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Pin POC: Matt Seaman, 971-724-1311,
matthew.w.seaman2.civ@mail.mil

THIS MIPR MUST BE ACCEPTED AS RECEIVED ELSE IT SHOULD BE REJECTED.

10. SEE ATTACHED PAGES FOR DELIVERY SCHEDULES, PRESERVATION AND PACKAGING INSTRUCTIONS, SHIPPING INSTRUCTIONS AND INSTRUCTIONS FOR DISTRIBUTION OF CONTRACTS AND RELATED DOCUMENTS.

11. TRANSPORTATION ALLOTMENT (Used if FOG Contractor's plant)

12. MAIL INVOICE TO (Payment will be made by)
DFAS-INDY VP GERS
8699 E 56TH STREET
INDIANAPOLIS IN 46249-3800

13. ACCOUNTING CLASSIFICATION

ACCR
APPROPRIATION | LIMIT/ SUBHEAD | SUPPLEMENTAL ACCOUNTING CLASSIFICATION | ACCNT STA DODAC | AMOUNT
02120152017  | A5XBG BP1200ARB04 253F 0010697000 A.0022230.1.19 | 021001 | 109,851.00
2034000  | 0030005256 |

14. FUNDS FOR PROCUREMENT ARE PROPERLY CHARGABLE TO THE ALLOTMENTS SET FORTH BELOW. THE AVAILABLE BALANCES OF WHICH ARE SUFFICIENT TO COVER THE ESTIMATED TOTAL PRICE.

15. AUTHORIZING OFFICER (Type name and title)
MATTHEW SEAMAN

16. SIGNATURE
SEAMAN, MATTHEW W. 12691 66840

17. DATE
07 MAY 2015

DD Form 448, JUN 72 (EG) PREVIOUS EDITION IS OBSOLETE
**ACCEPTANCE OF MIPR**

1. **TO** (Department Activity Address - Include ZIP Code)
   PD JOINT SERVICES
   ATTN: MATTHEW SEAMAN
   BUILDING 1 ANNEX (W9027P)
   Picatinny Arsenal, NJ 07806
   Tel:

2. **MIPR NUMBER**
   10697000

3. **AMENDMENT NO.**
   BASIC

4. **DATE (MIPR Signature Date)**

5. **AMOUNT (As listed on the MIPR)**

6. The MIPR identified above is accepted and the items requested will be provided as follows: (Check as Applicable)
   a. ALL ITEMS WILL BE PROVIDED THROUGH REIMBURSEMENT (Category I)
   b. ALL ITEMS WILL BE PROCURED BY THE DIRECT CITATION OF FUNDS (Category II)
   c. ITEMS WILL BE PROVIDED BY BOTH CATEGORY I AND CATEGORY II AS INDICATED BELOW
   d. THIS ACCEPTANCE, FOR CATEGORY I ITEMS, IS QUALIFIED BECAUSE OF ANTICIPATED CONTINGENCIES AS TO FINAL PRICE, CHANGES IN THIS ACCEPTANCE FIGURES WILL BE FURNISHED PERIODICALLY UPON DETERMINATION OF DEFINITIZED PRICES, BUT PRIOR TO SUBMISSION OF BILLINGS.

7. MIPR ITEM NUMBER(S) IDENTIFIED IN BLOCK 13, "REMARKS" IS NOT ACCEPTED (IS REJECTED) FOR THE REASONS INDICATED.
   a. ITEM NO TO BE PROVIDED THROUGH REIMBURSEMENT
      CATEGORY I
      QUANTITY
      ESTIMATED PRICE
   b. ITEM NO TO BE PROCURED BY DIRECT CITATION OF FUNDS
      CATEGORY II
      QUANTITY
      ESTIMATED PRICE

**THIS MIPR MUST BE ACCEPTED AS RECEIVED ELSE IT SHOULD BE REJECTED.**

8. **TOTAL ESTIMATED PRICE**
   c. **TOTAL ESTIMATED PRICE**

9. **ANTICIPATED DATE OF OBLIGATION FOR CATEGORY II ITEMS**
   d. **GRAND TOTAL ESTIMATED PRICE OF ALL ITEMS**

10. **Funds Data** (Check if applicable)
    a. ADDITIONAL FUNDS IN THE AMOUNT OF $ _________ ARE REQUIRED (See justification in Block 13)
    b. FUNDS IN THE AMOUNT OF $ _________ ARE NOT REQUIRED AND MAY BE WITHDRAWN

11. **Remarks**

12. **Accepting Activity** (Complete Address)
    FSO_448-2, JUL 71 (EG)
    DD FORM 448-2, JUL 71 (EG)

**PREVIOUS EDITIONS WILL BE USED UNTIL EXHAUSTED**

ED_001349_00001938-00008
### APPENDIX CROSSWALK

<table>
<thead>
<tr>
<th>FIELD/LOA</th>
<th>POSITION</th>
<th>REPRESENTS</th>
<th>SFIS ELEMENT</th>
<th>GFEDS</th>
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<td>A2ABM</td>
<td>2A</td>
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<td></td>
<td>(26-27)</td>
<td>ASN</td>
<td></td>
<td>A2ABM</td>
<td>2ABM</td>
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<td>4</td>
<td>28-39**</td>
<td>Functional Area</td>
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<td>131096</td>
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<td></td>
<td>131096QLOG</td>
<td>QLOG</td>
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<td>2540</td>
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<td>44-53</td>
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<td>0010009238</td>
<td>-</td>
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<td>7</td>
<td>54-63***</td>
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<td>(WBS)300100.001 or (I0) 100001093 or (CC) 2ABM0150</td>
<td>NA</td>
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<td>8</td>
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<td>Amount</td>
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<td>1,000.00</td>
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</tbody>
</table>

*Depends on appropriation. For example, "2020" does not have a limits in SFIS; "0300" has a limits.

**The fund used will determine how many characters there are for the functional Area (AMSCO/MDEP), but could be as few as or many as 12.

***The position could be shorter or longer based on the length of the WBS or IO.
Scope of Work
Air Quality Sampling of Open Burning
at the Radford Army Ammunition RFAAP

Introduction
The Radford Army Ammunition Plant (RFAAP) conducts on-site disposal of Mark 90 rocket motors via open burn pans. Data on potential combustion emissions and emission factors are available only from testing elsewhere. Some of these data are derived from small laboratory and pilot scale simulations and their relevance to the RFAAP’s scenario has been questioned. To resolve this issue, the RFAAP has asked the U.S. EPA’s Office of Research and Development (ORD) to submit this proposal for sampling and quantification of emissions. ORD has considerable experience sampling emissions from open burning and open detonation (OB/OD) of military ordnance and static firing of rocket motors (for example, see Aurell et al, 2015).

Since 2010 ORD has worked with the DoD’s Joint Munitions Command (and their predecessor, the Defense Ammunition Center), the Army Corps of Engineers, and the Defence Research and Development Canada - Valcartier to sample OB/OD emissions at three RFAAP sites in the US and Canada. ORD has developed a suite of technologies for sampling an array of OB/OD emission constituents from both aerial (Figure 1) and ground-based sampling platforms. This Scope of work covers application of these sampling technologies towards quantification of the RFAAP’s open burn emissions.

Method
ORD will conduct aerial sampling of emissions from Mark 90 rocket motor burns and their associated “Skid” or “Pit” waste. Ten total days of sampling will allow five days for the Mark 90s and five days for the Skid waste. Since the Mark 90 composition is constant and that of the Skid waste is variable, emission sampling for the latter will provide only a representative range of emission quantification. As Skid waste contains chlorine and the Mark 90s do not, Cl-related sampling will only be conducted on the Skid waste. The RFAAP will provide ORD with
composition (carbon, energetic, metals) and mass data on the disposal material to enable calculation of emission factors from their sampling data.

Targeted emission constituents and their sampling methods are listed in Table 1.

**Table 1A. Mark 90 Tests**

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method</th>
<th>Frequency</th>
<th>Minimum # of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>NDIR</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>Electrochemical cell</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>PM2.5</td>
<td>Impactor/filter/gravimetric</td>
<td>Batch</td>
<td>15</td>
</tr>
<tr>
<td>NG</td>
<td>Quartz Filter, HPLC</td>
<td>Batch</td>
<td>6</td>
</tr>
<tr>
<td>Pb, other metals</td>
<td>Filter, XRF</td>
<td>Batch</td>
<td>6</td>
</tr>
<tr>
<td>Cr (III, VI)</td>
<td>Filters, NIOSH 76057300</td>
<td>Batch</td>
<td>3</td>
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</table>

**Table 1B: Skid Waste Tests**

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method</th>
<th>Frequency</th>
<th>Minimum # of Samples</th>
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<tbody>
<tr>
<td>CO2</td>
<td>NDIR</td>
<td>Continuous</td>
<td></td>
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<tr>
<td>CO</td>
<td>Electrochemical cell</td>
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<tr>
<td>PM2.5</td>
<td>Impactor/filter/gravimetric</td>
<td>Batch</td>
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<td>NG</td>
<td>Quartz Filter, HPLC</td>
<td>Batch</td>
<td>6</td>
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<tr>
<td>Pb, other metals</td>
<td>Filter, XRF</td>
<td>Batch</td>
<td>5</td>
</tr>
<tr>
<td>Cr (III, VI)</td>
<td>Filters, NIOSH 76057300</td>
<td>Batch</td>
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<tr>
<td>Perchlorate</td>
<td>MCE filter/LCMS</td>
<td>Batch</td>
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</tr>
<tr>
<td>Chloride</td>
<td>MCE filter/Ion Chrom.</td>
<td>Batch</td>
<td>5</td>
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<tr>
<td>HCl</td>
<td>Na2CO3 filter/Ion Chrom.</td>
<td>Batch</td>
<td>5</td>
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<tr>
<td>Dioxins</td>
<td>Quartz filter/HRMS</td>
<td>Batch</td>
<td>2</td>
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</table>

Efforts will attempt to gather the minimum number of samples as indicated in Table 1 of each batch emission constituent to provide for statistical confidence. As time, site logistics, weather, and sampling dictates, additional samples will be taken. While the goal is to gather samples that sufficiently exceed analyte detection limits, the desired sampling volume to achieve this cannot be known a priori, as this would require knowledge of the emission factor itself. ORD’s best engineering judgment based on similar past sampling, along with a cumulative carbon counter to reflect the plume concentration observed by the sampler, will be used to estimate...
the necessary and sufficient sampling time/volume. The limiting constituent will likely be the trace dioxin and next the nitroglycerin, requiring the longer sampling time/volume. Aerial sampling will be conducted by an unmanned aerial system (UAS, see Figure 2 for an example) operated by a DoD contractor (ISSI, Inc.) at a height of less than 500 feet, will not extend beyond the boundaries of the RFAAP, and will be in visual contact with ground observers at all times. These parameters will be strictly adhered to as the site (Figure 3) is physically constrained by the river on one side, a tree-covered ridge on the parallel side, and a utility pole line down the center. We anticipate sampling to occur during at least two series of eight pan burns throughout each day. Observation points at both ends of the pan line and in the midpoint of the ridge will allow for visual observation of the plume and coordinating the optimal position of the sampler. As there may be advantage in collecting emissions from smaller burns, we understand that the RFAAP has permission from the State of Virginia to vary their burn prescription (number of pans, amount of material) for optimal sampling. Prior to conducting measurements, ORD will develop a Quality Assurance Project Plan (QAPP) for RFAAP and internal QA staff review.

Figure 2. Univ. Alaska - Fairbanks hexacopter with ORD sensor/sampler payload. Detonation plume sampling at Joint Base Elmendorf-Richardson, February 2015.

Figure 3. Overhead view of Radford burn pan site.
Mechanism
This work is proposed to be conducted by ORD, an Air Force Research Laboratory (AFRL) contractor (University of Dayton Research Institute, UD), and a NAVAIR contractor (ISSI, Inc.). Each can receive funding through a separate MIPR and have done so in the past from, variously, SERDP, Natick, and the Air Force Institute of Technology (AFIT). ORD will attach their received MIPR to an Interagency Agreement for ORD and Army signatures, allowing ORD to accept the funds. The University of Dayton is represented by Dr. Johanna Aurell, currently a visiting scientist at ORD and a former post-doctoral student of Dr. Gullett’s. Dr. Aurell is the chief designer and operator of the sampling system and is responsible for field sampling instruments.

ISSI, Inc. supplies and operates the aerial platform for the sampling instruments and has done so for four OB/OD campaigns with ORD. Dr. Gullett will oversee the project effort and coordinate amongst the RFAAP, ISSI, and UD. He is responsible for the overall conduct and output of the project.

Strawman Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tr>
<td>April 17, 2015</td>
<td>MIPR received at ORD, AFRL, and NAVSEA</td>
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<td>May 22, 2015</td>
<td>IA approved</td>
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<td>June 12, 2015</td>
<td>Funding available at ORD</td>
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<tr>
<td>July 10, 2015</td>
<td>QAPP approved</td>
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<tr>
<td>July 27, 2015</td>
<td>Sampling commences</td>
</tr>
<tr>
<td>August 7, 2015</td>
<td>Sampling concludes</td>
</tr>
<tr>
<td>September 4, 2015</td>
<td>Sample analysis complete</td>
</tr>
<tr>
<td>September 30, 2015</td>
<td>Draft final report submitted to RFAAP</td>
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Output
The output of this effort will include a final report to be reviewed by both ORD and the RFAAP. With the participation and authorship of the RFAAP, a journal paper and/or conference paper are also anticipated.

Budget

<table>
<thead>
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<th>Participant</th>
<th>Cost</th>
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<td>ORD</td>
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<td>AFRL (UDayton)</td>
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<td>NAVAIR (ISSI, Inc.)</td>
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110 References