AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. Contract ID Code	Page
Cost Plus Fixed Fee	1 Of 10

2. Amendment/Modification No.	3. Effective Date	4. Requisition/Purchase Req No.	5. Project No. (If applicable)
P00010	2013NOV27	SEE SCHEDULE	

6. Issued By Code W56HZV

U.S. ARMY CONTRACTING COMMAND
D'ELLE V. REMSEY
WARREN, MICHIGAN 48397-5000
HTTP://CONTRACTING.TACOM.ARMY.MIL

EMAIL: DELLE.V.REMSEY@US.ARMY.MIL

7. Administered By (If other than Item 6) Code S4402A

DCMA DALLAS
600 N PEARL STREET SUITE 1630
DALLAS TX 75201-2843

8. Name And Address Of Contractor (No., Street, City, County, State and Zip Code)

SOUTHWEST RESEARCH INSTITUTE
6220 CULEBRA RD
SAN ANTONIO, TX 78238-5166

Code 26401 Facility Code

☐ **9A. Amendment Of Solicitation No.**

9B. Dated (See Item 11)

☒ **10A. Modification Of Contract/Order No.**

W56HZV-10-C-0382

10B. Dated (See Item 13)

2010SEP24

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ **The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers**

☐ **is extended,** ☐ **is not extended.**

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendments: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. Accounting And Appropriation Data (If required)

NO CHANGE TO OBLIGATION DATA

13. THIS ITEM ONLY APPLIES TO MODIFICATIONS OF CONTRACTS/ORDERS
It Modifies The Contract/Order No. As Described In Item 14.

☐ **A. This Change Order is Issued Pursuant To: The Changes Set Forth In Item 14 Are Made In The Contract/Order No. In Item 10A.**

☐ **B. The Above Numbered Contract/Order Is Modified To Reflect The Administrative Changes (such as changes in paying office, appropriation data, etc.) Set Forth In Item 14, Pursuant To The Authority of FAR 43.103(b).**

☒ **C. This Supplemental Agreement Is Entered Into Pursuant To Authority Of:** AGREEMENT OF THE PARTIES

☐ **D. Other (Specify type of modification and authority)**

E. IMPORTANT: Contractor ☐ **is not,** ☒ **is required to sign this document and return _____ copies to the Issuing Office.**

14. Description Of Amendment/Modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

SEE SECOND PAGE FOR DESCRIPTION

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. Name And Title Of Signer (Type or print)		16A. Name And Title Of Contracting Officer (Type or print)	
		JOHN M. HOPFNER JOHN.HOPFNER@US.ARMY.MIL (586)282-7359	
15B. Contractor/Offeror	**15C. Date Signed**	**16B. United States Of America**	**16C. Date Signed**
_____ **(Signature of person authorized to sign)**		**By** /SIGNED/ **(Signature of Contracting Officer)**	2013NOV27

SECTION A - SUPPLEMENTAL INFORMATION

Buyer Name: D'ELLE V. REMSEY
Buyer Office Symbol/Telephone Number: CCTA-ASGB/(586)282-9597
Type of Contract: Cost Plus Fixed Fee
Kind of Contract: Research and Development Contracts
Type of Business: Other Nonprofit
Surveillance Criticality Designator: C
Weapon System: No Identified Army Weapons Systems
Contract Expiration Date: 2015JUN23

*** End of Narrative A0000 ***

Previous Negotiated Contract Value: $9,638,474

Negotiated Value of This Action: ($21,474)

Total Negotiated Contract Value: $9,617,000

Previous Obligated Contract Action: $9,617,000

Obligated Value of This Action: ($0)

Total Obligated Contract Value: $9,617,000

Total Amount Currently Unfunded: $0

1. The purposes of Modification P00010 are:

(a) To decrease the total contract value by $21,474.

(b) Revise sections C.1.1., C.7.3.1, C.7.3.2.1, C.7.3.2.2 and C.7.3.3 of the Scope of Work.

(c) Add section C.11 (Contracting Manpower Reporting) to the Scope of Work.

(d) Extend the ending period of performance date by 9 months, from 23 SEP 2014 to 23 JUN 2015. This means that the Performance Completion Date of subCLIN 0001AF is revised to read 23 JUN 2015 in Section B of the contract.

2. As a result, the contract is modified as follows:

Section B: CLIN 0001 is hereby modified as follows:

i. "Estimated Contract Value" is decreased by $21,474 from $9,638,474 to $9,617,000.

3. Except as provided herein, all other terms and conditions remain unchanged.

*** END OF NARRATIVE A0011 ***

Name of Offeror or Contractor: SOUTHWEST RESEARCH INSTITUTE

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS				
0001	SERVICES LINE ITEM The Contractor shall furnish all the supplies and services to accomplish the tasks specified in accordance with Section C - Scope of Work. Revised estimated Contract Value: $9,617,000 Revised Total Est. Cost: $8,913,142 Total Fee: $ 703,858 Total Amount Currently Obligated: $ 9,617,000* First Increment (total): $ 518,000 Second Increment (total): $ 2,340,000 Third Increment (total): $3,372,000 Fourth Increment (partial): $3,387,000* *Revised by Modification P00010 (End of narrative B001)				
0001AF	FY12 FOURTH INCREMENT FUNDING (PARTIAL) GENERIC NAME DESCRIPTION: SWRI - EPT HEAVY CLIN CONTRACT TYPE: Cost Plus Fixed Fee PRON: R322C155R3 PRON AMD: 01 ACRN: AC AMS CD: 63300544100 PSC: AC42 Inspection and Acceptance INSPECTION: Destination ACCEPTANCE: Destination Deliveries or Performance DLVR SCH REL CD: 001 — QUANTITY: 1 — PERF COMPL DATE: 23-JUN-2015 $ 378,000.00	1	LO		$ 378,000.00

SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT
SCOPE OF WORK

The Contractor, acting as an independent contractor and not as an agent of the Government, shall develop, integrate, and perform validation testing on a high efficiency diesel engine, a cross-drive transmission, and a high power density synchronous permanent magnet machine.

C.1 PROGRAM REQUIREMENTS

C.1.1 The overall goal of the program is to develop and demonstrate electronically controlled, powertrain components, which shall be properly sized in terms of power and ratio to meet the functional requirements of a 20 to 40 ton vehicle (rated power range of 750 to 1000 brake horsepower). The program is to advance the state of the art by developing new powertrain technologies which will improve overall efficiency by reducing fuel consumption, providing exportable electrical power, reducing noise, and by developing engines which can consume a wide range of fuels (DF-2, ULSD, JP-8, JP-5, Jet A and every combination and mixture of the five fuels). The Contractor is required to comply with the scope of the program for the powertrain, which includes:

1. Demonstrate an engine operating on the following fuels: (1) DF-2, (2) ULSD, (3) JP-8, (4) JP-5, (5) Jet-A, and any combination and mixture of the five. The engine and its control system shall be modified such that its output will remain unchanged (+/- 2%) no matter which combination or mixture of the five fuel types the engine is operating on. The engine will adapt to a change of fuel type, combination, and/or mixture without any intervention by an operator or maintainer within 5 minutes of engine operation.

2. Demonstrate a prototype engine peak thermal efficiency of 44% or greater on the following fuels: (1) DF-2, (2) ULSD, (3) JP-8, (4) JP-5, (5) Jet-A, and every combination and mixture of the five fuels.

3. Demonstrate a prototype engine heat rejection of 0.6 kW/kW or less on the following fuels: (1) DF-2, (2) ULSD, (3) JP-8, (4) JP-5, (5) Jet-A, and every combination and mixture of the five fuels.

4. Demonstrate a prototype engine that uses no aftertreatment and no exhaust gas recirculation (EGR).

5. Demonstrate a prototype engine that does not have to conform to U.S. emissions standards.

6. Demonstrate the durability of the prototype engine by completing a 50 hour NATO (AEP-5) durability test on JP-8 and subsequent validation of performance using the following fuels: (1) DF-2, (2) ULSD, (3) JP-8, (4) JP-5, (5) Jet-A, and every combination and mixture of the five fuels.

7. Demonstrate a transmission in an automatic cross-driven configuration with a ratio spread of no less than 10.

The transmission shall maintain 90% or greater efficiency over the entire operating range in all gear ratios. It shall be controlled by an electronic controller, capable of adapting the controls logic as necessary to maintain powertrain system efficiency and operation.

8. Demonstrate a generator providing at least 80kW of electrical power at high voltage (600VDC) at a tactical idle speed (equal to or below 1,800 RPM engine speed). The power generation shall generate at least 150 kW of continuous electrical power at high voltage (600 VDC).

9. Demonstrate a powertrain electronic controller(s) that is completely open source, to the government and have an open source compatible bus capable of accepting prognostics and diagnostics in the future.

10. Conduct a trade study of available technologies that reduce powertrain noise, vibration, and harshness (NVH), while operating under the conditions of #8 of section C.1.1. The study shall investigate and compare various powertrain noise reduction technologies, their effect on engine power, fuel economy, and their effect on the overall weight.

11. Conduct a Powertrain Energy Analysis, through simulation of the developed powertrain, indentifying all areas of energy consumption and loss.

12. Demonstrate the prototype powertrain solution for each component's performance validation by dynamometer testing and evaluation.

C.2 Engine development

C.2.1 Engine and Upgrade Technology Selection

The Contractor shall purchase and use a Cummins ISX15 common rail 2010 production engine for this project. The Contractor shall modify/configure this engine to meet 1) thermal efficiency requirements (44% or better) and 2) heat rejection requirements (0.6 kW / 1.0 kW of output power). The exact list of features (upgrade technologies) to be used on the final delivered powertrain shall be determined based on simulation and baseline engine test results that shall be conducted early in the project.

C.2.2 Engine Design and Analysis

The Contractor shall develop 1-D and 3-D models to investigate engine up-rate and efficiency improvements. These models shall accompany the project from the preliminary layout studies to the design work and the final optimization work. The Contractor shall evaluate the impact of potential technologies on increased power, efficiency, and heat rejection using the 1-D engine cycle simulation analysis tool GT-POWER. The Contractor shall experimentally evaluate the effects of the various target fuels on combustion. The Contractor shall evaluate the impact of increased power and cooling system modifications using 3-D Thermal Finite Element Analysis (FEA). The Contractor shall also estimate the impact of increased power on critical power cylinder temperatures by analyzing 1-D thermal network. The Contractor shall utilize Pro/ENGINEER for all Computer Aided Design (CAD) modeling of additional Powertrain components. Updates of drawings and 3-D CAD models shall be provided to the COR as they become available during the course of the project with a design summary package to be delivered at the end of the project.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.2.3 Engine Test Plan

At the start of the project, the Contractor shall obtain a Cummins ISX15 2010 production engine for the purposes of baseline performance testing. The Contractor shall remove the aftertreatment system, instrument the engine, install the engine in dynamometer test cell, and perform baseline performance testing. Data from this testing shall be used in the simulation models described above in section C.2.2 to determine the type and size of new components necessary to meet all the technical targets as described in C.2.1 above. The Contractor shall retrofit the engine with these new components deemed necessary to fulfill the program requirements, re-install the engine in a test cell and verify that indeed this modified powerpack can meet the requirements stated in section C.1.1 above. The Contractor shall test the engine in a 50 hour NATO test IAW NATO AEP-5, build it into a complete powertrain, and deliver it to TARDEC.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.3 Generator development

The Contractor shall design and develop one UQM integrated starter generator that supplies continuous 150 kW of electrical power at 600 VDC as well as the 80 kW of electrical power at 600VDC at tactical idle speed for this project. The Contractor shall provide a level of supervisory control over the integrated starter generator with a Powertrain Control Module (PCM) further detailed in section C.5 below. The Contractor shall coordinate between engine, generator and transmission manufacturers to prepare an interface specification for the generator. The interface specification shall include engine mounting mechanical specifications, electrical interface specifications (including connectors, signal protocols, operating modes, voltage and current levels and others) and transmission mounting mechanical specifications. This document shall be used as the primary design input to UQM to enable them to tailor the generator for the project.

The Contractor shall install one UQM integrated starter generator in a test cell and perform validation testing, as well as characterize the amount of power beyond the required 150 kW rating. After the generator performance testing, the Contractor shall mate the generator to the transmission power take-off (PTO) then test the system to assure rotational integrity. After the generator is tested and validated (to a performance capability as expected in Section C.1.1 above), the generator shall be delivered to TARDEC as part of a complete integrated powertrain.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.4 Transmission development

The Contractor shall develop two binary logic Ker-Train model KTR-Gemini III transmissions. Each transmission shall include a fully functional steering system. The first transmission shall have a 1:1.44 input bevel ratio, and the second transmission shall have a 1:1 input bevel ratio. The Contractor shall determine the efficiency of the first transmission in each gear at steady state conditions at various speeds and torques across the operating range of the transmission. In addition, the Contractor shall evaluate the spin loss of the first transmission and conduct component-level, analysis and verification testing. After testing is completed, the two transmissions shall be delivered to TARDEC, with only the first delivered as a complete integrated powertrain (fitted together with the engine and generator).

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.5 Control System development

C.5.1 Engine Control

The Contractor shall develop a system that utilizes the production engine's Electronic Control Unit (ECU) as a Slave controller that executes the fuel timing and quantity instructions from the Master Powertrain Control Module (PCM). The Master PCM shall make use of a high speed cylinder pressure analysis module, and the injection shall be carried out by the production engines ECU in order to make use of the complex rail pressure compensation algorithms developed by the engine manufacturer.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.5.2 Powertrain Control Module (PCM)

The Contractor shall develop a separate controller to provide transmission control functionality as well as serve as the Master Powertrain Control Module (PCM). The Contractor shall purchase and use the ETAS Flex ECU control system as the Master PCM for this project.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

The Contractor shall provide a Software User Manual (SUM) as specified in CDRL data item A006 with respect to the PCM at the end of the program.

The Contractor shall provide a Software Programmers Guide (SPG) as specified in CDRL data item A007 with respect to the PCM at the end of the program.

The Contractor shall provide Computer Software Product as specified in CDRL data item A008 with respect to the PCM at the end of the program.

C.5.3 Cylinder Pressure Analysis Module

The Contractor shall develop a custom module to implement the cylinder pressure analysis functionality. The Master PCM shall communicate with this module over a CAN bus to retrieve relevant in-cylinder condition information regarding engine power and efficiency. The PCM shall also make fueling decisions based on this information as described in Section C.5.2.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

The Contractor shall provide a Software User Manual (SUM) as specified in CDRL data item A006 with respect to the cylinder pressure analysis module at the end of the program.

The Contractor shall provide a Software Programmers Guide (SPG) as specified in CDRL data item A007 with respect to the cylinder pressure analysis module at the end of the program.

The Contractor shall provide Computer Software Product as specified in CDRL data item A008 with respect to the cylinder pressure analysis module at the end of the program.

C.5.4 Transmission Control

The Contractor shall use the logic (provided by the transmission manufacturer) required to properly shift the transmission. This logic shall be incorporated into the Master PCM in order to provide control, data logging, prognostic and diagnostic capabilities.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.5.5 Generator Control

The Contractor shall develop a system that utilizes the production generator's ECU as a Slave controller which handles all of the low level electronic control. The Master PCM shall communicate with the generator ECU over CAN to specify the power required from the generator.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.6 Fuel Compensation

C.6.1 Fuel System Testing

The Contractor shall confirm that the engine fuel system can successfully operate with all of the required test fuels.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.6.2 Power Correction Strategy

C.6.2.1 The Contractor shall calibrate the engine at steady state conditions across the full engine operating range to establish a lookup table of desired engine power as a function of pedal position and engine speed using DF-2 fuel. This lookup table shall be used as the baseline (or target) power map. Baseline maps for Indicated Mean Effective Pressure (IMEP), Location of Peak Pressure (LPP), Exhaust Gas Temperature (EGT), and exhaust air-fuel ratio shall be generated.

C.6.2.2 The Contractor shall determine actual engine power by calculating Indicated Mean Effective Pressure (IMEP) over the cycle through in-cylinder pressure measurement.

C.6.2.3 The Contractor shall use in-cylinder pressure to determine the Location of Peak Pressure (LPP) in order to determine if the engine is operating efficiently.

C.6.2.4 - The Contractor shall use information from the engine manufacturer's crankshaft position sensor as a secondary estimation of engine power.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7 Powertrain integration

C.7.1 Trade Study of Noise Signature Reduction Technologies

The Contractor shall conduct a trade study of available technologies that reduce powertrain noise, vibration, and harshness (NVH), while the powertrain is operating at a tactical idle speed (equal to or below 1,800 RPM). The study shall investigate and compare various powertrain noise reduction technologies and their effect on engine power, fuel economy, and overall weight. This trade study shall consider the noise reduction performance of available and emerging technologies, along with their effect on weight, performance, fuel economy, reliability/durability, vehicle packaging and cost. Aspects relevant to occupant comfort and communications shall be investigated, as well as external signature suppression.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.2 Powertrain Energy Analysis

The Contractor shall conduct a thorough energy and efficiency analysis of the powertrain. This includes a breakdown of the losses beginning with fuel effects, combustion analysis and heat transfer down to transmission energy balance. The flow of energy in three major groups (the combustion system, the engine system including accessories and the transmission) shall be analyzed and the individual losses identified and quantified. The energy analysis shall accompany the complete powertrain development program and shall be performed in coordination with the program progress. The Contractor shall continuously update the energy analysis as data becomes available from measurement and simulation to maintain the current status of energy flow for the powertrain. The outcome of each step of the energy analysis shall be compared to existing state of the art technologies to identify critical areas, most importantly those with high losses.

The Contractor shall determine the improvement potential, and evaluate alternatives and feed these results back to simulation and development.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.3 Powertrain Testing

C.7.3.1 Installation

The Contractor shall instrument the powerpack components as needed for all developmental and verification testing. The Contractor shall also conduct and record the results from all developmental and verification testing on the powerpack components at a location determined by the Contractor.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.3.2 Powertrain #1 Demonstration

C.7.3.2.1 Fuel Compensation Demonstration

The Contractor shall demonstrate the engine running on the five fuels and multiple fuel mixtures. The Contractor shall configure the test stand to allow switching of fuels while engine is running. Engine shall be run at maximum power output at a specific fixed speed. Fuels shall be switched while monitoring power output to demonstrate that the fuel compensation system can adapt to a new fuel stream within 5 minutes with less than a two percent change in output power.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.3.2.2 Generator Demonstration

The Contractor shall operate a motor in order to demonstrate the maximum power output of the generator at the equivalent powertrain

rated speed and tactical idle. Data shall be collected to validate generator performance at those operating points.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.3.2.3 Transmission #1 Demonstration

The Contractor shall run a motoring dynamometer at various operating points and in various transmission gears up to 500 horsepower. The Contractor shall demonstrate steering capability in Transmission #1 by commanding a steering input to the transmission while measuring speed differential of output shafts under constant dynamometer loading. The Contractor shall demonstrate manual shift capability along with a torque management safeguard system to prevent transmission overload. Data shall be collected to validate the system at various operating points.

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.7.3.3 Transmission #2 Functional Testing

The Contractor shall verify that the build-quality and operating performance of Transmission #2 meets the project requirements by conducting individual gear module tests under load and spin testing of the assembled transmission under no-load conditions. The spin testing shall verify that shifting and all steer rate (including pivot steer) performance agree with data generated during testing of Transmission #1 (C.4).

This task shall be tracked and updated on the monthly reports, as specified in CDRL data item A003 throughout the duration of this task.

C.8 Deliverables

The Contractor shall deliver one (1) fully functional powertrain prototype to the Government, in the configuration demonstrated. The powertrain shall include an engine, generator, transmission, electronic controllers and mechanical coupling adapters. The Contractor shall deliver the second transmission without an engine or generator.

The Contractor shall deliver all adapter plates and propshafts of the same design as those used for the dynamometer testing of the prototype engine, generator and transmission. The Contractor shall also deliver all manuals and specifications of the engine, generator and transmission of the optimized prototype powertrain including the installation drawings for all hardware. All the hardware shall be delivered by program completion to TARDEC (6501 East 11 Mile Road, AMSRD-TAR-R, MS 121, Warren, MI 48397-5000).

C.9 SUPPORT

The Contractor shall provide up to 10 man-weeks onsite technical engineering support to provide powertrain installation into a test cell at TARDECs propulsion laboratory in Warren, MI. The technical support shall provide hardware and software training to the COR in understanding and operating the prototype powertrains.

C.10 PROJECT MANAGEMENT / REPORTING

C.10.1 Start of Work Meeting

The Contractor shall host a Start of Work meeting within thirty (30) days after contract award. At the meeting, the Contractor shall present their proposed plan for accomplishing the contract requirements (including a draft Integrated Master Schedule (section C.10.3 below) and Contract Work Breakdown Structure (section C.10.4 below), as well as identify a senior governance structure).

C.10.2 IN PROCESS REVIEWS (IPR)

The Contractor shall host quarterly IPRs, at locations mutually agreed upon by the Contractor and the COR. An agenda shall be coordinated between the COR and the Contractor prior to Contractor-hosted reviews. The Contractor shall provide a summary of the program progress and status to include: overall system development, technical performance, test, cost, schedule, and safety issues. The Contractor shall describe those accomplishments and problems that have occurred since the previous review, including the current status of unresolved problems. The final IPR shall be considered a Final Review of this contract (to be held thirty (30) days prior to completion of the contract). The Final Review shall summarize close-out efforts. The Contractor shall deliver the Final Technical Report at this meeting in accordance with CDRL data item A002.

C.10.3 INTEGRATED MASTER SCHEDULE (IMS)

The Contractor shall develop and maintain an IMS which shall be traceable through the Contract Work Breakdown Structure (CWBS) in accordance with CDRL data item A004. The IMS shall be used to verify attainability of contract objectives, evaluate progress toward meeting program objectives, integrate the program schedule activities with all related components, and shall be reviewed at all IPRs.

The Contractor shall prepare and submit a draft IMS at the Start of Work meeting and a final IMS within thirty (30) days after the Start

of Work meeting.

C.10.4 CONTRACT WORK BREAKDOWN STRUCTURE (CWBS)

The Contractor shall develop and maintain a CWBS which shall be traceable through the IMS in accordance with CDRL data item A005. The CWBS establishes a framework for program planning and cost tracking. This structure shall be defined at a minimum down to the fourth level. The Contractor shall track and report on costs according to the CWBS down to the third level (as a minimum), and shall be reviewed at all IPRs. The Contractor shall prepare and submit a draft CWBS at the Start of Work meeting and a final CWBS within thirty (30) days after the Start of Work meeting.

C.10.5 PROGRESS REPORTS AND FINAL TECHNICAL REPORT

The Contractor shall prepare monthly progress, status, cost and management reports and prepare reviews in accordance with CDRL Item

A001. The Contractor shall prepare a Final Technical Report in accordance with CDRL data item A002.

C.11 CONTRACTOR MANPOWER REPORTING

C.11.1 The contractor shall report all contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract for the U.S. Army via a secure data collection site. The contractor is required to completely fill in all required data fields using the Army CMR site, which you can access by clicking on the "Department of Army CMRA" link from the following gateway web address: http://www.ecmra.mil/

C.11.2 Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the Army CMR help desk, which can be contacted using the "Send an email" link on the right side of the sign-in screen at the Army CMR site.

C.11.3 Additional information can be found in the clause in this contract entitled CONTRACTOR MANPOWER REPORTING (52.237-4000).

*** END OF NARRATIVE C0002 ***

SECTION F - DELIVERIES OR PERFORMANCE

F.3 PERIOD OF PERFORMANCE

F.3.1 The base period of performance for the contract shall be 57 months from the contract award date (from 24 SEP 2010 through 23 JUNE 2015).

*** END OF NARRATIVE F0002 ***