ADVANCED MOBILITY ON-CALL SYSTEM OPERATIONS ADMINISTRATIVE SERVICES SUPPORT AGREEMENT

between

THE CITY AND COUNTY OF DENVER
and
HIRE POWER, INC
Contract No. 202578680-00

THIS AGREEMENT ("Agreement") is made and entered into between the **CITY AND COUNTY OF DENVER** (the "City"), a home rule municipal corporation of the State of Colorado, and **HIRE POWER, INC** d/b/a **INNOVAR GROUP**, (the "Consultant"), a Colorado corporation with a principal place of business located at 7400 E. Orchard Rd, 4050N, Greenwood Village, Colorado 80111.

RECITALS:

WHEREAS, the City, through its Department of Transportation and Infrastructure (the "Department") desires to secure "readily available" professional services to support the Department on an "as needed" basis; and

WHEREAS, the Consultant represents that it has the present capacity, experience and qualifications to perform advanced mobility system operations administrative support and related services for the City in connection with various City projects, as specified in this Agreement; and

WHEREAS, in response to the City's Request for Qualifications, the Consultant submitted a Qualifications Statement for such services to the City. The Consultant and the City have negotiated a Scope of Services and Rates for such professional services, a copy of which is attached hereto and incorporated herein as **Exhibit A** and **Exhibit B**.

NOW, THEREFORE, in consideration of the premises and the mutual covenants and obligations herein set forth, the parties hereto mutually agree as follows:

SECTION 1 – ENGAGEMENT

1.01 Engagement. The City engages the Consultant with respect to the furnishing of professional services on an on-call basis, as set forth in this Agreement. The Consultant accepts such engagement upon, subject to and in accordance with the terms, conditions and provisions of this Agreement.

1.02 Line of Authority for Contract Administration. The City's Executive Director of the Department of Transportation and Infrastructure ("Executive Director") is the City's representative responsible for authorizing and approving the work performed under this Agreement. The Executive Director hereby designates the Contract Manager, or designee(s), as the Executive Director's authorized representative for the purpose of issuing a written Notice to Proceed and for purposes of administering, coordinating and finally approving the work performed by the Consultant under this

Agreement. The Executive Director expressly reserves the right to designate another authorized representative to perform on the Executive Director's behalf by written notice to the Consultant.

1.03 Independent Contractor. The Consultant is an independent contractor retained to perform professional or technical services for limited periods of time. Neither the Consultant nor any of its employees are employees or officers of the City under Chapter 18 of the Denver Revised Municipal Code, or for any purpose whatsoever.

1.04 Scope of Consultant's Authority. The Consultant shall have no authority to act on behalf of the City other than as expressly provided in this Agreement. The Consultant is not authorized to act as a general agent for or to undertake, direct or modify any contracts on behalf of the City. The Consultant lacks any authority to bind the City on any contractual matters. Final approval of all contractual matters that purport to obligate the City must be executed by the City in accordance with the City's Charter and the Denver Revised Municipal Code.

SECTION 2 – CONSULTANT'S SERVICES

2.01 General. The Consultant shall provide professional system operations administrative services as assigned by written Task Order, on an as-needed basis, in accordance with the terms and conditions of this Agreement. The Consultant's basic services shall consist of all of those services described in this Agreement and in **Exhibit A**.

2.02 Professional Responsibility; Task Requirements.

(a) All of the work performed by the Consultant under this Agreement shall be performed in accordance with the standards of care, skill, training, diligence, and judgment provided by highly competent individuals performing services of a similar nature to those described in the Agreement and in accordance with the terms of the Agreement.

(b) The Consultant agrees to strictly conform to and be bound by written standards, criteria, budgetary considerations and memoranda of policy furnished to it by the City and in compliance with applicable laws, statues, codes, ordinances, rules and regulations, of the City, state and federal government and all industry standards.

(c) All professional services or deliverables provided under this Agreement shall be adequate and sufficient for the project or task and its intended purpose, as reflected in the applicable Task Order.

(d) The Consultant shall prepare all documents as requested in a format that complies with all City, state and federal requirements. It shall be the Consultant's responsibility to contact the reviewing agencies to determine the acceptable format for the final documents. No documents will be considered final until approved by the City, even though any responsible federal and state agencies have approved such documents.

(e) The reports, studies, and other products prepared by the Consultant under this Agreement, when submitted by the Consultant to the Executive Director and the user agency for any identified phase of a task, must represent a thorough study and competent solution for the task as per usual and customary professional

standards and shall reflect all skills applicable to the assigned task.

(f) The responsibilities and obligations of the Consultant under this Agreement shall not be relieved or affected in any respect by the presence on the site of any agent, consultant or subconsultant, or an employee of the City.

(g) The Consultant shall provide all professional services required by the City in defending all claims against the City, which relate in any way to alleged default hereunder, errors or omissions of the Consultant or its subconsultants, without additional compensation.

2.03 Program and Budget:

(a) Each task proposal will include a maximum fee. The Consultant agrees to complete the task within the limits of the approved Task Order. Should all task work exceed such cost, the Consultant agrees to complete the task at no additional cost to City and, in a manner acceptable to the City.

2.04 Coordination and Cooperation:

(a) The Consultant agrees to perform under this Agreement in such a manner and at such times that the City or any contractor who has work to perform, or contracts to execute, can do so without unreasonable delay.

(b) Coordination with the City and other involved agencies shall be a continuing work item through all phases of each assigned task. Such coordination shall consist of regular progress and review meetings with the City, work sessions with the City Contract Manager, or as otherwise directed by the City. If requested, the Consultant shall document conferences and distribute notes to the City.

2.05 Personnel Assignments:

(a) The key professional personnel identified in **Exhibit C** will be assigned by the Consultant or its subconsultants to perform the services required under this Agreement, as appropriate.

(b) The Consultant's services shall be diligently performed by the regular professional and technical staff of the Consultant. In the event the Consultant does not have as part of its regular staff certain professional consultants, then such consulting services shall be performed, with City approval, by practicing professional consultants outside of the employ of the Consultant.

(c) The Consultant agrees, at all times during the term of this Agreement, to maintain on its payroll or to have access to through outside subconsultants, Certified Public Accountant (CPA) personnel in sufficient strength to meet the requirements of the City. Such personnel shall be of the classifications referenced in **Exhibit C**. The hourly rates specified in **Exhibit B** include all costs except those specifically referenced as reimbursables in the appropriate hourly rate schedule.

(d) Prior to designating an outside professional to perform subconsultant work, the Consultant shall submit the name of such subconsultant, together with a resume of training and experience in work of like character and magnitude of the task being contemplated, to the City and receive prior approval in writing.

(e) It is the intent of the parties hereto that all key professional personnel be engaged to perform their specialty for all such services required by this Agreement and that the Consultant's and the subconsultant's key professional personnel be retained for the life of this Agreement to the extent practicable and to the extent that such services maximize the quality of work performed hereunder.

(f) If the Consultant or a subconsultant decides to replace any of its key professional personnel, the Consultant shall notify the Executive Director in writing of the desired change. No such changes shall be made until replacement personnel are recommended by the Consultant and approved in writing by the Executive Director, which approval shall not be unreasonably withheld.

(g) If, during the term of this Agreement, the Executive Director determines that the performance of approved key personnel or a subconsultant is not acceptable, the Executive Director shall notify the Consultant and give the Consultant the time which the Executive Director considers reasonable to correct such performance. Thereafter, the Executive Director may require the Consultant to reassign or replace such key personnel. If the Executive Director notifies the Consultant that certain of its key personnel or a subconsultant should be replaced, Consultant will use its best efforts to replace such key personnel or a subconsultant within ten (10) days from the date of the Executive Director's notice.

(h) Neither the Consultant nor any subconsultant shall have other interests which conflict with the interests of the City, and the Consultant shall make written inquiry of all of its subconsultants concerning the existence of a potential for such conflict. In unusual circumstances, and with full disclosure to the City of such conflict of interest, the City, in its sole discretion, may grant a written waiver for the particular consultant or subconsultant.

(i) Actions taken by the City under this Article shall not relieve the Consultant of its responsibility for contractual or professional deficiencies, errors or omissions.

(j) The Consultant shall submit to the Executive Director a list of any additional key professional personnel who will perform work under this Agreement within thirty (30) days after this Agreement has been executed, together with complete resumes and other information describing their ability to perform the tasks which may be assigned. Such additional personnel must be recommended by the Consultant and approved by the Executive Director before they are assigned to a specific task.

(k) The Executive Director shall respond to the Consultant's written notice regarding replacement of key professional personnel within fifteen (15) days after the Executive Director receives the list of changes. If the Executive Director or his designated representative does not respond within that time, the changes shall be deemed to be approved.

2.06 Basic Services - General

(a) The Consultant shall, under the general direction of and at the written request of the Executive Director, furnish experienced advanced mobility system operations

administrative services. Subject to an express, agreed upon limitation of such duties set forth in any approved task proposal for the particular task assigned to the Consultant under this Agreement, the Consultant agrees to perform all of the services and duties set forth in this Agreement in regard to each task to which it is assigned, and its proposal is approved.

(b) When directed by the Executive Director to perform a particular task, the Consultant shall prepare a task specific proposal in accordance with the scope or description of Work for that task. A separate task specific proposal shall be prepared for each task for which the Consultant's services are required and shall set forth, at a minimum all of the following:

1. The maximum fee for the Consultant's proposed services.
2. Itemized fee breakdown.
3. The additional services budget, if any, for the task.
4. Any reimbursable expenses approved pursuant to paragraph 3.02.
5. A detailed description of the task and scope of work (the "Work").
6. A list of deliverables for the task.
7. An agreed upon schedule for deliverables and completion of the Work.

(c) Upon approval by the Executive Director of a task proposal, the approval and appropriation of funding for such Task Order, and the issuance of a written Notice to Proceed, the Consultant shall proceed to perform required Work.

(d) The assigned Work shall be performed in conformance with the approved Task Order. The terms of this Agreement cannot be altered by Task Order.

(e) The Consultant's basic services for each task to which it is assigned may consist of any of the services described in **Exhibit A** or services related to the services described in this Agreement.

(f) The Consultant shall obtain written authorization from the City before proceeding with each phase of each assigned task.

(g) Nothing in this Agreement shall be construed as placing any obligation on City to proceed with any phase beyond the latest phase authorized in writing by City for each assigned Task Order. Further, nothing in this Agreement shall be construed as guaranteeing the Consultant any minimum amount of work or number of tasks assigned under this Agreement.

(h) If a task which is assigned to the Consultant under this Agreement is funded in whole or part by federal funds, each of the applicable terms set forth in any funding arrangement for such funds shall be, and by this reference are incorporated into the Task Order for such task and included in the Consultant's basic services responsibilities for such task.

(i) The responsibilities and obligations of the Consultant under this Agreement shall

not be relieved or affected in any respect by the presence on the site of any agent, consultant, subconsultant, or employee of the City.

SECTION 3 – COMPENSATION, PAYMENT, AND FUNDING

The City shall compensate the Consultant for its services performed and expenses incurred under this Agreement and each Task Order as follows.

3.01 Basic Services: The City agrees to pay the Consultant, as compensation for any services rendered for a particular task, either the maximum fee, to be set forth in each approved Task Order, or an amount based on the Consultant's periodic invoices, whichever is less.

3.02 Reimbursable Expenses: Unless expressly authorized by the City as part of any approved Task Order or specified in **Exhibit B**, the City will not compensate the Consultant for expenses such as postage, travel, mileage, telephone, reproduction and messenger service costs incurred in connection with work performed under this Agreement. Such costs are, in all such instances, included in the hourly rates paid by the City. Reproduction of submittals requested by the City are not included in the hourly rates, and will be itemized as part of each on-call task order as a not-to-exceed reproducible expense.

3.03 Additional Services: The Consultant shall be compensated for any previously approved additional services performed for any assigned task, subject to the terms and conditions set forth herein and an additional services budget limits for that specific task.

3.04 Invoices: The Consultant shall invoice and be paid monthly in proportion to the progress of the work on each assigned task. Such invoices shall reflect the Consultant's actual hours, sub-consultant costs and reimbursable costs, and shall be based on the hourly rates or other rates for services contained in **Exhibit B**. The rates contained in **Exhibit B** can be modified only by a written amendatory or other agreement executed by the parties and signed by the signatories to this Agreement in accordance with Section 5.29. The Consultant shall maintain contemporaneous hourly records of the actual hours worked by its personnel and subconsultants, records of all allowable reimbursable expenses, and records of expendable supplies and services as necessary to support any audits by the City, and shall bill the City monthly for fees and costs accrued during the preceding month. The Consultant's invoice shall be separated by Task Order. Upon submission of such invoices to the City Project Manager, and approval by the City, payment shall issue. Final payment to the Consultant, for each assigned Task Order, shall not be made until after all Task Order work is performed and all deliverables are delivered.

3.05 Maximum Contract Amount; Funding:

(a) It is understood and agreed by the parties hereto that payment or reimbursement of all kinds to the Consultant, for all work performed under this Agreement, shall not exceed a maximum of **THREE MILLION DOLLARS AND NO CENTS ($3,000,000.00)**. In no event shall the maximum payment to the Consultant, for all work and services performed throughout the entire term of this Agreement exceed the contract maximum amount set forth above.

3.06 Appropriation and Funding.

(a) The City's payment obligation, whether direct or contingent, extends only to funds appropriated annually by the Denver City Council, paid into the Treasury of the City, and encumbered for the purpose of the Agreement. The City does not by the Agreement irrevocably pledge present cash reserves for payment or performance in future fiscal years, and the Agreement does not and is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City.

(b) As of the date of this Agreement, no funds have been appropriated for this Agreement. Instead, it is the City's intent to appropriate the funds necessary to compensate the Consultant for the work it performs on any assigned task, at the time it executes each Task Order. The applicable Manager or his designee, upon reasonable written request, will advise the Consultant in writing of the total amount of appropriated and encumbered funds which are or remain available for payment for all work by the Consultant on an assigned Project.

(c) The issuance of any form of order or directive by the City which would cause the aggregate amount payable to the Consultant for a specific Task Order to exceed the amount appropriated for that Task Order is prohibited. In no event shall the issuance of any change order or other form of order or directive by the City be considered valid or binding if it requires additional compensable work to be performed, which work will cause the aggregate amount payable for such work to exceed the amount appropriated and encumbered, unless and until such time as the Consultant has been advised in writing by the Manager that a lawful appropriation sufficient to cover the entire cost of such additional work, has been made. It shall be the responsibility of the Consultant to verify that the amounts already appropriated for the Consultant's Work on a task are sufficient to cover the entire cost of such Work, and any work undertaken or performed in excess of the amount appropriated is undertaken or performed in violation of the terms of this Agreement, without the proper authorization for such work, and at the Consultant's own risk and sole expense.

SECTION 4 – TERM AND TERMINATION

4.01 Term. The term of this Agreement shall commence on May 1, 2025, and shall expire on April 30, 2028, unless sooner terminated or extended by written amendment. The Consultant shall complete any task orders in progress as of the expiration date of this Agreement and the term will extend until the work is completed or earlier terminated by the Executive Director. Notwithstanding the foregoing, the City, at its sole option may renew this Agreement for up to two (2) additional one (1) year terms by written amendatory agreement executed in the same manner as this Agreement.

4.02 Termination.

(a) Nothing herein shall be construed as giving the Consultant the right to perform the services contemplated under this Agreement beyond the time when its services become unsatisfactory to the Executive Director.

(b) The Executive Director may terminate this Agreement for cause at any time if the

Consultant's services become unsatisfactory, in the sole discretion of the Executive Director. The City shall have the sole discretion to permit the Consultant to remedy the cause of a contemplated termination for cause without waiving the City's right to terminate the Agreement.

(c) In the event of a termination for cause, or in the event the Consultant becomes unable to serve under this Agreement, the City may take over work to be done under this Agreement and prosecute the work to the completion by contract or otherwise, and the Consultant shall be liable to City for all reasonable cost in excess of what the City would have paid the Consultant had there been no termination for cause.

(d) The City may, for convenience, cancel and terminate this Agreement by giving not less than thirty (30) days' prior written notice to the Consultant, which notice shall state the date of cancellation and termination.

(e) If the Consultant's services are terminated, postponed or revised, or if the Consultant shall be discharged before all the work and services contemplated have been completed, or if the project is, for any reason, stopped or discontinued, the Consultant shall be paid only for the portion of work or services which has been satisfactorily completed at the time of such dismissal, termination, cancellation, postponement, revision or stoppage.

(f) All documents relating to the administration of work completed or partially completed shall be delivered by the Consultant to the City in the event of any dismissal, termination, cancellation, postponement, revision or stoppage.

(g) In the event of any dismissal, termination, cancellation, postponement, revision or stoppage, the Consultant shall cooperate in all respects with the City. Such cooperation shall include, but not be limited and other documents referred to herein and assisting the City during a transition to another Consultant, if applicable.

SECTION 5 – GENERAL PROVISIONS

5.01 City's Responsibilities.

(a) The City shall provide available information regarding its requirements for each project, including related budgetary information, and shall cooperate fully with the Consultant at all times. However, the City does not guarantee the accuracy of any such information and assumes no liability therefore. The Consultant shall notify the City in writing of any information or requirements provided by the City which the Consultant believes to be inaccurate or inappropriate to the design or construction of the project.

(b) If the City observes or otherwise becomes aware of any fault or defect in the project or non-conformance with Contract Documents, it shall give prompt notice thereof to Consultant.

5.02 Ownership of Documents:

(a) The City shall have title and all intellectual and other property rights, in and to all documents, and all data used in the development of the same, whether in electronic or hard copy format, created by the Consultant pursuant to this Agreement, in preliminary and final forms and on any media whatsoever (collectively, the "Documents"), whether the project for which the Documents were created is executed or not. The Consultant shall identify and disclose, as requested, all such Documents to the City.

(b) To the extent permitted by the U.S. Copyright Act, 17 USC § 101 et seq., as the same may be amended from time to time, the Documents are a "work made for hire," and all ownership of copyright in the Documents shall vest in the City at the time the Documents are created. To the extent that the Documents are not a "work made for hire," the Consultant hereby assigns and transfers all right, title and interest in and to the Documents to the City, as of the time of the creation of the Documents, including the right to secure copyright, patent, trademark, and other intellectual property rights throughout the world and to have and to hold such copyright, patent, trademark, and other intellectual property rights in perpetuity.

(c) The Consultant shall provide (and cause its employees and subcontractors to provide) all assistance reasonably requested in securing for the City's benefit any patent, copyright, trademark, service mark, license, right or other evidence of ownership of such Documents, and shall provide full information regarding the Documents and execute all appropriate documentation in applying for or otherwise registering, in the City's name, all rights to such Documents.

(d) The Consultant agrees to allow the City to review any of the procedures used in performing the work and services hereunder, and to make available for inspection the field notes and other documents used in the preparation for and performance of any of the services performed hereunder.

(e) The Consultant shall be permitted to retain reproducible copies of all the Documents for their information and reference, and the originals of all of the Documents shall be delivered to the City promptly upon completion thereof, or if authorized by the City Manager, upon termination or expiration of this Agreement.

5.03 Taxes and Licenses: The Consultant shall promptly pay, when they are due, all taxes, excises, license fees and permit fees of whatever nature applicable to the work and services which it performs under this Agreement, and shall take out and keep current all required municipal, county, state or federal licenses required to perform its services under this Agreement. The Consultant shall furnish the Executive Director, upon request, duplicate receipts or other satisfactory evidence showing or certifying to the proper payment of all required licenses and/or registrations and taxes. The Consultant shall promptly pay all owed bills, debts and obligations it incurs performing work under this Agreement and shall not allow any lien, verified claim, mortgage, judgment or execution to be filed against land, facilities or improvements owned or beneficially owned by the City as a result of such bills, debts or obligations.

5.04 Examination Of Records: Any authorized agent of the City, including the City Auditor or his or her representative, has the right to access, and the right to examine, copy and retain copies, at City's election in paper or electronic form, any pertinent books, documents, papers and records related to Consultant's performance pursuant to this Agreement, provision of any goods or services to the City, and any other transactions related to this Agreement. Consultant shall cooperate with City representatives and City representatives shall be granted access to the forgoing documents and information during reasonable business hours and until the latter of three (3) years after the final payment under the Agreement or expiration of the applicable statute of limitations. When conducting an audit of this Agreement, the City Auditor shall be subject to government auditing standards issued by the United States Government Accountability Office by the Comptroller General of the United States, including with respect to disclosure of information acquired during the course of an audit. No examination of records and audits pursuant to this paragraph shall require Consultant to make disclosures in violation of state or federal privacy laws. Consultant shall at all time comply with Denver Revised Municipal Code 20-276.

5.05 Assignment and Subcontracting: The Consultant shall not voluntarily or involuntarily assign any of its rights or obligations, or subcontract performance obligations, under this Agreement without obtaining the Executive Director's prior written consent. Any assignment or subcontracting without such consent will be ineffective and void, and will be cause for termination of this Agreement by the City. The Executive Director has sole and absolute discretion whether to consent to any assignment or subcontracting, or to terminate the Agreement because of unauthorized assignment or subcontracting. In the event of any subcontracting or unauthorized assignment: (i) the Consultant shall remain responsible to the City; and (ii) no contractual relationship shall be created between the City and any sub-consultant, subcontractor or assign.

5.06 No Discrimination in Employment: In connection with the performance of work under the Agreement, the Consultant may not refuse to hire, discharge, promote or demote, or discriminate in matters of compensation against any person otherwise qualified, solely because of race, color, religion, national origin, ethnicity, citizenship, immigration status, gender, age, sexual orientation, gender identity, gender expression, marital status, source of income, military status, protective hairstyle, or disability. The Consultant shall insert the foregoing provision in all subcontracts.

5.07 Insurance:

(a) General Conditions: Consultant agrees to secure, at or before the time of execution of this Agreement, the following insurance covering all operations, goods or services provided pursuant to this Agreement. Consultant shall keep the required insurance coverage in force at all times during the term of the Agreement, or any extension thereof, during any warranty period, and for three (3) years after termination of the Agreement. The required insurance shall be underwritten by an insurer licensed or authorized to do business in Colorado and rated by A.M. Best Company as "A-"VIII or better. Each policy shall contain a valid provision or endorsement requiring notification to the City in the event any of the above-described policies be canceled or non-renewed before the expiration date thereof. Such written notice shall be sent to the parties identified in the Notices section of

this Agreement. Such notice shall reference the City contract number listed on the signature page of this Agreement. Said notice shall be sent thirty (30) days prior to such cancellation or non-renewal unless due to non-payment of premiums for which notice shall be sent ten (10) days prior. If such written notice is unavailable from the insurer, Consultant shall provide written notice of cancellation, non-renewal and any reduction in coverage to the parties identified in the Notices section by certified mail, return receipt requested within three (3) business days of such notice by its insurer(s) and referencing the City's contract number. If any policy is in excess of a deductible or self-insured retention, the City must be notified by the Consultant. Consultant shall be responsible for the payment of any deductible or self-insured retention. The insurance coverages specified in this Agreement are the minimum requirements, and these requirements do not lessen or limit the liability of the Consultant. The Consultant shall maintain, at its own expense, any additional kinds or amounts of insurance that it may deem necessary to cover its obligations and liabilities under this Agreement.

(b) Proof of Insurance: Consultant shall provide a copy of this Agreement to its insurance agent or broker. Consultant may not commence services or work relating to the Agreement prior to placement of coverages required under this Agreement. Consultant certifies that the certificate of insurance attached as **Exhibit D**, preferably an ACORD certificate, complies with all insurance requirements of this Agreement. The City requests that the City's contract number be referenced on the Certificate. The City's acceptance of a certificate of insurance or other proof of insurance that does not comply with all insurance requirements set forth in this Agreement shall not act as a waiver of Consultant's breach of this Agreement or of any of the City's rights or remedies under this Agreement. The City's Risk Management Office may require additional proof of insurance, including but not limited to policies and endorsements.

(c) Additional Insureds: For Commercial General Liability, Auto Liability, Professional Liability, and Excess Liability/Umbrella (if required) Consultant and subcontractor's insurer(s) shall include the City and County of Denver, its elected and appointed officials, employees and volunteers as additional insured.

(d) Waiver of Subrogation: For all coverages required under this agreement, with the exception of Professional Liability, Consultant's insurer shall waive subrogation rights against the City.

(e) Subcontractors and Subconsultants: All subcontractors and subconsultants (including independent contractors, suppliers or other entities providing goods or services required by this Agreement) shall be subject to all of the requirements herein and shall procure and maintain the same coverages required of the Consultant. Consultant shall include all such subcontractors as additional insured under its policies (with the exception of Workers' Compensation) or shall ensure that all such subcontractors and subconsultants maintain the required coverages. Consultant agrees to provide proof of insurance for all such subcontractors and subconsultants upon request by the City.

(f) Workers' Compensation/Employer's Liability Insurance: Consultant shall maintain the coverage as required by statute for each work location and shall maintain Employer's Liability insurance with limits of $100,000 per occurrence for each bodily injury claim, $100,000 per occurrence for each bodily injury caused by disease claim, and $500,000 aggregate for all bodily injuries caused by disease claims. Consultant expressly represents to the City, as a material representation upon which the City is relying in entering into this Agreement, that none of the Consultant's officers or employees who may be eligible under any statute or law to reject Workers' Compensation Insurance shall effect such rejection during any part of the term of this Agreement, and that any such rejections previously effected, have been revoked as of the date Consultant executes this Agreement.

(g) Commercial General Liability: Consultant shall maintain a Commercial General Liability insurance policy with limits of $1,000,000 for each occurrence, $1,000,000 for each personal and advertising injury claim, $2,000,000 products and completed operations aggregate, and $2,000,000 policy aggregate.

(h) Business Automobile Liability: Consultant shall maintain Business Automobile Liability with limits of $1,000,000 combined single limit applicable to all owned, hired and non-owned vehicles used in performing services under this Agreement.

(i) Professional Liability (Errors & Omissions): Consultant shall maintain minimum limits of $1,000,000 per claim and $1,000,000 policy aggregate limit. The policy shall be kept in force, or a Tail policy placed, for three (3) years for all contracts.

(j) Cyber Liability: Consultant shall maintain Cyber Liability coverage with minimum limits of $1,000,000 per occurrence and $1,000,000 policy aggregate covering claims involving privacy violations, information theft, damage to or destruction of electronic information, intentional and/or unintentional release of private information, alteration of electronic information, extortion and network security. If Claims Made, the policy shall be kept in force, or a Tail policy placed, for three (3) years.

5.08 Defense and Indemnification:

(a) Consultant hereby agrees to defend, indemnify, reimburse and hold harmless City, its appointed and elected officials, agents and employees for, from and against all liabilities, claims, judgments, suits or demands for damages to persons or property arising out of, resulting from, or relating to the work performed under this Agreement ("Claims"), unless such Claims have been specifically determined by the trier of fact to be the sole negligence or willful misconduct of the City. This indemnity shall be interpreted in the broadest possible manner to indemnify City for any acts or omissions of Consultant or its subcontractors either passive or active, irrespective of fault, including City's concurrent negligence whether active or passive, except for the sole negligence or willful misconduct of City.

(b) Consultant's duty to defend and indemnify City shall arise at the time written

notice of the Claim is first provided to City regardless of whether Claimant has filed suit on the Claim. Consultant's duty to defend and indemnify City shall arise even if City is the only party sued by claimant and/or claimant alleges that City's negligence or willful misconduct was the sole cause of claimant's damages.

(c) Consultant will defend any and all Claims which may be brought or threatened against City and will pay on behalf of City any expenses incurred by reason of such Claims including, but not limited to, court costs and attorney fees incurred in defending and investigating such Claims or seeking to enforce this indemnity obligation. Such payments on behalf of City shall be in addition to any other legal remedies available to City and shall not be considered City's exclusive remedy.

(d) Insurance coverage requirements specified in this Agreement shall in no way lessen or limit the liability of the Consultant under the terms of this indemnification obligation. The Consultant shall obtain, at its own expense, any additional insurance that it deems necessary for the City's protection.

(e) This defense and indemnification obligation shall survive the expiration or termination of this Agreement.

5.09 Colorado Governmental Immunity Act: The parties hereto understand and agree that the City is relying upon, and has not waived, the monetary limitations and all other rights, immunities and protection provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq.*

5.10 Federal Requirements. This Agreement is funded, in part, using federal funds from the Federal Highway Administration ("FHWA"). Consultant shall follow all terms and conditions contained in the FHWA funding agreement, which is attached and incorporated at **Exhibit E**.

5.11 Contract Documents; Order of Precedence. This Agreement consists of Sections 1 through 5, which precede the signature page, and the following attachments, which are incorporated herein and made a part hereof by reference:

Exhibit A	Consultant's Scope of Work
Exhibit B	Consultant's Rates
Exhibit C	Consultant's Key Personnel
Exhibit D	ACORD Insurance Certificate
Exhibit E	Federal Award

In the event of an irreconcilable conflict between a provision of Sections 1 through 5 and the listed attachments, or between provisions of any attachments, such that it is impossible to give effect to both, the order of precedence to determine which provision shall control to resolve such conflict, is as follows, in descending order:

Sections 1 through 5
Exhibit E
Exhibit A
Exhibit B
Exhibit C

5.12 When Rights and Remedies Not Waived: In no event will any payment or other action by the City constitute or be construed to be a waiver by the City of any breach of covenant or default that may then exist on the part of the Consultant. No payment, other action, or inaction by the City when any breach or default exists will impair or prejudice any right or remedy available to it with respect to any breach or default. No assent, expressed or implied, to any breach of any term of the Agreement constitutes a waiver of any other breach.

5.13 Governing Law; Venue: The Agreement will be construed and enforced in accordance with applicable federal law, the laws of the State of Colorado, and the Charter, Revised Municipal Code, ordinances, regulations and Executive Orders of the City and County of Denver, which are expressly incorporated into the Agreement. Unless otherwise specified, any reference to statutes, laws, regulations, charter or code provisions, ordinances, executive orders, or related memoranda, includes amendments or supplements to same. Venue for any legal action relating to the Agreement will be in the District Court of the State of Colorado, Second Judicial District (Denver District Court).

5.14. Conflict of Interest:

(a) No employee of the City shall have any personal or beneficial interest in the services or property described in the Agreement. The Consultant shall not hire, or contract for services with, any employee or officer of the City that would be in violation of the City's Code of Ethics, D.R.M.C. §2-51, et seq. or the Charter §§ 1.2.8, 1.2.9, and 1.2.12.

(b) The Consultant shall not engage in any transaction, activity or conduct that would result in a conflict of interest under the Agreement. The Consultant represents that it has disclosed any and all current or potential conflicts of interest. A conflict of interest shall include transactions, activities or conduct that would affect the judgment, actions or work of the Consultant by placing the Consultant's own interests, or the interests of any party with whom the Consultant has a contractual arrangement, in conflict with those of the City. The City, in its sole discretion, will determine the existence of a conflict of interest and may terminate the Agreement if it determines a conflict exists, after it has given the Consultant written notice describing the conflict.

(c) The Consultant agrees that it will not engage in any transaction, activity or conduct that would result in a conflict of interest under this Agreement. The Consultant represents that it has disclosed any and all current or potential conflicts of interest. A conflict of interest shall include transactions, activities or conduct that would affect the judgment, actions or work of the Consultant by placing the Consultant's own interests, or the interests of any party with whom the Consultant has a contractual arrangement, in conflict with those of the City. The City, in its sole discretion, shall determine the existence of a conflict of interest and may terminate this Agreement in the event such a conflict exists after it has given the Consultant written notice which describes the conflict. The Consultant shall have thirty (30) days after the notice is received to eliminate or

cure the conflict of interest in a manner that is acceptable to the City.

(d) Consultants shall not use City resources for non-City business purposes. City resources include computers, computer access, telephones, email accounts, copiers, printers, office space and other City facilities and equipment. If, as a result of access to City resources or as a result of Consultant providing services pursuant to the Agreement, Consultant obtains information about potential City contracts before that information is publicly available, Consultant shall notify the City in writing. The City, in its sole discretion, will determine if Consultant obtained an unfair advantage and is therefore disqualified from proposing or bidding.

5.15 No Third-Party Beneficiaries: Enforcement of the terms of the Agreement and all rights of action relating to enforcement are strictly reserved to the parties. Nothing contained in the Agreement gives or allows any claim or right of action to any third person or entity. Any person or entity other than the City or the Consultant receiving services or benefits pursuant to the Agreement is an incidental beneficiary only.

5.16 Time is of the Essence: The parties agree that in the performance of the terms, conditions and requirements of this Agreement by the Consultant, time is of the essence.

5.17 Confidential Information:

(a) "Confidential Information" means all information or data disclosed in written or machine recognizable form and is marked or identified at the time of disclosure as being confidential, proprietary, or its equivalent. Each of the Parties may disclose (a "Disclosing Party") or permit the other Party (the "Receiving Party") access to the Disclosing Party's Confidential Information in accordance with the following terms. Except as specifically permitted in this Agreement or with the prior express written permission of the Disclosing Party, the Receiving Party shall not: (i) disclose, allow access to, transmit, transfer or otherwise make available any Confidential Information of the Disclosing Party to any third party other than its employees, subcontractors, agents and consultants that need to know such information to fulfil the purposes of this Agreement, and in the case of non-employees, with whom it has executed a non-disclosure or other agreement which limits the use, reproduction and disclosure of the Confidential Information on terms that afford at least as much protection to the Confidential Information as the provisions of this Agreement; or (ii) use or reproduce the Confidential Information of the Disclosing Party for any reason other than as reasonably necessary to fulfil the purposes of this Agreement. This Agreement does not transfer ownership of Confidential Information or grant a license thereto. The City will retain all right, title, and interest in its Confidential Information.

(b) The Contractor shall provide for the security of Confidential Information and information which may not be marked, but constitutes personally identifiable information, HIPAA, CJIS, or other federally or state regulated information ("Regulated Data") in accordance with all applicable laws, rules, policies,

publications, and guidelines. If the Contractor receives Regulated Data outside the scope of this Agreement, it shall promptly notify the City.

(c) Confidential Information that the Receiving Party can establish: (i) was lawfully in the Receiving Party's possession before receipt from the Disclosing Party; or (ii) is or becomes a matter of public knowledge through no fault of the Receiving Party; or (iii) was independently developed or discovered by the Receiving Party; or (iv) was received from a third party that was not under an obligation of confidentiality, shall not be considered Confidential Information under this Agreement. The Receiving Party will inform necessary employees, officials, subcontractors, agents, and officers of the confidentiality obligations under this Agreement, and all requirements and obligations of the Receiving Party under this Agreement shall survive the expiration or earlier termination of this Agreement.

(d) Nothing in this Agreement shall in any way limit the ability of the City to comply with any laws or legal process concerning disclosures by public entities. The Parties understand that all materials exchanged under this Agreement, including Confidential Information, may be subject to the Colorado Open Records Act., § 24-72-201, *et seq*., C.R.S., ("CORA"). In the event of a request to the City for disclosure of confidential materials, the City shall advise the Contractor of such request to give the Contractor the opportunity to object to the disclosure of any of its materials which it marked as, or otherwise asserts is, proprietary or confidential. If the Contractor objects to disclosure of any of its material, the Contractor shall identify to the City the legal basis under CORA for any right to withhold. In the event of any action or the filing of a lawsuit to compel disclosure, the Contractor agrees to intervene in such action or lawsuit to protect and assert its claims of privilege against disclosure of such material or waive the same. If the matter is not resolved, the City will tender all material to the court for judicial determination of the issue of disclosure. The Contractor further agrees to defend, indemnify, and save and hold harmless the City, its officers, agents, and employees, from any claim, damages, expense, loss, or costs arising out of the Contractor's intervention to protect and assert its claim of privilege against disclosure under this Section, including but not limited to, prompt reimbursement to the City of all reasonable attorney fees, costs, and damages that the City may incur directly or may be ordered to pay.

5.18 Data Protection: The Contractor shall comply with all applicable federal, state, local laws, rules, regulations, directives, and policies relating to data protection, use, collection, disclosures, processing, and privacy as they apply to the Contractor under this Agreement, including, without limitation, applicable industry standards or guidelines based on the data's classification relevant to the Contractor's performance hereunder. The Contractor shall maintain security procedures and practices consistent with §§24-73-101 *et seq.*, C.R.S., and shall ensure that all regulated or protected data, provided under this Agreement and in the possession of the Contractor or any subcontractor, is protected and safeguarded, in a manner and form acceptable to the City and in accordance with the terms of this Agreement, including, without limitation, the use of appropriate technology,

security practices, encryption, intrusion detection, and audits.

5.19 Taxes, Charges and Penalties: The City is not liable for the payment of taxes, late charges or penalties of any nature, except for any additional amounts that the City may be required to pay under the City's prompt payment ordinance D.R.M.C. § 20-107, et seq. The Consultant shall promptly pay when due, all taxes, bills, debts and obligations it incurs performing the services under the Agreement and shall not allow any lien, mortgage, judgment or execution to be filed against City property.

5.20 Proprietary or Confidential Information:

(a) City Information: Consultant acknowledges and accepts that, in performance of all work under the terms of this Agreement, Consultant may have access to Proprietary Data or confidential information that may be owned or controlled by the City, and that the disclosure of such Proprietary Data or information may be damaging to the City or third parties. Consultant agrees that all Proprietary Data, confidential information or any other data or information provided or otherwise disclosed by the City to Consultant shall be held in confidence and used only in the performance of its obligations under this Agreement. Consultant shall exercise the same standard of care to protect such Proprietary Data and information as a reasonably prudent consultant would to protect its own proprietary or confidential data. "Proprietary Data" shall mean any materials or information which may be designated or marked "Proprietary" or "Confidential", or which would not be documents subject to disclosure pursuant to the Colorado Open Records Act or City ordinance, and provided or made available to Consultant by the City. Such Proprietary Data may be in hardcopy, printed, digital or electronic format.

(b) Consultant's Information: The City agrees during the term of this Agreement and thereafter, to hold the Consultant Confidential Information including any copies thereof and any documentation related thereto, in strict confidence and to not permit any person or entity to obtain access to it except as required for the City's exercise of the license rights granted hereunder, subject to applicable law. The parties understand that all the material provided or produced under this Agreement may be subject to the Colorado Open Records Act., § 24-72-201, et seq., C.R.S. (2019). In the event of a request to the City for disclosure of such information, the City shall advise Consultant of such request in order to give Consultant the opportunity to object to the disclosure of any of its documents which it marked as proprietary or confidential material. In the event of the filing of a lawsuit to compel such disclosure, the City will tender all such material to the court for judicial determination of the issue of disclosure and Consultant agrees to intervene in such lawsuit to protect and assert its claims of privilege against disclosure of such material or waive the same. Consultant further agrees to defend, indemnify and save and hold harmless the City, its officers, agents and employees, from any claim, damages, expense, loss or costs arising out of Consultant's intervention to protect and assert its claim of privilege against disclosure under this Article including but not limited to, prompt reimbursement

to the City of all reasonable attorney fees, costs and damages that the City may incur directly or may be ordered to pay by such court.

(c) Conflicts of Interest. Consultant acknowledges that as the City's Program Manager it will have access to non-public information that, if disclosed, could give proposers and bidders an unfair competitive advantage in selection processes used to award contracts. Consultant will not disclose non-public information that could give an entity an unfair advantage when competing for work. Consultant agrees to abide by written direction from the City concerning communications and interactions with contractors and consultants who may be interested in performing work on the Program. Consultant will disclose in writing any actual or potential organizational conflicts that may arise as a result of other work Consultant or its sub consultants are performing related to the Program. Consultant is responsible for monitoring its sub consultants compliance with these requirements. These requirements are not intended to, and do not, prevent Consultant from participating in industry forums, working to generate interest in projects or from communicating with entities or individuals who may be interested in working on projects in ways that do not give them an actual or perceived advantage in pursuing Program work.

5.21 Use, Possession or Sale of Alcohol or Drugs: The Consultant shall cooperate and comply with the provisions of Executive Order 94 and Attachment A thereto concerning the use, possession or sale of alcohol or drugs. Violation of these provisions or refusal to cooperate with implementation of the policy can result in the City's barring the Consultant from City facilities or participating in City operations.

5.22 Disputes: All disputes between the City and Consultant arising out of or regarding the Agreement will be resolved by administrative hearing pursuant to the procedure established by D.R.M.C. § 56-106(b)-(f). For the purposes of that administrative procedure, the City official rendering a final determination shall be the Executive Director as defined in this Agreement.

5.23 Survival of Certain Contract Provisions. The terms of the Agreement and any exhibits and attachments that by reasonable implication contemplate continued performance, rights, or compliance beyond expiration or termination of the Agreement survive the Agreement and will continue to be enforceable. Without limiting the generality of this provision, the Consultant's obligations to provide insurance and to indemnify the City will survive for a period equal to any and all relevant statutes of limitation, plus the time necessary to fully resolve any claims, matters, or actions begun within that period.

5.24 Advertising and Public Disclosure. The Consultant shall not include any reference to the Agreement or to services performed pursuant to the Agreement in any of the Consultant's advertising or public relations materials without first obtaining the written approval of the Executive Director. Any oral presentation or written materials related to services performed under the Agreement will be limited to services that have been accepted by the City. The Consultant shall notify the Executive Director in advance of the date and time of any presentation. Nothing in this provision precludes the transmittal of any information to City officials.

5.25 Legal Authority. Consultant represents and warrants that it possesses the legal authority, pursuant to any proper, appropriate and official motion, resolution or action passed or taken, to enter into the Agreement. Each person signing and executing the Agreement on behalf of Consultant represents and warrants that he has been fully authorized by Consultant to execute the Agreement on behalf of Consultant and to validly and legally bind Consultant to all the terms, performances and provisions of the Agreement. The City shall have the right, in its sole discretion, to either temporarily suspend or permanently terminate the Agreement if there is a dispute as to the legal authority of either Consultant or the person signing the Agreement to enter into the Agreement.

5.26 Notices. All notices required by the terms of the Agreement must be hand delivered, sent by overnight courier service, mailed by certified mail, return receipt requested, or mailed via United States mail, postage prepaid, to the following addresses:

to the City:	Department of Transportation and Infrastructure Attn: Executive Director 201 West Colfax Avenue Dept. 608 Denver, Colorado 80202
with a copy to:	City Attorney's Office 201 West Colfax Avenue Dept. 1207 Denver, Colorado 80202
to the Consultant:	Hire Power, Inc. 7400 E. Orchard Rd, 4050N Greenwood Village, Colorado 80111

Notices hand delivered or sent by overnight courier are effective upon delivery. Notices sent by certified mail are effective upon receipt. Notices sent by mail are effective upon deposit with the U.S. Postal Service. The parties may designate substitute addresses where or persons to whom notices are to be mailed or delivered. However, these substitutions will not become effective until actual receipt of written notification.

5.27 Severability: Except for the provisions of the Agreement requiring appropriation of funds and limiting the total amount payable by the City, if a court of competent jurisdiction finds any provision of the Agreement or any portion of it to be invalid, illegal, or unenforceable, the validity of the remaining portions or provisions will not be affected, if the intent of the parties can be fulfilled.

5.28 Agreement as Complete Integration-Amendments: The Agreement is the complete integration of all understandings between the parties as to the subject matter of the Agreement. No prior, contemporaneous or subsequent addition, deletion, or other modification has any force or effect, unless embodied in the Agreement in writing. No oral representation by any officer or employee of the City at variance with the terms of the Agreement or any written amendment to the Agreement will have any force or effect or bind the City.

5.29 Compliance with Denver Wage Laws: To the extent applicable to the Consultant's provision of Services hereunder, the Consultant shall comply with, and agrees to be bound by, all rules, regulations, requirements, conditions, and City determinations regarding the City's Minimum Wage and Civil Wage Theft Ordinances, Sections 58-1 through 58-26 D.R.M.C., including, but not limited to, the requirement that every covered worker shall be paid all earned wages under applicable state, federal, and city law in accordance with the foregoing D.R.M.C. Sections. By executing this Agreement, the Consultant expressly acknowledges that the Consultant is aware of the requirements of the City's Minimum Wage and Civil Wage Theft Ordinances and that any failure by the Consultant, or any other individual or entity acting subject to this Agreement, to strictly comply with the foregoing D.R.M.C. Sections shall result in the penalties and other remedies authorized therein.

5.30 No Construction Against Drafting Party: The parties and their respective counsel have had the opportunity to review the Agreement, and the Agreement will not be construed against any party merely because any provisions of the Agreement were prepared by a particular party.

5.31 City Execution of Agreement: The Agreement will not be effective or binding on the City until it has been fully executed by all required signatories of the City and County of Denver, and if required by Charter, approved by the City Council.

5.32 Changes: The City may make changes to a Task Orders at any time. In the event that the City wishes to make a change, it will advise Consultant in writing of the changes. Consultant will notify the City in writing within ten (10) days of any impact the changes have on schedule or cost and provide documentation to support any requested adjustment. The City and the Consultant will then negotiate an equitable adjustment to the maximum fee and schedule. If Consultant does not notify the City within ten (10) days, of cost or schedule impacts Consultant waives the right to request additional compensation or time for the requested change.

5.33 Electronic Signatures and Electronic Records: Consultant consents to the use of electronic signatures by the City. The Agreement, and any other documents requiring a signature under the Agreement, may be signed electronically by the City in the manner specified by the City. The parties agree not to deny the legal effect or enforceability of the Agreement solely because it is in electronic form or because an electronic record was used in its formation. The parties agree not to object to the admissibility of the Agreement in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK;
SIGNATURE PAGES FOLLOW.]

Contract Control Number: DOTI-202578680-00
Contractor Name: HIRE POWER, INC

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of:

SEAL

CITY AND COUNTY OF DENVER:

ATTEST:

By: _____

_____

APPROVED AS TO FORM:

Attorney for the City and County of Denver

By: _____

REGISTERED AND COUNTERSIGNED:

By: _____

By: _____

Contract Control Number: DOTI-202578680-00
Contractor Name: HIRE POWER, INC

By: DocuSigned by: Darryl Hoogstrate B46EF2CB75B544E...

Name: Darryl Hoogstrate
(please print)

Title: CEO
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

EXHIBIT A

Scope of Work

General Scope of Work

Provide on-call staff augmentation to perform System Operations Administrative Services to support traffic engineering/operations and Advanced Mobility/ITS/Connected Vehicle infrastructure, software development, network environment, and Geographical Information System.

The work to be performed will be authorized at the sole discretion of DOTI through issuance of a Task Order. DOTI reserves the right to choose and subsequently control the nature, extent and timing of each Consultant work assignment depending upon the overall schedule of project work, availability of funding, Consultant qualifications and performance, and other factors. The Consultant will work closely with DOTI staff and other stakeholders identified to provide services needed to deliver successful outcomes.

Recruitment Process and Verification of Qualifications and Expertise

Innovar Group has developed a successful and repeatable process concerning recruiting and matching candidates to the specific skill sets that our clients request.

Innovar Group has placed literally hundreds of technologists with our clients over thepast 25 years. Like the City, most of our clients require that we service their hiring needs along a multitude of technological skill sets. We utilize a multi-pronged process to ensure that both our sourcing and selection processes remain strong and allow us to be able to recruit people with the requisite skill sets on behalf of our customers. We maintain a strong network of skilled resources that has been built throughout our history, we utilize resume databases, social media, networking groups, technical open houses, job boards, AI tools and literally every tool available to source, screen and hire the best talent.

<u>Step #1 - Understanding the Job Requirement</u>

- It is essential that we take the time to ensure we have a solid understanding of our client's technical requirements. This begins with a team review of the Job Description provided by the client. The Job Description is reviewed by a Lead Recruiter and the Project Manager assigned to that client to determine what skills are mandatory, what skills are options, and what other skills we may believe to be useful based on our past experience.
- We next identify questions or areas where we may need clarification from the client or hiring manager. These questions are presented back to the client to ensure that we provide the correct candidates for each specific need.
- Innovar Group uses our internal database to maintain information as it relates to our clients and the specific needs that they have over time. This database is used to create a Client Profile. Our Client Profile ensures that we document and maintain specific details about our ongoing client needs, recruiting trends, and past hires to create a knowledge base and improve our recruitment for each client over time. For example, a client may require Help Desk candidates on an ongoing basis and by utilizing our Client Profile, Innovar is able to replicate prior recruiting activity thus ensuring speed to market and appropriate fit.
- Based on the feedback received from our client; or other insight we have gained from this client over time; Innovar Group creates a new Internal Job Description to include all of the additional details, specific notes, team dynamics, etc. that are essential to finding a successful candidate for our client.

Step #2 - Distribution of Recruiting Responsibilities

Once it is determined that we have a clear understanding of the Client requirement, the Director of Recruiting distributes recruiting responsibilities to the team. These responsibilities include the following:

- Search and contact any candidates that are on the Innovar Groups Recruiting Hot List. These are candidates with whom we have already worked at other Clients or who have earlier been fully vetted.
- Search and rescreen any candidates that fit the criteria within our internal database. (currently contains over 125,000 pre-screened candidates)
- Search and contact any candidates that fit the criteria within our subscription based recruiting tools such as LinkedIn Recruiter and ZoomInfo. Innovar invests substantial capital in our recruiting infrastructure to ensure that we have access to any candidate that may be on the market looking for a new IT engagement.
- Post the job on our Web Page and other Subscription based sites to attract diverse new talent and other resources which may fit the criteria but do not currently have a relationship with Innovar Group.

Step #3 - Screen and Select Short List

- After the initial 24-hour effort to contact all potential candidates the Innovar Group recruiting team begins the Screening and Comparison process.
- Each candidate is interviewed and asked detailed information about their past employment experience, technical history, and specifically years of experience in each of the essential skill areas for a given Job Requirement.
- Innovar Group will select the top 5-10 candidates out of all respondents to our initial recruiting push.
- Depending on the technology skill set additional technical screening may be performed. These screening techniques include:
    - Testing (i.e. TestDome or other online tests)
    - Technical Interviews with a Sr. Innovar Consultant who works for us in the same Technical Capacity as the needed Client Skill Set.

Candidate Selection and Submission to Client

- Once the Innovar Group team has determined the top 5-10 technically capable candidates all candidates go through a final selection process.
- Many considerations are given in the final selection process to ensure that Innovar Group provides the best overall candidate to our client, not just the most technical resource. These additional considerations include:
    - Personality
    - Cost
    - Location
    - Past Employment Longevity
    - References

Taking all the above into consideration, Innovar Group can submit the best 3-4 well rounded candidates to our client for review and selection.

Right to Representation Forms

The final step in our review process after the selection of our best candidates is sending each candidate our Right to Representation form. We make sure that our candidates are not working with another vendor on

any opportunity with the City during our prescreen process. Once verbally confirmed, we then send out our physical form for them to e-sign and send back for each position they want to be submitted to.

Each form will include:

- Name of Candidate
- Date signed
- Confirming they give Innovar Group exclusive representation for the specific position discussed.

Innovar Group maintains a virtual bench of resources. This virtual bench consists of pre- vetted candidates who are part of a selective list. We reach out to these candidates on a regular basis to ensure we know their current status, interest, and preparedness for their next engagement. By creating skill set and geographically designated virtual benches, we quickly have our first round of candidates to reach out to upon receiving a new job requirement from a customer. This approach helps us in continuing to build a positive reputation in the market as being advocates for our customers generating top tier referrals.

Our process for procuring candidates is multifaceted. It includes following our 19-step checklist to find the best talent for our customers. Those steps include a multitude of sources, including our own candidate database, referrals, online x-ray searching, searching local user groups, resume databases, online job boards, and more. Over our 24 years of experience, we realize that our power in supporting our customers comes from two important aspects. First, our ability to find candidates from the many resources that are available (the science of recruiting). Secondly, yet just as importantly, getting to know candidates for their talents and preferences, being able to accurately correlate those with the needs of our customers, and successfully describe to all parties how their needs and skills are mutually beneficial to one another (the art of recruiting). The combination of science and art is what makes our team successful year in and year out.

Innovar Group Recruiting Differentiators

Innovar has utilized a "best-of-breed" approach in selecting our recruitment tools.	
ASP delivered recruitment database Recruiting Solutions™	Modular, Web-native Human Capital Management Solutions give DENVER the power to leverage our extensive database of technology professionals currently numbering approximately 125,000 distinct resumes. These candidates have been mined and screened and allow us to be rapid, flexible and scalable in delivering talent that cannot be found on job boards. WorkforceERP enables Innovar Group to deliver the exact staffing solution that our clients require.
Internet Tools	Leading Internet tools like LinkedIn and ZoomInfo along with myriad others allow us to access talent, research target companies, identify industry leaders and source talent not posted on job boards.
Professional Briefcase	Innovar developed processes that allow us to replicate and scale our delivery. As with all our tools, this Briefcase is ASP delivered to our onsite and offsite team of Researchers, Recruiters and Account Managers.
Innovar Librarian™	**a.** Research Tools **b.** Collection of indexed Professional Groups **c.** Competitor Analysis We spend a lot of time identifying places where technologists like to meet like blogs and user groups and catalogue these resources in our briefcase.

The Innovar Difference

- Team of Senior Researchers and Recruiters
- Experience developing and managing recruitment programs on a national scale
- Selection of best-of-breed tools
- Adherence to industry leading processes

To recruit people to fulfil the skills required by the City, we would use all of the above- listed tools. Additionally, we are members of a variety of Technical user groups including TechYeet, Java Users Groups, Internet Users Groups, Oracle Users Groups and Creative Users Groups (for technical writers and trainers). We have previously placed many people in each skill set listed within this RFQ and are highly capable of continuing to perform at a high level for Denver.

Innovar leverages our proprietary tool, Talent Engine, to manage our candidate vetting process thus ensuring that our team follows a specific process each time we process a candidate.

Our vetting process is handled through a teaming of our recruiters coupled with our back- office support. Additionally, we leverage third party providers to conduct portions of our process as detailed below.

Our standard platform includes vetting of the following information:

- Background Checks (generally turned around in 24 hours; see below)
- Reference Checks (performed both by our internal team and via a 3rd party)
- Financial Background/Credit Checks (conducted by a 3rd party)
- E-Verify Confirmation (provides an automated link to federal databases to help employers determine employment eligibility and validity of their SS numbers.)

Pre-employment Screening

Background Checks, Reference Checks and Financial Background Checks are performed on our behalf by a third party, Hire Right, and are normally completed within 24 hours unless information is found during the initial screen causing the firm to proceed to additional research. We also experience a 24-hour turnaround with our drug testing firm. We have utilized these firms for the past eight years and have found them to be highly competent and responsive. Several of our clients are Department of Defense and Department of Energy oriented, requiring exhaustive pre-employment work.

Pre-testing.

Innovar Group conducts pre-testing through TestDome. These pre-tests leverage decades of applied organizational psychology research to develop content that accurately predicts on-the-job performance. Assessments consist of a variety of item and test types – from competency test and skill test solutions to personality test solutions and realistic simulations. We customarily work with our clients to determine which tests will provide the best determination of "goodness of fit" for their environment. These tests are performed at the request of the client and generally include no additional cost to the client.

In addition to our standard method of vetting, Innovar offers its clients the following resources free of charge:

- Educational Checks
- Financial /Credit Review
- Extensive Background Checks encompassing a wider and deeper scope

Staffing Model

Onboarding Process

We take pride in our streamlined onboarding process, ensuring that new hires can hit the ground running in less than a week if needed.

- Ensure candidates upon offer, have completed all necessary paperwork within 48 hours
- Complete all background screenings according to the City's policy immediately upon information provided by new hire
- Our Project Managers create a space to be available for all our clients and candidates for any urgent issues that arise
- We will provide check-in with candidates throughout the entire onboarding process along with notes to the hiring managers on the progress of new paperwork, background checks and start date.

Measurement and Tracking of Our Placements

Innovar has a formal Contractor Performance Review process that is comprised of scheduled contacts with both Denver Personnel and the placed worker. This quality process allows Innovar to provide feedback to the workers in addition to providing a forum for raising concerns that can then be addressed efficiently and expeditiously. The scheduled contacts are as follows:

- First Week: Project Manager (PM) will follow with either the direct supervisor or the Administrative team (this is decided by our client). Additionally, the PM will contact the worker during the first week to discuss the role and work duties.
- One Month: The Innovar PM contacts our client representative and our Recruiting Team contacts the worker.
- Quarterly: Thereafter, our PM contacts Denver and the worker quarterly (at a minimum) to remain current on progress in the role and satisfaction of both parties.

All the information gathered during these communications is logged into our proprietary applicant tracking system as this information is useful for both current and future work.

Replacing a Contractor: Process and Communication

When a client requests a contractor replacement, we carefully assess the situation to understand the client's concerns and the reasons for needing a change. Once we have a complete picture, we quickly source a suitable replacement from our pre-screened pool of candidates, ensuring they meet your specific needs. We then coordinate throughout the transition to ensure everything runs smoothly, providing continuous support during the handoff. After the new contractor is placed, we monitor progress and gather feedback to ensure ongoing satisfaction.

Steps for Replacing a Contractor:

- Initial Client Communication: Acknowledge the concern and gather specific details.
- Assess the Situation: Understand the root cause by discussing the issue with the City and contractor.
- Removal of Contractor: Our Primary contract Tami Gravina will communicate directly with the contractor to let them know their assignment has ended. We will also gather all equipment that may need to be returned to the City.
- Source a Replacement: Quickly search our network for a qualified replacement that meets the client's needs. While we will typically go to our network and previous consultants for all new positions, we will make finding a known contractor a top priority to make sure there are no issues going forward.
- Client Approval: Present the replacement candidate for client review and approval.
- Seamless Transition: Coordinate the handoff between contractors to ensure minimal disruption.
- Ongoing Monitoring: Follow up with the client to ensure satisfaction and adjust as necessary.

EXHIBIT B

Rates

Position Rate Sheet

List Staffing Position and respective hourly rate. Provide additional sheets as necessary.

Staffing Positions	Hourly Rate
Administrative Support	65
AI Architect	140
AI Engineer	110
Application Systems Analyst	90
Audio/Video (AV) Operations Engineer	75
Audio/Video Solutions Architect	100
Audio/Video Technician	70
AWS Connect Contact Center Engineer	110
AWS Connect Contact Center Solutions Architect	120
Azure Cloud Developer	130
Business Analyst	80
Business Intelligence / Data Warehouse / Reporting	110
Cisco Certified Internetworking Expert (CCIE – advanced-level engineer)	135
Cisco Certified Network Professional (CCNP – mid-level engineer)	120
Cisco Contact Center Engineer	90
Cisco Information Systems Security	120
Cisco Information Systems Security Professional (CISSP- security level engineer)	145
Cloud Administrator	100
Cloud Architect	120
Cloud Engineer	100
Data Analyst	105
Data Architect	125
Data Engineer	110
Data Scientist	135
Data Scientist	130
Database Administrator	95
Database Administrator	115
Desktop Support Technician	60
Document Management Developer	105
Document Management Developer	100
Document Management Systems Analyst	105
Document Management Systems Analyst	95
Enterprise Architect	130
Enterprise Architect	120
Enterprise Database Administration	110
Enterprise Document Management	100
Entry/Midlevel Code Developer	80
ERP Developer	150

ERP System Administrator	145
ERP Systems Analyst	130
ETL Engineer	105
Evaluation Lead	110
Evaluation Specialist Statistical Analysis	100
General Technical Services	95
GIS Analyst	85
GIS Analyst	85
GIS Developer	95
GIS Developer	105
GIS Technician	85
Grant Writer	70
Graphic Designer	85
Human Interface Designer	95
Identity Management Architect	135
Identity Management Developer	115
Identity Management, Directory Services, and Information Security	125
Identity Specialist	120
Information Security Architect	130
Information Security Engineer	110
Infrastructure Architect	125
Infrastructure Automation Architect	120
Infrastructure Automation Engineer	110
Infrastructure Cloud Consultant	120
Integration Architect	125
Integration Architect	125
IOT Infrastructure Architect	115
IOT Quality Engineer	90
IOT Security Specialist	130
IOT Software Engineer	110
IOT Wireless Product Strategy Director	135
IT Systems Administrator	90
IT Systems Administrator Associate	75
Motion Graphics Designer	75
Network Administrator I	65
Network Administrator II	85
Network Architect	95
Network Engineer	110
Network Technician	100
Program Manager	110
Project Coordinator	75
Project Manager	95
Quality Assurance Analyst	90

Report Developer	80
RPA (Robotics Process Automation) Engineer	110
RPA (Robotics Process Automation) Solutions Architect	120
Salesforce Architect	140
Salesforce Developer	125
Security Engineer	110
Senior Application Systems Analyst	110
Senior Business Analyst	105
Senior Business Intelligence Developer	110
Senior Database Administrator	125
Senior Database Developer	125
Senior Document Management Developer	125
Senior GIS Analyst	115
Senior GIS Developer	115
Senior IT Systems Administrator	110
Senior Java Developer	120
Senior Mulesoft Developer	130
Senior Network Engineer	125
Senior Project Manager	110
Senior Quality Assurance Analyst	105
Senior Sharepoint Developer	115
Senior SOA Developer	120
Senior Traffic Engineer	110
Senior Web Designer	105
Senior Web Developer	115
Server Support	95
Service Desk Technician	55
ServiceNow Developer	125
SharePoint Administrator	100
Sharepoint Analyst	110
SharePoint Architect	120
SharePoint Designer	115
SharePoint Developer	90
SharePoint Development / Design	105
Solution Architect	130
Storage Area Network (SAN) Engineer	120
Systems Architect	125
Technical Architect	120
Technical Project Manager	100
Technical Trainer	85
Technical Writer	90
Technical Writer	85
Telecommunications Technician	75

Television and Video Editor and Videographer	75
Television and Video Producer	75
Traffic Engineer	110
Traffic Signal Technician III	90
Visual Designer	100
Web Designer	85
Web Developer	85
Web Development / Design	90
Workday Developer	130
Writer / Content Designer/Content Strategist	85

EXHIBIT C

Key Personnel

- Tami Gravina – Denver Primary Project Manager
- Melissa Stern – Denver Secondary Project Manager
- Smitha Shetty – Director of Recruiting Services

STAFFING POSITIONS

List **ALL** staffing positions that your firm will be able to provide for on-call staff augmentation services. Provide a Description and Minimum Qualifications for each position listed. Do not list names of personnel, only positions. Provide additional sheets if necessary.

Staffing Position	Description	Minimum Qualifications
Administrative Support	Provides clerical and administrative assistance, including scheduling, communication, and documentation tasks.	1-2 years of administrative experience; proficiency in office software.
AI Architect	Designs and oversees AI solutions, ensuring scalability and alignment with business strategies.	10+ years in AI development and architecture; expertise in advanced machine learning frameworks.
AI Engineer	Develops and implements AI models and algorithms to solve complex business challenges.	5+ years in AI/ML development; strong programming skills in Python or R.
Application Systems Analyst	Analyzes business application requirements and translates them into technical specifications for system improvements.	3+ years in systems analysis; experience with software development lifecycle (SDLC).
Audio/Video (AV) Operations Engineer	Manages and supports AV infrastructure, ensuring optimal performance and reliability.	4+ years in AV systems management; proficiency in AV control systems.
Audio/Video Solutions Architect	Designs complex AV solutions, integrating new technologies to enhance user experience.	8+ years in AV architecture; experience in large-scale AV deployments.
Audio/Video Technician	Installs and maintains AV equipment, troubleshooting technical issues as needed.	2+ years of AV experience; familiarity with AV installation standards.
AWS Connect Contact Center Engineer	Implements and maintains AWS Connect solutions for efficient customer interactions.	3+ years with AWS Connect; expertise in AWS services integration.
AWS Connect Contact Center Solutions Architect	Designs and oversees scalable AWS Connect architectures for customer support.	5+ years in cloud architecture; deep knowledge of AWS Connect and related services.
Azure Cloud Developer	Develops cloud-based applications using Azure services, ensuring scalability and security.	4+ years in cloud development; proficiency in Azure SDKs and tools.

Business Analyst	Evaluates business processes and provides data-driven recommendations for improvements.	3+ years in business analysis; strong analytical and communication skills.
BI Data Warehouse / Reporting	Designs and maintains BI systems, transforming data into actionable insights.	5+ years in BI or data warehousing; expertise in BI tools like Power BI or Tableau.
Cisco Certified Internetworking Expert (CCIE – advanced-level engineer)	Manages complex network infrastructures with advanced configuration and security measures.	8+ years in network engineering; active CCIE certification.
Cisco Certified Network Professional (CCNP – mid-level engineer)	Configures and troubleshoots mid-level network systems for optimal performance.	5+ years in network support; active CCNP certification.
Cisco Contact Center Engineer	Maintains Cisco Contact Center platforms, ensuring seamless communication.	4+ years with Cisco Contact Center solutions; troubleshooting experience.
Cisco Information Systems Security	Secures network infrastructure and manages cybersecurity protocols.	5+ years in network security; familiarity with Cisco security tools.
Cisco Information Systems Security Professional (CISSP-security level engineer)	Designs and oversees security architectures, ensuring data protection and compliance.	8+ years in cybersecurity; previous or active CISSP certification.
Cloud Administrator	Manages cloud environments, optimizing resources and ensuring security compliance.	3+ years in cloud administration; experience with major cloud platforms (AWS, Azure, GCP).
Cloud Architect	Designs and oversees complex cloud infrastructure solutions, ensuring scalability and security.	10+ years in cloud architecture; advanced knowledge of multi-cloud environments.
Cloud Engineer	Develops and maintains cloud-based systems to support business operations.	5+ years in cloud engineering; proficiency in automation tools like Terraform.
Data Analyst	Analyzes data to provide actionable insights and support business decisions.	3+ years in data analysis; proficiency in SQL and data visualization tools.
Data Architect	Designs data architecture frameworks, ensuring efficient data flow and storage.	10+ years in data architecture; expertise in database design and data modeling.
Data Engineer	Builds and maintains data pipelines to facilitate seamless data integration.	5+ years in data engineering; experience with ETL tools and big data frameworks.

Data Scientist	Develops predictive models and data-driven strategies for business growth.	3+ years in data science; proficiency in statistical analysis and ML algorithms.
Database Administrator	Manages and optimizes database systems, ensuring data security, availability, performance, and implementing backup strategies.	4+ years in database administration; experience with SQL and NoSQL databases.
Desktop Support Technician	Provides technical support for hardware and software issues	2+ years in technical support; proficiency in troubleshooting and ticketing systems.
Document Management Developer	Develops and maintains document management systems to enhance organizational efficiency.	3+ years in document management; experience with platforms like SharePoint or OpenText.
Document Management Systems Analyst	Manages and optimizes the organization's document management systems, ensuring efficient document storage, retrieval, archiving, and compliance with retention policies and regulations.	4+ years in systems analysis; knowledge of document lifecycle management.
Enterprise Architect	Designs and maintains the overall architecture of IT systems across the organization, aligning IT infrastructure with business goals, and creating strategies for scalable and secure development.	6+ years in IT architecture; experience in strategic planning and system integration.
Enterprise Database Administration	Manages and supports enterprise-wide database systems, ensuring high availability, performance, and security while implementing backup and disaster recovery strategies.	7+ years of experience in enterprise-level database administration, with proficiency in cloud database solutions.
Enterprise Document Management	Oversees document management systems, ensuring efficient storage and retrieval of organizational documents.	5+ years in document management; familiarity with platforms like SharePoint or OpenText.
Entry/Midlevel Code Developer	Develops and maintains code for software applications, following best practices and coding standards.	2+ years in software development; proficiency in programming languages such as Java or Python.
ERP Developer	Designs and customizes ERP solutions to meet business requirements.	4+ years in ERP development; experience with platforms like SAP or Oracle.
ERP System Administrator	Manages and maintains ERP systems, ensuring system integrity and performance.	3+ years in ERP administration; proficiency in system configuration and troubleshooting.

ERP Systems Analyst	Analyzes business requirements and translates them into ERP system solutions.	3+ years in systems analysis; knowledge of ERP systems and business processes.
ETL Engineer	Designs and develops ETL processes for data integration and transformation.	4+ years in ETL development; experience with tools like Informatica or Talend.
Evaluation Lead	Leads evaluation projects to assess program effectiveness and impact.	5+ years in program evaluation; strong analytical and leadership skills.
Evaluation Specialist Statistical Analysis	Conducts statistical analysis to evaluate program outcomes and inform decision-making.	4+ years in statistical analysis; proficiency in statistical software like SPSS or SAS.
General Technical Services	Provides technical support and services across a range of IT functions.	2+ years in IT support; broad technical knowledge and problem-solving skills.
GIS Analyst	Analyzes spatial data to support decision-making and strategic planning.	3+ years in GIS analysis; proficiency in GIS software like ArcGIS or QGIS.
GIS Developer	Develops GIS applications and tools to enhance spatial data visualization and analysis.	4+ years in GIS development; programming skills in languages like Python or JavaScript.
GIS Technician	Collects and manages spatial data for GIS systems, ensuring data accuracy and integrity.	2+ years in GIS data management; experience with GIS software and data collection tools.
Grant Writer	Prepares grant proposals to secure funding for organizational projects and initiatives.	3+ years in grant writing; excellent research and writing skills.
Graphic Designer	Designs visual content for marketing and communication materials.	4+ years in graphic design; proficiency in design tools like Adobe Creative Suite.
Human Interface Designer	Designs user interfaces that enhance user experience and accessibility.	4+ years in UI/UX design; experience with design tools like Sketch or Figma.
Identity Management Architect	Designs and oversees identity management solutions to ensure secure access control.	8+ years in identity management; deep knowledge of identity and access management platforms.
Identity Management Developer	Develops identity management solutions to support authentication and authorization processes.	4+ years in identity management development; proficiency in relevant programming languages.
Identity Management, Directory Services, and Information Security	Manages identity governance processes, ensuring compliance with security policies.	3+ years in identity management; strong understanding of identity governance and administration.

Identity Specialist	Designs and oversees security architectures to protect organizational data and systems.	8+ years in cybersecurity; expertise in security frameworks and best practices.
Information Security Architect	Implements security solutions and monitors systems for potential threats and vulnerabilities.	5+ years in cybersecurity; experience with security tools and incident response.
Information Security Engineer	Designs and maintains complex IT infrastructure to support business operations.	7+ years in IT architecture; advanced knowledge of network and cloud infrastructure.
Infrastructure Architect	Designs automation solutions to enhance infrastructure efficiency and agility.	5+ years in automation architecture; experience with tools like Ansible or Puppet.
Infrastructure Automation Architect	Develops and implements automation scripts to streamline infrastructure management.	4+ years in infrastructure automation; proficiency in scripting languages like Python or Bash.
Infrastructure Automation Engineer	Responsible for automating infrastructure setup, configuration, and deployment processes in cloud environments.	5+ years of experience in automation tools (e.g., Terraform, Ansible, Puppet) and cloud platforms (AWS, Azure).
Infrastructure Cloud Consultant	Provides expertise on cloud infrastructure design, migration, and optimization for enterprise environments.	7+ years of experience with cloud infrastructure (AWS, GCP, Azure) and hybrid cloud strategies.
Integration Architect	Designs and implements complex integration solutions to ensure seamless data flow across multiple systems and platforms.	8+ years of experience in system integration, with expertise in tools like MuleSoft or Apache Camel.
Integration Architect	Designs integration strategies for enterprise applications, optimizing data exchanges and system communications.	7+ years of experience with APIs, middleware, and integration platforms (e.g., Dell Boomi, WSO2).
IOT Infrastructure Architect	Designs and builds IoT infrastructure solutions, ensuring secure, scalable, and efficient communication between IoT devices and systems.	8+ years of experience in IoT architecture and protocols (MQTT, CoAP), with hands-on expertise in cloud services.
IOT Quality Engineer	Ensures IoT devices and systems meet the highest quality standards through testing, validation, and continuous improvement processes.	5+ years of experience in quality assurance for IoT systems and familiarity with test automation tools.
IOT Security Specialist	Focuses on securing IoT devices and networks, implementing strategies for encryption, access control, and data protection.	6+ years of experience in IoT security, including vulnerability assessments and encryption protocols.
IOT Software Engineer	Develops software solutions for IoT systems, ensuring smooth communication and integration between devices and platforms.	5+ years of experience in software development for IoT, proficiency in Python, C++, or JavaScript.

IOT Wireless Product Strategy Director	Leads strategy development for wireless IoT products, focusing on market analysis, product lifecycle, and technological advancements.	10+ years of experience in wireless technologies (Wi-Fi, Zigbee, Bluetooth) and product strategy development.
IT Systems Administrator	Administers and supports IT infrastructure, ensuring optimal performance and uptime of servers, networks, and systems.	5+ years of experience in IT system administration with expertise in Windows and Linux environments.
IT Systems Administrator	Manages and troubleshoots IT systems, ensuring network connectivity, security, and reliability.	4+ years of experience with server management, networking, and cloud environments (AWS, Azure).
IT Systems Administrator Associate	Provides support for IT systems, focusing on daily operational tasks and troubleshooting.	2+ years of experience in system administration and familiarity with IT hardware and software.
Motion Graphics Designer	Creates dynamic visual content, using motion graphics software to design compelling animations and videos for marketing and branding purposes.	5+ years of experience with motion graphics software (e.g., After Effects, Cinema 4D) and strong design skills.
Network Administrator I	Supports network infrastructure, monitors network performance, and ensures connectivity across the organization.	3+ years of experience in network administration with a focus on routers, switches, and firewalls.
Network Administrator II	Manages and supports enterprise network systems, including routers, switches, and firewalls, ensuring network availability and performance.	5+ years of experience in network administration with expertise in routing, switching, and firewalls.
Network Architect	Designs and implements complex network infrastructures, ensuring scalability, reliability, and security for enterprise environments.	8+ years of experience in network architecture with a focus on large-scale, multi-site network solutions.
Network Engineer	Provides technical support and configuration for network devices, ensuring optimal connectivity and troubleshooting for the network infrastructure.	4+ years of experience with network engineering, including routers, switches, and network troubleshooting.
Network Technician	Provides hands-on support for network equipment, including installation, maintenance, and troubleshooting to ensure operational network systems.	2+ years of experience with network hardware installation, maintenance, and basic troubleshooting skills.
Program Manager	Leads and coordinates multiple projects within an organization, ensuring alignment with strategic goals and managing resources, timelines, and budgets.	7+ years of experience in program management with expertise in cross-functional team leadership and project execution.

Project Coordinator	Supports project managers by coordinating project schedules, resources, and communication to ensure timely project completion.	3+ years of experience in project coordination, with a focus on schedule and resource management.
Project Manager	Manages the end-to-end delivery of projects, ensuring scope, schedule, and budget are met, and effectively communicates with all stakeholders.	5+ years of experience in project management, PMP certification preferred.
Quality Assurance Analyst	Develops and executes test plans, identifies bugs, and ensures software quality through systematic testing procedures.	4+ years of experience in QA testing, including manual and automated testing tools.
Report Developer	Designs, develops, and maintains business reports using various reporting tools and databases to provide actionable insights.	5+ years of experience with reporting tools (e.g., Power BI, SSRS) and strong SQL skills.
RPA (Robotics Process Automation) Engineer	Designs and implements automation solutions to streamline business processes, reducing manual tasks through robotic process automation tools.	4+ years of experience with RPA tools (e.g., UiPath, Automation Anywhere) and process automation expertise.
Salesforce Architect	Leads the design and implementation of Salesforce solutions, ensuring they align with business needs and technical requirements.	6+ years of Salesforce experience, including architecture and configuration of Salesforce applications.
Salesforce Developer	Develops custom applications and solutions on the Salesforce platform, focusing on Apex, Visualforce, and Lightning components.	4+ years of experience in Salesforce development, with expertise in Apex, Visualforce, and Lightning.
Security Engineer	Designs and implements security measures across the organization's network, applications, and systems to safeguard against cyber threats.	6+ years of experience in network and application security, with expertise in firewalls, encryption, and incident response.
Senior Application Systems Analyst	Analyzes and designs complex application systems, ensuring system functionality and alignment with business needs.	6+ years of experience in application analysis and design, with expertise in various system development methodologies.
Senior Business Analyst	Collaborates with stakeholders to gather and analyze business requirements, translating them into actionable project deliverables and solutions.	7+ years of experience in business analysis, with proficiency in process modeling and requirements documentation.
Senior Business Intelligence Developer	Designs and develops BI solutions, providing insights through data analysis, reports, and dashboards for decision-making.	6+ years of experience in BI development, with expertise in tools like Power BI, Tableau, and SQL-based databases.

Senior Database Administrator	Oversees the design, implementation, and maintenance of database systems, ensuring data integrity, security, and optimal performance.	7+ years of experience in database administration with expertise in SQL, MySQL, or Oracle databases.
Senior Database Developer	Designs and develops complex database systems, writing efficient queries, optimizing performance, and ensuring data integrity.	7+ years of experience in database development with strong SQL skills and experience with database optimization.
Senior Document Management Developer	Develops and maintains document management systems, ensuring easy storage, retrieval, and security of documents across the enterprise.	6+ years of experience in document management systems, with expertise in ECM platforms like OpenText or SharePoint.
Senior GIS Analyst	Analyzes and interprets geospatial data to support business decisions, using GIS tools to create maps and reports.	6+ years of experience in GIS analysis, with proficiency in ArcGIS or QGIS and spatial data management.
Senior GIS Developer	Develops and customizes GIS applications, integrating GIS data with business systems to enhance spatial analysis capabilities.	7+ years of experience in GIS development with expertise in GIS software and scripting languages (Python, Java).
Senior IT Systems Administrator	Manages and maintains IT infrastructure, ensuring server, network, and system performance meets business requirements.	7+ years of experience in IT system administration with strong skills in Windows, Linux, and network configurations.
Senior Java Developer	Develops and maintains Java-based applications, ensuring scalable, reliable, and efficient solutions.	7+ years of experience in Java development, with expertise in frameworks like Spring and Hibernate.
Senior Mulesoft Developer	Designs and implements integration solutions using Mulesoft, ensuring seamless data exchange across systems and applications.	6+ years of experience in Mulesoft development with expertise in API management and integration patterns.
Senior Network Engineer	Designs, implements, and troubleshoots complex network systems, ensuring optimal performance and security across enterprise environments.	6+ years of experience in network engineering, with expertise in LAN/WAN, VPN, and network security.
Senior Project Manager	Designs, implements, and troubleshoots complex network systems, ensuring optimal performance and security across enterprise environments.	8+ years of experience in network engineering, with expertise in LAN/WAN, VPN, and network security.
Senior Quality Assurance Analyst	Designs, implements, and executes complex test cases to ensure software quality and identifies defects through systematic testing.	7+ years of experience in quality assurance, with expertise in manual and automated testing.

Senior Sharepoint Developer	Develops and customizes SharePoint solutions, including web parts, workflows, and integration with other enterprise systems.	5+ years of experience in SharePoint development with proficiency in SharePoint Designer and Visual Studio.
Senior SOA Developer	Designs and develops service-oriented architecture (SOA) solutions to support integration of distributed applications and services.	6+ years of experience in SOA development, with expertise in ESB, SOAP, REST APIs, and integration frameworks.
Senior Traffic Engineer	Plans and designs traffic management systems, analyzes traffic data, and develops solutions to improve traffic flow and safety.	3+ years of experience in traffic engineering, with knowledge of traffic modeling software and regulations.
Senior Web Designer	Designs visually appealing and user-friendly websites, focusing on aesthetics, layout, and navigation to enhance user experience.	6+ years of experience in web design, with expertise in HTML, CSS, and UI/UX principles.
Senior Web Developer	Develops and maintains complex web applications, focusing on both front-end and back-end technologies to create responsive and interactive websites.	7+ years of experience in web development with expertise in JavaScript, HTML5, CSS, and modern frameworks (e.g., React).
Server Support	Provides technical support for server systems, diagnosing and resolving issues related to servers, storage, and backups to ensure system availability.	4+ years of experience in server support, with knowledge of Windows Server, Linux, and server virtualization.
Service Desk Technician	Provides first-line IT support for users, troubleshooting hardware and software issues and escalating when necessary.	2+ years of experience in IT support, with expertise in service desk software and customer service.
ServiceNow Developer	Develops and customizes ServiceNow applications and modules, including workflows, forms, and reports, to streamline IT service management.	4+ years of experience with ServiceNow development, including ServiceNow scripting and automation.
SharePoint Administrator	Manages and configures SharePoint servers and sites, ensuring optimal performance and user access.	5+ years of experience in SharePoint administration, including SharePoint Online and on-premises configurations.
Sharepoint Analyst	Analyzes and assesses SharePoint requirements, supporting users and ensuring effective document management and collaboration.	4+ years of experience in SharePoint analysis, with proficiency in site structure, document management, and workflows.
SharePoint Architect	Designs and implements SharePoint solutions that meet business needs,	6+ years of experience in SharePoint architecture, with

	ensuring scalability and optimal performance.	expertise in system design and integration.
SharePoint Designer	Designs custom SharePoint pages and workflows, integrating with various systems to enhance functionality and user experience.	5+ years of experience with SharePoint Designer and custom development of workflows and web parts.
Sharepoint Developer	Develops custom SharePoint solutions, including web parts, workflows, and integration with business systems.	4+ years of experience in SharePoint development, with proficiency in .NET, JavaScript, and SharePoint APIs.
SharePoint Development / Design	Designs and develops SharePoint sites, workflows, and custom solutions to improve collaboration and productivity across the organization.	5+ years of experience in SharePoint development and design, with expertise in SharePoint Designer and Visual Studio.
Solution Architect	Designs and develops complex IT solutions that align with business requirements, ensuring system integration and scalability.	7+ years of experience in IT architecture, with expertise in cloud computing, enterprise systems, and solution design.
Storage Area Network (SAN) Engineer	Designs, configures, and manages storage area networks to ensure efficient data storage and retrieval for enterprise applications.	5+ years of experience in SAN technologies, including storage management and data backup strategies.
Systems Architect	Develops the architecture of IT systems, ensuring they meet the needs of the business while being scalable and secure.	8+ years of experience in systems architecture, with proficiency in cloud, on-premises, and hybrid system designs.
Technical Architect	Leads the technical design and development of solutions, working closely with stakeholders to ensure alignment with business goals and technical feasibility.	7+ years of experience in technical architecture, with expertise in system integration and technology implementation.
Technical Project Manager	Manages technical projects from inception to completion, ensuring projects are delivered on time, within scope, and meet technical specifications.	5+ years of experience in technical project management, with strong leadership and project delivery skills.
Technical Trainer	Develops and delivers training programs on technical subjects, helping staff and users gain proficiency in various technologies and tools.	4+ years of experience in technical training, with expertise in instructional design and knowledge transfer.
Technical Writer	Creates and maintains detailed technical documentation, including manuals, guides, and online help, for a variety of products and systems.	5+ years of experience in technical writing, with proficiency in creating clear, concise technical documentation.

Telecommunications Technician	Installs, maintains, and repairs telecommunications systems and equipment, ensuring proper communication services.	4+ years of experience in telecommunications systems installation and troubleshooting.
Television and Video Editor and Videographer	Edits video footage and creates compelling visual content, often involving shooting, editing, and post-production for various media projects.	5+ years of experience in video production and editing, with proficiency in video editing software (e.g., Adobe Premiere).
Television and Video Producer	Oversees the production of video content, managing all aspects of the project from concept through final delivery.	6+ years of experience in video production, with a focus on project management and team leadership.
Traffic Engineer	Analyzes and designs transportation systems and traffic flow patterns to improve road safety and efficiency.	5+ years of experience in traffic engineering, with expertise in traffic modeling and road design.
Traffic Signal Technician III	Installs, maintains, and repairs traffic signal systems, ensuring they operate efficiently to manage traffic flow.	3+ years of experience in traffic signal systems, with expertise in signal control and maintenance.
Visual Designer	Creates visual concepts and designs for digital products and marketing materials, focusing on user experience and brand consistency.	5+ years of experience in visual design, with proficiency in design tools such as Adobe Creative Suite.
Web Designer	Designs and develops aesthetically pleasing and functional websites that provide an optimal user experience.	5+ years of experience in web design, with expertise in HTML, CSS, and JavaScript.
Web Developer	Develops and maintains dynamic websites and web applications, focusing on both front-end and back-end development.	6+ years of experience in web development, with expertise in front-end and back-end technologies (e.g., JavaScript, Python).
Web Development / Design	Combines both web development and design to create cohesive websites and web applications that are user-friendly and visually appealing.	6+ years of experience in both web design and development, with proficiency in HTML5, CSS, JavaScript, and responsive design.
Workday Developer	Develops, configures, and customizes Workday solutions, integrating them with other enterprise systems and ensuring optimal performance.	5+ years of experience in Workday development, with expertise in Workday HCM, Financials, and Integration tools.
Writer / Content Designer/Content Strategist	Creates engaging written content and designs strategies to optimize content delivery across digital platforms, focusing on SEO and user engagement.	5+ years of experience in content creation, with expertise in content strategy, SEO, and digital marketing.

EXHIBIT D

Certificate of Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 03/10/2025

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Prince Insurance Group 4350 Wadsworth Blvd., Ste 201 Wheat Ridge, CO 80033 Justin Roush 303-991-7227	CONTACT NAME: Justin Roush PHONE (A/C, No, Ext): 303-991-7227 FAX (A/C, No): 303-991-7248 E-MAIL ADDRESS: jroush@prince-insurance.com
INSURED Hire Power Inc. DBA Innovar Group 7400 E Orchard Road, Ste 300S Greenwood Village, CO 80111	INSURER(S) AFFORDING COVERAGE — NAIC # INSURER A : The Hartford Casualty Co. — 29424 INSURER B : Pinnacol — 41190 INSURER C : Chubb Ins Solutions Agency Inc INSURER D : Kinsale Insurance Company — 38920 INSURER E : INSURER F :

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$ 1,000,000
	X CLAIMS-MADE ☐ OCCUR	X		34SBAAC6931	09/30/2024	09/30/2025	DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
D	X EPLI AND D&O			0100262438-0	09/30/2024	09/30/2025	MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	X POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:						EPLI/D&O	$ 1,000,000
A	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS	X		34SBAAC6931	09/30/2024	09/30/2025	BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
A	X UMBRELLA LIAB X OCCUR						EACH OCCURRENCE	$ 4,000,000
	EXCESS LIAB ☐ CLAIMS-MADE	X		34SBAAC6931	09/30/2024	09/30/2025	AGGREGATE	$ 4,000,000
	DED X RETENTION $ 10000							$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: Y If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		4247011	09/30/2024	09/30/2025	X PER STATUTE ☐ OTH-ER	
							E.L. EACH ACCIDENT	$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
C	Crime/Fiduciary			JO6418454	09/30/2024	09/30/2025	Crime	500,000
C	Cyber/Tech E&O			D02010124	09/30/2024	09/30/2025	Cyber/E&O	5,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

As required by written contract, the City and County of Denver, its Elected and Appointed Officials, Employees and Volunteers are included as Additional Insured with regards to General Liability, Excess Liability and Auto Liability.

CERTIFICATE HOLDER

CITYA-3

City and County of Denver
DOTI Permit Operations
2000 Third Ave Room 107
Denver, CO 80223

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

EXHIBIT E

Federal Highway Administration Award

1. Award No.
693JJ31850001

2. Effective Date
See No. 17 Below

3. CFDA No.
20.200

4. Award To

City and County of Denver
201 W. Colfax
Suite 509
Denver, CO 80202-5329

DUNS No.: 085596802
TIN No.: 84-6000580

5. Sponsoring Office

U.S. Department of Transportation
Federal Highway Administration
Office of Acquisition & Grants Management
1200 New Jersey Avenue, SE
HCFA-32, Mail Drop E62-204
Washington, DC 20590

6. Period of Performance

Forty-Eight (48) Months

7. Total Amount

Federal Share:	$6,000,007
Recipient Share:	$6,000,007
Total:	**$12,000,014**

8. Type of Agreement

Cooperative Agreement

9. Authority

23 U.S.C. 503(c)(4)

10. Procurement Request No.

HOTMXX1700000099

11. Funds Obligated

$6,000,007

12. Submit Payment Requests To

See "Payment" clause in General Terms and Conditions

13. Payment Office

See "Payment" clause in General Terms and Conditions

14. Accounting and Appropriations Data

15X044A060.0000.070N44A600.7001000000.41011.61006600 - Total Obligated = **$6,000,007**

15. Research Title and/or Description of Project

"Denver Smart City Program"

16. City and County Denver

_____

Signature Date
Name:
Title:

17. Federal Highway Administration

_____

Signature Date
Name: Stephanie Curtis
Title: Agreement Officer

Table of Contents

ATTACHMENT(s):

1. Technical Application, “Denver Smart City Program" (39 pages)
2. City and County of Denver's Budget - SF 424A (3 pages)
3. Project Oversight Agreement (12 pages)

SECTION A - AGREEMENT DESCRIPTION

A.1 STATEMENT OF PURPOSE

The Federal Highway Administration (FHWA) hereby enters into this Cooperative Agreement (Agreement) with the City and County of Denver (Recipient) to develop model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. These model deployments are expected to provide benefits in the form of:

- reduced traffic-related fatalities and injuries;
- reduced traffic congestion and improved travel time reliability;
- reduced transportation-related emissions;
- optimized multimodal system performance;
- improved access to transportation alternatives, including for underserved populations;
- public access to real time integrated traffic, transit, and multimodal transportation information to make informed travel decisions;
- cost savings to transportation agencies, businesses, and the traveling public; or
- other benefits to transportation users and the general public.

The purpose of this Agreement is to promote the use of innovative transportation solutions. The deployment of these technologies will provide Congress and the United States Department of Transportation (DOT) with valuable real life data and feedback to inform future decision making.

A.2 LEGISLATIVE AUTHORITY

Specific statutory authority for conducting this effort is found in 23 U.S.C. §503(c)(4), which authorizes the Secretary of Transportation to "…establish an advanced transportation and congestion management technologies deployment initiative to provide grants to eligible entities to develop model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment."

Per 23 U.S.C. §503(c)(4)(I)(i), funding for this effort is available from amounts authorized under §6002(a)(1), §6002(a)(2), and §6002(a)(4) of Public Law 114-94, the Fixing America's Surface Transportation Act (FAST).

The authority to enter into a cooperative agreement for this effort is found under 23 U.S.C. §502 - Surface Transportation Research, Development, and Technology, paragraph (b)(3) which states:

> "(3) **cooperation, grants, and contracts. —** The Secretary may carry out research, development, and technology transfer activities related to transportation—

> **(A)** independently;
> **(B)** in cooperation with other Federal departments, agencies, and instrumentalities and Federal laboratories; or
> **(C)** by making grants to, or entering into contracts and cooperative agreements with one or more of the following: the National Academy of Sciences, the American Association of State Highway and Transportation Officials, any Federal laboratory, Federal agency, State agency, authority, association, institution, for-profit or nonprofit corporation, organization, foreign country, or any other person."

Per 23 U.S.C. §503(c)(4)(J), the Federal share of the cost of a project for which a grant is awarded under this subsection shall not exceed 50 percent of the cost of the project.

A.3 BACKGROUND

States and jurisdictions across the country are tackling transportation challenges that often result in congestion and unreliable travel for people and goods, negative impacts on the environment, and reduced safety for users and vehicles. According to the Texas A&M University Transportation Institute, Americans spend on average over 40 hours per person stuck in traffic each year for an annual financial cost of $121 billion. Research indicates that cities account for 67% of all greenhouse gases (GHGs) released into the atmosphere, and the transportation sector is the second-biggest source of GHG emissions, responsible for emitting 28% of GHGs into the atmosphere. There were 32,675 deaths and more than 2.3 million injuries from vehicle crashes in 2014, and there were more than 6.1 million reported motor vehicle crashes. Recognizing that implementing technology solutions can help address transportation safety, mobility, and air quality challenges, section 6004 of the FAST Act establishes the advanced transportation and congestion management technologies deployment initiative.

Projects funded under this initiative will deploy advanced transportation and congestion management technologies, including:

i. **Advanced traveler information systems** – Systems that provide real time, predicted, and individualized information about travel choices, based on data from sensors (traffic, weather), mobile sources (personal portable devices, connected vehicles), and other information systems (public transportation, shared-use mobility, traffic incident management, construction, parking, congestion pricing/tolls or other costs) to allow travelers and shippers to make informed decisions regarding destinations, when to travel, routes, or modes. This information should be publicly accessible and not limited to users with smart phones.
ii. **Advanced transportation management technologies** – Technologies that assist transportation system operators in managing and controlling the performance of their systems to provide optimal services or respond to dynamic conditions, including interjurisdictional and intermodal coordination; technologies may include traffic signal equipment, advanced data collection and processing (from sensors, connected vehicles and other mobile sources, other information systems), dynamic lane controls/configurations, and cooperative transportation management algorithms including pricing strategies across jurisdictions/agencies/facilities/modes.
iii. **Infrastructure maintenance, monitoring, and condition assessment** – Technologies and systems that monitor the behavior or assess the condition of transportation infrastructure to

allow agencies to better manage their transportation assets through optimizing resource allocation, preventative maintenance processes, and responses to critical conditions.

iv. **Advanced public transportation systems** – Technologies that assist public transportation system operators or other shared mobility entities in managing and optimizing the provision of public transportation and mobility services; technologies may include remote fleet monitoring systems, coordinated communication systems, algorithms, and applications to enable better transit connections for users, advanced data collection and processing (from sensors, mobile/connected sources, other information systems) to provide dynamic responsive transit services, and communication and data systems that enable shared mobility services.

v. **Transportation system performance data collection, analysis, and dissemination systems** – Technologies and systems that actively monitor the performance of and interactions between transportation systems and permit agencies and other interested entities to conduct analyses and research, and explore innovative, value-added products and services.

vi. **Advanced safety systems, including vehicle-to-vehicle and vehicle-to-infrastructure communications, technologies associated with autonomous vehicles, and other collision avoidance technologies, including systems using cellular technology** – Deployment of technology-based safety systems such as described at Safer Car (http://www.safercar.gov/) or at the Intelligent Transportation Systems (ITS) Program (http://www.its.dot.gov/landing/safety.htm), or other applicable safety technologies.

vii. **Integration of intelligent transportation systems with the Smart Grid and other energy distribution and charging systems** – Technologies that link information from ITS and other transportation systems with information from Smart Grid and other energy distribution and charging systems to provide users with better information related to opportunities for recharging electric vehicles, and to provide energy distribution agencies with better information related to potential transportation-user demand.

viii. **Electronic pricing and payment systems** – Technologies that permit users to electronically conduct financial transactions for mobility services across jurisdictions and agencies, such as unified fare collection, payment, and tolling systems across transportation modes; or

ix. **Advanced mobility and access technologies, such as dynamic ridesharing and information systems to support human services for elderly and disabled individuals** – Technologies and systems that leverage data and communications systems to allow public agencies and human service organizations to provide improved mobility services to at-risk users such as elderly, disabled, or other individuals that require transportation assistance.

Advanced technologies can also help to revitalize neighborhoods and regions by attracting more business or residential developments to bring opportunities closer to where people live. Technologies also help provide transportation options and improved multimodal transportation systems, allowing users to have access to safe, reliable, and affordable connections to employment, education, healthcare, goods delivery, and other services. As such, technology helps create pathways to jobs and economic opportunity for traditionally disadvantaged populations.

ITS are laying the groundwork for innovative transportation solutions, with many locations currently serving as laboratories for new types of transportation services. Integrating ITS, connected vehicle technologies, automated vehicles, and other advanced technologies within the context of a jurisdiction or region provides enhanced travel experiences and makes moving people and goods safer, more efficient, and more secure. By enhancing the effective management and operation of the transportation system,

these solutions can leverage existing infrastructure investments, enhance mobility, sustainability, and livability for citizens and businesses, and greatly increase the attractiveness and competitiveness of jurisdictions and regions.

A.4 VISION, GOALS, AND FOCUS AREAS

The DOT's vision for the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) initiative is the deployment of advanced technologies and related strategies to address issues and challenges in safety, mobility, sustainability, economic vitality, and air quality that are confronted by transportation systems owners and operators. The advanced technologies are integrated into the routine functions of the location or jurisdiction, and play a critical role in helping agencies and the public address their challenges. Management systems within transportation and across other sectors (e.g., human services, energy, and logistics) share information and data to communicate between agencies and with the public. These management systems provide benefits by maximizing efficiencies based on the intelligent management of assets and the sharing of information using integrated technology solutions. The advanced technology solutions and the lessons learned from their deployment are used in other locations, scaled in scope and size, to increase successful deployments and provide widespread benefits to the public and agencies.

Goals for the ATCMTD program include:

- Reduced costs and improved return on investments, including through the enhanced use of existing transportation capacity;
- Delivery of environmental benefits that alleviate congestion and streamline traffic flow;
- Measurement and improvement of the operational performance of the applicable transportation networks;
- Reduction in the number and severity of traffic crashes and an increase in driver, passenger, and pedestrian safety;
- Collection, dissemination, and use of real time transportation related information to improve mobility, reduce congestion, and provide for more efficient and accessible transportation, including access to safe, reliable, and affordable connections to employment, education, healthcare, freight facilities, and other services;
- Monitoring transportation assets to improve infrastructure management, reduce maintenance costs, prioritize investment decisions, and ensure a state of good repair;
- Delivery of economic benefits by reducing delays, improving system performance and throughput, and providing for the efficient and reliable movement of people, goods, and services;
- Accelerated deployment of vehicle-to-vehicle, vehicle-to-infrastructure, and automated vehicle applications, and autonomous vehicles and other advanced technologies;
- Integration of advanced technologies into transportation system management and operations;
- Demonstration, quantification, and evaluation of the impact of these advanced technologies, strategies, and applications towards improved safety, efficiency, and sustainable movement of people and goods; and
- Reproducibility of successful systems and services for technology and knowledge transfer to other locations facing similar challenges.

A.5 STATEMENT OF WORK

The Recipient shall execute their proposed work plan as detailed in Attachment 1.

A.6 DELIVERABLES

The Recipient shall provide the deliverables detailed in Attachment 1 and the following items:

*Award date is shown on page 1, Block 17, FHWA signature date.

Deliverable	Approximate Due Date	Section 508 Compliant?
Kick-off Meeting Conduct a kick-off meeting with FHWA at mutually-agreed-upon location.	Within 4 weeks after award	No
Quarterly Progress Reports Submit progress reports to document activities performed, anticipated activities, and any changes to schedule or anticipated issues.	Quarterly in accordance with Section C, Item 3. Reporting	No
Project Management Plan The Recipient shall submit to FHWA for approval a Project Management Plan, which shall include, at a minimum: a) **Statement of Work**, with a description of **Tasks and Sub-Tasks** by which the project work activities will be organized, executed, and monitored. b) A **Project Schedule** (Gantt Chart or equivalent) displaying begin and end times for each Task and Sub-Task, plus achievement of Project Milestones. c) A description of major **Project Milestones**, including key Reports, start of operations of important systems or subsystems, and other important deliverables or events. d) A **Staffing** Table, which identifies a single Project Manager, plus project staff and/or consultants that will lead and support each Task (or Sub-Task if appropriate). e) A **Project Budget**, displaying planned expenditures for each Task, with a further breakdown by Cost Element for each Task, and by the federal share vs. non-federal share.	Within 60 days after award	No

Systems Engineering Documents In accordance with 23 CFR 940.11, the Recipient shall submit electronic copies of the milestone Systems Engineering documents applicable to this project, for approval by FHWA. This shall include, at a minimum: a) Concept of Operations (ConOps); b) Systems Engineering Management Plan (SEMP); & **c)** Other System Engineering Analysis Documents.	As applicable	No
Project Evaluation Plan. The Recipient shall submit to FHWA for approval an Evaluation Plan, which shall include, at a minimum: i. Statement of **Project Objectives**, ii. List of **Evaluation Criteria** (e.g. quantitative performance metrics and/or qualitative assessments) tailored to the Project Objectives, iii. Description of **data-collection** procedures tailored to these criteria, which could include, for example, before/after data, surveys, interviews, system-monitoring data, or other data needed to report on achievement of project objectives. iv. Outline of **Evaluation Report** (1-page, draft list of topics to be addressed)	Within 90 days after award	No
Report to the Secretary Submit a report to the Secretary that describes: a. Deployment and operational costs of the project compared to the benefits and savings the project provides; and b. How the project has met the original expectations projected in the deployment plan submitted with the application, such as: 1. data on how the project has helped reduce traffic crashes, congestion, costs, and other benefits of the deployed systems; 2. data on the effect of measuring and improving transportation system performance through the deployment of advanced technologies; 3. the effectiveness of providing real time integrated traffic, transit, and multimodal transportation information to the public to make informed travel decisions; and 4. lessons learned and recommendations for future deployment strategies to optimize transportation efficiency and multimodal system performance.	Annually beginning one year after the award date	Yes

Final Report The Recipient shall provide a final report within ninety (90) days after the termination or expiration of this Agreement. The FHWA Agreement Officer Representative (AOR), in consultation with the Recipient, will determine the final design and scope of the evaluation and report. Submit an electronic copy of all reports to the ATCMTD mailbox at ATCMTD@dot.gov, and to jeffrey.d.martin@dot.gov , dave.harris@dot.gov, peter.huang@dot.gov, and patricia.sergeson@dot.gov	Within 90 days after the termination or expiration of this Agreement	No

Note: Section 508 requirements are available online at: http://www.fhwa.dot.gov/aaa/generaltermsconditions.cfm.

SECTION B – AWARD INFORMATION

B.1 TYPE OF AWARD

This award is a cost reimbursement Cooperative Agreement (Agreement).

B.2 AVAILABLE FUNDING

The total amount of Federal funding that may be provided under this Agreement is identified on Page 1 of this Agreement in Item 7, for the entire period of performance, subject to the limitations shown below:

a. Currently, Federal funds identified on Page 1 of this Agreement, Items 11 and 14, are obligated to this Agreement. This Agreement is fully funded.
b. The FHWA's liability to make payments to the Recipient is limited to those funds obligated under this Agreement.

B.3 COST SHARING OR MATCHING

Cost sharing or matching is required, with the maximum Federal share being 50%; therefore, a minimum non-federal cost share of 50% is required. Cost sharing or matching means the portion of project costs not paid by Federal funds. For a more complete definition, please see the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 CFR Part 200, including section 200.306 on Cost Sharing or matching. Other Federal funds using their appropriate matching share may be leveraged for the deployment but cannot be considered as part of the ATCMTD matching funds, unless otherwise supported by statute.

The Recipient's match can be met through direct financial support or through "in-kind" services. By the completion date of the Agreement, the Recipient must have met the cost-sharing requirement. All cost share contribution must be submitted with sufficient detail and/or documentation to support the fair market value of the contribution. If additional detail and/or documentation are determined necessary in order to verify the contribution, the Recipient will provide the requested information in a timely fashion.

B.4 PERIOD OF PERFORMANCE

The period of performance for this Agreement is delineated on Page 1 in Item 6.

B.5 DEGREE OF FEDERAL INVOLVEMENT

The FHWA anticipates substantial Federal involvement between it and the Recipient during the course of this project. The anticipated Federal involvement will include: technical assistance and guidance to the Recipient; approved actions as defined in Attachment 3 – Project Oversight Agreement; participation in status meetings including kick off meeting and project reviews; review and comment on draft documents, as appropriate; performance reporting and financial reporting to ensure that the objectives and the terms and conditions of the agreement are met; and close monitoring of performance.

SECTION C - AWARD ADMINISTRATION INFORMATION

C.1 FEDERAL AWARD NOTICES

Only the Agreement Officer (AO) can commit the FHWA. The award document, signed by the AO, is the authorizing document. Only the AO can bind the Federal Government to the expenditure of funds.

C.2 GENERAL TERMS AND CONDITIONS

General terms and conditions including payment procedures, compliance requirements for Section 508 of the Rehabilitation Act of 1973 (as amended in 1998), and governing regulations that apply to this Agreement are available online at:

http://www.fhwa.dot.gov/aaa/generaltermsconditions.cfm

C.3 STATUTORY AND NATIONAL POLICY REQUIREMENTS

In addition to the FHWA's General Terms and Conditions incorporated by reference in Section C.2, the Recipient is also required to comply with all applicable U.S. Code: Title 23 requirements, Code of Federal Regulations (CFR): Title 23 requirements, and any other applicable statute or regulation.

C.4 ADDITIONAL TERMS AND CONDITIONS

C.4.A PUBLIC ACCESS TO DOCUMENTS

The Recipient agrees that the resulting deliverables/documentation submitted to the FHWA under this Agreement may be posted online for public access and/or shared by FHWA with other interested parties. The FHWA anticipates the documents cited herein may be posted on an FHWA website or other appropriate website.

C.4.B INDIRECT COSTS

Indirect costs are allowable under this Agreement in accordance with the Recipient's Federally Negotiated Indirect Cost Rates as documented in writing and approved by the Recipient's cognizant Government agency. In the absence of such Government-approved indirect rates, the following rates are hereby approved for use under this Agreement as shown below:

Table C.4.B – Indirect Costs

*Type**	*Indirect Rate*	*Period*	*Rate (%)*	*Base*
Fixed	Labor Overhead Indirect Rate	Indefinite	18.08	Direct Labor & Fringe Benefits

*Types of Rates: Pred - Predetermined; Fixed - Fixed; Final – Final; Prov: Provisional/billing; or De minimus.

In the event the Recipient determines the need to adjust the above listed rates, the Recipient will notify the AO of the planned adjustment and provide rationale for such adjustment. In the event such adjustment rates have not been audited by a Federal agency, the adjustment of rates must be pre-approved in writing by the AO.

This Indirect Cost provision does not operate to waive the limitations on Federal funding provided in this document. The Recipient's audited final indirect costs are allowable only insofar as they do not cause the Recipient to exceed the total obligated funding.

C.4.C DATA RIGHTS

The Recipient must make available to the FHWA copies of all work developed in performance with this Agreement, including but not limited to software and data. Data rights under this Agreement shall be in accordance with 2 CFR 200.315, Intangible property.

C.4.D PERSONALLY IDENTIFIABLE INFORMATION (PII)

Personally Identifiable Information (PII), as defined in 2 CFR §200.79 and 2 CFR §200.82, will not be requested unless necessary and only with prior written approval of the AO with concurrence from the AOR. PII is defined as any information about a human being, living or dead, regardless of nationality, that is maintained by an agency and that permits identification of that individual to be reasonably inferred by either direct or indirect means (as in data mining), including, but not limited to, name, social security number, date and place of birth, mother's maiden name, biometric records, education, financial transactions, medical history, non-work telephone numbers, and any other personal information that is linked or linkable to an individual.

C.4.E KEY PERSONNEL

The Recipient will provide notice to the AO of any changes in Key Personnel specified in the award. The notice will provide a Resume of the replacement for such Key Personnel. The following person(s) are/have been identified as Key Personnel:

Table C.4.E -- Key Personnel

Names	Title/Position
Michael Finochio	Engineering Manager, City and County of Denver
Crissy Fanganello	Director of Transportation, Public Works

C.4.F PROGRAM INCOME

Pursuant to 2 CFR 200.307, Program income earned during the Agreement period must be added to the Federal award and used for the purposes and under the conditions of the Federal award, unless otherwise approved by the AO. Program income must not be used to offset the Federal or Recipient contribution to this project.

C.4.G SUBAWARDS | SUBCONTRACTS

Unless described in the application and funded in the approved award, the Recipient must obtain prior written approval from the AO for the subaward, transfer, or contracting out of any work under this award. This provision does not apply to the acquisition of supplies, material, equipment, or general support services.The following subawards/subcontracts are currently approved under this Agreement:

Table C.4.G -- Approved Subawardees/Subcontractors

Name
None identified at the time of award

The following subawards/subcontracts consent is withheld under this Agreement:

- All sub-contracts and sub-awards not explicitly identified in Table C.4.G of this section.

Approval of each subaward/subcontract is contingent upon a fair and reasonable price determination, and approval by the AO for each proposed subcontractor/sub-recipient. Consent to enter into subawards/subcontracts will be issued through a formal amendment to the Agreement, or by written notification from the AO.

C.4.H ORDER OF PRECEDENCE

The Recipient's technical and budget applications are accepted, approved, and incorporated herein as Attachment 1 and Attachment 2. In the event of any conflict between this Agreement document and the Recipient's application, this Agreement document shall prevail.

C.4.I DESIGNATION AS RESEARCH OR NON-RESEARCH AGREEMENT

This Agreement is designated as: NON-RESEARCH

C.4.J CONFERENCE SUPPORT RESTRICTIONS

The Recipient must obtain written approval from the AOR prior to incurring any costs for conference or meeting support. See the definition of conference as contained in 2 CFR 200.432.

Food and beverage costs are not allowable conference/meeting expenses for reimbursement under this Agreement.

Note: Costs of meals are allowable as a travel per diem expense for individuals on travel status and pursuant to the Travel clause of this Agreement.

C.4.K TRAVEL

The Recipient may follow their own policies regarding travel, which may be based on actual costs, mileage, and/or per diem, as long as they are reasonable and consistent with travel costs they charge for other activities. If the Recipient does not have written travel policies, then they should follow the Federal Travel Regulations.

The Recipient shall invoice in accordance with 2 CFR §200.474 - Travel costs and the Federal Travel Regulations, and must submit documentation to support all travel costs. Travel requirements under this Agreement shall be met using the most economical form of transportation available. All travel shall be scheduled sufficiently in advance to take advantage of offered discount rates, unless authorized by the Agreement Officer. The following web site provides information on current Per Diem rates:

http://www.gsa.gov/portal/category/100120

C.4.L AGREEMENT PERFORMANCE REQUIREMENTS SUMMARY

Not Applicable.

C.4.M DISPUTES

The parties to this Agreement will communicate with one another in good faith and in a timely and cooperative manner when raising issues under this provision. Any dispute, which for the purposes of this provision includes any disagreement or claim, between the FHWA and the Recipient concerning questions of fact or law arising from or in connection with this Agreement and whether or not involving alleged breach of this Agreement, may be raised only under this Disputes provision.

Whenever a dispute arises, the parties will attempt to resolve the issues involved by discussion and mutual agreement as soon as practical. In no event will a dispute which arose more than three months prior to the notification made under the following paragraph of this provision constitute the basis for relief under this article unless FHWA waives this requirement.

Failing resolution by mutual agreement, the aggrieved party will document the dispute by notifying the other party in writing of the relevant facts, identify unresolved issues and specify the clarification or remedy sought. Within five working days after providing written notice to the other party, the aggrieved party may, in writing, request a decision from one level above the AO. The AO will conduct a review of the matters in dispute and render a decision in writing within thirty calendar days of receipt of such written request. Any decision of the AO is final and binding unless a party will, within thirty calendar days, request further review as provided below.

Upon written request to the FHWA Director, Office of Acquisition and Grants Management or designee, made within thirty calendar days after the AO's written decision or upon unavailability of a decision within the stated time frame under the preceding paragraph, the dispute will be further reviewed. This review will be conducted by the Director, Office of Acquisition and Grants Management. Following the review, the Director, Office of Acquisition and Grants Management, will resolve the issues and notify the parties in writing. Such resolution is not subject to further administrative review and to the extent permitted by law, will be final and binding. Nothing in this Agreement is intended to prevent the parties from pursuing disputes in a United States Federal Court of competent jurisdiction.

C.5 REPORTING

C.5.A ADDRESS FOR SUBMITTAL OF REPORTS AND DOCUMENTS

The Recipient must submit all required reports and documents electronically, under transmittal letter referencing the Agreement number, to the following address(s) follows:

- **Jeffrey Martin**, Agreement Specialist at the following address: **jeffrey.d.martin@dot.gov**
- **Dave Harris,** ATCMTD Program Manager at the following address: **dave.harris@dot.gov**
- **Peter Huang,** Agreement Officer Representative at the following address: **peter.huang@dot.gov**
- **Tricia Sergeson,** Transportation Specialists at the following address: **patricia.sergeson@dot.gov**

C.5.B QUARTERLY PROGRESS REPORT

The Recipient must submit an electronic copy of the SF-PPR to the FHWA staff identified under clause C.5.A on or before the 30th of the month following the calendar quarter being reported. Final PPRs are due 90 days after the end of the Agreement period of performance. The SF-PPR is available online: http://www.whitehouse.gov/sites/default/files/omb/grants/grants_forms.html.

Table 1 -- Quarterly Progress Report Periods

Calendar quarters are defined as:		Reports due on or before:
1st :	January – March	April 30th
2nd:	April – June	July 30th
3rd:	July – September	October 30th
4th:	October – December	January 30th

The quarterly progress report must include the required certification pursuant to 2 CFR 200.415, the SF-PPR cover page and the SF-PPR Block 10 Performance Narrative. The Recipient shall complete the Quarterly Reporting Template, expanding on SF PPR Block 10 as necessary, to include the following information:

a. Work performed for the current quarter;
b. Work planned for the upcoming quarter;
c. Status of all planned procurement activities, proposed procurement schedules, and a list of key procurement milestone dates;
d. Description of any problem encountered or anticipated that will affect the completion of the work within the time and fiscal constraints as set forth in the Agreement, together with recommended solutions to such problems; or, a statement that no problems were encountered;
e. A tabulation, clearly delineated by Federal share, cost share and total, of the current and cumulative costs expended by cost element (labor, travel, indirect costs, sub-recipient/subcontractor, etc.) by quarter versus budgeted costs;
f. Work performed in support of the FHWA and DOT Strategic Goals; and
g. Budget revisions.

In the SF-PPR Block 11, Other Attachments, include the following information as attached pages:

a. SF-425, Federal Financial Report, and
b. SF-425A, Federal Financial Report Attachment (if applicable).

C.5.C ANNUAL BUDGET REVIEW AND PROGRAM PLAN

The Recipient must submit an electronic copy of the Annual Budget Review and Program Plan to the AOR and the Agreement Officer 60 days prior to the anniversary date of this Agreement. The Annual Budget Review and Program Plan must include the required certification pursuant to 2 CFR 200.415. The Annual Budget Review and Program Plan must provide a detailed schedule of activities, estimate of specific performance objectives, include forecasted expenditures, and schedule of milestones for the upcoming year. If there are no proposed deviations from the Approved Project Budget, the Annual Budget Review must contain a statement stating such. The Recipient must meet via teleconference or web conference with the FHWA to discuss the Annual Budget Review and Program Plan. Work proposed under the Annual Budget Review and Program Plan must not commence until AO's written approval is received.

U.S. Department of Transportation
Advanced Transportation Congestion Management Technologies Deployment "ATCMTD" Initiative

DENVER
SMART CITY PROGRAM

ATCMTD
THE CITY AND COUNTY OF DENVER

I. COVER PAGE

Project Name:	**Denver Smart City Program**
Previously Incurred Project Cost:	$200,000
Future Eligible Project Cost:	$0.00
Total Project Cost:	$12,000,014
ATCMTD Request:	$6,000,007
Total Federal Funding (including ATCMTD):	$6,000,007
Are matching funds restricted to a specific project component? If so, which one?	No
State(s) in which the project is located:	Colorado
Is the project currently programmed in the: • Transportation Improvement Program (TIP) • Statewide Transportation Improvement Program (STIP) • MPO Long Range Transportation Plan • State Long Range Transportation Plan	No, the project is not currently programmed into any of the plans listed.

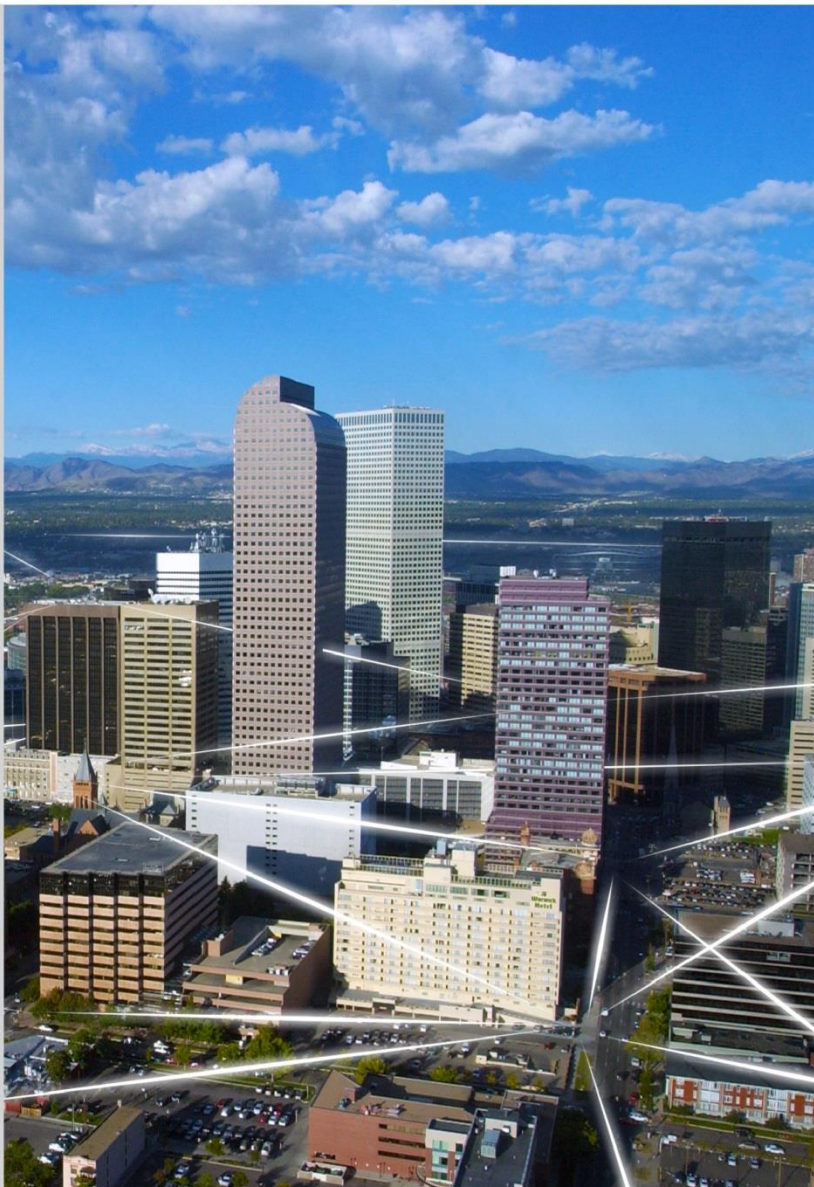


Table of Contents

A. Project Description

1. Introduction

The City and County of Denver is proposing three Intelligent Vehicle (IV) Projects utilizing advanced traveler information systems; advanced transportation management technologies; transportation system performance data collection, analysis, and dissemination systems and advanced safety systems to address issues and challenges in safety, mobility, and sustainability while building a foundation for future projects to improve economic vitality and air quality. Denver, Colorado faces a myriad of challenges at the intersection of transportation, environment and people:

- **Rapid population growth:** 10,000-15,000 new residents move to Denver each year[1],
- **Traffic congestion:** 80 percent of the population commutes in a single-occupant vehicle,
- **Dangerous roadways**: more than 15,000 crashes annually including 129 fatal crashes,
- **High percentage of residents living near or below the poverty rate**: 23.9% of the population is living on less than 125% of the federal poverty level,[2]
- **Increased cost of living**: 30 percent increase in cost of apartment rentals since 2010, and
- **Air pollution**: Denver is an ozone and CO_2 non-attainment area.

Although daunting, Denver's obstacles are not insurmountable. The United States Department of Transportation (USDOT) Smart City Challenge gave Denver the opportunity to develop a comprehensive plan that will address these challenges and transform our region into a global model where transportation and technology can break down barriers and connect all people to mobility freedom and opportunity. The Smart City Challenge served as the seed and spark to identify innovative solutions to our toughest issues. Now, the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative provides the opportunity for the City and County of Denver to bring our most critical Smart City Program projects to life through the proposed IV Projects.

These proposed IV Projects will address and support alleviation of some of our most pressing challenges. In addition to our rapid population growth, Denver has an influx of an additional 200,000 commuters from outside the City traveling to Denver-based jobs during the workweek-with the vast majority driving single occupant vehicles. This creates considerable congestion, yet expanding and widening roads is extraordinarily expensive and traditional infrastructure improvements do not alleviate many of Denver's other challenges. For this reason, we are prepared to match ATCMTD grant funds with City and County of Denver funds to focus first on such proposed IV Projects as the launch of our Smart City Program. These IV Projects will allow us to address our most pressing traffic congestion and safety issues and deliver measurable outcomes aligned with ATCMTD goals and focus areas. Implementing IV Projects will usher in a new era of transformational technologies for Denver and the region, bringing greater mobility safety, efficiency, and reliability to our transportation network. These benefits will also build a foundation for Denver to implement other Smart City projects to reduce costs, connect underserved communities with resources, and bring environmental and economic benefits to the City. The proposed Smart City IV Projects include:

IV-1, Connected Traffic Management Center (TMC) and Connected Fleets. The Denver TMC currently operates and maintains over 1,200 traffic signals, 460 closed circuit TV cameras,

[1] 2015 Census data.
[2] 2014 Census data.

and thousands of sensor and detection devices deployed citywide, but lacks the ability to communicate the valuable information that it gathers regarding roadway closures, construction, dangerous intersections, and other critical traveler information to the public. To meet this need immediately, Denver will partner with Waze (a community-based traffic and navigation application provider) to reduce congestion, improve safety and make data-driven urban planning decisions by connecting our TMC directly with travelers. To innovate today and prepare for the future, we will create a Connected TMC by building a Connected Vehicle (CV) operational environment to support current and future CV applications. As vehicles are a crucial part of a CV future, we will install dedicated short-range communications (DSRC) in 1,500 City fleet vehicles to jumpstart market penetration. The Connected TMC will allow us to innovate today by leveraging our existing ITS infrastructure while simultaneously preparing for a future with increasing CVs. Through IV-1, we aim to reduce crashes at identified Vision Zero intersections by 30% and reduce incident response times for citizen-reported crashes by 30%.

IV-2, Travel Time Reliability as a City Service for Connected Freight. Denver has quickly become a hub for innovation, but it has long been a hub for regional and national freight movement. I-25, I-70, and I-76 are all federally designated high priority corridors that pass through metro Denver, and which converge in North Denver to form a dense freight corridor. However, many of our underserved communities are also located in this corridor and are significantly impacted by noise, pollution, and wandering trucks. Today, freight movement is a free-for-all in North Denver. For years, residents have complained about serious safety issues where trucks are traversing the same neighborhood streets where children walk to school. These issues create a barrier to existing linkages to ladders of opportunities in these areas.

This IV-2 project will transform North Denver into a Freight Efficiency Corridor to tackle these issues. Right now, trucks must travel without much consistent information on traffic or fastest routes to their destination. With DSRC-enabled freight signal priority, we can make the traffic lights work for trucks instead of against them. Denver will be the first in the nation to offer this type of City service to the freight industry if organizations follow new business rules, including avoiding congested freeways, staying out of neighborhoods, and equipping their trucks with DSRC. This improved efficiency will result in long overdue safety improvements for our underserved communities in this corridor. We will target a 20% reduction in freight travel during peak periods to alleviate truck congestion on interstate and state highways, and a 20% reduction in freight travel time on critical arterial routes using freight signal priority. We will also aim to reduce reports of interruptive freight movement in neighborhoods by 30% to increase safety and use of linkages to ladders of opportunity.

IV-3, Safer Pedestrian Crossings for Connected Citizens. There are increasing demands to promote safer walking and biking to improve public health and air quality, as well as to reduce vehicle congestion. In 2015, 1,618 crashes involving pedestrians and 1,147 crashes involving bicycles occurred in Denver. Automated Pedestrian Detection (APD) technologies are a new solution to addressing pedestrian and driver interactions at difficult crossings. This project will deploy APD at four unprotected midblock trail crossings using Rectangular Rapid Flashing Beacons to enhance traditional pedestrian push buttons. Field data from these pilot locations will be continuously sent to the Denver TMC for research, field testing, and fine tuning of the APD system, and will be available to the public. The IV-3 project will also serve as a test for Connected Citizen pedestrian warning systems by allowing us to collect and disseminate pedestrian and bicycle crossing information via DSRC, increasing pedestrian safety.

2. City and County of Denver Travel Characteristics

Denver is a hotbed of innovation and opportunity. The city is experiencing unprecedented growth, increasing from 467,610 people in 1990 to 600,158 in 2010 (28%). The population increased an additional 10% between 2010 and 2014 (see Attachment A for more information regarding Denver's population). Denver also ranked first among big cities for economic and job growth[3] and ranked as the number one "best place for business and careers."[4] This city's work to improve transportation systems was recognized in 2013 when Denver was ranked the overall "Best City for Public Transportation" by U.S. News.[5] However, there is still work to be done in order to continue meeting the growing demands on our transportation network. **Error! Reference source not found.**1 (right) and Figure 2 (below) are infographics which summarize the characteristics and existing infrastructure of Denver to provide insight on the scale and capabilities of our City.

Figure 1. Denver characteristics

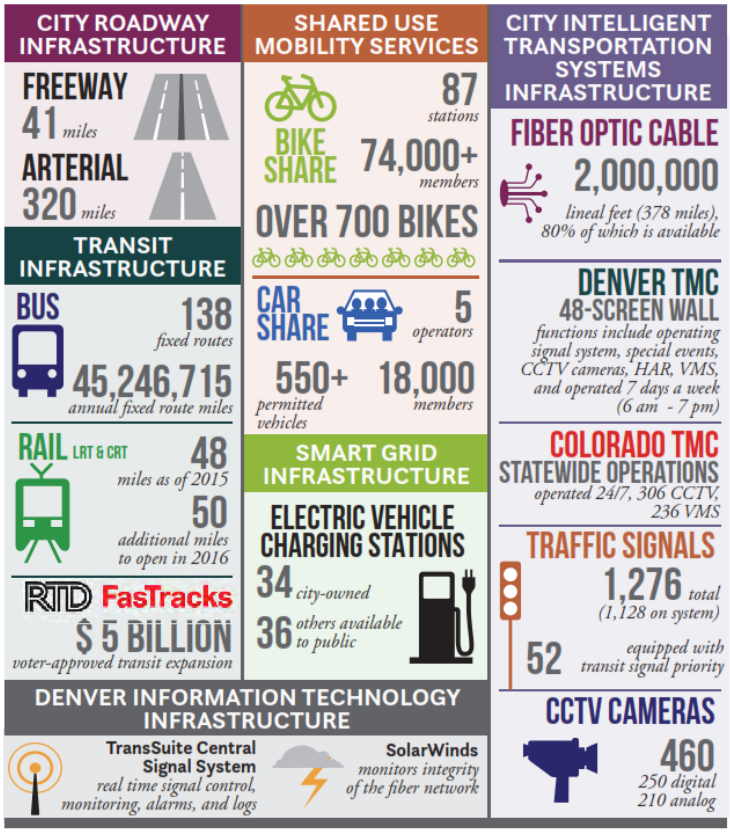


Figure 2. Denver infrastructure

Through the process of developing the SMART City program, we have identified the City's most pressing challenges related to transportation: freight movement in North Denver (IV-2); pedestrian and bicycle safety throughout Denver (IV-3); and improving capabilities of our TMC by enabling better communication with the traveling public today and simultaneously preparing for the transformational capabilities enabled by CV technology (IV-1). These projects will support USDOT priorities, including: 1) transportation elements associated with Smart Cities, 2) systemic applied pedestrian crossing technology, 3) traffic signal data acquisition, analysis, and management and 4) incorporation of CV technology in public sector and

[3]
[4]
[5] USNews, 2013

first responder fleets.

Denver is a city of challenges and opportunities, and therefore perfectly situated to serve as a model for other cities. An ATCMTD investment in Denver is an investment in solutions to challenges facing many cities across the nation. We are one of the most sought after, youngest, fastest growing cities in the nation, yet our infrastructure is extremely strained due to that growth. While we have summer-time ozone issues and localized CO emissions exceedances, we also have a high quality of life that entices many to come to Denver for employment and to live. Similar to other mid-sized cities, our list of challenges is long:

- Changing mobility patterns, particularly for millennials and baby boomers
- Accessibility for underserved populations
- Aging and degraded transportation infrastructure serving an ever-increasing and evolving population
- Technology and cybersecurity demands

Within our Smart City Program, we have prioritized these IV projects because they are focused on addressing these challenges specifically with outcome-based solutions.

a) Partnerships

Denver is fully committed to launching our Smart City Program efforts through partnerships with industry and external entities. We have existing private partners for ongoing Denver programs and initiatives including Panasonic, Xerox, and the Rocky Mountain Institute. They are all committed to helping us to further identify, test, and refine our Smart City Program, vision, and projects. Additionally, we have strong ties with our public sector partners at the Colorado Department of Transportation (CDOT) and the Denver Regional Council of Government (DRCOG) as well other regional neighbors and organizations such as the Metro Chamber of Commerce, and the Metro Mayors Caucus.

A key aspect of our Smart City Program is our SMART Council (described in Section A11, Partnership Plan), which includes strategically selected partners from government, academia, automaker industry, energy, policy, technology, safety, telecom, transportation and professional organizations. We will continue this legacy of partnership and collaboration with our proposed ATCMTD projects. Table 1 below presents each of our key partners for the three proposed IV Projects, including their responsibility and involvement with the projects. Letters of support from some of these partners are included in Attachment B.

Table 1. Denver Smart City Program Partners.

Partners	Responsibility	Projects		
		IV-1	IV-2	IV-3
CDOT	CDOT will bring insights from its $20 million RoadX and CV deployment programs to inform our IV Projects. CDOT is committed to supporting the implementation and acceleration of the Freight Efficiency Corridor Program to help prepare for the $1.2 billion Central I-70 project and to facilitating travel time reliability as a City service via freight signal priority.	X	X	

Partners	Responsibility	Projects		
		IV-1	IV-2	IV-3
DRCOG	DRCOG will participate in the local and regional SMART Council and provide transportation and traffic engineering expertise across all projects.	X	X	X
Jacobs Engineering Group, Inc.	In the role of Program Management Oversight (PMO) and Denver's lead Smart City consultant, Jacobs will draw upon its program management capabilities and leverage its work with CDOT on CV deployment. Jacobs will be responsible for helping Denver ensure the effective execution of the Smart City Program.	X	X	X
Econolite	Denver will partner with Econolite to launch its new CV intersection controller, Cobalt-Sky™. This is the first-ever traffic controller fully designed to apply the robust inputs offered by DSRC. Denver will implement the new traffic controller to enable freight signal priority on project IV-2.		X	X
Peloton Technology	For project IV-2, Peloton Technology will support Denver to launch travel time reliability as a City service to freight fleet operators as an incentive to equip their fleets with DSRC technology.		X	
Waze	The Waze provider Connected Citizens Program will reduce congestion, improve safety and inform smarter urban planning by connecting with travelers through project IV-1.	X		

b) Program Management Approach

Our overall program management approach is based on a lean management structure to ensure we are capable of making timely decisions when they are needed most. We will implement our Smart City Program and the proposed IV projects with the functional systems, organizational constructs, and implementation strategies that ensure we operate in alignment with our values and are achieving Denver's and USDOT's desired outcomes.

The Denver Smart City Program controls and contract administration procedures will track and manage baseline budget control, pending and approved change control, schedule control, monthly progress reports, and all necessary federal funding reports for the IV Projects. Our program management approach is tailored to support the continuous advancement of the entire Smart City Program, and will include management from both the City and the contract program manager.

Denver's Smart City Program will be co-chaired by Crissy Fanganello, the City's Director of Transportation and Mobility, and Evan Dreyer, Mayor Michael Hancock's Deputy Chief of Staff. They will head up an Executive Leadership Committee. The Leadership Committee will include several other key City officials, and also will include representatives from two of our primary Smart City Program collaborators: CDOT and DRCOG. The Executive Leadership Committee will provide strategic guidance and support to our project teams for the proposed IV Projects. The committee will also be responsible for engaging with our SMART Council

(defined in Section 11, Partnership Plan) and other strategic partners.

Project Management Plan. The contract program manager, Jacobs Engineering, will be responsible for monitoring and reporting all elements of Denver's Smart City Program. The proposed program relies on a robust and proven Project Management Plan (PMP) that describes the organization, management control systems, and processes that guide the full range of activities required to implement this groundbreaking program. Jacobs is well versed at successfully managing key PMP processes that will drive this program from initiation, planning and execution to monitoring, controlling and closing. Jacobs will be overseen by key City staff on the IV Project, including the Project Manager and Technical Manager (see Section B1, Staffing Organization). Denver will adhere to Project Management Body of Knowledge, 5th edition standards.

The PMP will be updated on a monthly basis, and will contain scope, schedule, communication, cost, quality, configuration management and risk management plans. Our contract program manager will be fully responsible for ensuring compliance with the PMP throughout the duration of the IV Project's contract. Denver's PMP will:

- Summarize the Smart City Program, including the scope, schedule and capital budget
- Describe organizational, partner and reporting relationships
- Establish goals and objectives that form the basis of the Smart City Program
- Provide information about the organization, control systems, processes, roles, responsibilities and lines of authority within the Smart City Program
- Cite definitive and authoritative references, including specific policies and procedures
- Designate inter-relationships between the Smart City practices and the agency-wide policies and procedures
- Establish consistent management practices
- Form mechanisms for managing technical and financial risks
- Demonstrate that Denver's program is structured in accordance with City and federal requirements

Denver is also committed to IV Project effectiveness, including continually evaluating the need for traditional ITS infrastructure and assessing the possibility of replacing the functionality of those systems with new CV technology. This will allow for continual cost-benefit analyses of planed CV technologies.

Project Funding. The budget estimate for the proposed IV Projects is provided in Section C (Funding Description) and is based on a three-year project period of performance. The estimate includes materials, labor, and installation costs for years one through three as well as an estimate for the annual cost to operate and maintain the proposed systems beyond the proposed grant period, including estimated annual maintenance, utility upgrades, end of useful life replacements, and periodic repairs. IV-1, -2, and -3 project needs will be procured through the City's existing service contracts, and for the purposes of this budget estimate, fully burdened rates have been used. Denver has consulted with third-party vendors, other cities, engineers and contractors installing similar projects to derive the budget costs presented in Section C.

Project Funding for this grant will be managed using Denver's existing PeopleSoft Accounting system to track budgets, encumbrances and payments. A monthly project status report will be created to document the current state of the project. Project tracking, reporting and requests for

reimbursement will be completed in accordance with the Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards.

3. Geographic Areas

We selected the three proposed IV Projects from our Smart City Program due to their focus on solving real safety and congestion challenges that Denver is facing today. A detailed description of each project is provided in Section A5, Transportation Systems and Services. Below is a brief description of the geographic area where each project will be implemented:

IV-1: Connected TMC and Connected Fleets. This project is centered on the Denver TMC, which operates 24 hours per day/seven days per week from within the Webb Municipal Office Building in Downtown Denver. This building houses the City's Transportation and Mobility department, which will implement proposed IV Projects, including IV-1. We will leverage our existing ITS infrastructure and immediately enable the deployment of CV applications by building a CV operational environment at the TMC. We will equip light-duty and heavy-duty City fleet vehicles with DSRC to jumpstart market penetration and empower the CV operational environment. These fleet vehicles blanket the City through daily operations and will generate data throughout Denver, limited to the City and County boundaries.

IV-2: Travel Time Reliability for Connected Freight. This project is focused on addressing the critical safety issues facing Denver's underserved neighborhoods in North Denver, including Globeville, Elyria-Swansea and Montbello. These areas have high percentages of minority populations, households with low-income, and families with children (see Table 2[6] below). These neighborhoods are constantly impacted by trucks traveling through this dense freight corridor, which includes Heartland Expressway, Ports-to-Plains and Camino Real. A Freight Efficiency Corridor will be established in the area bound on the east and west by I-25 and Pena Blvd, respectively (see Attachment C for a map of the Freight Corridor).

Table 2. Characteristics of North Denver Neighborhoods Impacted by Freight Traffic

Characteristic	Globeville	Elyria-Swansea	Montbello	Denver
Percentage of total population that is Hispanic	68%	84%	61%	32%
Percentage of total households with children	43%	55%	72%	25%
Average household income	$39,200	$44,700	N/A	$73,100

IV-3: Safer Pedestrian Crossings for Connected Citizens. This project will pilot APD technologies at the following four locations selected from a recently completed prioritization study of all uncontrolled trail crossings in Denver:

- Weir Gulch Trail at Decatur Street
- Lakewood Gulch Trail at Knox Court
- High Line Canal Trail at Monaco Street
- High Line Canal Trail at Yale Street

These four locations were identified from candidate locations that need additional treatment and

[6] Table Data retrieved from http://denvermetrodata.org/neighborhood/montbello and https://www.denvergov.org/Portals/746/documents/HIA/HIA_Section%202.pdf

were selected based on their proximity to existing traffic signal and communications infrastructure for ease of pilot deployment. By targeting these trail crossings, we expect to increase pedestrian and biker safety. This will also allow us to collect data on pedestrian and biker safety to support implementation of future safety-enhancing projects, encouraging alternative transportation and improving air quality.

4. Real World Issues and Challenges

Foremost among Denver's challenges are rapid population growth and traffic congestion. The city's population has increased by 23% since 2000.[7] This phenomenal residential growth is compounded as each workday 200,000 commuters who live outside of Denver travel to the City for work– the vast majority driving single-occupant vehicles. The traffic congestion created is considerable, as current infrastructure insufficiently supports the high volume of commuters. However, construction to expand and widen roads is extraordinarily expensive. We recently spent $30 million to add one lane for one mile to a major north-south arterial and we are preparing to spend – in partnership with the Federal Highway Administration and CDOT – $1.2 billion to add lanes to Interstate 70 and reconnect the urban street grid northeast of downtown. These are important improvements, but they are built on a supply model that we cannot sustain financially and do not utilize available technology or improve resident outcomes.

Traditional infrastructure improvements also do not alleviate many of Denver's other challenges, such as our difficulties obtaining compliance with federal ozone standards due to traffic congestion or high incidents of traffic accidents. Each year Denver has 15,000 crashes, with 129 resulting in fatality. In 2015 alone, Denver had 1,147 crashes involving bicycles and 1,618 crashes involving pedestrians.

Additionally, Denver has increasing cost of living, underserved areas, and children living in poverty. Since 2010, Denver rent prices have increased more than 5% each year,[8] making it harder for low-income families to remain or relocate here, and all but impossible for low-wage workers to live close to their jobs. Perhaps most alarming – up to 40% of Denver's residents live in underserved neighborhoods, primarily in the western, northern and northeastern portions of the city. Many of these underserved neighborhoods are disconnected by physical barriers such as highways, railroads and rivers, creating food deserts that negatively impact health.[9] These underserved communities have disproportionately high minority populations (see Table 2 above). Also, nearly one of every four Denver children lives in an area of concentrated poverty. The number of homeless students in Denver has increased 41% since 2013-14 and has doubled across the entire metro area since 2008.[10]

While all of these issues are not part of the measureable outcomes of this project, by implementing IV projects 1-3 we hope to lessen the impacts of these difficulties on the city and provide foundational technologies and data sources to further lessen these challenges with other Smart City projects. By targeting freight issues in underserved communities, IV-2 will increase

[7] 2015 Census data.

[8] FOX 31 Denver (2015). Study: Denver apartment rent increases to be the largest this year. Retrieved from http://kdvr.com/2015/04/14/study-denver-apartment-rent-increases-to-be-largest-in-u-s-this-year/

[9] Moyer, D. C. (2013). Denver food deserts and the impact on health. University of Denver. Retrieved from http://www.du.edu/korbel/ipps/media/documents/moyer_policymemo.pdf

[10] Denver Office of Children's Affairs (2015). The status of Denver's children: Community resource. Retrieved from https://www.denvergov.org/content/dam/denvergov/Portals/713/documents/2014_Data--Lisa/Status%20of%20Denver's%20Children%202015%20A%20Community%20Resource.pdf

the safety of residents and eliminate barriers to their utilization of linkages to ladders of opportunity, allowing residents safe passage to work or school. We anticipate this will also decrease the number of pedestrian-auto crashes and traffic accidents and fatalities by reducing interruptive freight movement in these neighborhood communities. IV-3 will also increase pedestrian safety through crossing technologies, ultimately reduce pedestrian-auto crashes and encourage walking or biking. This improves resident health, use of linkages to opportunity, and air quality. This is especially important for low-income communities that may have fewer transportation options and less access to opportunities. Additionally, by implementing CV technologies, we anticipate reduction of traffic accidents and fatalities through use of real-time data for reducing incident response times, as well as injuries and crashes at identified Vision Zero intersections.

Alignment with ATCMTD Goals and Focus Areas

The IV Projects proposed for our Denver Smart City Program will deploy technologies targeted by the ATCMTD initiative including 1) advanced traveler information systems, 2) advanced transportation management technologies, and 3) advanced safety systems including V2V and V2I communications, technologies associated with autonomous vehicles, and other collision avoidance technologies, including systems using cellular technology. Table 3 below presents where projects IV-1 through IV-3 align with the ATCMTD initiative's focus areas, while Table 4 describes how each project aligns with ATCMTD goals.

Table 3. Proposed Project Alignment with ATCMTD Focus Areas

		Projects		
Relevant ATCMTD Focus Areas	**Alignment with IV Projects**	**IV-1**	**IV-2**	**IV-3**
Transportation elements associated with Smart Cities	All 3 IV projects will deploy Smart Cities technology focused on improving transportation, including improving connectivity for the Denver TMC (IV-1), implementing DSRC to enable freight signal priority (IV-2) and deploying APD technology to make pedestrian crossings safer (IV-3).	X	X	X
Systemic applied pedestrian crossing technology	IV-3 will deploy APD technology at locations selected based on roadway characteristics including number of lanes and speed limits, population density, proximity to retail and crash history.			X
Traffic signal data acquisition, analysis, and management	All three IV projects involve capturing traffic signal data at the Denver TMC in order to better manage and analyze Denver roadways for improved traffic operations throughout the city. This includes creating a CV operational environment to capture traffic signal data (IV-1), deploying a freight signal priority application using traffic signal data (IV-2) and implementing APD technology integrated with traffic signal data (IV-3).	X	X	X
Incorporation of connected vehicle (CV) technology in	IV-1 will deploy DSRC in 1,500 heavy duty and light duty City vehicles.	X		

public sector and first responder fleets				

Table 4. Proposed Project Alignment with ATCMTD Goals and Focus Areas

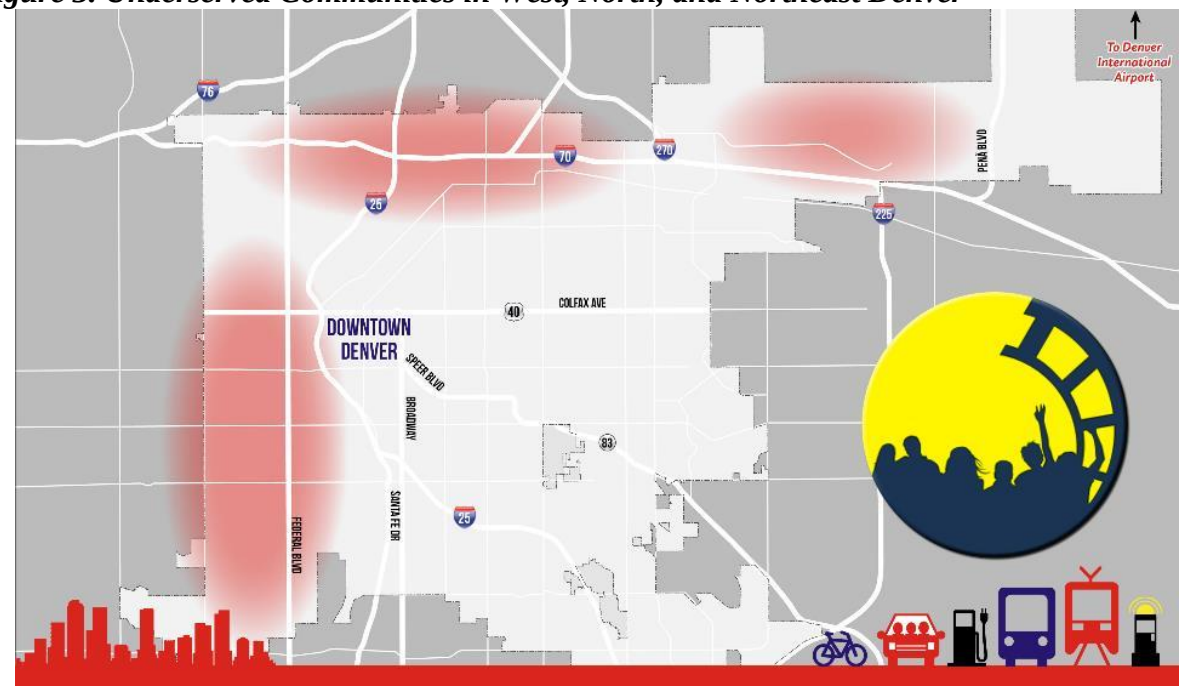
		Projects		
ATCMTD Goals	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Reduced costs and improved return on investments, including through the enhanced use of existing transportation capacity	By enabling the Denver TMC to use connected vehicle technology as an emerging data source, IV-1 will allow Denver to continuously assess the need to invest in expensive traditional ITS infrastructure, opening the door for reduced costs and improved return on investment. IV-2 will improve the efficiency of freight movement in North Denver to better leverage the existing transportation capacity of the highways and arterials that serve this dense freight corridor.	X	X	
Delivery of environmental benefits that alleviate congestion and streamline traffic flow	By providing better traveler information to the public (IV-1) and delivering travel time reliability as a City service (IV-2), Denver will improve safety and reduce congestion on its roadways citywide, which will have compounding benefits on the environment and on traffic flow.	X	X	
Measurement and improvement of the operational performance of the applicable transportation networks	By building a CV operational environment at the Denver TMC (IV-1) and deploying DSRC technology in the North Denver freight corridor (IV-2), we will gain the ability to constantly measure and improve operational performance of our transportation networks citywide.	X	X	
Reduction in the number and severity of traffic crashes and an increase in driver, passenger, and pedestrian safety	All three IV projects are targeting transformational benefits in safety. IV-1 will deliver Vision Zero messaging with Waze to warn drivers of dangerous intersections, IV-2 will keep trucks off of neighborhood streets, and IV-3 will deploy APD technology to improve pedestrian and bicycle safety.	X	X	X
Collection, dissemination, and use of real time transportation related information to improve mobility, reduce congestion, and provide for more efficient and accessible transportation, including access to safe, reliable, and affordable connections to employment, education, healthcare, freight facilities, and other services	All three IV projects will collect, disseminate, and use real-time data to achieve system performance improvements and transformational safety, mobility, and environmental benefits. IV-1 will empower the Denver TMC to utilize CV data. IV-2 will use DSRC data to deliver travel time reliability as a City service. IV-3 will deploy APD technology that will serve as an entirely new data source to improve and continuously evaluate conflicts at crossings for pedestrians and bicyclists.	X	X	X

		Projects		
ATCMTD Goals	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Delivery of economic benefits by reducing delays, improving system performance and throughput, and providing for the efficient and reliable movement of people, goods, and services	IV-2 will specifically target the freight industry to reduce delays and improve the performance of the transportation network and movement of goods in North Denver by providing travel time reliability as a City service.		X	
Accelerated deployment of vehicle-to-vehicle, vehicle-to-infrastructure, and automated vehicle applications, and autonomous vehicles and other advanced technologies	All three IV projects are focused on deploying connected vehicle technology. IV-1 will build the foundational CV operational environment necessary to deliver the DSRC freight signal priority application for IV-2 and deploy the Connected Citizen test bed for IV-3.	X	X	X
Integration of advanced technologies into transportation system management and operations	The applications deployed for each project will be integrated into the daily operations of our transportation system and network through building a CV operational environment for the Denver TMC (IV-1).	X		
Demonstration, quantification, and evaluation of the impact of these advanced technologies, strategies, and applications toward improved safety, efficiency, and sustainable movement of people and goods	By building a CV operational environment at the Denver TMC (IV-1), deploying DSRC technology in the North Denver freight corridor (IV-2), and deploying innovative APD technology (IV-3), we will demonstrate advanced technologies and gain the ability to quantify and evaluate the impact and benefits of these deployments.	X	X	X
Reproducibility of successful systems and services for technology and knowledge transfer to other locations facing similar challenges	All three of the IV projects are designed to serve as a model for other cities so that the technology and approach are both replicable and transferable around the nation.	X	X	X

Linkages to Ladders of Opportunity

We have a vision for our transportation future in Denver – A city where transportation and technology break down barriers and connect *all* people to mobility freedom and opportunity. All of our Smart City Program projects are targeted toward the areas of greatest need: West, North, and Northeast Denver, including the neighborhoods of Sun Valley, Globeville, Elyria-Swansea, and Montbello. Figure 3 (below) shows the geographic areas for our underserved communities. Specifically, Intelligent Vehicle project IV-2 will bring long overdue safety improvements for our underserved communities in North Denver by decreasing freight traffic in the Globeville, Elyria-Swansea and Montbello neighborhoods. While these neighborhoods have linkages to ladders of opportunity, those opportunities are being blocked by safety and congestion issues. Improved efficiency for freight movement in North Denver means less congestion, pollution, and noise in the neighborhoods most impacted by the industry. This will allow residents of these underserved communities to utilize their existing linkages to ladders of opportunity.

Figure 3. Underserved Communities in West, North, and Northeast Denver



5. Transportation Systems and Services

Automated Vehicle (AV) technology continues to advance at a rapid pace. Transformational benefits are on the near horizon and will bring greater safety, efficiency and access to transportation for residents, commuters and tourists – especially the young, elderly, disabled and underserved. Our Smart City Program will advance automation by funding projects that prepare our residents, our infrastructure and Colorado's regulatory environment for this technological revolution.

We recognize connectivity as a critical first step in ensuring a safe and coordinated environment for AVs. CV technology enables a transportation network to operate as an integrated system with Vehicle-to-Vehicle (V2V), Vehicle to Infrastructure (V2I) communication, and Vehicle-to-Device (V2X) communication. Many aspects of CV technology are ready for adoption today and offer significant opportunities to improve safety, mobility, and environmental impact. Denver is committed to realizing CV implementation with three key IV Projects to solve real safety and

congestion challenges that we are facing today and need to solve. We are building a future in connected automation to systematically align the needs of users and businesses with the transportation network for a safer, smarter and more environmentally friendly Denver. Below we present the proposed transportation systems and services for each of these projects.

IV-1, Connected TMC and Connected Fleets. TMC has significant infrastructure in place that will be leveraged for IV-1, including the 1,200 traffic signals, 460 closed circuit TV cameras and thousands of sensor and detection devices it operates and maintains. TMC operators monitor roadway conditions, special events and incidents seven days per week. The Denver TMC also shares data with CDOT's TMC. With a vast amount of data and ITS capability, Denver TMC operators often have valuable insight into the impacts of traffic, roadway construction and incidents – but they have limited ability to share that information with the traveling public. Our Smart City Program will develop a CV architecture and build an operational environment at the Denver TMC to reduce congestion and improve safety by connecting directly with travelers. We will immediately empower the CV environment by delivering DSRC applications for freight efficiency and by creating a live testing system for our most congested corridors – preparing Denver to be the first city that actively uses DSRC data for traffic signal control.

Waze Connected Citizens Program for Safety and Mobility. Denver is home to an estimated 150,000 active Waze users who report nearly 240,000 alerts while driving 25 million miles per month. They provide valuable insight into roadway conditions and incidents. By establishing a two-way data exchange between Waze and the Denver TMC at zero cost to our program, we will: 1) gain greater insight into roadway conditions with real-time incident and traffic jam information; 2) reduce traffic congestion with improved traveler information to reroute users around road closures, construction and incidents in real-time; 3) implement a Vision Zero messaging campaign to improve safety at our most dangerous intersections; 4) improve incident response times; and 5) make data-driven infrastructure decisions for smarter urban planning.

Denver TMC CV Operational Environment. As Denver adopts CV technology, we will establish the organizing principles and fundamental building blocks of a CV operational environment for the TMC. To utilize the expansive new data enabled by CV technology, it will be essential that the TMC be capable of collecting, parsing, storing, mining and analyzing CV data. Using the Connected Vehicle Reference Implementation Architecture as a guide, we will partner with CDOT and DRCOG to update the ITS Architecture for the Denver Regional Area and to ensure regional and national transferability of the architecture.

The CV architecture will support all physical components of a CV operational environment including existing ITS infrastructure, DSRC roadside equipment, vehicle-based DSRC devices, and other CV traveler equipment including portable DSRC, smartphones, tablets and satellite-based systems. We will deliver the computing, storage, privacy, security and data access capabilities necessary to develop center-based data management systems and connections to support services, including the USDOT Security Credential Management System, for our CV environment. We will design, build and test the Denver TMC CV operational environment as a foundation for a future with increasing CV data and to support our Smart City CV applications immediately. Attachment D is a context diagram showing how the Denver TMC CV operational environment will be delivered in parallel and work in harmony with our existing ITS and traffic management infrastructure.

Connected Fleets. City fleet vehicles blanket the city through daily operations. Equipped

vehicles are essential to the design, testing and operation of the Denver TMC CV operational environment. We will equip our fleet of 1,500 light- and heavy-duty vehicles with DSRC to lead by example and immediately generate Basic Safety Messages as vehicles move throughout the city. We will install DSRC roadside units at the three primary City facilities to facilitate capturing, processing, and analyzing the BSM data generated by fleet vehicles. We will launch a DSRC Equip Program to equip an additional 1,500 vehicles for citizens and partner fleets.

Tasks. We will complete the following tasks to successfully deliver project IV-1:

- **Task 1:** Develop project plan
- **Task 2:** Collaborate with Waze Connected Citizens Program to enhance traveler information
- **Task 3:** Design, build and test the Denver TMC CV environment
- **Task 4:** Equip the City fleet with DSRC
- **Task 5:** Design and launch DSRC Equip Program for other fleets and individual consumers

IV-2, Travel Time Reliability for Connected Freight. Colorado is home to three federally designated high priority corridors – Heartland Expressway, Ports-to-Plains and Camino Real – that pass directly through metro Denver (map of freight corridor included as Attachment C). Freight movement is closely connected to the health of our economy and the transportation system in our state. The Colorado Freight System includes highways, rail lines, airports and other intermodal facilities. It delivers goods, creates jobs and provides economic opportunities to people statewide. The transportation and warehousing sector in Colorado contributes $79 billion to Colorado's economy each year[11].

Given that a great majority of the region's population and traffic growth is expected to occur within I-25's north-south and I-70's east-west corridors, and that significant highway expansion is not likely, congestion will continue to be a challenge for freight movement. The Denver neighborhoods and local roads near major freight facilities and distribution centers are significantly impacted by freight traffic, noise and pollution. ***We have received complaints for decades about serious safety issues where trucks are traveling the same neighborhood streets where children walk to school.*** As plans proceed for the federally funded $1.2 billion reconstruction of I-70, underserved communities such as Globeville, Elyria-Swansea and Montbello stand to face even greater impacts during the extended construction than they already experience.

CV technology presents a wealth of capabilities to address these challenges. Denver will implement a Freight Efficiency Corridor Program and provide travel time reliability northeast of downtown in partnership with CDOT, Peloton Technology and Econolite.

Freight Efficiency Program. Denver will convene a broad stakeholder group to serve as the Freight Efficiency Corridor Program's Project Leadership Team (PLT). The PLT will consist of representatives from key equity partners to represent underserved communities. Other team members will include representatives from CDOT's Freight Advisory Committee, Colorado Motor Carrier Association, Metro Denver Chamber of Commerce, Metro Denver Economic Development Corp., Peloton Technology, UPS, FedEx, Safeway, and Walmart. The program will provide: 1) designated parking and staging areas for freight movement into the Denver area; 2) regularly updated and comprehensively defined routes for all freight traffic, not just oversize or hazardous movements; and 3) enhanced data collection capabilities to understand, assess and

[11] CDOT (2015). State highway freight plan.

respond to freight movement through Denver communities.

Travel Time Reliability as a Service Using Freight Signal Priority. Denver will be the first in the nation to deliver travel time reliability as a service to the freight industry using traffic signal priority. This has three major benefits, as it 1) incentivizes fleets to equip with DSRC at their expense, 2) gives Denver the opportunity to drive business rules for freight travel through the City in order to reduce peak period traffic and lessen the impact on underserved communities, providing proactive instead of reactive guidance to the freight industry, and 3) coincides perfectly with upcoming I-70 reconstruction, which will require extensive freight industry engagement. We will use technology to provide a service and help the industry navigate the construction impact instead of merely offering information about the impact.

To deliver this service, we will:

- Equip designated arterials and freeways with 100 DSRC Road Side Units
- Design, test, deploy and evaluate a DSRC-based freight signal priority application in partnership with Econolite
- Launch travel time reliability as a City service to freight fleet operators as an incentive to equip their fleets with DSRC technology facilitated by Peloton Technology
- Demonstrate a first-in-the-nation arterial freight platooning operation with signal priority using Peloton and Econolite technology to exhibit future possibilities

Providing a travel time reliability service to the freight industry will not only reduce the high cost and environmental impact of freight congestion but it will significantly improve the quality of life in the neighborhoods and underserved communities that surround many of Denver's high throughput freight facilities and distribution centers.

Tasks. We will complete the following tasks to successfully deliver project IV-2:

- **Task 1:** Develop project plan
- **Task 2:** Engage stakeholders and develop a Freight Efficiency Corridor Program
- **Task 3:** Design and launch Freight Efficiency Corridor Program
- **Task 4:** Design, develop, test and deploy freight signal priority on arterials
- **Task 5:** Coordinate outreach and communication to freight industry via Peloton Technology
- **Task 6:** Launch Denver travel time reliability service for connected freight
- **Task 7:** Evaluate Denver travel time reliability service for connected freight
- **Task 8:** Design, develop, test and demonstrate arterial freight platooning operation using freight signal priority

IV-3, Safer Pedestrian Crossing for Connected Citizens. Federally assisted pilot programs for Automated Pedestrian Detection (APD) are needed in the United States in order to collect and evaluate pedestrian and driver interaction with technologies like Rectangular Rapid Flashing Beacons (RRFB) and Hawk Signals installations. There are increasing demands on public agencies to promote safer walking and biking to improve public health, improve air quality, and to reduce vehicle congestion. The ATCMTD grant provides the opportunity to deploy APD at unprotected midblock trail crossings in conjunction with RRFB. This pilot project will install APD devices to enhance traditional pedestrian push buttons at four unprotected midblock trail crossings, including Weir Gulch Trail at Decatur Street, Lakewood Gulch Trail at Knox Court, High Line Canal Trail at Monaco Street and High Line Canal Trail at Yale Street.

The initial pilot project will be used to place pedestrian, or bicycle calls in lieu of pedestrian push

buttons. It will also be used to extend flashing beacon times for late arriving and slower than average pedestrians. It is anticipated that installing APD in conjunction with RRFBs will assist bicycles and mobility impaired people who cannot always reach or find the pedestrian push buttons. Field data from these locations will be continuously sent to Denver's Traffic Management Center (TMC) for public access, research, field testing, and fine tuning of the APD system. Findings from this pilot will also be used for APD implementation at Hawk Signals, and traditional signalized intersections. This project will also serve as a test bed for Connected Citizen pedestrian warning systems by collecting and disseminating pedestrian and bicycle crossing information via DSRC.

Tasks. We will complete the following tasks to successfully deliver project IV-3:

- **Task 1:** Develop project plan
- **Task 2:** Develop, test, and deploy APD at four selected pilot locations
- **Task 3:** Develop, test, and deploy Denver TMC connection to APD field devices
- **Task 4:** Evaluate APD implementation
- **Task 5:** Develop, test, and deploy DSRC at APD locations to collect and disseminate pedestrian and bicycle crossing information

6. Long-Term Operations and Maintenance

The USDOT Smart City Challenge, along with all of our ongoing Smart City efforts, has been prioritized to ensure we meet the current and future expectations of our customers in the community. This prioritization is evident in our ongoing budgeting processes for a variety of resources including staffing, materials, and evaluation. Our commitment will stand strong as we continue to set goals and drive toward a variety of outcomes, many of which will only be achieved outside of the proposed three year ATCMTD grant period of performance. Denver is and intends to continue to be transparent in our priorities and funding for innovative, entrepreneurial, and technological approaches to achieve affordable, safe, reliable transportation outcomes and mobility freedom for all members of our community. We believe our commitment to transparency with our community necessitates accountability with our staff and elected/community leaders.

In our budget estimate, we have provided the expected continued annual investment necessary beyond the three-year period of performance (see Attachment E). We will ensure long-term operations and maintenance of the proposed systems by programming this into our annual budget process. The long-term operations and maintenance activities that will be programmed include annual maintenance, utility upgrades, end of useful life replacements, and periodic repairs.

7. Challenges to Deployment

The key challenges related to our Smart City Program are presented in the graphic below as technical, policy, and institutional project risks along with a proposed mitigation strategy and estimated level of impact.

Figure 4. Anticipated Challenges and Mitigation Strategies

Risk Category	Risk	Mitigation Strategy	Impact
Technical	Addressing system security and data privacy	Prioritize security and privacy using national and regional standards to guide the design of the Enterprise Data Management platform and ensure all data in and data out of the Smart City system is properly managed.	High
	Managing the complexity of a Smart City system	Establish an experienced team of systems engineers prepared to handle the multilayered task of integrating multiple system inputs for a large, complex deployment.	Medium
	Prioritizing Smart City solutions	Build a cross-discipline stakeholder group representative of the users of the system.	Medium
	Addressing data quality and integrity issues	Avoid the "trash-in, trash-out" problem by establishing data quality standards and checking data quality before, during, and after implementation.	Medium
	Matching the pace and availability of emerging technology	Institute a user-needs approach to implementing technology. Allow the needs and availability of technology to drive the solutions rather than select and implement a technology without a defined goal.	Low
Policy	USDOT drops commitment to Smart City implementation	Leverage other federal funds and seek additional local resources to implement as many of the Smart City Program elements as possible.	Low
Institutional	Cost overruns/scope creep	Develop and implement a meaningful and actionable Program Management Plan to help control costs and ensure minimal scope creep while continuing to allow for changes to the Program that maintain alignment with the grant's goals.	Medium
	Lack of (or reductions in) stakeholder support	Reinforce stakeholder support prior to project kick-off and maintain positive working relationships and open communication with all stakeholders.	Medium
	Inability to reach agreement among project partners	Reinforce agreements with project partners prior to beginning of Program, and require adherence to the Program Management Plan throughout the life of the project.	Low
	Lacking financial sustainability to continue program	Ensure partners' long term commitment to Program components and institutionalize those elements moving forward.	Low

8. System Performance Improvements

Performance measurement is strongly embedded in Denver's culture and provides significant value to Denver. For the last four years, Peak Performance, Peak Academy and Peak Analytics have established a performance framework throughout the entire City enterprise to actively manage, innovate and improve delivery of services. The simple framework requires agencies to establish a strategic plan, develop performance measures, create a cadence of accountability and participate in training and receive coaching on improving service delivery.

Each agency meets regularly with the Mayor, Budget Director, Chief Performance Officer and others to review key performance indicators and discuss innovations and challenges within the agency. Peak Academy works with every agency's front line staff on problem solving, process improvement and innovation. Since the inception of Peak, this nationally recognized program has trained more than 5,000 employees and resulted in $15 million worth of hard and soft

savings to the City and additional value created for citizens. In the second half of 2016, Peak will conduct multiagency report-outs on coordinated efforts to achieve the City's 2020 Sustainability Goals.

Following Peak standard practices in problem definition, Denver will begin a Performance Measurement Plan for our Smart City Program by creating a logic model for each IV project. Using stakeholder input, these models will outline the project scope and enumerate all relevant inputs, outputs, key short- or long-term outcomes and metrics that will be used to quantify performance. The plan will also detail major assumptions, including identification of external factors that could impact results, and will create an actionable plan to achieve outcomes.

With this approach, Denver will target measurable outcomes for the three proposed Smart City Program projects, IV-1 through IV-3 (see Table 5 below), which are expected to be nearly or completely met by the first year after project implementation. While IV-1 and IV-2 are anticipated to create significant performance improvements, IV-3 is not anticipated to improve system performance, due to its focus on safety and the pilot nature of the project.

Table 5. System Performance Improvements

Smart City Program Project	System Performance Improvements
IV-1: Connected Traffic Management Center and Connected Fleets	• Reduce incident response times for citizen-reported crashes by 30% • Increase DSRC vehicle market penetration to 10% by 2020
IV-2: Travel Time Reliability for Connected Freight	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports of interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods

9. Safety, Mobility, and Environment Benefits

In addition to the system performance improvements identified above, Denver will target the following safety, mobility, and environmental benefits for the three proposed Smart City Program projects, IV-1 through IV-3 (see Table 6). These benefits are expected to be realized by the first year after project implementation.

Table 6. Safety, Mobility and Environmental Benefits

Smart City Program Project	Safety, Mobility, and Environmental Benefits
IV-1: Connected Traffic Management Center and Connected Fleets	• Reduce injuries at identified Vision Zero intersections by 30% • Reduce crashes at identified Vision Zero intersections by 30% • Analyze the 240,000 monthly Waze user reports for traffic flow and incident patterns • Reduce incident response times for citizen-reported crashes by 30%

Smart City Program Project	Safety, Mobility, and Environmental Benefits
IV-2: Travel Time Reliability for Connected Freight	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports of interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods • Reduce spot measurement of emissions at heavy freight movement intersections by 50% for platooning demonstration • Increase throughput at intersections by a factor of two to three times for platooning demonstration
IV-3: Safer Pedestrian Crossings for Connected Citizens	• Reduce conflicts and near-misses at uncontrolled trail crossing pilot locations • Provide safer walking and biking opportunities to improve public health, reduce vehicle congestion, and improve air quality

Benefit projections for IV-3 are unable to be quantified at this time due to lack of baseline data on conflicts and near misses at trail crossings. Implementing IV-3 will allow us to track and measure this data to quantify these conflicts moving forward.

10. Vision, Goals and Objectives for the Deployment

Goal setting, continuous improvement and performance measurement are fundamental to Denver's entire business practice. For example, we set goals for sustainability and measure against them in every possible category, including air quality, climate, housing, mobility and workforce. Four years ago we launched Peak Performance, a citywide improvement program designed to transform Denver into a data-driven government. Our vision for our Smart City Program is to "create a city where transportation and technology break down barriers and connect all people to mobility freedom and opportunity." We have identified three (3) overarching goals which are all relevant to the proposed IV projects. Table 7 (below) presents each goal and its relevant impact area and component. For Goal 1, we present our detailed objectives, targeted measurable outcomes (see Table 7). As Goals 2 and 3 are broad reaching, they do not have specific measurable outcomes.

Table 7. IV Project Goals, Objectives, and Measurable Outcomes

Goal #1: Improve Connectivity Impact Area(s) – Ladders of Opportunity, Mobility, and Safety	
Objectives	**Measurable Outcomes**
1. Build a connected vehicle operational environment at the Denver Traffic Management Center	• Reduce injuries at identified Vision Zero intersections by 30% • Reduce crashes at identified Vision Zero intersections by 30% • Analyze 240,000 monthly Waze user reports for traffic flow and incident patterns • Reduce incident response times for citizen-reported crashes by 30%

Goal #1: Improve Connectivity Impact Area(s) – Ladders of Opportunity, Mobility, and Safety	
Objectives	**Measurable Outcomes**
2. Equip 3,000 vehicles with dedicated short range communication (DSRC) to jumpstart market penetration	• Increase DSRC vehicle market penetration to 10 percent by 2020
3. Offer travel time reliability service to freight industry using DSRC-based traffic signal priority	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports for interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods • Reduce spot measurement of emissions at heavy freight movement intersections by 50% for platooning demonstration • Increase throughput at intersections by a factor of two or three times for platooning demonstration
Goal #2: Leverage Partners Impact Area(s) – Efficiency	
Objectives	
1. Leverage CDOT's $20 million RoadX Program and their additional $7M contribution to bolster our projects focused on freight efficiency and integrated freeway and arterial operations (IV).	
2. Deploy the first implementation of Econolite's new Connected Vehicle intersection controller, Cobalt Sky™ (IV).	
Goal #3: Collaborate at Every Level Impact Area(s) – Efficiency	
Objectives	
1. Unite cities around the nation with local, national and international experts through our SMART Council.	
2. Deliver technology-driven solutions designed by and for our communities that are measurable, scalable, replicable and exportable to cities nationwide.	
3. Collaborate with and provide open access to USDOT's independent evaluation team to monitor our progress toward our goals, objectives, and measurable outcomes.	
4. Publish our Smart City Program performance metrics to visualize progress toward our goals and objectives.	

11. Partnership Plan

Denver recognizes that cities need to move beyond fragmented or incremental thinking in today's fast-paced global economy, especially when it comes to instituting new technologies. Cities must build and continuously renew networks of collaborators and partners. To engage in and utilize partnerships for the Denver Smart City Program, we will create a Start-ups, Municipalities and Academic Research for Technology (SMART) Council.

SMART Council

Denver's SMART Council will lead and inform our program and provide us with a vehicle for sharing, replicating and exporting results. The SMART Council will unite the City with start-ups, tech innovators, municipalities across the nation and the world, academic researchers, and transportation service providers. The SMART Council will be essential to successfully delivering the proposed Intelligent Vehicle projects for the ATCMTD grant opportunity and will serve as our strategy and plan for ensuring successful partner engagement through the period of performance. The Council will be organized into four sub groups under our Smart City Program that will meet quarterly and report to the Smart City Executive Team:

1. Local SMART Council Work Group. At the local level, Denver will establish a community-based SMART Council Work Group. Mobility users, neighborhood residents, stakeholder organizations and nonprofit providers such as Mile High United Way and Mile High Connects (a cross-sector partnership of organizations committed to increasing access to housing) will provide key input into our program. We also will engage foundations, neighboring municipalities, and organizations such as RTD, DRCOG and the Metro Mayors Caucus. This local SMART Council Work Group will meet at least quarterly to ensure stakeholder input is central to the projects.

2. National/International Cities SMART Council. The reach of the SMART Council will go far beyond our local borders. We will invite the six other Smart City Challenge finalist cities to join the national and international arm of the SMART Council, as well as other national and global cities. This concept has already received support from 20 cities, including Atlanta, Indianapolis, Baltimore and Seattle. Denver will partner with Transportation for America and utilize its already established network of partner cities and organizations to ensure that we share our successes and challenges with a dedicated group of communities. This group will serve as an assembly of ideas, where concepts will be shared during an annual global summit, regular face-to-face meetings, online webinars and on our Smart City website. This will be the forum for the brightest minds from around the country and the globe to help us refine our projects and prepare them for scaling and exporting.

3. Start-Up/Entrepreneurial Community – SMART Council Spark. Denver has cultivated powerful partnerships with the Colorado Technology Association, local tech incubators Galvanize and Innovation Pavilion, and national organizations such as 1776. These and other engines of innovation and new ideas will serve on the SMART Council's Spark Committee to infuse new energy into our thinking and project applications.

4. Research and Education – Academic SMART. Academic SMART Council, co-led by Colorado State University and the University of Colorado Denver, will bring an important research component to our Smart City Program. Other coalition members will include Colorado School of Mines, North Dakota State University, Mountain Plains Consortium University Transportation Center, Virginia Tech Transportation Institute and University of California Riverside. The National Renewable Energy Laboratory and Electric Power Research Institute will also contribute to this subset of the SMART Council.

This research arm of the SMART Council will bring together multidisciplinary teams of researchers, educators, policymakers and stakeholders to conduct collaborative research that addresses the fundamental challenges of implementing Smart City technologies and informs decisions that lead to energy, economic, environmental, social and cultural sustainability. Understanding these challenges and the underlying impacts of smart city technologies is a vital

component of replicable strategies.

The Academic SMART Council will also focus on education and workforce development to help develop the next generation of Smart City professionals, particularly women and underrepresented minorities in STEM fields. The committee will oversee a K-12 educational outreach program through partnerships with UCD, Colorado Mathematics, Engineering and Science Achievement and the Denver Schools of Science and Technology.

12. Existing Local and Regional Advanced Transportation Technology Investments Plan

Currently, Denver invests over $150 million annually on capital improvements, including critical maintenance and rehabilitation projects, high priority capital investments, and leveraging state and federal dollars. Partnered with DRCOG, Denver has a long history of developing, designing, implementing, and maintaining ITS devices. Through Congestion Mitigation and Air Quality Federal Funding two main ITS funding mechanisms have been established. The Transportation Improvement Program (TIP) is used by Denver to implement transportation projects with objectives to address air quality issues. The Traffic Signal System Improvement Program (TSSIP) is an operations improvement tool used by Denver. Benefits for both types of projects are demonstrated through air quality improvement data and reporting. The following projects are some of the current ITS projects:

- *Transit Signal Priority (TSP) Pilot Project.* Denver in collaboration with the Regional Transportation District successfully implemented a pilot TSP on Colorado Boulevard. The results of this pilot implementation illustrated that TSP is technically feasible.
- *Center-to-Center Demonstration*. DRCOG, Denver, Littleton, Englewood, and CDOT completed a demonstration project involving center-to-center communications between traffic signal systems at neighboring agencies. The purpose of the demonstration project was to control the group of signals operated and maintained by several agencies on Santa Fe Drive in response to changes in traffic volume, generally due to a diversion from the freeway.
- *Bicycle Detection.* Funds were allocated to Denver for pilot implementations of bicycle detection. Bicycle detection will allow more efficient operations while continuing to accommodate bicyclists.
- *CMAQ Benefits of Uninterruptible Power Supplies and Ethernet Conversion*. The implementation of Uninterruptible Power Supplies (UPS) and Ethernet Communications protocol both condition the power for the controllers and maintain signal operations during power interruptions. Both of these functions help the signal system provide more reliable operations.

Table 8. Current CMAQ TSSIP projects:

TSSIP Fiscal Year Expenditures					
Projects	**FY 2013/14**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Denver Colorado Blvd: 1st Ave - 50th Ave		$1,078,000			
Speer Blvd: Elitch - 13th Ave X					
Central Business District (CBD) Ph 1					$1,222,000
Central Business District (CBD) Ph 2			$1,029,000	$1,060,000	
DTC Blvd: Tamarac St - Union Ave					
Colorado: Hampden to 1st	$484,000				

TSSIP Fiscal Year Expenditures					
Projects	**FY 2013/14**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Colfax: Sheridan to I-25	$747,000				
Colfax: Logan to Yosemite					

Table 9. Current TIP projects

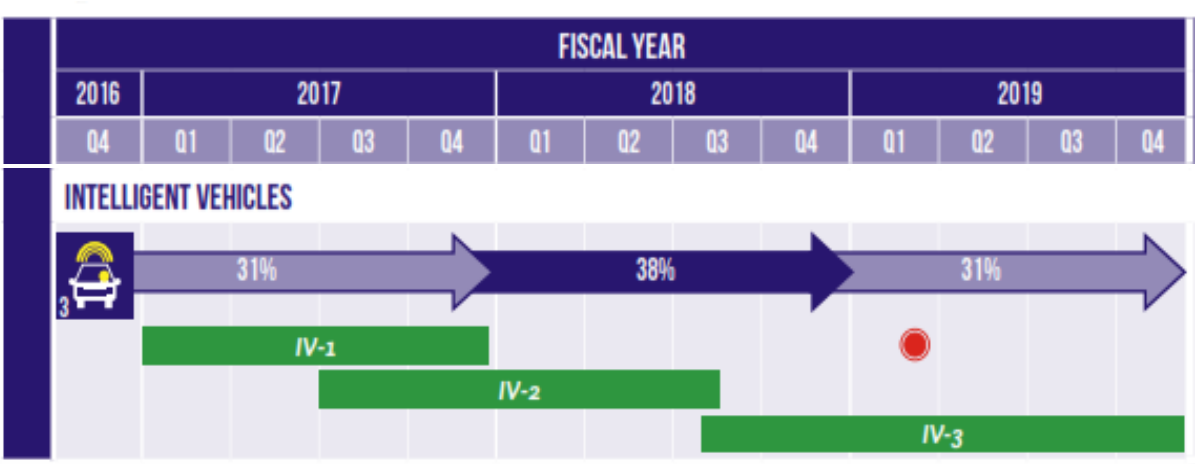
Denver TIP Fiscal Year Expenditures					
City Wide Implementation Projects	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**Total**
Federal Portion	$1,090,000	$1,340,000	$1,344,000	$1,026,000	$4,800,000
Denver Match	$542,000	$666,000	$668,000	$509,000	$2,385,000
Total	$1,632,000	$2,006,000	$2,012,000	$1,535,000	$7,185,000

These projects represent existing and future ITS infrastructure investments which all serve as standalone data sources and strategies. The IV-1 project will integrate all Denver TMC data sources, including the aforementioned investments, to leverage every available resource. Projects IV-2 and IV-3 will be implemented in areas that are long overdue for technology investment. As there is a lack of existing technology for these projects to leverage, IV-2 and IV-3 will become the foundation upon which future projects can build. However, our staggered implementation approach for these projects will allow IV-2 and IV-3 to build off the technology foundation established by IV-1.

13. Deployment Schedule

Figure 5 (below) provides a high-level summary of the deployment schedule for the proposed IV Projects across the three-year period of performance beginning in Quarter 4 of 2016. The IV projects will be delivered with a staggered approach. The percentages shown in Figure 5 represent the percentage spent. Quarter 4 of 2016, beginning October 1, will begin the project initiation phase. This will include the kick-off meeting within four weeks after the grant is awarded, as well as monthly reports. Delivery of project IV-1 will occur in 2017, IV-2 in 2018, and IV-3 in 2019. These time periods also include monthly reports as well as an annual report to the Secretary. Additionally, Denver has a commitment to evaluate the effectiveness of these IV Projects, including the cost-benefit.

Figure 5. Deployment Schedule



14. Innovative Technology Initiatives

Smart City and CV technologies provide an exciting opportunity to revitalize the transportation network with transformative data analytics and powerful applications, and are another form of ITS that should adhere to the national and regional vision for ITS architecture, standards and certification processes.

The Smart City Program will require expanding our ITS Regional Architecture in order to establish the framework for Smart City and CV concepts to be implemented across the metro area. This will position the entire region as an agent of change and a benchmark for the nation. We will jumpstart an update to the architecture by leveraging CDOT's RoadX project and the available architecture and standards work completed by the USDOT for CV concepts. The USDOT's CV Reference Implementation Architecture (CVRIA) provides the physical, functional, communications and enterprise architecture viewpoints as guidance for implementing CV applications. More importantly, the CVRIA was built to ensure CV deployments fit into the greater National ITS Architecture, enabling a standards-based implementation that will ensure the new system can be seamlessly integrated into existing transportation management and ITS systems for the region and as a model for additional Smart Cities to follow.

For CV technologies, Denver will coordinate with USDOT-appointed certification bodies in the selection and procurement of all DSRC devices and utilize the newly developed Crash Avoidance Metrics Partnership (CAMP) security certificate management system processes and procedures for the deployment and management of security certificates for DSRC devices. For all Smart City or CV architecture and standards activities, Denver will engage and coordinate with national and international standards development organizations to ensure future deployments benefit from the experiences and lessons learned from the Denver implementation. Attachment F showcases how Denver will leverage existing and innovative technology initiatives from USDOT and standards organizations throughout our Smart City deployment.

B. Staffing Description

1. Staffing Organization

For this program, Denver carefully identified the necessary project team of city staff (including two new positions) who will participate in and lead the effort. Our staff will be supplemented by contractor support from Jacobs Engineering, Econolite, and Peloton Technology. CDOT will provide additional regional partner support. Jacobs Engineering will be responsible for IV Project management (see Section A2, under Program Management Approach), overseen by key

City Staff including:

Steve Hersey, City Traffic Engineer, IV Project Manager. Steve is Denver's co-lead for Connected and Autonomous Vehicles, and has a wealth of experience dating back to 1993 when he began working for CDOT in the Traffic Engineering group. His extensive work on Colorado's first managed lane corridor, including tolling and active traffic management infrastructure, will be invaluable on this program. His ability to integrate traditional traffic engineering systems with connected and autonomous vehicle technologies will help to achieve the desired project outcomes. Steve will be responsible for overseeing the scope, schedule, and budget of this project.

Michael Finochio, TMC Engineering Manager, IV Technical Manager. Michael will co-lead with Steve and is responsible for traffic operations, ranging from ITS devices to traveler information, directing construction projects, contracts, budgeting, and day-to-day operations. He serves as a subject matter expert on ITS design, implementation, and operations. Michael has close working relationships with various regional and national players in the transportation arena.

These key City staff will be supported by the SMART Council (see Section A11, Partnership Plan) and the Mayor's Executive Leadership Team (see Section A2, under Program Management Approach) for all IV Projects.

2. Primary Point of Contact

The primary point of contact for the project will be Michael Finochio:

Michael Finochio, Engineering Manager
Public Works/Transportation & Mobility, City and County of Denver
Office: 720-913-0801
E-mail: michael.finochio@denvergov.org

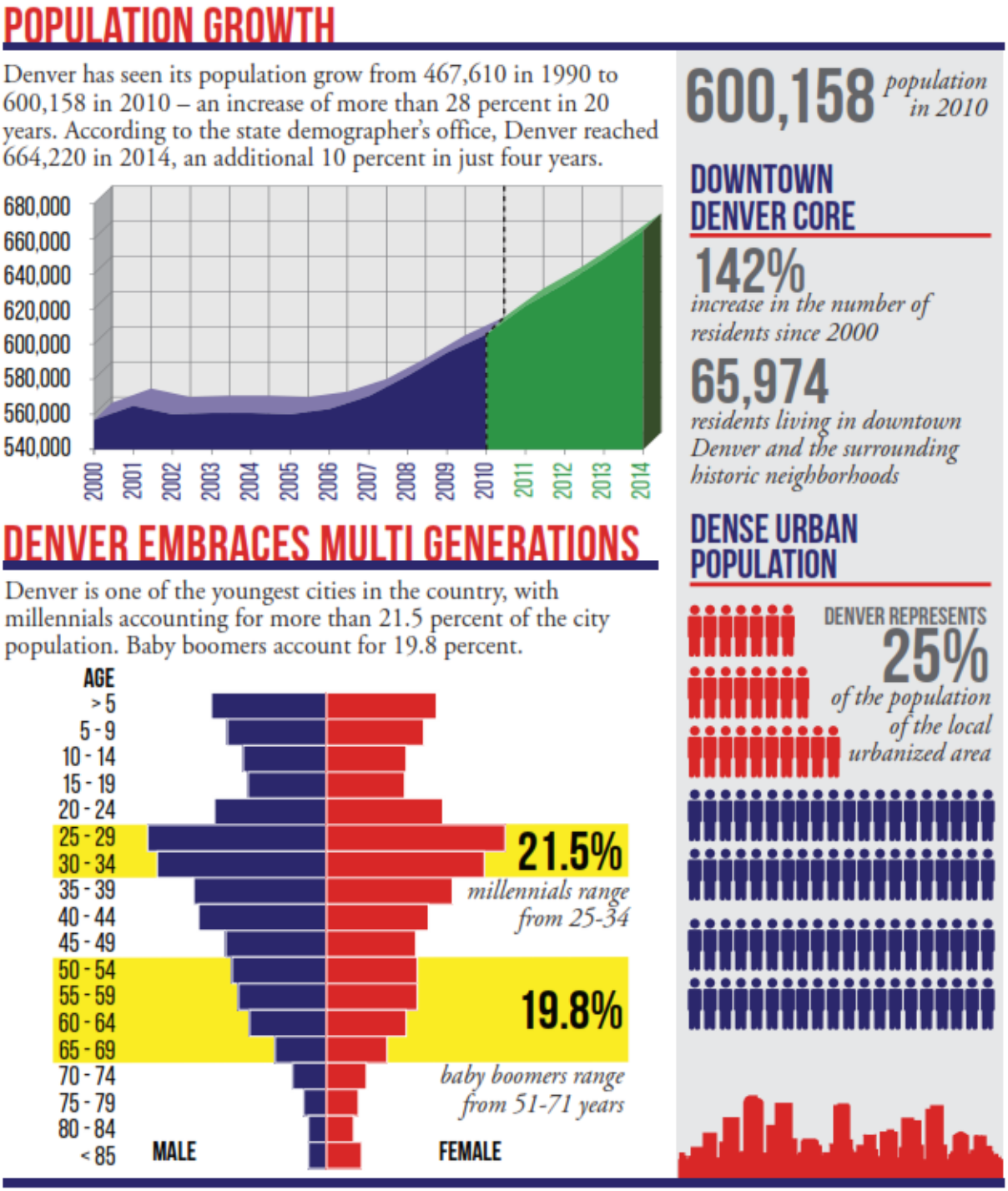
C. Funding Description

Table 10 below presents a breakdown of the estimated costs by proposed IV project, including an identification of the funding sources and amounts. If selected, the proposed IV projects will be funded by Denver (50% of total project funding) and through ATCMTD funds (50%). A more detailed budget estimate is included as Attachment E.

Table 10. Estimated Costs Rounded to the Nearest Dollar

Project	Denver funds	ATCMTD funds	Total
IV-1	$2,061,242	$2,061,242	$4,122,485
IV-2	$3,217,245	$3,217,246	$6,434,491
IV-3	$721,519	$721,519	$1,443,038
Total	**$6,000,007**	**$6,000,007**	**$12,000,014**

Supporting Documents
Attachment A. Denver Population Infographic



Attachment B. Partner Letters of Support

COLORADO
Department of Transportation
Office of the Executive Director
4201 East Arkansas Ave, Suite 262
Denver, CO 80222

June 20, 2016

The Honorable Anthony Foxx, Secretary
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: City and County of Denver Support Letter for ATCMTD Grant Application

Dear Secretary Foxx:

The Colorado Department of Transportation (CDOT) strongly supports the Advanced Transportation and Congestion Management Technologies Deployment Initiative (ATCMTD) application submitted by the City & County of Denver to implement Connected Traffic Management Center (TMC) and Connected Fleets; Travel Time Reliability as a City Service for Connected Freight and Safer Pedestrian Crossings for Connected Citizens.

Rapid population growth. Increased traffic congestion. Hundreds of traffic-related deaths and serious injuries each year. Air pollution. Numerous disconnected and disadvantaged communities. Those are just some of the challenges facing Denver and cities across the country. Denver was built by pioneers dedicated to achieving bold outcomes through collaborative, community-based problem solving. That spirit continues to drive us forward today. Our challenges are many, but they can be overcome.

With the ATCMTD grant, we have selected the following Intelligent Vehicles and Safety projects to address the serious challenges facing Denver today and will deliver measurable outcomes aligned with the ATCMTD goals and focus areas. These Intelligent Vehicle/Safety projects will usher in a new era of transformational technologies for Denver and the region, bringing greater mobility safety, efficiency and reliability to our transportation network.

Denver's contribution of $6.0 M of total local match demonstrates a firm belief and commitment in in these projects to improve connectivity, reliability and safety in our community. Denver staff will contribute far more through the day to day management of this funding opportunity and continuing to build out the comprehensive approach we developed through our Smart City Challenge application.

We thank you for your consideration of Denver's ATCMTD grant which will prepare us for coming advancements in automation and allow us to maximize our existing infrastructure; establish a first-in-the-nation Freight Efficiency Corridor Program, install DSRC along key routes, and offer travel time reliability as a City service using freight signal priority to incentivize freight operators to equip their fleets with DSRC; and address pedestrian crossings with new tools and technology to increase the safety of our community.

Please do not hesitate to contact me with any questions.

Sincerely,

Shailen P. Bhatt
Executive Director

4201 E. Arkansas Ave, Suite 262, Denver, CO 80222 P 303.757.9201 F 303.757.9656 www.codot.gov

ECONOLITE

Solutions that Move the World®

June 21, 2016

Robert Rupert
US Department of Transportation
1200 New Jersey Ave, SE
Mail Drop: E86-205
Washington, DC 20590

Dear Mr. Rupert:

Econolite is pleased to support the City of Denver's proposal response to the United States Department of Transportation's Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative. USDOT's investments over the last 15 years in Connected Vehicle (CV) standards and related technologies establishes a framework for innovations that are inducing a transformation of ITS. The ATCMTD initiative amplifies and expedites the application of these innovations with measurable benefit to the proposer that is awarded this opportunity.

The framework of connected vehicles provides opportunity to completely redefine the interaction between vehicles and infrastructure, enabling an entirely new methodology for traffic control. Econolite has been following USDOT's lead on CV for the last 15 years and is ready to release a new CV intersection controller. This ground-breaking technology overcomes prior limitations by providing the traffic controller with geometric awareness of the intersection as well as CV trajectory data as an input for vehicle demand. We believe this broadened awareness will enable an entirely new set of traffic control strategies, optimization models, and features.

The City of Denver has long been a progressive agency that embraces new technologies and leverages the opportunities opened by USDOT. Denver has identified means for Econolite to integrate our CV-based traffic controller within their IV-2 project that focuses on Travel Time Reliability for Connected Freight. For IV-2, Econolite will help build the value proposition of CV technologies to freight companies via ETA-based signal priority for freight vehicles.

ECONOLITE

Solutions that Move the World®

This program is designed to significantly expand the operational capabilities of the CV environment by leveraging the real-time data exchanges of connected vehicles to optimize traffic flow and safety. These solutions will seamlessly connect to other integrated systems within a smart-city network infrastructure. This ensures that the critical V2I building blocks are in place and ready to help agencies, freight companies, and local businesses realize the full potential of connected vehicles.

Econolite is excited to be part of this program and provides full support to the City of Denver in their pursuit of this opportunity.

Sincerely,

Eric Raamot
Vice President, Engineering
Econolite Control Products, Inc.

3360 E. La Palma Ave • Anaheim, CA 92806-2856 • PH: (714) 630-3700 • FAX: (714) 630-6349
P.O. Box 6150 • Anaheim, CA 92816-0150 • www.econolite.com

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June 23, 2016

Crissy Fanganello
Director of Transportation
Denver Public Works
City and County of Denver
201 West Colfax Avenue
Denver, CO 80202

RE: Denver's ATCMTD Grant Application

Dear Mrs. Fanganello:

I write in support of the City and County of Denver's United States Department of Transportation (USDOT) Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant application. The City and County of Denver's grant application will help the entire Denver metro area reap the benefits of a dedicated linkage between advanced technology and transportation solutions to improve mobility, increase safety, and increase efficiency.

Jacobs stands dedicated in our commitment to Denver. The capabilities of the project components included in the city's grant application will help the City assume a proactive stance with regards to congestion, safety, and efficiency while elevating Denver to a national leader in connected vehicle technology.

The ATCMTD will help enable the City and County of Denver to deliver innovative projects to help ensure residents se easing congestion, that businesses can operate more efficiently, and that pedestrians and bicyclists can move about the city in a safe manner. Jacobs strongly supports this grant application and looks forward to partnering with the City and County of Denver and other project partners in this endeavor.

Sincerely,

Julie Skeen
Rocky Mountain Operations Manager
Jacobs Engineering Group Inc.

Peloton Technology
1060 La Avenida Street
Mountain View, CA 94043
650.395.7356

www.peloton-tech.com

June 23, 2016

To: Crissy Fanganello
Director of Transportation & Mobility
Denver Public Works
City and County of Denver

Subject: Partner Letter of Support for the USDOT Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative

Dear Ms. Fanganello,

I am writing to express the support of Peloton Technology for the Denver Smart City Program ATCMTD proposal to USDOT. Specifically, Peloton Technology will support the project titled IV-2, Travel Time Reliability for Connected Freight.

Peloton will support the project with expertise which encompasses Intelligent Freight Vehicles, V2V and V2I Connectivity to improve mobility, and initial forms of vehicle automation. Peloton is developing innovative ITS platooning technology for heavy vehicles that features V2X (vehicle-to-vehicle/infrastructure/cloud) communications, radar-based active safety systems, vehicle control algorithms and a cloud-based Network Operations Center (NOC) to link heavy trucks traveling along freight corridors – connecting terminals, arterials, highways and interchanges. These systems can save fuel, reduce emissions, improve safety and enhance quality of life in the City.

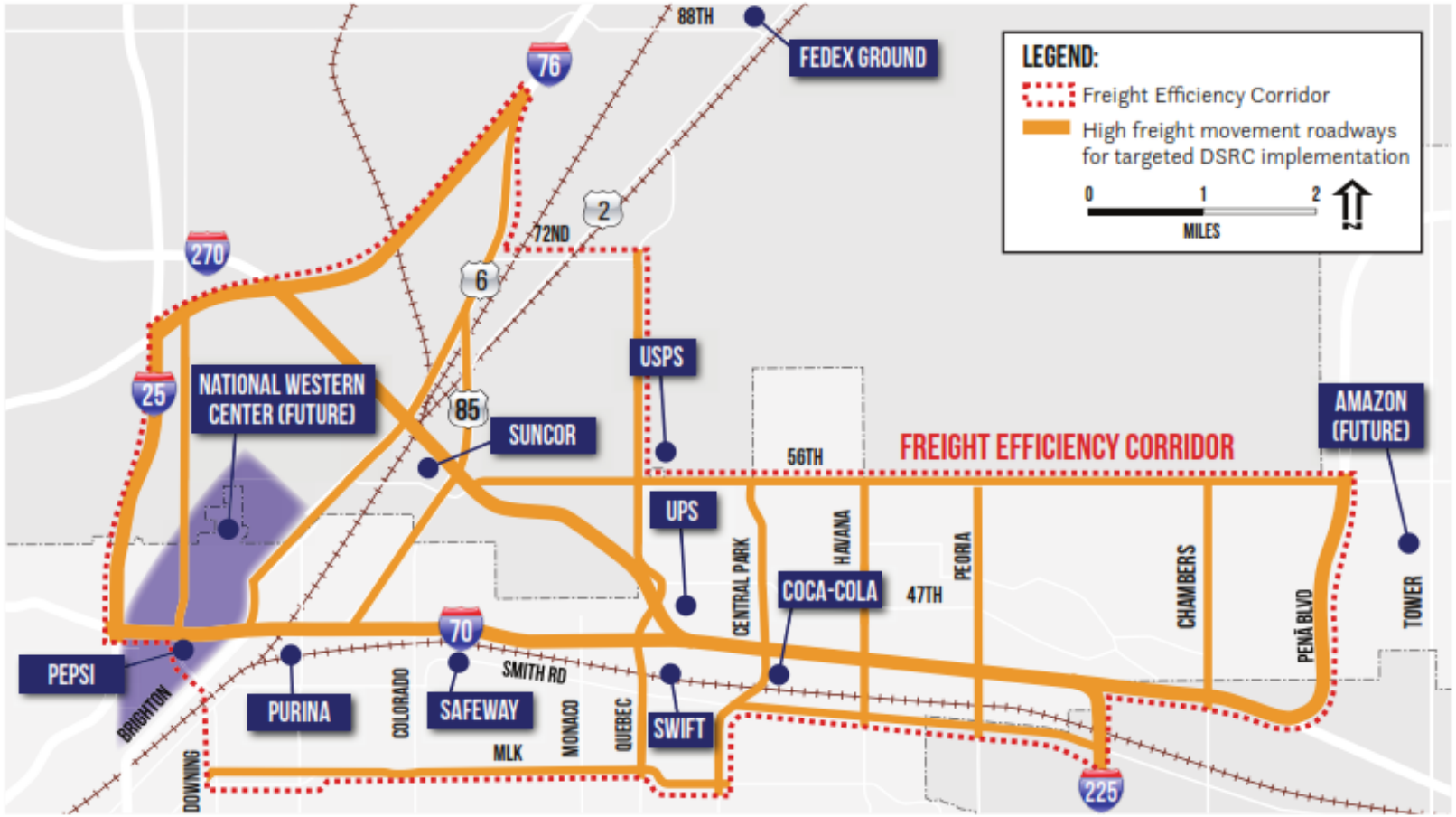
Peloton will also be pleased to serve on the IV-2 Project Leadership Team (PLT). We look forward to being a part of this exciting deployment effort.

Sincerely,

DocuSigned by:
Josh Switkes

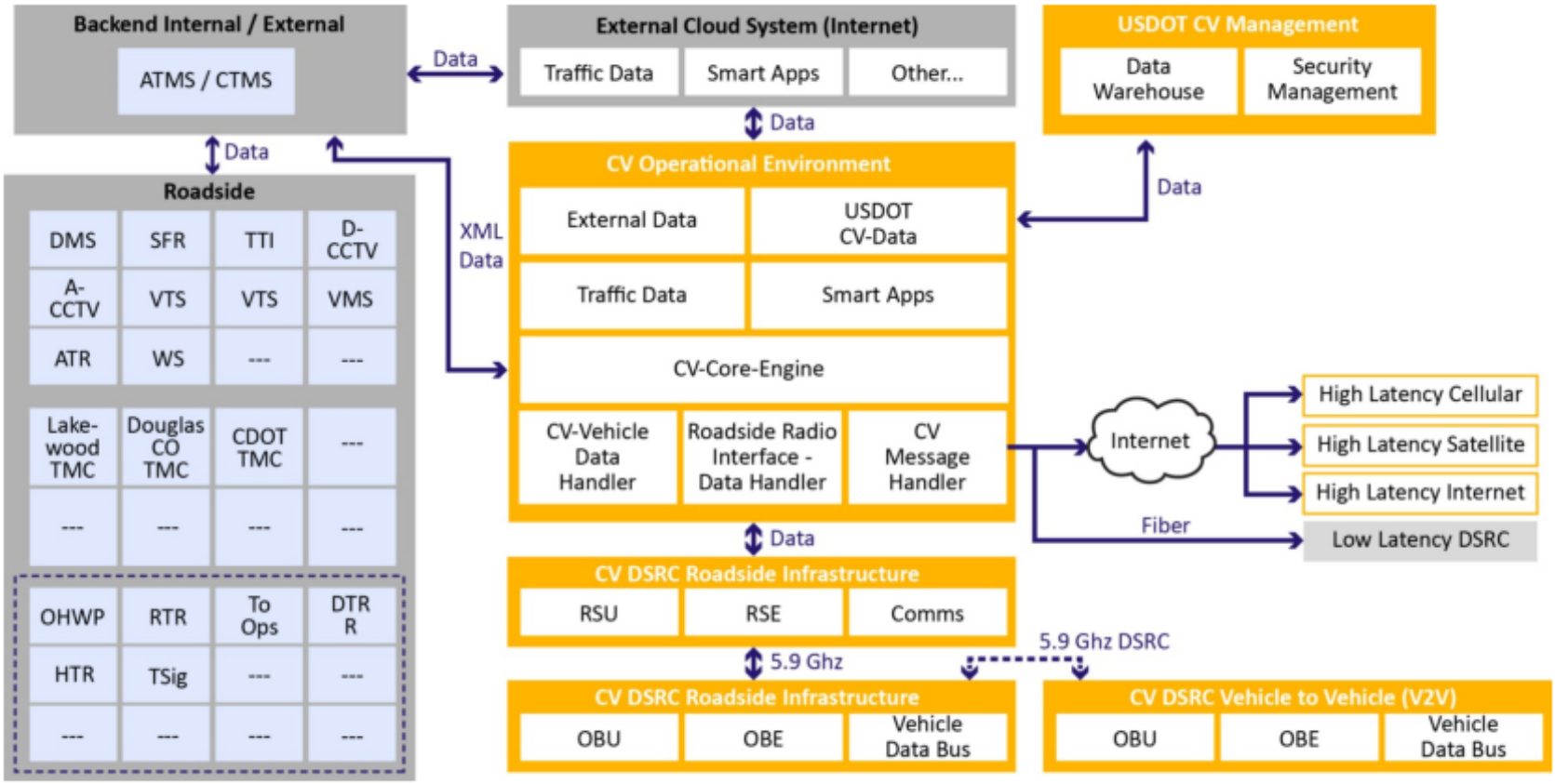
Josh Switkes
Founder & CEO
Peloton Technology

Attachment C. North Denver Freight Corridor Map



. Stretching from I-25 to Pena Boulevard, North Denver is dense with freight movement and industrial facilities and is primed for improving safety and freight efficiency. The Freight Efficiency Corridor will allow trucks access to their destinations through routes that do not disturb neighborhood communities.

Attachment D. Context Diagram for Denver TMC CV Operational Environment



Attachment E. Detailed IV Project Budgets

13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

INTELLIGENT VEHICLES

FUNDING	*$12,000,014*
ATCMTD Funded	$5,930,052
City Funded	$6,069,962

INTELLIGENT VEHICLES - YEARLY SPEND PLAN

Materials	Unit	Cost per Unit	Total $ 3 year Investment	FY2016 0%	FY2017 20%	FY2018 50%	FY2019 30%	Investment after FY2019 15%
IV-1, Connected Traffic Management Center and Connected Fleets								
Waze Connected Citizens Program - FREE	0	$ -	$ -	$ -	$ -	$ -	$ -	
DSRC Onboard Units	1500	$ 1,200	$ 1,800,000	$ -	$ 360,000	$ 900,000	$ 540,000	
Annual Requirements/Config Management Software License	3	$ 5,000	$ 15,000	$ -	$ 3,000	$ 7,500	$ 4,500	
IV-2, Travel Time Reliability for Connected Freight								
DSRC Roadside Units	50	$ 2,500	$ 125,000	$ -	$ 25,000	$ 62,500	$ 37,500	
Roadside Signage	161	$ 1,000	$ 161,000	$ -	$ 32,200	$ 80,500	$ 48,300	
Peloton	1	$ 165,000	$ 165,000	$ 4,489	$ 53,429	$ 55,032	$ 52,050	
Econolite	1	$ 542,000	$ 542,000	$ 14,746	$ 175,506	$ 180,771	$ 170,977	
IV-3, Safer Pedestrian Crossing for Connected Citizens								
Roadside Cabinets	4	$ 25,000	$ 100,000	$ -	$ 20,000	$ 50,000	$ 30,000	
Detection	4	$ 40,000	$ 160,000	$ -	$ 32,000	$ 80,000	$ 48,000	
Communications	4	$ 8,000	$ 32,000	$ -	$ 6,400	$ 16,000	$ 9,600	
Signs and Markings	4	$ 5,000	$ 20,000	$ -	$ 4,000	$ 10,000	$ 6,000	
RR flashers and Poles	4	$ 10,000	$ 40,000	$ -	$ 8,000	$ 20,000	$ 12,000	
DSRC Roadside Units	4	$ 2,500	$ 10,000	$ -	$ 2,000	$ 5,000	$ 3,000	
Total Direct Materials			**$ 3,170,000**	**$ 19,235**	**$ 721,535**	**$ 1,467,303**	**$ 961,927**	**$ 475,500**
% of Spending per Year				**1%**	**23%**	**46%**	**30%**	

Labor	City / Contract	FTE	NEW % Effort	Hourly Labor Rate	Total $ 3 year Investment		+ 3% Escalation from previous year	+ 3% Escalation from previous year	+ 3% Escalation from previous year	8%
IV-1, Connected Traffic Management Center and Connected Fleets										
Engineering/Design										
CV Senior Systems Architect/System Engineers	Contract	2.5	25.0%	$ 102	$ 423,386	$ 11,519	$ 137,098	$ 141,210	$ 133,559	
CV Application/Software Developer	Contract	2	25.0%	$ 95	$ 315,260	$ 8,577	$ 102,085	$ 105,147	$ 99,450	
CV Security/Network Engineer	Contract	2	15.0%	$ 102	$ 203,225	$ 5,529	$ 65,807	$ 67,781	$ 64,108	
Traffic Engineer, Steve Hersey	City	1	33%	$ 48	$ 105,753	$ 2,877	$ 34,244	$ 35,271	$ 33,360	
Technician - City	City	1	33%	$ 38	$ 83,721	$ 2,278	$ 27,110	$ 27,923	$ 26,410	
Install										
ITS Engineer/Electrical Engineer	Contract	2	25.0%	$ 75	$ 248,107	$ 6,750	$ 80,340	$ 82,750	$ 78,267	
Traffic Signal & Elec Technician	Contract	2	25.0%	$ 60	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
IV-2, Travel Time Reliability for Connected Freight										
Engineering/Design										

13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

	Urban Planners	Contract	2	15.0%	$ 120	$ 237,617	$ 6,465	$ 76,943	$ 79,252	$ 74,958	
	Freight SME/ Industry Coordinator	Contract	2	15.0%	$ 87	$ 171,960	$ 4,678	$ 55,683	$ 57,353	$ 54,246	
	CV Senior Systems Architect/System Engineers	Contract	2.5	50.0%	$ 102	$ 846,772	$ 23,037	$ 274,195	$ 282,421	$ 267,119	
	CV Application/Software Developer	Contract	3	50.0%	$ 95	$ 945,779	$ 25,731	$ 306,255	$ 315,442	$ 298,351	
	CV Security/Network Engineer	Contract	2	50.0%	$ 102	$ 677,417	$ 18,430	$ 219,356	$ 225,937	$ 213,695	
	Traffic Engineer, Steve Hersey	City	1	33%	$ 48	$ 105,753	$ 2,877	$ 34,244	$ 35,271	$ 33,360	
	Technician - City	City	1	33%	$ 38	$ 83,721	$ 2,278	$ 27,110	$ 27,923	$ 26,410	
Install											
	Signal Timing Engineer/Traffic Modeler	Contract	2	15.0%	$ 100	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
	Traffic Control/MOT	Contract	2	15.0%	$ 75	$ 148,864	$ 4,050	$ 48,204	$ 49,650	$ 46,960	
	ITS Engineer/Electrical Engineer	Contract	2	25.0%	$ 75	$ 248,107	$ 6,750	$ 80,340	$ 82,750	$ 78,267	
	Traffic Signal & Elec Technician	Contract	2	25.0%	$ 60	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
IV-3, Safer Pedestrian Crossing for Connected Citizens											
Engineering/Design											
	Traffic Engineer	Contract	1	10.0%	$ 120	$ 79,206	$ 2,155	$ 25,648	$ 26,417	$ 24,986	
	Traffic Engineer, Steve Hersey	City	1	10%	$ 48	$ 31,758	$ 864	$ 10,284	$ 10,592	$ 10,018	
	Technician - City	City	1	10%	$ 38	$ 25,141	$ 684	$ 8,141	$ 8,385	$ 7,931	
Install											
	Signal Timing Engineer/Traffic Modeler	Contract	1	10.0%	$ 100	$ 66,162	$ 1,800	$ 21,424	$ 22,067	$ 20,871	
	Traffic Control/MOT	Contract	1	10.0%	$ 75	$ 49,621	$ 1,350	$ 16,068	$ 16,550	$ 15,653	
	ITS Engineer/Electrical Engineer	Contract	1	10.0%	$ 75	$ 49,621	$ 1,350	$ 16,068	$ 16,550	$ 15,653	
	Traffic Signal & Elec Technician	Contract	1	10.0%	$ 60	$ 39,697	$ 1,080	$ 12,854	$ 13,240	$ 12,523	
Total Direct Labor						**$ 5,782,105**	**$ 157,308**	**$ 1,872,316**	**$ 1,928,486**	**$ 1,823,995**	**$ 462,568**
% of Spending per Year							**3%**	**32%**	**33%**	**32%**	

Labor Overhead	City / Contr	FTE	NEW % Effort	Labor Rate (+ X% burden)	Total $ 3 year Investment		+ 3% Escalation from previous year	+ 3% Escalation from previous year	+ 3% Escalation from previous year	10%
IV-1, Connected Traffic Management Center and Connected Fleets										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
IV-2, Travel Time Reliability for Connected Freight										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
Senior Program Developer	Contract	1	100.0%	$ 107	$ 708,683	$ 19,280	$ 229,480	$ 236,365	$ 223,558	
Community Liason	Contract	1	100.0%	$ 63	$ 416,872	$ 11,341	$ 134,988	$ 139,038	$ 131,505	
IV-3, Safer Pedestrian Crossing for Connected Citizens										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
Total Overhead					**$ 2,296,316**	**$ 62,474**	**$ 743,575**	**$ 765,882**	**$ 724,385**	**$ 229,631.61**
% of Spending per Year						**3%**	**32%**	**33%**	**32%**	

Other Direct Cost			Unit	Cost per Unit	Total $ 3 year Investment	3%	32%	33%	32%	10%
IV-1, Connected Traffic Management Center and Connected Fleets										
Contingency - Material			10%		$ 181,500.00	$ 4,938	$ 58,772	$ 60,535	$ 57,255	

13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

	Contingency - Install Labor			10%		$ 157,794	$ 4,293	$ 51,096	$ 52,628	$ 49,777	
IV-2, Travel Time Reliability for Connected Freight											
	Contingency - Material			10%		$ 28,600.00	$ 778	$ 9,261	$ 9,539	$ 9,022	
	Contingency - Install Labor			10%		$ 34,121	$ 928	$ 11,049	$ 11,380	$ 10,764	
IV-3, Safer Pedestrian Crossing for Connected Citizens											
	Contingency - Material			10%		$ 31,200.00	$ 849	$ 10,103	$ 10,406	$ 9,842	
	Contingency - Install Labor			10%		$ 318,378	$ 8,662	$ 103,095	$ 106,188	$ 100,434	
Total Direct Cost						**$ 751,593**	**$ 20,448**	**$ 243,375**	**$ 250,676**	**$ 237,094**	**$ 75,159**
% of Spending per Year							**3%**	**32%**	**33%**	**32%**	

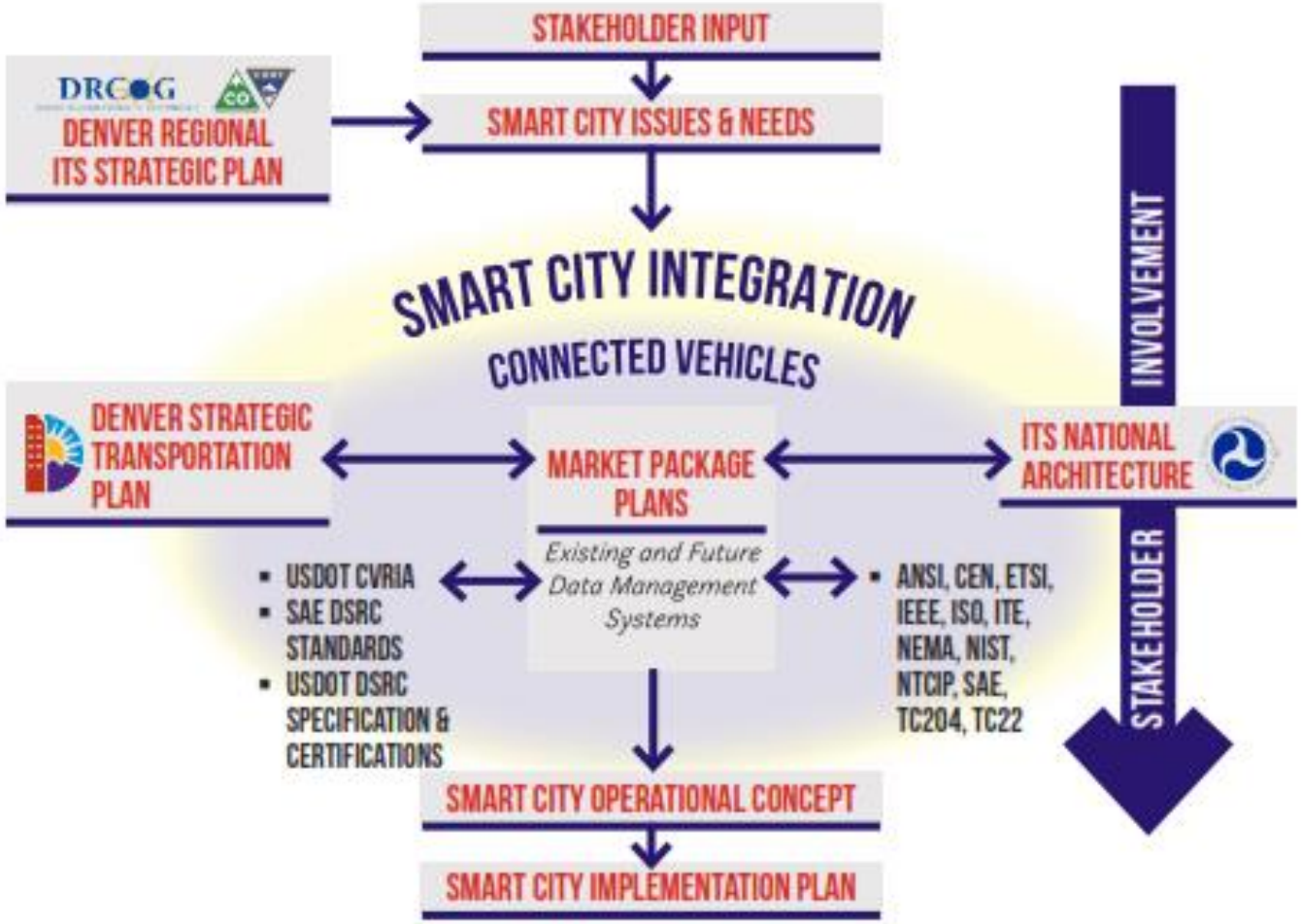
GRAND TOTAL - Cost						**$ 12,000,014**	**$ 259,464**	**$ 3,580,801**	**$ 4,412,347**	**$ 3,747,401**	**$ 1,242,859**
% of Spending per Year							**2%**	**30%**	**37%**	**31%**	

FUNDING	**$12,000,014**
ATCMTD Funded	$5,930,052
City Funded	$6,069,962

		ATCMTD	Denver
BY PROJECTS	**$ 12,000,014**	$ 6,000,007	$ 6,000,007
IV-1, Connected Traffic Management Center and Connected Fleets	$ 4,122,485	$ 2,061,242	$ 2,061,242
IV-2, Travel Time Reliability for Connected Freight	$ 6,434,491	$ 3,217,245	$ 3,217,245
IV-3, Safer Pedestrian Crossing for Connected Citizens	$ 1,443,038	$ 721,519	$ 721,519

	2016	2017	2018	2019
IV-1, Connected Traffic Management Center and Connected Fleets	$ 62,777.49	$ 1,110,191.66	$ 1,677,107.41	$ 1,272,408.01
IV-2, Travel Time Reliability for Connected Freight	$ 167,276.02	$ 2,048,156.34	$ 2,193,685.03	$ 2,025,373.39
IV-3, Safer Pedestrian Crossing for Connected Citizens	$ 29,410.76	$ 422,453.45	$ 541,555.06	$ 449,619.21

Attachment F. Approach to Updating Regional ITS System Leveraging Technology



Denver will integrate its Smart City Program into the existing ITS Architecture process; utilize USDOT, SAE, IEEE, and other relevant standards; and engage the appropriate standards development stakeholders for new Smart City concepts.

OMB Approval No. 4040-0006
Expiration Date 07/30/2010

BUDGET INFORMATION - Non-Construction Programs

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. ATCMTD		$	$	$ 6,000,007.00	$ 6,000,007.00	$ 12,000,014.00
2.						
3.						
4.						
5. Totals		$	$	$ 6,000,007.00	$ 6,000,007.00	$ 12,000,014.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
	(1) ATCMTD	(2)	(3)	(4)	(5)
a. Personnel	$ 1,786,383.47	$	$	$	$ 1,786,383.47
b. Fringe Benefits	765,592.92				765,592.92
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual	8,460,952.44				8,460,952.44
g. Construction					
h. Other	525,687.92				525,687.92
i. Total Direct Charges (sum of 6a-6h)	11,538,616.75				$ 11,538,616.75
j. Indirect Charges	461,397.33				$ 461,397.33
k. TOTALS (sum of 6i and 6j)	$ 12,000,014.08	$	$	$	$ 12,000,014.08
7. Program Income	$ 0	$	$	$	$

SECTION C - NON-FEDERAL RESOURCES				
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. ATCMTD	$ 6,000,007.03	$	$	$ 6,000,007.03
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 750,000	$ 75,000	$ 150,000	$ 225,000	$ 300,000
14. Non-Federal	$ 750,000	75,000	150,000	225,000	300,000
15. TOTAL (sum of lines 13 and 14)	$ 1,500,000	$ 150,000	$ 300,000	$ 450,000	$ 600,000

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT				
(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b)First	(c) Second	(d) Third	(e) Fourth
16. ATCMTD	$ 1,500,000	$ 1,500,000	$ 3,000,000	$ 0
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 1,500,000	$ 1,500,000	$ 3,000,000	$ 0

SECTION F - OTHER BUDGET INFORMATION	
21. Direct Charges: 11,538,616.74	22. Indirect Charges: 461,397.33
23. Remarks:	

Project Oversight Agreement

The Federal Highway Administration (FHWA) anticipates substantial Federal involvement between the CO Division of FHWA and the City and County of Denver throughout the course of the ATCMTD project. The anticipated federal involvement will include: technical assistance and guidance; approved actions as defined here in this document; and participation in project development and technical meetings.

Due to the deployment of new connected vehicle and other innovative technologies the FHWA Colorado Division has designated this project a Project of Division Interest (PODI). This designation is consistent with other current Connected Vehicle (CV) deployments in Colorado which are also designated as PODIs, as well as with other states' deployments of Connected Vehicle technologies and ATCMTD grants.

PODIs are projects that present a meaningful opportunity for FHWA involvement to enhance overall program objectives. As part of this PODI designation the Division has prepared a project-specific Stewardship and Oversight Plan. This serves to outline the working relationship between the City and County of Denver and the FHWA.

A. PROJECT RISK ASSESSMENT

FHWA considers the risks to the delivery of the project in the determination of the level of oversight would be provided to each project. A risk assessment is performed for each project for the following categories:

1. Complexity,
2. Cost,
3. Schedule,
4. Funding,
5. Environmental Considerations,
6. Project Administration,
7. National/Regional Significance,
8. Urgency,
9. Corporate Actions, and
10. Local Considerations.

The results from the risk analysis tool highlights the major risk areas on the project and provides a categorical triage (i.e., High, Medium, or Low) as to how each of those risk areas applies to this project. The following table summarizes the risk analysis results for this project:

Risk Area	Risk Ranking (H/M/L)	Risk Description/ Comments
Complexity	H	• High risk ITS project (H)

Cost	L	• Less than 25% of the City's transportation budget (L) • Less than $750 million in total project cost (L) • Low risk of cost creep (CER) (L) • More than 20% Federal Assistance (H)
Schedule	L	• Simple schedule with few project interfaces (L). • Insignificant schedule risk because of utility or right of way impacts (L). • Medium risk of schedule change/delays due to software development challenges as well as private sector/stakeholder commitment to participate (M).
Urgency	L	• Project is currently proceeding as planned and has no significant issues (L) • Current phase of project is expected to be completed in the next year or so with no significant issues (L) • Minimal political/stakeholder interests and involvement in current phase of project (L)
Environmental Considerations	L	• Project likely requires a Categorical Exclusion (CE), i.e. minimum environmental impacts and project mitigation (L) • Little opposition to project and low risk of legal challenges (L)
Funding	L	• Project is funded with traditional local, and federal funds (L) • All project funding will be identified in a state planning document such as a State Transportation Improvement Plan (STIP) as well as the TIP (L)
Project Administration	M	• Project is the City of Denver with some experience and acceptable past performance of delivering similar projects (M/H) • Project sponsor has adequate resources to deliver the project (L) • Project procurement is expected to follow the traditional ITS process (L) • Low risk of issues meeting Federal Regulations, e.g. DBE, Buy America, Uniform Act, improper payments, and construction quality assurance (M)
National/Regional Significance	M	• Interstate project impacting over 150,000 ADT • Provides congestion relief and air quality improvement (L)
Corporate Actions	L	• No significant project elements, protocols or features have been identified that will impact or influence a FHWA national goal and no corporate activities are anticipated in the next year (L)

B. PROJECT ELEMENTS FOR FHWA INVOLVEMENT

Based on the areas identified, FHWA has considered the following elements of program delivery as providing an opportunity for added value by its involvement. The specific activities that FHWA will be involved are listed in Section C, but the elements target for involvement are the following:

☒ Project Authorization and Project Agreement
☒ Project Planning and Programming
☒ Project Financing
☒ Environmental Clearances/NEPA
☒ Preliminary Design (Systems Engineering Management Plan and Concept of Operations, and other documents deemed appropriate by FHWA, depending on the project elements)
☒ Final Design
☒ Plan, Specification, & Estimate Development
☒ Advertising and Award
☐ Innovative Contracting/Design Build
☒ Contract Administration
☒ Construction Inspection & Quality (Verification of System)
☒ Other – Describe: Compliance with the ATCMD Cooperative Agreement reporting requirements

C. PROJECT ACTIVITIES FOR FHWA INVOLVMENT

Based on project risks, and project elements in which FHWA involvement would add value, specific actions to be taken by FHWA on this Project should be selected. Choose from the following actions below, and then provide a more detailed description of what that action will entail.

☒ Retained Project Approval Actions

See attachment A for a detailed accounting of who will take responsibility for each project approval action. Quarterly invoices will be required by the ATCMTD grant.

☒Project/Technical Meetings

If FHWA plans to regularly attend and participate in project/technical meetings, check this box.

FHWA anticipates attending project design and stakeholder meetings, selectively. FHWA expects City of Denver to inform FHWA of all upcoming meetings for FHWA to determine if it's necessary to participate.

☒Document/Plan Review

If FHWA plans to review the plans and/or documents prepared for this project (beyond those that would be reviewed for a required approval action in the first section), check this box. Provide a brief description of which documents and plans will be reviewed.

☐Field Review/Inspection & Report

If FHWA plans to conduct field reviews or inspections on this project, check this box. Provide a brief description of the anticipated frequency of these inspections and for which phases of the project.

☐Program/Process Reviews & Report

If FHWA plans to include this project in any risk-based program or process reviews, check this box. Provide a brief description of the risk and which review would be including this project.

☐CAP Review

If FHWA plans to include this project in a CAP review, check this box. Provide a brief description of which year of CAP would include it.

☒Special Review

IF FHWA plans to conduct any other sort of special review that includes this project, check this box. Provide a brief description of the review and how this project will be included. 2 CFR 200 Risk Assessment.

☒Other – Describe:

If FHWA plans any other specific project level actions and involvement not otherwise reflected in this POA, check this box.

FHWA AOR (Agreement Officer's Representative) and the CO DIV Program Oversight Manager (POM) shall work to ensure reporting requirements outlined in the Grant Agreement are met by City of Denver.

ATTACHMENT A
PROJECT ACTION RESPONSIBILITY MATRIX
ATCMTD

PROJECT ACTION RESPONSIBILITY MATRIX		
ACTION	**Agency to Approve/Concur**	
PROGRAMMING (All phases)		
Ensure project in Statewide Transportation Improvement Program (STIP)/Transportation Improvement Program (TIP)		City of Denver
Identify proposed funding category		City of Denver
FINANCIAL MANAGMENT (All phases)		
Obligate funds/approve Federal-aid project agreement, modifications, and project closures (project authorizations) (Note: this action cannot be assumed by State)		FHWA
Authorize current bill (Note: this action cannot be assumed by State)		FHWA
ATCMTD Quarterly Invoice and Report		FHWA
ENVIRONMENT (All phases)		
All EA/FONSI, EIS/ROD, 4(f), 106, 6(f) and other approval actions required by Federal environmental laws and regulations. (Note: this action cannot be assumed by STATE except under 23 U.S.C. 327)		FHWA
Categorical Exclusion approval actions (Note this action cannot be assumed by the State except through an assignment under 23 U.S.C. 326 or 327, or through a programmatic agreement pursuant to Section 1318(d) of MAP-21 and 23 CFR 771.117(g)))		FHWA
PRELIMINARY DESIGN (Design Phase)		

PROJECT ACTION RESPONSIBILITY MATRIX		
ACTION		**Agency to Approve/Concur**
Consultant Contract Selection		FHWA
Sole source Consultant Contract Selection		FHWA
Approve hiring of consultant to serve in a "management" role (Note: this action cannot be assumed by State) [23 CFR 172.9]		FHWA
Approve consultant agreements and agreement revisions (Federal non-Major Projects) [23 CFR 172.9]		City of Denver
Approve exceptions to design standards [23 CFR 625.3(f)]		City of Denver
Interstate System Access Change [23 USC 111] (Note: this action cannot be assumed by State)		FHWA
Interstate System Access Justification Report [23 USC 111] (Note: action may be assumed by State pursuant to 23 USC 111(e))		FHWA
Airway highway clearance coordination and respective public interest finding (if required) [23 CFR 620.104]		City of Denver
Concur on Award		FHWA
DETAILED / FINAL DESIGN (Design Phase)		
Approve retaining right-of-way encroachments [23 CFR 1.23 (b) & (c)]		FHWA
Approve use of local force account agreements [23 CFR 635.104 & 204]		City of Denver
Approve use of publicly owned equipment [23 CFR 635.106]		City of Denver
Approve the use of proprietary products, processes [23 CFR 635.411]		FHWA

PROJECT ACTION RESPONSIBILITY MATRIX		
ACTION		**Agency to Approve/Concur**
RIGHT-OF-WAY (Design and Operational Phases)		
Make feasibility/practicability determination for allowing authorization of construction prior to completion of ROW clearance, utility and railroad work [23 CFR 635.309(b)]		FHWA
Make public interest finding on whether State may proceed with bid advertisement even though ROW acquisition/relocation activities are not complete for some parcels [23 CFR 635.309(c)(3)]		FHWA
Ensure compliant ROW certificate is in place [23 CFR 635.309(c)]		City of Denver
Approve Hardship and Protective Buying [23 CFR 710.503] (If a Federal-aid project) (Note: this action cannot be assumed by State)		FHWA
Approve Interstate Real Property Interest Use Agreements [23 CFR 710.405] (Note: this action cannot be assumed by State)		FHWA
Approve non-highway use and occupancy [23 CFR 1.23(c)]		FHWA for Interstate City of Denver for Non-Interstate
Approve disposal at less than fair market value of federally funded right-of-way, including disposals of access control [23 U.S.C. 156] (Note: this action cannot be assumed by State)		FHWA
Approve disposal at fair market value of federally funded right-of-way, including disposals of access control [23 CFR 710.409] (Note: 23 CFR 710.201 authorizes FHWA and STATE to agree to		FHWA for Interstate City of Denver for Non-Interstate

PROJECT ACTION RESPONSIBILITY MATRIX		
ACTION	**Agency to Approve/Concur**	
scope of property-related oversight and approvals for all actions except those on the Interstate System)		
Functional replacement of property [23 CFR 710.509] (Note: this action cannot be assumed by State)		FHWA
SYSTEM OPERATIONS AND PRESERVATION (Design Phase)		
Accept Transportation Management Plans (23 CFR 630.1012(b))		City of Denver
Approval of System Engineering Analysis (for ITS) [23 CFR 940.11]		FHWA
PS&E AND ADVERTISING (Design Phase)		
Approve PS&E [23 CFR 635.309 (a)]		FHWA
Authorize advance construction and conversions [23 CFR 635.309] (Note: this action cannot be assumed by State)		FHWA
Approve utility or railroad force account work [23 CFR 645.113 & 646.216]		City of Denver
Approve utility and railroad agreements [23 CFR 645.113 & 646.216]		City of Denver
Approve use of consultants by utility companies [23 CFR 645.109(b)]		City of Denver
Approve exceptions to maximum railroad protective insurance limits [23 CFR 646.111]		City of Denver
Authorize (approve) advertising for bids [23 CFR 635.112, 309]		FHWA
CONTRACT ADVERTISEMENT AND AWARD (Design Phase) **All contracts to be done by competitive bidding unless otherwise authorized by law**		

PROJECT ACTION RESPONSIBILITY MATRIX	
ACTION	**Agency to Approve/Concur**
Approve cost-effectiveness determinations for construction work performed by force account or by contract awarded by other than competitive bidding [23 CFR 635.104 &.204]	City of Denver
Approve emergency determinations for contracts awarded by other than competitive bidding [23 CFR 635.104 &.204]	FHWA
Approve advertising period less than 3 weeks [23 CFR 635.112]	FHWA
Approve addenda during advertising period [23 CFR 635.112]	City of Denver
Concur in award of contract [23 CFR 635.114]	FHWA
Concur in rejection of all bids [23 CFR 635.114]	FHWA
Concur Design-Build Requests-for-Proposals and Addenda [23 CFR 635.112]	FHWA
CONSTRUCTION (Construction Phase)	
Approve changes and extra work [23 CFR 635.120]	FHWA
Approve contract time extensions [23 CFR 635.120]	City of Denver
Concur in use of mandatory borrow/disposal sites [23 CFR 635.407]	City of Denver
Accept materials certification [23 CFR 637.207]	FHWA
Concur in settlement of contract claims [23 CFR 635.124]	FHWA
Concur in termination of construction contracts [23 CFR 635.125]	City of Denver
Waive Buy America provisions [23 CFR 635.410] (Note: this action cannot be assumed by State)	FHWA

PROJECT ACTION RESPONSIBILITY MATRIX		
ACTION	**Agency to Approve/Concur**	
Final inspection/acceptance of completed work [23 USC 114(a)]		FHWA
CIVIL RIGHTS (All phases)		
Approval of Disadvantaged Business Enterprise (DBE) Project Contract Goal as per 49 CFR 26.51(d). [49 CFR 26.51(e)(3)]		City of Denver
Acceptance of Bidder's Good Faith Efforts to Meet Contract Goal [49 CFR 26.53] or of Prime Contractor's Good Faith Efforts to Find Another DBE Subcontractor When a DBE Subcontractor is Terminated or Fails to Complete Its Work [49 CFR 26.53(g)] (Note: this action cannot be performed by the FHWA)		City of Denver
Equal Employment Opportunity (EEO) Contract Compliance Review [23 CFR Part 230, Subpart D]).		City of Denver
Training Special Provision – Approval of Project Goal for training slots or hours [23 CFR Part 230, Subpart A]		City of Denver
Training Special Provision – Approval of New Project Training Programs (Note: this action cannot be assumed by State) [23 CFR 230.111(d), (e)]		FHWA
FOOTNOTES:		

(1) City of Denver is responsible for ensuring that all individual elements of the project are eligible. FHWA will check that the scope of the project as described in submitted project agreement is eligible for the category of funding sought. All final eligibility and participation determinations are retained by FHWA.

(2) If there is a 23 U.S.C. 326 or 327 assignment or PCE agreement, decisions are handled in accordance with those assignments or agreements.

(3) Modifications to, or variations of this agreement require a written agreement between the City

PROJECT ACTION RESPONSIBILITY MATRIX	
ACTION	**Agency to Approve/Concur**
and County of Denver Project Manager and the FHWA CO DIV Project Manager, in accordance with City and County of Denver amendment procedures. (4) Approvals and Concurrences of line items in this agreement can be submitted directly to the Agreement Officer Representative (AOR) and the CO DIV Project Manager.	

Contract Control Number: PWADM-201738687-00

Grantor Name: Federal Highway Administration

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of January 30, 2018

SEAL

CITY AND COUNTY OF DENVER

ATTEST:

By

APPROVED AS TO FORM:

Attorney for the City and County of Denver

By

REGISTERED AND COUNTERSIGNED:

By

By

Contract Control Number: PWADM-201738687-00

Grantor Name: Federal Highway Administration

By: see attached signature page

Name: _____
(please print)

Title: _____
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

AMENDMENT TO ASSISTANCE AGREEMENT

1. **AMENDMENT NO.: 0001** **EFFECTIVE DATE**: See Block 9

2. **PROCUREMENT REQUEST NO.:** N/A

3. **AMENDMENT OF AGREEMENT NO**.: 693JJ31850001

4. **ISSUED BY:** Federal Highway Administration (FHWA)
Office of Acquisition and Grants Management, HCFA-32
1200 New Jersey Avenue, S.E.
Washington, DC 20590

5. **NAME AND ADDRESS OF RECIPIENT:** City and County of Denver
201 W. Colfax
Suite 509
Denver, CO 80202-5329
DUNS #: 085596802

6. **ACCOUNTING AND APPROPRIATION DATA**:

   - None

7. **DESCRIPTION OF AMENDMENT**:

   The purpose of this unilateral administrative amendment is to hereby designate Ryan Buck as the Agreement Specialist for the cooperative agreement.

   Ryan Buck, Agreement Specialist
   Office of Acquisition and Grants Management
   Federal Highway Administration
   Ryan.Buck@dot.gov
   202-366-4229

   All other terms and conditions remain unchanged.

8. **Name of Person Authorized to Sign**

(N/A) Administrative Amendment

_____
Signature

Date Signed: _____

Printed Name: _____

Title: _____

9. **Signature of FHWA Agreement Officer**

_____
Signature

Date Signed:

Printed Name:

Jeffrey Martin
Agreement Officer

U.S. Department of Transportation
Advanced Transportation Congestion Management Technologies Deployment "ATCMTD" Initiative

DENVER
SMART CITY PROGRAM

ATCMTD
THE CITY AND COUNTY OF DENVER

I. COVER PAGE

Project Name:	**Denver Smart City Program**
Previously Incurred Project Cost:	$200,000
Future Eligible Project Cost:	$0.00
Total Project Cost:	$12,000,014
ATCMTD Request:	$6,000,007
Total Federal Funding (including ATCMTD):	$6,000,007
Are matching funds restricted to a specific project component? If so, which one?	No
State(s) in which the project is located:	Colorado
Is the project currently programmed in the: • Transportation Improvement Program (TIP) • Statewide Transportation Improvement Program (STIP) • MPO Long Range Transportation Plan • State Long Range Transportation Plan	No, the project is not currently programmed into any of the plans listed.

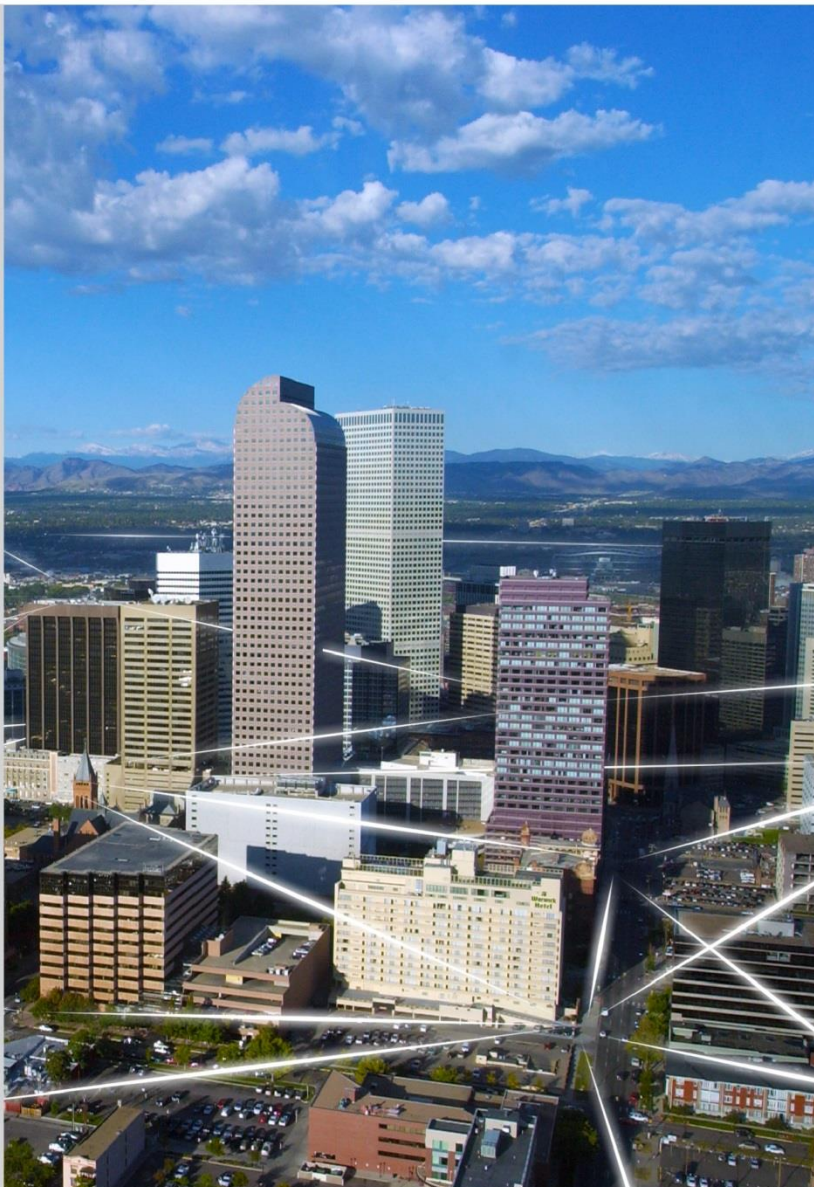


Table of Contents

A. Project Description

1. Introduction

The City and County of Denver is proposing three Intelligent Vehicle (IV) Projects utilizing advanced traveler information systems; advanced transportation management technologies; transportation system performance data collection, analysis, and dissemination systems and advanced safety systems to address issues and challenges in safety, mobility, and sustainability while building a foundation for future projects to improve economic vitality and air quality. Denver, Colorado faces a myriad of challenges at the intersection of transportation, environment and people:

- **Rapid population growth:** 10,000-15,000 new residents move to Denver each year[1],
- **Traffic congestion:** 80 percent of the population commutes in a single-occupant vehicle,
- **Dangerous roadways**: more than 15,000 crashes annually including 129 fatal crashes,
- **High percentage of residents living near or below the poverty rate**: 23.9% of the population is living on less than 125% of the federal poverty level,[2]
- **Increased cost of living**: 30 percent increase in cost of apartment rentals since 2010, and
- **Air pollution**: Denver is an ozone and CO_2 non-attainment area.

Although daunting, Denver's obstacles are not insurmountable. The United States Department of Transportation (USDOT) Smart City Challenge gave Denver the opportunity to develop a comprehensive plan that will address these challenges and transform our region into a global model where transportation and technology can break down barriers and connect all people to mobility freedom and opportunity. The Smart City Challenge served as the seed and spark to identify innovative solutions to our toughest issues. Now, the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative provides the opportunity for the City and County of Denver to bring our most critical Smart City Program projects to life through the proposed IV Projects.

These proposed IV Projects will address and support alleviation of some of our most pressing challenges. In addition to our rapid population growth, Denver has an influx of an additional 200,000 commuters from outside the City traveling to Denver-based jobs during the workweek- with the vast majority driving single occupant vehicles. This creates considerable congestion yet expanding and widening roads is extraordinarily expensive and traditional infrastructure improvements do not alleviate many of Denver's other challenges. For this reason, we are prepared to match ATCMTD grant funds with City and County of Denver funds to focus first on such proposed IV Projects as the launch of our Smart City Program. These IV Projects will allow us to address our most pressing traffic congestion and safety issues and deliver measurable outcomes aligned with ATCMTD goals and focus areas. Implementing IV Projects will usher in a new era of transformational technologies for Denver and the region, bringing greater mobility safety, efficiency, and reliability to our transportation network. These benefits will also build a foundation for Denver to implement other Smart City projects to reduce costs, connect underserved communities with resources, and bring environmental and economic benefits to the City. The proposed Smart City IV Projects include:

IV-1, Connected Traffic Management Center (TMC) and Connected Fleets. The Denver TMC currently operates and maintains over 1,200 traffic signals, 460 closed circuit TV cameras, and thousands of sensor and detection devices deployed citywide, but lacks the ability to communicate the valuable information that it gathers regarding roadway closures, construction, dangerous intersections, and other critical traveler information to the public. To meet this need immediately, Denver will partner with Waze[R1] (a community-based traffic and navigation application provider) to reduce congestion,

[1] 2015 Census data.
[2] 2014 Census data.
[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

improve safety and make data-driven urban planning decisions by connecting our TMC directly with travelers. To innovate today and prepare for the future, we will create a Connected TMC by building a Connected Vehicle (CV) operational environment to support current and future CV applications. As vehicles are a crucial part of a CV future, we will install dual DSRC/CV2X (Dedicated Short Range Communications/Cellular to Everything) in 250 City fleet vehicles to jumpstart market penetration. The Connected TMC will allow us to innovate today by leveraging our existing ITS infrastructure while simultaneously preparing for a future with increasing CVs. Through IV-1, we aim to reduce crashes at identified Vision Zero intersections by 30% and reduce incident response times for citizen-reported crashes by 30%.

IV-2, Travel Time Reliability as a City Service for Connected Freight. Denver has quickly become a hub for innovation, but it has long been a hub for regional and national freight movement. I-25, I-70, and I-76 are all federally designated high priority corridors that pass through metro Denver, and which converge in North Denver to form a dense freight corridor. However, many of our underserved communities are also located in this corridor and are significantly impacted by noise, pollution, and wandering trucks. Today, freight movement is a free-for-all in North Denver. For years, residents have complained about serious safety issues where trucks are traversing the same neighborhood streets where children walk to school. These issues create a barrier to existing linkages to ladders of opportunities in these areas.

This IV-2 project will transform North Denver into a Freight Efficiency Corridor to tackle these issues. Right now, trucks must travel without much consistent information on traffic or fastest routes to their destination. With dual DSRC/CV2X-enabled freight signal priority, we can make the traffic lights work for trucks instead of against them. Denver will be the first in the nation to offer this type of City service to the freight industry if organizations follow new business rules, including avoiding congested freeways, staying out of neighborhoods, and equipping their trucks with dual DSRC/CV2X. This improved efficiency will result in long overdue safety improvements for our underserved communities in this corridor. We will target a 20% reduction in freight travel during peak periods to alleviate truck congestion on interstate and state highways, and a 20% reduction in freight travel time on critical arterial routes using freight signal priority. We will also aim to reduce reports of interruptive freight movement in neighborhoods by 30% to increase safety and use of linkages to ladders of opportunity.

IV-3, Safer Pedestrian Crossings for Connected Citizens. There are increasing demands to promote safer walking and biking to improve public health and air quality, as well as to reduce vehicle congestion. In 2015, 1,618 crashes involving pedestrians and 1,147 crashes involving bicycles occurred in Denver. Automated Pedestrian Detection (APD) technologies are a new solution to addressing pedestrian and driver interactions at difficult crossings. This project will deploy APD at four HAWK (Hi-intensity Activated crosswalk) traffic signals; with expansion plans to full movement intersections dependent on budget availability. ~~unprotected midblock trail crossings using Rectangular Rapid Flashing Beacons~~ to enhance traditional pedestrian push buttons. Field data from these pilot locations will be continuously sent to the Denver TMC for research, field testing, and fine tuning of the APD system, and will be available to the public. The IV-3 project will also serve as a test for Connected Citizen pedestrian warning systems by allowing us to collect and disseminate pedestrian and bicycle crossing information via dual DSRC/CV2X, increasing pedestrian safety.

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

2. City and County of Denver Travel Characteristics

Denver is a hotbed of innovation and opportunity. The city is experiencing unprecedented growth, increasing from 467,610 people in 1990 to 600,158 in 2010 (28%). The population increased an additional 10% between 2010 and 2014 (see Attachment A for more information regarding Denver's population). Denver also ranked first among big cities for economic and job growth[3] and ranked as the number one "best place for business and careers."[4] This city's work to improve transportation systems was recognized in 2013 when Denver was ranked the overall "Best City for Public Transportation" by U.S. News.[5] However, there is still work to be done in order to continue meeting the growing demands on our transportation network. **Error! Reference source not found.**1 (right) and Figure 2 (below) are infographics which summarize the characteristics and existing infrastructure of Denver to provide insight on the scale and capabilities of our City.

Figure 1. Denver characteristics

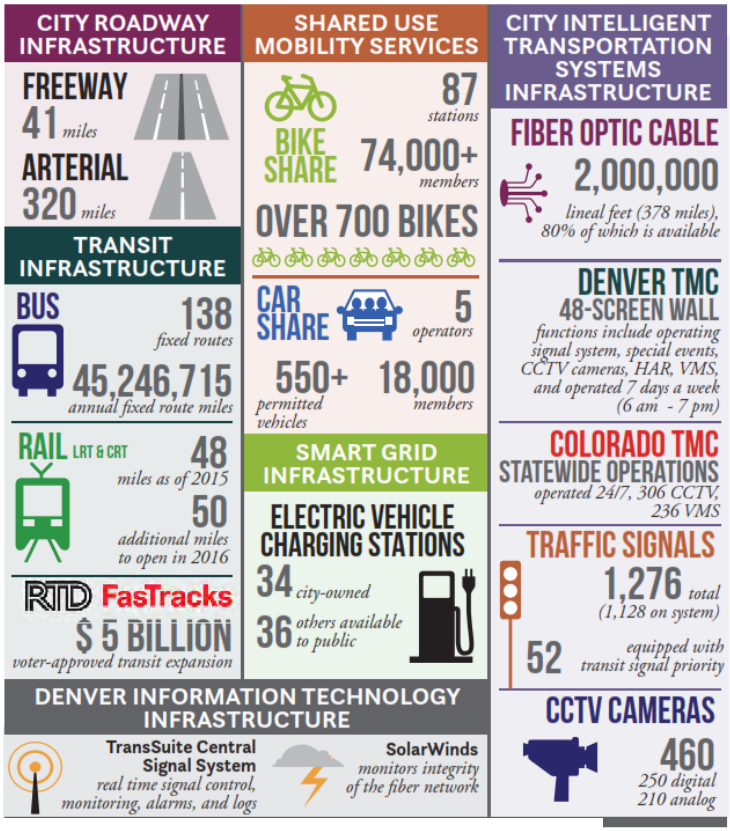


Figure 2. Denver infrastructure

Through the process of developing the SMART City program, we have identified the City's most pressing challenges related to transportation: freight movement in North Denver (IV-2); pedestrian and bicycle safety throughout Denver (IV-3); and improving capabilities of our TMC by enabling better communication with the traveling public today and simultaneously preparing for the transformational capabilities enabled by CV technology (IV-1). These projects will support USDOT priorities, including: 1) transportation elements associated with Smart Cities, 2) systemic applied pedestrian crossing technology, 3) traffic signal data acquisition, analysis, and management and 4) incorporation of CV technology in public sector and first responder fleets.

[3] Area Development, 2015
[4] Forbes, 2015
[5] USNews, 2013
[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

Denver is a city of challenges and opportunities, and therefore perfectly situated to serve as a model for other cities. An ATCMTD investment in Denver is an investment in solutions to challenges facing many cities across the nation. We are one of the most sought after, youngest, fastest growing cities in the nation, yet our infrastructure is extremely strained due to that growth. While we have summer-time ozone issues and localized CO emissions exceedances, we also have a high quality of life that entices many to come to Denver for employment and to live. Similar to other mid-sized cities, our list of challenges is long:

- Changing mobility patterns, particularly for millennials and baby boomers
- Accessibility for underserved populations
- Aging and degraded transportation infrastructure serving an ever-increasing and evolving population
- Technology and cybersecurity demands

Within our Smart City Program, we have prioritized these IV projects because they are focused on addressing these challenges specifically with outcome-based solutions.

a) Partnerships

Denver is fully committed to launching our Smart City Program efforts through partnerships with industry and external entities. We have existing private partners for ongoing Denver programs and initiatives including Panasonic[R1], Xerox[R1], and the Rocky Mountain Institute[R1]. They are all committed to helping us to further identify, test, and refine our Smart City Program, vision, and projects. Additionally, we have strong ties with our public sector partners at the Colorado Department of Transportation (CDOT) and the Denver Regional Council of Government (DRCOG) as well other regional neighbors and organizations such as the Metro Chamber of Commerce, and the Metro Mayors Caucus.

A key aspect of our Smart City Program is our SMART Council (described in Section A11, Partnership Plan), which includes strategically selected partners from government, academia, automaker industry, energy, policy, technology, safety, telecom, transportation and professional organizations. We will continue this legacy of partnership and collaboration with our proposed ATCMTD projects. Table 1 below presents each of our key partners for the three proposed IV Projects, including their responsibility and involvement with the projects. Letters of support from some of these partners are included in Attachment B.

Table 1. Denver Smart City Program Partners.

Partners	Responsibility	Projects		
		IV-1	IV-2	IV-3
CDOT	CDOT will bring insights from its $20 million RoadX and CV deployment programs to inform our IV Projects. CDOT is committed to supporting the implementation and acceleration of the Freight Efficiency Corridor Program to help prepare for the $1.2 billion Central I-70 project and to facilitating travel time reliability as a City service via freight signal priority.	X	X	
DRCOG	DRCOG will participate in the local and regional SMART Council and provide transportation and traffic engineering expertise across all projects.	X	X	X

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

Partners	Responsibility	Projects		
		IV-1	IV-2	IV-3
Jacobs Engineering Group, Inc.	In the role of Program Management Oversight (PMO) and Denver's lead Smart City consultant, Jacobs[R1] will draw upon its program management capabilities and leverage its work with CDOT on CV deployment. Jacobs[R1] will be responsible for helping Denver ensure the effective execution of the Smart City Program.	X	X	X
Econolite	Denver will partner with Econolite[R1] to launch its new CV intersection controller, Cobalt-Sky™. This is the first-ever traffic controller fully designed to apply the robust inputs offered by dual DSRC/CV2X. Denver will implement the new traffic controller to enable freight signal priority on project IV-2.		X	X
Peloton[R1] Technology	For project IV-2, Peloton[R1] Technology will support Denver to launch travel time reliability as a City service to freight fleet operators as an incentive to equip their fleets with dual DSRC/CV2X technology.		X	
Waze[R1]	The Waze[R1] provider Connected Citizens Program will reduce congestion, improve safety and inform smarter urban planning by connecting with travelers through project IV-1.	X		

b) Program Management Approach

Our overall program management approach is based on a lean management structure to ensure we are capable of making timely decisions when they are needed most. We will implement our Smart City Program and the proposed IV projects with the functional systems, organizational constructs, and implementation strategies that ensure we operate in alignment with our values and are achieving Denver's and USDOT's desired outcomes.

The Denver Smart City Program controls and contract administration procedures will track and manage baseline budget control, pending and approved change control, schedule control, monthly progress reports, and all necessary federal funding reports for the IV Projects. Our program management approach is tailored to support the continuous advancement of the entire Smart City Program and will include management from both the City and the contract program manager.

Denver's Smart City Program will be co-chaired by Crissy Fanganello, the City's Director of Transportation and Mobility, and Evan Dreyer, Mayor Michael Hancock's Deputy Chief of Staff. They will head up an Executive Leadership Committee. The Leadership Committee will include several other key City officials, and also will include representatives from two of our primary Smart City Program collaborators: CDOT and DRCOG. The Executive Leadership Committee will provide strategic guidance and support to our project teams for the proposed IV Projects. The committee will also be responsible for engaging with our SMART Council (defined in Section 11, Partnership Plan) and other strategic partners.

Project Management Plan. The contract program manager, Jacobs Engineering[R1], will be responsible for monitoring and reporting all elements of Denver's Smart City Program. The

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

proposed program relies on a robust and proven Project Management Plan (PMP) that describes the organization, management control systems, and processes that guide the full range of activities required to implement this groundbreaking program. Jacobs[R1] is well versed at successfully managing key PMP processes that will drive this program from initiation, planning and execution to monitoring, controlling and closing. Jacobs[R1] will be overseen by key City staff on the IV Project, including the Project Manager and Technical Manager (see Section B1, Staffing Organization). Denver will adhere to Project Management Body of Knowledge, 5th edition standards.

The PMP will be updated on a monthly basis, and will contain scope, schedule, communication, cost, quality, configuration management and risk management plans. Our contract program manager will be fully responsible for ensuring compliance with the PMP throughout the duration of the IV Project's contract. Denver's PMP will:

- Summarize the Smart City Program, including the scope, schedule and capital budget
- Describe organizational, partner and reporting relationships
- Establish goals and objectives that form the basis of the Smart City Program
- Provide information about the organization, control systems, processes, roles, responsibilities and lines of authority within the Smart City Program
- Cite definitive and authoritative references, including specific policies and procedures
- Designate inter-relationships between the Smart City practices and the agency-wide policies and procedures
- Establish consistent management practices
- Form mechanisms for managing technical and financial risks
- Demonstrate that Denver's program is structured in accordance with City and federal requirements

Denver is also committed to IV Project effectiveness, including continually evaluating the need for traditional ITS infrastructure and assessing the possibility of replacing the functionality of those systems with new CV technology. This will allow for continual cost-benefit analyses of planed CV technologies.

Project Funding. The budget estimate for the proposed IV Projects is provided in Section C (Funding Description) and is based on a six-year ~~three-year~~ project period of performance. The estimate includes materials, labor, and installation costs for years one through six ~~three~~ as well as an estimate for the annual cost to operate and maintain the proposed systems beyond the proposed grant period, including estimated annual maintenance, utility upgrades, end of useful life replacements, and periodic repairs. IV-1, -2, and -3 project needs will be procured through the City's existing service contracts, and for the purposes of this budget estimate, fully burdened rates have been used. Denver has consulted with third-party vendors, other cities, engineers and contractors installing similar projects to derive the budget costs presented in Section C.

Project Funding for this grant will be managed using Denver's existing PeopleSoft Accounting system to track budgets, encumbrances and payments. A quarterly program ~~monthly project~~ status report will be created to document the current state of the program ~~project~~. Project tracking, reporting and requests for reimbursement will be completed in accordance with the Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards.

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

3. Geographic Areas

We selected the three proposed IV Projects from our Smart City Program due to their focus on solving real safety and congestion challenges that Denver is facing today. A detailed description of each project is provided in Section A5, Transportation Systems and Services. Below is a brief description of the geographic area where each project will be implemented:

IV-1: Connected TMC and Connected Fleets. This project is centered on the Denver TMC, which operates 24 hours per day/seven days per week from within the Webb Municipal Office Building in Downtown Denver. This building houses the City's Transportation and Mobility department, which will implement proposed IV Projects, including IV-1. We will leverage our existing ITS infrastructure and immediately enable the deployment of CV applications by building a CV operational environment at the TMC. We will equip light-duty and heavy-duty City fleet vehicles with dual ~~DUAL~~ DSRC/CV2X to jumpstart market penetration and empower the CV operational environment. These fleet vehicles blanket the City through daily operations and will generate data throughout Denver, limited to the City and County boundaries.

IV-2: Travel Time Reliability for Connected Freight. This project is focused on addressing the critical safety issues facing Denver's underserved neighborhoods in North Denver, including Globeville, Elyria-Swansea and Montbello. These areas have high percentages of minority populations, households with low-income, and families with children (see Table 2[6] below). These neighborhoods are constantly impacted by trucks traveling through this dense freight corridor, which includes Heartland Expressway, Ports-to-Plains and Camino Real. A Freight Efficiency Corridor will be established in the area bound on the east and west by I-25 and Pena Blvd, respectively (see Attachment C for a map of the Freight Corridor).

Table 2. Characteristics of North Denver Neighborhoods Impacted by Freight Traffic

Characteristic	Globeville	Elyria-Swansea	Montbello	Denver
Percentage of total population that is Hispanic	68%	84%	61%	32%
Percentage of total households with children	43%	55%	72%	25%
Average household income	$39,200	$44,700	N/A	$73,100

IV-3: Safer Pedestrian Crossings for Connected Citizens. This project will pilot APD technologies at the following four locations selected from a recently completed prioritization study of all uncontrolled ~~trail~~ crossings in Denver:

- Galena St & 29th Ave ~~Weir Gulch Trail at Decatur Street~~
- Glena St & MLK Blvd ~~Lakewood Gulch Trail at Knox Court~~
- GVR Blvd & Walden St ~~High Line Canal Trail at Monaco Street~~
- Morrison Rd & Raleigh St ~~High Line Canal Trail at Yale Street~~

These four locations were identified from candidate locations that need additional treatment and were selected based on their ~~proximity to~~ existing traffic signal and communications infrastructure for ease of pilot deployment. By targeting these ~~trail~~ crossings, we expect to increase pedestrian

[6] Table Data retrieved from http://denvermetrodata.org/neighborhood/montbello and https://www.denvergov.org/Portals/746/documents/HIA/HIA_Section%202.pdf

[R1] Equivalent partner(s) based on open BIDs

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and biker safety. This will also allow us to collect data on pedestrian and biker safety to support implementation of future safety-enhancing projects, encouraging alternative transportation and improving air quality.

4. Real World Issues and Challenges

Foremost among Denver's challenges are rapid population growth and traffic congestion. The city's population has increased by 23% since 2000.[7] This phenomenal residential growth is compounded as each workday 200,000 commuters who live outside of Denver travel to the City for work– the vast majority driving single-occupant vehicles. The traffic congestion created is considerable, as current infrastructure insufficiently supports the high volume of commuters. However, construction to expand and widen roads is extraordinarily expensive. We recently spent $30 million to add one lane for one mile to a major north-south arterial and we are preparing to spend – in partnership with the Federal Highway Administration and CDOT – $1.2 billion to add lanes to Interstate 70 and reconnect the urban street grid northeast of downtown. These are important improvements, but they are built on a supply model that we cannot sustain financially and do not utilize available technology or improve resident outcomes.

Traditional infrastructure improvements also do not alleviate many of Denver's other challenges, such as our difficulties obtaining compliance with federal ozone standards due to traffic congestion or high incidents of traffic accidents. Each year Denver has 15,000 crashes, with 129 resulting in fatality. In 2015 alone, Denver had 1,147 crashes involving bicycles and 1,618 crashes involving pedestrians.

Additionally, Denver has increasing cost of living, underserved areas, and children living in poverty. Since 2010, Denver rent prices have increased more than 5% each year,[8] making it harder for low-income families to remain or relocate here, and all but impossible for low-wage workers to live close to their jobs. Perhaps most alarming – up to 40% of Denver's residents live in underserved neighborhoods, primarily in the western, northern and northeastern portions of the city. Many of these underserved neighborhoods are disconnected by physical barriers such as highways, railroads and rivers, creating food deserts that negatively impact health.[9] These underserved communities have disproportionately high minority populations (see Table 2 above). Also, nearly one of every four Denver children lives in an area of concentrated poverty. The number of homeless students in Denver has increased 41% since 2013-14 and has doubled across the entire metro area since 2008.[10]

While all of these issues are not part of the measurable outcomes of this project, by implementing IV projects 1-3 we hope to lessen the impacts of these difficulties on the city and provide foundational technologies and data sources to further lessen these challenges with other Smart City projects. By targeting freight issues in underserved communities, IV-2 will increase the safety of residents and eliminate barriers to their utilization of linkages to ladders of opportunity, allowing residents safe passage to work or school. We anticipate this will also decrease the number of

[7] 2015 Census data.

[8] FOX 31 Denver (2015). Study: Denver apartment rent increases to be the largest this year. Retrieved from http://kdvr.com/2015/04/14/study-denver-apartment-rent-increases-to-be-largest-in-u-s-this-year/

[9] Moyer, D. C. (2013). Denver food deserts and the impact on health. University of Denver. Retrieved from http://www.du.edu/korbel/ipps/media/documents/moyer_policymemo.pdf

[10] Denver Office of Children's Affairs (2015). The status of Denver's children: Community resource. Retrieved from https://www.denvergov.org/content/dam/denvergov/Portals/713/documents/2014_Data--Lisa/Status%20of%20Denver's%20Children%202015%20A%20Community%20Resource.pdf

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pedestrian-auto crashes and traffic accidents and fatalities by reducing interruptive freight movement in these neighborhood communities. IV-3 will also increase pedestrian safety through crossing technologies, ultimately reduce pedestrian-auto crashes and encourage walking or biking. This improves resident health, use of linkages to opportunity, and air quality. This is especially important for low-income communities that may have fewer transportation options and less access to opportunities. Additionally, by implementing CV technologies, we anticipate reduction of traffic accidents and fatalities through use of real-time data for reducing incident response times, as well as injuries and crashes at identified Vision Zero intersections.

Alignment with ATCMTD Goals and Focus Areas

The IV Projects proposed for our Denver Smart City Program will deploy technologies targeted by the ATCMTD initiative including 1) advanced traveler information systems, 2) advanced transportation management technologies, and 3) advanced safety systems including V2V and V2I communications, technologies associated with autonomous vehicles, and other collision avoidance technologies, including systems using cellular technology. Table 3 below presents where projects IV-1 through IV-3 align with the ATCMTD initiative's focus areas, while Table 4 describes how each project aligns with ATCMTD goals.

Table 3. Proposed Project Alignment with ATCMTD Focus Areas

		Projects		
Relevant ATCMTD Focus Areas	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Transportation elements associated with Smart Cities	All 3 IV projects will deploy Smart Cities technology focused on improving transportation, including improving connectivity for the Denver TMC (IV-1), implementing dual DSRC/CV2X to enable freight signal priority (IV-2) and deploying APD technology to make pedestrian crossings safer (IV-3).	X	X	X
Systemic applied pedestrian crossing technology	IV-3 will deploy APD technology at locations selected based on roadway characteristics including number of lanes and speed limits, population density, proximity to retail and crash history.			X
Traffic signal data acquisition, analysis, and management	All three IV projects involve capturing traffic signal data at the Denver TMC in order to better manage and analyze Denver roadways for improved traffic operations throughout the city. This includes creating a CV operational environment to capture traffic signal data (IV-1), deploying a freight signal priority application using traffic signal data (IV-2) and implementing APD technology integrated with traffic signal data (IV-3).	X	X	X
Incorporation of connected vehicle (CV) technology in public sector and first responder fleets	IV-1 will deploy dual DSRC/CV2X in 250 ~~1,500~~ heavy duty and light duty City vehicles.	X		

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Table 4. Proposed Project Alignment with ATCMTD Goals and Focus Areas

		Projects		
ATCMTD Goals	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Reduced costs and improved return on investments, including through the enhanced use of existing transportation capacity	By enabling the Denver TMC to use connected vehicle technology as an emerging data source, IV-1 will allow Denver to continuously assess the need to invest in expensive traditional ITS infrastructure, opening the door for reduced costs and improved return on investment. IV-2 will improve the efficiency of freight movement in North Denver to better leverage the existing transportation capacity of the highways and arterials that serve this dense freight corridor.	X	X	
Delivery of environmental benefits that alleviate congestion and streamline traffic flow	By providing better traveler information to the public (IV-1) and delivering travel time reliability as a City service (IV-2), Denver will improve safety and reduce congestion on its roadways citywide, which will have compounding benefits on the environment and on traffic flow.	X	X	
Measurement and improvement of the operational performance of the applicable transportation networks	By building a CV operational environment at the Denver TMC (IV-1) and deploying dual DSRC/CV2X technology in the North Denver freight corridor (IV-2), we will gain the ability to constantly measure and improve operational performance of our transportation networks citywide.	X	X	
Reduction in the number and severity of traffic crashes and an increase in driver, passenger, and pedestrian safety	All three IV projects are targeting transformational benefits in safety. IV-1 will deliver Vision Zero messaging ~~with Waze~~ to warn drivers of dangerous intersections, IV-2 will keep trucks off of neighborhood streets, and IV-3 will deploy APD technology to improve pedestrian and bicycle safety.	X	X	X

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		Projects		
ATCMTD Goals	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Collection, dissemination, and use of real time transportation related information to improve mobility, reduce congestion, and provide for more efficient and accessible transportation, including access to safe, reliable, and affordable connections to employment, education, healthcare, freight facilities, and other services	All three IV projects will collect, disseminate, and use real-time data to achieve system performance improvements and transformational safety, mobility, and environmental benefits. IV-1 will empower the Denver TMC to utilize CV data. IV-2 will use DUAL DSRC/CV2X data to deliver travel time reliability as a City service. IV-3 will deploy APD technology that will serve as an entirely new data source to improve and continuously evaluate conflicts at crossings for pedestrians and bicyclists.	X	X	X
Delivery of economic benefits by reducing delays, improving system performance and throughput, and providing for the efficient and reliable movement of people, goods, and services	IV-2 will specifically target the freight industry to reduce delays and improve the performance of the transportation network and movement of goods in North Denver by providing travel time reliability as a City service.		X	
Accelerated deployment of vehicle-to-vehicle, vehicle-to-infrastructure, and automated vehicle applications, and autonomous vehicles and other advanced technologies	All three IV projects are focused on deploying connected vehicle technology. IV-1 will build the foundational CV operational environment necessary to deliver the dual DSRC/CV2X freight signal priority application for IV-2 and deploy the Connected Citizen test bed for IV-3.	X	X	X
Integration of advanced technologies into transportation system management and operations	The applications deployed for each project will be integrated into the daily operations of our transportation system and network through building a CV operational environment for the Denver TMC (IV-1).	X		
Demonstration, quantification, and evaluation of the impact of these advanced technologies, strategies, and applications toward improved safety, efficiency, and sustainable movement of people and goods	By building a CV operational environment at the Denver TMC (IV-1), deploying dual DSRC/CV2X technology in the North Denver freight corridor (IV-2), and deploying innovative APD technology (IV-3), we will demonstrate advanced technologies and gain the ability to quantify and evaluate the impact and benefits of these deployments.	X	X	X

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		Projects		
ATCMTD Goals	**Alignment with IV Projects**	**IV -1**	**IV -2**	**IV -3**
Reproducibility of successful systems and services for technology and knowledge transfer to other locations facing similar challenges	All three of the IV projects are designed to serve as a model for other cities so that the technology and approach are both replicable and transferable around the nation.	X	X	X

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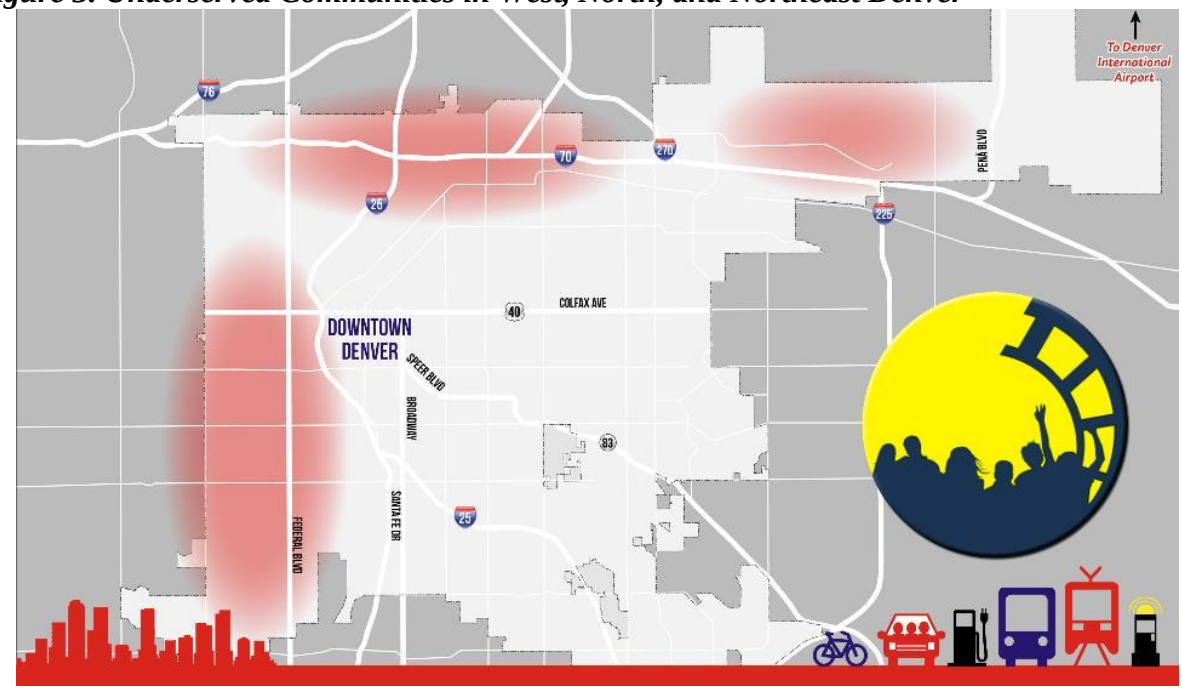
Linkages to Ladders of Opportunity

We have a vision for our transportation future in Denver – A city where transportation and technology break down barriers and connect *all* people to mobility freedom and opportunity. All of our Smart City Program projects are targeted toward the areas of greatest need: West, North, and Northeast Denver, including the neighborhoods of Sun Valley, Globeville, Elyria-Swansea, and Montbello. Figure 3 (below) shows the geographic areas for our underserved communities. Specifically, Intelligent Vehicle project IV-2 will bring long overdue safety improvements for our underserved communities in North Denver by decreasing freight traffic in the Globeville, Elyria-Swansea and Montbello neighborhoods. While these neighborhoods have linkages to ladders of opportunity, those opportunities are being blocked by safety and congestion issues. Improved efficiency for freight movement in North Denver means less congestion, pollution, and noise in the neighborhoods most impacted by the industry. This will allow residents of these underserved communities to utilize their existing linkages to ladders of opportunity.

Figure 3. Underserved Communities in West, North, and Northeast Denver



5. Transportation Systems and Services

Automated Vehicle (AV) technology continues to advance at a rapid pace. Transformational benefits are on the near horizon and will bring greater safety, efficiency and access to transportation for residents, commuters and tourists – especially the young, elderly, disabled and underserved. Our Smart City Program will advance automation by funding projects that prepare our residents, our infrastructure and Colorado's regulatory environment for this technological revolution.

We recognize connectivity as a critical first step in ensuring a safe and coordinated environment for AVs. CV technology enables a transportation network to operate as an integrated system with Vehicle-to-Vehicle (V2V), Vehicle to Infrastructure (V2I) communication, and Vehicle-to-Device (V2X) communication. Many aspects of CV technology are ready for adoption today and offer significant opportunities to improve safety, mobility, and environmental impact. Denver is committed to realizing CV implementation with three key IV Projects to solve real safety and

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congestion challenges that we are facing today and need to solve. We are building a future in connected automation to systematically align the needs of users and businesses with the transportation network for a safer, smarter and more environmentally friendly Denver. Below we present the proposed transportation systems and services for each of these projects.

IV-1, Connected TMC and Connected Fleets. TMC has significant infrastructure in place that will be leveraged for IV-1, including the 1,200 traffic signals, 460 closed circuit TV cameras and thousands of sensor and detection devices it operates and maintains. TMC operators monitor roadway conditions, special events and incidents seven days per week. The Denver TMC also shares data with CDOT's TMC. With a vast amount of data and ITS capability, Denver TMC operators often have valuable insight into the impacts of traffic, roadway construction and incidents – but they have limited ability to share that information with the traveling public. Our Smart City Program will develop a CV architecture and build an operational environment at the Denver TMC to reduce congestion and improve safety by connecting directly with travelers. We will immediately empower the CV environment by delivering dual DSRC/CV2X applications for freight efficiency and by creating a live testing system for our most congested corridors – preparing Denver to be the first city that actively uses dual DSRC/CV2X data for traffic signal control.

Waze[R1] Connected Citizens Program for Safety and Mobility. Denver is home to an estimated 150,000 active Waze[R1] users who report nearly 240,000 alerts while driving 25 million miles per month. They provide valuable insight into roadway conditions and incidents. By establishing a two-way data exchange between Waze[R1] and the Denver TMC at zero cost to our program, we will: 1) gain greater insight into roadway conditions with real-time incident and traffic jam information; 2) reduce traffic congestion with improved traveler information to reroute users around road closures, construction and incidents in real-time; 3) implement a Vision Zero messaging campaign to improve safety at our most dangerous intersections; 4) improve incident response times; and 5) make data-driven infrastructure decisions for smarter urban planning.

Denver TMC CV Operational Environment. As Denver adopts CV technology, we will establish the organizing principles and fundamental building blocks of a CV operational environment for the TMC. To utilize the expansive new data enabled by CV technology, it will be essential that the TMC be capable of collecting, parsing, storing, mining and analyzing CV data. Using the Connected Vehicle Reference Implementation Architecture as a guide, we will partner with CDOT and DRCOG to update the ITS Architecture for the Denver Regional Area and to ensure regional and national transferability of the architecture.

The CV architecture will support all physical components of a CV operational environment including existing ITS infrastructure, dual DSRC/CV2X roadside equipment, vehicle-based dual DSRC/CV2X devices, and other CV traveler equipment including portable dual DSRC/CV2X, smartphones, tablets and satellite-based systems. We will deliver the computing, storage, privacy, security and data access capabilities necessary to develop center-based data management systems and connections to support services, including the USDOT Security Credential Management System, for our CV environment. We will design, build and test the Denver TMC CV operational environment as a foundation for a future with increasing CV data and to support our Smart City CV applications immediately. Attachment D is a context diagram showing how the Denver TMC CV operational environment will be delivered in parallel and work in harmony with our existing ITS and traffic management infrastructure.

Connected Fleets. City fleet vehicles blanket the city through daily operations. Equipped vehicles

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are essential to the design, testing and operation of the Denver TMC CV operational environment. We will equip our fleet of 250 ~~1,500~~ light- and heavy-duty vehicles with dual DSRC/CV2X to lead by example and immediately generate Basic Safety Messages as vehicles move throughout the city. We will install dual DSRC/CV2X roadside units at the three primary City facilities to facilitate capturing, processing, and analyzing the BSM data generated by fleet vehicles. We will launch a dual DSRC/CV2X Equip Program to equip an additional 1,500 vehicles for citizens and partner fleets.

Tasks. We will complete the following tasks to successfully deliver project IV-1:

- **Task 1:** Develop project plan
- **Task 2:** Collaborate with Waze[R1] Connected Citizens Program to enhance traveler information
- **Task 3:** Design, build and test the Denver TMC CV environment
- **Task 4:** Equip the City fleet with dual DSRC/CV2X
- **Task 5:** Design and launch dual DSRC/CV2X Equip Program for other fleets and individual consumers

IV-2, Travel Time Reliability for Connected Freight. Colorado is home to three federally designated high priority corridors – Heartland Expressway, Ports-to-Plains and Camino Real – that pass directly through metro Denver (map of freight corridor included as Attachment C). Freight movement is closely connected to the health of our economy and the transportation system in our state. The Colorado Freight System includes highways, rail lines, airports and other intermodal facilities. It delivers goods, creates jobs and provides economic opportunities to people statewide. The transportation and warehousing sector in Colorado contributes $79 billion to Colorado's economy each year[11].

Given that a great majority of the region's population and traffic growth is expected to occur within I-25's north-south and I-70's east-west corridors, and that significant highway expansion is not likely, congestion will continue to be a challenge for freight movement. The Denver neighborhoods and local roads near major freight facilities and distribution centers are significantly impacted by freight traffic, noise and pollution. ***We have received complaints for decades about serious safety issues where trucks are traveling the same neighborhood streets where children walk to school.*** As plans proceed for the federally funded $1.2 billion reconstruction of I-70, underserved communities such as Globeville, Elyria-Swansea and Montbello stand to face even greater impacts during the extended construction than they already experience.

CV technology presents a wealth of capabilities to address these challenges. Denver will implement a Freight Efficiency Corridor Program and provide travel time reliability northeast of downtown in partnership with CDOT, Peloton Technology and Econolite.

Freight Efficiency Program. Denver will participate in the ~~convene a~~ broad stakeholder group to serve as the Freight Efficiency Corridor Program's Project Leadership Team (PLT). The PLT will consist of representatives from key equity partners to represent underserved communities. Other team members will include representatives from CDOT's Freight Advisory Committee, Colorado Motor Carrier Association, Metro Denver Chamber of Commerce, Metro Denver Economic Development Corp., Peloton Technology, UPS, FedEx, Safeway, and Walmart. The program will

[11] CDOT (2015). State highway freight plan.

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provide: 1) designated parking and staging areas for freight movement into the Denver area; 2) regularly updated and comprehensively defined routes for all freight traffic, not just oversize or hazardous movements; and 3) enhanced data collection capabilities to understand, assess and respond to freight movement through Denver communities.

Travel Time Reliability as a Service Using Freight Signal Priority. Denver will be the first in the nation to deliver travel time reliability as a service to the freight industry using traffic signal priority. This has three major benefits, as it 1) incentivizes fleets to equip with dual DSRC/CV2X at their expense, 2) gives Denver the opportunity to drive business rules for freight travel through the City in order to reduce peak period traffic and lessen the impact on underserved communities, providing proactive instead of reactive guidance to the freight industry, and 3) coincides perfectly with upcoming I-70 reconstruction, which will require extensive freight industry engagement. We will use technology to provide a service and help the industry navigate the construction impact instead of merely offering information about the impact.

To deliver this service, we will:

- Equip designated arterials and freeways with 100 dual DSRC/CV2X Road Side Units
- Design, test, deploy and evaluate a dual DSRC/CV2X-based freight signal priority application in partnership with Econolite[R1]
- Launch travel time reliability as a City service to freight fleet operators as an incentive to equip their fleets with dual DSRC/CV2X technology facilitated by Peloton[R1] Technology
- Demonstrate a first-in-the-nation arterial freight platooning operation with signal priority using Peloton[R1] and Econolite[R1] technology to exhibit future possibilities

Providing a travel time reliability service to the freight industry will not only reduce the high cost and environmental impact of freight congestion but it will significantly improve the quality of life in the neighborhoods and underserved communities that surround many of Denver's high throughput freight facilities and distribution centers.

Tasks. We will complete the following tasks to successfully deliver project IV-2:

- **Task 1:** Develop project plan
- **Task 2:** Engage stakeholders and develop a Freight Efficiency Corridor Program
- **Task 3:** Design and launch Freight Efficiency Corridor Program
- **Task 4:** Design, develop, test and deploy freight signal priority on arterials
- **Task 5:** Coordinate outreach and communication to freight industry via Peloton[R1] Technology
- **Task 6:** Launch Denver travel time reliability service for connected freight
- **Task 7:** Evaluate Denver travel time reliability service for connected freight
- **Task 8:** Design, develop, test and demonstrate arterial freight platooning operation using freight signal priority

IV-3, Safer Pedestrian Crossing for Connected Citizens. Federally assisted pilot programs for Automated Pedestrian Detection (APD) are needed in the United States in order to collect and evaluate pedestrian and driver interaction with technologies like Rectangular Rapid Flashing Beacons (RRFB) and HAWK ~~Hawk~~ Signals installations. There are increasing demands on public agencies to promote safer walking and biking to improve public health, improve air quality, and to reduce vehicle congestion. The ATCMTD grant provides the opportunity to deploy APD at HAWK unprotected midblock ~~trail~~ crossings ~~in conjunction with RRFB~~. This pilot project will install APD devices to enhance traditional pedestrian push buttons at four ~~unprotected~~ midblock

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~~trail~~ crossings, including Galena St & 29th Ave, Glena St & MLK Blvd, GVR Blvd & Walden St, and Morrison Rd & Raleigh St ~~Weir Gulch Trail at Decatur Street, Lakewood Gulch Trail at Knox Court, High Line Canal Trail at Monaco Street and High Line Canal Trail at Yale Street.~~

The initial pilot project will be used to place pedestrian, or bicycle calls in lieu of pedestrian push buttons. It will also be used to extend flashing beacon times for late arriving and slower than average pedestrians. It is anticipated that installing APD in conjunction with HAWK traffic signals ~~RRFBs~~ will assist bicycles and mobility impaired people who cannot always reach or find the pedestrian push buttons. Field data from these locations will be continuously sent to Denver's Traffic Management Center (TMC) for public access, research, field testing, and fine tuning of the APD system. Findings from this pilot will also be used for APD implementation at ~~Hawk Signals, and~~ traditional signalized intersections. This project will also serve as a test bed for Connected Citizen pedestrian warning systems by collecting and disseminating pedestrian and bicycle crossing information via dual DSRC/CV2X.

Tasks. We will complete the following tasks to successfully deliver project IV-3:

- **Task 1:** Develop project plan
- **Task 2:** Develop, test, and deploy APD at four selected pilot locations
- **Task 3:** Develop, test, and deploy Denver TMC connection to APD field devices
- **Task 4:** Evaluate APD implementation
- **Task 5:** Develop, test, and deploy dual DSRC/CV2X at APD locations to collect and disseminate pedestrian and bicycle crossing information

6. Long-Term Operations and Maintenance

The USDOT Smart City Challenge, along with all of our ongoing Smart City efforts, has been prioritized to ensure we meet the current and future expectations of our customers in the community. This prioritization is evident in our ongoing budgeting processes for a variety of resources including staffing, materials, and evaluation. Our commitment will stand strong as we continue to set goals and drive toward a variety of outcomes, many of which will only be achieved outside of the proposed six ~~three~~ year ATCMTD grant period of performance. Denver is and intends to continue to be transparent in our priorities and funding for innovative, entrepreneurial, and technological approaches to achieve affordable, safe, reliable transportation outcomes and mobility freedom for all members of our community. We believe our commitment to transparency with our community necessitates accountability with our staff and elected/community leaders.

In our budget estimate, we have provided the expected continued annual investment necessary beyond the six ~~three~~-year period of performance (see Attachment E). We will ensure long-term operations and maintenance of the proposed systems by programming this into our annual budget process. The long-term operations and maintenance activities that will be programmed include annual maintenance, utility upgrades, end of useful life replacements, and periodic repairs.

7. Challenges to Deployment

The key challenges related to our Smart City Program are presented in the graphic below as technical, policy, and institutional project risks along with a proposed mitigation strategy and estimated level of impact.

Figure 4. Anticipated Challenges and Mitigation Strategies

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Risk Category	Risk	Mitigation Strategy	Impact
Technical	Addressing system security and data privacy	Prioritize security and privacy using national and regional standards to guide the design of the Enterprise Data Management platform and ensure all data in and data out of the Smart City system is properly managed.	High
	Managing the complexity of a Smart City system	Establish an experienced team of systems engineers prepared to handle the multilayered task of integrating multiple system inputs for a large, complex deployment.	Medium
	Prioritizing Smart City solutions	Build a cross-discipline stakeholder group representative of the users of the system.	Medium
	Addressing data quality and integrity issues	Avoid the "trash-in, trash-out" problem by establishing data quality standards and checking data quality before, during, and after implementation.	Medium
	Matching the pace and availability of emerging technology	Institute a user-needs approach to implementing technology. Allow the needs and availability of technology to drive the solutions rather than select and implement a technology without a defined goal.	Low
Policy	USDOT drops commitment to Smart City implementation	Leverage other federal funds and seek additional local resources to implement as many of the Smart City Program elements as possible.	Low
Institutional	Cost overruns/scope creep	Develop and implement a meaningful and actionable Program Management Plan to help control costs and ensure minimal scope creep while continuing to allow for changes to the Program that maintain alignment with the grant's goals.	Medium
	Lack of (or reductions in) stakeholder support	Reinforce stakeholder support prior to project kick-off and maintain positive working relationships and open communication with all stakeholders.	Medium
	Inability to reach agreement among project partners	Reinforce agreements with project partners prior to beginning of Program, and require adherence to the Program Management Plan throughout the life of the project.	Low
	Lacking financial sustainability to continue program	Ensure partners' long term commitment to Program components and institutionalize those elements moving forward.	Low

8. System Performance Improvements

Performance measurement is strongly embedded in Denver's culture and provides significant value to Denver. For the last four years, Peak Performance, Peak Academy and Peak Analytics have established a performance framework throughout the entire City enterprise to actively manage, innovate and improve delivery of services. The simple framework requires agencies to establish a strategic plan, develop performance measures, create a cadence of accountability and participate in training and receive coaching on improving service delivery.

Each agency meets regularly with the Mayor, Budget Director, Chief Performance Officer and others to review key performance indicators and discuss innovations and challenges within the agency. Peak Academy works with every agency's front-line staff on problem solving, process improvement and innovation. Since the inception of Peak, this nationally recognized program has trained more than 5,000 employees and resulted in $15 million worth of hard and soft savings to

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the City and additional value created for citizens. In the second half of 2016, Peak will conduct multiagency report-outs on coordinated efforts to achieve the City's 2020 Sustainability Goals.

Following Peak standard practices in problem definition, Denver will begin a Performance Measurement Plan for our Smart City Program by creating a logic model for each IV project. Using stakeholder input, these models will outline the project scope and enumerate all relevant inputs, outputs, key short- or long-term outcomes and metrics that will be used to quantify performance. The plan will also detail major assumptions, including identification of external factors that could impact results, and will create an actionable plan to achieve outcomes.

With this approach, Denver will target measurable outcomes for the three proposed Smart City Program projects, IV-1 through IV-3 (see Table 5 below), which are expected to be nearly or completely met by the first year after project implementation. While IV-1 and IV-2 are anticipated to create significant performance improvements, IV-3 is not anticipated to improve system performance, due to its focus on safety and the pilot nature of the project.

Table 5. System Performance Improvements

Smart City Program Project	System Performance Improvements
IV-1: Connected Traffic Management Center and Connected Fleets	• Reduce incident response times for citizen-reported crashes by 30% • Increase dual DSRC/CV2X vehicle market penetration to 10% by 2020
IV-2: Travel Time Reliability for Connected Freight	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports of interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods

9. Safety, Mobility, and Environment Benefits

In addition to the system performance improvements identified above, Denver will target the following safety, mobility, and environmental benefits for the three proposed Smart City Program projects, IV-1 through IV-3 (see Table 6). These benefits are expected to be realized by the first year after project implementation.

Table 6. Safety, Mobility and Environmental Benefits

Smart City Program Project	Safety, Mobility, and Environmental Benefits
IV-1: Connected Traffic Management Center and Connected Fleets	• Reduce injuries at identified Vision Zero intersections by 30% • Reduce crashes at identified Vision Zero intersections by 30% • Analyze the 240,000 monthly Waze[R1] user reports for traffic flow and incident patterns • Reduce incident response times for citizen-reported crashes by 30%

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Smart City Program Project	Safety, Mobility, and Environmental Benefits
IV-2: Travel Time Reliability for Connected Freight	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports of interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods • Reduce spot measurement of emissions at heavy freight movement intersections by 50% for platooning demonstration • Increase throughput at intersections by a factor of two to three times for platooning demonstration
IV-3: Safer Pedestrian Crossings for Connected Citizens	• Reduce conflicts and near-misses at uncontrolled trail crossing pilot locations • Provide safer walking and biking opportunities to improve public health, reduce vehicle congestion, and improve air quality

Benefit projections for IV-3 are unable to be quantified at this time due to lack of baseline data on conflicts and near misses at trail crossings. Implementing IV-3 will allow us to track and measure this data to quantify these conflicts moving forward.

10. Vision, Goals and Objectives for the Deployment

Goal setting, continuous improvement and performance measurement are fundamental to Denver's entire business practice. For example, we set goals for sustainability and measure against them in every possible category, including air quality, climate, housing, mobility and workforce. Four years ago, we launched Peak Performance, a citywide improvement program designed to transform Denver into a data-driven government. Our vision for our Smart City Program is to "create a city where transportation and technology break down barriers and connect all people to mobility freedom and opportunity." We have identified three (3) overarching goals which are all relevant to the proposed IV projects. Table 7 (below) presents each goal and its relevant impact area and component. For Goal 1, we present our detailed objectives, targeted measurable outcomes (see Table 7). As Goals 2 and 3 are broad reaching, they do not have specific measurable outcomes.

Table 7. IV Project Goals, Objectives, and Measurable Outcomes

Goal #1: Improve Connectivity Impact Area(s) – Ladders of Opportunity, Mobility, and Safety	
Objectives	**Measurable Outcomes**
1. Build a connected vehicle operational environment at the Denver Traffic Management Center	• Reduce injuries at identified Vision Zero intersections by 30% • Reduce crashes at identified Vision Zero intersections by 30% • Analyze 240,000 monthly Waze[R1] user reports for traffic flow and incident patterns • Reduce incident response times for citizen-reported crashes by 30%

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

Goal #1: Improve Connectivity Impact Area(s) – Ladders of Opportunity, Mobility, and Safety	
Objectives	**Measurable Outcomes**
2. Equip 3,000 vehicles with dedicated short range communication (dual DSRC/CV2X) to jumpstart market penetration	• Increase dual DSRC/CV2X vehicle market penetration to 10 percent by 2020
3. Offer travel time reliability service to freight industry using dual DSRC/CV2X-based traffic signal priority	• Reduce travel time on designated arterial routes by 20% using freight signal priority • Reduce reports for interruptive freight movement in neighborhood communities by 30% • Reduce freight traffic on major freeways and arterials in the Freight Efficiency Corridor by 20% during peak periods • Reduce spot measurement of emissions at heavy freight movement intersections by 50% for platooning demonstration • Increase throughput at intersections by a factor of two or three times for platooning demonstration
Goal #2: Leverage Partners Impact Area(s) – Efficiency	
Objectives	
1. Leverage CDOT's $20 million RoadX Program and their additional $7M contribution to bolster our projects focused on freight efficiency and integrated freeway and arterial operations (IV).	
2. Deploy the first implementation of Econolite's[R1] new Connected Vehicle intersection controller, Cobalt Sky™ (IV).	
Goal #3: Collaborate at Every Level Impact Area(s) – Efficiency	
Objectives	
1. Unite cities around the nation with local, national and international experts through our SMART Council.	
2. Deliver technology-driven solutions designed by and for our communities that are measurable, scalable, replicable and exportable to cities nationwide.	
3. Collaborate with and provide open access to USDOT's independent evaluation team to monitor our progress toward our goals, objectives, and measurable outcomes.	
4. Publish our Smart City Program performance metrics to visualize progress toward our goals and objectives.	

11. Partnership Plan

Denver recognizes that cities need to move beyond fragmented or incremental thinking in today's fast-paced global economy, especially when it comes to instituting new technologies. Cities must build and continuously renew networks of collaborators and partners. To engage in and utilize partnerships for the Denver Smart City Program, we will create a Start-ups, Municipalities and

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Academic Research for Technology (SMART) Council.

SMART Council

Denver's SMART Council will lead and inform our program and provide us with a vehicle for sharing, replicating and exporting results. The SMART Council will unite the City with start-ups, tech innovators, municipalities across the nation and the world, academic researchers, and transportation service providers. The SMART Council will be essential to successfully delivering the proposed Intelligent Vehicle projects for the ATCMTD grant opportunity and will serve as our strategy and plan for ensuring successful partner engagement through the period of performance. The Council will be organized into four subgroups under our Smart City Program that will meet quarterly and report to the Smart City Executive Team:

1. Local SMART Council Work Group. At the local level, Denver will establish a community-based SMART Council Work Group. Mobility users, neighborhood residents, stakeholder organizations and nonprofit providers such as Mile High United Way and Mile High Connects (a cross-sector partnership of organizations committed to increasing access to housing) will provide key input into our program. We also will engage foundations, neighboring municipalities, and organizations such as RTD, DRCOG and the Metro Mayors Caucus. This local SMART Council Work Group will meet at least quarterly to ensure stakeholder input is central to the projects.

2. National/International Cities SMART Council. The reach of the SMART Council will go far beyond our local borders. We will invite the six other Smart City Challenge finalist cities to join the national and international arm of the SMART Council, as well as other national and global cities. This concept has already received support from 20 cities, including Atlanta, Indianapolis, Baltimore and Seattle. Denver will partner with Transportation for America and utilize its already established network of partner cities and organizations to ensure that we share our successes and challenges with a dedicated group of communities. This group will serve as an assembly of ideas, where concepts will be shared during an annual global summit, regular face-to-face meetings, online webinars and on our Smart City website. This will be the forum for the brightest minds from around the country and the globe to help us refine our projects and prepare them for scaling and exporting.

3. Start-Up/Entrepreneurial Community – SMART Council Spark. Denver has cultivated powerful partnerships with the Colorado Technology Association, local tech incubators Galvanize and Innovation Pavilion, and national organizations such as 1776. These and other engines of innovation and new ideas will serve on the SMART Council's Spark Committee to infuse new energy into our thinking and project applications.

4. Research and Education – Academic SMART. Academic SMART Council, co-led by Colorado State University and the University of Colorado Denver, will bring an important research component to our Smart City Program. Other coalition members will include Colorado School of Mines, North Dakota State University, Mountain Plains Consortium University Transportation Center, Virginia Tech Transportation Institute and University of California Riverside. The National Renewable Energy Laboratory and Electric Power Research Institute will also contribute to this subset of the SMART Council.

This research arm of the SMART Council will bring together multidisciplinary teams of researchers, educators, policymakers and stakeholders to conduct collaborative research that addresses the fundamental challenges of implementing Smart City technologies and informs decisions that lead to energy, economic, environmental, social and cultural sustainability.

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Understanding these challenges and the underlying impacts of smart city technologies is a vital component of replicable strategies.

The Academic SMART Council will also focus on education and workforce development to help develop the next generation of Smart City professionals, particularly women and underrepresented minorities in STEM fields. The committee will oversee a K-12 educational outreach program through partnerships with UCD, Colorado Mathematics, Engineering and Science Achievement and the Denver Schools of Science and Technology.

12. Existing Local and Regional Advanced Transportation Technology Investments Plan

Currently, Denver invests over $150 million annually on capital improvements, including critical maintenance and rehabilitation projects, high priority capital investments, and leveraging state and federal dollars. Partnered with DRCOG, Denver has a long history of developing, designing, implementing, and maintaining ITS devices. Through Congestion Mitigation and Air Quality Federal Funding two main ITS funding mechanisms have been established. The Transportation Improvement Program (TIP) is used by Denver to implement transportation projects with objectives to address air quality issues. The Traffic Signal System Improvement Program (TSSIP) is an operations improvement tool used by Denver. Benefits for both types of projects are demonstrated through air quality improvement data and reporting. The following projects are some of the current ITS projects:

- *Transit Signal Priority (TSP) Pilot Project.* Denver in collaboration with the Regional Transportation District successfully implemented a pilot TSP on Colorado Boulevard. The results of this pilot implementation illustrated that TSP is technically feasible.
- *Center-to-Center Demonstration.* DRCOG, Denver, Littleton, Englewood, and CDOT completed a demonstration project involving center-to-center communications between traffic signal systems at neighboring agencies. The purpose of the demonstration project was to control the group of signals operated and maintained by several agencies on Santa Fe Drive in response to changes in traffic volume, generally due to a diversion from the freeway.
- *Bicycle Detection.* Funds were allocated to Denver for pilot implementations of bicycle detection. Bicycle detection will allow more efficient operations while continuing to accommodate bicyclists.
- *CMAQ Benefits of Uninterruptible Power Supplies and Ethernet Conversion.* The implementation of Uninterruptible Power Supplies (UPS) and Ethernet Communications protocol both condition the power for the controllers and maintain signal operations during power interruptions. Both of these functions help the signal system provide more reliable operations.

Table 8. Current CMAQ TSSIP projects:

TSSIP Fiscal Year Expenditures					
Projects	**FY 2013/14**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Denver Colorado Blvd: 1st Ave - 50th Ave Speer Blvd: Elitch - 13th Ave X		$1,078,000			
Central Business District (CBD) Ph 1					$1,222,000
Central Business District (CBD) Ph 2			$1,029,000	$1,060,000	
DTC Blvd: Tamarac St - Union Ave					
Colorado: Hampden to 1st	$484,000				

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TSSIP Fiscal Year Expenditures					
Projects	**FY 2013/14**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Colfax: Sheridan to I-25	$747,000				
Colfax: Logan to Yosemite					

Table 9. Current TIP projects

Denver TIP Fiscal Year Expenditures					
City Wide Implementation Projects	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**Total**
Federal Portion	$1,090,000	$1,340,000	$1,344,000	$1,026,000	$4,800,000
Denver Match	$542,000	$666,000	$668,000	$509,000	$2,385,000
Total	$1,632,000	$2,006,000	$2,012,000	$1,535,000	$7,185,000

These projects represent existing and future ITS infrastructure investments which all serve as standalone data sources and strategies. The IV-1 project will integrate all Denver TMC data sources, including the aforementioned investments, to leverage every available resource. Projects IV-2 and IV-3 will be implemented in areas that are long overdue for technology investment. As there is a lack of existing technology for these projects to leverage, IV-2 and IV-3 will become the foundation upon which future projects can build. However, our staggered implementation approach for these projects will allow IV-2 and IV-3 to build off the technology foundation established by IV-1.

13. Deployment Schedule

Figure 5 (below) provides a high-level summary of the deployment schedule for the proposed IV Projects across the three-year period of performance beginning in Quarter 4 of 2016. The IV projects will be delivered with a staggered approach. The percentages shown in Figure 5 represent the percentage spent. Quarter 4 of 2016, beginning October 1, will begin the project initiation phase. This will include the kick-off meeting within four weeks after the grant is awarded, as well as monthly reports. Delivery of project IV-1 will occur in 2017, IV-2 in 2018, and IV-3 in 2019. These time periods also include monthly reports as well as an annual report to the Secretary. Additionally, Denver has a commitment to evaluate the effectiveness of these IV Projects, including the cost-benefit.

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Figure 5. Deployment Schedule

▪ 2020	▪ 2021	▪ 2022	▪ 2023	▪ 2024
1. FHWA approval for Scope change from DSRC to Dual and time extension of 2 years 2. 25 RSU installation 3. 25 OBU installation 4. Validation of 25 installs 5. Bench test dual units 6. RFP for dual units 7. Vendor selection for dual units 8. SCMS -kick off 9. Advanced Warning Sign (AWS) vendor selection 10. Construction to install AWS 11. Install Boulder AI cameras 12. Upgrade 4 cabinets with Intelight signal controllers and Hirschmann switches 13. Install Boulder AI cameras 14. Integrate cameras with controllers 15. Validation documentation 16. Start discussions with CDOT and RTD for collaboration 17. Bring MOST onboard for data analysis	**Data Analysis and Planning** 1. Data analysis results for Connected Ped and Connected Fleet 2. Chose more intersections for Connected Ped 3. Select more intersections (375) for RSU deployment 4. Select 225 more vehicles to be equipped with OBUs 5. Identify more use cases 6. If SCMS is a success, then engage external partners 7. CAN integration - for BSM Part 2 messages 8. Contracts with auto manufacturers (if needed) 9. EDM, ODE	**Deployment** 1. Deploy remaining RSUs 2. Deploy remaining OBUs 3. Select 5 external partners vehicles for demo 4. Get MOUs in place with external partners 5. Deploy cameras 6. Upgrade cabinets as needed 7. Install Advanced Warning signs as needed 8. Systems integration 9. Documentation	**Sustainability planning:** 1. TMC integration 2. Finalize SCMS 3. Roles and Responsibilities 4. Sustainability plan 5. Firmware upgrades 6. Release management 7. Inventory 8. Budget 9. Lessons learned	1. Provide final documentation to FHWA 2. Maintenance and Operations plan

14. Innovative Technology Initiatives

Smart City and CV technologies provide an exciting opportunity to revitalize the transportation network with transformative data analytics and powerful applications, and are another form of ITS that should adhere to the national and regional vision for ITS architecture, standards and certification processes.

The Smart City Program will require expanding our ITS Regional Architecture in order to establish the framework for Smart City and CV concepts to be implemented across the metro area. This will position the entire region as an agent of change and a benchmark for the nation. We will jumpstart an update to the architecture by leveraging CDOT's RoadX project and the available architecture and standards work completed by the USDOT for CV concepts. The USDOT's CV Reference Implementation Architecture (CVRIA) provides the physical, functional, communications and enterprise architecture viewpoints as guidance for implementing CV applications. More importantly, the CVRIA was built to ensure CV deployments fit into the greater National ITS Architecture, enabling a standards-based implementation that will ensure the new system can be seamlessly integrated into existing transportation management and ITS systems for the region and

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as a model for additional Smart Cities to follow.

For CV technologies, Denver will coordinate with USDOT-appointed certification bodies in the selection and procurement of all dual DSRC/CV2X devices and utilize the newly developed Crash Avoidance Metrics Partnership (CAMP) security certificate management system processes and procedures for the deployment and management of security certificates for dual DSRC/CV2X devices. For all Smart City or CV architecture and standards activities, Denver will engage and coordinate with national and international standards development organizations to ensure future deployments benefit from the experiences and lessons learned from the Denver implementation. Attachment F showcases how Denver will leverage existing and innovative technology initiatives from USDOT and standards organizations throughout our Smart City deployment.

B. Staffing Description

1. Staffing Organization

For this program, Denver carefully identified the necessary project team of city staff (including two new positions) who will participate in and lead the effort. Our staff will be supplemented by contractor support from Jacobs[R1] Engineering, Econolite[R1], and Peloton[R1] Technology. CDOT will provide additional regional partner support. Jacobs[R1] Engineering will be responsible for IV Project management (see Section A2, under Program Management Approach), overseen by key City Staff including:

~~**Steve Hersey, City Traffic Engineer, IV Project Manager.** Steve is Denver's co-lead for Connected and Autonomous Vehicles, and has a wealth of experience dating back to 1993 when he began working for CDOT in the Traffic Engineering group. His extensive work on Colorado's first managed lane corridor, including tolling and active traffic management infrastructure, will be invaluable on this program. His ability to integrate traditional traffic engineering systems with connected and autonomous vehicle technologies will help to achieve the desired project outcomes. Steve will be responsible for overseeing the scope, schedule, and budget of this project.~~

Michael Finochio, ~~TMC~~ Engineering Manager, IV Program ~~Technical~~ Manager. Michael ~~will co-lead with Steve and~~ is responsible for traffic operations, ranging from ITS devices to traveler information, directing construction projects, contracts, budgeting, and day-to-day operations. He serves as a subject matter expert on ITS design, implementation, and operations. Michael has close working relationships with various regional and national players in the transportation arena.~~-~~Michaele will be responsible for overseeing the scope, schedule, and budget of this project.

These key City staff will be supported by the SMART Council (see Section A11, Partnership Plan) and the Mayor's Executive Leadership Team (see Section A2, under Program Management Approach) for all IV Projects.

2. Primary Point of Contact

The primary point of contact for the project will be Michael Finochio:

Michael Finochio, Engineering Manager
Public Works/Transportation & Mobility, City and County of Denver
Office: 720-913-0801
E-mail: michael.finochio@denvergov.org

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C. Funding Description

Table 10 below presents a breakdown of the estimated costs by proposed IV project, including an identification of the funding sources and amounts. If selected, the proposed IV projects will be funded by Denver (50% of total project funding) and through ATCMTD funds (50%). A more detailed budget estimate is included as Attachment E.

Table 10. Estimated Costs Rounded to the Nearest Dollar

Project	Denver funds	ATCMTD funds	Total
IV-1	$2,061,242	$2,061,242	$4,122,485
IV-2	$3,217,245	$3,217,246	$6,434,491
IV-3	$721,519	$721,519	$1,443,038
Total	**$6,000,007**	**$6,000,007**	**$12,000,014**

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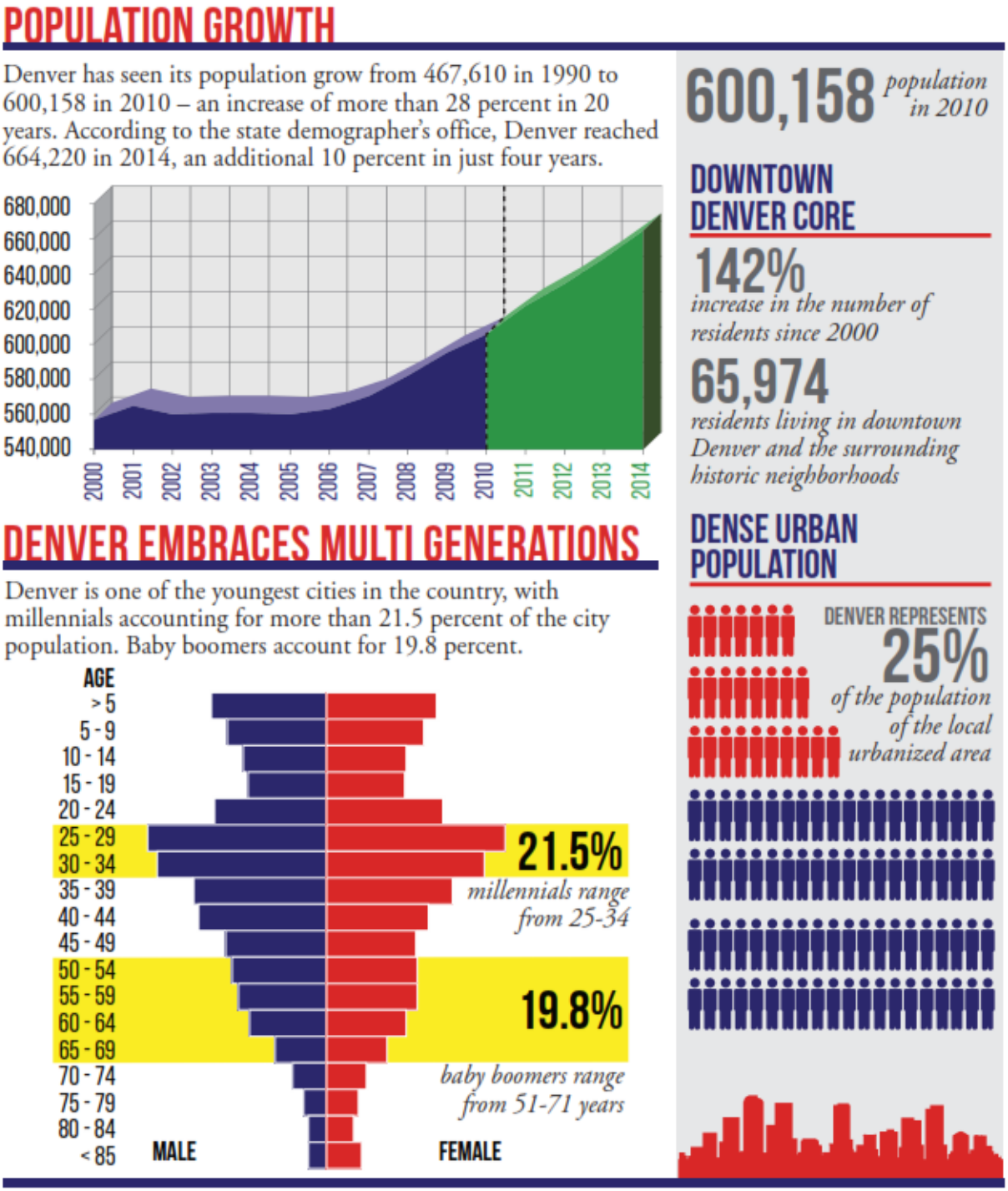
Supporting Documents
Attachment A. Denver Population Infographic



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Attachment B. Partner Letters of Support

COLORADO
Department of Transportation
Office of the Executive Director
4201 East Arkansas Ave, Suite 262
Denver, CO 80222

June 20, 2016

The Honorable Anthony Foxx, Secretary
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: City and County of Denver Support Letter for ATCMTD Grant Application

Dear Secretary Foxx:

The Colorado Department of Transportation (CDOT) strongly supports the Advanced Transportation and Congestion Management Technologies Deployment Initiative (ATCMTD) application submitted by the City & County of Denver to implement Connected Traffic Management Center (TMC) and Connected Fleets; Travel Time Reliability as a City Service for Connected Freight and Safer Pedestrian Crossings for Connected Citizens.

Rapid population growth. Increased traffic congestion. Hundreds of traffic-related deaths and serious injuries each year. Air pollution. Numerous disconnected and disadvantaged communities. Those are just some of the challenges facing Denver and cities across the country. Denver was built by pioneers dedicated to achieving bold outcomes through collaborative, community-based problem solving. That spirit continues to drive us forward today. Our challenges are many, but they can be overcome.

With the ATCMTD grant, we have selected the following Intelligent Vehicles and Safety projects to address the serious challenges facing Denver today and will deliver measurable outcomes aligned with the ATCMTD goals and focus areas. These Intelligent Vehicle/Safety projects will usher in a new era of transformational technologies for Denver and the region, bringing greater mobility safety, efficiency and reliability to our transportation network.

Denver's contribution of $6.0 M of total local match demonstrates a firm belief and commitment in in these projects to improve connectivity, reliability and safety in our community. Denver staff will contribute far more through the day to day management of this funding opportunity and continuing to build out the comprehensive approach we developed through our Smart City Challenge application.

We thank you for your consideration of Denver's ATCMTD grant which will prepare us for coming advancements in automation and allow us to maximize our existing infrastructure; establish a first-in-the-nation Freight Efficiency Corridor Program, install DSRC along key routes, and offer travel time reliability as a City service using freight signal priority to incentivize freight operators to equip their fleets with DSRC; and address pedestrian crossings with new tools and technology to increase the safety of our community.

Please do not hesitate to contact me with any questions.

Sincerely,

Shailen P. Bhatt
Executive Director

4201 E. Arkansas Ave, Suite 262, Denver, CO 80222 P 303.757.9201 F 303.757.9656 www.codot.gov

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ECONOLITE

Solutions that Move the World®

June 21, 2016

Robert Rupert
US Department of Transportation
1200 New Jersey Ave, SE
Mail Drop: E86-205
Washington, DC 20590

Dear Mr. Rupert:

Econolite is pleased to support the City of Denver's proposal response to the United States Department of Transportation's Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative. USDOT's investments over the last 15 years in Connected Vehicle (CV) standards and related technologies establishes a framework for innovations that are inducing a transformation of ITS. The ATCMTD initiative amplifies and expedites the application of these innovations with measurable benefit to the proposer that is awarded this opportunity.

The framework of connected vehicles provides opportunity to completely redefine the interaction between vehicles and infrastructure, enabling an entirely new methodology for traffic control. Econolite has been following USDOT's lead on CV for the last 15 years and is ready to release a new CV intersection controller. This ground-breaking technology overcomes prior limitations by providing the traffic controller with geometric awareness of the intersection as well as CV trajectory data as an input for vehicle demand. We believe this broadened awareness will enable an entirely new set of traffic control strategies, optimization models, and features.

The City of Denver has long been a progressive agency that embraces new technologies and leverages the opportunities opened by USDOT. Denver has identified means for Econolite to integrate our CV-based traffic controller within their IV-2 project that focuses on Travel Time Reliability for Connected Freight. For IV-2, Econolite will help build the value proposition of CV technologies to freight companies via ETA-based signal priority for freight vehicles.

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ECONOLITE

Solutions that Move the World®

This program is designed to significantly expand the operational capabilities of the CV environment by leveraging the real-time data exchanges of connected vehicles to optimize traffic flow and safety. These solutions will seamlessly connect to other integrated systems within a smart-city network infrastructure. This ensures that the critical V2I building blocks are in place and ready to help agencies, freight companies, and local businesses realize the full potential of connected vehicles.

Econolite is excited to be part of this program and provides full support to the City of Denver in their pursuit of this opportunity.

Sincerely,

Eric Raamot
Vice President, Engineering
Econolite Control Products, Inc.

3360 E. La Palma Ave • Anaheim, CA 92806-2856 • PH: (714) 630-3700 • FAX: (714) 630-6349
P.O. Box 6150 • Anaheim, CA 92816-0150 • www.econolite.com

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June 23, 2016

Crissy Fanganello
Director of Transportation
Denver Public Works
City and County of Denver
201 West Colfax Avenue
Denver, CO 80202

RE: Denver's ATCMTD Grant Application

Dear Mrs. Fanganello:

I write in support of the City and County of Denver's United States Department of Transportation (USDOT) Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant application. The City and County of Denver's grant application will help the entire Denver metro area reap the benefits of a dedicated linkage between advanced technology and transportation solutions to improve mobility, increase safety, and increase efficiency.

Jacobs stands dedicated in our commitment to Denver. The capabilities of the project components included in the city's grant application will help the City assume a proactive stance with regards to congestion, safety, and efficiency while elevating Denver to a national leader in connected vehicle technology.

The ATCMTD will help enable the City and County of Denver to deliver innovative projects to help ensure residents se easing congestion, that businesses can operate more efficiently, and that pedestrians and bicyclists can move about the city in a safe manner. Jacobs strongly supports this grant application and looks forward to partnering with the City and County of Denver and other project partners in this endeavor.

Sincerely,

Julie Skeen
Rocky Mountain Operations Manager
Jacobs Engineering Group Inc.

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Peloton Technology
1060 La Avenida Street
Mountain View, CA 94043
650.395.7356

www.peloton-tech.com

June 23, 2016

To: Crissy Fanganello
Director of Transportation & Mobility
Denver Public Works
City and County of Denver

Subject: Partner Letter of Support for the USDOT Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Initiative

Dear Ms. Fanganello,

I am writing to express the support of Peloton Technology for the Denver Smart City Program ATCMTD proposal to USDOT. Specifically, Peloton Technology will support the project titled IV-2, Travel Time Reliability for Connected Freight.

Peloton will support the project with expertise which encompasses Intelligent Freight Vehicles, V2V and V2I Connectivity to improve mobility, and initial forms of vehicle automation. Peloton is developing innovative ITS platooning technology for heavy vehicles that features V2X (vehicle-to-vehicle/infrastructure/cloud) communications, radar-based active safety systems, vehicle control algorithms and a cloud-based Network Operations Center (NOC) to link heavy trucks traveling along freight corridors – connecting terminals, arterials, highways and interchanges. These systems can save fuel, reduce emissions, improve safety and enhance quality of life in the City.

Peloton will also be pleased to serve on the IV-2 Project Leadership Team (PLT). We look forward to being a part of this exciting deployment effort.

Sincerely,

DocuSigned by:
Josh Switkes

Josh Switkes
Founder & CEO
Peloton Technology

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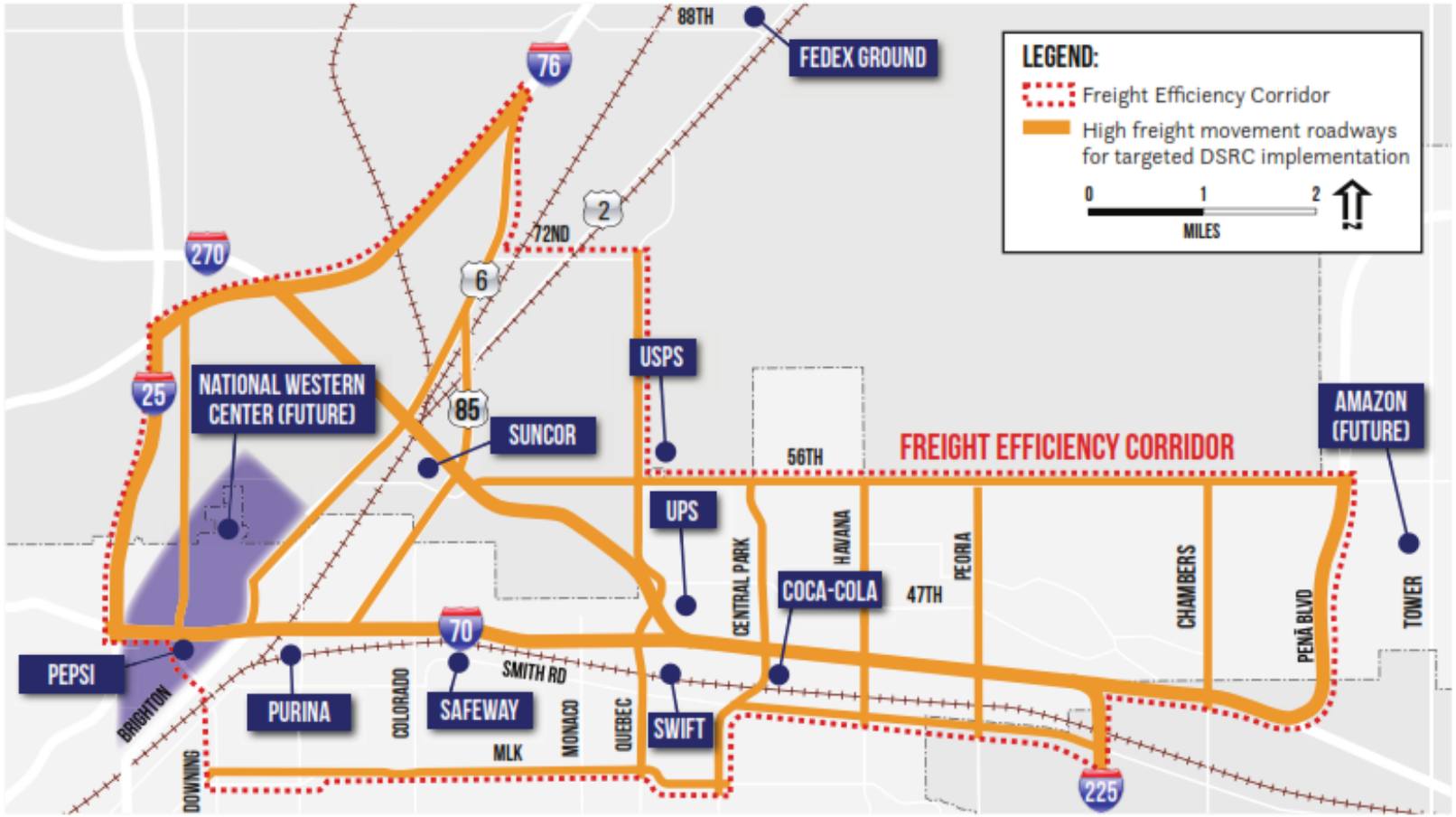
Blue text indicate revision to original grant application

Attachment C. North Denver Freight Corridor Map



. Stretching from I-25 to Pena Boulevard, North Denver is dense with freight movement and industrial facilities and is primed for improving safety and freight efficiency. The Freight Efficiency Corridor will allow trucks access to their destinations through routes that do not disturb neighborhood communities.

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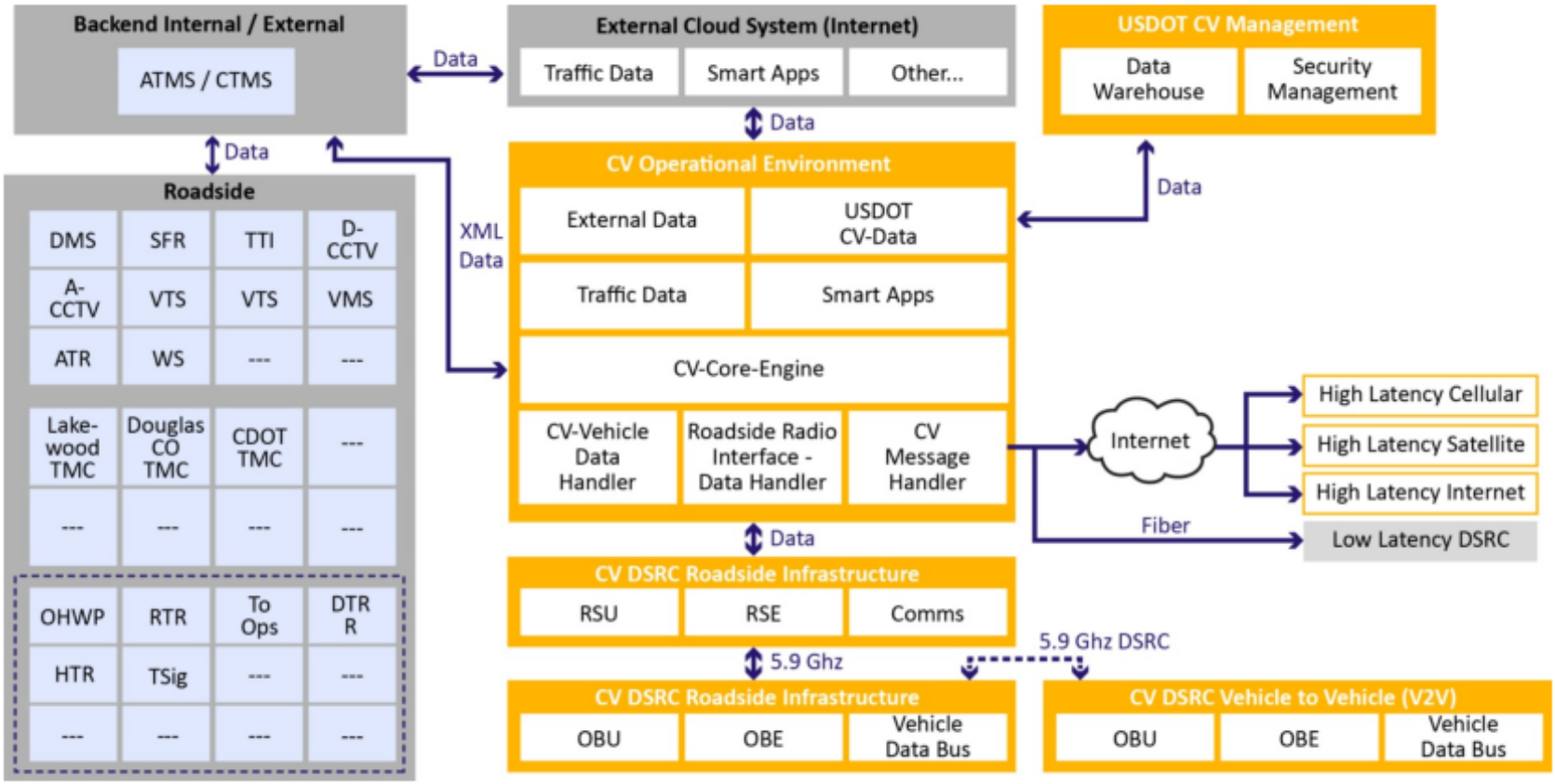
Blue text indicate revision to original grant application

Attachment D. Context Diagram for Denver TMC CV Operational Environment



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Blue text indicate revision to original grant application

Attachment E. Detailed IV Project Budgets

13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

INTELLIGENT VEHICLES

FUNDING	*$12,000,014*
ATCMTD Funded	$5,930,052
City Funded	$6,069,962

INTELLIGENT VEHICLES - YEARLY SPEND PLAN

Materials	Unit	Cost per Unit	Total $ 3 year Investment	FY2016 0%	FY2017 20%	FY2018 50%	FY2019 30%	Investment after FY2019 15%
IV-1, Connected Traffic Management Center and Connected Fleets								
Waze Connected Citizens Program - FREE	0	$ -	$ -	$ -	$ -	$ -	$ -	
DSRC Onboard Units	1500	$ 1,200	$ 1,800,000	$ -	$ 360,000	$ 900,000	$ 540,000	
Annual Requirements/Config Management Software License	3	$ 5,000	$ 15,000	$ -	$ 3,000	$ 7,500	$ 4,500	
IV-2, Travel Time Reliability for Connected Freight								
DSRC Roadside Units	50	$ 2,500	$ 125,000	$ -	$ 25,000	$ 62,500	$ 37,500	
Roadside Signage	161	$ 1,000	$ 161,000	$ -	$ 32,200	$ 80,500	$ 48,300	
Peloton	1	$ 165,000	$ 165,000	$ 4,489	$ 53,429	$ 55,032	$ 52,050	
Econolite	1	$ 542,000	$ 542,000	$ 14,746	$ 175,506	$ 180,771	$ 170,977	
IV-3, Safer Pedestrian Crossing for Connected Citizens								
Roadside Cabinets	4	$ 25,000	$ 100,000	$ -	$ 20,000	$ 50,000	$ 30,000	
Detection	4	$ 40,000	$ 160,000	$ -	$ 32,000	$ 80,000	$ 48,000	
Communications	4	$ 8,000	$ 32,000	$ -	$ 6,400	$ 16,000	$ 9,600	
Signs and Markings	4	$ 5,000	$ 20,000	$ -	$ 4,000	$ 10,000	$ 6,000	
RR flashers and Poles	4	$ 10,000	$ 40,000	$ -	$ 8,000	$ 20,000	$ 12,000	
DSRC Roadside Units	4	$ 2,500	$ 10,000	$ -	$ 2,000	$ 5,000	$ 3,000	
Total Direct Materials			$ 3,170,000	$ 19,235	$ 721,535	$ 1,467,303	$ 961,927	$ 475,500
% of Spending per Year				1%	23%	46%	30%	

Labor	City / Contract	FTE	NEW % Effort	Hourly Labor Rate	Total $ 3 year Investment		+ 3% Escalation from previous year	+ 3% Escalation from previous year	+ 3% Escalation from previous year	8%
IV-1, Connected Traffic Management Center and Connected Fleets										
Engineering/Design										
CV Senior Systems Architect/System Engineers	Contract	2.5	25.0%	$ 102	$ 423,386	$ 11,519	$ 137,098	$ 141,210	$ 133,559	
CV Application/Software Developer	Contract	2	25.0%	$ 95	$ 315,260	$ 8,577	$ 102,085	$ 105,147	$ 99,450	
CV Security/Network Engineer	Contract	2	15.0%	$ 102	$ 203,225	$ 5,529	$ 65,807	$ 67,781	$ 64,108	
Traffic Engineer, Steve Hersey	City	1	33%	$ 48	$ 105,753	$ 2,877	$ 34,244	$ 35,271	$ 33,360	
Technician - City	City	1	33%	$ 38	$ 83,721	$ 2,278	$ 27,110	$ 27,923	$ 26,410	
Install										
ITS Engineer/Electrical Engineer	Contract	2	25.0%	$ 75	$ 248,107	$ 6,750	$ 80,340	$ 82,750	$ 78,267	
Traffic Signal & Elec Technician	Contract	2	25.0%	$ 60	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
IV-2, Travel Time Reliability for Connected Freight										
Engineering/Design										

[R1] Equivalent partner(s) based on open BIDs

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13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

	Urban Planners	Contract	2	15.0%	$ 120	$ 237,617	$ 6,465	$ 76,943	$ 79,252	$ 74,958	
	Freight SME/ Industry Coordinator	Contract	2	15.0%	$ 87	$ 171,960	$ 4,678	$ 55,683	$ 57,353	$ 54,246	
	CV Senior Systems Architect/System Engineers	Contract	2.5	50.0%	$ 102	$ 846,772	$ 23,037	$ 274,195	$ 282,421	$ 267,119	
	CV Application/Software Developer	Contract	3	50.0%	$ 95	$ 945,779	$ 25,731	$ 306,255	$ 315,442	$ 298,351	
	CV Security/Network Engineer	Contract	2	50.0%	$ 102	$ 677,417	$ 18,430	$ 219,356	$ 225,937	$ 213,695	
	Traffic Engineer, Steve Hersey	City	1	33%	$ 48	$ 105,753	$ 2,877	$ 34,244	$ 35,271	$ 33,360	
	Technician - City	City	1	33%	$ 38	$ 83,721	$ 2,278	$ 27,110	$ 27,923	$ 26,410	
Install											
	Signal Timing Engineer/Traffic Modeler	Contract	2	15.0%	$ 100	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
	Traffic Control/MOT	Contract	2	15.0%	$ 75	$ 148,864	$ 4,050	$ 48,204	$ 49,650	$ 46,960	
	ITS Engineer/Electrical Engineer	Contract	2	25.0%	$ 75	$ 248,107	$ 6,750	$ 80,340	$ 82,750	$ 78,267	
	Traffic Signal & Elec Technician	Contract	2	25.0%	$ 60	$ 198,485	$ 5,400	$ 64,272	$ 66,200	$ 62,613	
IV-3, Safer Pedestrian Crossing for Connected Citizens											
Engineering/Design											
	Traffic Engineer	Contract	1	10.0%	$ 120	$ 79,206	$ 2,155	$ 25,648	$ 26,417	$ 24,986	
	Traffic Engineer, Steve Hersey	City	1	10%	$ 48	$ 31,758	$ 864	$ 10,284	$ 10,592	$ 10,018	
	Technician - City	City	1	10%	$ 38	$ 25,141	$ 684	$ 8,141	$ 8,385	$ 7,931	
Install											
	Signal Timing Engineer/Traffic Modeler	Contract	1	10.0%	$ 100	$ 66,162	$ 1,800	$ 21,424	$ 22,067	$ 20,871	
	Traffic Control/MOT	Contract	1	10.0%	$ 75	$ 49,621	$ 1,350	$ 16,068	$ 16,550	$ 15,653	
	ITS Engineer/Electrical Engineer	Contract	1	10.0%	$ 75	$ 49,621	$ 1,350	$ 16,068	$ 16,550	$ 15,653	
	Traffic Signal & Elec Technician	Contract	1	10.0%	$ 60	$ 39,697	$ 1,080	$ 12,854	$ 13,240	$ 12,523	
Total Direct Labor						**$ 5,782,105**	**$ 157,308**	**$ 1,872,316**	**$ 1,928,486**	**$ 1,823,995**	**$ 462,568**
% of Spending per Year							**3%**	**32%**	**33%**	**32%**	

Labor Overhead	City / Contr	FTE	NEW % Effort	Labor Rate (+ X% burden)	Total $ 3 year Investment		+ 3% Escalation from previous year	+ 3% Escalation from previous year	+ 3% Escalation from previous year	10%
IV-1, Connected Traffic Management Center and Connected Fleets										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
IV-2, Travel Time Reliability for Connected Freight										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
Senior Program Developer	Contract	1	100.0%	$ 107	$ 708,683	$ 19,280	$ 229,480	$ 236,365	$ 223,558	
Community Liason	Contract	1	100.0%	$ 63	$ 416,872	$ 11,341	$ 134,988	$ 139,038	$ 131,505	
IV-3, Safer Pedestrian Crossing for Connected Citizens										
System Development Lead	Contract	1	33.0%	$ 131	$ 285,453	$ 7,766	$ 92,433	$ 95,206	$ 90,048	
Project Manager, Michael Finochio	City	1	33.0%	$ 48	$ 104,800	$ 2,851	$ 33,936	$ 34,954	$ 33,060	
Total Overhead					**$ 2,296,316**	**$ 62,474**	**$ 743,575**	**$ 765,882**	**$ 724,385**	**$ 229,631.61**
% of Spending per Year						**3%**	**32%**	**33%**	**32%**	

Other Direct Cost			Unit	Cost per Unit	Total $ 3 year Investment	3%	32%	33%	32%	10%
IV-1, Connected Traffic Management Center and Connected Fleets										
Contingency - Material			10%		$ 181,500.00	$ 4,938	$ 58,772	$ 60,535	$ 57,255	

[K1] Equivalent partner(s) based on open BIDs

Blue text indicate revision to original grant application

13. Annual Spend Plan - Intelligent Vehicles

Version 1, dated June 19, 2016

	Contingency - Install Labor			10%		$ 157,794	$ 4,293	$ 51,096	$ 52,628	$ 49,777	
IV-2, Travel Time Reliability for Connected Freight											
	Contingency - Material			10%		$ 28,600.00	$ 778	$ 9,261	$ 9,539	$ 9,022	
	Contingency - Install Labor			10%		$ 34,121	$ 928	$ 11,049	$ 11,380	$ 10,764	
IV-3, Safer Pedestrian Crossing for Connected Citizens											
	Contingency - Material			10%		$ 31,200.00	$ 849	$ 10,103	$ 10,406	$ 9,842	
	Contingency - Install Labor			10%		$ 318,378	$ 8,662	$ 103,095	$ 106,188	$ 100,434	
Total Direct Cost						**$ 751,593**	**$ 20,448**	**$ 243,375**	**$ 250,676**	**$ 237,094**	**$ 75,159**
% of Spending per Year							**3%**	**32%**	**33%**	**32%**	

GRAND TOTAL - Cost						**$ 12,000,014**	**$ 259,464**	**$ 3,580,801**	**$ 4,412,347**	**$ 3,747,401**	**$ 1,242,859**
% of Spending per Year							**2%**	**30%**	**37%**	**31%**	

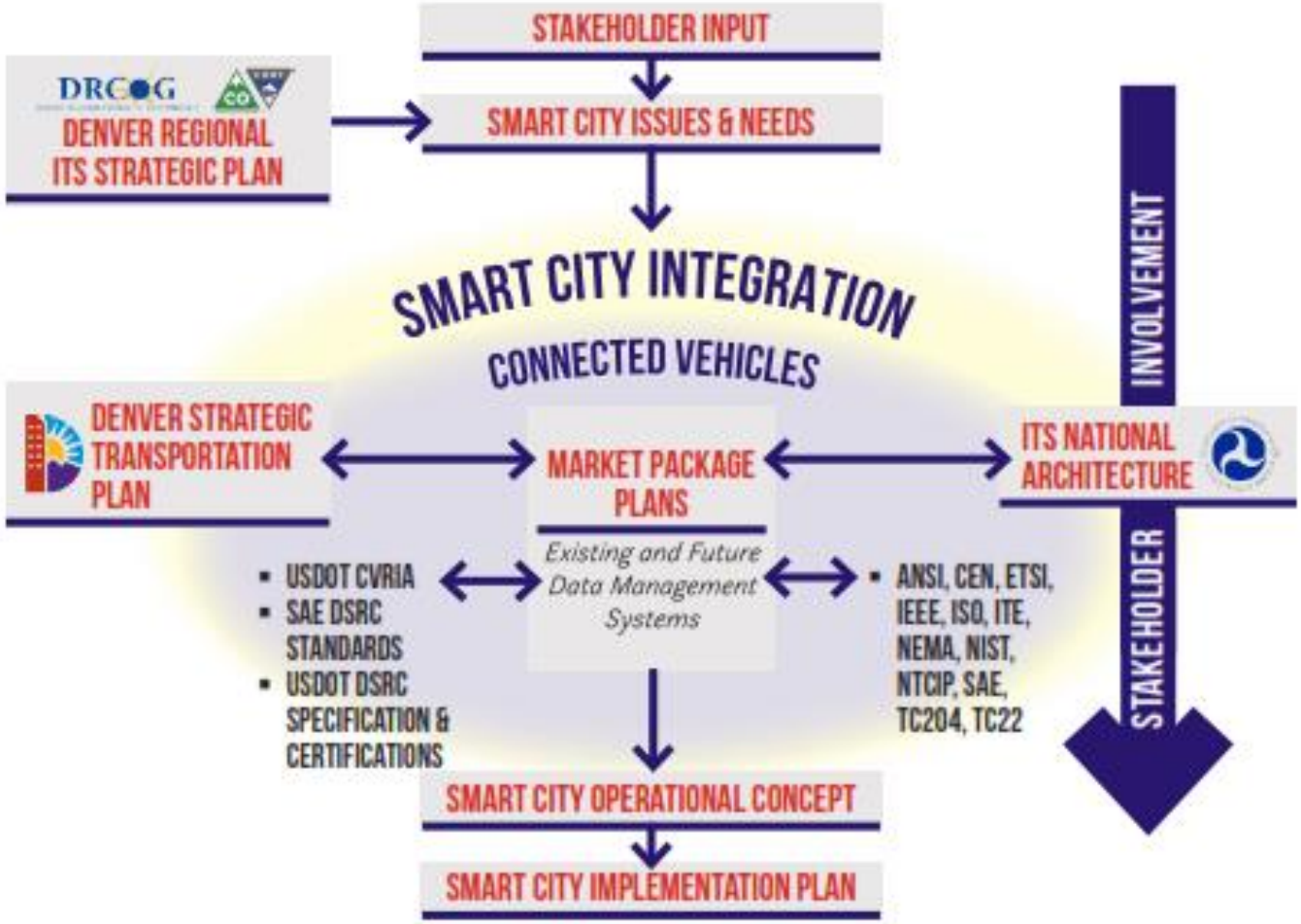
FUNDING	**$12,000,014**
ATCMTD Funded	$5,930,052
City Funded	$6,069,962

		ATCMTD	Denver
BY PROJECTS	**$ 12,000,014**	$ 6,000,007	$ 6,000,007
IV-1, Connected Traffic Management Center and Connected Fleets	$ 4,122,485	$ 2,061,242	$ 2,061,242
IV-2, Travel Time Reliability for Connected Freight	$ 6,434,491	$ 3,217,245	$ 3,217,245
IV-3, Safer Pedestrian Crossing for Connected Citizens	$ 1,443,038	$ 721,519	$ 721,519

	2016	2017	2018	2019
IV-1, Connected Traffic Management Center and Connected Fleets	$ 62,777.49	$ 1,110,191.66	$ 1,677,107.41	$ 1,272,408.01
IV-2, Travel Time Reliability for Connected Freight	$ 167,276.02	$ 2,048,156.34	$ 2,193,685.03	$ 2,025,373.39
IV-3, Safer Pedestrian Crossing for Connected Citizens	$ 29,410.76	$ 422,453.45	$ 541,555.06	$ 449,619.21

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

Attachment F. Approach to Updating Regional ITS System Leveraging Technology



Denver will integrate its Smart City Program into the existing ITS Architecture process; utilize USDOT, SAE, IEEE, and other relevant standards; and engage the appropriate standards development stakeholders for new Smart City concepts.

[R1] Equivalent partner(s) based on open BIDs
Blue text indicate revision to original grant application

OMB Number: 4040-0004
Expiration Date: 12/31/2022

Application for Federal Assistance SF-424

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☐ New	C: Increase Duration
☐ Application	☐ Continuation	* Other (Specify):
☒ Changed/Corrected Application	☒ Revision	

* 3. Date Received:	4. Applicant Identifier:
08/07/2020	City and County of Denver

5a. Federal Entity Identifier:	5b. Federal Award Identifier:
	693JJ31850001

State Use Only:

6. Date Received by State:	7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Denver, City and County of

* b. Employer/Taxpayer Identification Number (EIN/TIN):	* c. Organizational DUNS:
846000580	0855968020000

d. Address:

* Street1:	201 W. Colfax, Ste. 509
Street2:	
* City:	Denver
County/Parish:	
* State:	CO: Colorado
Province:	
* Country:	USA: UNITED STATES
* Zip / Postal Code:	80202-5329

e. Organizational Unit:

Department Name:	Division Name:
Transportation Operations	

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:	Mr.	* First Name:	Michael
Middle Name:			
* Last Name:	Finochio		
Suffix:			

Title: Engineering Manager

Organizational Affiliation:
Department of Transportation & Infrastructure

* Telephone Number:	(720) 913-0801	Fax Number:	

* Email: michael.finochio@denvergov.org

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

B: County Government

Type of Applicant 2: Select Applicant Type:

C: City or Township Government

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

DOT Federal Highway Administration

11. Catalog of Federal Domestic Assistance Number:

20.200

CFDA Title:

Highway Research and Development Program

*** 12. Funding Opportunity Number:**

DTFH6116RA00012

* Title:

Advanced Transportation and Congestion Management Technologies Deployment Initiative

13. Competition Identification Number:

DTFH6116RA00012

Title:

Advanced Transportation and Congestion Management Technologies Deployment Initiative

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Implement three key Intelligent Vehicle projects as proposed in Denver's Smart Cities grant proposal related to: a) Connected Fleets; b) Travel Time Reliability and c) Safer Pedestrian Crossings.

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: CO-001 * b. Program/Project: CO-001

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 10/01/2016 * b. End Date: 02/24/2024

18. Estimated Funding ($):

* a. Federal	6,000,007.00
* b. Applicant	6,000,007.00
* c. State	
* d. Local	
* e. Other	
* f. Program Income	
* g. TOTAL	12,000,014.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Mr. * First Name: Michael

Middle Name:

* Last Name: Finochio

Suffix:

* Title: Engineering Manager, DOTI

* Telephone Number: (720) 913-0801 Fax Number:

* Email: michael.finochio@denvergov.org

* Signature of Authorized Representative: Michael R. Finochio * Date Signed: 08/07/2020

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2022

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. ATCMTD Projects		$	$	$ 6,000,007.00	$ 6,000,007.00	$ 12,000,014.00
2.						
3.						
4.						
5. Totals		$	$	$ 6,000,007.00	$ 6,000,007.00	$ 12,000,014.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) ATCMTD Projects	(2)	(3)	(4)	Total (5)
a. Personnel	$ 1,399,091.55	$	$	$	$ 1,399,091.55
b. Fringe Benefits	277,160.04				277,160.04
c. Travel	50,000.00				50,000.00
d. Equipment	2,500,000.00				2,500,000.00
e. Supplies	100,000.00				100,000.00
f. Contractual	7,370,696.12				7,370,696.12
g. Construction	0.00				0.00
h. Other	0.00				0.00
i. Total Direct Charges (sum of 6a-6h)	11,696,947.71				$ 11,696,947.71
j. Indirect Charges	303,066.29				$ 303,066.29
k. TOTALS (sum of 6i and 6j)	$ 12,000,014.00	$	$	$	$ 12,000,014.00
7. Program Income	$	$	$	$	$

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. ATCMTD Projects	$ 6,000,007.03	$	$	$ 6,000,007.03
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 6,000,007.03	$	$	$ 6,000,007.03

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$	$	$	$	$
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$	$	$	$	$

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16. ATCMTD Projects	$ 1,500,000.00	$ 2,500,000.00	$ 1,700,000.00	$ 300,000.00
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 1,500,000.00	$ 2,500,000.00	$ 1,700,000.00	$ 300,000.00

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: 1,500,000

22. Indirect Charges: 500,000

23. Remarks:

Contract Control Number: DOTI-202056688-01 (201738687-01)
Contractor Name: FEDERAL HIGHWAY ADMINISTRATION

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of: 11/20/2020

DocuSigned by:

SEAL

CITY AND COUNTY OF DENVER:

ATTEST:

By: DocuSigned by:
63CED40350814EC...

Mayor
Michael B. Hancock

DocuSigned by:
401385B0DD354C3...

Clerk and Recorder/Public Trustee
Paul López

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

Attorney for the City and County of Denver

By: DocuSigned by:
E6825B8FF00A43C...

Assistant City Attorney
John G. McGrath

By: DocuSigned by:
075CC87878F04C1...

Chief Financial Officer
Brendan J Hanlon

By: DocuSigned by:
02605F4F8B7845D...

Auditor
Timothy M. O'Brien

*******See Attached Signature Page*****

Contract Control Number: DOTI-202056688-01 (201738687-01)
Contractor Name: FEDERAL HIGHWAY ADMINISTRATION

By: _____

Name: _____
(please print)

Title: _____
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

AMENDMENT TO ASSISTANCE AGREEMENT

1. **AMENDMENT NO.: 0002** **EFFECTIVE DATE**: See Block 9

2. **PROCUREMENT REQUEST NO.:** N/A

3. **AMENDMENT OF AGREEMENT NO.**: 693JJ31850001

4. **ISSUED BY:** Federal Highway Administration (FHWA)
Office of Acquisition and Grants Management, HCFA-32
1200 New Jersey Avenue, S.E.
Washington, DC 20590

5. **NAME AND ADDRESS OF RECIPIENT:** City and County of Denver
201 W. Colfax
Suite 509
Denver, CO 80202-5329
DUNS #: 085596802

6. **ACCOUNTING AND APPROPRIATION DATA**:

- None

7. **DESCRIPTION OF AMENDMENT**:

The purpose of this bilateral amendment is to (1) incorporate a revised Technical Narrative for the City & County of Denver's Advanced Transportation & Congestion Management Technologies Deployment (ATCMTD) Program Project entitled "Denver Smart City Program"; (2) Incorporate a revised SF 424 & SF 424A; (3) Revise the period of performance for this project to end on February 24, 2024.
Accordingly, the agreement is amended as cited on Page 2.

8. Name of Person Authorized to Sign on behalf of the City & County of Denver

Signature

Date Signed: 10/1/2020

Printed Name: Michael Finocchio

Title: Engineering Manager

9. Signature of FHWA Agreement Officer

Ryan J Buck
Signature

Date Signed: 11/12/2020

Printed Name:

Ryan Buck
Agreement Officer

1. Page 1 of 16, Block No. **6. Period of Performance**, revise as follows:
   Delete: 48 Months
   Add: 72 Months

2. Page 2 of 16, **ATTACHMENTS**, add as follows:

   4. Revised Technical Application, "Denver Smart City Program" dated August 7, 2020 (41 pages)

   5. Revised Budget Application, dated August 7, 2020 (6 pages)

Except as noted herein, all other terms and conditions remain unchanged and in full force and effect.

END OF AMENDMENT

1. Award No.
693JJ31850001

2. Effective Date
See No. 17 Below

3. CFDA No.
20.200

4. Award To

City and County of Denver
201 W. Colfax
Suite 509
Denver, CO 80202-5329

DUNS No.: 085596802
TIN No.: 84-6000580

5. Sponsoring Office

U.S. Department of Transportation
Federal Highway Administration
Office of Acquisition & Grants Management
1200 New Jersey Avenue, SE
HCFA-32, Mail Drop E62-204
Washington, DC 20590

6. Period of Performance

Forty-Eight (48) Months

7. Total Amount

Federal Share:	$6,000,007
Recipient Share:	$6,000,007
Total:	**$12,000,014**

8. Type of Agreement

Cooperative Agreement

9. Authority

23 U.S.C. 503(c)(4)

10. Procurement Request No.

HOTMXX1700000099

11. Funds Obligated

$6,000,007

12. Submit Payment Requests To

See "Payment" clause in General Terms and Conditions

13. Payment Office

See "Payment" clause in General Terms and Conditions

14. Accounting and Appropriations Data

15X044A060.0000.070N44A600.7001000000.41011.61006600 - Total Obligated = **$6,000,007**

15. Research Title and/or Description of Project

"Denver Smart City Program"

16. City and County Denver

See Attached Signature Page

Signature Date
Name:
Title:

17. Federal Highway Administration

Stephanie L Curtis 2-8-18

Signature Date
Name: Stephanie Curtis
Title: Agreement Officer

AMENDMENT TO ASSISTANCE AGREEMENT

1. **AMENDMENT NO.: 0003** **EFFECTIVE DATE**: See Block 9

2. **PROCUREMENT REQUEST NO.:** N/A

3. **AMENDMENT OF AGREEMENT NO**.: 693JJ31850001

4. **ISSUED BY:** Federal Highway Administration (FHWA)
Office of Acquisition and Grants Management, HCFA-32
1200 New Jersey Avenue, S.E.
Washington, DC 20590

5. **NAME AND ADDRESS OF RECIPIENT:** City and County of Denver
201 W. Colfax
Suite 509
Denver, CO 80202-5329
SAM UEI #: JL75DFB1NLR4

6. **ACCOUNTING AND APPROPRIATION DATA**:

- None

7. **DESCRIPTION OF AMENDMENT**:

The purpose of this bilateral amendment is to (1) incorporate a revised schedule for the City & County of Denver's Advanced Transportation & Congestion Management Technologies Deployment (ATCMTD) Program Project entitled "Denver Smart City Program"; (2) Revise the period of performance for this project to end on May 24, 2026; and (3) update the recipient's key personnel, as identified in the agreement. Accordingly, the agreement is amended as cited on Page 2.

8. **Name of Person Authorized to Sign on behalf of the Recipient**

John Yu
Signature

Date Signed: 12/04/2023

Printed Name: John S Yu

Title: Senior Engineer

9. **Signature of FHWA Agreement Officer**

RYAN JOSEPH BUCK
Digitally signed by RYAN JOSEPH BUCK
Date: 2023.12.05 14:23:38 -05'00'
Signature

Date Signed: 12/5/2023

Printed Name:

Ryan Buck
Agreement Officer

1. Page 1 of 16, Block No. **6. Period of Performance**, revise as follows:
Delete: 72 Months
Add: 99 Months

2. Page 2 of 16, **ATTACHMENTS**, add as follows:

6. 693JJ31850001 - Revised Schedule, dated August 28, 2023 (3 pages)

3. Page 12 of 16, Section C.4.E – Key Personnel

Delete the current table and replace with the following:

Names	**Title Position**
John Yu	Senior Engineer
Michael Comstock	Director of Traffic Operations

Except as noted herein, all other terms and conditions remain unchanged and in full force and effect.
END OF AMENDMENT

Contract Control Number: DOTI-202371796-02 (201738687-02)
Contractor Name: FEDERAL HIGHWAY ADMINISTRATION

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of: 1/11/2024 | 11:23 AM PST

DocuSigned by:

SEAL

CITY AND COUNTY OF DENVER:

ATTEST:

By: DocuSigned by:
Michael C. Johnston
5DC361FDC863466...
Mayor
Michael C. Johnston

DocuSigned by:
Audrey Kline
E0F80F841070488...
Deputy Clerk and Recorder
Audrey Kline

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

Attorney for the City and County of Denver

By: DocuSigned by:
John McGrath
E0825B8FF80A43C...
Assistant City Attorney
John McGrath

By: DocuSigned by:
Nicole Doheny
A3CE12EB736D4D9...
Chief Financial Officer
Nicole Doheny

By: DocuSigned by:
Timothy O'Brien
BBCB7E81F4174C0...
Auditor
Timothy O'Brien

EXHIBIT 1