ITEM: AAMPO 3
DATE: 09-27-22

AMES AREA METROPOLITAN PLANNING ORGANIZATION

TRANSPORTATION POLICY COMMITTEE

SUBJECT: FFY 2024 IOWA CLEAN AIR ATTAINMENT PROGRAM (ICAAP) PROJECT

BACKGROUND:

The Iowa Clean Air Attainment Program (ICAAP) helps to fund transportation projects and programs that result in attaining or maintaining the national ambient air quality standards (NAAQS). The Ames Area MPO is in attainment of the NAAQS, however, ICAAP funds are available for projects in the area which result in reductions in vehicle emissions and traffic congestion.

The Ames Area MPO needs to review all ICAAP applications within the area to ensure that they are financially feasible and conform with Ames Area MPO transportation planning process. If the criteria are met, the MPO can adopt formal resolutions stating that the proposed projects conform to the regional transportation process. These resolutions are needed by the project sponsors to submit their project to the Iowa Department of Transportation for consideration. Project sponsors are responsible for delivering their completed application to the Iowa Department of Transportation by the State's deadline of October 1, 2022, at 5PM.

The following project has been submitted for a resolution by the Ames Area MPO for the FFY 2024 ICAAP grant cycle:

Project Sponsor	Sponsor Priority	Project Name	ICAAP Request	Total Cost Project
City of Ames	1	Ames Traffic Network – Phase 4 (Fiber Network & Adaptive Control)	$1,521,280	$1,901,600

*See attachment for full project application.

Awards will be made by the Iowa Transportation Commission in early 2023. Funds will become available in FFY 2024, which begins on October 1, 2023.

ALTERNATIVES:

1. Certify that the project shown in the Iowa Clean Air Attainment Program grant application conforms to the MPO's regional transportation planning process.
2. Do not move forward with certifying the grant application.

ADMINISTRATOR'S RECOMMENDATION:

The Ames Area MPO Transportation Technical Committee has reviewed the proposed grant application and unanimously recommended approval. The work accomplished under this grant could lead to future ICAAP funding that will free up local funds to be reprioritized for other local regional projects.

Therefore, it is the recommendation of the Administrator that the Transportation Policy Committee adopt Alternative No. 1, as described above.

Form 230017 (05-20)

IOWADOT

PROJECT APPLICATION
IOWA CLEAN AIR ATTAINMENT PROGRAM (ICAAP)

General Information:

Applicant Agency: City of Ames (Public Agency (required)) E-mail: damion.pregitzer@cityofames.org

Contact Person (*Name and Title*): Damion Pregitzer, Traffic Engineer

Complete Mailing Address: City Hall, 515 Clark Avenue (Street Address and/or Box Number)

Ames (City) | IA (State) | 50010 (ZIP Code) | 515-239-5160 (Daytime Phone)

If more than one agency or organization is involved in this project, please state the name, contact person, mailing address, and telephone number of the second agency. *(Attach an additional page if more than two agencies are involved.)*

Co-Applicant Agency: (Public Agency, Non-Profit Organization[1], For-Profit Organization[1], or Individual[1]) E-mail:

Contact Person (*Name and Title*):

Complete Mailing Address: (Street Address and/or Box Number)

City | State | ZIP Code | Daytime Phone

Project Information:

Project Title[2]: Fourth Phase Deployment Ames Traffic Signal Master Plan

Project Description (including length, if applicable):

This Fourth Phase will provide a fiber optic connection from Lincoln Way and University Boulevard, West along Lincoln Way to South Dakota Avenue, continuing down South Dakota Avenue to Mortensen Road, following Mortensen to Hayward Avenue, back to Lincoln Way. The fiber will also continue along Mortensen Road/Parkway to University Boulevard, adding a redundant link for the signals along University. This phase will also include a spur along Dakota Avenue, from Mortensen Road to Highway 30 WB ramp, as well as connecting Fire Station #2.

*Project priority (1 = highest priority): _____ (a sponsor submitting multiple applications in this funding cycle must assign a numerical rank or priority to each application.)[3]

*Assign the proposed project to one or more of the following categories (check one or more):

- ☐ Transportation-Related Project in the State Implementation Plan (SIP)
- ☐ Transportation Control Measure (TCM)
- ☑ Traffic Flow Improvement (Intersection, Signalization, Other)
- ☑ Planning and Project Development
- ☐ Travel Demand Management (TDM)
- ☑ Transit-Related Improvement
- ☐ Shared-Ride
- ☐ Bicycle or ☐ Pedestrian Facility or Program (select one)
- ☐ Intermodal Freight
- ☐ Passenger
- ☐ Alternative Fuels
- ☐ Vehicle Inspection and Maintenance Program
- ☐ Outreach Activity (Education, Advertising, or Technical Assistance)

*Is the project consistent with the State Implementation Plan for air quality for non-attainment areas? ☐ Yes ☐ No ● Not Applicable

*Is the project consistent with the MPO's local congestion management plan? ● Yes ☐ No ☐ Not Applicable

*Is the project consistent with the ● MPO ☐ RPA ☐ Statewide Long-Range Transportation Plan? ● Yes ☐ No ☐ Not Applicable

Notes: [1]Requires public agency as co-sponsor of application.
[2]The term "project" means any ICAAP infrastructure or program proposal.
[3]The Iowa Department of Transportation will use the priority ratings to reflect the sponsor.

Project Costs *(an itemized breakdown must be included on an attached sheet)*:

Total Cost: $1,901,600.00

Iowa Clean Air Attainment Program Fund Request: $1,521,280.00

Applicant Match $380,320.00

Projects with a private for-profit co-applicant require a minimum 50 percent applicant match; all other projects require a minimum 20 percent applicant match.

	List All Applicant Match Sources	Amount	Assured or Anticipated (Date Anticipated)
1.	City of Ames	$380,320.00	July 31, 2023
2.			
3.			

Are any state funds involved in this project? ☐ Yes ● No

If Yes, please explain the source and conditions:

Are any other federal funds involved in this project? ☐ Yes ● No

If Yes, please explain the source and conditions:

Estimated Project Development Schedule:

Design: Start Date: _____ Completion Date: _____

Land Acquisition: Start Date: _____ Completion Date: _____

Construction: Start Date: July 01, 2024 Completion Date: July 01, 2025

Has any part of this project been started? ● Yes ☐ No

If Yes, please explain:

Ames Traffic Signal Master plan, phases 1, 2, 3.

How do you plan to measure the success of this project?

Completion of the fiber optic connection to Fire Station #2, and implementation of the Advanced Traffic Management System along the western portion of Lincoln Way.

Required Documentation and Narrative Information

The following documents and narratives must be submitted with this application. In the upper right corner of each document or narrative write the corresponding letter shown below.

- ☑ A. A NARRATIVE assessing existing congestions/air quality conditions, outlining the concept of the proposed project, and providing adequate project justification. How will this project reduce congestion, reduce travel or single occupant vehicle usage, and/or improve air quality? Which transportation-related pollutant(s) are being addressed: carbon monoxide, ozone, or particulate matter (PM)?
- ☑ B. A DETAILED MAP identifying the location of the project and clearly differentiating the subject project from any past or future project phases.
- ☑ C. An ITEMIZED BREAKDOWN of the total project costs. This documentation does not need to be a detailed, line-item type of estimate. However, it must accomplish two objectives: First, it must show the method by which the cost estimate was prepared; and second, it must enable a reviewer to determine if the cost estimate is reasonable. The manner in which these objectives are achieved may vary widely depending on the type, scope, and complexity of the project. Absent a fully itemized list of costs, some general guidelines for possible methods of estimating each type of project cost are provided on Attachment A.
- ☑ D. A TIME SCHEDULE for the total project development.
- ☑ E. An OFFICIAL CERTIFICATION from the applicant's governing body (authority) that it shall:
  (1) commit the necessary local matching funding for project implementation and
  (2) upon project completion, be responsible for adequately maintaining and operating the project for public use during the project's useful life.
- ☑ F. An ADOPTED FORMAL RESOLUTION from the appropriate MPO or RPA declaring the sponsor's proposed project or program conforms to the MPO's or RPA's regional transportation planning process. (For MPOs, the project or program must be identified in the fiscally constrained transportation plan and, if applicable, the congestion management plan in TMAs.)
- ☑ G. CALCULATIONS for vehicle emission reductions and total project cost-effectiveness for the targeted pollutants. Project applicant must show through a quantitative analysis how many kilograms of pollutant will be reduced (CO, VOC, NOx, and, if applicable, PM). Project sponsor must calculate the cost-effectiveness of the project by: Dividing the total annualized project cost by the number of kilograms per year of pollutant reduced ($ per kg). Applicant must also show all assumptions and source of data used to calculate the estimates. The applicant must use the most current vehicle emission factors developed by the Iowa DNR and consistent with the U.S. EPA's MOBILE 6.2 air quality model. These emission factors are periodically updated and may be obtained from the Iowa DOT's ICAAP website at: https://iowadot.gov/systems_planning/Grant-Programs/Iowa-Clean-Air-Attainment-Program-ICAAP.
- ☑ H. Completed MINORITY IMPACT STATEMENT attached to application.

The award of ICAAP funds; any subsequent funding or letting of contracts for design, construction, reconstruction, improvement, or maintenance; and the furnishing of materials for this project shall not involve direct or indirect interest of any state, county, or city official, elective or appointive. All of the above are prohibited by Iowa Code 314.2, 362.5, or 331.342. Any award of funding or any letting of a contract in violation of the foregoing provisions shall invalidate the award of ICAAP funding and authorize a complete recovery of any funds previously disbursed.

Certification

To the best of my knowledge and belief, all information included in this application is true and accurate, including the commitment of all physical and financial resources. This application has been duly authorized by the participating local authority. I understand the attached **official endorsement(s)** binds the participating local governments to assume responsibility for adequate maintenance of any new or improved facilities.

If ICAAP funding assistance is approved for the project described in this application, I understand that an executed contract between the applicant and the Iowa DOT is required before such funding assistance can be authorized for use in implementing the project.

Representing the City of Ames
(Name of Applicant's Governing Authority)

Signature

8/29/2022
Date

Damion Pregitzer, City of Ames Traffic Engineer
Typed Name and Title
(Governing Authority Official)

Date

IOWADOT
Form 105101 (3-18)

Minority Impact Statement

Pursuant to 2008 Iowa Acts, HF 2393, Iowa Code 8.11, all grant applications submitted to the State of Iowa that are due beginning Jan. 1, 2009, shall include a Minority Impact Statement. This is the state's mechanism for requiring grant applications to consider the potential impact of the grant project's proposed programs or policies on minority groups.

Please choose the statement(s) that pertains to this grant application. Complete all the information requested for the chosen statement(s). Submit additional pages as necessary.

☐ The proposed grant project programs or policies could have a disproportionate or unique **positive** impact on minority persons.

Describe the positive impact expected from this project.

Indicate which groups are impacted.

☐ Women ☐ Persons with a disability ☐ Blacks ☐ Latinos ☐ Asians

☐ Pacific Islanders ☐ American Indians ☐ Alaskan Native Americans ☐ Other_____

☐ The proposed grant project programs or policies could have a disproportionate or unique **negative** impact on minority persons.

Describe the negative impact expected from this project.

Present the rationale for the existence of the proposed program or policy.

Provide evidence of consultation with representatives of the minority groups impacted.

Indicate which groups are impacted.

☐ Women ☐ Persons with a disability ☐ Blacks ☐ Latinos ☐ Asians
☐ Pacific Islanders ☐ American Indians ☐ Alaskan Native Americans ☐ Other _____

☑ The proposed grant project programs or policies are **not expected to have** a disproportionate or unique impact on minority persons.

Present the rationale for determining no impact.

The area of travel encompassed by this project is used by the general public and does not contain any areas where minorities would be a prevalent population.

I hereby certify that the information on this form is complete and accurate, to the best of my knowledge.

Name Damion Pregitzer, PE PTOE

Title Traffic Engineer

Definitions

"Minority Persons," as defined in Iowa Code 8.11, means individuals who are women, persons with a disability, Blacks, Latinos, Asians or Pacific Islanders, American Indians, and Alaskan Native Americans.

"Disability," as defined in Iowa Code 15.102, subsection 7, paragraph "b," subparagraph (1):
b. As used in this subsection:

(1) *"Disability"* means, with respect to an individual, a physical or mental impairment that substantially limits one or more of the major life activities of the individual, a record of physical or mental impairment that substantially limits one or more of the major life activities of the individual, or being regarded as an individual with a physical or mental impairment that substantially limits one or more of the major life activities of the individual.

"Disability" does not include any of the following:
(a) Homosexuality or bisexuality.
(b) Transvestism, transsexualism, pedophilia, exhibitionism, voyeurism, gender identity disorders not resulting from physical impairments or other sexual behavior disorders.
(c) Compulsive gambling, kleptomania, or pyromania.
(d) Psychoactive substance abuse disorders resulting from current illegal use of drugs.

"State Agency," as defined in Iowa Code 8.11, means a department, board, bureau, commission, or other agency or authority of the State of Iowa.

REQUEST FOR IOWA'S CLEAN AIR ATTAINMENT PROGRAM (ICAAP)

ATTACHMENT A

Itemized breakdown of total project costs guidelines.

Construction costs
These may be based on historical averages for entire projects of similar size and scope. Examples include:

- Typical cost per mile of trail (e.g., $200,000 per mile for moderate terrain and limited number of structures).
- Typical cost per square foot of bridge deck.
- Typical cost per square foot of fiber optic traffic signal interconnect cable (i.e., $178,000 per mile).
- Typical cost per traffic signal upgrade (i.e., $163,000 per lump sum signal bid item).

Design/Inspection costs
These may be estimated based on the following typical percentages of construction costs, such as:

- 8 to 10 percent for preliminary up through final design and letting activities.
- 12 to 15 percent for construction inspection activities.

Right of way acquisition costs
These may be estimated based on:

- Impact and description of impact.
- Typical cost per square foot for permanent right of way.
- Typical cost per square foot for temporary easements.

Utility and railroad costs
These may be estimated based on:

- Impact and description of impact.
- Typical cost per linear foot of relocated or reconstructed facility (i.e., track, pipe, electrical lines).
- Typical cost per installation (i.e., railroad switches, utility poles, transformers, control boxes).

Indirect costs
If indirect costs are involved (e.g., wages):

- Estimated hours.
- Estimated hourly rate, salary.
- Estimated fringe, direct.
- Other direct cost estimate.
- Other indirect cost estimate.

City of Ames

TRAFFIC SIGNAL COMMUNICATION NETWORK

Fourth Phase – September 2022

IOWA CLEAN AIR ATTAINMENT PROGRAM

A – Introduction

This grant application is for the deployment of the Fourth Phase of the Traffic Communication Network Master Plan for the City of Ames, utilizing the ITS Systems Engineering Process and the Ames Area Metropolitan Planning Organization (AAMPO) Regional Intelligent Transportation Systems (ITS) Architecture, to provide communication, coordination, and management of the traffic signals systems along the Western portion of Lincoln Way. This project will also connect South Dakota Street as well as Mortensen Road, in addition to connecting Fire Station #2 which will be used as a Hub location. This project will continue the program for the City of Ames to improve their ability to monitor, manage, and change traffic signal timings along major arterials in real time to provide optimum traffic signal operations and promote efficient traffic flows. Detailed literature reviews and engineering evaluations have been completed by gbaSI for the City to provide technical information for this grant application.

The majority of transportation related air pollution and emissions occur when traffic is stopped, during initial acceleration after stopping, and during stop and go traffic operations. This Fourth Phase Deployment will offer opportunities to improve air quality by providing monitoring and management capabilities to City staff for the implementation of optimized signal coordination, reducing congestion, eliminating unnecessary vehicle stops, encouraging uniform traffic flows, and reducing the amount of time traffic waits at signals. This Fourth Phase Deployment will continue the expansion of the fiber optic communication backbone begun as Phase One, Phase Two and Phase Three of this program and will facilitate the expansion of the Advanced Traffic Management System (ATMS) to other corridors with future projects.

These improvements also fall in line with the City's existing EcoSmart strategy, which strives to reduce energy consumption and decrease the City's carbon footprint. This strategy involves several programs including Smart Ride, which focuses on efforts to reduce carbon emissions through increasing efficiency in transportation services both in city operations and in public services. The City of Ames has already moved to purchasing fuel-efficient vehicles including sub-compacts, hybrids, and an all-electric Zenn vehicle for fuel-efficient driving and carbon footprint reduction.

Another benefit of improving the City's overall Traffic Network and allowing them to remotely manage and monitor their network systems is providing more consistent, reliable, shorter travel times along a corridor for their existing and already thriving city-wide bus transit system (CyRide).

B – Background

The City of Ames has an on-going initiative to create a city-wide high speed fiber optic (FO) communication network that will link existing city traffic signals, school crossing signals and flashers, pedestrian crossings, and traffic data collection devices to allow remote monitoring, communication, and control. Additionally, this fiber network could provide communication to other public facilities, such as Police, Fire and Maintenance buildings, other city government building, schools, and libraries.

Planning, design, and implementation of a city-wide high speed fiber optic network would enable the City to more efficiently and responsively manage the traffic network and to implement optimized signal coordination, reduce congestion, eliminate unnecessary vehicle stops, encourage uniform traffic flows, and reduce the amount of time traffic waits at signals.

Phase Four of the Ames Traffic upgrade project will expand the communication backbone of the traffic network to enhance and improve the Traffic Department's ability to manage traffic flow and respond to events. This phase also affords upgrades to the traffic management devices and software that will provide the ability institute the latest in traffic management protocols and practices. This will result in improved traffic flow on a regular basis and the capacity to adjust traffic plans to match increased demands created by special events, incidents, or construction. Real time monitoring of traffic operations and improved management practices, such as traffic adaptive programs, will combine to ease congestion and provide management capabilities that will boost the capacity of the current roadways, ease congestion and the resulting air pollution, and reduce fuel consumption. The most noticeable improvement to the general public, will be the reduction in time spent driving to their destination or sitting in traffic. Lincoln Way and Hyland Avenue, included in the Phase Four Deployment, was found to be below acceptable levels of operations per the Ames Mobility 2040 Final Report (Table 19 - Existing Conditions Intersection Capacity Utilization Analysis Results).

Project Details

This Fourth Phase will provide a fiber optic connection from Lincoln Way and University Boulevard, West along Lincoln Way to South Dakota Avenue, continuing down South Dakota Avenue to Mortensen Road, following Mortensen to Hayward Avenue, back to Lincoln Way. The fiber will also continue along Mortensen Road/Parkway to University Boulevard, adding a redundant link for the signals along University. This phase will also include a spur along Dakota Avenue, from Mortensen Road to Highway 30 WB ramp, as well as connecting Fire Station #2 at the corner of Chamberlain Street and Welch Avenue. This fiber expansion project will provide the

required communication network necessary to continue the expansion of the traffic network to improve the entire traffic operations for the City of Ames.

This phase expands the network begun in Phases 1, 2 and 3 to include the remaining signals along Lincoln Way, connect the Fire Station #2, and add redundancy to the south of the Lincoln Way. This will allow for the advanced Traffic Adaptive traffic management program to interoperate the corridors and coordinate the traffic operations along the corridors to maximize traffic flow and reduce congestion. By coordinating the flow along the individual corridors with the adjoining corridors the Traffic Department will have the ability to further reduce congestion and pollution.

As this project encompasses the corridors noted, there will be ancillary benefits to the city besides the improved traffic management ability. Here are a few examples of possible uses:

- The CCTV capacity can be shared with Police, Fire, Dispatch, and Emergency Services to allow for monitoring of the corridors.
- The dark fiber that is not used by the Traffic Department could be allocated for use by other city departments or governmental agencies. This could eliminate the need to use commercially available fiber and be subjected to future increased cost and limited availability as the demand for fiber increases.
- With the onset of “Smart City” and “Connected Vehicle” technology the dark fiber from this project could be valuable to both governmental entities (City, IDOT, ISU, County, USDA, as examples) and commercial interests.
- The ability to test “Connected Car” technology with a modern traffic system that includes Advanced Traffic Controller capacity could be of great value to Iowa State University in attracting research grants for their Engineering Department.
- The ability to monitor the areas around events (football and basketball games, concerts, and special events) would allow the timely implementation of traffic management measures to expedite the exit of the vehicles associated with these events.

With the availability of technology today and the explosion of technology that will soon be coming, one of the constant requirements will be a robust fiber optic network. In the vast majority of cases, regardless of the technology, it requires a high-capacity communication medium. The fiber optic backbone that will continue with this project will be a big step in providing that solution for the City of Ames.

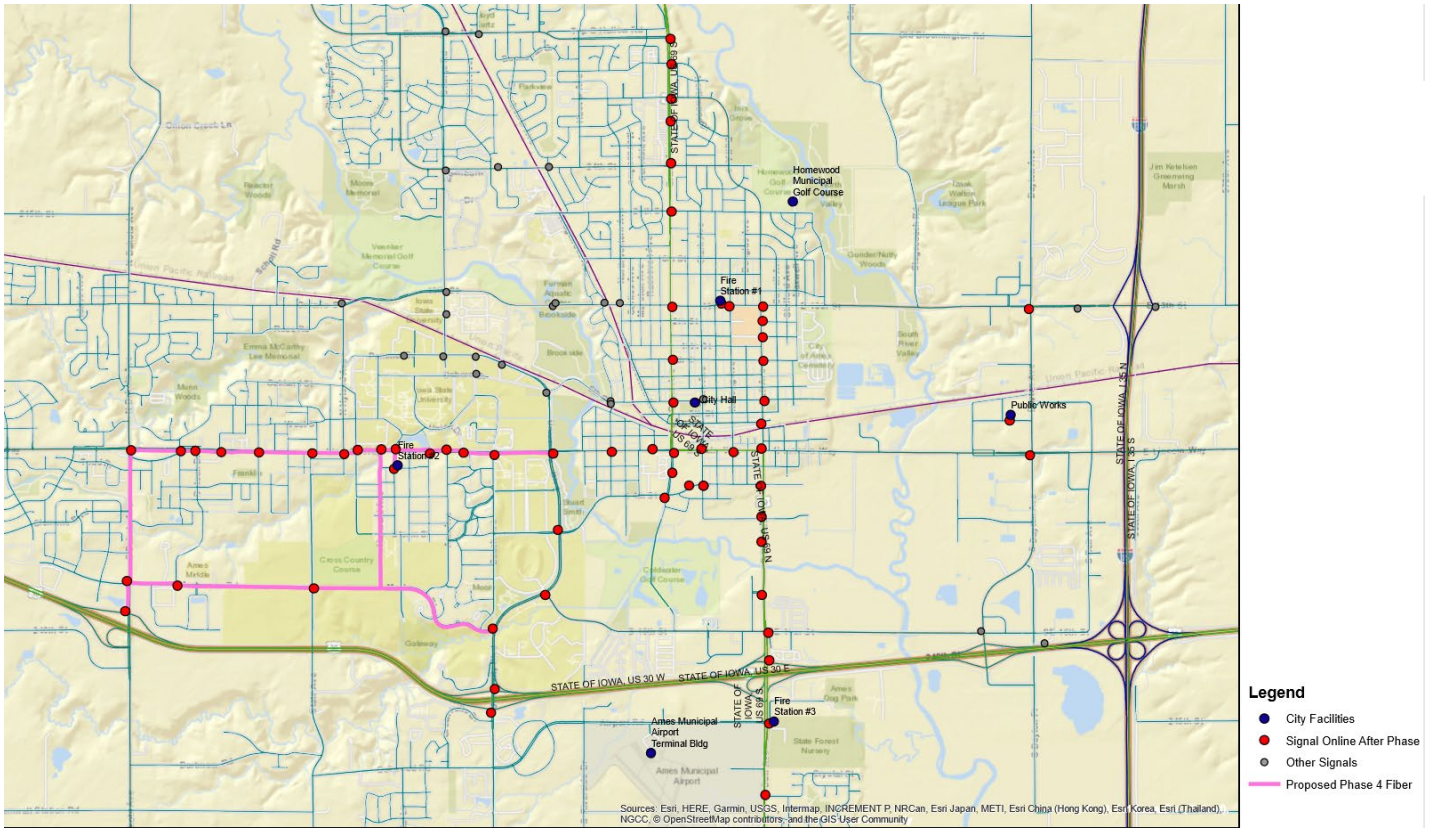

Figure 1 - Fourth Phase Fiber Routing
(shown in Pink)

This Phase also encompasses improvements to the necessary traffic control devices on these corridors and connection to Fire Station #2 for added redundancy to the network. This will give the City of Ames the capability of managing traffic flow on a "real time" basis through Traffic Adaptive Programs or by using the VPN function and communication capacities to monitor and adjust timing plans at the individual intersections to meet the traffic demands.

Fourth Phase Deployment

The Fourth Phase Deployment of the Traffic Network Master Plan will extend the management corridor created in Phase Two along one of the busiest and most congested traffic corridors in the City of Ames while also providing the core fiber optic communication and traffic management components and software that will be the basis for future expansion of the traffic management system. This phase affords the ability to connect to the rest of Lincoln Way, which will provide a communication pathway to connecting the western portion of the city.

This communication system will permit the Traffic Department to connect to individual intersections on a "real time" basis which will permit traffic monitoring and changes to the timing of the intersection, if necessary, from the central office location without traveling to the actual intersection. This will provide a much more efficient and accurate method of traffic management and will reduce stops and delays along the corridor. By being able to remotely monitor and adjust the traffic timing plans the personnel from the Traffic Department will reduce the need to travel to the individual intersections which will save the City time and fuel.

The Fourth Phase Deployment communication network will allow the Traffic Department to continue to deploy Advanced Traffic Controllers (ATC), along project corridors and have access to the latest traffic management programs and systems. Advanced traffic management programs such as Traffic Adaptive Systems require fast, robust communication abilities to function effectively as an exchange of detection information and platoon numbers are passed up and down the corridor. This exchange of detection information and platoon numbers provides the basis for the amount of time allotted to a direction of travel within the intersection and allows the Traffic Adaptive System to adjust traffic plans according to the demands of the traffic flow. Traffic Adaptive Systems operate on a "real time" basis and can provide an efficient and effective traffic management protocol that reduces delays and stops along the traffic corridor. The deployment of ATCs and a fiber optic communications network with a connection to Fire Station #2, will facilitate the collection of data from the corridor on a live basis, video feed to Police and Fire Departments, and monitoring of traffic flow from areas where congestion or accidents could occur.

The Fourth Phase Deployment will expand the backbone of the full city-wide traffic management system with an additional Hub connected at Fire Station #2. This brings the number of Hubs to 5 at the completion of this phase.

C – Implementation Plan

The Ames Traffic Network Master Plan project is made up of several separate components and items that together create an integrated signal communication and coordinated traffic operations system. The key components of the system are:

- Fiber optic cable and conduit system along arterials
- Communication hardware and switches located within new signal cabinets
- Procurement of ATMS management software licenses (as needed) for arterial traffic signal control and CCTV system control

AMES FOURTH PHASE DEPLOYMENT

Estimate of Project Implementation Costs – <u>Total for Project - $1,901,600 +/-</u>

Item 1: Fiber Cost: $810,000

144 strand Single Mode Fiber Optic Cable
Hand Holes and Conduit Installation
$27 @ foot at approximately 30,000 ft.

Item 2: Fiber Terminations Cost at Cabinets: $70,500

30 terminations per cabinet at 18 cabinets at $75 @ termination - $40,500
Miscellaneous patch cords and splice panels - $30,000

Item 3: Traffic Cabinet and Controller Cost: $693,200

Traffic Signal Cabinet with Controller at 18 cabinets at $35,000 @ cabinet - $630,000
Installation cost at 18 cabinets at $2,400 @ cabinet - $43,200
Cross Connect Cabinet at 2 locations at $10,000 per location - $20,000

Item 4: Network Switches Cost: $69,400

1 Layer 3 Network Switches @ $19,000 - $19,000
18 Layer 2 Network Switches @ $2,800 - $50,400

Item 5: Traffic Operations Center Costs: $118,500

Central Office Software (ATMS) for 18 intersections - $36,000
Traffic Adaptive Modules and Intersection Implementation at $5,000 - $90,000
One Year Maintenance and Support - $18,000

Item 6: Consultant Costs: $140,000

Infrastructure Design - $90,000
Network Design and Programming - $50,000

Fourth Phase Deployment Cost Estimate

Items	Description	Quantity	Items	Cost	ICAAP Grant (80%)	City Contribution (20%)	Total Cost
1-6	Fourth Phase Deployment	1	6	$1,901,600	$1,521,280	$380,320	$1,901,600

D – Project Timeline

The Ames Fourth Phase Deployment will commence in the summer of 2024 upon award of a grant from the ICAAP program. It is anticipated that this Phase of deployment will be finalized in the Winter of 2023-2024. Future ICAAP grant applications for fiber optic infrastructure, traffic signal upgrades, ATMS software, and TOC improvements are expected to be requested based upon the completion of the First, Second and Third Phase Deployments.

Project Summary

The Fourth Phase Deployment of the Traffic Network Master Plan will extend a management corridor along one of the busiest and most congested traffic corridors in the City of Ames while also providing the core fiber optic communication and traffic management components and software that will be the basis for future expansion of the traffic management system. This communication system will permit the Traffic Department to connect to individual intersections on a "real time" basis which will permit traffic monitoring and changes to the timing of the intersection, if necessary, from the central office location without traveling to the actual intersection. This will provide a much more efficient and accurate method of traffic management and will reduce stops and delays along the corridor.

E – Traffic System Operation and Management

The Traffic Network Master Plan outlines and defines the communication network that would become a critical component of a responsive and efficient traffic management system. The Fourth Phase Deployment will be the continuation of the process started in Phases One, Two and Three to create a city-wide traffic network and provides value as a stand-alone project because of the reduction in congestion and the accompanying fuel consumption and air pollution. This system would be supervised, maintained, and controlled by the Traffic Operations Department for the City of Ames. The additional capabilities provided by the network will allow the city personnel to upgrade their traffic management practices to include central office abilities along the Lincoln Way corridor. This will allow them to more effectively implement management practices in each of the corridors that will reduce congestion and delays. By allowing communication and control capacities to each intersection the efficiency of both the personnel and the intersection will be vastly improved. The ability of city personnel to monitor intersections from a central office location will save time and money and will more than offset the expenditure of funds from the Traffic Department Budget to match the ICAAP funding.

F – Integration with Ames Forward 2045

The concept of an efficient traffic control system that is connected to a communication network that allows for a more flexible and adaptive approach is a concept that is consistent with the goals put forth by the Ames Area Metropolitan Planning Organization in their Ames Forward 2045 Long Range Transportation Plan. As noted in the minutes for the September 22, 2015 meeting of the AAMPO Transportation Policy Committee:

Traffic Adaptive Signal Systems are included in the Ames Forward 2045 Long Range Transportation Plan as a short term, high priority under the Roadway portion of the plan.

This statement recognizes the importance of the need for a Traffic Adaptive System to help manage the traffic flow within the City of Ames. This Fourth Phase Deployment is the next step in reaching that goal by including the 18 intersections on the project corridors into the Traffic Adaptive signal system the fiber optic communications network.

This project's corridor of Lincoln Way received an "Unreliable" score for travel reliability in the Ames Forward 2045 Final Report (Figure 3-5 Passenger Vehicle Travel Reliability). The ability to monitor, adjust, and improve the capabilities of the traffic control system provides a key component towards attaining a more efficient and responsive transportation system. That is the overall objective of the Ames Forward 2045 Plan. This can be accomplished by reducing the congestion along the Lincoln Way corridor through coordination based on communication. The capacity to communicate between the traffic control mechanisms at the intersections in those corridors and a central traffic management system will provide the city with control and management abilities that will optimize the intersections' capabilities to handle traffic demands more effectively. As a result, Ames will be able to mitigate some of the corresponding pollutants associated with vehicles dealing with congestion and delays.

This project also has 9 intersections that rank in the top 25 intersections for crash frequency (Table 11) and crash rate (Table 13) according to the Ames Mobility 2040 Long Range Transportation Plan. This information was not revisited as part of the Ames Forward 2045 report. With an improved traffic flow and better usage of the existing roadway infrastructure provided by a Traffic Adaptive Traffic Management System the frequency of crashes would be expected to be reduced.

City Ranking	Number of Crashes 2009-2013	Location
4	53	Lincoln Way/Hyland Ave
9	40	Lincoln Way/N Dakota Ave
12	38	Lincoln Way/Sheldon Ave
14	36	Lincoln Way/Welch Rd
16	33	Lincoln Way/Marshall Ave
18	33	Lincoln Way/Beach Ave
19	33	Lincoln Way/State Ave
21	30	Mortensen Rd/S Dakota Ave
22	29	Lincoln Way/Dotson Dr

G – Air Quality Improvement

The Ames Traffic Network Master Plan defines the requirements and steps necessary to create an integrated traffic control system made up of traffic signals, ITS devices and systems, and other traffic management assets. This central control system will greatly enhance and expand the abilities of the City to quickly understand and respond to traffic operational and safety concerns. The Traffic Network Master Plan will improve the ability of the City of Ames to monitor, manage, and change traffic signal timings along in real time to provide optimum traffic signal operations and promote efficient traffic flows. As the next step in fulfilling the Ames Traffic Network Master Plan, this Phase Four Deployment project will continue the necessary improvements in the traffic and communications systems to facilitate the technology and innovations that will allow for the mitigation of air quality issues as they relate to traffic congestion.

Numerous studies and reports have been completed in the recent past which documents the benefits and effectiveness of advanced signal control systems and TOC management centers. Some studies have shown that delays can be reduces by up to 42% (1). Others noted reduced stops by between 18 – 29% (2). In Tysons Corner, Virginia, system enhancements and management activities decreased total annual emissions VO, CO, VOC, and NOx by 134,600 kilograms (3). A study using ITS Deployment Analysis Software (IDAS) was conducted by Eugene, Oregon to evaluate the potential benefits of a hypothetical adaptive signal control system along one corridor with 8 signalized intersections resulted in a 5:1 benefit-to-cost ratio (4).

In general, most studies have shown an 8-13% decrease in fuel consumption, a 7-14% decrease in emissions, 20-40% reduction in vehicle stops, 10-20% reduction in travel times, 10-15%

increases in average speed, and a 20-40% decrease in average delay. While no detailed calculations for potential air quality improvement have been completed for the addition of a TOC and ATMS in Ames, it is inarguable that the implementation of traffic management technologies and procedures will significantly improve traffic operations and decrease vehicle emissions.

Below are the results of emissions calculations and summaries completed for the Lincoln Way Corridor. This shows the emission reductions that the evaluated project corridor could be expected to experience with the implementation of coordinated signal control of intersections on this route. With the addition of overall signal system management and control practices through the implantation of a citywide ATMS, additional savings will be recognized.

The analysis of the traffic signal operations along this corridor used SYNCHRO models that were developed using the most current peak hour traffic volumes (2021) and signal timings (2022) provided by the City of Ames, along with the existing lane configurations at each intersection. To determine the impacts of the traffic signal interconnection and coordination projects the following assumptions were used:

- Peak hour traffic volumes occur during six hours per weekday and for two hours on Saturdays and Sundays, for a total of 34 hours per week.

Analysis of the project corridors determined that the implementation of the managed and coordinated traffic signal system would immediately reduce the number of stops per vehicle along Lincoln Way by 20%, and create a nearly 9% estimated decrease in VOC, CO, and NOx. Using the Iowa DOT 2009 Emission factors (MOBILE6.2 2.5 mph) determined that the implementation of the managed and coordinated traffic signal system would immediately create a nearly 9% decrease in VOC, CO, and NOx. Table 3 – Emissions Reductions for Lincoln Way summarizes the peak hour, daily and yearly emissions estimates, along with the project cost and estimated annual cost per kilogram of the reduced emissions. This project is estimated to reduced 6,000kg of CO, 1,900kg of VOC and 400kg of NOx annually. The annual cost per kilogram reduced is estimated to be $15.85 for CO, $50.04 for VOC, and $237.70 for NOx.

Lincoln Way Emission Reduction Summary - total kilogram amounts and percent improvements expected per peak hour, per off-peak hour, per day, and per year. (Synchro estimation)

Table 2 – Lincoln Way Corridor

Peak Hour Emissions				
	No Build	Build	Delta	% Improvement
CO (kg)	27.65	25.26	-2.39	-8.64%
NOx (kg)	5.38	4.91	-0.47	-8.74%
VOC (kg)	6.41	5.85	-0.56	-8.74%
Off-peak Hour Emissions				
	No Build	Build	Difference	% Improvement
CO (kg)	20.74	18.95	-1.79	-8.64%
NOx (kg)	4.04	3.68	-0.35	-8.74%
VOC (kg)	4.81	4.39	-0.42	-8.74%
Daily Emissions				
	No Build	Build	Difference	% Improvement
CO (kg)	276.5	252.6	-23.9	-8.64%
NOx (kg)	53.8	49.1	-4.7	-8.74%
VOC (kg)	64.1	58.5	-5.6	-8.74%
Yearly Emissions				
	No Build	Build	Difference	% Improvement
CO (kg)	100,923	92,199	-8,723	-8.64%
NOx (kg)	19,637	17,922	-1,716	-8.74%
VOC (kg)	23,397	21,353	-2,044	-8.74%

Table 3 - Emissions Reductions for Lincoln Way Fourth Phase Deployment Project of the Traffic Network Master Plan Ames, Iowa				
Percent of Daily Traffic in PM Peak Hour[1]	10%			
PM Peak Hour Volumes	25,000			
Percent Daily Vehicle Delay Reduction	11%			
		Emission Type		
Calculations	**Factor**	**CO**	**VOC**	**NOx**
Before Project				
Existing Delay PM Peak Hour (hr)	141			
Emission Factor[2] (EF), (g/hr)		103.0	33.4	7.5
Peak Hour Emissions = (Peak Delay) * (EF), (g)		14,520	4,710	1,060
Daily Emissions = ((Peak Emissions)/10%), (g/day)		145,200	47,100	10,600
After Project				
New Delay PM Peak Hour (hr)	125.0			
Emission Factor[2] (EF), (g/hr)		103.0	33.4	7.5
Peak Hour Emissions = (Peak Delay) * (EF), (g)		12,880	4,180	940
Daily Emissions = ((Peak Emissions)/10%), (g/day)		128,800	41,800	9,400
Emissions Reduction				
Daily Reduction (g/day)		16,400	5,300	1,200
Annual Reduction = ((Daily) * 365)/1000), (kg/year)		6,000	1,900	400
Cost Effectiveness				
Project cost ($)		$1,901,600		
Project Life (yrs)		20		
Annual Project Cost ($/year)		$95,080		
Annual Cost per kg of Reduced Emissions ($/kg/year)		$ 15.85	$ 50.04	$ 237.70
1 - Assumed 10% of daily traffic occurred in PM Peak Hour				
2 - Pollutant emission factors obtained from the MOBILE6.2 2.5mph table for Year 2009 as outlined in the MOBILE6 User Information Sheet. Information provided by the Iowa DOT.				

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