Minnesota Statewide Regional ITS Architecture and Systems Engineering Checklist for CLASS B-2: ARTERIAL TRAFFIC MANAGEMENT

FHWA Final Rule 940 and FTA National ITS Architecture Policy

For all ITS projects or projects with an ITS component, a Systems Engineering Checklist shall be completed and submitted with the Project Submittal Form. For questions regarding the completion of this checklist contact Rashmi Brewer, P.E. – MnDOT Office of Connected & Automated Vehicles (CAV-X) at 651-234-7063 or e-mail at Rashmi.Brewer@state.mn.us.

St. Paul Downtown Traffic Management System Enhancements

SECTION 1 – Project Information

1.1 CONTACT PERSON (e.g. PROJECT MANAGER)

Name/Title: Mike Klobucar

Agency: City of St. Paul

Signature:

Date: 3/27/2019

Telephone: 651-266-6208

Email: mike.klobucar@ci.stpaul.mn.us

1.2 PROJECT LOCATION *(list all)*

DMS LOCATIONS:

SB Kellogg Blvd at 7th St W
EB Kellogg Blvd at Market St
EB Kellogg Blvd at Wabasha St
EB Kellogg Blvd at Minnesota St
EB Kellogg Blvd at Jackson St
EB Kellogg Blvd at Broadway St
SB 5th St W at 7th St W
NB Shepard Rd at Eagle Pkwy
NB Shepard Rd South of Randolph Av
SB Shepard Rd east of Sibley St

1.3 PROJECT NUMBER

1.3A Federal Project Number: CMAQ 6219 (176)

1.3B State/Local Project Number: 164-030-012

City Project Number: T-1371

1.4 PROJECT SCHEDULE

Letting Date: 5/15/2019

Anticipated Start Date: 7/1/2019

1.5 NATURE OF WORK *(Check all that apply)*

☒ Scoping ☒ Design ☒ Software/Integration ☒ Construction ☒ Operations & Management
☐ Evaluations ☒ Planning ☒ Equipment Replacement ☐ Research & Development
☐ Others (Please Specify) _____

1.6 PROJECT FEATURES AND TYPES OF ITS APPLICATIONS *(Check all that apply)*

Arterial Traffic Management Features for Project Site(s):

Observation and Detection

- ☐ Visual Surveillance (e.g. CCTV)
- ☐ Traffic Detectors (excluding presence detectors at intersections for signal control)
- ☐ Condition Reporting System

Information Sharing

- ☒ Dynamic Message Sign (DMS)
- ☐ Web Pages for Construction and Traveler Information
- ☐ 511 Phone

Infrastructure Support Tool

- ☒ Landline Communication (Fiber, Copper, Telephone Lines, DSL Lines)
- ☐ Wireless Communication (Point-to-Point and Cellular)
- ☒ Power

Local Area Traffic Control and Traveler Alerts

- ☐ Dynamic Speed Display Signs
- ☐ Emergency Vehicle Preemption with or without control center oversight
- ☐ Red Light Running System
- ☐ Transit Signal Priority with or without control center oversight

Data Processing and Response Formulation

- ☒ TMC Software / Central Traffic Signal Control Software
- ☐ Data Extract Tool

Corridor-wide Traffic Control

- ☒ Traffic Signal Control System

1.7 NEEDS ASSESSMENT

Please describe the problem statement, goals and objectives of the project.

The City of St. Paul is seeking to improve traffic operations in the downtown area. The downtown area is home to numerous of businesses, residents, and several large event venues. The event venues can draw in 20,000 plus visitors several times a week or more throughout the year. The additional traffic created by the event increases traffic congestion on roadways in the downtown area that are already congested at times due to the background traffic.

Furthermore, the City currently uses legacy 170 traffic signal controllers at most of the traffic signals in the downtown area. The City uses Centracs, a central management system for signals, to monitor and control the signals. Communications is largely done through copper interconnect as the existing controllers do not support communications via fiber. The current copper interconnect system does not have redundancy built into it, so if one cabinet loses its connection, all subsequent cabinets lose connectivity as well. Also, the legacy controllers offer limited or no functionality for Bus Rapid Transit and Light Rail Transit operations, and they do not allow for signal performance measurement data to be collected.

In addition, the City has recently had substantial changes to its downtown region including the recent addition of CHS Field, the Metro Transit Greenline LRT, and several roadway realignments. Also, high frequency transit routes are planned for several routes in the downtown area. Given the inflex of event traffic, the significant changes to the roadway network, as well as evolving traffic patterns, signal operations that once worked for the prevailing traffic conditions no longer works for the current trends.

Lastly, portions of the downtown area located adjacent to the Mississippi River is subject to flooding at certain times of the year. Roadways become impassible during these times and must be temporary

closed. The current strategy is to reroute traffic by using temporary static signage. This creates issues for traffic accessing the downtown area as people may not be aware of the road closure in advance.

The objective of the project is to provide the City of St. Paul with a traffic management system that allows for real-time alternative route information to be posted to dynamic message signs. It also allows for incident and emergency management, and improvements to traffic signal operations.

How were these needs identified? (Check all that apply)

☐ Internal Assessment ☒ Stakeholder Involvement ☐ Regional ITS Architecture (Volume 9)

☐ Arterial Traffic Management Systems Engineering Concept of Operations/High Level Functional Requirements

☒ Other ITS Planning or Technical Documents (Please Specify) Concept of Operations, System Requirements, and System Validation documents.

☐ Design Documents (Please Specify) _____

1.8 SYSTEMS ENGINEERING DOCUMENTATION

	Existing	Existing To Be Modified	To Be Developed	Not Applicable	Document Reference (file number, name, or web link)/Comments
Alternatives Analysis	☐	☐	☐	☒	All applicable documents are available at the following URL: https://www.stpaul.gov/departments/public-works/projects/downtown-traffic-signal-enhancements-project
Concept of Operations	☒	☐	☐	☐	
Requirements	☒	☐	☐	☐	
Design	☐	☐	☒	☐	
System Test Plan	☒	☐	☐	☐	
System Verification Plan	☒	☐	☐	☐	
Evaluation	☐	☐	☐	☒	
Others (Please Specify)	☐	☐	☐	☐	

Standard Systems Engineering/Concept of Operations/Functional Requirements have been reviewed (*Refer to ITS Concept of Operations for Arterial Traffic Management, June 2010, http://www.dot.state.mn.us/its/projects/2006-2010/itssystemsengarterialfreeway/arterialconops.pdf*):

☒ Yes ☐ No

1.9 RELATIONSHIP TO OTHER PROJECTS AND PHASES

Please list any construction and tied projects.

Project Title	Project Number
N/A	_____
_____	_____
_____	_____

SECTION 2 – Regional Architecture Assessment

2.1 PROJECT IS INCLUDED IN THE MINNESOTA STATEWIDE REGIONAL ITS ARCHITECTURE
(*Refer to Sections 4.3 and 4.4 of the Implementation Volume,* ***Minnesota Statewide Regional ITS Architecture,*** *2018, http://www.dot.state.mn.us/its/projects/2006-2010/mnitsarchitecture/)*

☒ Yes ☐ No

If "No", please list additional ITS devices, features, and/or functions that are not listed in **1.6** and send a copy of the complete checklist via email to the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1.

If "Yes", Project ID (from *Sections 4.3 and 4.4 of the Implementation Volume*):

S07 Traffic Signal Timing and Control Improvements, Centralized Traffic Signal Control, and Automated Traffic Signal Performance Measures

S15 Arterial Traffic Management Systems

S17 Integrated Corridor Management

Is the project consistent with the description in the Architecture? ☒ Yes ☐ No

If "No", please summarize the differences below and send a copy of the complete checklist via email to the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1.

2.2 DOES THE DESIGN INCORPORATE NATIONAL ITS STANDARDS?

☒ Yes ☐ No

If "Yes", please specify what ITS Standards are being used:

☒ NTCIP 1201 Global Object Definitions	☐ NTCIP 1209 Data Element Definitions for Transportation Sensor Systems	☐ ASTM WK7604 Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data
☒ NTCIP 1202 Object Definitions for Actuated Traffic Signal Controller Units	☐ NTCIP 1210 Field Management Stations – Part 1: Object Definitions for Signal System Masters	☒ NTCIP Center-to-Field Group
☒ NTCIP 1203 Object Definitions for DMS	☒ NTCIP 1211 Object Definitions for Signal Control and Prioritization (SCP)	☐ NTCIP Center-to-Center Group
☒ NTCIP 1206 Object Definitions for Data Collection and Monitoring Devices	☐ NTCIP 1210 Field Management Stations – Part 1: Object Definitions for Signal System Masters	☐ ITE TMDD 2.1 TMDD and MS/ETMCC
☐ NTCIP 1208 Object Definitions for CCTV Switching	☐ ASTM E2468-05 Standard Practice for Metadata to	

Support Archived Data
Management Systems

☐ Other (Please Specify)

General information on ITS Standards can be found at http://www.standards.its.dot.gov/.
*Minnesota Standards are listed in Section 10 of Volume 13 of the *Minnesota Statewide Regional ITS Architecture* document as generated by RAD-IT.

2.3 IS AN INTERAGENCY AGREEMENT NEEDED FOR THIS PROJECT?
☐ Existing ☒ To be Developed ☐ No
Please describe: (Agency name, agreement number, and nature of contract)

RAMSEY COUNTY: HAS JURISDICTION OVER SOME ROADS IN PROJECT AREA, PERMITS/AGREEMENTS NEEDED FOR CONSTRUCTION/MAINTENANCE OF TMS DEVICES ON COUNTY ROADS. RAMSEY COUNTY WILL ALSO FUND PART OF THE PROJECT.

SECTION 3 – Procurement

3.1 PROCUREMENT METHODS *(Check all that apply)*
☒ Construction Contract
☐ Professional Technical Services Contract/Agreement
☐ Joint Powers Contract/Agreement
☒ Interagency Contract/Agreement
☐ Work Order Contract/Agreement
☐ Commodities Contract
☐ Purchase Order (State/Local Furnish)
☐ Other

Comments:

SECTION 4 – Operations and Management Commitment

4.1 STAFFING AND RESOURCES NEEDED FOR OPERATIONS AND MANAGEMENT
(Staff hours covering, for example, device/system maintenance plus management. Estimate and specify per year and per site or for all sites in project)

MAINTENANCE:

DMS – 8 HOURS PER YEAR PER SITE * 10 SITES * 2 STAFF MEMBERS = 160 HOURS PER YEAR

TOTAL HOURS = 160 HOURS PER YEAR

OPERATIONS:

DMS – 520 HOURS PER YEAR FOR 10 SITES * 1 STAFF MEMBER = 520 HOURS PER YEAR

TOTAL HOURS = 520 HOURS PER YEAR

4.2 ESTIMATED ANNUAL OPERATIONS AND MANAGEMENT COSTS
(Question 4.1 staffing labor hours x average direct hourly rate, plus direct expenses)

MAINTENANCE:

SUBTOTAL COST = 160 HOURS PER YEAR * $35 PER HOUR = $5,600 PER YEAR

DIRECT EXPENSES = $5,000 PER YEAR

TOTAL COST = $10,600 PER YEAR

OPERATIONS:

TOTAL COST = 520 HOURS PER YEAR * $40 PER HOUR = $20,800 PER YEAR

SECTION 5 - Approval

APPROVAL (Refer to page 7 of the HPDP ITS Systems Engineering Requirements for a list of approval agencies)

I certify that to the best of my knowledge all of the information on this checklist is accurate. I acknowledge that I am aware of the requirements set forth in the HPDP – ITS Systems Engineering for this project.

Name/Title: Nick VanGunst/Project Manager

Agency: Alliant Engineering, Inc.

Signature: Nick VanGunst

Date: 2/28/19

Telephone: 612-767-9352

Email: nvangunst@alliant-inc.com

REVIEWED FOR COMPLIANCE WITH STATE AND FEDERAL RULES/POLICY, AND APPROVED FOR FEDERAL AID FUNDING

Name/Title: Cathy Huebsch,
District Federal Aid Engineer

Agency: MnDOT - Metro District

Signature: Cathy Huebsch

Date: 4/24/2019

Telephone: 651-234-7766

Email: cathy.huebsch@state.mn.us