**Minnesota Statewide Regional ITS Architecture**

**and Systems Engineering Checklist for**

**CLASS B-1: FREEWAY 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 651-304-7572 or e-mail at [Rashmi.Brewer@state.mn.us](mailto:Rashmi.Brewer@state.mn.us).

*(Enter project name or type)*

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| **SECTION 1 – Project Information** | | | | | |
| **1.1 CONTACT PERSON (e.g. PROJECT MANAGER)**  Name/Title:       Agency:  Signature:       Date:  Telephone:       Email: | | | | | | |
| **1.2 PROJECT LOCATION** *(list all)* | | | | | **1.3 PROJECT NUMBER**  1.3A Federal Project Number:  1.3B State/Local Project Number: |
| **1.4 PROJECT SCHEDULE**  Letting Date:  Anticipated Start Date: | | | | | |
| **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)*  *Freeway Traffic Management Features for Project Site(s):*   |  |  |  | | --- | --- | --- | | **Observation and Detection** | **Information Sharing** | **Traffic Control** | | Video (e.g. CCTV)\*  Traffic Detection\*  Condition Reporting System  Automatic Vehicle Location (AVL) for FIRST, maintenance and State Patrol vehicles | Dynamic Message Sign (DMS)\*  Radio Broadcasts  Web Pages for Construction and Traveler Information  511 Phone and 511 Mobile App | Lane Control Signs  Ramp Meters\*  Electronic Toll Collection\*  Automated Gate Closure Systems | | Weather Sensors and Provision of Current and Forecast Weather Conditions | Computer Aided Dispatch (CAD) for FIRST, maintenance, and State Patrol vehicles, including CAD-CARS integration |  | |  |  |  | | **Data Processing and Response Formulation** | **Data Processing and Response Formulation** | **CAV Infrastructure** | | TMC Software/ATMS  Data Extract Tool | Landline Communication (Fiber, Copper, Telephone Lines, DSL Lines)  Wireless Communication (Point-to-Point and Cellular)  Power | CAV Infrastructure Systems |   *SE analysis for applications with asterisks (\*) has been completed for deployments specific to MnDOT. The SE documents can be used as references for performing SE analysis for other agencies. Contact MnDOT contact person listed on page 1 for more information.* | | | | | | |
| **1.7 NEEDS ASSESSMENT**  *Please describe the problem statement, goals and objectives of the project.*    *How were these needs identified? (Check all that apply)*  Internal Assessment  Stakeholder Involvement  Regional ITS Architecture (Implementation Volume)  Freeway Traffic Management Systems Engineering Concept of Operations/High Level Functional Requirements  Other ITS Planning or Technical Documents (Please Specify)  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 |  |  |  |  |  |
| 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 Freeway Traffic Management, May 2020,* [*http://www.dot.state.mn.us/its/projects/2016-2020/cavreadiness/freeway-con-ops.pdf*](http://www.dot.state.mn.us/its/projects/2016-2020/cavreadiness/freeway-con-ops.pdf)):

Yes  No

|  |  |
| --- | --- |
| **1.9 RELATIONSHIP TO OTHER PROJECTS AND PHASES**  *Please list any construction and tied projects.*  **Project Title Project Number** | |
| **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/2016-2020/itsarchitecture/implementation-volume.pdf*](http://www.dot.state.mn.us/its/projects/2016-2020/itsarchitecture/implementation-volume.pdf)*)*  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*):  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 1208 Object Definitions for CCTV Switching | ASTM WK7604 Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data | | NTCIP 1203 Object Definitions for DMS | NTCIP 1209 Data Element Definitions for Transportation Sensor Systems | IEEE 1455-1999 Standard for Message Sets for Vehicle/ Roadside Communications | | NTCIP 1204 Object Definitions for Environmental Sensor Stations | NTCIP Center-to-Field Group | ITE TMDD 2.1 TMDD and MS/ETMCC | | NTCIP 1206 Object Definitions for Data Collection and Monitoring Devices | NTCIP Center-to-Center Group | SAE J2735: DSRC Message Set Dictionary | | NTCIP 1207 Object Definitions for Ramp Meter Control Units | ASTM E2468-05 Standard Practice for Metadata to Support Archived Data Management Systems | SAE J3067: Candidate Improvements to DSRC Message Set Dictionary [SAE J2735] Using Systems Engineering Methods | | 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) |

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| **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: |

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| **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)* |
| **4.2 Estimated annual operations and Management costs**  *(Question 4.1 staffing labor hours x average direct hourly rate, plus direct expenses)* |
| **Section 5 - Approval** |
| **Approval (Refer to page 7 of the HPDP ITS Systems Engineering Requirement 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:       Agency:  Signature:       Date:  Telephone:       Email: |