**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.

*(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):*

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| **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 |  |
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| **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

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| **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 [ ]  NoIf “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 [ ]  NoIf “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 [ ]  NoIf “Yes”, please specify what ITS Standards are being used:

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| [ ]  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)       |
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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 [ ]  NoPlease 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:       |