**Minnesota Statewide Regional ITS Architecture**

**and Systems Engineering Checklist for**

**CLASS A-2: PROGRAMMATIC ITS APPLICATION -**

**Dynamic Curve Warning**

**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).

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*(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: | | Email: | Phone: | | | |
| **1.2 PROJECT LOCATIONS** *(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 ITS APPLICATIONS** *(Check all that apply)*  Dynamic Curve Warning System Core Components:   |  |  | | --- | --- | | Speed Detection | Warning Signs | | Processing/Communications |  | | | |
| Optional Features:   |  |  | | --- | --- | | Height/Length Detection | Weigh-in-Motion (WIM) Sensors | | Video | Communications to ATMS | | Traffic Detection | CAV Infrastructure Systems | | | |
| **1.7 NEEDS ASSESSMENT**  Please describe the problem statement, goals and objectives of the project.    How were the needs identified? *(Check all that apply)*   |  |  |  | | --- | --- | --- | | Internal Assessment | Stakeholder Involvement | Regional ITS Architecture (Implementation Volume) | | Model Systems Engineering Document for Dynamic Curve Warning | | | | Other ITS Planning or Technical Documents (Please Specify) | | | | Design documents (Please Specify) | | | | | |
| **1.8 SYSTEMS ENGINEERING DOCUMENTATION**  A programmatic Systems Engineering analysis has been developed for this application. A Concept of Operations, Functional Requirements and a Test Plan are available as references and **shall be reviewed for consistency** at <https://www.dot.state.mn.us/its/projects/2016-2020/se-wzdi-phase1.html>.  Model Systems Engineering document for Dynamic Curve Warning (i.e. Concept of Operations, Functional Requirements and a Test Plan) has been reviewed, and the project is consistent with the document.  Or,  If the project is not entirely consistent with the Model Systems Engineering document, a project specific concept of operations, functional requirements and/or a test plan will be developed using the Model Systems Engineering document as a base. Contact the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1 for guidance and assistance. | | |
| **1.9 RELATIONSHIP TO OTHER PROJECTS AND PHASES**  Please list any construction and tied projects.  **Project Title Project Number**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | | | |

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| **SECTION 2 – Regional Architecture Assessment** | | | | | |
| **2.1 PROJECT IS INCLUDED IN THE MINNESOTA STATEWIDE REGIONAL ARCHITECTURE** (*Refer to ITS Initiatives and Project Concepts for Implementation, 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 DATA COLLECTION AND SHARING**  Please use the table below to provide the following information:   1. Operational data obtained from the system 2. Frequency of obtaining the data (e.g. every 5 minutes, daily, weekly, monthly, etc.) 3. Purpose(s) of obtaining the data, 4. Is the data archived, and 5. Who do you share the data with? (e.g. MnDOT RTMC, MnDOT OFCVO, U of M Traffic Observatory, etc.)   The list below is not a complete list. Please add additional data and rows to the list as appropriate.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Data Obtained** | **Frequency of Obtaining Data** | **Purposes** *(Check all that apply)* | **Is Data Archived?** | **Data Sharing Partners** | | Speed data |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Warning sign activation logs |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Message displayed |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Equipment operational status and fault indication |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Vehicle height/length data |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Traffic detection (speed) data |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | WIM data |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | | | | | |
| **2.3 ITS STANDARDS** *(For information only)*  Applicable ITS Standards for Dynamic Curve Warning projects may include:   * NTCIP-STMP: NTCIP using STMP * NTCIP-SNMP: NTCIP using SNMP * NTCIP 1203: Object Definitions for Dynamic Message Signs (DMS) * NTCIP 1204: Object Definitions for Environmental Sensor Stations (ESS) * NTCIP 1209: Data Element Definitions for Transportation Sensor Systems (TSS) * NTCIP 1205: Object Definitions for Closed Circuit Television (CCTV) Camera Control * NTCIP 1208: Object Definitions for Closed Circuit Television (CCTV) Switching * RSE-C2F: RSE - Center to Field Communications * RSE-C2F-SNMP: RSE - Center to Field Communications - SNMP * RSE-F2F: Roadside Equipment to ITS Roadway Equipment * DSRC-WSMP: Vehicle-to-Vehicle/Infrastructure using WSMP * SAE J2735: Dedicated Short Range Communications (DSRC) Message Set Dictionary * RSU V4: USDOT Roadside Unit (RSU) Specification Document – Version 4   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 2018* as generated by RAD-IT. | | | | | |
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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 ANNUAL Staffing and resources needed for operations and Management**  *(Staff hours covering, for example, high water detection operations plus maintenance. 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)* |
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| **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: | | Email: | Phone: | |