**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.

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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:       |

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| **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**

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| Letting Date:      Anticipated Start Date:        |

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

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| --- | --- | --- | --- |
| [ ]  Scoping | [ ]  Design | [ ]  Software/Integration | [ ]  Construction |
| [ ]  Operations & Management | [ ]  Evaluations  | [ ]  Planning | [ ]  Equipment Replacement |
| [ ]  Research & Development | [ ]  Others (Please Specify)       |

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| **1.6 PROJECT FEATURES AND ITS APPLICATIONS** *(Check all that apply)*Dynamic Curve Warning System Core Components:

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| --- | --- |
| [ ]  Speed Detection | [ ]  Warning Signs |
| [ ]  Processing/Communications |  |

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| Optional Features:

|  |  |
| --- | --- |
| [ ]  Height/Length Detection | [ ]  Weigh-in-Motion (WIM) Sensors |
| [ ]  Video | [ ]  Communications to ATMS |
| [ ]  Traffic Detection | [ ]  CAV Infrastructure Systems |

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| **1.7 NEEDS ASSESSMENT** Please describe the problem statement, goals and objectives of the project.     How were the needs identified? *(Check all that apply)*

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| --- | --- | --- |
| [ ]  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)       |

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| **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 [ ]  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 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.

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| --- | --- | --- | --- | --- |
| **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 |       |

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| **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.

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| --- | --- |
| Name/Title:       | Agency:       |
| Signature:       | Date:       |
| Email:       | Phone:       |

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