



## I-95 CORRIDOR COALITION PROPOSED PROJECT IDEA

### **Project Title: Design of an Archived Data Management System for Coalition-Collected Operations Data**

#### **Briefly Describe Your Project Idea (please include a list of any partners):**

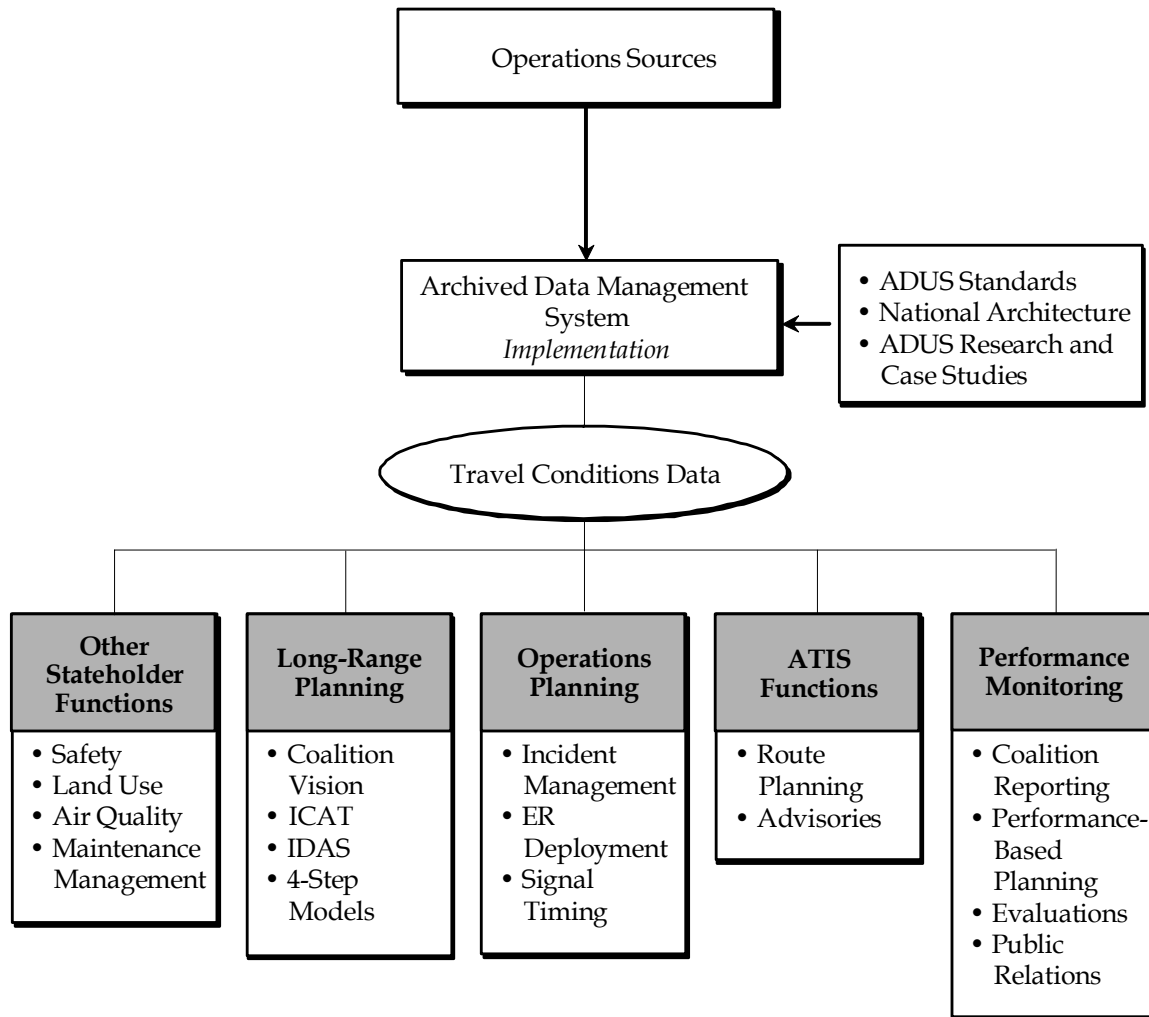
##### *Objective*

An archived data management system (ADMS) is a computerized records system that collects, stores, retrieves, shares, processes, manages and provides access to data. In the context of this project, the archived data will be travel time data and roadway event-related data (e.g., incidents, weather, and work zones). These data are used by Coalition members to monitor roadways, implement control strategies, and disseminate information in real-time. In particular, the performance measurement activities envisioned by the Coalition would be enabled by the existence of an ADMS. Without an ADMS, development of routine performance reports would be problematic. With an ADMS, data cleansing, fusing, and analysis are all accomplished up-front.

However, these data can also be archived and used for a variety of “after the fact” purposes:

- Performance reports – To analyze trends in conditions on Coalition roadways, including:
  - Congestion levels and travel time reliability;
  - Bottleneck and nonrecurring delay, with nonrecurring delay broken down by source (incidents, weather, work zones, special events);
  - Incident durations, broken down into component times (detection, verification, response, on-scene, clearance);
  - Incident locations (hotspots) and frequency;
  - Weather events; and
  - Work zone durations and extents.
- Evaluations – To eliminate the need to undertake special data collection for evaluating the effectiveness of different strategies;
- Data inputs to existing applications and models – To provide data for travel forecasting and simulation models that require travel times for inputs and validation. Air quality models also require vehicle speeds as inputs and these should preferably be measured, not modeled;
- Data inputs to emerging applications and research – advanced applications such as near-term travel time prediction and Integrated Corridor Management will rely on histories of traffic patterns;
- Operations planning – To analyze and understand the nature of traffic problems (e.g., where they occur, when they occur, how long they last, etc.) is tantamount to effective operations planning, including:
  - Detour planning;
  - Ramp meter and DMS deployments;
  - Evacuation planning;
  - Work zone scheduling and planning; and
  - Incident management deployment.

The following figure show the flow of data from operations sources such as traffic counters, vehicle probes, incident reports, etc. into an archived data management system. The bottom of the figure shows the potential uses of archived travel conditions data by the Coalition and its member agencies.



### *Technical Approach*

Development of an ADMS for the Coalition should be done with the following tasks:

- **System requirements.** A formal requirements process must be undertaken to determine what features the Coalition’s ADMS should possess, based how stakeholders would use it. This step will guide all subsequent tasks and will be documented as formal functional requirements. All relevant stakeholders from the Coalition – including data providers and end users – will be included in the requirements process. In defining the stakeholders’ needs, the following areas should be addressed:
  - » Potential users;
  - » Types of data and information desired;
  - » Format for receiving the resulting data and information;
  - » Format for getting the data; and
  - » Frequency for obtaining the data or information.
- **Data formats and definitions (e.g., data dictionary).** Just developing a common format for all Coalition partners to use would provide a major benefit for integration, regardless of the

development of a formal archive. A review of all existing standards (TMDD, P1512, ASTM) is the starting point for this task. Defining and providing metadata is a key aspect of this process. Location referencing must also be addressed during this task;

- **Data structure (schemas and table relationships).** The first step in developing a formal ADMS is to define how the data elements will be strung together and what the overall architecture for the system will be;
- **Data collection methods.** The processes for gathering data from Coalition partners must be defined;.
- **Data quality control procedures.** Because the data will be coming from a wide variety of sources, it is essential that quality control procedures be applied. Many ADMS installations have developed quality control procedures that can be adapted for the Coalition ADMS;
- **Data processing software, including integration with legacy sources.** In addition to quality control, the procedures to be used for aggregations, transformations, and fusing with data from legacy sources must be specified. The most obvious of the data that needs to be integrated are probe-based travel times and traditional traffic counts;.
- **Base information system for managing data, including data output tools.** Applications may be developed for the ADMS to allow both extraction for other uses (existing models) as well as new applications (performance reports). Functional aspects of the system will also be specified in this task including:
  - » Hardware/software environment;
  - » Queries – capability for users to query the archive using SQL;
  - » Versioning – versioning on the data structures and applications;
  - » Transactions – records of all transactions against the archive including queries, report generation, backups, and updates;
  - » Backups – capabilities to copy and separately store all data, programs and any related files to allow rapid and full restoration of any automated system in case of catastrophic or partial failure;
  - » Error Handling;
  - » User Interface – Regular Users
    - Typical web browser functionality;
    - Capability for operator to interact with the archive;
    - Map/GIS interface with capability to locate devices, incidents, and resources on map display that corresponds accurately to real-world locations; and
    - Capability to define and display roadway links with selected associated data.
  - » User Interface – Administrators
    - Add/Remove/Maintain user accounts for regular users, database administrators (DBAs), maintenance personnel, and user support personnel;
    - Maintain logs of user statistics;
    - Maintain computer systems;
    - Maintain web server;
    - Make sure the data sources are up;
    - Maintain overall system security; and
    - Other administrator work to upkeep the integrity of the entire system.
  - » User Interface - Maintenance Personnel
    - Fix any bugs that appear from regular use;
    - Maintain a running list of known bugs/problems/issues
    - Maintain the test system;

- Fix bugs in the test system, test them, perform regression testing and then move the changes to production; and
  - Develop a label system to keep track of bugs fixing releases i.e., service patches.
- » User Feedback – capability to send feedback to the administrator/maintenance personnel regarding any system functionality, or other questions;
- » Help Functions – on-line help that enumerates typical query sessions;
  - Provide navigation aids of the web user interface;
  - Display of all relevant time, space and additional constraints to the users; and
  - Descriptions of scenarios of questions to the users, and how they can obtain answers to these scenario questions.
- » Output Formats – output files in a variety of formats including:
  - CSV;
  - XML; and
  - Maps.
- » Security – security capabilities that allow access control for multiple levels of operator access capability for any automated system components; and
- » Configuration Management

This project will design (but not implement) an archived data management system, developing system requirements and recommending the approaches to be used for data formats, data structure, etc., as indicated above. The project will estimate the cost to implement the program, providing the Coalition with options for funding and phasing the development of an archived data management system.

**Objectives:** To design an archived data management system to serve as the repository for Coalition-collected operations data.

**Provide a brief summary of the importance of this project to the Coalition:** Corridor level operations and planning require that decisions be based on sound information. Operations activities by Coalition members generate a tremendous amount of data for real time applications. These data also can be used in a wide array of planning, monitoring, and evaluation activities WITHOUT the need for original data collection efforts.

**Budget:** \$150,000 total project costs.  
\$150,000 in Coalition funds.

**FHWA Match Requirement:**

**A. Check which best describes the “type” of project. (See Appendix A for details.):**

Deployment and/or Integration of ITS infrastructure Components (Complete section B below)

or

General Support Activity including administrative activities, training, studies, etc. (Complete section C below)