Intelligent Transportation Systems Deployment Tracking Survey Data Repository:

User's Guide

www.its.dot.gov/index.htm

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U.S. Department of Transportation

Table of Contents

U.S. Department of Transportation
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ITS Deployment Tracking Survey Data Repository: User's Guide | i

List of Figures

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey Data Repository: User's Guide | ii

Chapter 1. Introduction

This document describes the Intelligent Transportation Systems (ITS) Deployment Tracking Surveys (DTS) Data Repository. The goal of establishing the data repository was to make the extensive amount of deployment data collected over the years by the United States Department of Transportation (USDOT) Intelligent Transportation System Joint Program Office (ITS JPO) available to researchers, policy makers, and other interested parties for exploration, analysis, and use.

The ITS DTS Data Repository contains data collected from a series of nationwide surveys conducted over the past twenty years. Surveys included in the repository are divided into three categories:

- ITS Deployment Tracking Surveys (1999 to 2016)

- 2019 Connected Vehicle and Automated Vehicle (CV/AV) Survey

- Special Topic Deployment Surveys

The ITS Deployment Tracking Surveys were conducted a total of ten times between 1999 and 2016 and were administered to freeway, arterial, and transit management agencies in 108 large and medium size metro areas. The CV/AV Survey was first conducted in 2019, and will be part of an ongoing series of CV/AV surveys. In addition the ITS JPO conducted a number of Special Topic Deployment Surveys, including the 2019 Small Urban and Rural Transit Survey and surveys related to Electronic Toll Collection (ETC), Incident Management/Public Safety, Statewide ITS Systems, Metropolitan Planning Organizations (MPO) and Transportation Management Centers (TMCs).

The various deployment tracking survey instruments were designed to collect data characterizing ITS technology deployment, as well as programs and policies implemented to support ITS. The ITS JPO initiated the DTS in response to U.S. Transportation Secretary Pena's goal (established in 1995) that the 75 largest metropolitan areas should be outfitted with an integrated ITS infrastructure in the next ten years. During the ten-year goal period, the survey was conducted annually to track ITS deployment progress toward the Secretary of Transportation's goal. Following the goal period, the ITS JPO has conducted the survey every two to three years. The ITS JPO continues to use the survey to measure ITS deployment progress and also uses the results to respond strategically to ITS deployment gaps and execute technical transfer activities that help states and local agencies plan and execute ITS deployments.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey Data Repository: User's Guide | 1

Chapter 2. Deployment Tracking Methodology

This chapter provides a high-level overview of the methodology used for the Intelligent Transportation Systems (ITS) Deployment Tracking Surveys (DTS) (1999-2016), the Connected Vehicle and Automated Vehicle (CV/AV) Survey (2019), and the Special Topic Deployment Surveys.

ITS Deployment Tracking Surveys (1999-2016)

Data collection during the first few years of the DTS centered on 75 of the nation's largest metropolitan areas, as these were the focus of Transportation Secretary Pena's ITS goal. In 2002, the survey population expanded to include three additional large metropolitan areas (at the request of those cities) and 30 medium-sized metropolitan areas experiencing high congestion.   A total of ten surveys were conducted in the following years: 1999, 2000, 2002, 2004, 2005, 2006, 2007, 2010, 2013, and 2016.

State, regional, and local transportation agencies owning and operating highway, arterial, and transit transportation infrastructure in each subject metropolitan area were identified using information provided by Metropolitan Planning Organizations (MPOs). Agency contacts were validated and a database containing the name, address, telephone number, and email address of each contact was prepared. Prior to administering each DTS, the research team notified all contacts of the upcoming survey and requested that they confirm whether or not they are the appropriate contact. The research team developed alternate contacts as needed.

Originally, five types of surveys were developed: Freeway Management, Arterial Management, Transit Management, Electronic Toll Collection (ETC), and Incident Management/Public Safety (ETC and Incident Management/Public Safety surveys are described in more detail below under "Special Topic Deployment Surveys"). Questions for each survey were developed through a consultative process conducted with US Department of Transportation (DOT) Subject Matter Experts (SMEs) to ensure continued relevancy of survey results.

Selected questions were repeated each year so trends could be developed for tracking purposes. However significant revisions to survey questions were made each wave to reflect changes in program and practice. In the early of years of the DTS, data collection focused on intelligent infrastructure components such as surveillance and control technologies. In recent years, the data collection expanded to include concepts such as Integrated Corridor Management (ICM) and CV and AV technologies.

Surveys in the first few years were self-administered paper survey instruments that were completed by hand and returned via mail. Starting in 2004, agency contacts were emailed a link to complete an on-line survey. Follow-up emails and telephone calls were then made to encourage responses.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey Data Repository: User's Guide | **2**

DTS Data Limitations (1999 to 2016)

Missing Values

The data collected reflect the responses provided by agency staff and were accepted as provided. Every effort was made to encourage an agency response each year a survey was conducted. Although a large proportion of agencies responded each time the survey was conducted, other agencies responded sporadically, leaving missing values for some years.

Errors in Response

In some cases, estimates of deployment for an agency (e.g., freeway centerline miles under surveillance) may contain error due to differing interpretations by agency respondents. As an example, when asked to provide the number of freeway centerline miles under surveillance in the metropolitan area, a respondent may have provided a response related to an area larger or smaller than the metropolitan area boundary (i.e., boundary error). This type of response error may explain, at least in part, the fluctuations that exist for some of the trend data.

2019 Connected Vehicle and Automated Vehicle Survey

The 2019 CV/AV Survey was administered as part of an ongoing effort by the ITS Joint Program Office (JPO) to track the deployment of ITS. The survey focuses on CV and AV technologies and was designed to address the following key questions:

- What are current levels of CV and AV testing/deployment?
- What are agencies' level of readiness with respect to CV and AV?
- What are the key challenges and barriers to CV and AV deployment?
- What assistance/resources are needed to overcome challenges and barriers?

The 2019 CV/AV survey utilized freeway, arterial, and transit agency contact lists developed for previous DTS. These lists included agencies from 78 large metropolitan areas and 30 medium size metropolitan areas. Invitations to the online survey were sent to 753 freeway management, arterial management, and transit management agencies. Online data collection ran from October 7th to December 31st 2019. The final response rate was 60 percent, resulting in 475 completed surveys (66 freeway management, 301 arterial management, and 108 transit management).

Special Topic Deployment Surveys

In addition to the surveys of freeway, arterial, and transit agencies, the ITS JPO has administered a series of special topic surveys, which include surveys tailored to other agency types. Each of the surveys is described in more detail below.

2019 Small Urban and Rural Transit Survey

The ITS JPO conducted the Small Urban and Rural Transit Survey in response to a General Accountability Office (GAO) recommendation that the ITS JPO should track the deployment of ITS within

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **3**

small urban and rural areas. The GAO's recommendation stemmed from its own evaluation of ITS deployment among transit providers, which included a small urban and rural transit provider survey administered in 2015. The 2019 Small Urban and Rural Transit Survey used the GAO's original survey instrument, adding a few new questions related to Connected Vehicles (CV), Automated Vehicles (AV), and partnerships with private transportation providers.

To provide data comparable to the GAO's 2015 survey, the 2019 survey replicated the GAO's sampling methodology.[1] The sample frame constructed from the National Transit Database, yielded 325 small urban and 621 rural transit providers. A stratified sampling approach was used to select separate samples of small urban and rural transit providers. Invitations to the online survey were sent to a sample of 152 small urban and 177 rural transit providers. The survey was fielded between September 9, 2019, and October 28, 2019. The final response rate was 74 percent, resulting in 244 transit agency surveys (107 small urban and 137 rural). The data were weighted to reflect accurately the distribution of small urban and rural transit providers within the population. Data users should use the weighting variable [WEIGHT] when analyzing the data.

Electronic Toll Collection (ETC) Surveys

ETC data were gathered from toll road and bridge operators in 78 of the nation's largest metropolitan areas and 30 medium sized metropolitan areas. The ITS JPO administered these surveys 1999-2013, as part of the DTS effort.   Data collected included ETC technologies and bridge and toll road operations.

Incident Management/Public Safety Surveys

Incident management/public safety data were collected from fire rescue and law enforcement agencies in 78 of the nation's largest metropolitan areas and 30 medium sized metropolitan areas. The ITS JPO administered these surveys 1999-2013 as part of the DTS effort. Data gathered included incident management programs, policies, and technologies.

Metropolitan Planning Organization (MPO) Surveys

Planning data were collected from MPOs in 78 of the nation's largest metropolitan areas and 30 medium sized metropolitan areas. The ITS JPO administered these surveys in 1999, 2000, and 2004. Data gathered included planning and coordination efforts for Intelligent Transportation System (ITS) deployment.

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[1] For more information on sampling methodology see *Intelligent Transportation Systems: Findings from the Small Urban and Rural Transit Provider Survey, FHWA-ITS-20-799, forthcoming.*

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **4**

Statewide ITS Systems Surveys

State-level data were collected from State DOTs describing the functions performed and the statewide transportation technologies located throughout the nation. The ITS JPO administered the statewide surveys in 2002, 2004, 2006, and 2007. Data included surveillance technologies as well as traffic management, traveler information programs, and funding.

Transportation Management Center (TMC) Surveys

Traffic management data were collected from State DOTs describing the functions performed and the technologies applied by TMCs located throughout the nation. The ITS JPO administered these surveys in 2007, 2010, and 2013. Data included surveillance technologies as well as traffic management, traveler information programs, and funding.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **5**

Chapter 3. ITS Deployment Tracking Surveys (DTS) Data Repository Contents

The Intelligent Transportation Systems (ITS) Deployment Tracking Surveys (DTS) Data Repository includes files related to the DTS (1999 to 2016), the 2019 Connected Vehicle and Automated Vehicle (CV/AV) Survey, and several Special Topic Deployment Surveys.

Deployment Tracking Surveys (1999 to 2016)

Each survey year includes: 3 survey instruments (freeway, arterial, and transit), 3 data files (freeway, arterial, and transit), and 1 summary report. A description of the files is provided below.

1999-2016 Survey Instruments – Freeway, Arterial, and Transit Management survey instruments used to collect data from 1999 to 2016 – **30 survey files**

1999-2016 Deployment Data – Excel data files (that also include data dictionaries) associated with the Freeway, Arterial, and Transit Management surveys – **30 data files**

1999-2016 Final Reports – For each survey year, a Summary Report was prepared synthesizing key findings and trends from the Freeway, Arterial, and Transit Management surveys **- 10 files**

1999-2016 Common Survey Questions – Three files (one for each survey type – freeway, arterial, and transit) that group common questions across all survey years (1999 to 2016). The questions are organized by key topic area – **3 files**

2019 Connected Vehicle and Automated Vehicle (CV/AV) Survey

2019 CV/AV Survey – Survey Instrument, Excel data files, Common Questions file, and Summary Report – 1 survey file, 4 data files (freeway, arterial, transit and a file combining all three), 1 common questions file, 1 report –**Total of 7 files**

Special Topic Deployment Surveys

A summary of the special topic survey files is provided below.

2019 Small Urban and Rural Transit Survey – Survey Instrument, Excel data file, and Summary Report – 1 survey file, 1 data file, 1 report – **Total of 3 files**

*Note that the 2019 Small Urban and Rural Transit survey includes a weighting variable [WEIGHT] that should be used when analyzing data to accurately reflect the distribution of small urban and rural transit providers within the population.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **6**

Electronic Toll Collection (ETC) Surveys (1999-2013) **–** Survey Instruments and Excel data files, and– 9 survey files, 9 data files, 1 common questions file – **Total of 19 files**

Incident Management/Public Safety Surveys (1999-2013) – Survey Instruments, Excel data files, and Common Questions files for Fire Rescue and Law Enforcement:

- **Fire Rescue–** 10 survey files, 10 data files, 1 common questions file – **Total of 21 files**
- **Law Enforcement –** 10 survey files, 10 data files, 1 common questions file - **Total of 21 files**

Metropolitan Planning Organization (MPO) Surveys (1999, 2000, 2004) – Survey Instruments, Excel data files, and Common Questions file – 3 survey files, 3 data files, 1 common questions file – **Total of 7 files**

Traffic Management Center (TMC) Surveys (2002, 2004, 2007, 2010, 2013) Survey Instruments, Excel data files, and Common Questions file – 5 survey files, 5 data files, 1 common questions file – **Total of 11 files.**

Statewide ITS Systems Surveys (2002, 2004, 2006, 2007) – Survey Instruments, Excel data files, and Common Questions files – 4 survey files, 4 data files, 1 common questions file – **Total of 9 files.**

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **7**

Chapter 4. Common Survey Questions (1999-2016)

This chapter provides a more in-depth look at the 1999 -2016 Common Survey Questions files, as they present a useful way to begin exploring the contents of the Intelligent Transportation Systems (ITS) Deployment Tracking Survey (DTS) Data Repository. The **Common Survey Questions** files provide the data user with an understanding of the topics and survey questions available for analysis. The 1999 -2016 **Common Survey Questions** files include a separate file for Freeway Management, Arterial Management, and Transit Management. Each file contains a complete set of questions asked in the survey instruments from1999 to 2016.

Each **Common Survey Questions** file includes an **index worksheet** summarizing the topics covered in the survey (Freeway, Arterial, or Transit), and several **topic worksheets** that provide detailed information including question wording, response choices, variable names, variable formats, and survey year.

There are additional Common Survey Question files for the Connected Vehicle and Automated Vehicle (CV/AV) survey questions, and for Special Topic Deployment Surveys, including:

- Electronic Toll Collection (ETC) Common Survey Questions
- Incident Management/Public Safety: Fire & Rescue Common Survey Questions and Law Enforcement Common Survey Questions
- Metropolitan Planning Organization (MPO) Common Survey Questions
- Statewide ITS Common Survey Questions
- Transportation Management Center (TMC) Common Survey Questions

While this chapter focuses on the Common Survey Question files for Freeway, Arterial, and Transit management, the Common Survey Questions files for the Special Topic Deployment Surveys and for CV/AV follow the same format.

Index Worksheet

The **index worksheet** is a guide to the contents of the various **topic worksheets** in the file. The index lists the topics covered in the DTS from 1999 to 2016 (e.g., 511, Auto Enforcement, Incident Management, etc.). Figure 1 displays (non-expanded) elements of the Index worksheet for the **Freeway Management Common Survey Questions** file. If a user does not see a topic they are interested in listed, consider using the search function within Excel (ALT-F), as there may be a question on the topic in the database, even if it is not identified as an Index topic. Users also may want to search on other, similar

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **8**

related terms (for example, in addition to searching on "variable message signs" the user could search on "dynamic message signs").

Figure 1- Index Worksheet in Freeway Management "Common Survey Questions" Workbook

Initially, various rows and columns of the **Index** worksheet are hidden to simplify the display. The appearance of the Index worksheet can be changed by using various buttons (labeled 1, 2, 3, 4) and "+" or "-"symbols. Selecting these buttons, or symbols, will expand rows and columns to reveal, or hide, additional information for each topic.

Figure 2 displays the first several rows and columns for the **fully expanded Freeway Management Index worksheet**. Under the "511" topic, several "sub-topics" are highlighted in black including "511 Services." Under each of these sub-topics, are included a number of rows describing question types including one labeled "Operational 511."

- Topic: 511
- Subtopic: 511 Services
- Question: Operational 511
- Variable Type: Multiple Choice
- Row in Topic Worksheet: 13
- Year: 2004
- Question number/wording: Q15 (hover over the year to get question number and wording)

The information provided in this figure indicates that "Operational 511" refers to a multiple-choice question asked in Question 15 of the 2004 survey and located in row 13 of the "511" topic worksheet. To learn more details regarding this question, the user must turn to the "511" topic worksheet and explore rows related to the "511 Services" sub-topic.

Figure 2- Expanded Index Worksheet in Freeway Management Common Survey Questions Workbook

Topic Worksheets

Figure 3 presents the "511" topic worksheet for the Freeway Management Common Questions file. Highlighted in black are sub-topics, including "511 Services." The rows of this worksheet can be expanded (or collapsed) by selecting a numbered button (1 or 2) or a system ("+","-").

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide   **10**

Figure 3 – Topic Worksheet for "511" Topic in Freeway Management Common Survey Questions Workbook

Figure 4 presents the results of fully expanding the "511" topic worksheet to reveal the questions asked under the sub-topic "511 Services." Note that the question "Does your agency have or plan to have an operational 511 system?" was asked in questions 15 of the 2004 Freeway Management survey and this question is coded in a Multiple Choice format (0=No;1=Yes;2=No Response). Within the 2004 Freeway Management, this question is labeled: "04_FM_Q15_1C01R01." Given this variable name, a user may now find the responses to this question in the 2004 Freeway Management data file.

	B	C	D	E	F	G	H	I
2	511							
3		Choices (in batteries)	1999	2000	2002	2004	2005	2006
5								
6								
7	511 SERVICES							
8	Question Wording					Does your agency have or plan to have an operational 511 system?		
9	Question # (Where to find in survey)					15		
10	Question Format					Multiple Choice		
11	Values					0,1,2		
12	Value Labels					0=No;1=Yes;2=No Resp		
13	Survey Variable1 Name	Operational 511				Operational511System		
14	Data File Variable1 Name					04_FM_Q15_1R01C01		
15								
16						What is the status?		
17	Question # (Where to find in survey)					15		
18	Question Format					Multiple Choice		
19	Values					0,1,2		
20	Value Labels					0=No;1=Yes;2=No Resp		
21	Survey Variable1 Name	Operational Status				Operational511Status		
22	Data File Variable1 Name					04_FM_Q15_2R01C01		
23								
24						What is the deployment date?		
25	Question # (Where to find in survey)					15		
26	Question Format					Text		
27	Values							
28	Value Labels							
29	Survey Variable1 Name	Deployment Date				Operational511Deploy		
30	Data File Variable1 Name					04_FM_Q15_2R02C01TX		
31								

INDEX 511 Auto Enforcement Communications Connected Vehicles (CV) Data Archiving DMS DSRC ICM Incident Management Integration ITS Work

Figure 4 – Expanded "511" Topic Worksheet in Freeway Management Common Questions Workbook

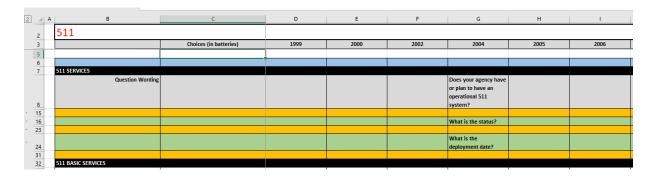To summarize. It is recommended that potential data users explore the contents of the **Common Survey Questions files** to understand the data contained in the repository for the 1999 -2016 DTS. The **Index worksheet** lists the topics contained in the data and the wording of specific questions asked under a topic for a particular year or set of years. If a user is interested in the data contained under a topic, additional details are provided under various **Topic worksheets** in the file. Details provided in the **Topic worksheet** include the variable names which the user can use to extract the required data from the appropriate data file.

Please note that any Index worksheets (and Topic worksheets) may not include all questions on the given topic. Some of the survey questions are cross-cutting, but they were categorized under a single topic based on the best fit. For example, a user interested in incident management questions would search the Incident Management Index Worksheet; however, the Integrated Corridor Management (ICM) Index also includes a question on incident management. As a result, in addition to using the Index and Topic

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **11**

worksheets, it is recommended that users also use the Excel search function (ALT-F) for a more comprehensive search. In addition, if users cannot find questions on a certain topic, consider searching for other, similar terms (e.g., dynamic message signs and variable message signs). Finally, users can also review the survey instruments to identify questions of interest.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | 12

Chapter 5. Survey Data Files for Deployment Tracking Survey (1999-2016)

This chapter provides more detailed information on the development and contents of the data files, data dictionaries, and variable summary statistics for the Deployment Tracking Surveys (1999-2016).

DTS Data Preparation

Survey data were entered into Microsoft Excel files using consistent coding formats and variable naming convention.   Variables are coded using one of four formats:

- Numeric (integer value);
- Boolean (0,1);
- Multiple-Choice (integer value based on question selection options);
- Text.

In addition, a consistent variable name structure was developed to ensure a unique variable name for each of the variables in the data base:

XX_XX_QXX_XRXXCXXTXT

Year	Survey	Question #	Identifier

Where:

- Survey Year – e.g. 99,00,02, etc.;
- Survey – freeway (FM), arterial (AM), transit (TM)
- Question # – Question number in survey;
- Identifier - Sub-question code;
- TXT – added if variable is text format.

Each Excel data file contains three worksheets: one entitled "Data," and a second entitled "Data Dictionary," and a third one entitled "Var Summ Stats"

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **13**

Data Worksheet

Figure 5 presents an example **Data worksheet**. One record was created for each returned survey for each year (shown as a row in the data file). The data files, although unique to each survey year, contain a set of consistent variables. The first three columns of the file contain the following variables for each record:

- MetroArea – Name of Metropolitan Area where agency is located;
- AgencyName – Name of Agency returning survey[2];
- AgencyNumber - Unique ID number that was used in each survey year in order to allow matching of survey respondents over time.
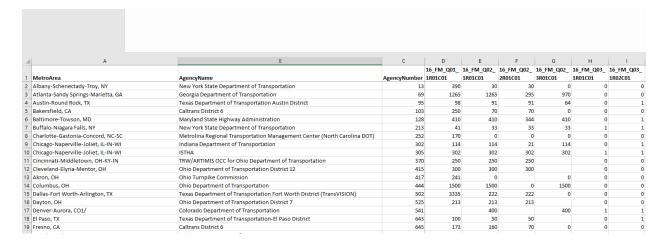
	A	B	C	D	E	F	G	H	I
				16_FM_Q01_	16_FM_Q02_	16_FM_Q02_	16_FM_Q02_	16_FM_Q03_	16_FM_Q03_
1	MetroArea	AgencyName	AgencyNumber	1R01C01	1R01C01	2R01C01	3R01C01	1R01C01	1R02C01
2	Albany-Schenectady-Troy, NY	New York State Department of Transportation	13	390	30	30	0	0	0
3	Atlanta-Sandy Springs-Marietta, GA	Georgia Department of Transportation	69	1265	1265	295	970	0	0
4	Austin-Round Rock, TX	Texas Department of Transportation Austin District	95	98	91	91	64	0	1
5	Bakersfield, CA	Caltrans District 6	103	250	70	70	0	0	0
6	Baltimore-Towson, MD	Maryland State Highway Administration	128	410	410	344	410	0	1
7	Buffalo-Niagara Falls, NY	New York State Department of Transportation	213	41	33	33	33	1	1
8	Charlotte-Gastonia-Concord, NC-SC	Metrolina Regional Transportation Management Center (North Carolina DOT)	252	170	0	0	0	0	0
9	Chicago-Naperville-Joliet, IL-IN-WI	Indiana Department of Transportation	302	114	114	21	114	0	1
10	Chicago-Naperville-Joliet, IL-IN-WI	ISTHA	305	302	302	302	302	1	1
11	Cincinnati-Middletown, OH-KY-IN	TRW/ARTIMIS OCC for Ohio Department of Transportation	370	250	250	250		0	0
12	Cleveland-Elyria-Mentor, OH	Ohio Department of Transportation District 12	415	300	300	300		0	0
13	Akron, OH	Ohio Turnpike Commission	417	241	0		0	0	0
14	Columbus, OH	Ohio Department of Transportation	444	1500	1500	0	1500	0	0
15	Dallas-Fort Worth-Arlington, TX	Texas Department of Transportation Fort Worth District (TransVISION)	502	3335	222	222	0	0	0
16	Dayton, OH	Ohio Department of Transportation District 7	525	213	213	213		0	0
17	Denver-Aurora, CO1/	Colorado Department of Transportation	541		400		400	1	1
18	El Paso, TX	Texas Department of Transportation-El Paso District	643	100	50	50		0	1
19	Fresno, CA	Caltrans District 6	645	173	160	70	0	0	0

Figure 5 – Data Workbook "Data" Worksheet

Data Dictionary

Figure 6 presents an example **Data Dictionary (DD)** worksheet. The data dictionary serves as a guide relating the questions contained in a survey to the Survey Variable Name, Data File Variable Name, Variable Format, Possible Variable Values, and Value Labels.

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[2] The name of an agency may have changed over time because of realignment due to administrative boundary changes due to US Census updates over time.
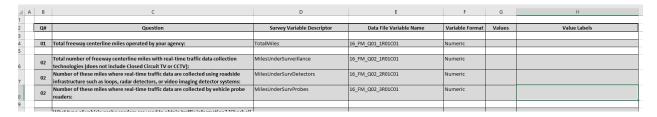
U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **14**

Figure 6 – Data Workbook "Data Dictionary (DD)" Worksheet

Variable Summary Statistics

Figure 7 includes an example of the **Variable Summary Statistics (Var Summ Stats)** worksheet This worksheet summarizes several characteristics of each variable in the data file including the question number (Q#), the Data File Variable Name (used in the column headings of the "Data" worksheet), the Survey Variable Descriptor, the Variable Format, and summary statistics for the variable based on the variable format where:

- Numeric – includes a count of the number of records with non-missing values and the sum of these values;
- Boolean – a count of the responses for each possible response (N=No; Y=Yes; F=False; T=True)
- Multiple Choice – a count of the responses for each possible response in the survey.
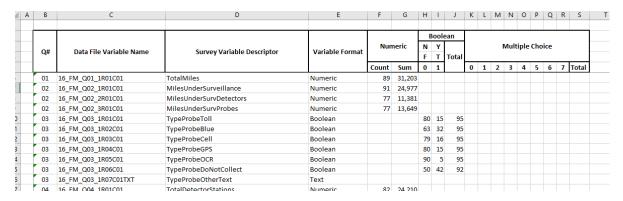

Figure 7 – Data Workbook "Var Summ Stats" Worksheet

U.S. Department of Transportation
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Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **15**

Chapter 6. Use Cases

This chapter presents two use cases as examples for how a user might conduct different searches.

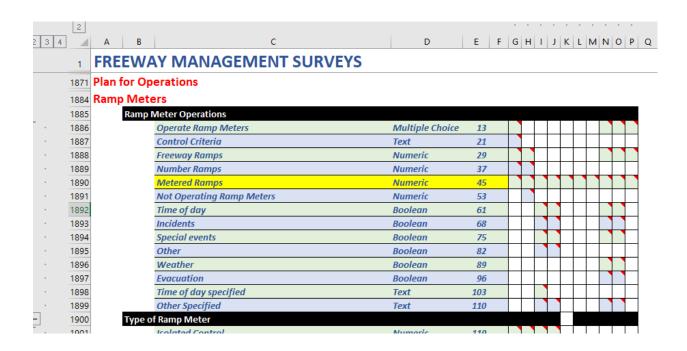## Use Case 1: Extracting Data for a Trend – ITS Deployment Tracking Surveys (1999 to 2016)

The following steps may be used to examine a deployment trend for a particular technology (or other question) from the ITS DTS Data Repository:

1. Open the relevant **Common Questions file** for the survey you are interested in (e.g., freeway, arterial, transit) to the **Index worksheet.**
2. Locate the topic of interest in the ITS DTS Data Repository by examining the Topic and Sub-Topic information contained in the **Index worksheet**
3. If the topic is contained in the DTS, identify the questions asked (by year) and the name of the variables in the associated data file from the **Topic worksheet.**
4. Open the relevant **Excel data file** for each year containing the identified variable and extract the data associated with the variable.

The following example demonstrates how to locate trend data for a "Ramp Meters" Topic. In this case, the search identifes trends to the question: "Total number of metered ramps" for Freeway Management agencies.

Step 1: Open the Index worksheet in the Freeway Management Common Survey Questions File and locate "Ramp Meters" topic.
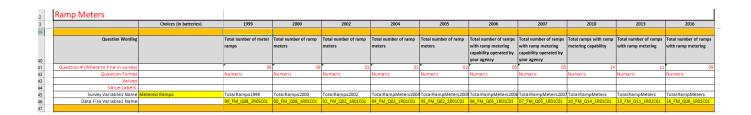
Step 2: Determine if the topic of interest is included in the ITS DTS Data Repository by examing the Topic and Sub-Topic information contained in the Index worksheet

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey Data Repository: User's Guide | **16**

Notes: Expand the Index worksheet to reveal Topics and Sub-Topics. Topics are highlighted in red and Sub-Topics highlighted in black.

Notes: Expand a row under a "Sub-Topic" to reveal the "Subject(s)" addressed by survey question(s) along with the Variable Type and the row in the **Topic worksheet** containing information related to the question. In this example, "Metered Ramps" is in Numeric format and located in row 45 of the "Ramp Meters" topic worksheet.

Step 3: Identify the questions asked, the names of the variables, and the the associated data files (survey year) by opening the "Ramp Meters" Topic worksheet and locating the row containing "Metered Ramps."

Notes: Note that the question has been asked each year between 1999 and 2016. Capture the variables names for each year for use in extracting data from each data file.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | 17

Step 4: Download the datasets for each year and run summary statistics on the ramp meter variable for each year survey.

	A	B	C	D	E	F	G	H	
			1999	2000	2002	2004	2005	2006	
	AgencyID	AgencyName	99_FM_Q08_2R05C01	00_FM_Q08_1R01C01	02_FM_Q02_1R01C01	04_FM_Q02_1R01C01	05_FM_Q02_1R01C01	06_FM_Q05_1R01C01	
	13	New York State Department of Transportation	0	0	0	0	0	0	
	15	New York State Thruway Authority	0	0	0	0	0	0	
	33	Pennsylvania Turnpike Commission	0	0	0	0	0	0	
	69	Georgia Department of Transportation	5	5	5	5	9	8	
	95	Texas Department of Transportation Austin District	0	0	0	0	0	0	
	103	Caltrans District 6	0	0	0	0	0	0	
	128	Maryland State Highway Administration	0	0	0	0	0	0	
	143	Louisiana Department of Transportation	0	0	0	0	0	0	
	149	Alabama Department of Transportation	0	0	0	0	0	0	
	189	Massachusetts Highway Department	0	0	0	0	0	0	
	213	New York State Department of Transportation	0	0	0	0	0	0	
	215	New York State Thruway Authority	0	0	0	0	0	0	
	241	South Carolina Department of Transportation	0	0	0		0	0	
	252	Metrolina Regional Transportation Management Center (North Carolina DOT)	0	0	0	0	0	0	
	255	South Carolina Department of Transportation District Office	0	0	0	0	0	0	
	297	Illinois Department of Transportation	113	113	113	0	0	113	
	301	Indiana Department of Transportation Highway Operations	0	0	0	0	0	0	
	302	Indiana Department of Transportation	0	0	0	0	0	0	

Notes: This is an example table consists data extracted from each data file for the appropriate variable. In this case, the values displayed are the number of metered ramps operated by an agency for each year. Data must include the Agency ID from each file (for merging).

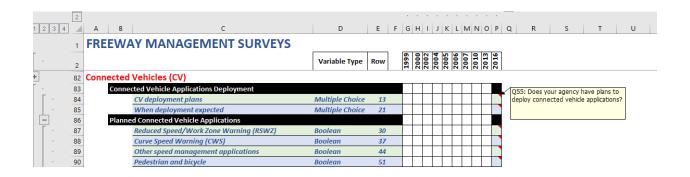# Use Case 2: Searching for Latest Data on a Topic

The following steps may be used to extract the **latest data on a particular topic** from the ITS DTS Data Repository:

1. Open the **Common Questions** file for the survey you are interested in to the **Index worksheet.**
2. Determine if the topic of interest is included in the ITS DTS Data Repository by examing the Topic and Sub-Topic information contained in the **Index worksheet.**
3. If the topic is contained in the DTS, identify the questions asked and the name of the variables in the associated data file from the **Topic worksheet.**
4. Open the relevant agency data file for the most recent year (and years if needed) containing the question/variable and extract the data associated with the variable for post-processing. Include the Agency Number.

The following example demonstrates how to locate the latest data available for a "Connected Vehicles (CV)" Topic. In this case, the search identifes the latest answers to the question: "Does your agency have plans to deploy connected vehicle applications?" for Freeway Management agencies.
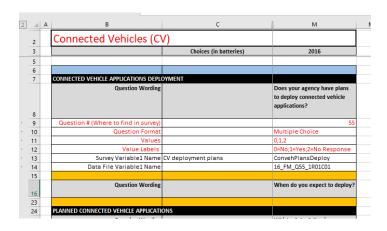
Step 1: Open the Index Worksheet in the Freeway Management Common Survey Questions Workbook and locate Connected Vehicles (CV) topic.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | 18

Step 2: Examine the Topic and Sub-Topic information contained in the Index worksheet.
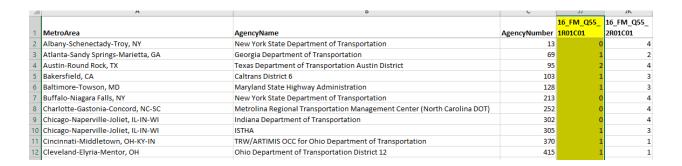

Notes: Expanding the Index worksheet to reveals the sub-topic "Connected Vehicle Applications Deployment" and the question "Does your agency have plans to deploy connected vehicle applications?"

Step 3: Identify the questions asked and the name of the variables in the associated data file by opening the Connected Vehicles topic worksheet.

Notes: Data for this question are located in the 2016 Freeway Management data file and the variable name in the file is "16_FM_Q55_1R01C01."

Step 4: Download the relevant data file containing the variable "16_FM_Q55_1R01C01," and perform your analysis,

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | **19**

	MetroArea	AgencyName	AgencyNumber	16_FM_Q55_1R01C01	16_FM_Q55_2R01C01
2	Albany-Schenectady-Troy, NY	New York State Department of Transportation	13	0	4
3	Atlanta-Sandy Springs-Marietta, GA	Georgia Department of Transportation	69	1	2
4	Austin-Round Rock, TX	Texas Department of Transportation Austin District	95	2	4
5	Bakersfield, CA	Caltrans District 6	103	1	3
6	Baltimore-Towson, MD	Maryland State Highway Administration	128	1	3
7	Buffalo-Niagara Falls, NY	New York State Department of Transportation	213	0	4
8	Charlotte-Gastonia-Concord, NC-SC	Metrolina Regional Transportation Management Center (North Carolina DOT)	252	0	4
9	Chicago-Naperville-Joliet, IL-IN-WI	Indiana Department of Transportation	302	0	4
10	Chicago-Naperville-Joliet, IL-IN-WI	ISTHA	305	1	3
11	Cincinnati-Middletown, OH-KY-IN	TRW/ARTIMIS OCC for Ohio Department of Transportation	370	1	1
12	Cleveland-Elyria-Mentor, OH	Ohio Department of Transportation District 12	415	1	1

Alternate Approach

As an alternative to using the Common Questions files, a user might also review the latest DTS survey instrument to determine if the survey includes questions of interest. In the example of Connected Vehicles, the user would review the CV/AV survey instrument. For other ITS technologies, the user would review the 2016 ITS DTS survey instrument..After reviewing the appropriate survey a user can use the Common Questions file or the data dictionary found in the data file corresponding to the survey.

Use Case 3: Extracting Data for a Particular Agency (1999-2016 Deployment Tracking Surveys)

Each agency surveyed was assigned a unique Agency ID used each year to faciliate the ability to extract data for a particular agency both within a survey year and across survey years. The example below demonstrates how a user can extract a response for a Freeway Management question for the New York State Department of Transportation in the Albany, NY Metropolitan Area (Agency ID = 13). Some agencies answered both Freeway and Arterial surveys and this number is the same for both surveys.

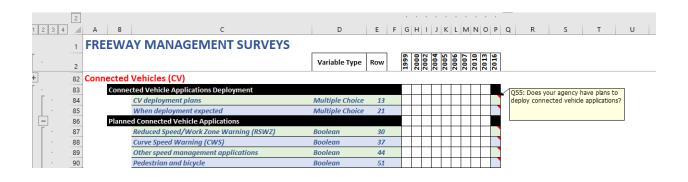The following steps can be used to extract data for a specific agency from the ITS DTS Data Repository:

1. Open the Common Questions file to the Index worksheet.
2. Determine if the topic of interest is included in the ITS DTS Data Repository by examing the Topic and Sub-Topic information contained in the Index worksheet.
3. If the topic is contained in the DTS, identify the questions asked and the name of the variables in the associated data file from the topic worksheet. (note question could be asked over multiple years)
4. Open the relevant agency data file(s) for the year(s)containing the variable and extract the data associated with the variable for post-processing.

If a user knows the data and variable names of interest, then the user may go directly to the data file to extact the data. Please note that data for a specific agency may not be available every year the survey was conducted (in every data file). Agencies may not have responded in each survey year. See appendices to this document to identify when a particular agency returned a specific survey.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | 20

The following example demonstrates how to locate the latest data available for an agency (Agency ID = 13) on a "Connected Vehicles (CV)" topic. In this case, the search identifes the latest answers to the question: "Does your agency have plans to deploy connected vehicle applications?" for Freeway Management agencies.
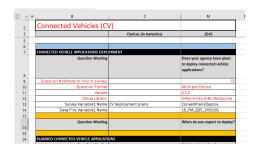
Step 1: Open the Index Worksheet in the Freeway Management Common Survey Questions Workbook and locate Connected Vehicles (CV) topic.

Step 2: Examine the Topic and Sub-Topic information contained in the Index worksheet.

Notes: Expanding the Index worksheet to reveals the sub-topic "Connected Vehicle Applications Deployment" and the question "Does your agency have plans to deploy connected vehicle applications?"

Step 3: Identify the questions asked and the name of the variables in the associated data file by opening the Connected Vehicles topic worksheet.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide   21

Notes: Data for this question are located in the 2016 Freeway Management data file and the variable name in the file is "16_FM_Q55_1R01C01."

Step 4: The user may acquire the information s/he needs simply by viewing the data (e.g., the file shows that the New York State Department of Transportation in Albany, NY does not operate or plan to operate Connected Vehicle applications, but if additional analysis is required, the user can download the relevant data file containing the variable"16_FM_Q55_1R01C01."

	MetroArea	AgencyName	AgencyNumber	16_FM_Q55_1R01C01	16_FM_Q55_2R01C01
2	Albany-Schenectady-Troy, NY	New York State Department of Transportation	13	0	4
3	Atlanta-Sandy Springs-Marietta, GA	Georgia Department of Transportation	69	1	2
4	Austin-Round Rock, TX	Texas Department of Transportation Austin District	95	2	4
5	Bakersfield, CA	Caltrans District 6	103	1	3
6	Baltimore-Towson, MD	Maryland State Highway Administration	128	1	3
7	Buffalo-Niagara Falls, NY	New York State Department of Transportation	213	0	4
8	Charlotte-Gastonia-Concord, NC-SC	Metrolina Regional Transportation Management Center (North Carolina DOT)	252	0	4
9	Chicago-Naperville-Joliet, IL-IN-WI	Indiana Department of Transportation	302	0	4
10	Chicago-Naperville-Joliet, IL-IN-WI	ISTHA	305	1	3
11	Cincinnati-Middletown, OH-KY-IN	TRW/ARTIMIS OCC for Ohio Department of Transportation	370	1	1
12	Cleveland-Elyria-Mentor, OH	Ohio Department of Transportation District 12	415	1	1

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems Joint Program Office

ITS Deployment Tracking Survey: Data Repository: User's Guide | 22

U.S. Department of Transportation