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16. Abstract As part of TxDOT (Texas Department of Transportation) Project 0-6297 entitled "Freight Planning Factors Impacting Texas Commodity Flows," the Center for Transportation Research (CTR) team focused on understanding the critical factors that influence freight planning in Texas. All U.S. states are required in terms of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and by the subsequent Transportation Equity Act for the 21st Century (TEA-21) to conduct statewide freight transportation planning. However, understanding how freight impacts the transportation system of a state and conducting statewide freight planning requires robust data. Consequently, as part of TxDOT Project 0-6297, the CTR team developed a relational Multimodal Freight Database software (RMFDB) that captured relevant publicly available freight variables that can be used for updating TxDOT freight models and studies. The objective of this Implementation Project was to disseminate information about the Relational Multimodal Freight Database by hosting six workshops in Texas.					
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## **The Multimodal Freight Database – A Potential User Perspective**

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## **Products**

The three products produced by this project are posted to the Internet and also contained on a CD ROM, which accompanies this report.

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### CD ROM

<i>5-6297-01-P1</i>	<i>Relational Multimodal Freight Database Webinar</i>
<i>5-6297-01-P2</i>	<i>Relational Multimodal Freight Database Workshops</i>
<i>5-6297-01-P3</i>	<i>Multimodal Freight Database and User Manual</i>





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## **Chapter 1. Introduction**

As part of TxDOT (Texas Department of Transportation) Project 0-6297 entitled “Freight Planning Factors Impacting Texas Commodity Flows,” the Center for Transportation Research (CTR) team focused on understanding the critical factors that influence freight planning in Texas. All U.S. states are required in terms of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and by the subsequent Transportation Equity Act for the 21st Century (TEA-21) to conduct statewide freight transportation planning. However, understanding how freight impacts the transportation system of a state and conducting statewide freight planning requires robust data. Consequently, as part of TxDOT Project 0-6297, the CTR team developed a relational Multimodal Freight Database Software (MFD) that captured relevant publicly-available freight variables that can be used for updating TxDOT freight models and studies. The objectives of Implementation Project 5-6297-01 are to (1) disseminate information about the MFD by hosting six workshops (Task 1), host a webinar to demonstrate the MFD to selected FHWA freight leaders (Task 2), and to update the MFD given the feedback received during Tasks 1 and 2 (Task 3). This report documents the research team’s efforts in achieving these objectives.



## Chapter 2. Multimodal Freight Database Workshops

The objective of Task 1 was to demonstrate the MFD to key potential users for review and comment. This chapter summarizes the outcome of Task 1: Conduct Multimodal Freight Database Workshops.

### 2.1 Workshops

The research team hosted six workshops and invited potential users in TxDOT's District and Regional Offices, at Texas MPOs, and at Texas cities to attend one of the following workshops:

- El Paso; September 28th, 2011 – 10:00AM-3:00PM (Location: 1430 Joe Battle Blvd, El Paso, TX, 79936),
- Tyler; October 5th, 2011 – 10:00AM-3:00PM (Location: 2709 W Front Street, Tyler, TX 75702)
- San Angelo; October 12th, 2011 – 10:00AM-3:00PM (Location: 4502 Knickerbocker Road, San Angelo, TX, 76904),
- Lubbock; October 19th, 2011 – 10:00AM-3:00PM (Location: 135 Slaton Road, Lubbock, TX, 79404),
- Houston; October 26th, 2011 – 10:00AM-3:00PM (Location: 7600 Washington Avenue, Houston, TX, 77007), and
- Corpus Christi; November 9th, 2011 – 10:00AM-3:00PM (Location: 1701 S Padre Island Dr., Corpus Christi, TX, 78416).

During the workshops, the research team *(i)* reviewed the development of the MFD, *(ii)* demonstrated the installation and use of the MFD, *(iii)* provided participants with the opportunity to conduct a number of data searches, *(iv)* gathered feedback from participants as to their experience using the database, and *(v)* gathered feedback as to any improvements that participants deemed necessary to improve the MFD and workshops. Each workshop participant was given a workshop folder that contained:

- the workshop agenda,
- the workshop presentations,
- a list of abbreviations and definitions used by the presenters during the workshop,
- challenges/exercises for participants,
- a MFD feedback form, and
- a workshop feedback form.

The next sections provide information about the participants and the input received from participants regarding the MFD. The CD-ROM contains the Workshop Booklet, which provides detailed information about the Multimodal Freight Database Workshops.

## 2.2 Participants

TxDOT employee titles that may be interested in freight transportation were identified and the contact information for these employees was obtained from TxDOT's Human Resources Division<sup>1</sup>. Potential MPO and City participants were identified from MPO or City websites or by calling MPO and City offices. Table 2.1 provides the number of participants by agency that attended each workshop.

**Table 2.1: Workshop Participants by Agency**

El Paso District Office September 28 <sup>th</sup> , 2011		Tyler District Office October 5 <sup>th</sup> , 2011	
TxDOT	7	TxDOT	6
MPOs	2	MPO	2
City and/or Other Entities	4	City and/or Other Entities	-
<b>Total Participants:</b>	<b>13</b>	<b>Total Participants:</b>	<b>8</b>
San Angelo District Office October 12 <sup>th</sup> , 2011		Lubbock District Office October 19 <sup>th</sup> , 2011	
TxDOT	3	TxDOT	4
MPOs	4	MPOs	2
City and/or Other Entities	1	City and/or Other Entities	-
<b>Total Participants:</b>	<b>8</b>	<b>Total Participants:</b>	<b>6</b>
Houston District Office October 26 <sup>th</sup> , 2011		Corpus Christi District Office November 9 <sup>th</sup> , 2011	
TxDOT	18	TxDOT	11
MPOs	8	MPOs	6
City and/or Other Entities	1	City and/or Other Entities	-
<b>Total Participants:</b>	<b>27</b>	<b>Total Participants:</b>	<b>17</b>

In total, 79 people participated in the six workshops that were hosted as part of this Implementation project.

<sup>1</sup>

TxDOT's Human Resources Division provided the research team with an employee contact list that covered titles such as Engineers, Planners, Environmental Planners, ITS Analysts, and GIS Analysts, among others at the 25 TxDOT District and Regional Offices.

## 2.3 Multimodal Freight Database Feedback

After the workshop participants were given the opportunity to conduct the Challenges/Exercises, participants were asked to provide the research team with feedback regarding the user friendliness of the interfaces and recommendations for improvements to the current MFD. Table 2.2 categorizes the feedback that was received in terms of feedback pertaining to the Data included, the designed Interfaces to facilitate the running of queries, and the Reporting format used to present the query output.

**Table 2.2: MFD Feedback**

Category	Description
Data	Add truck traffic counts (AADT) variable
	Use the commodity code NAICS instead
	Include the FAF BEAs
	Include county level data, city or anything more specific to the regions
	Aggregate unknown, not specified in mode tab
	Aggregate Multimodal, Truck & Rail, Truck & Water, Rail & Water in mode tab
	Fix misspelled words in commodity tab
Interface	Add text box in commodity tab
	Automatically/Interactively update relevant criteria as selections are made
	Change button Check All to Select All
	Clear port search text box after change or unselect port
	Field descriptions appear when on top of words
	Have a button that says "Run Query"
	Have a new screen to allow users to select the sorting form that they desire before running a query
	Identify projected years in the year tab
	Include database abbreviations in Select Databases screen
	Include a Start Over button in all screens
	Organize the ports by state, then alphabetically
	Run Query button should appear when no filtering is selected in filtering screen and invalidate the next button
	Unselect all choices when pressing Start Over button
Report	A glossary tab to explain what each variable category include
	Add Excel grid-like style to enhance readability
	Add total amounts by Database (bottom)
	Add grand totals in new column and include a total amount for the categories with only one record
	Add hyperlink next to the database names for description and limitations

Category	Description
	Add message that indicates database overlap
	Align all common variables in the report
	Button to Export to Excel
	Collapse Option for each hyperlink
	Collapse/Expand All button
	Divide databases in tabs
	Field descriptions appear when on top of words
	Freeze headings
	Have a "top" hyperlinks at the end
	Filtering Option
	Include an index to the side for manageability
	Only show databases that fit criteria
	Save as Word, Excel, PDF document option
	Show a summary of criteria chosen at the top
	Show Grand Total without having to expand the hyperlinks
	Show subtotals without having to expand the hyperlinks
	Sorting Option

The research team considered each of these recommendations and incorporated most of the suggested improvements. However, in some cases the recommendations were conflicting with one or more of the recommendations that were included in the revised MFD. In those cases, the research team did not address the specific comment or incorporated the specific recommendation (see Chapter 4).



## **Chapter 3. Multimodal Freight Database Webinar**

The objective of Task 2 was to demonstrate the Multimodal Freight Database (MFD) to FHWA freight leaders and TxDOT Division staff to gain support for the development of a national database and to discuss the integration of proprietary data into the existing MFD. The webinar was hosted by Mr. Kirk Fauver (Statewide Planning Engineer, FHWA) and Ms. Jolanda Prozzi (Assistant Director, CTR). The webinar was conducted using Adobe Connect on December 8, 2011 from 1:00-2:30 p.m. (CST). This chapter summarizes the outcome of Task 2: Conduct Multimodal Freight Database Webinar. The CD ROM contains the detailed report of the FHWA webinar.

### **3.1 Welcome and Introduction**

Mr. Kirk Fauver started the webinar at 1:05 p.m. (CST) by introducing himself and sharing relevant information with the participants regarding the webinar structure. The following individuals participated in the webinar:

- Jolanda Prozzi (CTR)
- Migdalia Carrion (CTR)
- Dan Seedah (CTR)
- Dr. C. Michael Walton (UT)
- Jennifer Moczygemba (TxDOT)
- Orlando Jamandre (TxDOT)
- Kirk Fauver (FHWA)
- Jim Thorne (FHWA)
- Kate Quinn (FHWA)
- Carol Keenan (FHWA)
- Chip Millard (FHWA)
- Eric Pihl (FHWA)
- Lisa Randall (FHWA)
- Michael Sprung (FHWA)
- Ralph Volpe (FHWA)
- Spencer Stevens (FHWA)

### **3.2 Presentation**

Ms. Jolanda Prozzi started the presentation by outlining the origins of the relational Multimodal Freight Database (MFD). Specifically, the database was developed as part of a larger TxDOT research project (TxDOT Project 0-6297) approximately two years ago.

Ms. Prozzi proceeded to outline the topics covered in the presentation, which included a discussion of the study objectives of TxDOT Project 0-6297 of which the development of the MFD was a component, a brief presentation on the development of the database, a more in-detail overview of the database, and a few slides summarizing the feedback and suggested improvements received from potential Texas users of the MFD.

Ms. Prozzi explained that the main objectives of TxDOT Project 0-6297 were to (1) obtain freight data and (2) synthesize the information in such a manner that the document could be a basis for the development of a freight plan for Texas. More specifically, the study sought to

improve the understanding of the nature of the commodities moved in Texas, the business and transportation system factors that affect shipping decisions, and the factors that impact freight competitiveness in Texas. These objectives were achieved by hosting a series of workshops with the shipper and freight planning communities in Texas. Secondary objectives of the study included the identification and documentation of the current state of the multimodal freight system in Texas, the development of recommendations for freight investments and policies to be considered by TxDOT, and finally, to explore the interest in the development of a Texas Freight Advisory Committee. Finally, Ms. Prozzi commented that, as a component of TxDOT Project 0-6297, the data gathered were packaged into the relational Multimodal Freight Database (MFD).

Ms. Prozzi mentioned that the database was developed with the intention of being a single source for Texas freight data that can be made available to the freight planning community in Texas. As a single data source, the database needed to be capable of mapping across multiple commodity codes used in the different public databases. Other features of the database include a user-friendly interface and the need for minimal computer processing.

Ms. Prozzi further discussed the features and limitations of the MFD. The MFD includes freight variables obtained from publicly available databases, which can be used for planning purposes, and presents the information contained in these databases in a similar format. The database also provides the user with an overview of the information contained in each public database. On the other hand, the MFD does not contain any private or proprietary data. Ms. Prozzi elaborated that this limitation was by design to avoid concerns about dissemination. Ms. Prozzi also added that the database to be submitted in January 2012 will contain the most recent available data, but no mechanism currently exists to incorporate future data releases. Finally, Ms. Prozzi mentioned that the MFD does not provide an analysis of the data, combine any data sources, or assesses the reliability and/or accuracy of the data. Ms. Prozzi did mention, however, that an overview of each data source, including the sponsoring agency, data location, methods used, and stated limitations was included in the MFD, but an evaluation of this information was not conducted by the research team.

In the discussion on the database Development and Coding, Ms. Prozzi focused on the selection of the data variables included in the MFD, the selection of the data sources, and the level of data aggregation.

For the variable selection, the research team consulted with the Project Advisors and ultimately included the following variables:

- Year,
- Mode of Transportation,
- Origin and Destination,
- Port (Entry and Exit),
- Commodity Type,
- Type of Movement,
- Number of Loads,
- Containers,
- Value, and
- Weight.

In terms of selecting the data source, the research team conducted an initial review of 31 potential and relevant data sources. The list was reduced to 22 data sources after excluding

private and proprietary data, as well as data sources that have been terminated and for which data are no longer collected. The remaining 22 data sources were all publicly available (with the exception of the Carload Waybill and the North American Trucking Survey, which are available to federal and state agencies upon request). Of these 22 data sources, only 11 contained all or some of the identified freight variables of interest. The following data sources were thus included in the current version of the MFD:

- Commodity Flow Survey (CFS) - U.S. Census Bureau and the Bureau of Transportation Statistics,
- Freight Analysis Framework (FAF) - FHWA,
- North American Transborder Freight Data (TBR) - Bureau of Transportation Statistics,
- Annual Coal Report (ACR) - U.S. Department of Energy,
- Bureau Crossing Data (BCD) - Bureau of Transportation Statistics,
- Fresh Fruits and Vegetable Shipments by Commodity, State, and Month (FFV) - U.S. Department of Agriculture,
- Maritime Administration Data (MAR) - Maritime Administration (DOT),
- National Transportation Statistics (NTS) - Bureau of Transportation Statistics,
- US Trade Data (USA) - STAT-USA and Foreign Trade Division of the U.S. Census Bureau,
- Waterborne Commerce Statistics of USA (WBN) - U.S. Army Corps of Engineers, and
- Carload Waybill Public Use File (WAY) - Surface Transportation Board (DOT).

Ms. Prozzi then presented several tables to demonstrate the differences in the level of aggregation used in the 11 data sources. A coding system was developed to present the data uniformly and at the same levels of aggregation. For example, in terms of commodity information, most data sources typically use either the commodity or industry classification system, although databases do exist that use a unique classification system. The research team thus developed a data map to document how commodity data from different databases were coded in the MFD. This data map was subsequently used to convert commodity codes from HS, NAICS, SCTG, and STCC to the commodity codes used by the research team. Although initial discussions with TxDOT revealed the need for only the nine commodity codes included in TxDOT's Statewide Analysis Model (SAM), the research team ultimately used 41 commodity codes (i.e., the 2-digit STCC codes plus two codes to denote unknown or not reported information). Ms. Prozzi illustrated the research team's coding efforts by showing excerpts of the original North American Transborder Freight Data (TBR) and Carload Waybill Public Use File (WAY) data alongside excerpts of the same data after it were re-coded by the research team.

In terms of the software platform for the MFD, the research team used Visual Basic to develop the queries and relied on Wizard Access to develop the forms and reports. The MFD also includes a user friendly interface that allows the user to search an individual database or to specify a number of freight variables to be searched in multiple databases. To conclude this section, Ms. Prozzi explained that, in hindsight, using Wizard Access to develop the forms and reports was not the best option and that the research team is currently working on improving the software's user interfaces.

Ms. Migdalia Carrion subsequently continued with a review of the software product. Ms. Carrion started by explaining how to install and use the MFD. She explained that an automated run should appear if the MFD CD is placed in the CD-ROM drive of a computer. She also explained how to install the MFD if the automated run does not appear and manual installation is

required. Ms. Carrion then explained the software features of the MFD. A question mark appears in all the MFD screens. When the user clicks on the question mark, the MFD User Manual opens in Microsoft Word. The MFD User Manual provides step-by-step guidance on how to use the MFD. The Manual also contains two Appendixes: A and B. Appendix A contains an overview of each data source, including the sponsoring agency, data location, methods used to gather the data, and stated limitations. Appendix B contains the code developed by the research team and used in the MFD. The “About the Databases” button that appear on the second screen of the MFD links to an .html file format of the information provided in Appendix A. The latter makes it easier for the user to locate information regarding a particular data source. Finally, the “Summary” button allows the user to populate a query in a timely manner. The “Summary” report contains a number of hyperlinks that can be expanded to display the data by clicking on the hyperlinks. The report can be saved, copied, and pasted into either Excel or Word.

Mr. Tim Thorne then assisted Ms. Carrion to share the desktop view of her computer with the participants. Ms. Carrion then proceeded to demonstrate the MFD by guiding participants through an example.

Ms. Prozzi then continued the presentation by outlining some of the feedback and suggestions for improvement obtained by potential MFD users in Texas. Ms. Prozzi explained that the MFD was demonstrated in a series of workshops to potential TxDOT and MPO users.

During each workshop, the data included in the MFD and the development of the MFD was discussed. A sample query was created to display the functionality of the MFD and potential users were then encouraged to run pre-designed queries. Once the potential users had time to review the MFD and its features, participants were asked to provide the research team with feedback and suggestions for improvements to the MFD.

Ms. Prozzi proceeded to demonstrate the feedback obtained from potential users. Overall, the feedback received was very positive. Several recommendations were also made to improve the MFD. These improvements can be categorized as (a) data, (b) interface, and (c) reporting improvements.

In terms of data improvements, the MPO participants expressed a need for more disaggregated data; i.e., down to the city or region level. Most participants also expressed the need for more data to be included in the MFD. In terms of the interface, the participants recommended that the variables are defined when the mouse is moved over the variable name, as well as for relevant criteria to be interactively updated as selections are made. Most of the recommendations related to the creation of the reports and how the data are displayed. For example, participants recommended that the data be displayed in a grid-like format to allow for sorting, filtering, and further analysis of the data. Ms. Prozzi remarked that most of the remaining effort will be on improving the data reporting structure.

Ms. Prozzi concluded by mentioning that the research team is sharing this information with the FHWA, because it is believed that other states may also benefit from this exercise.

### **3.3 Concluding Remarks**

The FHWA webinar participants suggested a number of agencies that could be interested in the MFD. One participant suggested presenting the MFD to one of the AASHTO committees, possibly by the intermodal or the planning committee. Other possible interested parties could be the participants of the mid-year summer meetings of the freight and economics committees, including Mr. Ralph Schmidt, who works with freight data. Other possible interested individuals include Ms. Ann Purdue, liaison for most of the TRB freight committees, and Ms. Joedy

Cambridge, liaison for the TRB port and waterway committees. The FHWA participants also recommended that the research team calculate the costs of developing a national database and the costs associated with maintaining and updating the TxDOT MFD.



## Chapter 4. Multimodal Freight Database

The objective of Task 3 was to finalize the MFD for dissemination to all TxDOT districts and MPOs. This chapter provides the user recommendations that were incorporated in the revised MFD.

### 4.1 Recommended Improvements

Table 4.1 categorizes the feedback that was received in terms of feedback pertaining to the Data included, the designed Interfaces to facilitate the running of queries, and the Reporting format used to present the query output. The research team considered each of these recommendations and incorporated most of the suggested improvements. However, in some cases where the recommendation conflicted with one or more of the other recommendations or the recommendation was irrelevant (“n/a”) because of changes made in the revised MFD, the research team did not address the specific comment or incorporated the specific recommendation (see Table 4.1).

**Table 4.1: MFD Feedback**

Category	Description	Included in Revised MFD
Data	Add truck traffic counts (AADT) variable	
	Use the commodity code NAICS instead	
	Include the FAF BEAs	
	Include county level data, city or anything more specific to the regions	Yes
	Aggregate unknown, not specified in mode tab	
	Aggregate Multimodal, Truck & Rail, Truck & Water, Rail & Water in mode tab	
	Fix misspelled words in commodity tab	Yes
Interface	Add text box in commodity tab	Yes
	Automatically/Interactively update relevant criteria as selections are made	Yes
	Change button Check All to Select All	Yes
	Clear port search text box after change or unselect port	n/a
	Field descriptions appear when on top of words	n/a
	Have a button that says "Run Query"	Yes
	Have a new screen to allow users to select the sorting form that they desire before running a query	Yes
	Identify projected years in the year tab	Yes
	Include database abbreviations in Select Databases screen	Yes
	Include a Start Over button in all screens	n/a

Category	Description	Included in Revised MFD
	Organize the ports by state, then alphabetically	Yes
	Run Query button should appear when no filtering is selected in filtering screen and invalidate the next button	n/a
	Unselect all choices when pressing Start Over button	n/a
Report	A glossary tab to explain what each variable category include	
	Add Excel grid-like style to enhance readability	Yes
	Add total amounts by Database (bottom)	Yes
	Add grand totals in new column and include a total amount for the categories with only one record	Yes
	Add hyperlink next to the database names for description and limitations	n/a
	Add message that indicates database overlap	n/a
	Align all common variables in the report	Yes
	Button to Export to Excel	Yes
	Collapse Option for each hyperlink	n/a
	Collapse/Expand All button	n/a
	Divide databases in tabs	Yes
	Field descriptions appear when on top of words	
	Freeze headings	n/a
	Have a "top" hyperlinks at the end	n/a
	Filtering Option	Yes
	Include an index to the side for manageability	n/a
	Only show databases that fit criteria	Yes
	Save as word, excel, PDF document option	Yes
	Show a summary of criteria chosen at the top	Yes
	Show Grand Total without having to expand the hyperlinks	n/a
	Show subtotals without having to expand the hyperlinks	n/a
	Sorting Option	Yes

## 4.2 Concluding Remarks

To conclude, the MFD was reviewed positively and many potential users seemed enthusiastic about the database. It is thus recommended that the revised MFD be disseminated to all TxDOT districts and Texas MPOs. It is also recommended that the revised MFD be presented to the AASHTO Intermodal and Planning committees, as well as to the TRB mid-year summer meetings of the freight and economics committees.