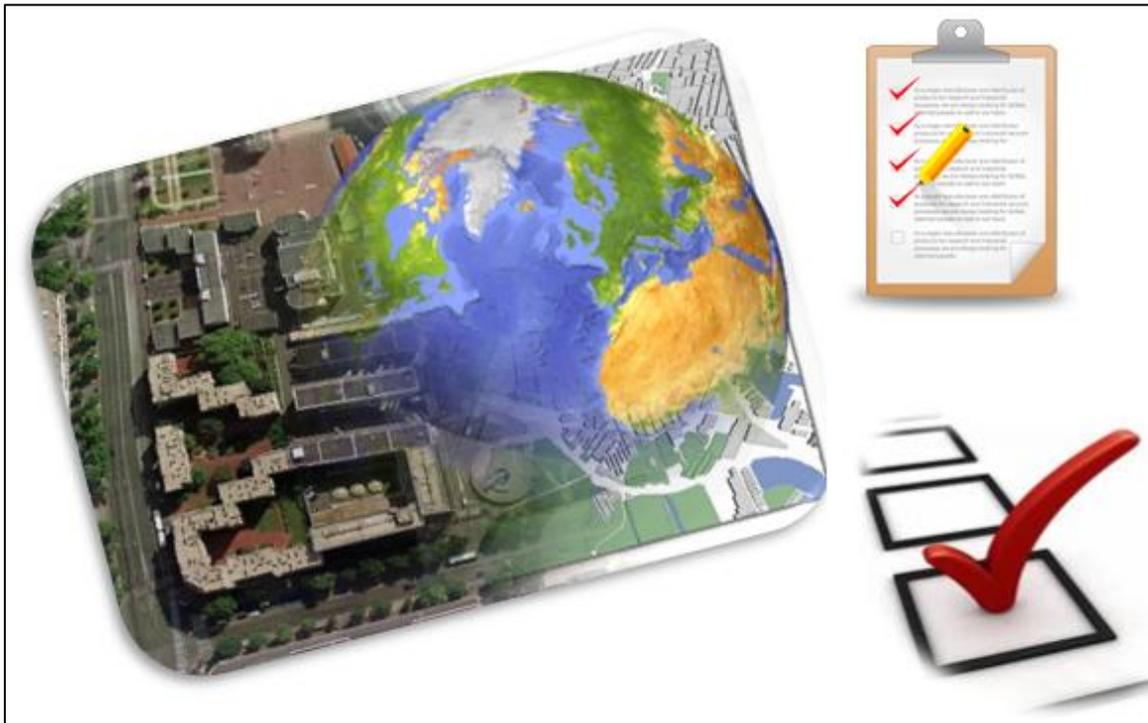


# NEEDS ASSESSMENT FOR TRANSIT AND GIS DATA CLEARINGHOUSE



Prepared for  
Public Transit Office  
Florida Department of Transportation (FDOT)

**April 2011**

# Needs Assessment for Transit and GIS Data Clearinghouse



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## BACKGROUND

The Florida Department of Transportation (FDOT) has developed several transit forecasting and evaluation tools that require the use of up-to-date transit route and stop data in a geographical information system (GIS) format. These tools were developed to support the preparation of Transit Development Plans, compare new transit alternatives, and assess and compare the performance of transit systems throughout the state and country. They include the Transit Boarding Estimation and Simulation Tool (TBEST) and the Florida Transit Geographic Information Systems (FTGIS).

TBEST is a software package developed by FDOT to assist transit planners in responding to the need to forecast future transit ridership both to support local service planning and to comply with Transit Development Planning (TDP) requirements. The model uses a GIS framework to allow service planning at the transit stop level and use of detailed social-demographic data. The development of up-to-date GIS data files for input into TBEST is critical to analyzing ridership alternatives.

FTGIS was developed as an application for analyzing and displaying National Transit Data (NTD) and performance measures for Florida's fixed-route transit systems. FTGIS provides a comprehensive set of GIS functions that range from the very basic mapping functions to highly specialized applications that are customized for transit planning purposes.

FDOT and transit agencies consistently receive requests for up-to-date transit data in GIS format for various statewide applications. Florida has 29 urban fixed route transit agencies, most of which have system level route and stop locations in a GIS format for their day to day operations and customer information purposes. The challenge for anyone trying to access or collect this information statewide level is contacting and collecting information from 29 different agencies.

At the local transit systems level, the challenge is transferring existing geographical data for use by other transit applications and providing it in a format useful for other applications.

Therefore, FDOT is considering the development of a Transit GIS Data Clearinghouse (TGDC) to collect, store, maintain data for easy access and use by statewide, regional and local transit agencies. If a Transit GIS Clearinghouse was available to collect, store, and convert transit GIS data from around the state into a standard format, this would assist in meeting the external data requests.

Additionally, transit agencies, as part of their daily operations, collect and store data for different purposes and from different sources and applications. Advanced Public Transportation Systems (APTS), also known as Transit Intelligent Transportation Systems (Transit ITS), generate, collect, and store large amounts of data. Further, many of these transit data sets contain a

geographic element that can be integrated in GIS. This presents great opportunities for converting data into useful information that can be used in decision making and can be formatted for use in other GIS based applications. As part of the data clearinghouse development, additional needs may arise for the development of new programs and tools which will allow transit agencies to capture, convert, and store additional transit data. These tools can better capture and display transit data to assist transit agencies in making intelligent decisions and more efficiently utilize resources.

This project focuses on identifying transit data sets that have a GIS component which can be used in transit planning. To achieve this, there is a need to get feedback from the transit agencies to help identify these data sets as well as the underlying technologies and applications. Further, transit agencies will be asked about agency needs for additional data and information necessary to enhance their current planning capabilities. Knowing the existing data sets from the transit agencies as well as agency data and information requirements can help plan and guide the development of a transit data library to better capture, store and utilize the data. By standardizing and centrally locating the appropriate features transit agencies can become more efficient with the data collection, storage, maintenance, and use of transit data. Potential options may involve expanding TBEST, FTGIS, or a new program to collect, store, and display GIS data from the Florida transit agencies.

In addition, having automated tools that are used to collect and store transit GIS data in a standard format can help transit agencies improve efficiencies and allow them to share data across regional boundaries. For the Public Transit Office of the Florida Department of Transportation, having access to standardized transit GIS data sets can help identify the needs of transit agencies and it can also help define programs to support transit agencies across the state, based on uniform data sets.

## PROJECT OBJECTIVE AND TASKS

The objective of this project was to get feedback from the transit agencies regarding the use of current transit applications, and the needs for transit GIS data and information that can enhance their current planning capabilities and develop conceptual alternatives to collect, house and access the data. This project surveyed transit agencies on the existence of transit data sets that have a geographical component, investigated the degree of current and planned GIS use, and explored the potential need for and creation of the Transit GIS Data Clearinghouse. The work tasks for this project are described as follows:

Task 1: Develop the Survey Instrument

A web-based survey instrument was developed to obtain feedback from the transit agencies on the use of GIS for transit applications. The survey collected information on transit GIS data and information needs, identify requirements, resources, and level of interest. The survey also addressed any concerns transit agencies may have on the use of transit GIS data and suggestions for future development.

#### Task 2: Compile and Analyze the Survey Data

After creating and conducting the surveys, data were collected and organized by transit agency. A summary of the surveys for the transit agencies was presented in different formats, including tables, graphs, and charts. Further, data were grouped in different categories to gain better understanding of the survey results. This assists identifying the most important issues and concerns transit agencies may have. Based on this analysis, potential challenges were identified and the best possible solutions were presented.

#### Task 3: Create the Transit GIS Data Clearinghouse User Group

A User Group was organized to assist in and guide the creation of the clearinghouse. The User Group will be comprised of FDOT Transit, Systems Planning and Statistics Office representatives, transit agencies personnel, and a few FDOT consultants responsible for maintaining transit applications.

The TGDC User Group is expected to address issues like the availability of transit GIS data sets, assessment of the data sets (e.g., accuracy, formats, etc.), current software applications, data storage, and need for future tools and technical support. This advisory group is also expected to provide guidance in the future development of applications that involve transit GIS data collection and storage and data management needs and requirements.

#### Task 4: Prepare a Final Report/Action Plan

This final report was prepared to document the survey instrument, survey analysis, results, observations, and feedback from the TGDC User Group. A summary of the surveys are included in the Appendix and the original surveys collected from the transit agencies have been stored for future use.

As part of this final report, an Action Plan was developed which includes recommendations for future implementation strategies to collect, store, convert and maintain transit GIS data in a format and location that is easily accessible to transit agencies. It also identifies the roles of the Central Office and transit agencies in creating, maintaining and enhancing the database. It will consider timeframe and costs for development and maintenance and identifies data needs and gaps to be considered for future study. The Action Plan presents a fully developed, comprehensive approach to implementing a Florida GIS Transit Data Clearinghouse.

## GIS SURVEY

A survey was designed to collect opinions and concerns from different agencies. The survey focuses on identifying data sets that have a GIS component which can be used in transit planning. To achieve this, the survey was designed to get feedback from the transit agencies to identify these data sets as well as the underlying technologies and applications and to gain a better understanding on the GIS capabilities and challenges transit agencies face. This survey explores the future need for software applications or tools that can help extract transit GIS data from Automatic Vehicle Location (AVL) systems, Automatic Passenger Counters (APCs), Stop Inventories, Scheduling systems, GIS systems, or other technologies that have a geographic element or data that can be converted into GIS.

## SURVEY INSTRUMENT

In this project, the Qualtrics web survey tool was used. Qualtrics is a software tool that enables users to create their own web-based surveys and conduct statistical analysis. It allows organizations to conduct and use the research suite tool. Users can utilize the software tool directly. The data can be analyzed online, exported to Microsoft Excel, or imported into a dedicated statistical analysis program such as SPSS. Figure 1 depicts a screenshot of the Qualtrics Graphical User Interface. See Appendix A for more information about this survey.

**Q1.**  
**Purpose of this Survey:**

The Florida Department of Transportation (FDOT) has developed several transit forecasting and evaluation tools that require the use of data in a Geographical Information System (GIS) format. These tools were developed to support the preparation of Transit Development Plans, compare new transit alternatives, help improve efficiencies, and assess the performance of transit systems throughout the state and country. One of the challenges for local transit systems is to transfer existing geographical data for use by other transit applications. FDOT is considering the development of a Transit GIS Data Clearinghouse (TGDC) to collect, store, maintain the data for easy access and use by the transit agencies.

The objective of this project is to get feedback from the transit agencies regarding the use of GIS, data from existing transit technologies, and the needs for transit GIS data and information that can enhance current planning capabilities. This project will survey transit agencies on the current and future use of GIS, existence of transit data sets that have a geographical component. An expert panel will be assembled to guide this research and the development of future transit applications. Lastly, an action plan based on the agencies' feedback and guidance from the expert panel will be prepared. It is expected that this project will open opportunities for greater and more efficient use of transit GIS data that can help improve the delivery of transit services in the State of Florida.

This survey will focus on identifying data sets that have a GIS component which can be used in transit planning. To achieve this, there is a need to get feedback from the transit agencies to identify these data sets as well as the underlying technologies and applications and to gain a better understanding on the GIS capabilities and challenges transit agencies face. This survey will also explore the future need for software applications or tools that can help extract transit GIS data from Automatic Vehicle Location (AVL) systems, Automatic Passenger Counters (APCs), Stop Inventories, Scheduling systems, GIS systems, or other technologies that have a geographic element or data that can be converted into GIS.

The Survey should take no more than 30 minutes to complete. Thank you for your participation in this significant research effort.

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Survey Completion  
0%  100%

Figure 1 Transit GIS Data Clearinghouse Survey

## DATA ANALYSIS AND SURVEY RESULTS

As depicted in Figure 2, 22 agencies (69%) responded to the survey from the 32 agencies the survey was sent. These agencies include the 29 urban fixed route agencies, Key West, which is a non-urban fixed route system and two regional transit authorities. Winter Haven Area Transit was surveyed separately from the Polk County Transit Services Division and the Tampa Bay Area Regional Transit Authority was also surveyed, as they are responsible for long range regional planning for the Tampa Bay transit agencies. The surveyed agency list is presented in Appendix B.

Figure 3 presents the completion rate of the survey. From the 22 agencies that responded to the survey, 19 (86%) agencies completed the survey while the remaining three agencies provided partial responses (Figure 4). The following sections present the data analysis and results based on the administered GIS survey, which is included in the Appendix A of this report.

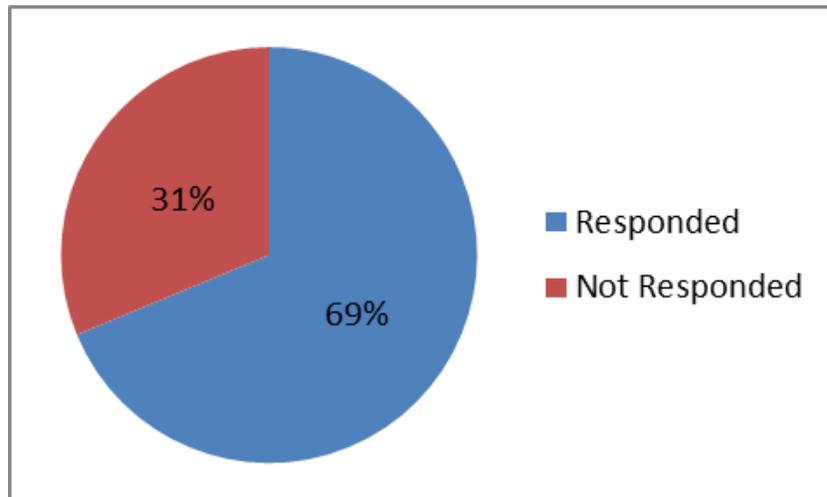


Figure 2 Response rate

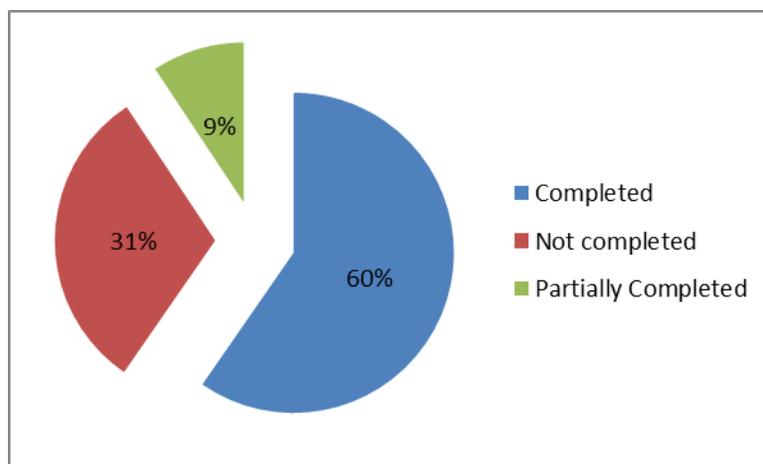


Figure 3 Completion rate

### *GIS Utilization*

The most basic indicator of GIS activity at a transit agency is the presence or awareness of GIS within an agency. Several questions in the survey seek to better understand GIS Utilization at Florida's transit agencies. This is presented in the GIS Usage section.

## GIS Usage

### 2. Does your agency use a Geographical Information System (GIS)? If no, please provide feedback.

#	Answer	Response	%
1	Yes	19	86%
2	No	3	14%
	Total	22	100%

Figure 4 GIS usage

The results of this survey question are extremely positive. With 86% of the respondents indicating GIS usage within its agency, it is clear that GIS is gaining traction within Florida's transit agencies. In fact, of the 3 respondents indicating that GIS is not used within the agency, one indicated reliance on other departments or agencies for GIS services and the other indicated it was planning on purchasing GIS for its organization. Based on this, the "No" agencies have an appreciation and recognition of the benefits of GIS. Further, the third "no" respondent stated that GIS was not part of the transit system, but indicated the presence of transit GIS data such as stops, time points, and routes. Therefore, it appears that the respondent answering this question does not maintain GIS data or operate GIS software, but some other department does utilize GIS and has transit related data.

### *Level of Usage*

The presence of GIS technologies and data provide a general indication of the level of usage. Other survey questions explored the extent of GIS adoption at the agencies. It is apparent that GIS is gaining more widespread use within the transit agencies and it is evident that several agencies have mature GIS services. As shown in Figure 5, close to 50% of the respondents described its agency's GIS activities as "extensive use". Further, over 50% of the responding transit agencies have been utilizing GIS for more than 5 years (Figure 6).

### 6. Select the general category that best describes your department's use of GIS.

#	Answer	Response	%
1	Planning stage	5	29%
2	Limited use	3	18%
3	Extensive use	8	47%
4	Other	1	6%
	Total	17	100%

Figure 5 Use of GIS in agency

### 5. How long has your agency been using GIS?

#	Answer	Response	%
1	Less than one year	0	0%
2	1-2 years	1	6%
3	3-5 years	7	41%
4	More than 5 years	9	53%
5	Not currently, but plan to implement GIS in one year	0	0%
6	Not using GIS	0	0%
10	Don't know	0	0%
	Total	17	100%

Figure 6 GIS usage by experience

Activity among multiple departments within a transit agency is another indicator of an agency's broader acceptance of GIS technologies. The survey showed that the respondents had GIS activity in multiple departments, see Figure 7. This illustrates how GIS is integrated in several functional areas of FL transit agencies. In addition, as depicted in Figure 7, planning departments use GIS more than other departments. Under the other category, the respondents indicated that they use GIS in Operations, Maintenance, Facilities and Construction. Planners (68%) are the ones that make use of GIS the most (Figure 8). Overall 76% of the respondents use GIS frequently or occasionally, see Figure 9.

### 13. Which departments use GIS? Please check all that apply.

#	Answer	Response	%
1	Planning	17	100%
2	Marketing	5	29%
3	IT	5	29%
4	Administration	5	29%
5	Other	6	35%

Figure 7 GIS usage by Department

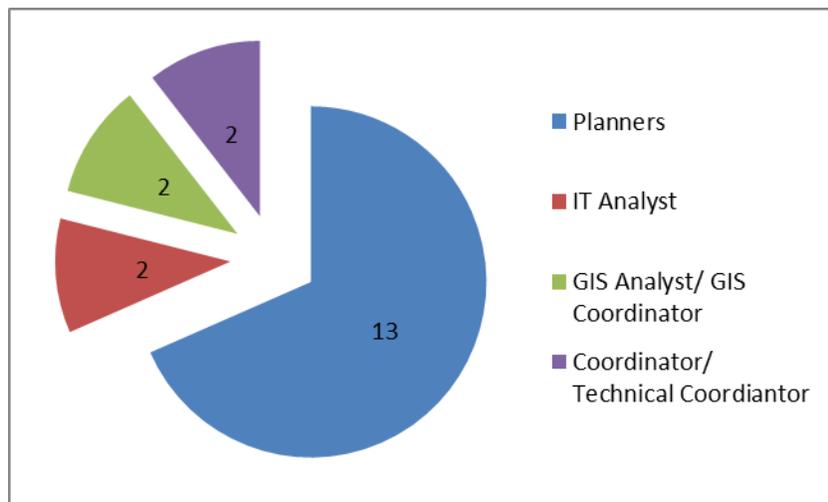


Figure 8 Respondent Title

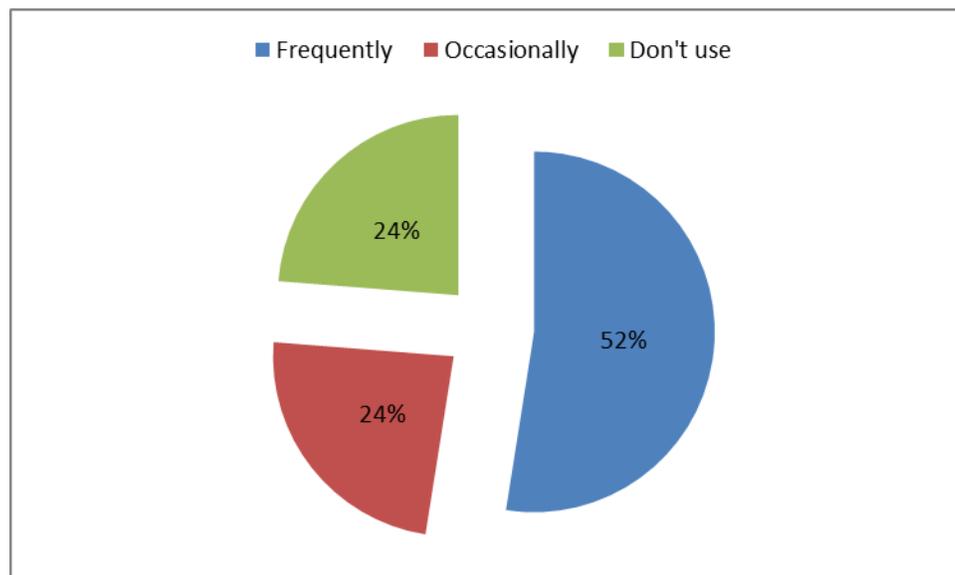


Figure 9 Use of GIS by the respondent

Another type of activity that reveals the extent of GIS utilization is the organizational structure of where and how GIS is implemented within an agency. Most agencies start with a project that requires the investment of GIS. Then typically that project serves as a catalyst for a department organized GIS. Under a departmental organized GIS most all the activities support a single department's mission. This may be occurring in more than one department. The most mature implementation of a GIS is an enterprise system, which requires the implementation of relational databases that support geospatial analysis that serve as a core set of data and many users.

To better understand the status of Florida's agencies, a question of the organizational setting for the GIS activity was asked, see Figure 10. Not surprising, agencies mostly have departmental and

project implementations of GIS technologies. It is not uncommon to have two different types of deployment to occur, which suggests a broader utilization of GIS. There is a great deal of overlap between the project level and department level implementations, of the 12 project implementations, 8 also reported department implementations.

From the 11 agencies that responded to having department level implementations, two of the agencies that reported departmental or project oriented GIS implementations also have enterprise systems. In fact, of the three agencies reporting enterprise systems, two had either project or departmental implementations too. With multiple implementations on-going, the agencies are primed for approaching enterprise-wide implementations.

**16. At what level of implementation does your agency deploy GIS technology? Please check all that apply.**

#	Answer	Response	%
1	Project	12	71%
2	Department	11	65%
3	Enterprise-wide	3	18%
4	Other	0	0%

Figure 10 GIS usage by Level of Implementation

The widespread acceptance of GIS within the responding agencies is a positive direction. The opportunities to discover more avenues to utilize geospatial data and technologies can increase in an organization as more users start relying on GIS. A diverse user group, with different needs and skills, presents opportunities for collaboration and innovation and as individuals attempt to streamline and skills evolve, opportunities to grow the acceptance and utilization of geospatial technologies exist.

## GIS Applications

The different types of GIS technologies employed by an agency are indicators of GIS acceptance and utilization. The use of multiple GIS applications by an agency to meet the differing needs of the multiple users and departments is representative of an advanced GIS agency. Other indicators of mature and technologically sophisticated GIS systems are the utilization of relational geospatial databases, data distribution applications, and customized applications. A better understanding of the software and applications used by an agency were explored by the survey.

### *Software*

The survey asked a question about the GIS software utilized by the agency (Figure 11). The different types of software implemented at the transit agency provide insight into the agency's

GIS utilization. The most prominent implementation type is the desktop GIS platform. Almost all agencies indicated using a version of ESRI's desktop software. Several agencies indicated using more than one GIS desktop application. For the agencies using MapInfo, the ESRI desktop software was also being implemented.

### 3. Please specify the GIS Platforms used? Check all that apply.

#	Answer	Response	%
1	ESRI Desktop Software	15	88%
2	ESRI Server Software	5	29%
3	MapInfo	4	24%
4	Caliper Maptitude or TransCAD	0	0%
5	Cube GIS	1	6%
6	Other	1	6%

Figure 11 GIS Software utilized by agencies

Some agencies indicated using server GIS technologies which is an indication of a more advanced GIS implementation. Server based GIS technologies support desktop application as well as web based applications. Server technologies require a more sophisticated skill level involving database privileges and varied data representations. These technologies rely on relational databases and can be viewed by non-GIS users, GIS users and possibly the public through the internet. Several agencies (5) indicated the use of server technologies. The survey only asked about one specific type of server technology (ESRI Server Software). However, the survey allowed for an "Other" option for the answer and none indicated the use of a server technology different than ESRI. All of the five agencies employing GIS server technologies have been utilizing GIS for more than 3 years, and three of the five agencies have been using GIS for more than 5 years.

Web-based GIS solutions are an indication of advanced GIS utilization. Figure 12 presents the results to the question of whether agencies have web-based GIS applications or not. Several agencies reported (7) implementing web-based GIS solutions. Of those agencies 4 indicated publishing the data to the public. The remaining three indicated the web applications were only published to support internal application and users. All of the 7 agencies using web-based GIS applications have been utilizing GIS for more than 3 years and 4 agencies have been utilizing GIS for more than 5 years. Again, this supports the general thesis that more mature agencies employ more sophisticated GIS technologies.

**14. Does your organization have a web-based GIS application? If this is available to the public, please provide URLs.**

#	Answer	Response	%
1	Yes. But only publish data for internal use	3	18%
2	Yes. Publish data to the public	4	24%
3	No. We don't use web-GIS service	10	59%
	Total	17	100%

Figure 12 Responses for web-based GIS application

### *Customized Applications*

Another measure of higher technical sophistication is the development of GIS applications. This is presented in Figure 13. For the most part the agencies indicated a high rate application development (53%). Agencies performing these activities require unique solutions which off-the-shelf applications are not meeting. The agencies using customized application are generally more mature with 7 of the agencies developing GIS applications have been using GIS for more than 5 years.

The applications developed include, creation of mapping applications, inventories of stops, routes, timepoints, and stop images. Two agencies reported creating databases to track accidents, transportation improvement plans, and transit data such as schedules including the above mentioned inventories. The presence of these applications is an encouraging trend for Florida Transit agencies.

**8. Have your agency developed GIS Applications (in-house or outsourced)?**

#	Answer	Response	%
1	Yes	9	53%
2	No	8	47%
	Total	17	100%

Figure 13 Responses to the development of GIS applications by the agency

### *Advanced Public Transportation Systems*

Additional software applications and technologies contribute to understanding the level of GIS usage at Florida's agencies. One such area of technologies is Advanced Public Transportation Systems. The data elements of Advanced Public Transportation Systems are usually geospatial.

The survey, seeking to understand if agencies are using APTS and consequently GIS data, asked about the agency's use of APTS.

The respondents indicated a wide variety of APTS systems (Figure 14). The table below indicates the extent of APTS utilization. If agencies are utilizing APTS, there is a higher level of sophistication and data accuracy needed to effectively make use of these technologies. Additionally, APTS technologies usually generates enormous amount of data. Given the broader use of these technologies, it is important to understand the outcomes of these technologies. A common occurrence with these applications is data overload. With the agencies indicating the need to access AVL and APC data and on-time performance records, agencies may be challenged to access and share APTS data. Nevertheless, it is encouraging that Florida's transit agencies are starting to utilize data from APTS technologies to improve the delivery of transit services.

**26. What transit Advanced Public Transportation Systems (APTS) technologies does your agency use? Please check all that apply.**

#	Answer	Response	%
1	Automatic Passenger Counters (APCs)	9	47%
2	Automatic Vehicle Location (AVL)	11	58%
3	Transit Stop Inventories	12	63%
4	Transit Scheduling System	10	53%
5	Electronic Farebox Collection (EFC)	9	47%
6	Realtime Information System	4	21%
7	Geographic Information System (GIS)	15	79%
8	Other	3	16%

**Figure 14 Use of Advanced Public Transportation Systems**

## Data

The ability to access, utilize, and share data is critical for transit agencies to leverage the advantages of GIS. The extent of data used, distributed, and acquired reveals a more expansive utilization of GIS activities. The amount and type of GIS data a transit agency utilizes is an indicator of the level of GIS usage. Greater utilization requires more GIS data. Almost all the transit agencies use bus transit routes, stops, transit stations, census tracts, and Traffic Analysis Zones (TAZs).

### ***Data Standards***

As depicted in Figure 15, agencies follow different standards. Of the agencies that responded to this question, 11 transit agencies follow their own standards while 6 transit agencies follow local GIS group standards. From Figure 15, it is clear that agencies lack of uniform standards that would be ideal for sharing GIS data.

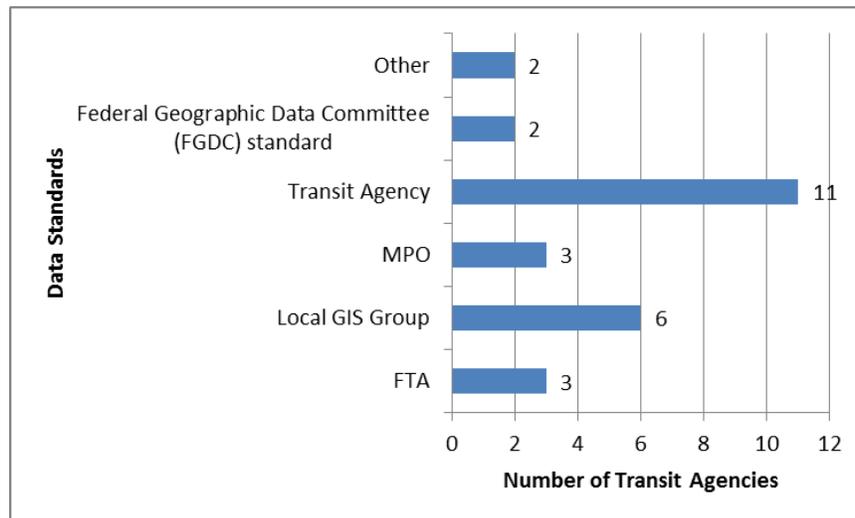


Figure 15 Data Standards followed by agencies

### ***Data Usage***

The amount of GIS data an agency stores may serve as a metric of how much an agency utilizes GIS technologies. The survey asked about the datasets stored in GIS. Many agencies reported having GIS data which include Bus Transit Routes (85%), Stops (90%), Timepoints (60%) and Transit Stations (65%). The presence of these data sets suggests an acceptance and utilization of GIS within each agency.

### ***Access to Data***

Access to transit GIS data can be a barrier to wide-spread GIS implementation. Providing access to other data users and allowing access to data outside the control of a department or an agency are important in order for GIS to be successful at a transit agency. Consequently, a better understanding of the transit GIS data used, shared, and developed by transit agencies is important. Respondents to the survey indicated that data are obtained from various sources: government, commercial, consultant services, and in-house (developed and created), suggesting that access to data is not a major barrier (Figure 16).

**7. Where does your department obtain GIS data? Please check all that apply.**

#	Answer	Response	%
1	Government agencies	16	94%
2	Commercial sources	7	41%
3	Developed in-house	13	76%
4	Other	1	6%

Figure 16 GIS data sources for the agencies

However, the agencies did provide insight into other areas of information that they would prefer to have access to. This was asked in question 10.

**10. What GIS data you wish you had access to, but don't have access now (sources can be from within or outside your organization).**

The responses to this question ranged widely from no data needs to specific data requests. For those agencies that requested GIS data, the type of data varied as well. This varied from data derived from ITS technologies to data outside jurisdictional boundaries such as demographic and base data such as roads.

As depicted in Figure 17, we also see that 10 agencies responded that they need GIS data beyond their jurisdictional boundaries while 6 agencies replied that they do not need GIS data beyond their jurisdictional boundaries. 11 agencies replied that they have access to data outside their jurisdictional boundaries while 5 agencies replied that they do not have access to data outside their jurisdictional boundaries.

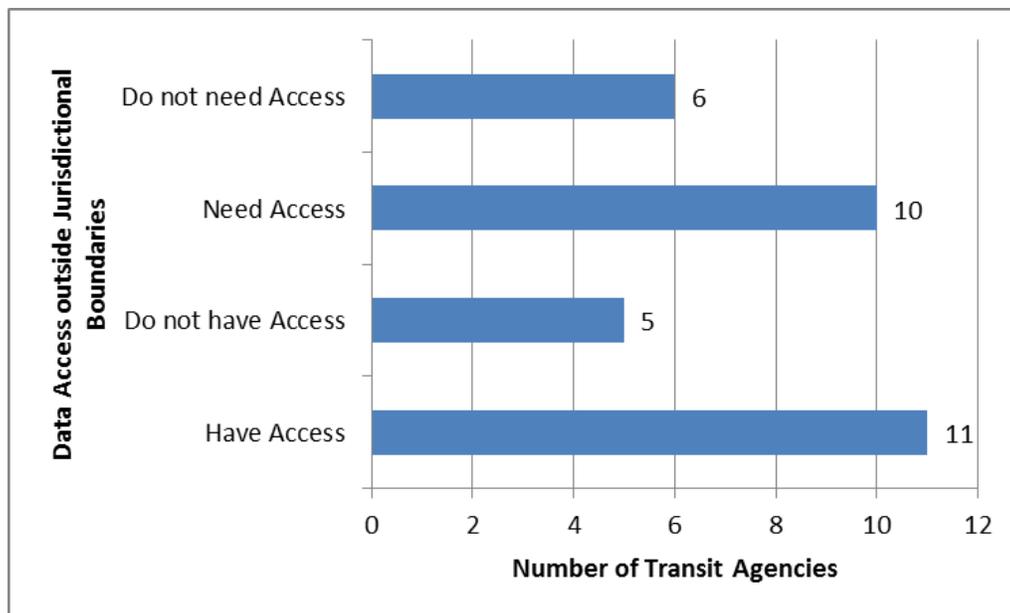


Figure 17 GIS data access outside agency's jurisdictional boundaries

One example may illustrate one of the causes. Respondents indicated the desire to have access to AVL and APC data. This type of request suggests organizational limitations where access to internal data is not universally available or may not be available in a format that is immediately helpful.

The agencies with no data needs were very clear about its agency's needs with responses like:

*"We have access to everything we need at this point"*

*"We have access to what we need."*

*"We have sufficient data for our purposes (road layers and so on)"*

All of the agencies, which indicated no additional need for GIS data, have used GIS for more than 5 years. With GIS data becoming more widely available, it is not surprising that experienced GIS departments are able to acquire any and all data they need. Awareness of this availability seems to be limited to agencies with more experience.

## External Sources

Most of the survey respondents (88%) indicated the availability and access to data outside its organization (Figure 18). However, this is slightly contradictory to the multiple agencies indicating the need to access data outside its jurisdictional boundaries. This suggests that the users have access to some data outside their organization, but there are additional datasets that they would like to have access to.

### 11. Do you have access to data outside your organization?

#	Answer	Response	%
1	Yes	15	88%
2	No	2	12%
	Total	17	100%

Figure 18 Response to data access outside agency

### Data Distribution

Transit agencies with quality data are able to freely distribute and share their data with other organizations. While not directly related to data and GIS sophistication, the ability to regularly and freely share data is an indication of good data stewardship. An agency that does not have faith in the quality and accuracy of its data would not easily share its data. Almost all the agencies indicated sharing data with other organizations most commonly to Government agencies, Private companies and to other Non-profit organizations, see Figure 19. One agency indicated that they provide GIS data to educational institutions.

**21. Does your department provide GIS data to other organizations? Please check all that apply.**

#	Answer	Response	%
1	Government agencies	15	94%
2	Non-profit organizations	8	50%
3	Private companies	13	81%
4	Other	2	13%
5	No	1	6%

Figure 19 Response to GIS data providing to other organizations

Though there are many concerns over sharing data, the major obstacle is lack of resources. However many agencies stated that data sharing is difficult due to privacy concerns or institutional barriers, see Figure 20.

**30. From your experience, what are the main difficulties in sharing data? Please check all that apply.**

#	Answer	Response	%
1	Privacy concerns	6	32%
2	Preparatory System	4	21%
3	Institutional barriers	6	32%
4	Lack of Resources	13	68%
5	Other	2	11%

Figure 20 Difficulties in sharing data

Almost all the agencies are willing to share data. 95% of the agencies expressed their willingness to sharing data. There was only one agency (5%) that responded that they were not sure at this time if they could share the data, see Figure 21.

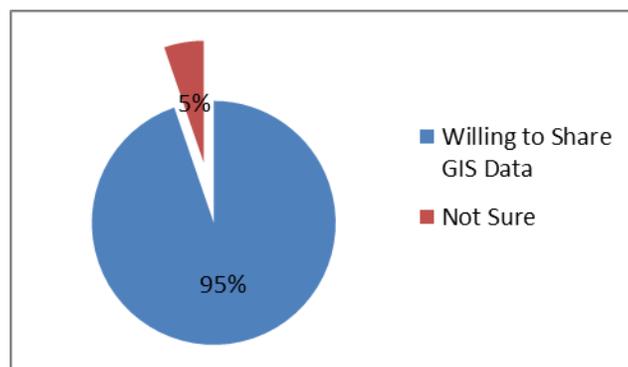


Figure 21 Agencies willing to share data

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## SUMMARY OF RESULTS

A survey was sent to 32 agencies, which included transit agencies and regional organizations, see Appendix B for the list of the agencies. The survey was responded by 22 (69%) of the 32 agencies. From the 22 agencies that responded, 19 (86%) agencies completed the survey fully while 3 agencies provided partial responses. 86% of the respondents indicated GIS usage within its agency and close to 50% of the respondents described its agency's GIS activities as "extensive use". Further, over 50% of the responding transit agencies have been utilizing GIS for more than 5 years. The survey shows that planning departments use GIS more than other departments. Overall 76% of the respondents use GIS frequently or occasionally.

The survey results also show that almost all agencies indicated using a version of ESRI's desktop software. Several agencies indicated using more than one GIS desktop application. Some agencies indicated using server GIS technologies which is an indication of a more advanced GIS implementation. Server based GIS technologies support desktop application as well as web based applications. Several agencies (7) reported implementing web-based GIS solutions. Of those agencies, four (4) indicated publishing the data to the public. The remaining three (3) indicated that the web applications were only published to support internal applications and users. The survey, seeking to understand if agencies are using APTS and consequently GIS data, asked about the agency's use of APTS. The respondents indicated the use of data from a wide variety of APTS systems.

The ability to access, utilize, and share data is critical for transit agencies to leverage the advantages of GIS. Greater utilization requires more GIS data. Almost all the transit agencies use bus transit routes, stops, transit stations, census tracts and Traffic Analysis Zones (TAZs). Many agencies reported having GIS data which include Bus Transit Routes (85%), Stops (90%), Timepoints (60%) and Transit Stations (65%). This survey also discovered that agencies follow different standards. Of the agencies that responded to this question, 11 transit agencies follow their own standards while 6 transit agencies follow local GIS group standards. Another observation from the survey is that agencies lack of uniform standards that would be ideal for sharing GIS data.

In data jurisdictional boundary discussion, we noted that 10 agencies responded that they need GIS data beyond their jurisdictional boundaries while 6 agencies replied that they do not need GIS data beyond their jurisdictional boundaries. 11 agencies replied that they have access to data outside their jurisdictional boundaries while 5 agencies replied that they do not have access to data outside their jurisdictional boundaries.

Lastly, we noticed that most of the survey respondents (88%) indicated the availability and access to data outside their organization. This is slightly contradictory to the multiple agencies indicating the need to access data outside its jurisdictional boundaries, which suggests the need to access additional external datasets. The agencies expressed their willingness to sharing data.

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## RECOMMENDATIONS /ACTION PLAN

The Florida Department of Transportation (FDOT) has developed several transit forecasting and evaluation tools that require the use of data in a Geographical Information System (GIS) format. Specifically, the Florida Transit Geographic Information Systems (FTGIS) and Transit Boardings Estimation and Simulation Tool (TBEST) require GIS data. FTGIS was developed as an application to analyze and display National Transit Data (NTD) and performance measures for Florida's fixed-route transit systems. TBEST is an ArcGIS-based software program that provides comprehensive transit analysis and ridership forecasting. TBEST is capable of simulating travel demand at the individual stop level, while accounting for network connectivity, spatial and temporal accessibility, time-of-day variations, and route/stop competition. For these applications to maximize their usefulness, up-to-date GIS data are needed. However, this can be challenging, as transit agencies may have difficulty to timely handle continuous requests for GIS data without a mechanism to help transfer their geographical data.

Transit agencies also receive external requests for GIS data in various formats for different purposes. If a Transit GIS Clearinghouse was available to collect, store, and convert transit GIS data from around the state into a standard format, this would assist in meeting the external data requests.

Additionally, transit agencies, as part of their daily operations, collect and store data for different purposes and from different sources and applications. Advanced Public Transportation Systems (APTS) also known as Transit Intelligent Transportation Systems (Transit ITS) in particular generate, collect, and store large amounts of data. Further, many of these transit data sets contain a geographic element that can be integrated in GIS. This would help transit agencies in making intelligent decisions and more efficiently utilize resources.

To assist in this effort, a survey was conducted to get feedback from the transit agencies regarding the use of GIS, data from existing transit technologies, and the needs for transit GIS data and information that can enhance current planning capabilities. After analyzing the data from GIS survey, the following tasks are suggested in future plans.

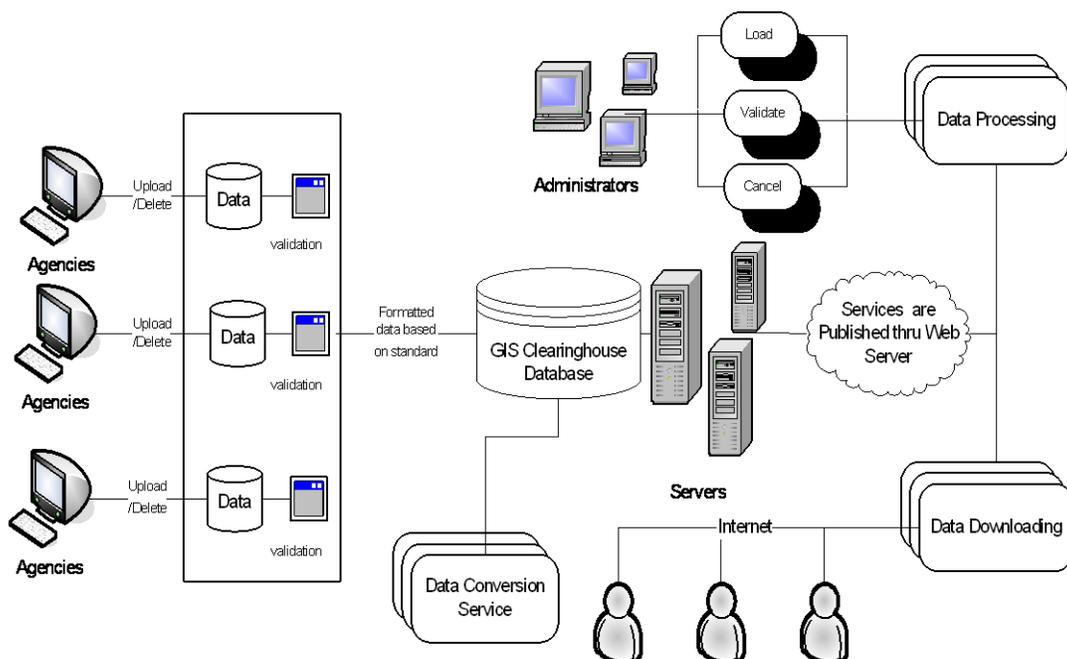
### *Development of the Transit and GIS Data Clearinghouse*

From the survey results, it can be implied that there is a need for a Transit GIS data clearinghouse. Transit agencies are constantly providing GIS data to other organizations (government, non-profit organizations, consultants, etc.) and the data are mainly shared upon request via e-mails, manual transfers, and other means. Therefore, to promote efficiencies in sharing data, there is a need for a GIS Clearinghouse. The Transit GIS data Clearinghouse can act as a library of GIS data stored by all the agencies that can meet the demand for GIS data. This can also serve as a catalyst for technology transfer and it can generate ideas for the creation of GIS datasets that other agencies have developed. In addition, 63% of the agencies need GIS data

beyond their jurisdictional boundaries. The clearinghouse will simplify the data transfer process by removing the burden of data access and distribution.

The clearinghouse can provide a forum for collaboration in the development and advancement of GIS. It will increase the accessibility and usability of GIS data and tools; it will improve consistency across agencies; and it can act as data repository for uploading and downloading transit and GIS data. Agencies can use the clearinghouse as GIS data dissemination mechanism that will benefit all users of GIS data. The data will be secured in the clearinghouse server.

Software applications, sponsored by FDOT, like FTGIS and TBEST can greatly benefit by being able to use GIS data from the clearinghouse. Interfaces to automatically transfer transit and GIS data from the clearinghouse to these software applications can be developed. GIS data can be converted to the TBEST and FTGIS preferred format. Figure 22 depicts a high-level diagram of the proposed Transit GIS Clearinghouse.



**Figure 22 Transit GIS Clearinghouse Frameworks**

The application framework plays an important role in the development of GIS clearinghouse. As depicted in Figure 22, agencies would upload data to GIS clearinghouse using user-friendly web functions. Once the data is in the server, the clearinghouse can convert the data to specific requirements using conversion services. Users can download data or requests summary reports. Administrators can have access to manipulate the data using web sharing services.

To encourage participation, the data uploading process needs to be easy and intuitive. Nevertheless, a simple how-to document needs to be prepared to explain the steps required to

upload the data. A similar document for downloading the data from the clearinghouse should also be prepared.

## Description of System Development

A description of GIS data clearinghouse process is suggested as follows. It includes three parts and more detail would be revised further.

### *Data Upload*

This application could be divided into two parts: one is the user management interface, and the other is administration interface. Agencies should be able to browse their local files through the online application. The data file could be selected and uploaded when agencies try to upload. The application would allow user to upload files through File Transfer Protocol (FTP), which will be reliable and time saving. After data are uploaded, agencies should be able to take actions in their control panel.

### *Data Validation and Conversion*

Validation process should be followed after the data has been collected. In order to reduce the mistakes made by agencies, the data cannot be loaded to the database unless the data have been validated and prove to be correct. Standardized metadata will also be generated during the validation process. GIS data clearinghouse would also provide data conversion service to those agencies who want to convert their local data to some common data format.

### *Data Input and Interface Design*

The Graphical User Interface (GUI) of application needs to be divided into two parts, one is user management interface, and the other is administration interface.

One of the key features in data file management in user interface part is uploading data. The following steps of uploading should be carefully considered when developing application. The process for Data uploading and importing is included in Table 1:

<b><u>User Interface</u></b>	
Login	Each agency can log into the online application.
Data file management	Agencies are allowed to manage the data file they uploaded. They may upload, update (replace), or delete the data files.

Rollback	Agencies should be able to delete the data they previous loaded into the database. In some cases, the same data may be loaded twice or more, so the agencies should be able to rollback to previous stages if they made such mistake.
<b><u>Administration Interface</u></b>	
Login	Web administrator can log into the online application.
Conflict management	Administrator should be able to review all data files uploaded by agencies. Some data files may have conflicts; Administrator should be able to deal with this issue.

Table 1 Interface Design

Table 1 shows a basic interface design for uploading and managing data. The application allows people upload files through a reliable and time-saving solution which is FTP. When the agencies finish uploading the data, the online application should return to the data file management control page which allows the user to manage the data files. User may be able to validate the data, load the data to database or rollback the data. The agencies should be able to take actions in their control panel and be redirected to web pages with the desired features.

### *Create transit GIS data standards*

Agencies collect data from their everyday operations; the data may come from different data source and may have different formats. According to the survey, transit agencies follow many GIS standards, including their own. This poses a challenge for sharing data. Therefore, it is recommended that a Minimum Uniform GIS Data Standard be created to support the development of state-wide applications and to facilitate data sharing among agencies in the State of Florida. The standards should be easy use and clear to the agencies. Suggested data standards would be sent to agencies and revised. The GIS data clearinghouse should be able to accept all common formats of the data. Suggested GIS standard would include transit stop and route layers as well as data from APTS applications.

### *Provide technical assistance for conversion to standards*

To assist the agencies with the transition to new standards, technical assistance should be provided to reduce the burden to agency staff. This can also help expedite the conversion process and encourage transit agencies to participate.

Technical assistance may include training services, documentation, or some other type of GIS help. The assistance would be developed in close coordination with Florida transit agencies in order to produce agreed upon data standards. Initial data conversion could be done with the assistance of FDOT consultants to ensure the quality and validity of baseline data, but continued maintenance and updates to the data would then be done by the transit agencies on a regular basis. This would definitely help expand the use of GIS in the State of Florida.

### *Assist Florida agencies with sharing data from APTS technologies*

The use of data from APTS applications can be challenging. Considering that agencies may have different APTS technologies from different vendors, data need to be uniform. Therefore, it is recommended that procedures be developed for transit agencies to facilitate the use of uniform data among agencies. Since the amount of APTS is vast, initially is recommended to concentrate on data that can be used as performance measures like on-time performance, passengers per hour, passengers per mile, and passenger activity at bus stops.

### *Promote the use of the Transit GIS Data Clearinghouse*

As some agencies are still not familiar with GIS data resources and how to take advantage of GIS data, it is suggested that information about the benefits, examples, and best practices on the use of the data be documented in a website. The development of a website for the Transit GIS Data Clearinghouse can be used for promoting and for providing technical assistance as well as for uploading and downloading GIS data. Similarly, the Transit GIS Data Clearinghouse can be promoted during workshops at Florida conferences to help agencies better understand the use and benefits of transit GIS data.

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## APPENDIX A Transit GIS Data Clearinghouse Survey

### Transit GIS Data Clearinghouse - Final Survey

#### Q1 Purpose of this Survey:

The Florida Department of Transportation (FDOT) has developed several transit forecasting and evaluation tools that require the use of data in a Geographical Information System (GIS) format. These tools were developed to support the preparation of Transit Development Plans, compare new transit alternatives, help improve efficiencies, and assess the performance of transit systems throughout the state and country. One of the challenges for local transit systems is to transfer existing geographical data for use by other transit applications. FDOT is considering the development of a Transit GIS Data Clearinghouse (TGDC) to collect, store, maintain the data for easy access and use by the transit agencies.

The objective of this project is to get feedback from the transit agencies regarding the use of GIS, data from existing transit technologies, and the needs for transit GIS data and information that can enhance current planning capabilities. This project will survey transit agencies on the current and future use of GIS, existence of transit data sets that have a geographical component. An expert panel will be assembled to guide this research and the development of future transit applications. Lastly, an action plan based on the agencies' feedback and guidance from the expert panel will be prepared. It is expected that this project will open opportunities for greater and more efficient use of transit GIS data that can help improve the delivery of transit services in the State of Florida.

This survey will focus on identifying data sets that have a GIS component which can be used in transit planning. To achieve this, there is a need to get feedback from the transit agencies to identify these data sets as well as the underlying technologies and applications and to gain a better understanding on the GIS capabilities and challenges transit agencies face. This survey will also explore the future need for software applications or tools that can help extract transit GIS data from Automatic Vehicle Location (AVL) systems, Automatic Passenger Counters (APCs), Stop Inventories, Scheduling systems, GIS systems, or other technologies that have a geographic element or data that can be converted into GIS.

The Survey should take no more than 30 minutes to complete. Thank you for your participation in this significant research effort.

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Q2 Please fill out the following information:

First Name  
Last Name  
Title  
Transit Agency  
Phone  
Email

Q3 Does your agency use a Geographical Information System (GIS)? If no, please provide feedback.

- Yes
- No \_\_\_\_\_

If No Is Selected, Then Skip To What transit APTS technologies do you...

Q4 Please specify the GIS Platforms used? Check all that apply.

- 
- ESRI Desktop Software
  - ESRI Server Software
  - MapInfo
  - Caliper Maptitude or TransCAD
  - Cube GIS
  - Other \_\_\_\_\_

Q5 Do you personally use GIS in your work?

- Yes, frequently
- Yes, occasionally
- No

Q6 How long has your agency been using GIS?

- Less than one year
- 1-2 years
- 3-5 years
- More than 5 years
- Not currently, but plan to implement GIS in one year
- Not using GIS
- Don't know

Q7 Select the general category that best describes your department's use of GIS.

- Planning stage
- Limited use
- Extensive use
- Other \_\_\_\_\_

Q8 Where does your department obtain GIS data? Please check all that apply.

- Government agencies
- Commercial sources
- Developed in-house
- Other \_\_\_\_\_

Q9 Have your agency developed GIS Applications (in-house or outsourced)?

- Yes
- No

Answer If Q9 Yes is selected.

Q10 Please describe the applications that were developed.

Q11 What GIS data you wish you had access to, but don't have access now (sources can be from within or outside your organization).

Q12 Do you have access to data outside your organization?

- Yes
- No

Q13 Which department manages GIS?

Q14 Which departments use GIS? Please check all that apply.

- Planning
- Marketing
- IT
- Administration
- Other \_\_\_\_\_

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Q15 Does your organization have a web-based GIS application? If this is available to the public, please provide URLs

- Yes. But only publish data for internal use
- Yes. Publish data to the public \_\_\_\_\_
- No. We don't use web-GIS service

Q16 Do you, your organization, or your department perform tasks that require the same spatial information over and over again? If so, what tasks?

Q17 At what level of implementation does your agency deploy GIS technology? Please check all that apply.

- Project
- Department
- Enterprise-wide
- Other \_\_\_\_\_

Q18 Specify the GIS data standards followed by your agency. Please check all that apply.

- FTA
- Local GIS Group
- MPO
- Transit Agency
- Federal Geographic Data Committee (FGDC) standard
- Other \_\_\_\_\_

Q19 Are you using a standard for compiling documentation (metadata) about your GIS data? If yes, please specify.

- Yes \_\_\_\_\_
- No

Q20 Do you need GIS data beyond your jurisdictional boundaries?

- 
- Yes
  - No

Q21 Do you have access to GIS data beyond your jurisdictional boundaries? If No, please specify.

- Yes
- No \_\_\_\_\_

Q22 Does your department provide GIS data to other organizations? Please check all that apply.

- Government agencies
- Non-profit organizations
- Private companies
- Other \_\_\_\_\_
- No

Q23 The following is a list of areas where GIS can be applied. Please check all that apply.

- Transit Development Plan
- Service Planning
- Trip Planning
- Performance and Reporting
- Modeling
- Scheduling
- Operations
- Customer Service
- Market Analysis
- Map production
- Special population needs
- Other \_\_\_\_\_

Q24 If your agency uses GIS in response to FTA policies and Regulations, select one or more of the following options:

- American Disability Act Compliance
- Title VI program
- Welfare to Work Program
- Paratransit Services
- Security and Police Operations
- Other \_\_\_\_\_

Q25 Number of GIS Employees and % effort dedicated to GIS Activities

GIS Staff (does not include users):		
GIS Coordinator or Manager		
GIS Analyst / Programmer / Developer		
GIS Users		
Other		

Q26 What is the approximate annual GIS Budget for the whole agency?

Data	
Hardware (Servers, PCs)	
Software	
Training	
Other	

Q27 What transit Advanced Public Transportation Systems (APTS) technologies does your agency use? Please check all that apply.

- Automatic Passenger Counters (APCs)
- Automatic Vehicle Location (AVL)
- Transit Stop Inventories
- Transit Scheduling System
- Electronic Farebox Collection (EFC)
- Realtime Information System
- Geographic Information System (GIS)
- Other \_\_\_\_\_

Q28 Which transit Advanced Public Transportation Systems (APTS) technologies is your agency planning to implement? Please check all that apply.

- 
- Automatic Passenger Counters (APCs)
  - Automatic Vehicle Location (AVL)
  - Transit Stop Inventories
  - Transit Scheduling System
  - Electronic Farebox Collection (EFC)
  - Realtime Information System
  - Geographic Information System (GIS)
  - Other

Q29 Below is a list of commonly used GIS datasets. Please select the datasets that are available in your agency. Check all that apply.

- Bus Transit Routes
- Census Tracts
- Census Blocks
- Political Boundaries
- Stops
- Zip-codes
- TAZs
- Transit Stations
- Park & Ride Lots
- Timepoints
- Right-of-way
- Rail Transit Routes
- Vehicle Maintenance / Storage
- Accident Locations
- Sidewalks
- AVL (Automatic Vehicle Location)
- APC (Automatic Passenger Counter)
- EFC (Electronic Fare Collection)
- Other 1 \_\_\_\_\_
- Other 2 \_\_\_\_\_
- Other 3 \_\_\_\_\_

Q30 How interested is your agency in using GIS for data collected from Advanced Public Transportation Systems (APTS) or Transit ITS? Please use a 1 to 5 scale, with 5 representing the highest and 1 being the lowest.

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	5	4	3	2	1
Level of Interest	<input type="radio"/>				

Q31 From your experience, what are the main difficulties in sharing data? Please check all that apply.

- Privacy concerns
- Preparatory System
- Institutional barriers
- Lack of Resources
- Other \_\_\_\_\_

Q32 In your opinion, what is the best way to share transit GIS Data? Please use a 1 to 5 scale, with 5 representing the best and 1 being the worst.

	5	4	3	2	1
Use web services to publish data automatically	<input type="radio"/>				
Upload data to a data center manually	<input type="radio"/>				
Staff shares data on request	<input type="radio"/>				
Other	<input type="radio"/>				

Q33 How are data shared by your agency?

Q34 What is the biggest challenge in applying transit GIS data in your agency? Please use a 1 to 5 scale, with 5 representing the best and 1 being the worst.

	5	4	3	2	1
Insufficient knowledge	<input type="radio"/>				
No resources	<input type="radio"/>				
Difficult to train people	<input type="radio"/>				
Difficult to use data from transit technologies	<input type="radio"/>				
Other	<input type="radio"/>				

Q35 In your opinion, what is the best way to develop applications from transit GIS data?

- Use web services to publish data for independent developers
- Use of open source transit GIS applications
- Develop applications internally
- Other \_\_\_\_\_

Q36 Which of the following uses of transit GIS data have been utilized in your agency to improve performance? Please check all that apply.

- Transit pattern and trend analysis
- Market segmentation
- Route restructuring
- Stop and amenities location
- Ridership forecasting
- Other \_\_\_\_\_

Q37 Would you be willing to share data for the Transit GIS Data Clearinghouse? If No, please provide feedback.

- Yes
- No

Answer If Q37 No is selected.

Q38 Please provide feedback.

Q39 Who are currently the recipients for transit GIS data?

- Internal customers
- External Costumers
- Both

Q40 What are the plans for future use of GIS data in your agency?

Q41 Is your agency willing to participate in the Transit GIS Data Clearinghouse (TGDC) User's Group?

- Yes
- No

Answer If Is your agency willing to participate in the Transit GIS ... Yes Is Selected

Q42 Please provide the contact information for the person that will be participating in the TGDC User's Group.

Q43 Do you have any of the following information from any of the APTS/transit ITS or GIS systems in your agency? If so, please send the documentation to transit@fiu.edu.

- Database schema
- Data dictionary
- Field descriptions
- Documentation on data processes and procedures
- Other \_\_\_\_\_

Q44 Please use the box below to provide any additional comments that you think it can help this project. Note that this is the last question in the survey. Once you press the Submit button, the survey will be closed. If you want to review your responses, you can do so by pressing the Previous button now.

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## APPENDIX B Surveyed Agency List

No.	Agency Name
1	Bay Town Trolley
2	Broward County Transit
3	Citrus Connection (Lakeland)
4	Collier Area Transit
5	Escambia County Area Transit
6	Hernando County (The Bus)
7	Hillsborough Area Transit Authority
8	Indian River Transit
9	Jacksonville Transit Authority
10	Key West Transit
11	Lake Xpress (Lake County)
12	LeeTran (Lee County)
13	LYNX (Orlando)
14	Manatee County Area Transit
15	Martin County Council on Aging

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<b>16</b>	<b>Miami-Dade Transit</b>
<b>17</b>	<b>Okaloosa County Transit</b>
<b>18</b>	<b>Palm Tran</b>
<b>19</b>	<b>Pasco County Public Transportation</b>
<b>20</b>	<b>Pinellas Suncoast Transit Authority</b>
<b>21</b>	<b>Polk County Transit</b>
<b>22</b>	<b>Regional Transit System (Gainesville)</b>
<b>23</b>	<b>Sarasota County Transit Authority</b>
<b>24</b>	<b>SFRTA (Tri-Rail)</b>
<b>25</b>	<b>Space Coast Area Transit</b>
<b>26</b>	<b>St. Johns County (Sunshine Bus)</b>
<b>27</b>	<b>St. Lucie County Transit</b>
<b>28</b>	<b>StarMetro (Tallahassee)</b>
<b>29</b>	<b>SunTran (Ocala)</b>
<b>30</b>	<b>TBARTA(Tampa Bay Area)</b>
<b>31</b>	<b>VOTRAN (Volusia County)</b>
<b>32</b>	<b>Winter Haven Area Transit</b>