Transportation GIS Trends

Esri • Summer 2011

GIS for Transportation

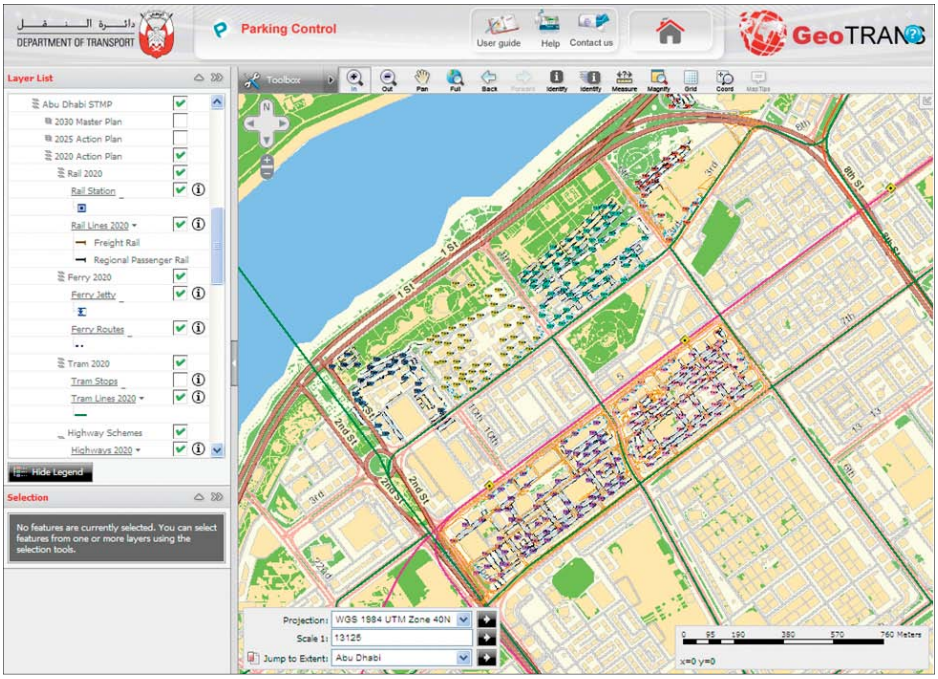
Abu Dhabi DOT Deploys Enterprise GIS to Serve Transportation Plans

By Saed Abu Helwa, Technical Director, GISTEC

On the coast of the Arabian Gulf rests one of the most modern and fastest-growing cities in the world, Abu Dhabi. The Emirate of Abu Dhabi has witnessed a huge growth in infrastructure and construction projects in recent years, such as the famous mega projects of developing the Yas and Saadiyat Islands into tourist and travel destinations.

The Department of Transport (DOT) is the organization in the Abu Dhabi government that's responsible for delivering an effective transportation system that contributes to the economic growth, quality of life, and environmental sustainability of the fast-growing emirate. DOT's authority is to regulate, plan, and develop an efficient and well-integrated transportation system that serves the public interest by enhancing mobility with safe, secure, and environmentally responsible travel in the aviation, maritime, public transport, and highways sectors.

As part of Abu Dhabi 2030 (the country's infrastructure plan), DOT needed to acquire, build, and implement the best GIS technology possible. Because Abu Dhabi's DOT is a fairly young organization, it has only recently adopted GIS. DOT realized that a robust GIS system was required to support the planning and daily operational and business needs of building, managing, and maintaining a state-of-the-art transportation network as well as new public transportation services.



The GeoTRANS web viewer displays the different parking types, such as premium and standard, within Abu Dhabi City.

DOT conducted an in-depth evaluation of the different GIS technologies before deciding on Esri's ArcGIS Server and Latitude Geographics Group Ltd.'s Geocortex Essentials technology. Based on the ArcGIS platform, Geocortex provides flexible core elements as well as out-of-the-box tools, processes, and features that would give DOT the ability to build and maintain an evolving web-based mapping solution. The project was awarded to GISTEC, the Esri distributor for the United Arab Emirates (UAE), in cooperation with GeoSolveIT, a United Kingdom company that is expert in building transportation GIS solutions.

Several key objectives were to be achieved by the completion of the project:

- Build the foundation transportation data model, infrastructure, and database for the GIS within DOT.

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In This Issue

On the Road

Visit Esri at the following conferences:

American Association of Port Authorities Annual Convention
September 11–15, 2011
Seattle, Washington, USA

International Highway Engineering Exchanges Program (IHEEP) Conference
September 11–15, 2011
Winnipeg, Manitoba, Canada

Transport Security Expo and Conference
September 13–14, 2011
Olympia, London, UK

GIS in Public Transportation Conference
September 13–15, 2011
St. Petersburg, Florida, USA

Railway Interchange 2011
September 18–21, 2011
Minneapolis, Minnesota, USA

POST-EXPO
September 27–29, 2011
Stuttgart, Germany

American Public Transportation Association (APTA) Expo
October 3–5, 2011
New Orleans, Louisiana, USA

American Trucking Association (ATA) Management Conference & Expo
October 15–18, 2011
Grapevine, Texas, USA

ITS America/World Congress
October 16–20, 2011
Orlando, Florida, USA

Airports Council International (ACI) World/Africa General Assembly, Conference & Expo
November 7–9, 2011
Marrakech, Morocco

Gulf Traffic
December 12–14, 2011
Dubai, United Arab Emirates

Talking Transportation

Terry Bills
Esri Industry Manager
Transportation and Logistics

Alexander Gerschenkron, the famous economic historian, once posited a benefit for those countries that come late to economic development: they could introduce the latest technology and thus jump over some of the standard development paths followed by their predecessors. Our lead story on Abu Dhabi Department of Transport (DOT) indicates that much the same analogy can be applied to GIS. In just a little over a year and a half, Abu Dhabi DOT has been able to achieve remarkable results.

Starting with a careful database design process, the DOT has been developing a comprehensive spatial data model designed to not only accommodate the requirements of each transportation mode but also provide a model allowing the integration of information across those modes. This data model is designed to manage and maintain all the DOT's tabular and spatial data and provide the underlying data infrastructure supporting all its subsequent business and operational workflows. DOT staff consciously examined the operational practices of leading transportation agencies and designed this architecture with great care. In this way, they were able to implement a number of successful systems in a very short period of time. A number of valuable lessons can be drawn from this example.

Several of the stories in this month's edition highlight the fact that GIS has now become an integral part of managing a modern transportation infrastructure. Whether capturing and cataloging the Navajo Nation's vast road inventory or alerting the public to real-time road closure information, GIS has become a central component of any strategy to more effectively manage a transportation infrastructure. Increasingly however, transportation agencies need to not only better manage infrastructure but also communicate their effectiveness to their citizens. Performance measurement, sustainability, and public accountability and transparency are critical components of responsive public agencies in the modern environment, and GIS can significantly add value to all these efforts. We will see more and more examples of these initiatives in coming issues.

In the meantime, I encourage you to enjoy this issue, and I hope that it will stimulate further thoughts in your own organization.

Terry C. Bills

Online

Visit us at esri.com/transportation.

Follow us on Twitter at twitter.com/esritransport.

You will find more news and information specific to GIS for the transportation industry in *ArcNews*, a quarterly magazine for the GIS community.
Visit esri.com/arcnews.

ArcLogistics Update Gives Drivers a Break

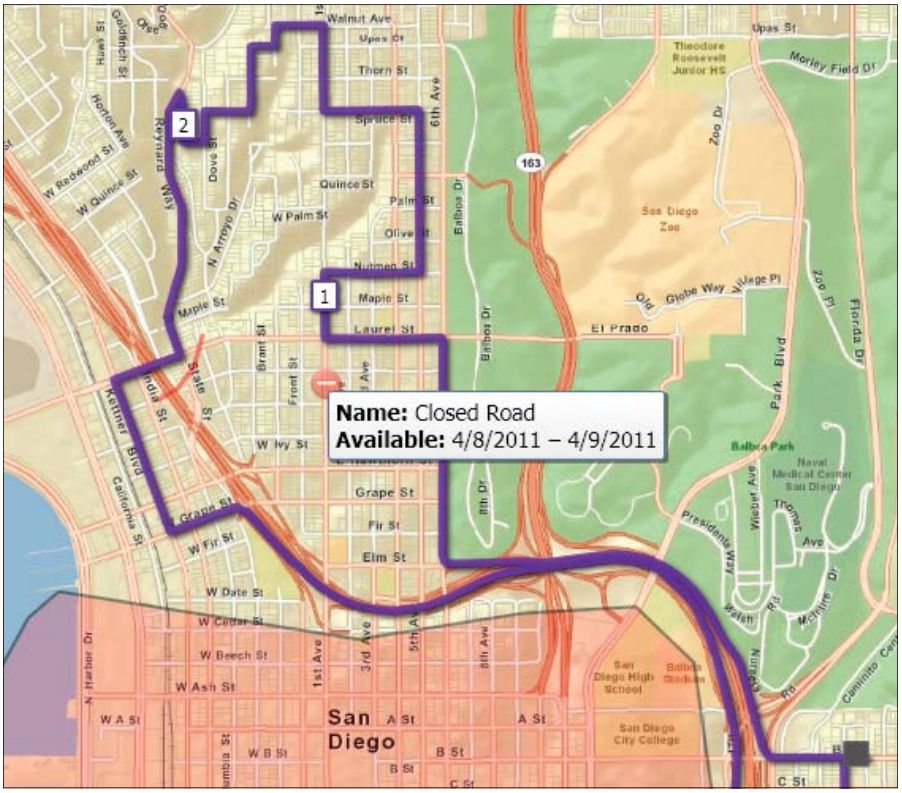
Thanks to a recent ArcLogistics update, users now have more options to create efficient route plans that reflect reality. New settings provide drivers with multiple breaks throughout the day such as 15-minute and 1-hour-lunch breaks. These new settings will help dispatchers better account for the actual time it takes to complete a route when creating the day's plan. Additional driver break settings include the ability to have breaks occur after a certain number of driving hours or after a certain amount of total work time.

Additionally, dispatchers can now build in actual arrival and departure delays. An example of an arrival/departure delay would be the amount of time a driver has to take to find parking or exit a large facility such as an apartment complex or corporate campus. The new arrival/departure delay settings are in addition to setting actual service times for each stop (once the driver or crew can actually start work) and help ensure that actual service time at each stop is being considered during route planning.

Because ArcLogistics is web based, Esri's development team is able to push these small, regular improvements to customers on a frequent basis.

Another improvement made to ArcLogistics is the inclusion of several new barrier types, including "slow-down" polygons that allow for tunable speed settings on all streets within the polygon. Dispatchers with local knowledge of a town or neighborhood can use the polygons to override speed limits on the streets within the polygon to better reflect vehicle speeds at certain times of the day.

To see a complete list of all the improvements in the recent update and to try ArcLogistics for free for 30 days, visit esri.com/arclogistics.



Create multiple barriers that affect your route, such as slow-down polygons and point barriers.

Case Studies Wanted

Share the benefits of your GIS work with colleagues by submitting case studies for future issues of this newsletter. Case study articles can be a full page or half a page, up to 800 words. We also like to include high-resolution screen shots or photography with the articles. To submit a case study article, contact Marshall Cammack at mcammack@esri.com or Terry Bills at tbills@esri.com.

Esri Career Opportunities

Are you looking for a career where you can apply your industry expertise in a challenging new way? Join Esri and help broaden the applicability of GIS in the transportation sector.

Solution Engineer, Commercial—Work closely with account executives to understand client requirements and help formulate appropriate GIS solutions.

Senior Project Manager, Transportation Services (Atlanta, Georgia)—Use your domain expertise to lead the development and growth of the GIS services business in the transportation industry.

Learn more and apply online at esri.com/careers.

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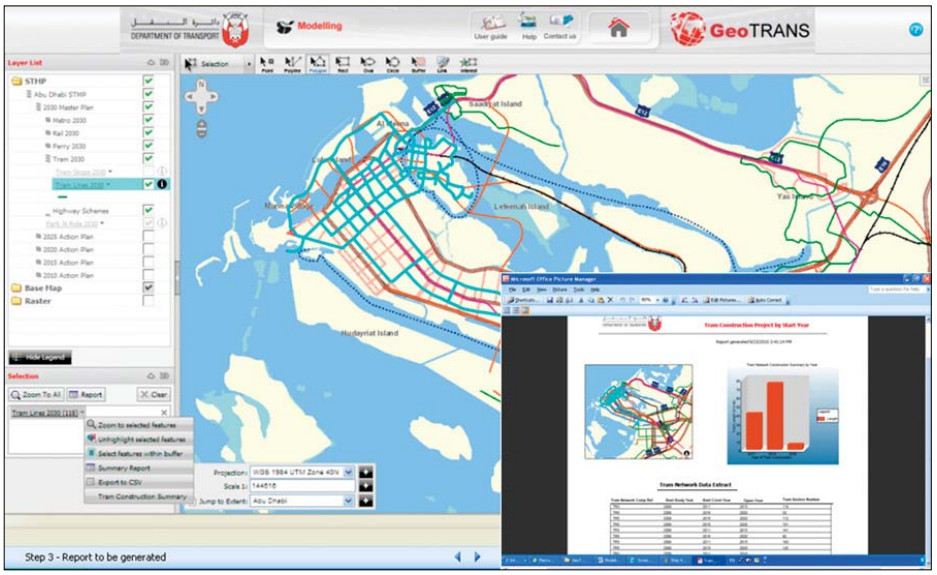
Abu Dhabi DOT Deploys Enterprise GIS to Serve Transportation Plans

- Use GIS data for planning, design, construction, operations, and maintenance processes.
- Build a public Internet portal (DARB) to deliver services such as driving directions, bus route information, and road works information.
- Explore the capabilities to provide GIS services and data to Abu Dhabi government organizations via Abu Dhabi Spatial Data Initiative (AD-SDI).
- Identify the enterprise GIS road map for DOT, which would focus on building the platform to create and integrate GIS applications with other DOT business systems such as No-Objection Certificate (NOC), transportation impact studies (TIS), road works, and permits.
- Build GeoTRANS, an enterprise-level intranet portal that would provide accurate and reliable geospatial information and services to various DOT sectors such as surface, aviation, and maritime transportation.

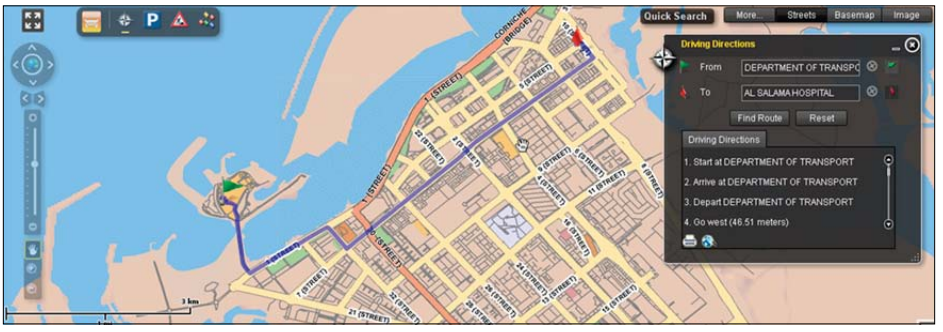
In July 2010, the GeoTRANS system was launched on the DOT intranet to support all the organization's sectors and included an interface to the AD-SDI. The GIS was used to integrate the isolated datasets of different departments into a single geodatabase that encompasses Surface Transport Master Plan (STMP) data; the complete, emirate-wide road network; and information on parking, TIS, and accidents. Today, the GeoTRANS GIS portal is supporting and enhancing DOT's daily business in terms of planning, network operation, public awareness of road works projects, and much more. This project is an excellent example of fast-track implementation of a successful enterprise GIS for transportation in a place with the highest demands in terms of functionality and workflows due to the rapidly growing infrastructure in Abu Dhabi Emirate.

The following is a brief description of some of the services provided by the GeoTRANS intranet portal for DOT users:



Here, the GeoTRANS web viewer shows the proposed construction length of selected tramlines for each year.

With the DARB public viewer, citizens can see the parking areas in Abu Dhabi City with parking rates and time allowed.



Routes and driving directions are displayed in the DARB public viewer based on user choice of start and destination options.

Modeling Application

This application disseminates key information on DOT's 2030 Surface Transport Master Plan, a long-term conceptual transportation infrastructure strategy outlined for Abu Dhabi. A website contains information on the master plan and the respective five-year action plans (2015, 2020, and 2025). The site shows the planned conceptual locations for the metro, tram, rail, highway, park and ride, and ferry services. The website will be regularly maintained to show STMP updates. The website also has basemap layers and various useful and frequently referenced datasets, such as imagery

and other basemap datasets (e.g., highway routes).

Safety Application

This application currently contains road safety data, including summary information about accident hot spots. This is used to support engineers in visual analysis of the summary accident data.

Parking Application

This application provides users with information about parking locations and assets, both on- and off-street, including the DOT-managed parking facilities.

Transportation Impact Studies Application

The TIS application disseminates information concerning traffic count surveys. The site shows the location of proposals and the remediation/mitigation measures associated with a specific traffic study area. The application also has basemap layers and other useful and frequently referenced datasets, such as imagery and utilities, to support highway engineers.

Bus and Taxi Application

This application provides rich information about existing bus routes and bus stops as well as taxi facilities, including lay-by and stand locations. It allows users to analyze and manage data with respect to other activities in DOT and reflect the same on the public portal site for public use and dissemination.

DARB Public Portal

While GeoTRANS provided advanced tools and functionalities for the DOT's internal end users to access maps, tools, analytics, and reports, DOT envisioned its public portal, DARB (www.darb.ae), as the main gateway to share maps and services with citizens in the United Arab Emirates, using a fast and simple, map-based interface. All the services were planned and implemented in English as well as Arabic languages to cater to both the local culture and the diversified expatriate community of the UAE. Some of the main services that have been launched for the public are car travel, bus travel, aviation, maritime, and the DARBI (Geofeedback) applications.

The following is a summary of DARB transportation services offered to the public:

Car Travel

There is a wide range of services offered to the public in this application. It can help users find driving directions and parking areas, understand future parking plans, and locate roadwork and detours.

Bus Travel

The Bus Travel application can help users find bus routes within Abu Dhabi City, Al Ain, and Western Region as well as intercity bus services. Users can find the map displaying the complete bus route based on the origin and the destination options specified. Additionally, they can also discover the points of interest that are along the selected bus route.

Aviation

Many services are offered to the public in the Aviation application. It can help users find locations of and driving directions to airports and obtain parking and airport terminal information.

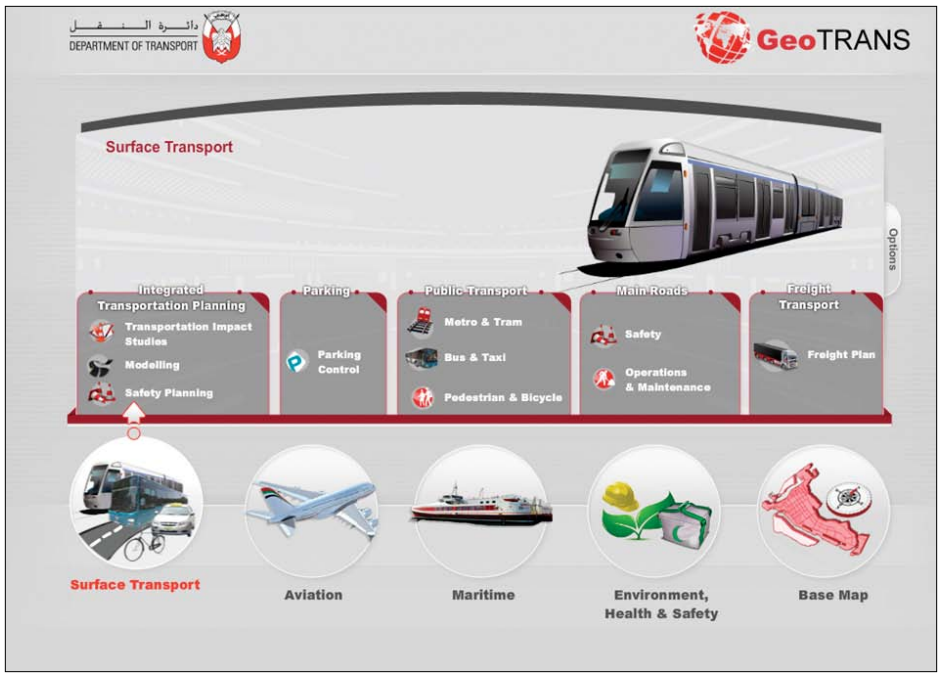
Maritime

This application helps users find the locations of and bus routes to ferry terminals from various parts of Abu Dhabi.

DARBI

Public users can use the map in this innovative feature in the DARB portal to record any incidents pertaining to road asset, parking, bus shelter, street lighting, and road conditions. Users can click on the map and choose the type of incident to be reported, enter all the required information about the incident, and even upload photos. Incident reports are sent to DOT's Customer Care department for further action. Once an issue is addressed by DOT, the user receives an e-mail with a link to open the Geofeedback map directly in DARB and see the status of the incident report.

For more information, contact Saed Abu Helwa, GISTEC (e-mail: Saed.abuhelwa@gistec.com).



The GeoTRANS intranet portal provides geospatial information and services for Abu Dhabi Department of Transport.

Visualizing Traffic Counts

By Elisabeth Van Der Leeuw, Senior GIS Analyst, and Ray Brice, Senior GIS Analyst, Pima County ITD, Tucson, Arizona

Pima County, Arizona, is located in the heart of the beautiful Sonoran Desert and is larger than the state of New Jersey. Spanish settlements in the area date to the late seventeenth century, and the Native American presence spans many thousands of years. Today, the county is home to nearly a million people.

In Pima County, the Department of Transportation (DOT) has maintained historic traffic counts on many of the road segments since 1968. With the help of the county's GIS group, clients such as government consultants, designers, Realtors, and the DOT's Traffic Engineering department will now have a more user-friendly interface utilizing some of the newer GIS and web technologies. The DOT Traffic Count Map serves traffic and intersection count data to the public as well as other agencies statewide.

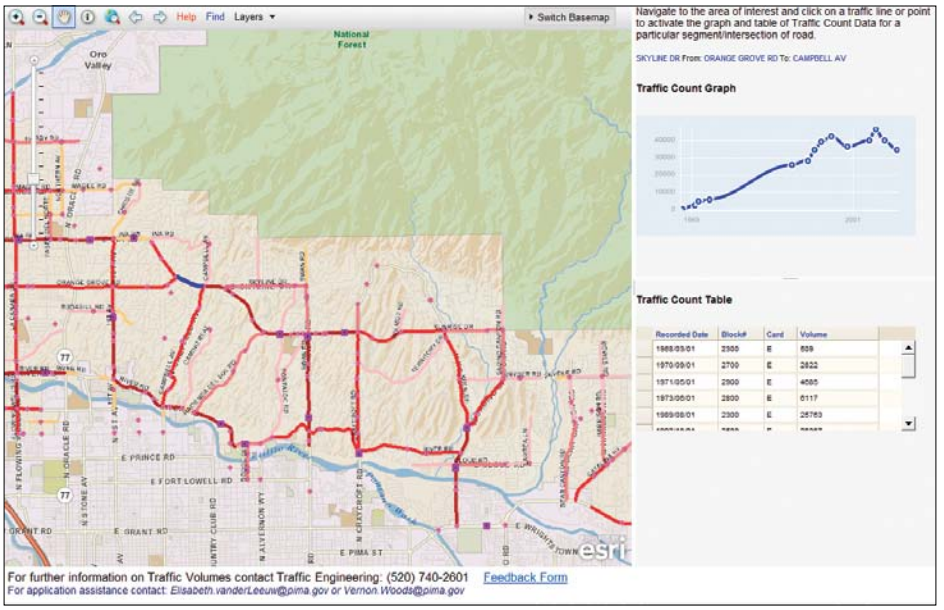
The result is a highly interactive map displaying the county's most up-to-date traffic count data. The application gives users a visual context for traffic counts, both in terms of the general location of the count and the number of vehicles. It allows access to Pima County Traffic Engineering's historic traffic count data, displayed via an easy-to-interpret trend line with a corresponding tabular representation. The application (http://gis.pima.gov/apps/trafficcounts/dottrafficcounts.htm) is intended to serve traffic count data to both the public and internal users in an easy-to-navigate GIS application.

The web-based application, created using Esri's ArcGIS for Server, shows information such as major roads' average daily traffic and intersection approach counts. Information provided in the application helps users conducting engineering safety and traffic impact studies and determining which routes are used most and where new roads or new developments should be located. In the future, the application will also show minor-road average daily traffic counts as well as turning movement and crash data.

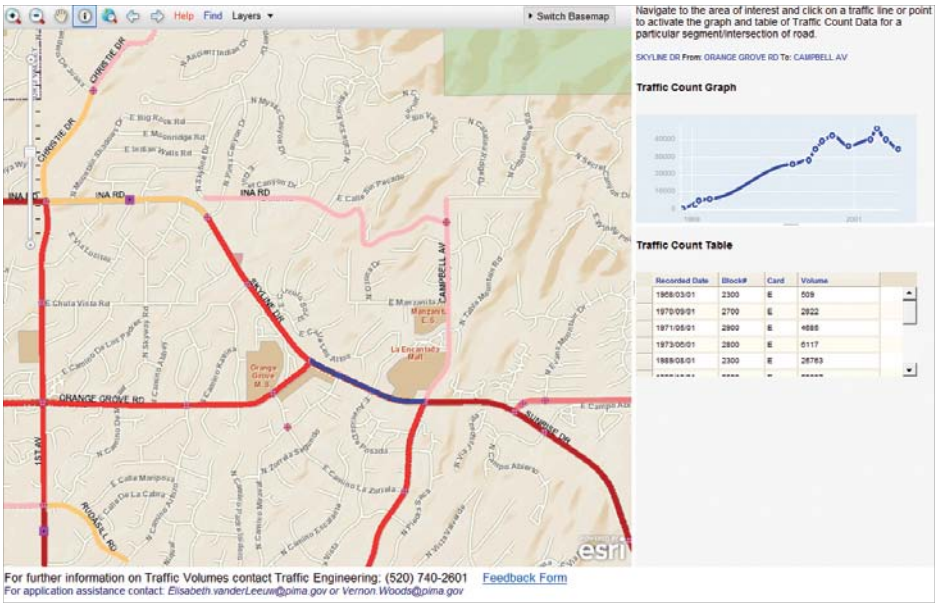
The new website is an improvement over the previous application, which provided static PDF documents showing road segments and average daily traffic counts. Typical users of traffic count data such as contractors, Realtors, and designers can now see the road segments spatially. In addition to the visual interface, the dynamic map also provides historic traffic counts for individual segments that graphically display trends.

GIS layers used in the map did not exist previously in the Pima County GIS library. The Traffic Engineering department maintains its data in SQL Server tables. A process was created to map the traffic count segments and intersection points using linear referencing. For this, some initial data cleanup was required to linearly reference the traffic count segments with the street route layer. During this cleanup process, GIS fields were added to traffic engineering data tables and populated with the same road name that is used in the street route layer, eliminating discrepancies such as misspellings and abbreviations. An automated nightly scheduled task is run to create the GIS layers, using a Python script to

The Pima County Courthouse is a landmark that is familiar to the county's nearly one million citizens.



Pima County DOT's Traffic Count Map serves traffic and intersection count data via the web to the public and other statewide agencies.



Traffic Count Map is a highly interactive map application that displays the county's most up-to-date traffic data.

display route events.

The Traffic Count Map application was created using Esri's ArcGIS API for JavaScript along with a Dojo toolkit, used to eliminate browser idiosyncrasies. The JavaScript API was chosen due to the fact that it was free, plus it was the platform that was most accommodating to the level and experience of the developer.

A dynamic optimized map service displaying the traffic count layers was created in ArcGIS Server. The layers were symbolized at various scale ranges according to the most recent count taken for each particular segment of road. Historic traffic counts were added as tables to the MXD, providing access to the data through the state's Representational State Transfer (REST) system. Several county basemaps containing various reference layers were also created to improve the performance of the application for a large number of potential users. A daily cache update process, based on changes made to dynamic reference layers, was put in place to provide timely updates that the county user base has come to expect. Dojo chart and table widgets were configured to display historic road and intersection traffic count data upon selection of the corresponding feature displayed in the application.

For more information, contact Denise Silvester, senior civil engineering assistant, Pima County DOT/Traffic Engineering (e-mail: Denise.Silvester@dot.pima.gov).