



Geographic Information Systems (GIS)

An Introduction to Geospatial Analyses

Thursday, May 29, 2014

Maryland Traffic Records Forum
The Conference Center at
The Maritime Institute



ALBRECHT
ENGINEERING INC

The logo for Albrecht Engineering Inc features a stylized, grey, triangular shape above the company name. The name 'ALBRECHT' is in a large, bold, blue font, and 'ENGINEERING INC' is in a smaller, blue font below it.

Introductions

- **Julie Spangler, GISP**

- Senior GIS Analyst with JMT Technology Group, Baltimore, MD
- Adjunct Faculty Member
 - Geospatial Applications Program, Community College of Baltimore County,
 - Environmental Science Program, McDaniel College

- **Candice Ottley-Francois, PMP, GISP**

- GIS Project Manager with Albrecht Engineering, Inc., Baltimore, MD
- Engineer by training, GIS Professional by trade
 - Focus on GIS for Transportation & Public Safety

Objectives

- Offer a basic understanding of the technology and framework
- Highlight some uses and applications of GIS
- Investigate some of the primary sources for readily available data
- Discuss how to build a business case
- Discuss how to evaluate data prior to use
- Outline a course of action to learn more

What is GIS?

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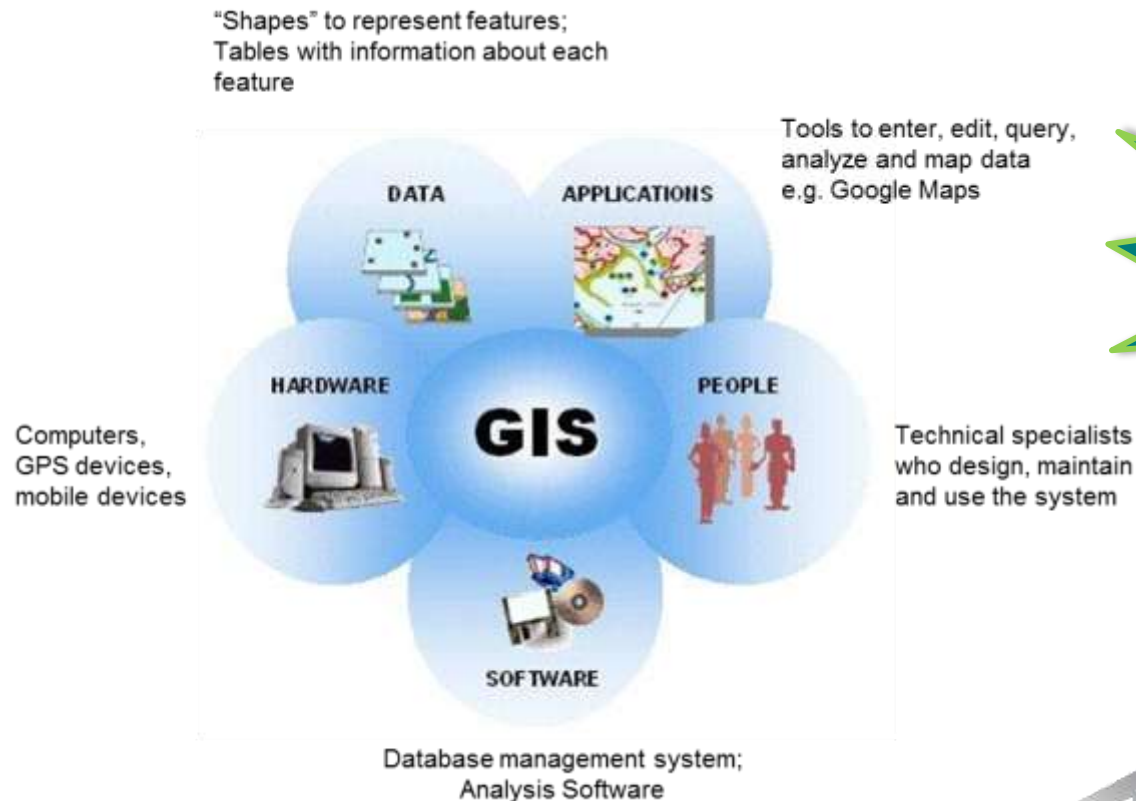
What is GIS?

- **Textbook Definition**

- Acronym for *geographic information system*.
- An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed.
- **More simply: A computer based tool for problem solving and information management.**

What is GIS?

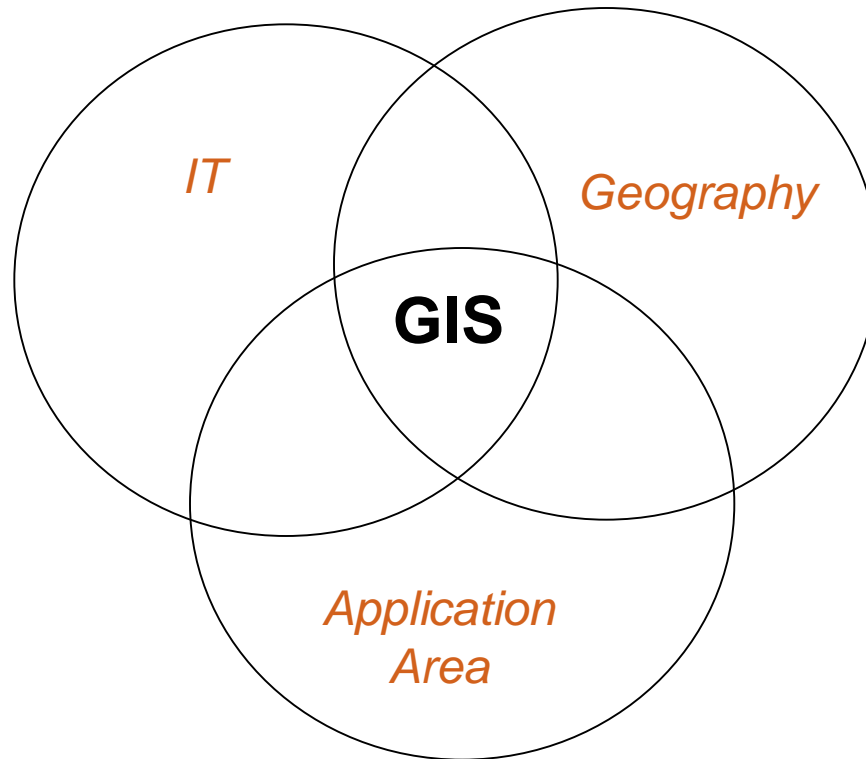
- Computer system that captures, stores, analyzes, manages and presents data that are linked to location



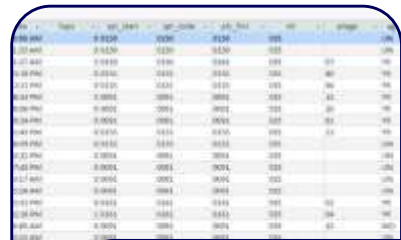
Three key characteristics of GIS

- Features are **georeferenced**
- Features are organized in **layers**
- Features have **attributes**

Why do we use GIS?



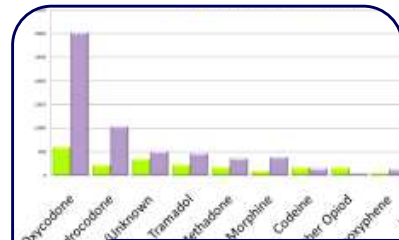
Why do we use GIS?



ID	NAME	AGE	SEX	HEIGHT	WEIGHT	HAIR	EYES
1001	John	25	M	175	70	Brown	Blue
1002	Jane	22	F	160	55	Blonde	Green
1003	Mike	30	M	180	80	Black	Brown
1004	Sarah	28	F	165	60	Red	Blue
1005	David	20	M	170	65	Black	Grey

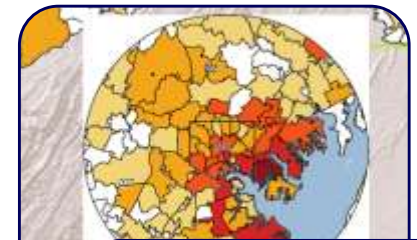
Tables

- Input and Manage Data



Charts

- Investigate Patterns



Maps

- Analyze Spatial Relationships

Spatial Analysis

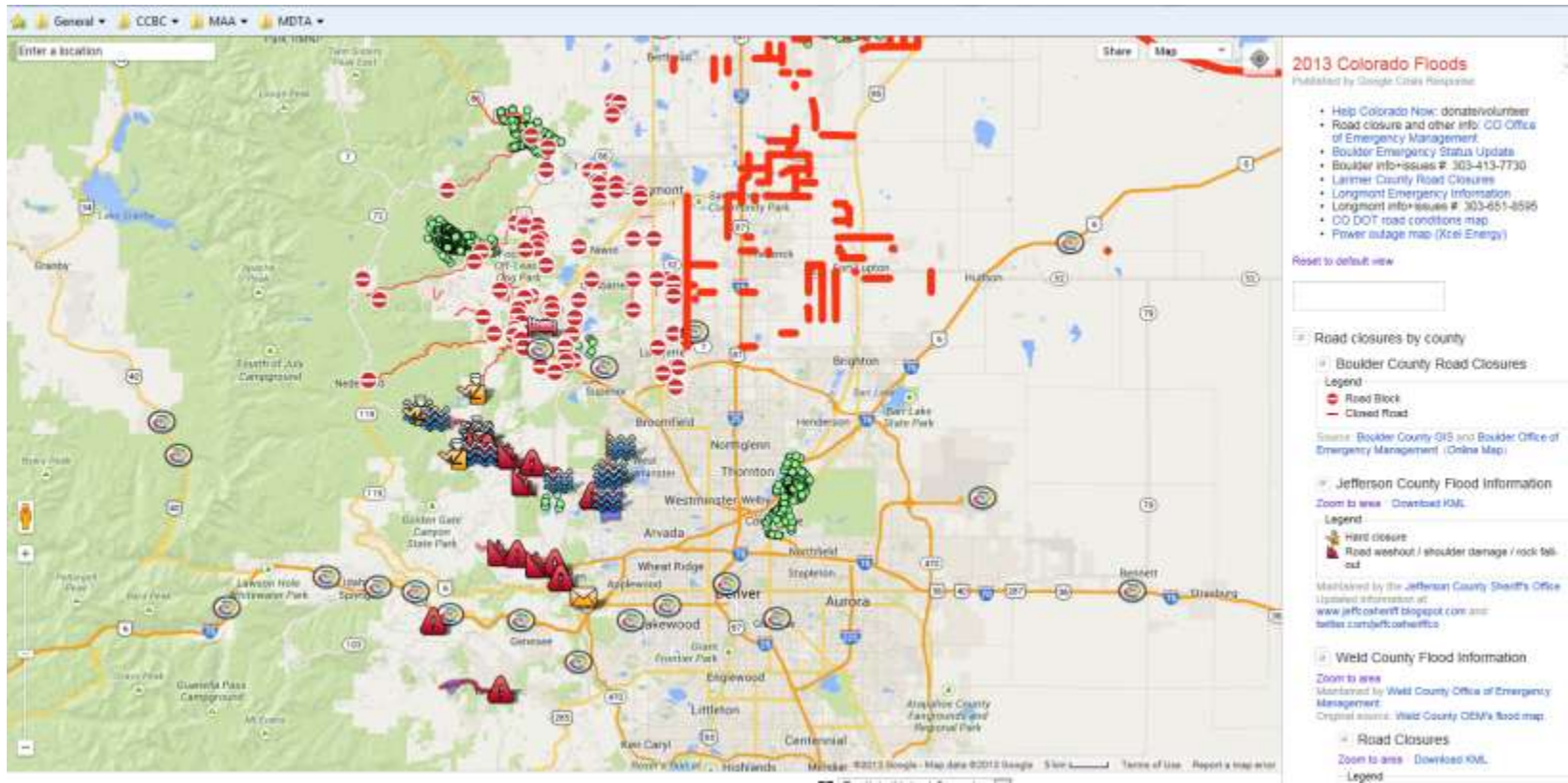
- **Allows a user to manipulate data to examine location, attributes and relationships of geographic features**
- **3 types of spatial relationships**
 - Proximity
 - How close one feature is to another
 - Direction
 - Relative and absolute relationships of one feature to another
 - Topology
 - Overlaps, adjacency, containment , connectivity, contiguity of features

What can you do with GIS?

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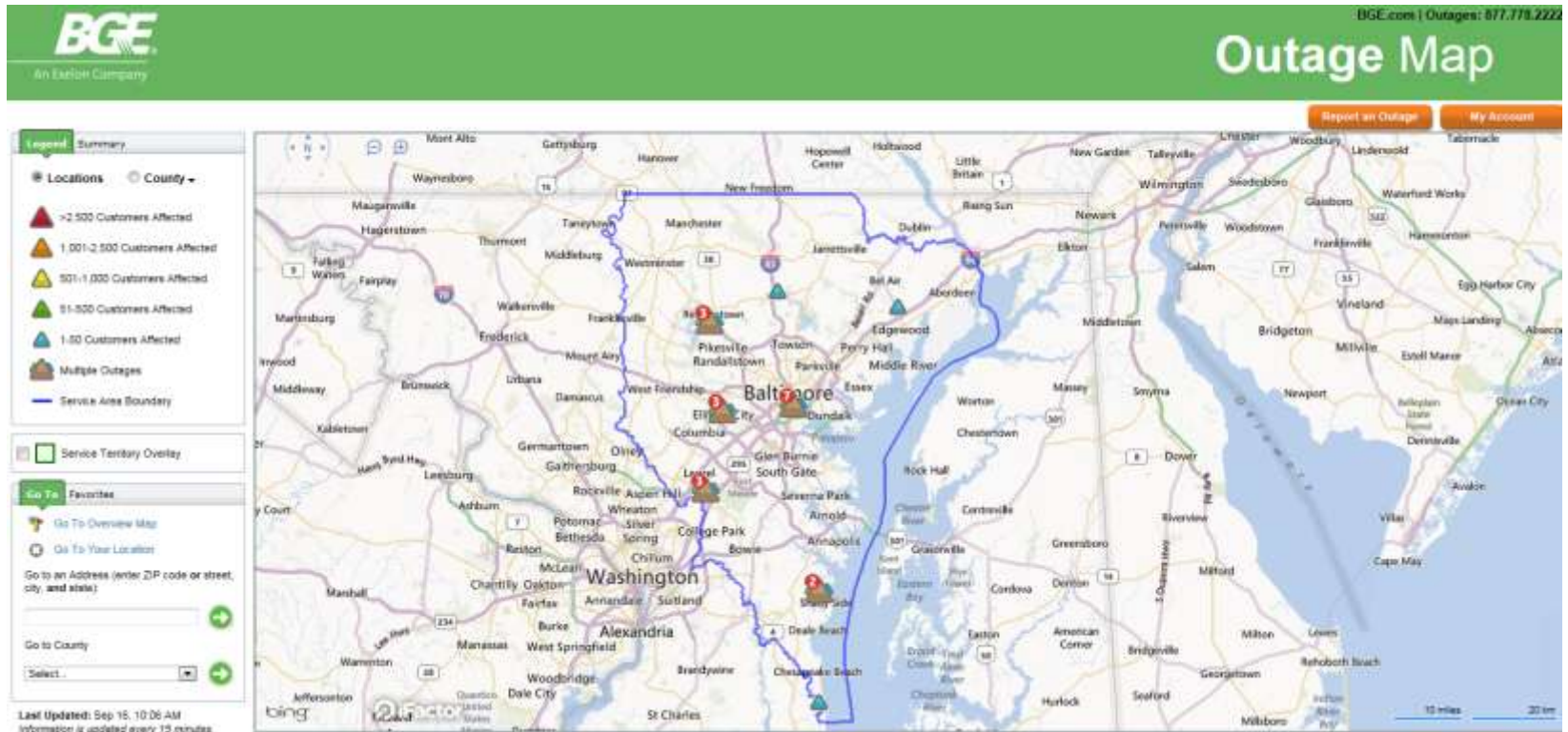
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Map Where Things Are



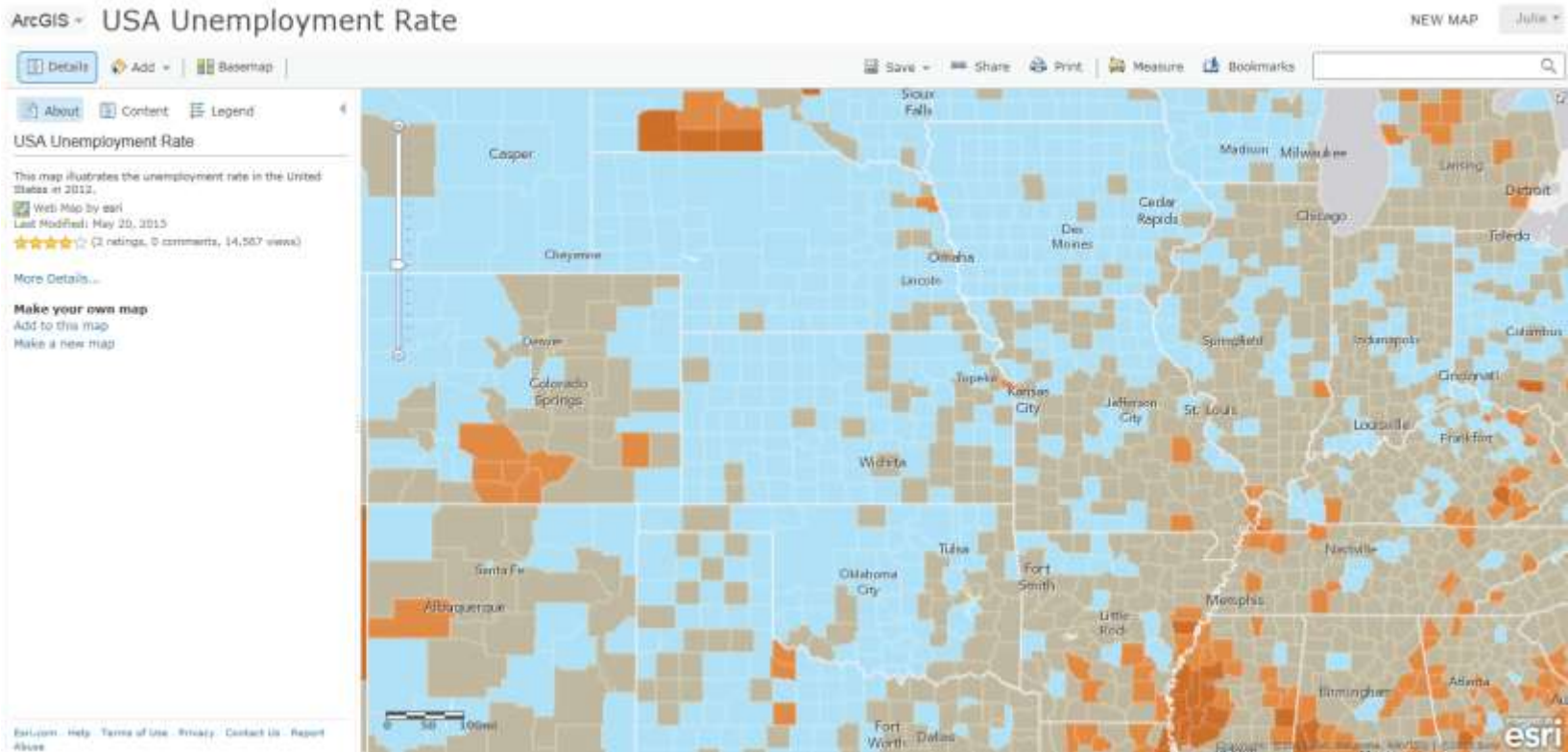
2013 Colorado Floods Crisis Map

Map Quantities



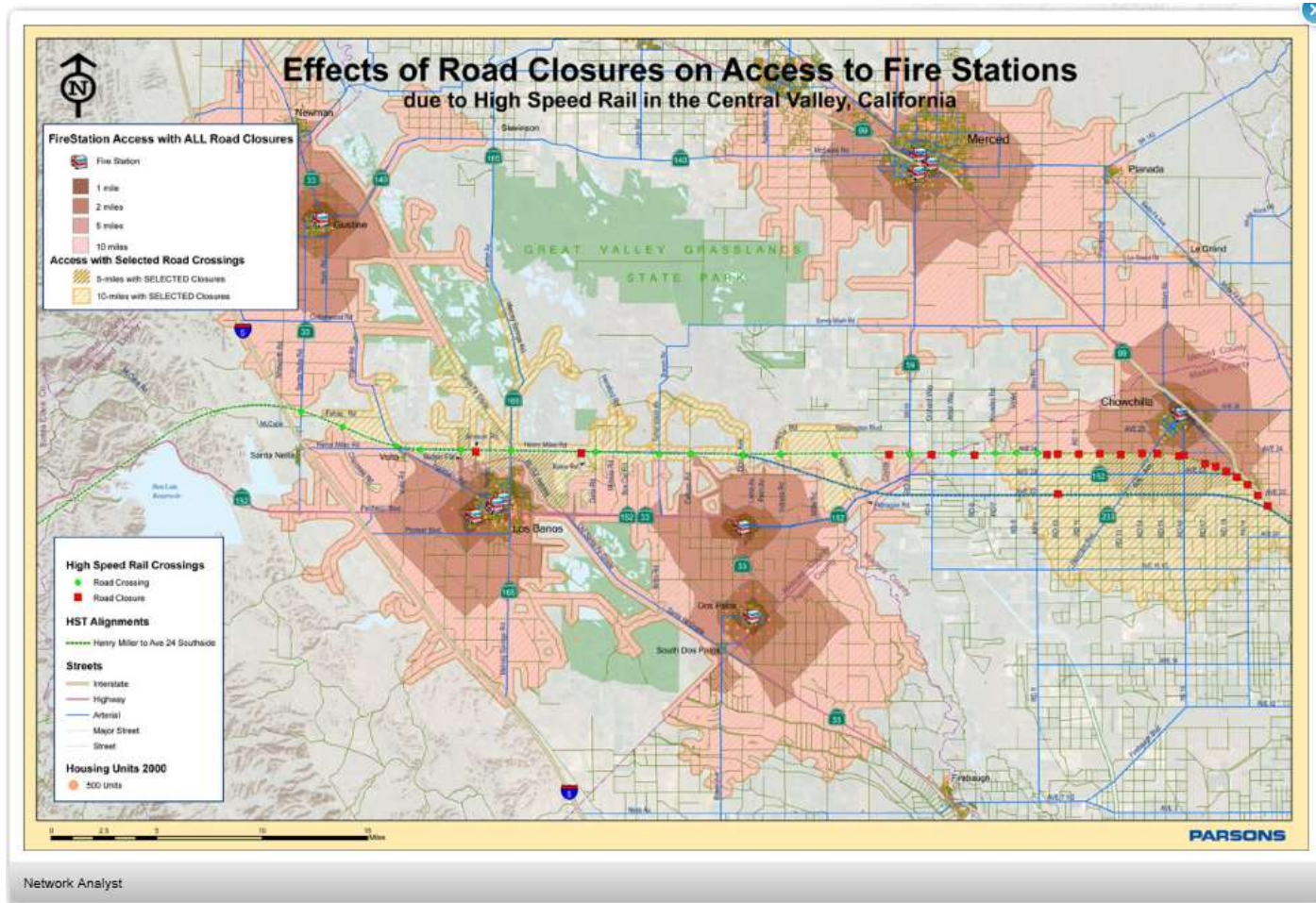
BGE Power Outage Map

Map Densities



ArcGIS.com (Free Login Required)

Find What's Inside



Case Study: Impacts of High Speed Rail on Fire Station Access

Find What's Nearby

PETCO Improves Location Selection

950-store (and growing) PETCO Animal Supplies relies on statistics and data — not intuition — to select new sites.

by Matt Pillar

In the context of a discussion about PETCO Animal Supplies' use of GIS (geographic information systems) technology for store site selection, Shawn Hanna is quick to point out that the chairman of his company is an ace at picking winning spots at which to build. "We've historically managed a site selection committee that boasts many decades of combined experience making field-level site selection



PETCO mitigates the risk associated with opening new locations by using ESRI Business Analyst for site selection solution.

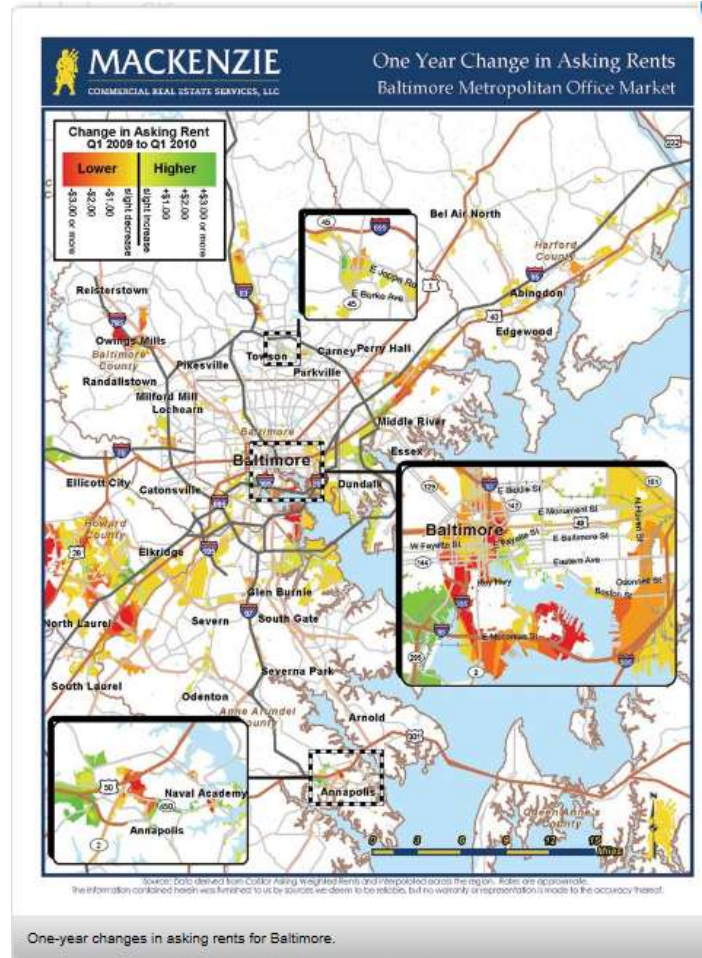
also be significant, and in a changing economy that can introduce considerable uncertainty in the selection process."

How To Choose A Site Selection Solution

While Hanna had experience with portfolio valuation of institutional real estate investments, retail site selection was new to him. Nonetheless, his department was tasked with determining the best way to offer an independent assessment of potential new PETCO retail

Case Study: Petco Improves Location Selection

Map Change



Case Study: One year changes in asking rents for Baltimore

Who uses GIS?

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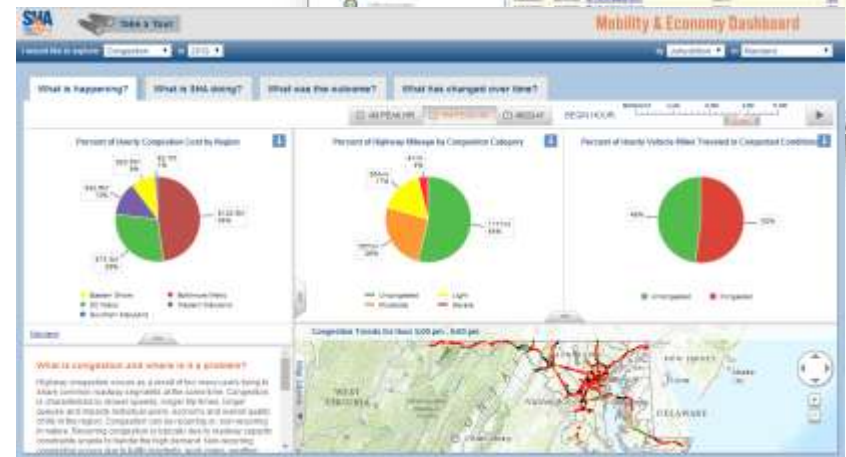
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Safety Improvement Studies

- **Maryland State Highway Administration**
 - Office of Preliminary Planning and Engineering (OPPE)
- **Identify candidates for safety improvements**
- **Analyze crash history**
 - PDF Reports
 - Line diagrams
 - GIS data aggregated to street segment
- **Perform field observations to analyze existing conditions**
- **Make recommendations for remediation**
- **Forecast congestion impact of recommendations**

Mobility Performance Indicators

- **Maryland State Highway Administration**
 - Office of Preliminary Planning and Engineering (OPPE)
- **i-TMS**
 - Traffic volume (counts)
 - Historical data
 - Truck percentages
- **Mobility Dashboard**
 - Traffic Performance Metrics
 - Congestion
 - Reliability
 - Volume
 - Based on INRIX data



Transit Planning Studies

- Maryland Transit Administration
- Baltimore Red Line
 - Demographic Analysis
 - Employment Analysis
 - Land Use Analysis
 - Population Build Out
 - Forecasts to 2030



Figure 1: Red Line Corridor - Alternative C

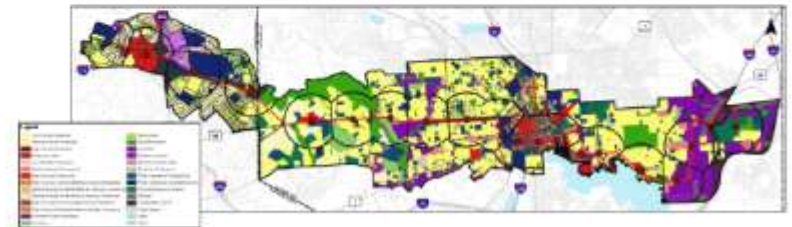
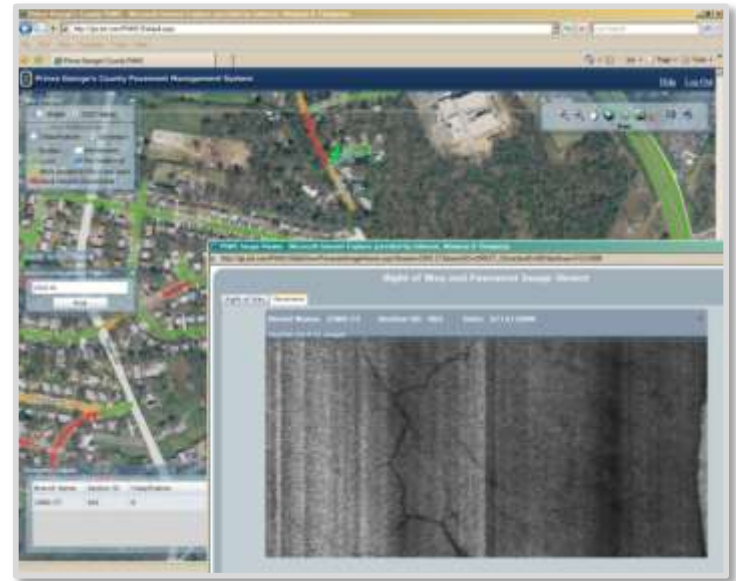


Figure 2: Red Line Corridor Existing Land Use

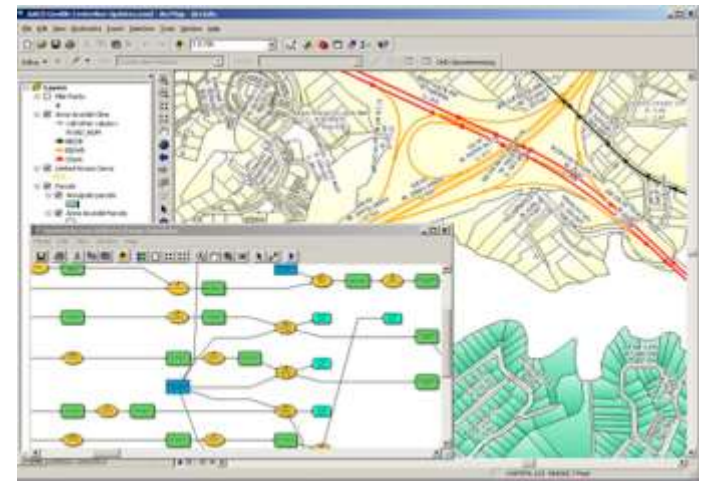
Asset Management

- **Prince George's County, MD**
 - Department of Public Works & Transportation
 - Department of Inspections, Permitting & Enforcement
- **Pavement Assessment & Management System (PAMS)**
 - Condition Survey
 - Pavement Rating
 - Needs Lists
 - Project Formulation
 - Work Coordination
 - Cost Estimation



E911 Routing

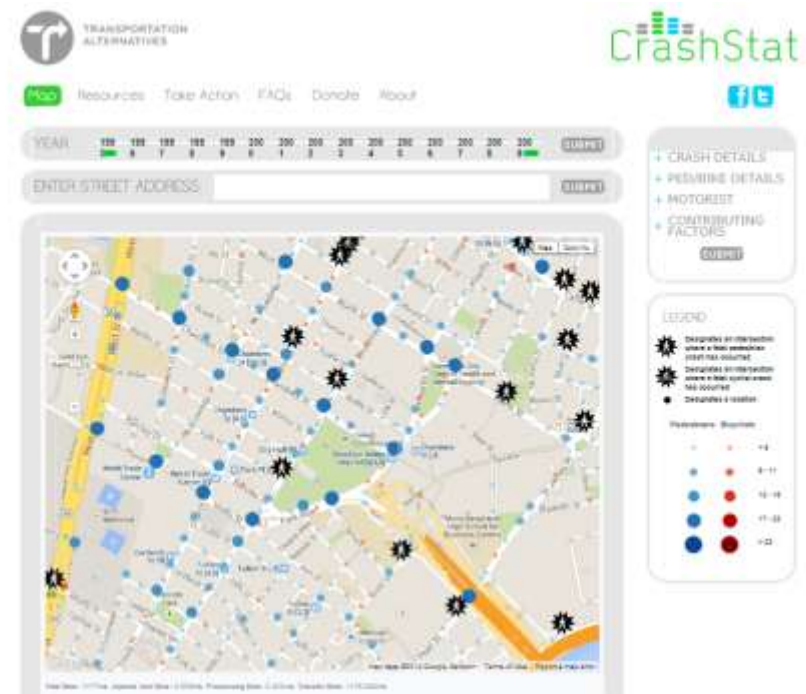
- Anne Arundel County, MD
- Structure Address Verification
 - Physical location for every address in County
 - Physical location for every phone number in County
- Rutable Street Centerline for E911 Computer Aided Dispatch System
 - Address Ranges
 - Speeds
 - Limited Access/One Ways
 - Elevation
 - Travel Cost



Crash Reporting - CrashStat

- **Transportation Alternatives, New York, NY**

- View locations of pedestrian and bicyclist crashes on a map
- Query or Filter crashes
 - Location
 - Type of Crash
 - Year
 - Demographics (age/sex)
 - Crash Details
 - Contributing Factors
- Generate Reports



How do I build my business case?

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Define The Question

- **What are you trying to model?**
 - Ask questions about what things go where?
 - Quantify an existing pattern to better understand it?
 - Examine relationships between different events?
 - Identify trends, clusters or hotspots?
 - Show how things change through time?
 - Predict or forecast something?
 - Find best places, routes or scenarios for a type of activity?
- **Remember: All traffic activities involve a location**

Identify Data Needs

- **What types of data do you need?**
 - Crash data, volume data, roadway characteristics, trip generators, demographics
 - Base data – boundaries, parcels, street centerline, edge of pavement, street names, buildings, utility data
- **What level of detail do you need?**
 - How aggregated or disaggregated?
 - What type of location identifier?
 - County, Street Address, Intersections, Routes and Mile Points
 - What attributes do you need?

Identify Data Needs

- **What data format do you need?**
 - Points
 - Lines
 - Polygons
 - Table that includes a location field
- **Note: Data can be manipulated to the format that your model requires**
 - E.g. Tabular data with well-defined locations can be converted to GIS data!
 - E.g. Points can be aggregated to polygons

Frame The Data Request

- **Clearly state your objectives**
 - What are you studying? What are you using the data to do?
- **Be specific about the location of interest**
 - Statewide, District, County, ADC Grids, Corridor, Intersection, Radius around a location
- **What type of data do you need?**
- **What type of attributes do you need?**
- **How detailed or generalized should the data be?**

Sample Data Request Form

Creating a Clear Data Request			
From the options listed below select all applicable answers for EACH:			
How am I going to use this data? <input type="checkbox"/> Plan an educational program <input type="checkbox"/> Presentation <input type="checkbox"/> Evaluate a program <input type="checkbox"/> Assist with legislation <input type="checkbox"/> Plan enforcement <input type="checkbox"/> Media <input type="checkbox"/> Other <input type="checkbox"/> Please specify: _____	Gender / Age <input type="checkbox"/> Male <input type="checkbox"/> Female Please specify age(s) range: Specific age _____ or Ages from _____ through _____	Priority Area <input type="checkbox"/> Bicycle <input type="checkbox"/> Large Truck/Tractor Trailer <input type="checkbox"/> Motorcycle <input type="checkbox"/> Passenger Car <input type="checkbox"/> Pedestrian <input type="checkbox"/> Pick-Up Truck <input type="checkbox"/> SUV <input type="checkbox"/> Van	Race / Ethnicity Hispanic or Latino <input type="checkbox"/> Yes <input type="checkbox"/> No Specific Race/Ethnicity <input type="checkbox"/> American Indian/Alaskan Native <input type="checkbox"/> Asian <input type="checkbox"/> Native Hawaiian/Pacific Islander <input type="checkbox"/> African American/Black <input type="checkbox"/> White
Weather <input type="checkbox"/> Clear <input type="checkbox"/> Rain <input type="checkbox"/> Snow <input type="checkbox"/> Ice <input type="checkbox"/> Other	Month / Day / Time Please specify range(s) for each: Specific month _____ or Months from _____ through _____ Day _____ or _____ through _____ Time _____ or _____	Type of Road <input type="checkbox"/> County <input type="checkbox"/> State <input type="checkbox"/> Other, please specify: _____	Contributing Factors <input type="checkbox"/> Speed <input type="checkbox"/> Drugs/Alcohol <input type="checkbox"/> Cell Phone <input type="checkbox"/> Seatbelt <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Other, please specify: _____
Other Available Data <input type="checkbox"/> % of Stay in Hospital <input type="checkbox"/> % of citations <input type="checkbox"/> % of citations <input type="checkbox"/> Total # Issued <input type="checkbox"/> % found guilty <input type="checkbox"/> Location of violator's residence <input type="checkbox"/> % of victims living in county vs.		Examples Good Data Request: Subject: Citation Data How Data will be Used: legislative request Data Needed: please provide 5 years of citation figures for restraint codes 22412.2 D, E and G. Poor Data Request: Subject: Citation Data How Data will be Used: Prgrm Development Data Needed: 3 - 5 year trends for my County	My Data Request Question
This template is only used to guide you in creating a good data request. You are NEITHER limited NOR bound to these categories***			

This template is only used to guide you in creating a good data request. You are NEITHER limited NOR bound to these categories

Evaluate The Data

■ Quality and Currency

- Acquire and review any metadata from source
- How frequently is the data updated?
- What lag time is expected from the time of the actual event until it is published as data for analysis?
- How accurate is the data?

■ Suitability for Analysis

- If the data is a sample, how well does it represent the population?
- Are there known outliers?

Evaluate The Data

- **Very important to evaluate data in context**
 - Data will likely have inherent bias
 - Who created it and for what purpose?
 - Be wary of assumptions that have already been made
 - Just because a dataset is common doesn't mean it has clean capture rules
 - Understand the short comings of the dataset to have an appropriate confidence level
 - Not all data is collected the same way—individual counties may have different policies
 - Appreciate the idea that sometimes datasets will really be “close enough”

Develop Your Model

- **What is the analytical approach?**
- **What are some of the tools and techniques that apply?**
 - Reclassify, Overlay, Intersect, etc.
 - Weighted analysis
 - Proximity analysis
- **What are the assumptions?**
- **How likely is it that the independent variables are actually causing the changes to the dependent variable?**

Develop Your Model

■ Considerations

- Different conceptualizations of spatial relationships will yield different results
- Near things are more alike than far away things—spatial dependence
- Effects of sample size
- Effects of boundaries
- What is significant at one spatial scale may not be significant at another
- Clustering based on space, clustering based on space and time

Where can I get data?

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Data Sources

- **Local**
 - Cities, Counties, Educational Facilities (e.g. UMD, Towson University)
- **State**
 - Department of Information Technology, MDOT Agencies
- **Regional**
 - Regional Planning Commissions
- **Federal**
 - National Atlas, Census, FHWA
- **Commercial**
 - Esri, INRIX

Local Example: MCTSA Data Services

■ Maryland Center for Traffic Safety Analysis

- Census data
- Crash data
- Citation data

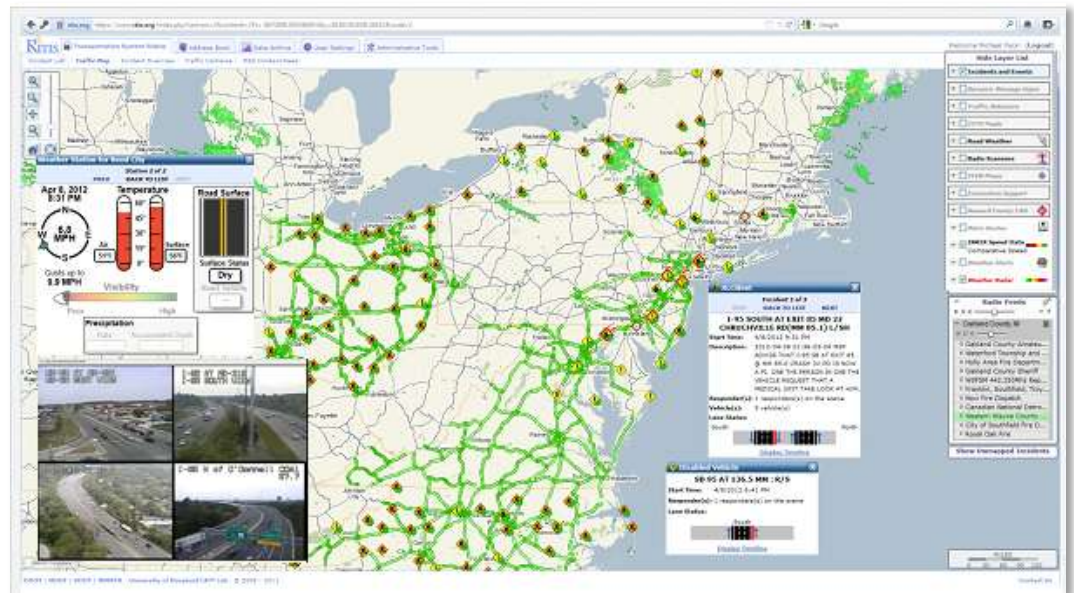


The screenshot shows the website for the Maryland Center for Traffic Safety Analysis (MCTSA) Data Services. The page is part of the University of Maryland School of Medicine's Shock, Trauma and Anesthesiology Research (STAR-ORC) website. The main navigation bar includes links for 'ABOUT US', 'PROSPECTIVE STUDENTS', 'STUDENT LIFE', 'FACULTY', 'RESEARCH', 'PATIENT CARE', 'ALUMNI & GIVING', and 'MAKE A GIFT'. A search bar and social media icons are also present. The page features a large banner image of emergency responders and medical staff, with the text 'National Study Center for Trauma and Emergency Medical Systems (NSC)'. Below the banner, the page title is 'MCTSA - Data Services'. The main content area describes the Data Services track, which utilizes the NSC's expertise in statistics, epidemiology, and programming. It lists several key services: advancing the interpretation/analysis of multiple data sets to address the four E's of traffic safety (education, enforcement, engineering, and EMS); providing state and local level outputs; providing statistical analyses needed to evaluate legislative and programmatic initiatives and support highway safety policy decisions; serving as data support services for the Maryland Strategic Highway Safety Plan (SHSP); continuing coordination of the statewide seat belt observational survey methodology and survey design infrastructure; providing data fact sheets in support of partner agencies; and serving as a data and analysis resource for State agencies, such as the Highway Safety Office, Motor Vehicle Administration. The page also includes a section for 'Available Data Reports' and a link to 'Data Inquiries - Frequently Asked Questions'. A footer note asks if the user needs help writing a clear data request and provides a link to a guide.

Local Example: UMD CATT Lab - RITIS

- Center for Advanced Transportation Technology Lab
- Available to Public Safety & DOT employees

- No Cost
- Historical Data
- Live events
- Incidents
- Traffic
- Weather



Local Example: Open Data Baltimore

beta
OPEN
BALTIMORE

Home Residents Business Visitors Government Office of the Mayor Help

Sign Up Sign In

Welcome to Baltimore City's Data Catalog

The goal of OpenBaltimore is to provide, to the public, access to City data in an effort that supports government transparency, openness and innovative uses that will help improve the lives of Baltimore residents, visitors and businesses through use of technology. OpenBaltimore will enable the local developer community to develop applications that will hopefully solve the city's most vexing problems.

Brought to you by
STEPHANIE RAWLINGS-BLAKE
MAYOR

Address	Year	Value
1000 N. E. Ave.	2008	100000
1000 N. E. Ave.	2009	100000
1000 N. E. Ave.	2010	100000
1000 N. E. Ave.	2011	100000
1000 N. E. Ave.	2012	100000
1000 N. E. Ave.	2013	100000
1000 N. E. Ave.	2014	100000
1000 N. E. Ave.	2015	100000
1000 N. E. Ave.	2016	100000
1000 N. E. Ave.	2017	100000

Real Property Taxes

Current Real Property Tax in Baltimore

Year	Value	Rate
2017	100000	0.0000
2016	100000	0.0000
2015	100000	0.0000
2014	100000	0.0000
2013	100000	0.0000
2012	100000	0.0000
2011	100000	0.0000
2010	100000	0.0000
2009	100000	0.0000
2008	100000	0.0000

Parking Citations

Information on parking citations issued within the City of Baltimore

Year	Value	Rate
2017	100000	0.0000
2016	100000	0.0000
2015	100000	0.0000
2014	100000	0.0000
2013	100000	0.0000
2012	100000	0.0000
2011	100000	0.0000
2010	100000	0.0000
2009	100000	0.0000
2008	100000	0.0000

BPD Part 1 Victim Based Crime Data

All BPD data on Open Baltimore is preliminary data and subject to change. The information presented

Year	Value	Rate
2017	100000	0.0000
2016	100000	0.0000
2015	100000	0.0000
2014	100000	0.0000
2013	100000	0.0000
2012	100000	0.0000
2011	100000	0.0000
2010	100000	0.0000
2009	100000	0.0000
2008	100000	0.0000

State Example: MD iMap

- Comprehensive List of Data Sources in MD

The screenshot displays the MD iMap website interface. The header includes the Maryland state logo and the text "MD iMAP". A navigation menu at the top lists: HOME, ONLINE MAPS, DATA, SOFTWARE, AGGREGATING, CENTERLINE, SUPPORT, PARTNERS, and FAQ. A search bar is located in the top right corner.

The main content area is titled "Maryland iMap - Data" and features a "Data Resources" section. This section is organized into several sub-sections:

- MD iMap Services**: Includes "Web Services are data or tools that can be used in desktop GIS software, thin mapping client software, or just even custom web-mapping tools." and "Search Available MD iMap Services" with a link to an automated look-up tool.
- Additional Web Services**: A heading for further service information.
- ESRGC Map Services**: Describes the Eastern Shore Regional GIS Cooperative's data distribution services in cooperation with the Counties and the regional Councils of the Eastern Shore of Maryland.
- Additional GIS Data**: A heading for more data sources.
- GIS Data Download Sites**: Lists an index of available data download sites, noting that data can be downloaded in some cases, and that many state and local government agencies have GIS web mapping applications where data can be viewed. Links to these sites can be found by accessing links available from the corresponding organization located on the MDGC homepage.
- Data Inventory**: Describes the Maryland GIS Inventory, which provides information concerning the availability of GIS data layers statewide. The inventory is obtained by the National State Geographic Information Council (NSGIC) and maintained by the nationwide GIS community.

Below the main content, there are two columns of links:

- City/Municipal/County Government Agencies**:
 - City of Rockville, Department of Information and Technology, GIS
- County Government Agencies**:
 - Anne Arundel County, Office of Information Technology, GIS
 - Baltimore City, Office of Information Technology, GIS
 - Baltimore County, Office of Information Technology, GIS
 - Calvert County, Department of Technical Services, GIS
 - Carroll County, Office of Technology Services, GIS
 - Cecil County, Department of Planning & Zoning, GIS
 - Frederick County, Information Technologies, GIS
 - Harford County, GIS

On the right side of the page, there are three additional boxes:

- MD iMap in the News**: A box with a red triangle icon, mentioning "ArcGIS 10.2.2 now available from GO Download Site. Go to Software tab. Q&A 'Where Do I Get Software From?'" and a "More News" link.
- Service Alerts**: A box with a gear icon, stating "No service alerts at this time."
- Upcoming Events**: A box with a calendar icon, listing "MD iMap Technical Committee Meetings are held on the 1st or 3rd Tuesday from 1:00 - 3:00 at MDGC" and "MD iMap Executive Committee Meeting - TBD".

The left sidebar contains a navigation menu with the following categories:

- Interactive Online Maps
- ADMINISTRATION**: MD iMap Technical Committee, Standards, Policies and Procedures, Maryland Statewide Addressing Initiative
- TECHNICAL INFO**: Developer Resources, Physical Architecture, Data Management and Data Submission
- MORE RESOURCES**: ArcGIS Online for MD, ESRGC Website, MD Open Data Portal, MSOG Website, Harmons - Nationwide GIS Inventory, Public Safety Technology Forum

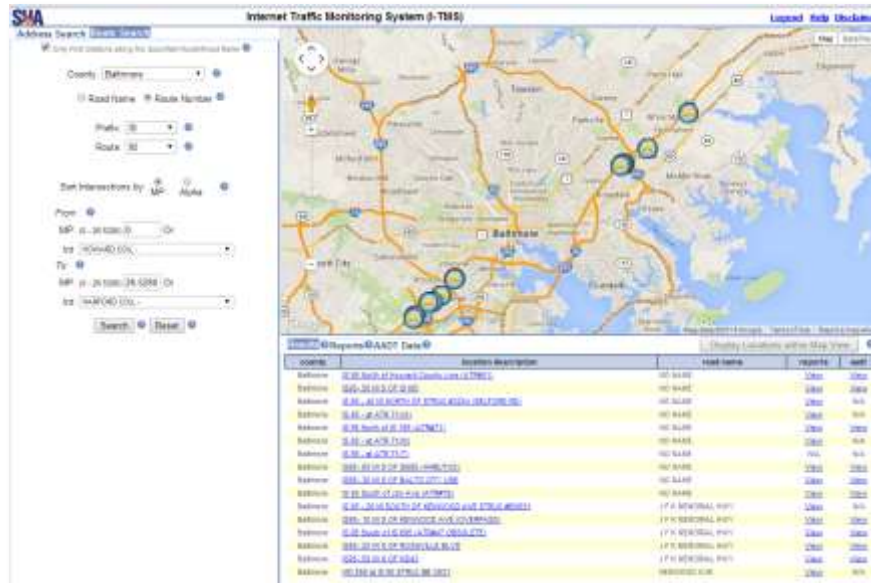
State Example: CHART

- Coordinated Highways Action Response Team
 - Feeds Dynamic Messaging Signs

The screenshot displays the CHART website interface. At the top, it features the Maryland Department of Transportation logo and the title "COORDINATED HIGHWAYS ACTION RESPONSE TEAM". Below this is a search bar with the placeholder text "Find services, agencies and more". A navigation menu includes links for HOME, LOCAL INFO, INTERACTIVE MAP, SEVERE WEATHER, TRAFFIC CAMERAS, and LANE CLOSURES. The main content area is divided into several sections: "LOCAL TRAVELER INFORMATION" with links for Local, Live Traffic Cameras, Interactive Map, Maryland Highway & Traffic Information, Lane Closures, Route Restrictions, Speed Sensor Data, and Highway Message Signs; "WEATHER INFORMATION" with links for Severe Weather Information, Local Weather Station Data, Current Weather Conditions, Tropical Weather, and Satellite Images; "Speed Sensor Data" showing a table of sensor locations and status; and logos for CHART, SHA (State Highway Administration), and 511. A text block explains that CHART is a joint effort of the Maryland Department of Transportation, Maryland Transportation Authority, and the Maryland State Police, and describes its mission to improve "real-time" operations of Maryland's highway system through teamwork and technology.

State Data: iTMS

- Traffic Count reports in PDF or Excel Format



- Data also available in GIS format:

<http://www.sha.maryland.gov/pages/GIS.aspx?PageId=838>

Federal Example: FHWA Resources

U.S. Department of Transportation
Federal Highway Administration

About Programs Resources Briefing Room Contact Search FHWA

Office of Planning, Environment, & Realty (HEP)
Planning - Environment - Real Estate

HEP | Events | Guidance | Publications | Glossary | Awards | Contacts

GIS in Transportation

HOME About this Site GIS Applications Resources Links FHWA Contacts Geospatial Data Collaboration

GIS Data GIS Software GIS-Related Organizations Other Federal Agencies

GIS Data

FHWA Data Resources

- [National Transportation Planning and Program Process](#) - A website providing contact information for transportation professionals, highway network reports, and transportation GIS coverages for the U.S. and Mexico. Most files are available in ARC/INFO® interchange (.e00) format, but the U.S. state boundaries are available in ArcView Shape® (.shp) format.
- [Census Transportation Planning Package](#) - Attribute data of special tabulations from the decennial census designed for transportation planners are available on this site in spreadsheet and plain text formats. From the homepage, click on "Data Products" in the left navigation bar.
- [National Bridge Inventory \(NBI\)](#) - FHWA's NBI offers a wealth of tabular data about bridges across the U.S. From the homepage, click on "Tables of Frequently Requested NBI Information" to locate spreadsheet data.
- [National Highway Planning Network \(NHPN\)](#) - The NHPN is a database that contains line features representing just over 450,000 miles of current and planned highways in the U.S. The NHPN consists of interstates, principal arterials, and rural minor arterials. Files are available in ARC/INFO® Interchange (.e00) format.

Other Data Resources

- [Federal Geographic Data Committee \(FGDC\)](#) - The FGDC's website is aimed at developing the National Spatial Data Infrastructure (NSDI). The site provides news, publications, a calendar of GIS events, and access to vast volumes of data stored on approximately 100 servers registered with the NSDI. To search for data on this site, go to the clearinghouse listed on the left hand navigation bar.
- [FWS Regional Ecosystem Coverages](#) - Spatial ecosystem data for each of the 7 FWS Regions, Puerto Rico, Hawaii, and the lower 48 are provided.
- [The GeoCommunity Data Catalog](#) - The Data Catalog provides many types of data that users can download free of cost or for a nominal fee. This service offers statewide and county-level data such as Digital Elevation Models, Digital Orthophoto Quadrangles, National Wetland Inventory, and land use data. International data is also available. Users will need to create a GeoCommunity Account to download files.
- [Geodata.gov](#) - This site is a subsite of the Geo-one-stop Initiative, and is the U.S. Government's web-based portal for one-stop access to maps, data, and other geospatial services. The site hosts data in 17 different categories, including, among others, political boundary, cadastral, and transportation network coverages.
- [Geospatial Data for Public Use Roads and Parking Lots](#) - During 2000 and 2001, FWS and the Federal Lands Highways (FLH), Central Federal Lands Division collected geo-spatial data on all roads and parking lots for use with geographic information systems. This information is available for use by other federal agencies, state agencies, local governments and the public.
- [Geo-one-stop Initiative](#) - The Federal gateway to shared spatial data, offering links to existing data layers and to GIS clearinghouse websites in all 50 states.
- [Migratory Bird Data Center of FWS](#) - The site links to bird population and habitat databases.
- [The National Atlas of the United States®](#) - This Internet Mapping Server offers several different categories of map layers, which users can download free of charge. Agriculture, climate, geology, transportation, and water features are among the types of layers available. Vector files are in shapefile format. Image files are in georeferenced tagged image file format (GeoTIFF).
- [National Oceanic and Atmospheric Administration \(NOAA\)](#) - The NOAA's National Ocean Service (NOS) site provides users access to downloadable US bathymetric and hydrographic data.
- [National Wetlands Inventory \(NWI\) of the Fish and Wildlife Service \(FWS\)](#) - NWI produces and provides spatial information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats and other wildlife habitats.
- [National Park Service \(NPS\) GIS](#) - NPS's GIS site provides access to data, training opportunities, and detailed descriptions of modeling applications occurring nationwide.
- [NatureServe](#) - NatureServe is a non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation action. NatureServe also provides data on ecological systems and the distribution of animal populations throughout the Americas.
- [U.S. Army Corps of Engineers \(USACE\) Geospatial Data Clearinghouse Node](#) - USACE's Geospatial Data Clearinghouse offers metadata for dam and military boundary coverages.
- [U.S. Census Bureau](#) - The U.S. Census Bureau's website sharing a range of GIS data, including census maps, cartographic boundary files, and school district boundaries.
- [U.S. Environmental Protection Agency \(EPA\)](#) - The EPA's GIS website offering links to a geospatial data clearinghouse, software downloads, and an Envirofacts Data Warehouse.
- [U.S. Geologic Survey \(USGS\)](#) - The USGS website providing information about the physical landscape of the United States. The site hosts high-quality, downloadable data layers and the National Map, a tool for maintaining consistent nationwide GIS data.
- [USDA Forest Service Geodata Clearinghouse](#) - The FSGeodata Clearinghouse provides download access to selected geospatial information and metadata held by the Forest Service for National Forest System lands, including feature data such as roads and streams, map images, and fire mapping information.

Federal Example: National Atlas

The screenshot displays the National Atlas website interface. At the top, the logo for **nationalatlas.gov** is visible with the tagline "Where We Are". A search bar for "nationalatlas.gov" and a "Google Custom Search" button are present. A navigation menu includes categories such as Agriculture, Boundaries, Biology, Climate, Environment, Geology, Government, History, Mapping, People, and Transportation. Below this, a secondary menu features "MAP MAKER", "Map Layers", "Printable Maps", "Wall Maps", "Dynamic Maps", "Articles", and "Mapping Professionals".

The main content area is titled "Home" and features a promotional banner for the "Streamer" tool. The banner text reads: "Have you ever dropped a stick in a river and wondered where it might go if it floated all the way downstream? Now you can trace its journey using Streamer".

The "Streamer" tool interface shows a map of the Great Basin region. A network of red lines represents the streamer's path, starting from a point labeled "upstream..." and flowing through the terrain. Key geographical features labeled on the map include the Snake River, Colorado River, North Platte River, and the Great Basin. The city of Denver is also marked. Below the map, there are controls for "skip" and "replay".

At the bottom of the interface, there are links for "View USGS News Release" and "Streamer in the News".

Federal Example: Census

The screenshot shows the U.S. Census Bureau website homepage. At the top, there is a navigation bar with the following links: Home | Maps | About Us | Index A to Z | Glossary | FAQs. The main header includes the U.S. Department of Commerce logo and the 'United States Census Bureau' logo. Below the header is a secondary navigation bar with links for People, Business, Geography, Data, Research, and Newsroom. A search bar is located on the right side of the header.

The main content area is divided into several sections:

- American Community Survey:** A featured article with a photo of a row of houses. The text states: "The Census Bureau plans to release statistics from the 2012 ACS on Thursday, Sept. 19, 2013. The ACS produces estimates for numerous social, economic and housing characteristics including language, education, the commute to work, employment, mortgage status and rent, as well as income, poverty and health insurance." A "See More" button is visible below the text.
- U.S. Census Bureau Economic Indicators:** A table showing various economic indicators with their values and percentage changes.

Indicator	Value	Change
Business Inventories July 2013 Report Released 10:00 AM EDT, 9/13/13	\$1,661.9 B	0.4%
Advance Monthly Retail Sales August 2013 Report Released 8:30 AM EDT, 9/13/13	\$426.6 B	0.2%
Monthly Wholesale Inventories July 2013 Report Released 10:00 AM EDT, 9/11/13	\$500.0 B	0.1%
Quarterly Profits - Manufacturers' 2nd Quarter 2013 Report Released 9:00 AM EDT, 9/11/13	\$142.1 B	-0.6%
- QuickFacts:** A section titled "Quick, easy access to facts about people, business, and geography." It includes a "Select a state to begin" dropdown menu.
- Interactive Map:** A section titled "Use this map to explore Census data through a mashup of population and economic data." It features a small map thumbnail.
- Census News:** A section with several news items:
 - Media Advisory – Census Bureau to Host Pre-release Web Conference on 2012 American Community Survey Statistics** (Thursday, September 12, 2013)
 - What: The Census Bureau will hold a Web conference to discuss the Sept. 19 release of 2012 American Community Survey Statistics.** [Read More](#)
 - More Than 1 Million U.S. Residents Speak Vietnamese at Home, Census Bureau Reports** (Wednesday, September 11, 2013)
 - A U.S. Census Bureau report released today says that there were 1.4 million people who spoke Vietnamese at home.** [Read More](#)
 - More Than 1 Million U.S. Residents Speak Korean at Home, Census Bureau Reports** (Wednesday, September 11, 2013)
- Stat of the Day:** A section titled "Potential Trick-Or-Treaters" with the text: "41.1 million estimated potential trick-or-treaters in 2012 □ children age 5 to 14 □ across the U.S. Of course, many other children □ older than 14 and younger than 5 □ also go trick-or-treating." A "See More" button is at the bottom.
- We changed our homepage:** A red banner with the text "Tell us what you think".

Commercial: Esri Data Products

Demographics and Lifestyle Data

Analyze markets, evaluate competitors, and identify opportunities. Get demographics and lifestyle data using any of these methods:

Map Services

[ArcGIS Online Map Services](#) use the latest available data to give you access to demographic and lifestyle maps for the United States and several other countries.

Business Analyst

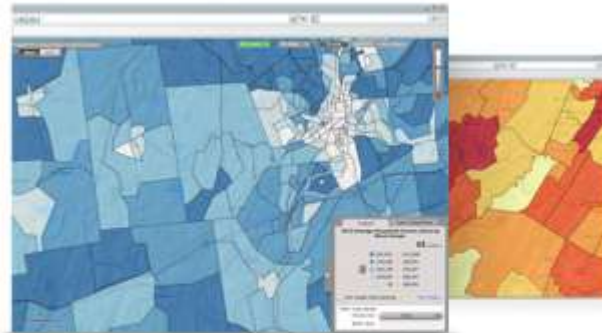
[Business Analyst](#) provides reports and maps to help you with market planning, territory design, and customer segmentation.

Community Analyst

[Community Analyst](#) provides people working in government agencies or involved with public planning with reports and maps to help optimize and allocate resources.

DVD

[Demographic, Consumer, and Business Data DVDs](#) are available. Select the data you need and at what level of details, such as by ZIP code.



Imagery

Access high-resolution global satellite imagery and Global Land Survey (GLS) datasets. Get imagery in one of the following ways:

Map Service

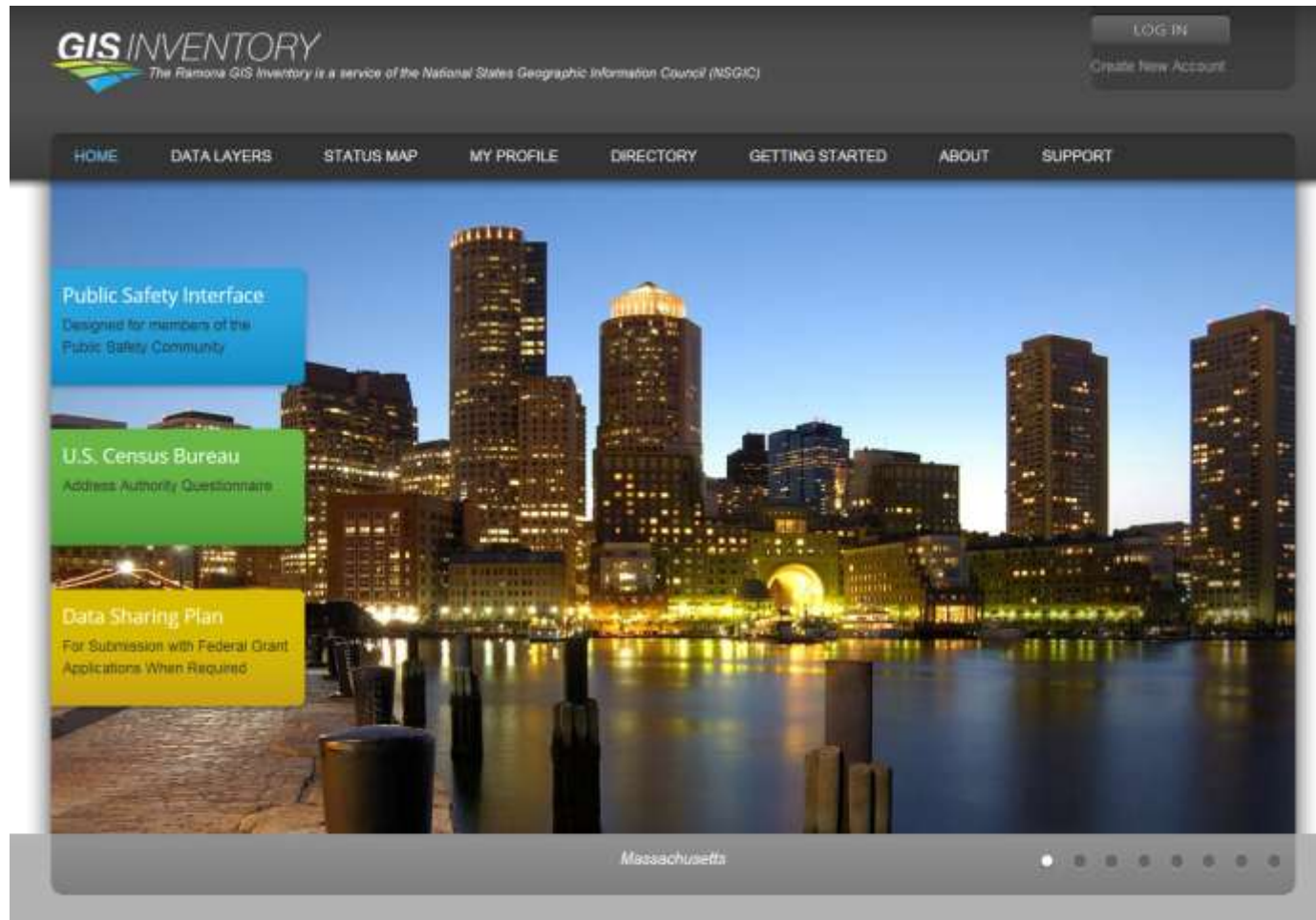
[ArcGIS Online World Imagery map service](#) gives one meter or better satellite and aerial imagery in many parts of the world.

Image Services

[ArcGIS Online Image Services](#) offer you the best continuous



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Access your maps and information from anywhere.



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ArcGIS includes a living atlas of the world, with beautiful and authoritative maps on hundreds of topics.



Get Started Quickly



Powerful out-of-the-box Apps



Integrate

What training opportunities exist?

Thursday, May 29, 2014

Maryland Traffic Records Forum
The Conference Center at
The Maritime Institute

Training Opportunities

- **Review Case Studies**
 - Magazines, Journals, [Websites](#)
- **Technical Guidance**
 - [ArcUser Magazine](#)
- **How To Books**
 - [Getting to Know ArcGIS](#)
 - GIS Tutorial
- **Online Training Opportunities**
 - [Esri Free](#) Training
 - [Esri Paid](#) Training
 - [MIT Open Courseware](#)
- **Formal Classes**
 - Online
 - [Penn State World Campus](#)
 - In the Classroom

■ Meetings

- Local GIS groups
- MSGIC
- Esri MUG
- Esri CMUG
- MAGTUG

■ Conferences

- [Esri Events](#)
- [FOSS4G](#)
- [Where](#)
- [GIS-T](#)

Questions?

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