

Municipal Geospatial Information Security

By Christopher Freeman
University of North Carolina Greensboro
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Study Objectives

- Define Critical Infrastructure
- Review literature and public legislation for existing definitions
- Develop a local policy restricting certain critical information
- Survey Municipal websites for geospatial information.
- Catalog and then rank observed data
- Create a vulnerability ranking for cities at risk of terrorist attack.

Project Discussion

- _ City of Greensboro Prior to September 11, 2001.
 - Presented all geospatial information on the Internet.
- _ City of Greensboro immediately following September 11, 2001.
 - Survey of web applications
 - 14 minute "hit" from Tehran, Iran
 - Removal of all web applications
 - Closure of FTP (File Transfer Protocol) site.

Critical Infrastructure

- Critical Infrastructure – a facility, either public or private that operates in a capacity to provide fundamental necessities of life, and provides a common good or service to large portions of the population, and would provide a significant negative socio-economic impact should it fail.
- For a municipality, this might include:
 - Water Distribution
 - Electricity
 - Telecommunications
 - Petroleum Distribution
 - More?

Critical Infrastructure

- Critical Infrastructure Information (data) can exist as:
 - High resolution aerial imagery.
 - Engineering Drawings.
 - Water/Sewer distribution plans.
 - Electrical transmission and facility plans.
 - Architectural drawings.
 - Electronic drawings:
 - CAD/GIS data, Scans, PDF or other document type.

NC Public Records Law

- §132-1.7 Sensitive Public Security Information.** (a) Public records, as defined in G.S.132-1, shall not include information containing specific details of public security plans and arrangements or the detailed plans and drawings of public buildings and infrastructure facilities...

City of Greensboro Data Security Policy

- _ Based on early research from this study:
 - Greensboro developed a policy restricting Water/Sewer Pipelines, Storm Water Pipelines, Telecommunications Infrastructure, Internal Security Plans, and all associated data/drawings.
 - Policy effective July 1, 2004
 - _ No complaints to date
 - _ Used as a model to safeguard information by APA, and municipalities throughout NC.

Internet Survey

"133 Cities Project"

- _ Initially funded by NIMA (now NGA) to acquire aerial imagery of 133 Cities and MSA's
 - Cities were chosen following 9/11 based on demographics and terrorism risk.
 - Aerial imagery is 1 foot pixel resolution.
- _ 152 cities (including those in the MSA's) were used for this study.

Internet Survey Tasks

- _ Visit each Municipal Home Page
- _ Examine each site for data download areas
- _ Catalog all web addresses in a database
- _ Check for security
- _ Download and examine geospatial information
- _ Categorize observed data

Data Distribution

— Data Distribution options:

- Direct FTP
- Download from interactive mapping application
- HTML links

Looking for FTP Sites

- Using Google™, a search for the municipality primary web page was executed. The address was logged into a database.
- Download pages and links to FTP were also entered when found.
- Observed data was classified by sector and security.

Input Form : Form

USGS/NGA 133 Cities Project : Available Geospatial Information

Metro ID: 69

Metro Area: Los Angeles, California

City, State: Los Angeles, California

Web Address: <http://www.ci.la.ca.us/>

FTP Address: <http://navigatela.lacity.org/index1.htm>

Notes: Critical infrastructure available on viewer.

Geospatial Data? Secured? **Save Table**

Geospatial Data Classified by Economic Sector

<input checked="" type="checkbox"/> Telecommunications	<input type="checkbox"/> Transportation	<input checked="" type="checkbox"/> Public Health	<input type="checkbox"/> Food
<input checked="" type="checkbox"/> Electrical	<input checked="" type="checkbox"/> Water Supply/Distribution	<input type="checkbox"/> Agriculture	<input type="checkbox"/> Shipping
<input checked="" type="checkbox"/> Petroleum	<input type="checkbox"/> Emergency	<input type="checkbox"/> Chemical	<input type="checkbox"/> Defense
<input type="checkbox"/> Financial/Banking	<input type="checkbox"/> Continuity of Govt	<input type="checkbox"/> Commercial	<input type="checkbox"/> Landmarks/Icons

Record: 75 of 152

Classification of Observed Data

The sixteen Economic Sectors used in this study:

- Telecommunications
- Electrical Transmission
- Petroleum Distribution
- Banking and Finance
- Transportation
- Water Distribution
- Emergency Systems
- Continuity of Government
- Public Health
- Agriculture and Livestock
- Chemical and Manufacturing
- Commercial and Public Venues
- Food Distribution
- Mail and Shipping
- National Symbols and Icons
- Defense Industrial Base

Survey Results

Summary of observed sites:

■ <u>Study Group Total:</u>	<u>152</u>	
■ <u>Secured FTP sites:</u>	<u>34</u>	<u>22.3%</u>
■ <u>Sites with ANY data:</u>	<u>47</u>	<u>30.9%</u>
■ <u>Sites with NO data:</u>	<u>44</u>	<u>28.9%</u>
■ <u>Sites with Geospatial data</u>	<u>34</u>	<u>22.3%</u>
■ <u>Sites with FTP:</u>	<u>91</u>	<u>59.8%</u>
■ <u>Sites without FTP:</u>	<u>61</u>	<u>40.1%</u>
■ <u>Other download options:</u>	<u>11</u>	<u>7.2%</u>
■ <u>Percent of study group with Geospatial data</u>		<u>36.2%</u>

Survey Results

— Weighting the data

- City of Greensboro Department Directors* were given the sixteen economic sectors
- They were asked to rank them in order of importance from 1 to 16.
- Individual sector scores were then averaged and adjusted such that the sum for all sectors was 100.
- Their responses were then used to rank sector importance.

* (Directors included Police and Fire Chiefs, Water Department, MIS, County Emergency Management, Planning and Engineering)

Survey Results

_ Using sector weights with observed data:

- Data was initially collected as yes/no (1 or 0) in master table.
- The number "1" was replaced with the sector weight.
 - _ Example: Water pipelines observed? 1 (or yes) is replaced with 25 (the sector score).
- This is repeated for all observations and then summed to produce a rank score.

Survey Results

Cities w/Data	Sector	Percent of sites w/data (34)	Percent of observed cities (152)	Sector Weight
6	Telecommunications	17.6	3.9	8
4	Electrical Distribution	11.7	2.6	10
4	Petroleum Distribution	11.7	2.6	20
11	Transportation	32.3	7.2	8
17	Water Distribution	50.0	11.1	25
8	Emergency Management	23.5	5.2	5
2	Gov't Continuity	5.8	1.3	1
8	Public Health	23.5	5.2	1
1	Agricultural	2.9	0.6	2
2	Chemical Industry	5.8	1.3	5
6	Retail	17.6	3.9	1
2	Food Distribution	5.8	1.3	1
4	Shipping	11.7	2.6	8
1	Defense Industry	2.9	0.6	1
3	Monuments/Icons	8.8	1.9	3
0	Financial	0	0	1

Top 10 List

— Top ten cities that contain the highest quantity of data in the most economic sectors based on sector weight:

<u>Rank</u>	<u>City</u>	<u>Score (out of 100)</u>
1.	Austin, Tx	93
2.	Albuquerque, NM	74
3.	Los Angeles, Ca	64
4.	Tucson, Az	59
5.	Richmond, Va	57
6.	Charlotte, NC	53
7.	Minneapolis, Mn	53
8.	Washington, DC	52
9.	Dallas, Tx	49
10.	Honolulu, Hi	46

Case Study: Austin, Texas

The City of Austin invites users to freely download data from FTP with detailed instructions.

City of Austin GIS Data Sets

The table below lists GIS data sets developed by the **City of Austin** and provided by Communication and Technology Management (see list of contributing departments). Underlined entries are available for download from the City of Austin Infrastructure Support Services Anonymous FTP server (<ftp://issweb.ci.austin.tx.us/>). The files are in ArcView "shape" format and require GIS software that can view or import this format. Each data set has at least 3 associated files, ending in .shp, .shx, and .dbf, which have been compressed into a .ZIP file. You must unzip the files using a decompression utility like winzip. The GeoDisc Austin Metro GIS Inventory CD contains many of these data sets, plus some additional data. It is available for purchase for \$25 from the City of Austin's Document Sales Window (505 Barton Springs Rd., 1st floor).

For information concerning these data sets, please contact Dolph Scott at dolph.scott@ci.austin.tx.us. You can also directly access these files via an FTP program (host: <ftp://issweb.ci.austin.tx.us/> user-id: anonymous; password: your e-mail address).

You can download **ArcExplorer**, a viewing software from **ESRI**, at no cost, to view these data sets. If you need to convert these shape format files to .dxf, try using **Arc2Cad** from **Guthrie CAD\GIS Software**. **AutoCAD Map** can import shape files into AutoCAD.

DXF format of Building Footprints, Contours, Base (lots and ROW), and Transportation (paved surfaces) are also available via anonymous FTP (<ftp://issweb.ci.austin.tx.us/pub/GIS-Data/Regional/dxfdata/usgsqg/>). These files are clipped and organized by USGS 7.5 minute Quarter Quads. **Map Finder** has information about the location of 7.5 minute quadrangle maps. Quarter quads are simply 7.5 Quadrangle maps cut into 4 smaller maps. They are numbered 1, 2, 3, or 4. An example is Austin East 4 and the corresponding folder is named a_east_4.

For information about City of Austin development requirements, including site plans, zoning, permitting and application packets, go to the **City of Austin Development Process** web site.

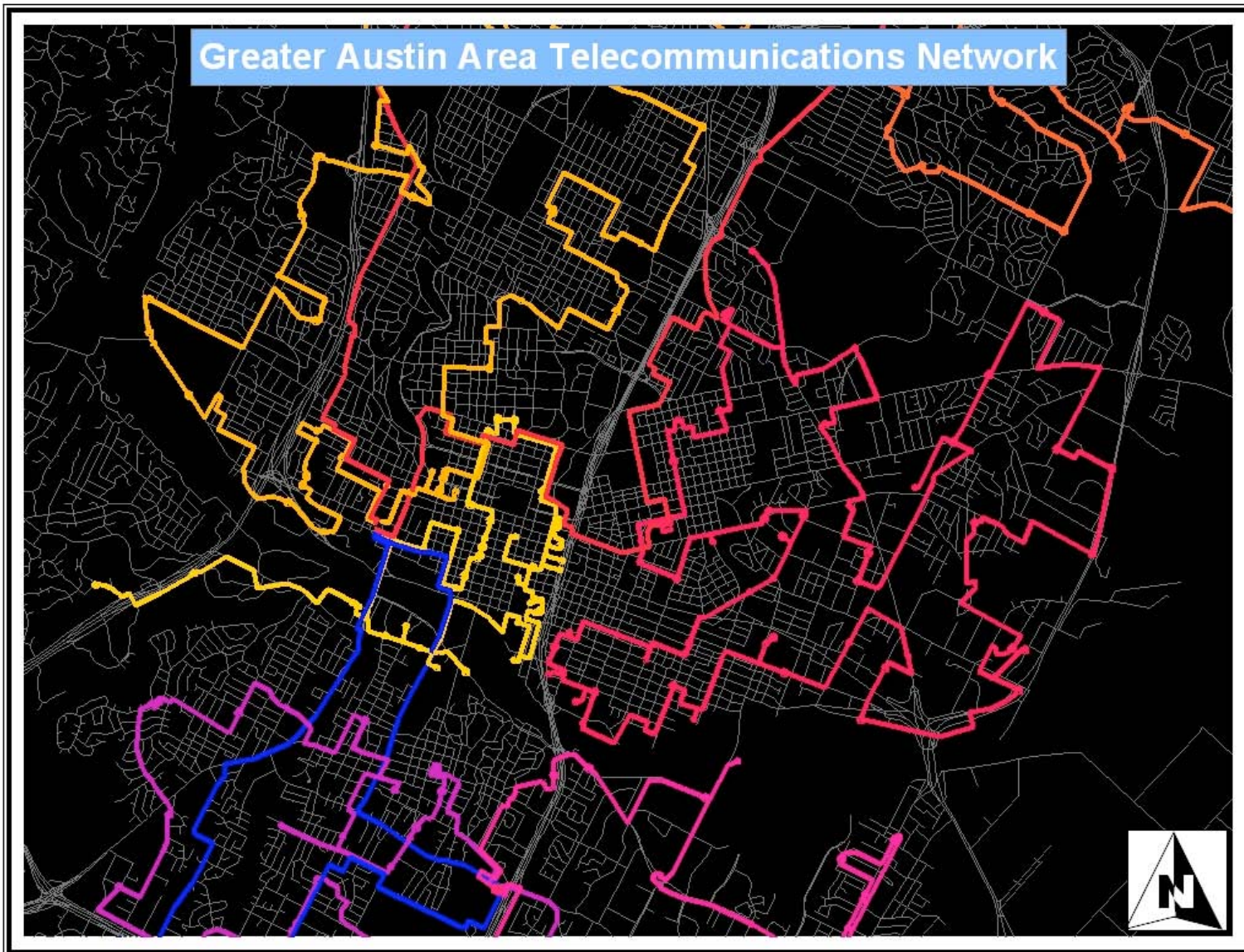
These files are being made available courtesy of the City of Austin's Communication & Technology Management **Department**

DXF Data Image Map: To determine which USGS Quarter Quad you will need to download DXF file, [click here](#).

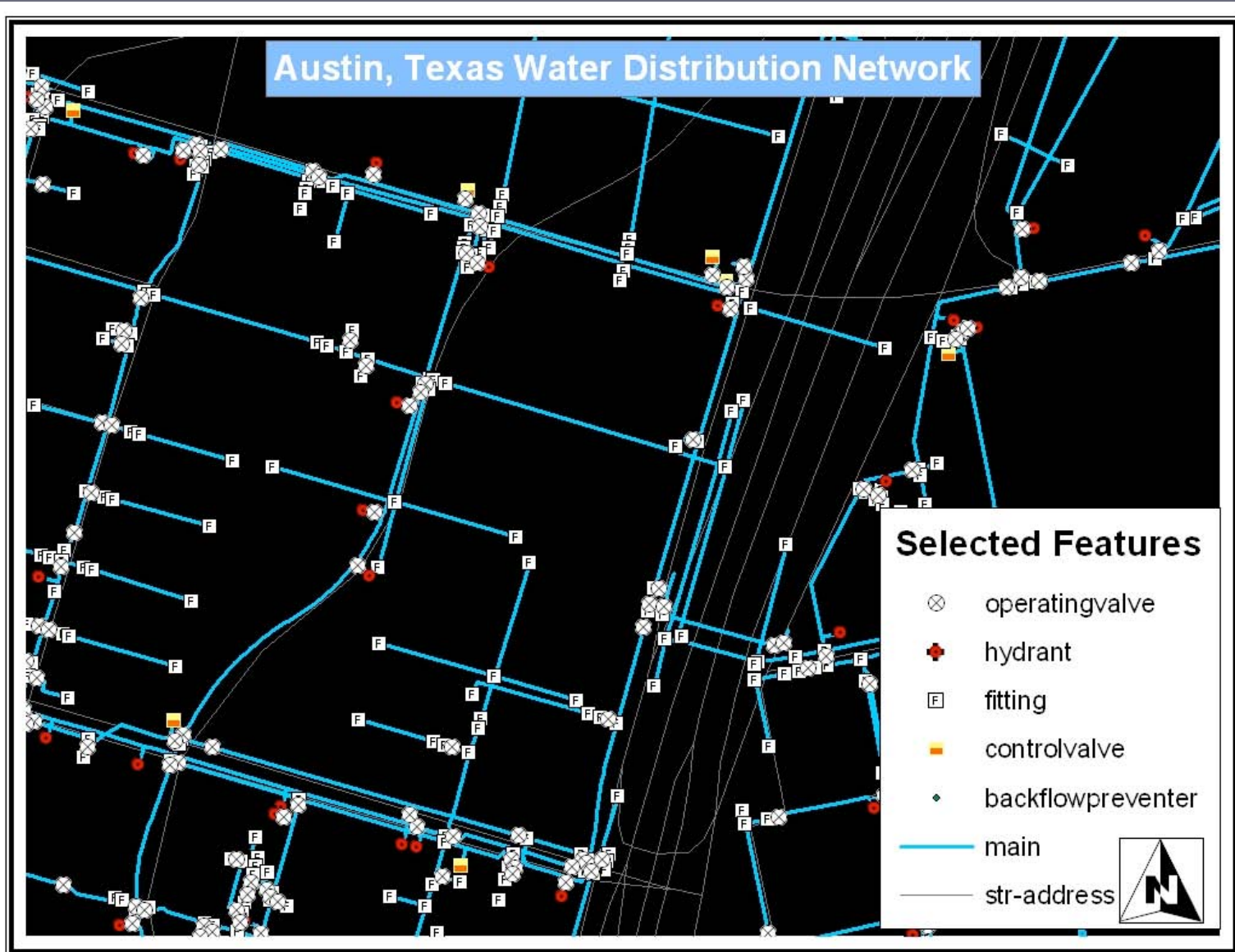
GIS Shapefile Image Map: To determine which USGS Quarter Quad you will need to download the City of Austin 2 foot contours only, [click here](#).

>>>

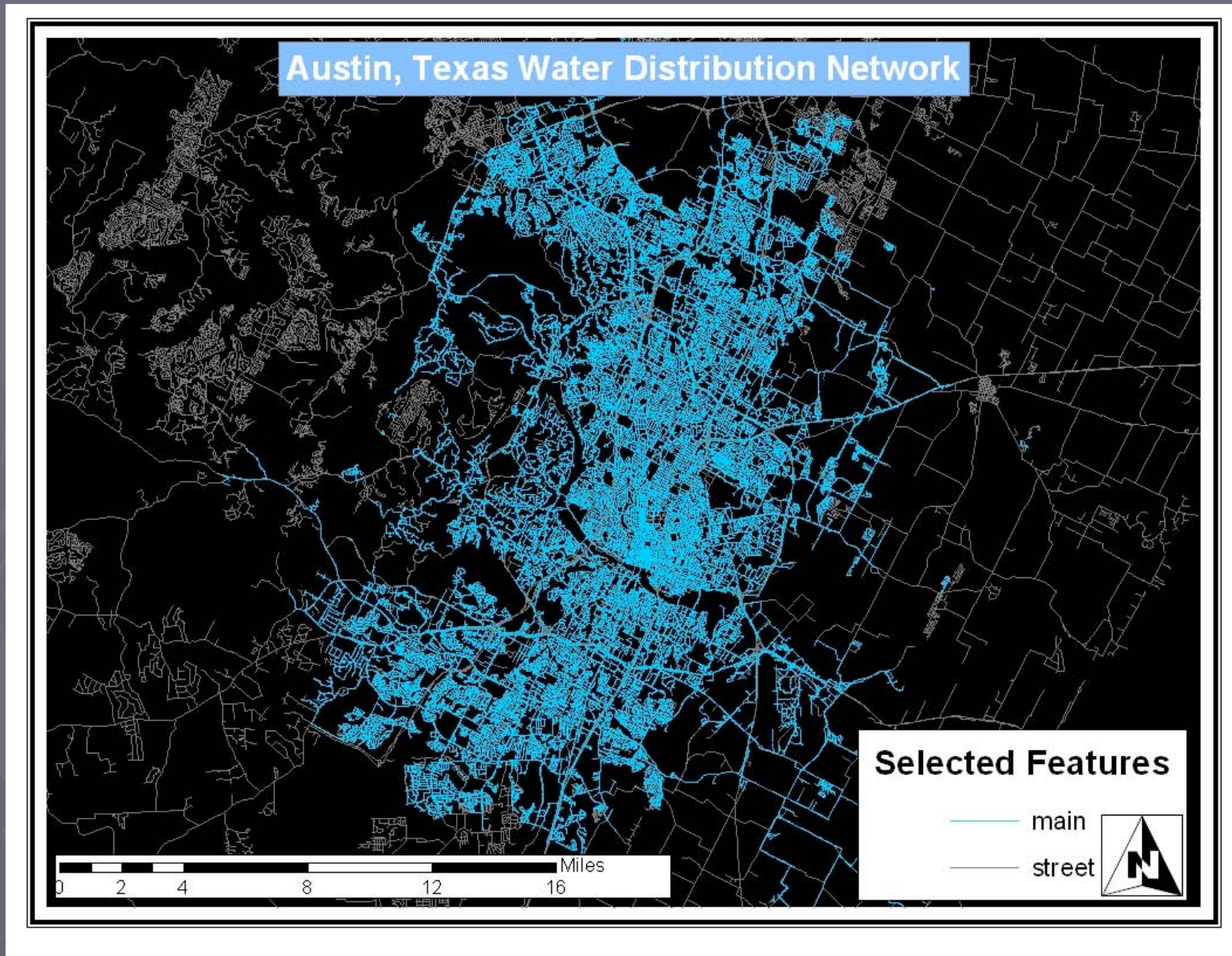
Observed Data



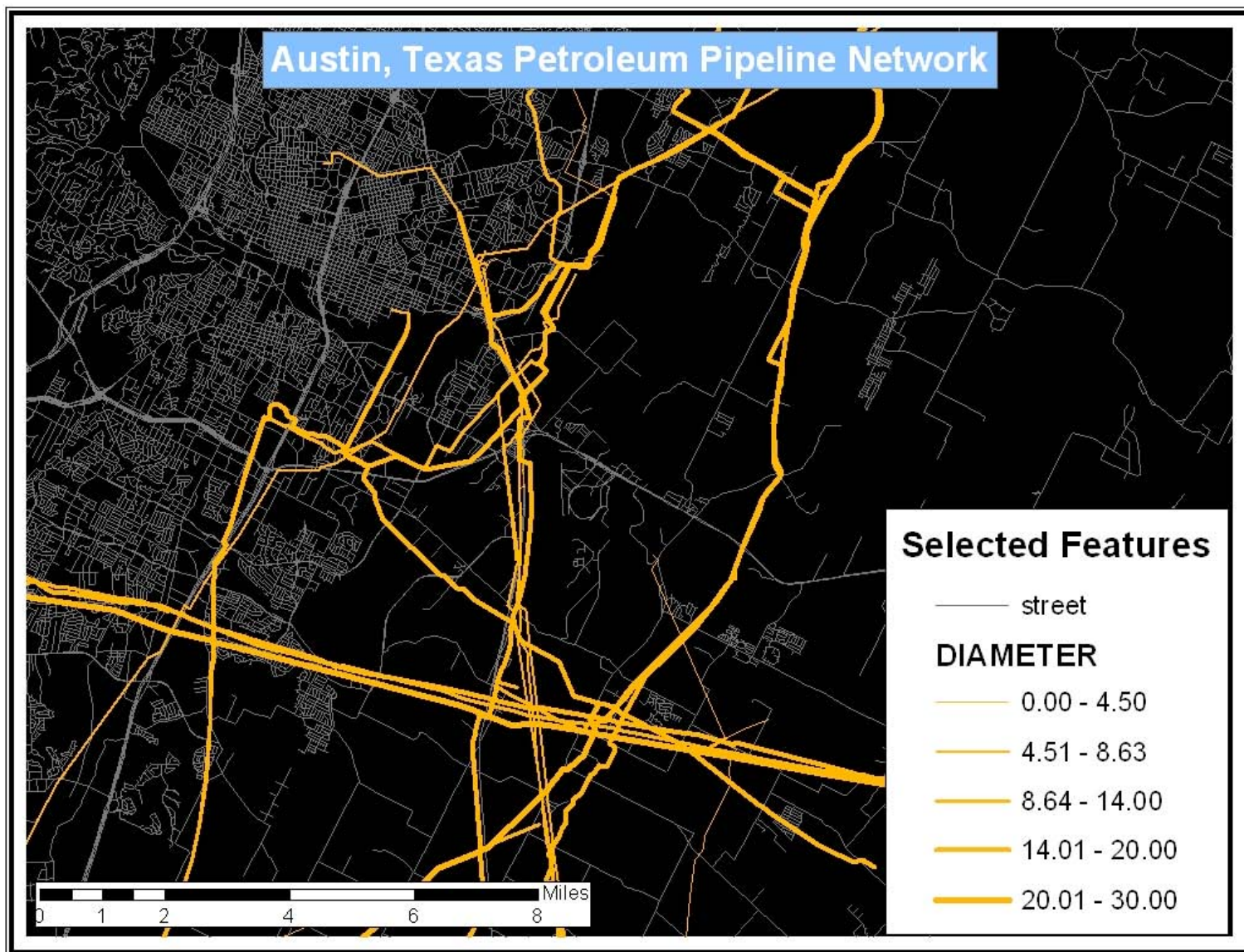
Observed Data



Observed Data



Observed Data



Observed Data

Attributes of pipeline

OPER_NM	SYS_NM	SUBSYS_NM	DIAMETER	CMDTY_DESC	INTERSTATE	STATUS_CD	QUALI
GULF ENERGY PIPELINE, LLC	AUSTIN SYSTEM	423-501	16.00	NATURAL GAS	N	I	U
CITGO PRODUCTS PIPELINE COMPANY	CASA PIPELINE SYSTEM	LULING STA TO AUSTIN TERMINAL	8.63	GASOLINE, #2 FUEL OIL	N	I	U
PG&E TEXAS PIPELINE, L.P.	20/2		14.00	NATURAL GAS	N	I	U
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U
EQUILON PIPELINE CO LLC	RANCHO SYSTEM		24.00	CRUDE	Y	I	U
PG&E TEXAS PIPELINE, L.P.	20/2		16.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	20		20.00	NATURAL GAS	N	B	U
PG&E TEXAS PIPELINE, L.P.	20		20.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	20/1		20.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	19		20.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	9034		12.75	NATURAL GAS	N	B	U
PG&E TEXAS PIPELINE, L.P.	9033		12.75	NATURAL GAS	N	B	U
TEXACO INC.	LINE P (SOUTH)		20.00	NATURAL GAS	N	I	U
EL PASO FIELD SERVICES COMPANY	TEXAS PIPELINE SYSTEM	AUSTIN REFINED PRODUCTS	4.50	REFINED PRODUCTS	N	I	G
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U
PG&E TEXAS PIPELINE, L.P.	90371/3		4.50	NATURAL GAS	N	I	U
TEXACO INC.	LINE P (SOUTH)		20.00	NATURAL GAS	N	I	U
HOUSTON PIPE LINE COMPANY	LINE 3103		16.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	9033/2		2.38	NATURAL GAS	N	I	U
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U
HOUSTON PIPE LINE COMPANY	LINE 3103		16.00	NATURAL GAS	N	I	U
TEXACO INC.	LINE P (SOUTH)		20.00	NATURAL GAS	N	I	U
HOUSTON PIPE LINE COMPANY	LINE 3103		10.75	NATURAL GAS	N	I	U
HOUSTON PIPE LINE COMPANY	LINE 3103		16.00	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	17C		20.00	NATURAL GAS	N	I	U
TEXACO INC.	LINE P (SOUTH)		20.00	NATURAL GAS	N	I	U
TXU LONE STAR PIPELINE	P (SOUTH)		20.00	NATURAL GAS	N	I	U
TXU LONE STAR PIPELINE	PA		8.63	NATURAL GAS	N	I	U
GULF ENERGY PIPELINE, LLC	LONE STAR DELIVERY	423-302 SOUTH TEXAS	10.75	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	9037		1.32	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	90371		4.50	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	17B		6.63	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	9037		2.38	NATURAL GAS	N	I	U
PG&E TEXAS PIPELINE, L.P.	9037		12.75	NATURAL GAS	N	I	U
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U
WILLIAMS PIPE LINE COMPANY	LONGHORN	BAYTOWN TO EL PASO	18.00	GASOLINE, DIESEL, JET FUEL	Y	I	V
SOUTHTEX 66 PIPELINE COMPANY,LTD	BENEDUM - SWEENY	LINE EZ	10.75	NATURAL GAS LIQUIDS	Y	I	U

Observed Data – Schematic Drawings



Recommendations

- 1. Develop legal definitions at the Federal and State levels for Critical Infrastructure Information.
- 2. Include FTP and other Data medium descriptions into current public records law.
- 3. Research ways to secure data that is in harmony with FOIA.
- 4. Security is cheap with FTP. Use it.
- 5. Educate municipal employees to be responsible when distributing data...the audience is GLOBAL.
- Introduce a "GeoSecurity Officer" responsible for implementing guidelines and monitoring municipal data distribution practices.

Recent Developments

- **Rand Corporation report “Mapping the Risks” authors interested in this study:**

- Interest in how their report is being used “in the field”.
- They need more information about FTP.
- Interested in the solution being used in Greensboro.

- **Attention of the local media:**

- Raises public debate on “how much information is too much information?”
- Informs the public of how information is being used and now, its global availability.

- **It is curious that the Cities that have complained about information restriction, all have secured FTP sites...**