DSL Target Marketing using ArcIMS

Authored By: Eric Pimpler and Eric Cabading

Abstract

SBC Communications, Inc., is a global leader in telecommunications services, and provides a full range of voice, data, networking, and e-business services to address the specific needs of individual businesses and consumers. SBC is America's leading provider of high-speed DSL Internet access service with over 2 million business and residential customers in it's 13 state territory. In support of on-going DSL sales and marketing efforts, the Marketing GIS department at SBC developed the DSL Prospecting application to enhance the identification of areas most likely to be responsive to targeted marketing campaigns. Developed as an ArcIMS application, the DSL Prospecting tool enables users to visualize telecommunications boundary data along with existing business and residential customers, and summarized market penetration information. This paper presents an overview of the application, and the data processing methodology used to support the application.

I. The Business Case

How DSL Works

When you connect to the Internet, you might connect through a regular modem, through a local-area network connection in your office, through a cable modem, or through a digital subscriber line (DSL) connection. DSL is a very high-speed connection that uses the same wires as a regular telephone line (see Figure 1). Some of the advantages of DSL include the ability to leave your Internet connection open and still use the phone line for voice calls, much higher speeds than a regular modem (1.5 Mbps vs. 56 Kbps), no new wiring, and a company provided DSL modem as part of the installation.

A standard telephone installation in the United States consists of a pair of copper wires that the phone company installs in your home. These copper wires have lots of room for carrying more than phone conversations. DSL exploits this extra capacity to carry information on the wire without disturbing the line's ability to carry conversations. Typically, the telephone wires limit the frequency range of human voices to 0 to 3,400 Hertz even though the wires can handle several million Hertz in most cases. By limiting the frequencies used for voice data on the wires, DSL providers can safely transmit data over the other capacity of the lines.

Most homes and small business users are connected to an asymmetric DSL (ADSL) line. ADSL divides up the available frequencies in a line on the assumption that most Internet users look at, or download, much more information than they send, or upload. Under this assumption, if the connection speed from the Internet to the user is three or four times faster than the connection from the user back to the Internet, then the user will see the most benefit. However, ADSL is a distance-sensitive technology. The connection speed varies greatly depending on how far you are from the central office of the company

providing the ADSL. As the connection's length increases, the signal quality decreases and the connection speed goes down. The limit for ADSL service is 18,000 feet (5,460 meters), though for speed and quality of services reasons many ADSL providers (including SBC Communications) place a lower limit on the distances for the service.

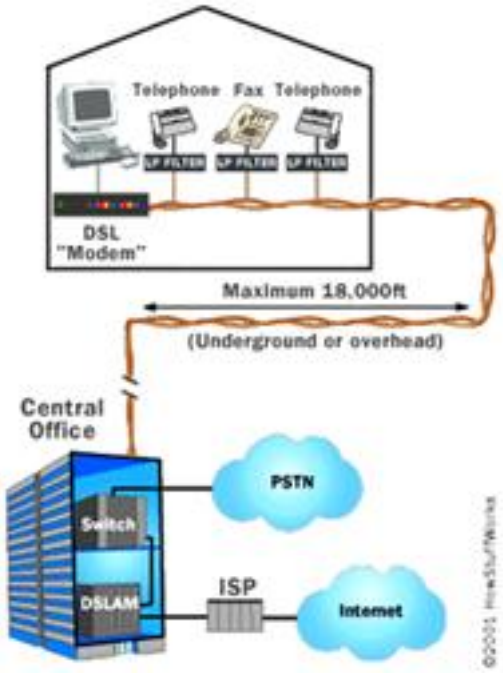

Figure 1: How DSL Works

DSL Equipment: DSLAM

The DSLAM at the access provider is the equipment that really allows DSL to happen. A DSLAM takes connections from many customers and aggregates them onto a single, high-capacity connection to the Internet. The DSLAM provides one of the main differences between user services through ADSL and through cable modems. Because cable modems usually share a network loop that runs through a neighborhood, adding users means lowering performance in many instances. ADSL provides a dedicated connection from each user back to the DSLAM, meaning that users won't see a performance decrease as new users are added.

Getting DSL Service: Regular Access vs. Remote Terminal Access

Since DSL is a distance sensitive product (maximum of 18,000 feet from central office), telecommunications geography comes into play when determining a customer's ability to get DSL service. A wire center is the basic unit of telecommunications geography (see Figure 2), and is typically serviced by a single central office where subscriber lines are connected to the local switching equipment. At a more fine-grained level each wire center is composed of one or more Distribution Areas (DA) (see Figure 3). From a customer perspective, DSL service is first deployed to those DA's that are within the maximum distance of a central office (18,000 feet), and later to DA's referred to as Remote Terminals (RT). A Remote Terminal is generally any type of switch or routing equipment that is located outside the

traditional central office. An RT is typically linked back to the central office through a fiber optic cable. RT's were originally used to serve high growth areas where there are limited copper facilities. Recently, RT's have been implemented to break the 18,000 foot DSL limitation from the central office to serve people in outlying areas. The objective is to put the DSL equipment closer to the subscriber, thus eliminating the distance limitation for those areas serviced by the RT.

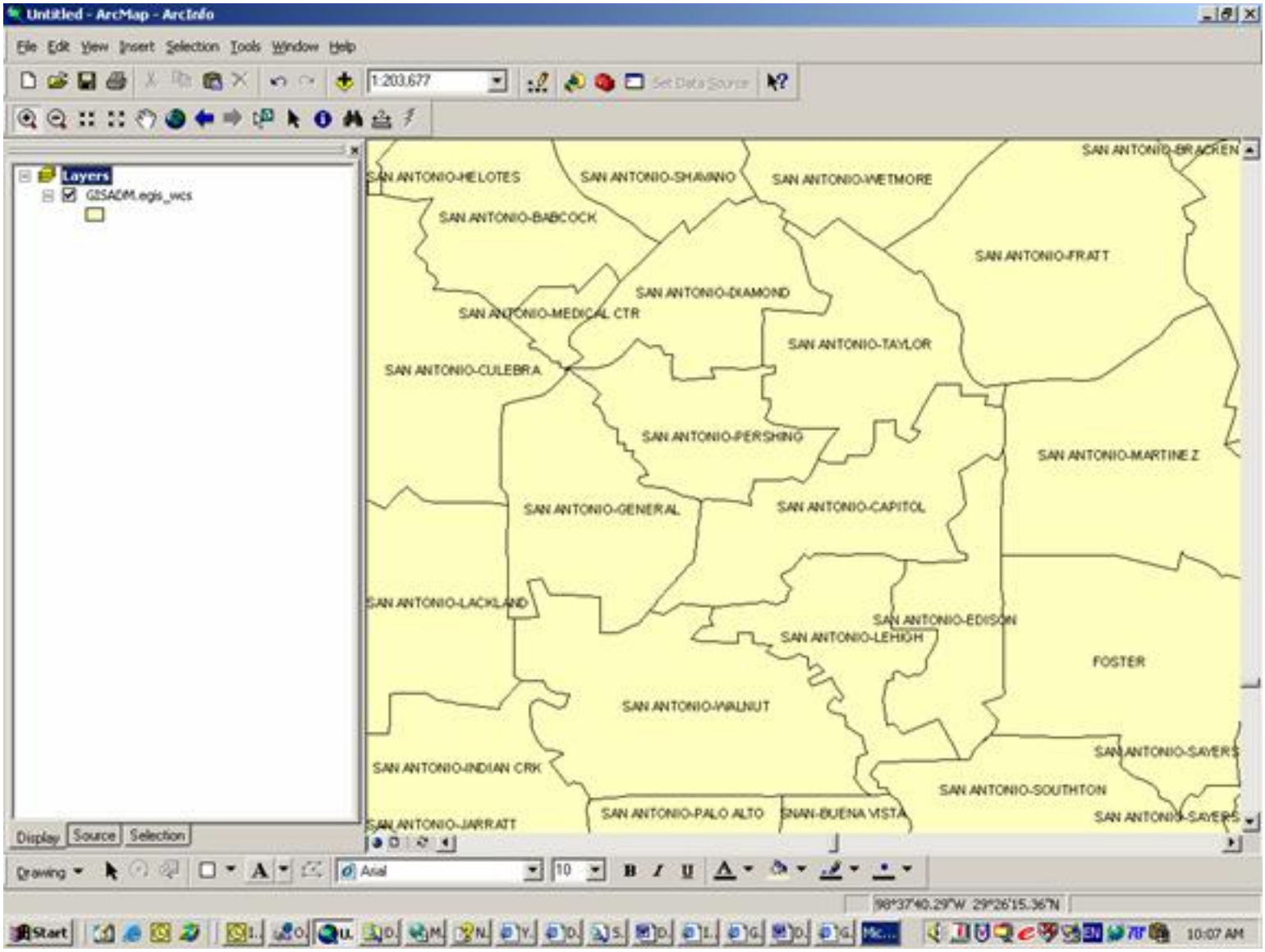

Figure 2: Wire Center Boundaries

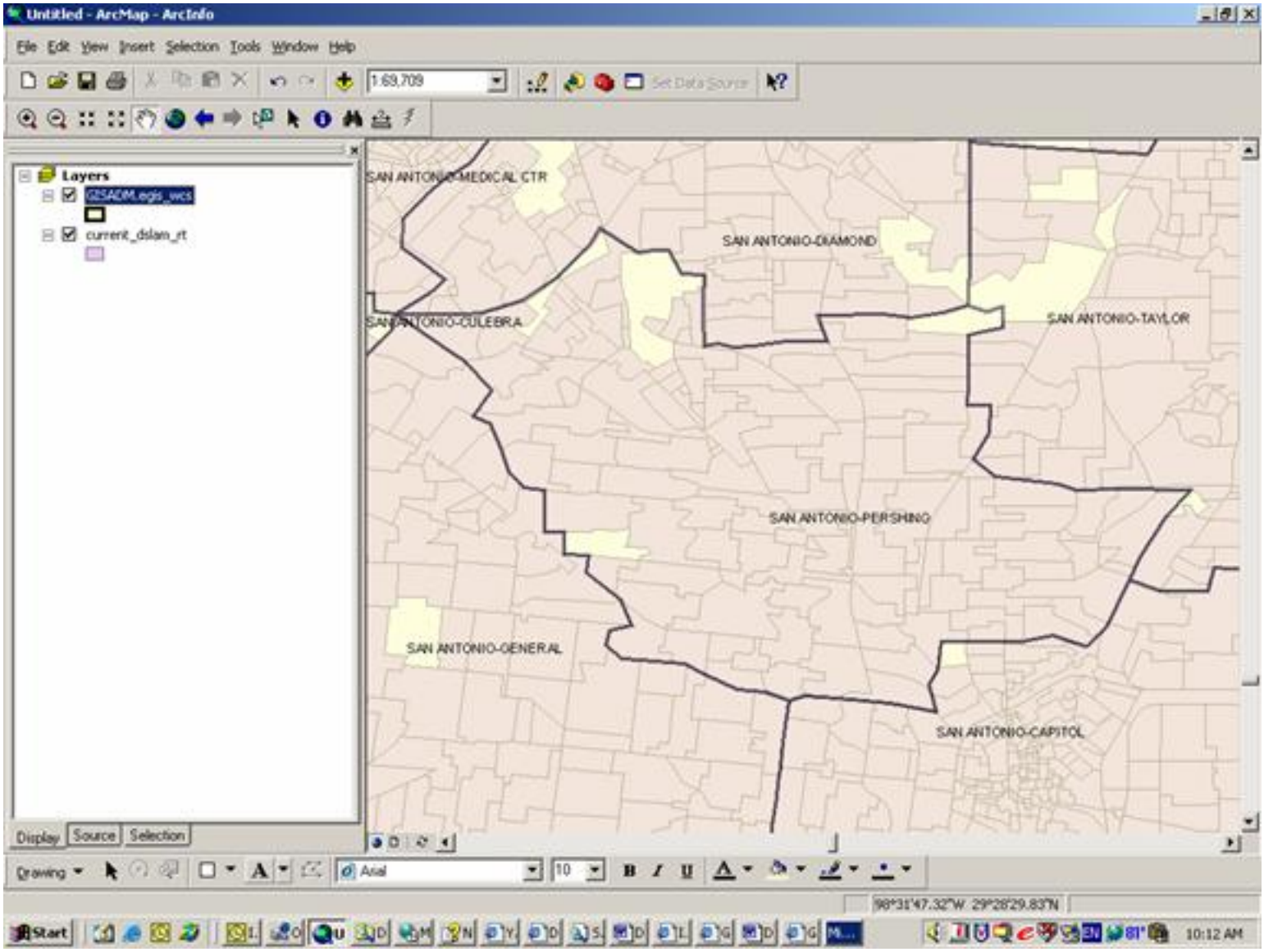

Figure 3: DA Boundaries with Wire Center Boundaries

Marketing and Sales Opportunities

RT's have become the focal point for the immediate deployment of DSL capabilities in high growth areas, and represent a key opportunity area for expanding the DSL customer base for SBC Communications and other DSL providers. Yankee Group predicts that DSL deployment in North America will grow to 13.5 million lines by 2005, compelling carriers to adopt new technology solutions that cost-effectively extend DSL throughout RT environments. In addition, market penetration of DA's under 18,000 feet is also a high priority. To address these priorities, the Marketing GIS Group at SBC Communications developed an Intranet solution based on ESRI technology to enable marketing and sales representatives to assess the potential opportunities for growing the DSL customer base. A number of functional objectives were accomplished with the completion of this tool including:

- Visualization of where DSL has been deployed

- Visualization of how DSL has been deployed (traditional DSLAM versus RT)

- Visualization of geocoded customer information (business and residential) in relation to the DSL deployment status of individual DA's.

- Access to detailed, individual customer information including name, address, revenue, DSL subscription status

- Market penetration statistics

- Identification of areas that would be responsive to direct marketing efforts

- Ability to download customer information to Microsoft Excel

Although this tool was originally built as a high-level planning tool for identifying areas that would be good candidates for direct marketing efforts, it has gained popularity throughout the sales and marketing workforce as a low-level tool that can be used for door-to-door marketing of DSL service due to its ability to identify areas that are both capable of receiving DSL service and contain high concentrations of potential customers.

II. Software Architecture

The DSL Prospecting Tool was built as a 3-tier Intranet based application available corporate wide to all management employees of SBC. The client side user interface was built using Macromedia's Dreamweaver MX product along with JavaScript for user input validation. The middle tier is composed of ESRI's ArcIMS 4.x product with the ColdFusion Connector along with an internally based authorization and authentication product for verifying management status. The backend data storage tier is composed of ArcSDE 8.3 which manages the spatial data in an Oracle 8.1.7 database instance.

III. Application Interface

To access the DSL Prospecting Tool, employees must first enter their unique user identification and password (see Figure 4). This information is then passed through an internally developed authentication and authorization process to verify the management status of the user. Once the status has been verified, a second screen appears and prompts the user to enter a base geography by entering a wire center code or Zipcode along with the type of customer data (business or residential) they would like to visualize (see Figure 5). Based on the information entered by the user the application will then display a map of the base geography along with customer information in the form of geocoded customer addresses, DA boundary information representing the status of DSL deployment in the form of “current” and “future” categories, and detailed street data (see Figure 6). A “current” status implies that DSL service is available for that area while “future” implies that DSL service will be available in the near future. Market penetration statistics can be generated for the base geography by selecting the “Get Market Penetration Statistics” link (see Figure 7). Finally, users can download customer information for the selected

geography to an Excel spreadsheet by selecting the Export link (see Figure 8).

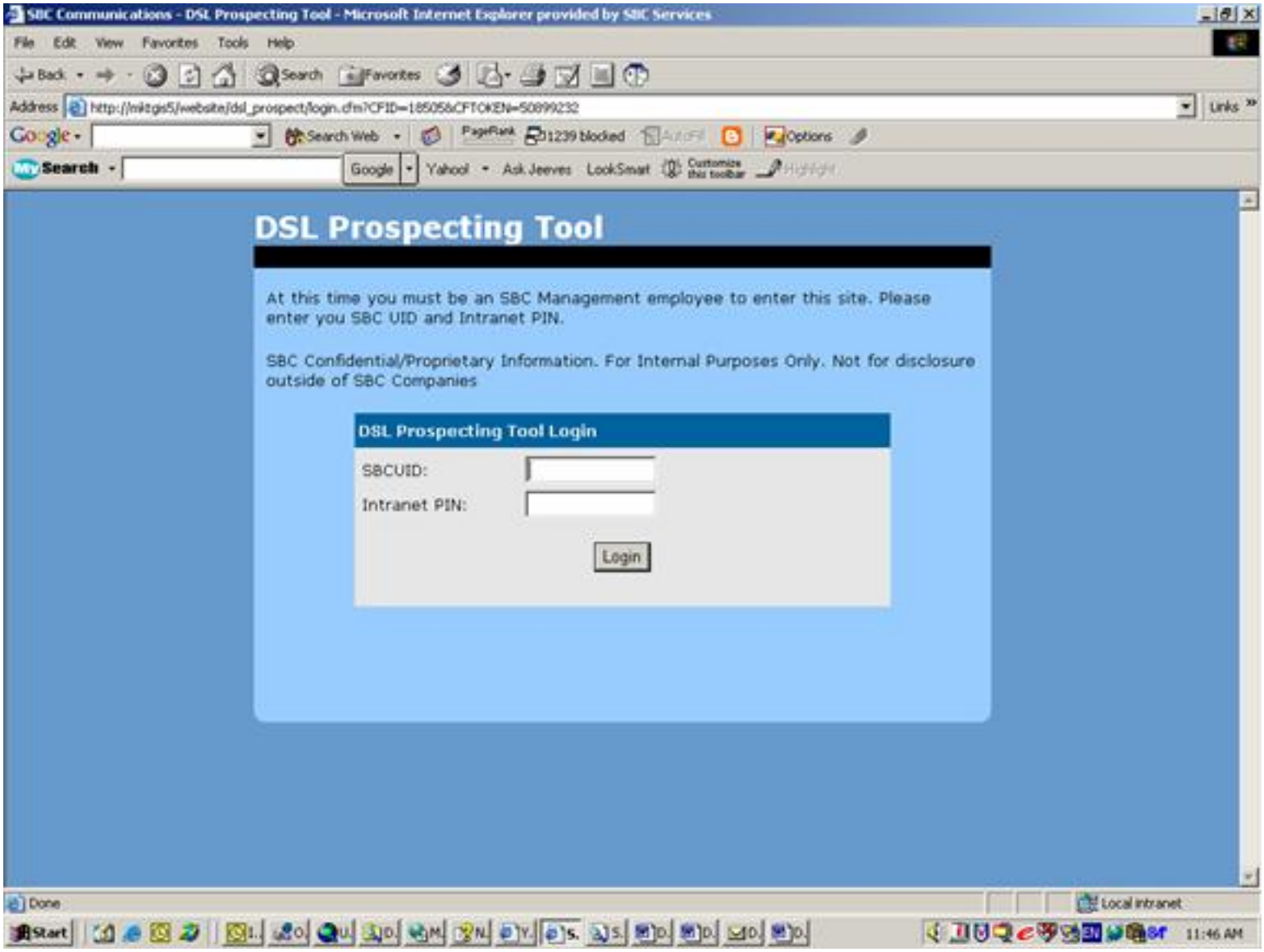

Figure 4: User verification

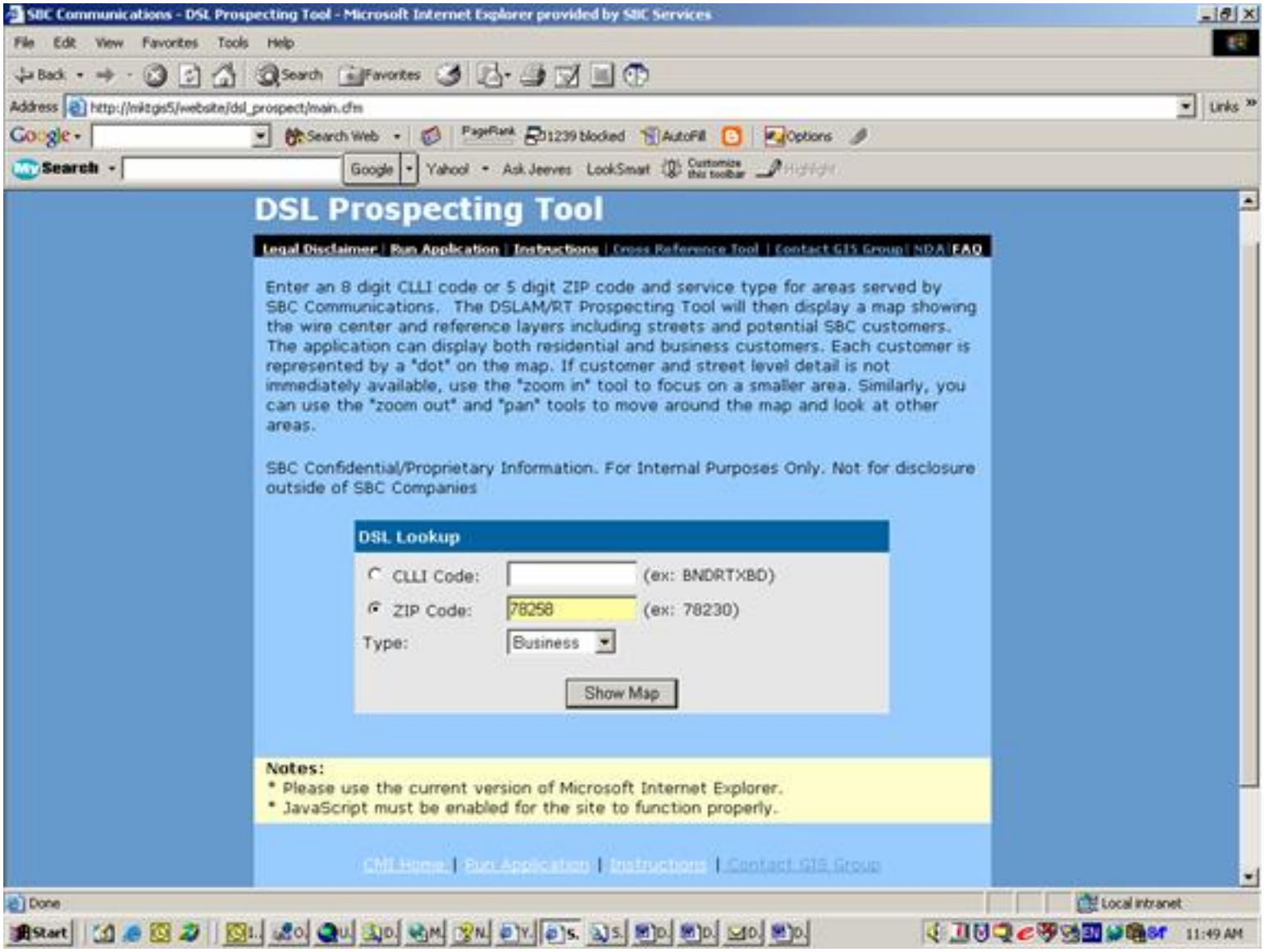

Figure 5: Enter Base Geography and Customer Type

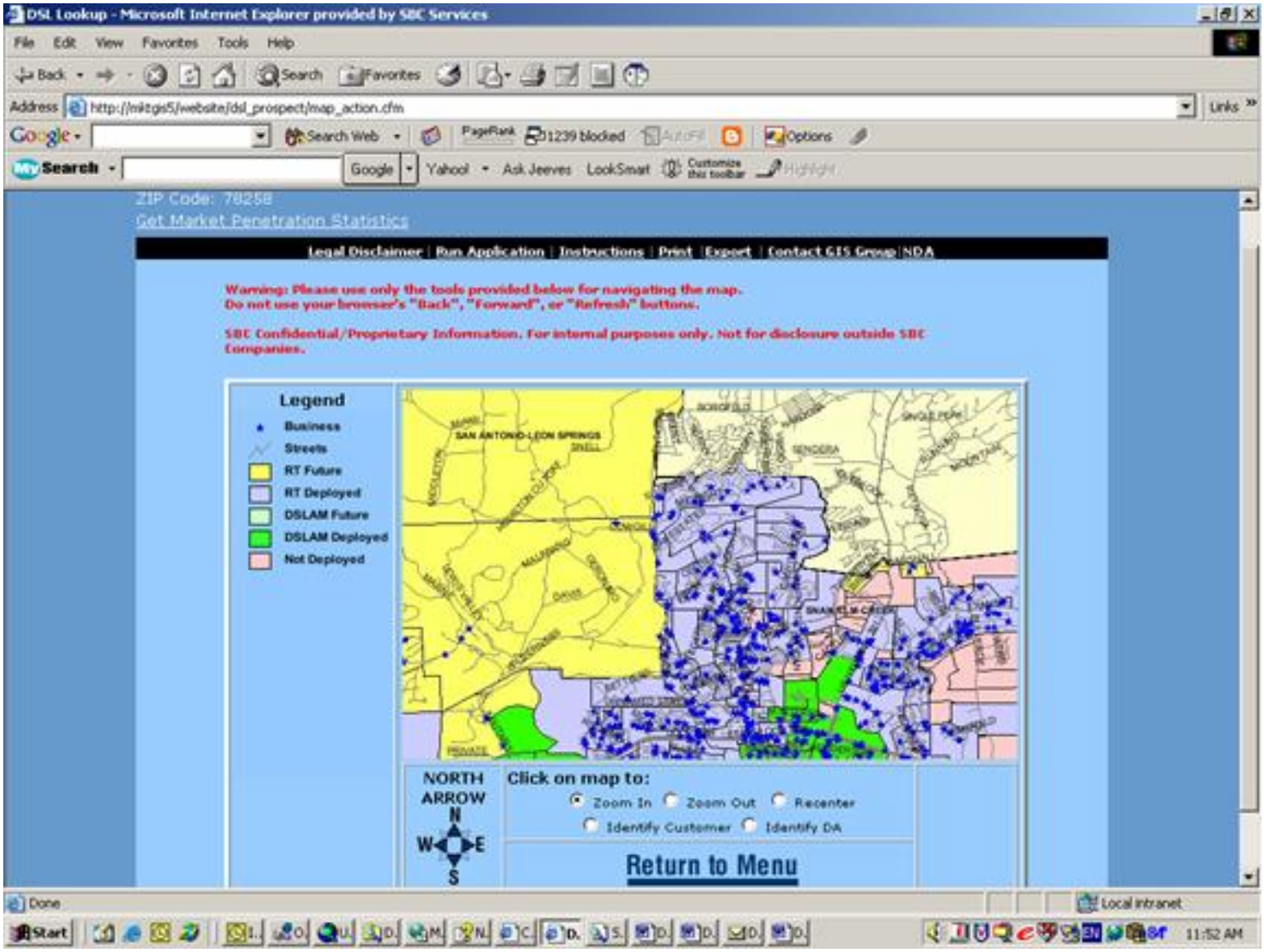

Figure 6: DA Boundary Map with Geocoded Customer Information

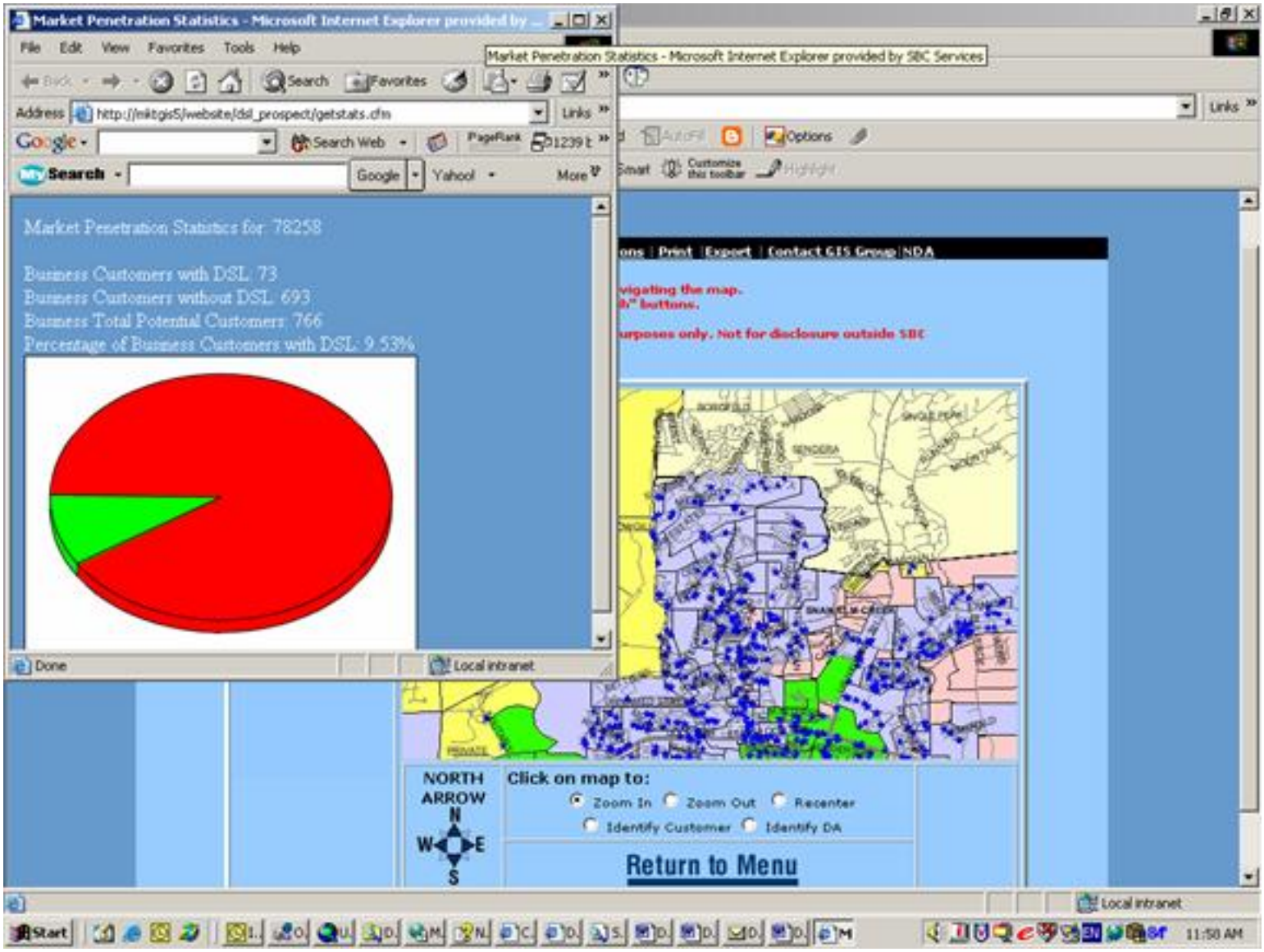

Figure 7: Market Penetration Statistics

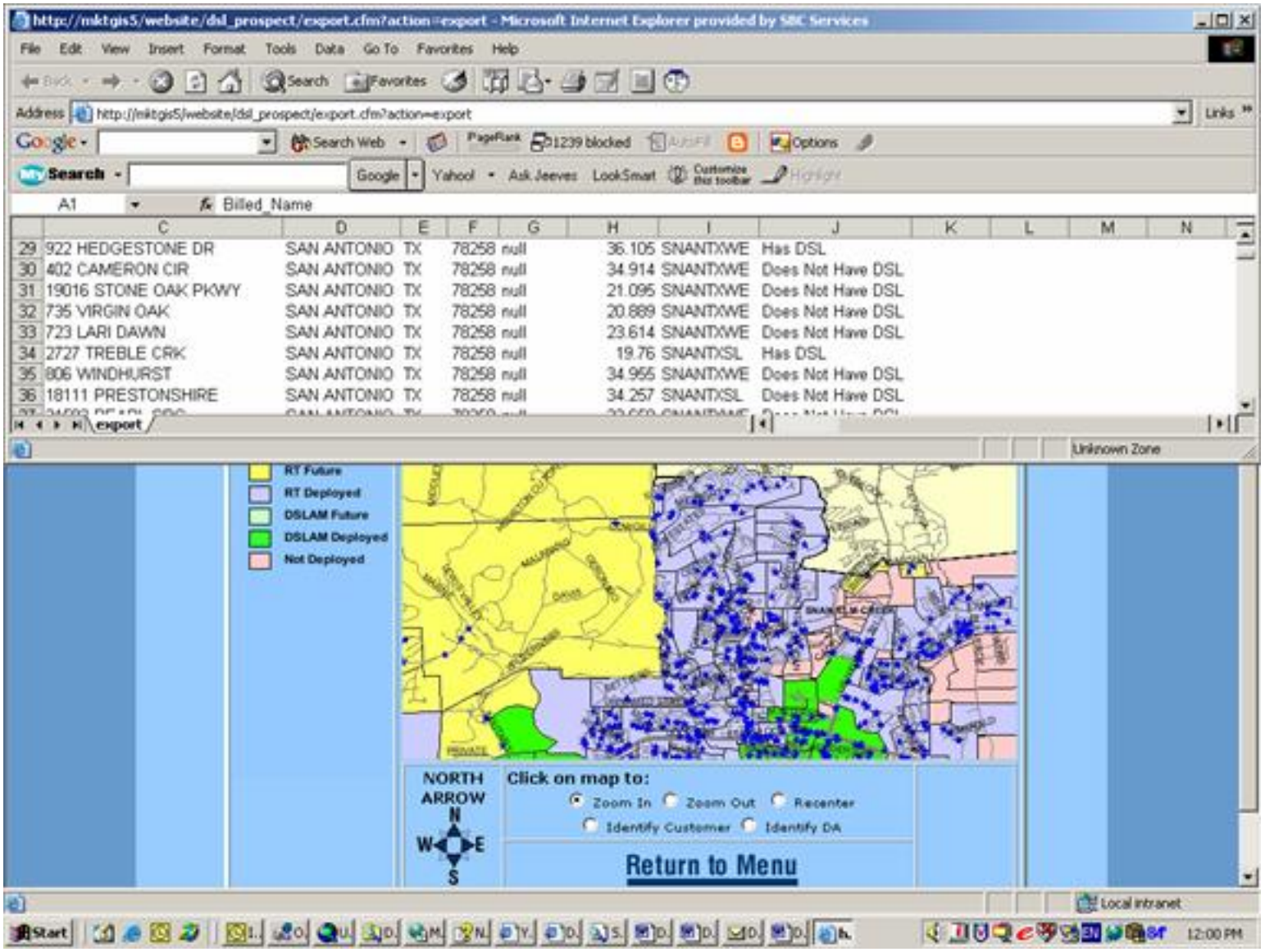

Figure 8: Customer Information Downloaded to Excel Spreadsheet

IV. Data Processing

The application is updated on a monthly basis with new customer and telecommunications boundary information. Several internal processes were designed and developed to accommodate this update schedule. From a customer data perspective it was necessary to develop an efficient Extract-Transform-Load (ETL) process for taking raw customer information stored in a legacy, enterprise database and turning it into a spatially enabled ArcSDE point layer suitable for viewing in an ArcIMS map service (see Figure 9). At a high level this was accomplished through the internal development of a number of processing “engines” and internal procedures. Included in this development was a custom, internally developed address standardization and geocoding interface built to efficiently process approximately 30 million customer addresses on a monthly basis. In addition, a number of SQL Loader jobs were written to import the geocoded customer address files into an Oracle database instance specifically developed to support GIS data for the Marketing GIS Group. Following the importation of customer information to Oracle, a 3 rd party free-ware program, DBMS2SDE (available through arcscripts.esri.com), was used to build ArcSDE point layers based on the geographic coordinates generated through the geocoding

process. Finally, the customer point layers are updated in the ArcIMS map service.

A separate process for updating the telecommunications boundaries was also developed. Since DA's were used as the base unit of geography for this application it was necessary to categorize each DA into one of five categories: DSLAM Current, DSLAM Future, RT Current, RT Future, and Not Deployed. These categories are then used for display purposes in the application. Each month, DA boundaries are downloaded from a separate internally developed application, and joined to attribute information to produce the new geographic boundary data which is then updated in the ArcIMS service.

V. Conclusions

With the number of DSL subscribers in North America predicted to increase from 2.5 million customers in 2001 to 16.5 million customers in 2006 according to the Yankee Group, it is advantageous for the telecommunications industry to have access to advanced planning tools. Because distance is a factor in DSL deployment, GIS based systems are at the forefront of these tools. The ability to visualize where DSL has and will be deployed in relation to an existing customer base is of paramount importance when planning future DSL deployment schedules and for planning direct marketing campaigns to existing and potential customers. By developing the DSL Prospecting Tooll, the Marketing GIS Group at SBC Communications has enhanced the company's ability to plan its deployment schedule and sales and marketing efforts.

References

- Curt Franklin. “How DSL Works.” http://computer.howstuffworks.com .

- Matt Davis. “Global DSL Equipment Forecast.” The Yankee Group. Copyright, February, 2003