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FINAL RESEARCH REPORT

APPLICATIONS OF GEOGRAPHIC ANALYSIS IN PAROLE AND PROBATION

GRANT #1999-CE-VX-0005

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EXECUTIVE SUMMARY

The advent of community-based supervision in parole and probation agencies has led to a new need for detailed locational information relating to all aspects of necessary tasks. Agencies need to know where their offenders are located: Where do they live? Where do they work? How are treatment facilities located with respect to the offenders needing treatment? Where are sex offenders? What is the distribution of offenders with respect to hot spots[1] of crime? How can law enforcement agencies know, in a timely manner, where parolees and probationers are located? Who are the mandatory releasees this week and where did they go? Is there any connection between an outbreak of crime and the domicile or place of work (or route to and from work) of a parolee or probationer? This project was designed to assist the Maryland Division of Parole and Probation in developing the capability to answer such questions. Hardware and software were provided, in addition to training and consulting on matters relating to the development of in-house capabilities in the realm of geographic information systems (GIS). Three staff members received intensive training in the application of GIS tools to data provided by the Division in the course of calendar year 2000. At the conclusion of this training, the staff members were capable of taking raw data from the Division database, parsing and geocoding it, querying it, mapping the results and incorporating them in reports. Databases subjected to analysis in the course of this project dealt with aggravated assault, treatment data and sex offender data. Meetings were held with management and staff and

[1] The term "hot spot" has two meanings in this report. The generic meaning refers to any cluster of crimes. When capitalized, as in "Hot Spot," the reference is to the government Hot Spot crime reduction program involving areas officially designated as such and qualifying for specific forms of support, such as a storefront police presence. For additional information on the manner in which the formal Hot Spot program relates to the Maryland Division of Parole and Probation, see: http://ns1.dpscs.state.md.us/pnp/hotspot.shtml.

representatives of other law enforcement agencies, including Baltimore City and County Police Departments, and the Police Departments of Anne Arundel and Howard Counties with a view to assisting in the integration of GIS tools and database access across agency boundaries. Division management have now expressed the intention of increasing GIS capabilities in the near future as tools to be used in the new Proactive Community Supervision (PCS) model.

INTRODUCTION

PROJECT OBJECTIVES AND GOALS

As noted in the project proposal, new emphasis on community probation has given new prominence to questions relating to the location of parolees and probationers and their relationship to various elements of communities, including the resources needed for supervision. The Proactive Community Supervision (PCS) model represents a radical departure from prior practice in the Maryland Division of Parole and Probation (DPP). With a net increase of 5,331 offenders admitted to Maryland prisons between 1990 and 1996 (DPP, 2000), it became clear that alternatives to incarceration would have to be explored, and the model eventually adopted, the PCS, places a premium on information and communication. Consistent with this, a Division report called for a technology upgrade:

> Additional technology needed under the PCS model includes digital cameras, electronic surveillance technology, and Geographic Information Systems (GIS) to map offender locations for planning purposes and resource allocations (DPP, 2000).

Virtually every activity embedded in the new PCS model can benefit from the support of GIS tools. In an article detailing various aspects of PCS, Division Director Judith Sachwald noted, for example, that

> Under PCS, agents are assigned to supervise offenders in a specific neighborhood or area . . . PCS takes agents into the community to do the bulk of their work . . . Agents work with [offenders] to identify and guide them to the services they need to fight addictions, gain basic job skills and education, and find a decent job (Sachwald, 2000).

This brief quotation points to a sample of the rich variety of geographic data that could be used to support agents in the field. Agents work in *specific neighborhoods* in the

community and guide offenders to needed services. Thus quite apart from the basic need to map offenders in order find out where they are, information on those neighborhoods and communities can help agents fulfill their responsibilities relating to treatment, employment, and other services. Such information can be mapped and related to the geography of offenders in order to optimize the match-ups between offenders and services.

This suggestion is only the tip of the iceberg of possibilities for spatial analysis in support of community crime prevention in a PCS framework. Great concern, for example, focuses on *recidivism*, which can itself be represented on a map of recidivists symbolizing a dichotomy between those who did and did not complete treatment. Is recidivism (or failure to complete treatment) more prevalent in some neighborhoods than others? Why? Are needed support services lacking in those neighborhoods? What adjustments can be made to improve access? Another tool mentioned in the recent reports on PCS is *risk assessment*. This too can be mapped, either as individual risk scores or cumulative scores across neighborhoods or communities, or both, in order to provide a better community perspective on risk.

Examples of questions relevant to a geographic perspective include:

Where are persons under supervision located with respect to:

- Crime hot spots (both formally and informally defined);
- Other probationers or parolees;
- The subjects of protective orders; and
- The availability of drug treatment and other needed services, including the agency office serving as the focus of community-based efforts.

Other relevant questions include:

- What type of offender lives where?

- What are offenders doing?
- How can agent travel time to offenders be minimized?
- Does the administrative geography of the DPP need to be adjusted so that boundaries reflect functional areas with respect to PCS management?
- Can geographic analysis of agent caseloads help evaluate agent performance?

The primary objective of this project was to introduce and transfer GIS technology to the DPP. Prior to this project, in Baltimore City locational information to facilitate responses to questions in the DPP was compiled manually by zip code. This system was slow, labor-intensive, and error prone. Furthermore, even when data were compiled, the capacity for analysis was severely limited owing to the inflexibility of the available information. Zip codes are too coarse as units of analysis, containing in Baltimore City an average of more than 22,000 persons. With zip codes as the underlying units of observation, subjects of a locational analysis may in reality be located anywhere within the zip code area, rendering the "pinpointing" of information impossible. This project enhanced the ability of the DPP to analyze and to display information relating to its clientele with much greater precision through the introduction of geographic information system (GIS) technology in partnership with the University of Maryland Baltimore County (UMBC). The project has assisted DPP in moving toward analytical self-sufficiency in the realm of GIS through the development of a research partnership between DPP and UMBC.

Specific project goals included:

- purchasing a computer, GIS software, and base maps;
- obtaining raw data from DPP and parsing and geocoding the data;

- selecting and training DPP staff on GIS technology through working on various exercises

- acting as a catalyst to enhance the interface between DPP and its law enforcement partners with respect to the sharing of data amenable to analysis in GIS; and

- showing the value to DPP management of GIS technology within community corrections.

RESEARCH DESIGN AND METHODOLOGY

GIS capabilities were "twinned" at both the DPP and UMBC, in order to conduct a process of technology transfer, training, and analysis over a period of 12 months. Data were transferred to UMBC for processing and analysis, and products were returned to DPP to demonstrate how practical assistance could be provided in the caseload management process. In order to build in-house analytical capability at DPP, agency personnel were assigned on a limited basis to learn how to use GIS and related programs. This project was designed to support DPP initiatives to include the supervision of sex offenders throughout Baltimore City (known as Region II), whether probationers, parolees, or mandatory releasees. The original intent also included other special populations, such as Hot Spots and Drug Court, whether at the Circuit or District Court level. However, time did not permit extension of the project to these specific populations. Future plans would include using this technology for the *Maryland Correctional Options Program (COP)* that stresses community supervision and accountability, and *Break the Cycle*, which emphasizes testing, sanctions and treatment for addicted offenders, and other special programs. Although the limited time available for the project did not permit inclusion of these initiatives, the project did use GIS for mapping drug offenders and their accessibility to substance abuse treatment facilities in Baltimore City. These offenders comprise the bulk of the populations in *COP* and *Break the Cycle.*

PROJECT LIMITATIONS

The project was designed to start January 1, 2000 and terminate December 31, 2000. The Organization and Management plan reflected this time frame (Table 1). In order to ensure a rapid start to the project, and to enable the Principal Investigator to dedicate an appropriate fraction of his time to the project, the PI was able to obtain a one course reduction in teaching load the Spring semester, 2000. To further ensure adequate support for the anticipated major start-up effort, and to adhere to the Organization and Management Plan, a Research Assistant was hired effective January 2000. No start-up problems were anticipated. As the letter of support from former Director Thomas Williams (Appendix II) indicated: "I understand that the project, if funded, would take place in calendar year 2000. The Organization and Management Plan appears to outline a logical series of achievable steps *and we could accommodate this schedule.*" [Emphasis added.]

Meetings were held with DPP staff as early as possible in 2000 in order to ensure that the project would commence as scheduled. The PI initially met with two DPP staff on January 10th to discuss the project objectives and goals, as well as to establish an initial working relationship. Based on that meeting, it was determined that other DPP staff and staff from the Department of Public Safety and Correctional Services' (DPSCS) Information Technology and Communications Division (ITCD) needed to be present at the next meeting. Specifically, meetings were held at DPP on February 3 (the earliest possible date manageable by all parties), February 29, and March 28.

At each meeting, the necessity of access to data and the designation of project personnel within DPP were stressed repeatedly. Also at each meeting, assurances were received to the effect that these requirements would soon be met. As time passed, however it became clear that the Organization and Management Plan was falling seriously behind schedule. In addition, it was determined by ITCD staff at the March 28 meeting, that a Memorandum of Understanding (MOU) would be needed between DPP, UMBC, ITCD, and the Department's Assistant Attorney General before data could be given to the PI and the project could begin. This requirement had not been mentioned in

the original support letter or in any prior conversations, planning meetings, or other communications.

The MOU was needed in order for the PI to receive access to confidential records on offenders. The DPCS is extremely careful with the use and dissemination of data. The MOU was a necessity. Assurances were received to the effect that the MOU would be made available within two weeks following the March 28 meeting. However, given the bureaucratic culture of government, and the numerous signatures required, the MOU did not become operational until late June (Appendix I), thus cutting in half the time available for the project. In order to meet the project objectives and goals, the entire project would have to be condensed into the second half of 2000, the shaded area in Table I, an impossible task.

In Spring 2000, while waiting for the MOU to materialize, the PI and his assistant, lacking "real" data, put considerable effort into attempting to adapt published ESRI exercises for the DPP environment. This effort was ultimately deemed unproductive since the ESRI materials were too abstract, even with modification, to make for a suitable training environment for DPP personnel.

As soon as the MOU was signed, ITCD staff began to extract the required data so it could be transmitted to the PI. While waiting for the data to be extracted and transmitted, the PI installed and configured the hardware and software at DPP. In addition, DPP staff were selected and committed to the project. The staff selected to participate on this project included a trainer-for-trainers, highly computer literate; the DPP's Management Information Systems (MIS) Manager, who is responsible for preparing DPP's *ad hoc* reports; and the MIS Manager's Assistant. The assumption was that at least one (presumably the trainer-for-trainers) would then go on to diffuse GIS throughout the agency. The release time necessary for training these individuals was paid for out of grant funds. Training sessions were held with those three persons on an approximately weekly basis, from July through September, with some exceptions due to illness or other conflicting responsibilities. However, the staff were committed to this project, and enthusiastic.

On June 26th, the PI and research assistant met with DPP staff and staff from the Howard County Police and Baltimore County Police Departments to explore how data could be shared among the different agencies. At this meeting, a presentation on the Regional Crime Analysis System (RCAS) was conducted by Philip Canter of the Baltimore County Police Department. This meeting served as a catalyst for enhancing the relationships between these agencies with respect to the sharing of data amenable to analysis in GIS.

In late September, the PI pointed out that the two data sets that had been provided (*Drug Treatment* and *Sex Offenders*) had been exploited as much as possible, and new data would now be needed in order to take the project forward. No additional data were forthcoming. However, it was agreed that the PI should make a presentation to DPP managers and others in order to demonstrate the potential of GIS within DPP and to generate new ideas for using GIS technology. It was anticipated that this meeting would take place in October. The plan was to have the presentation at the monthly DPP Leadership meeting so that DPP's regional administrators statewide and executive staff could see the same presentation. However, it was not possible to put this meeting on the DPP Leadership Team's meeting agenda due to previously scheduled presenters for October, November, and December and January. By February, the Monday morning meeting time presented a schedule conflict for the PI.

Although this large group meeting did not take place as anticipated, the PI did meet on February 13, 2001 with two executive managers at DPP, the Executive Deputy Director Richard Sullivan and Deputy Director Debra Kafami; Patrick McGee, the Correctional Options Program Manager; and Elizabeth Bartholomew, Research Coordinator for the DPP's Center for Sex Offender Management (CSOM) collaborative program planning grant. The PI shared the results of the exercises, which demonstrated how this technology could be used in DPP. Mr. McGee was extremely interested in using the GIS technology with his offenders, in particular, Hot Spot offenders who were assigned to his span of control in January 2001. Ms. Bartholomew also expressed interest in GIS technology in relation to tracking sex offenders, in particular, the proximity of their homes to schools, childcare centers, and playgrounds. The Executive Deputy

Director Sullivan and Deputy Director Kafami were interested in using GIS technology in relationship to management issues, such as the assignment of caseloads according to offenders' geographic location and where to locate DPP offices. From this meeting, it was agreed that a mutually convenient meeting for DPP staff and the PI would be scheduled this Spring to further explore the use of this technology in relationship to the DPP's new Proactive Community Supervision model. Eventually, a presentation was scheduled for September 10, 2001.

CONCLUSION

From the PI's perspective, the discontinuity between the obvious interest in the project at the agency on the one hand, and the extraordinary delays, on the other, is puzzling, and may provide a lesson for other potential collaborations. Implementing a new project while an organization is undergoing significant operational and cultural changes is apparently extremely difficult. Also, one must not forget that government is often bureaucratic. The weak link in a collaboration between a public agency and a university-based PI may be that the PI is completely dependent on the agency for the material resources for the project, but the agency has total control over those resources, so the PI is in effect at the mercy of the agency.

WHAT WAS DONE?

Training was carried out with three individuals from the Division of Parole and Probation. This training involved the application of GIS tools to three data sets relating to Baltimore City:

- Aggravated assaults (as a stop gap while waiting for actual DPP data)
- Drug treatment, i.e. offenders in treatment for addiction or other conditions demanding therapy of some sort
- Sex offenders

INTRODUCTION VIA AGGRAVATED ASSAULT DATA

The three personnel participating in the orientation to GIS had no prior experience with GIS, or computer mapping in any form, and they also varied in general computer expertise, with two being very experienced, and one much less so. In order to demonstrate in a simple way how local data could be mapped, and prior to the provision of data relating to parole and probation issues, a previously-acquired data set of Baltimore City aggravated assaults was made part of the first analysis. The focal point of the geographic area was the Division of Parole and Probation office (Reisterstown Plaza) where the instruction was taking place. This analysis demonstrated the mapping of point data and the use of elementary queries, such as the selection of all incidents that occurred on the street (shown in yellow in figure 1), in addition to incidents that occurred with and without injury. The concept of buffering was also illustrated via the placement of a one mile buffer around the Reisterstown Plaza location and the mapping of incidents that occurred within that buffer zone.

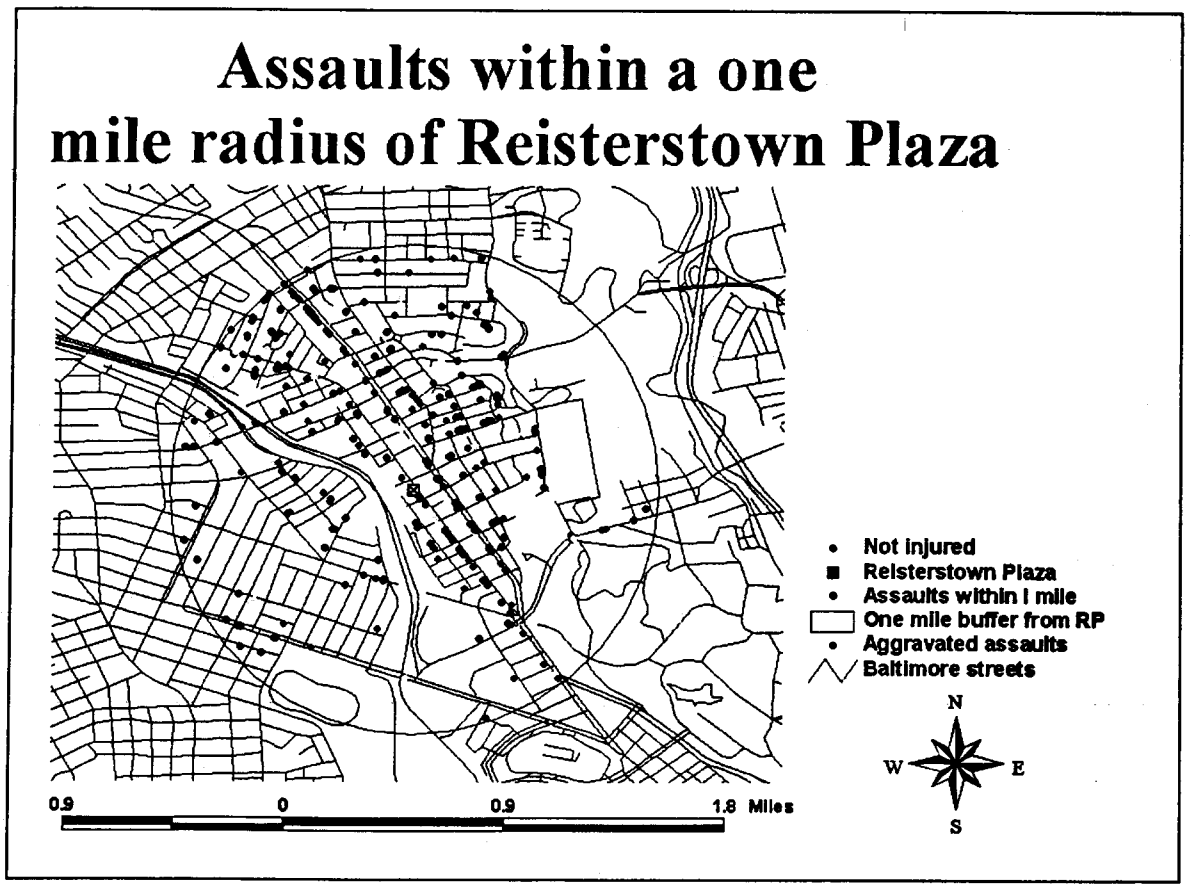


Figure 1. Layout from an introductory analysis to demonstrate mapping of point data in the vicinity of the Division of Parole and Probation offices in Reisterstown Plaza, Baltimore.

DRUG TREATMENT DATA

1. USING DRUG TREATMENT DATA – FROM DATABASE TO MAP

The analyses undertaken in the course of this project assumed no prior knowledge on the part of the personnel involved, and built skills incrementally by employing data and problems likely to engage the interest of the trainees. The background resource employed for reference purposes was *Getting to Know ArcView GIS* (Second edition, 1997), published by Environmental Systems Research Institute, Inc. (ISBN 1 86242 019 X). The trainees were strongly encouraged to work through the book in order to reinforce the skills developed in the course of the regular instruction sessions. Page references in the following materials relate to this book.

In the material that follows, edited versions of the training materials have been included in order to illustrate the issues addressed by the project. This report has also been designed to act as a guide for any DPP personnel who may wish to work through examples given that the data and all these projects are still available on the computer provided as part of this grant. All that is necessary to make the GIS system at DPP functional is a valid license from ESRI who provided permission for the use of the UMBC license for the duration of the project. This licensing arrangement regarded the DPP project as an extension of UMBC's lab facility on a temporary basis, through December 31, 2000. Licensed copies of digital streets data bases have been provided to DPP.

In the following materials, the format generally adopted states the objective to be addressed, followed by the steps necessary to accomplish that objective, as well as the products that emerged from the activity. ***Readers may wish to skip "steps" which will be of more interest to persons wishing to emulate the activities presented.***

OBJECTIVE

- Take raw DPP data in text format, parse it, convert it to dBase format, and geocode it in order to make the data compatible with ArcView.

STEPS

- Identify the relevant file as supplied on floppy disk (OBII.txt, 168k)
- Open MS Excel or similar spreadsheet or database program. (MS Access is OK, of course.)
- In excel, go to Data, Get External Data, Import Text File (or just double click the file name).
- Step through the Text Import Wizard, using the Fixed Field Guide sheet (attached) to help you determine where column breaks should be and what type of data you are dealing with.
- Step 1.
- Data are Fixed Width.
- Start import at Row 1.
- File origin Windows (ANSI).
- Step 2.
- Click on column guide to insert breaks at appropriate locations.
- Click on and drag to remove lines at inappropriate locations.
- Step 3.

- Click on column headers to select the columns and make decisions about the designations of each column, such as whether it is text, date, etc. Only a few date columns need to be changed.

- Finish. (Excel offers the opportunity to place the data in the current worksheet – OK.) Data are now in an Excel worksheet, properly formatted.

- File, Save As, then rename the file and select dBase IV format.

- Message appears. Click OK.

- Message appears. Click Yes.

- Your file is now compatible with ArcView, but needs to be geocoded (linked to the street map) before it can be mapped and analyzed. See Chapter 26 in Text.

GEOCODING: MATCHING DATA ADDRESSES TO THE BASE MAP

- Open ArcView and create a new View. Add Citystreets.shp theme. See CD entitled *Baltimore City Streets Reference File for Geocoding.* Open the Attribute table for the streets theme.

- [Note how this table is structured and consult p. 26-4 for additional explanation.]

- Go to the Project table of Contents and click Tables, Add, and open the Sex Offenders table.

- Rename the Address Field so that it can be identified for geocoding purposes. (Table, Properties, provide the appropriate alias.)

- Make the View active.

- Theme Menu, Properties.
- Click the Geocoding icon.
- Select the 'U.S. Streets' Address Style if not already displayed.
- (See pages 26-6, 26-7 for more explanation.)
- Click OK.
- View, Geocode Addresses.
- Go to Address Table drop down list and select the Sex Offenders dbf table.
- Have 'Address' show in the Address Field box.
- Click Batch Match.
- [Program links addresses to locations on the streets map.]
- Results should show 514 (85%) as a 'Good Match.' (This is pretty good.)
- We now need to deal with 'No Match' records (88 = 14%)
- Click Interactive Re-match. (See *Handling Un-Matched Addresses*, p. 26-14.)
- No candidate appears for the first unmatched address, so we will relax the criteria for matching.
- Click Preferences in the Geocoding Editor box.
- Reduce Spelling Sensitivity to a low level. This will result in the display of virtually all candidates for the address under review. This is

important since the street addresses in the source file are contaminated with lots of "junk;" see illustration attached.

- Check 'Review candidates . . . when . . . ' and check relevant boxes.
- Click OK.
- Click Continue/Next, as necessary, and go through all unmatched records, as follows:
- Compare 'upper' addresses with the address that shows in the 'lower' box. If a match seems reasonable, click Match.
- Click Done.
- Click Done in the Re-Match Addresses box.
- Make the new geocoded shapefile active so you can see the points on the streets map. {Make sure the geocoded file is saved where you can find it.)

Note that the address data are contaminated by various errors and inconsistencies, such as the addition of the city name to the street address as shown below.

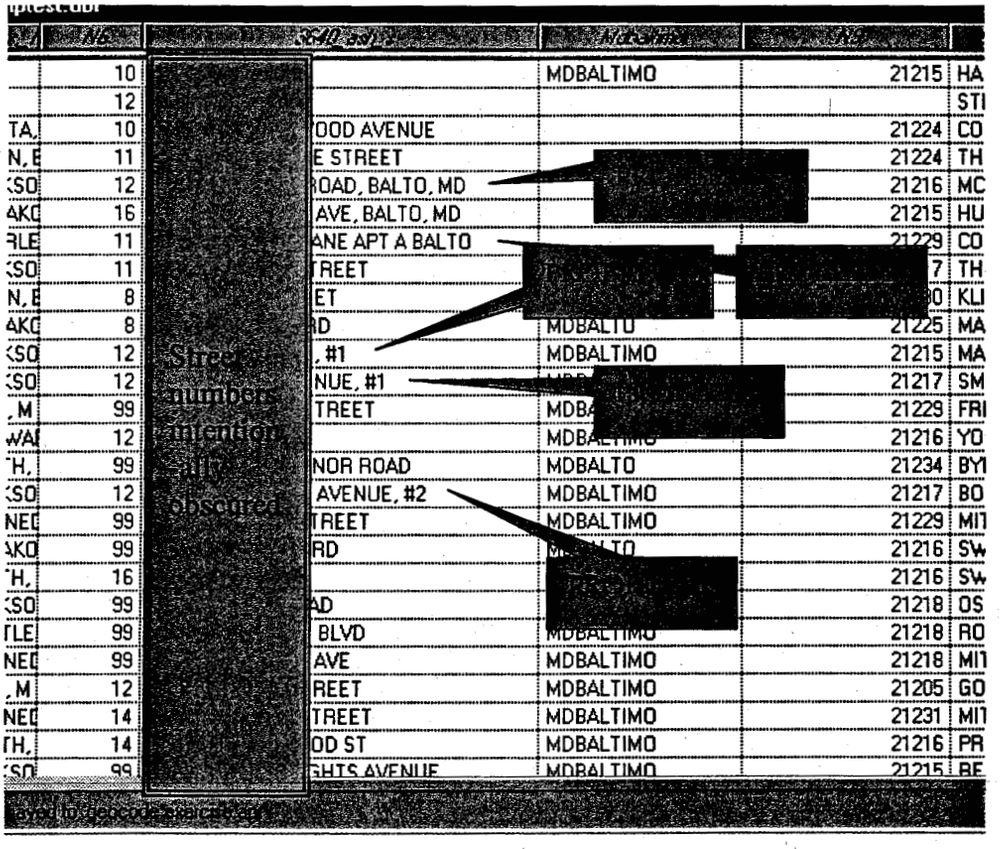


Figure 2. Common problems encountered in the process of matching data to a streets base map.

IMPORTANT NOTE

Problems like this can be avoided by making sure that the address records are as "clean" as possible at the source. Coordination is necessary between the parties responsible for reporting addresses, and those responsible for geocoding and analysis. Without such coordination, a substantial amount of data will be lost.

Some problems can be overcome via interactive matching, but in other cases records will be lost to the process of geographic analysis owing to the lack of a geocodable address.

2. USING DRUG TREATMENT DATA: ASKING QUESTIONS AND MAPPING RESULTS

OBJECTIVE

Develop queries from the Drug treatment data and map the resulting patterns.

STEPS

- Write a series of queries that will separate the caseloads of several agents.
- Create separate shape files for each and make distinctive symbols.
- Write a query that will create a shape file to show where all Agent xxxx's clients are who are single and employed.
- Write a query that will identify the locations of all younger clients (born since 1969).
- Modify the legend for the Drug treatment file so as to give each agent a distinctive symbol, illustrating how to avoid the steps taken above to create separate symbolization for each agent.
- Develop other queries that address real issues concerning the Drug treatment data, and convert them into shapefiles that illustrate the analyses.

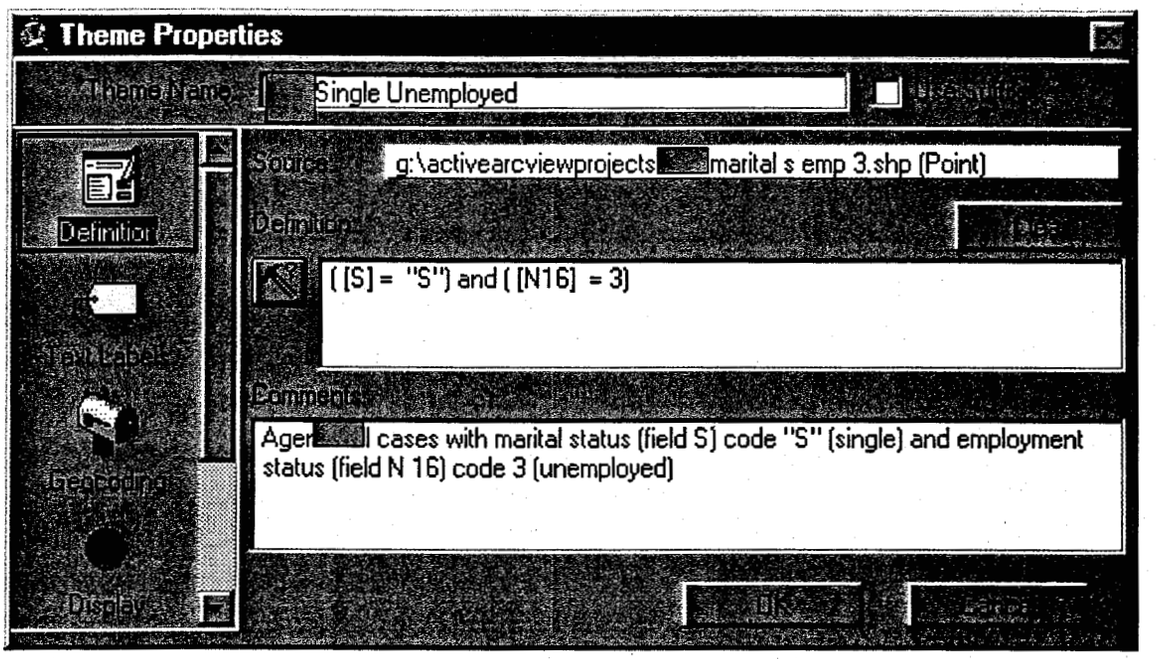


Figure 3. Query to separate Agent xxxx cases that are single and unemployed. Agent's name intentionally obscured.

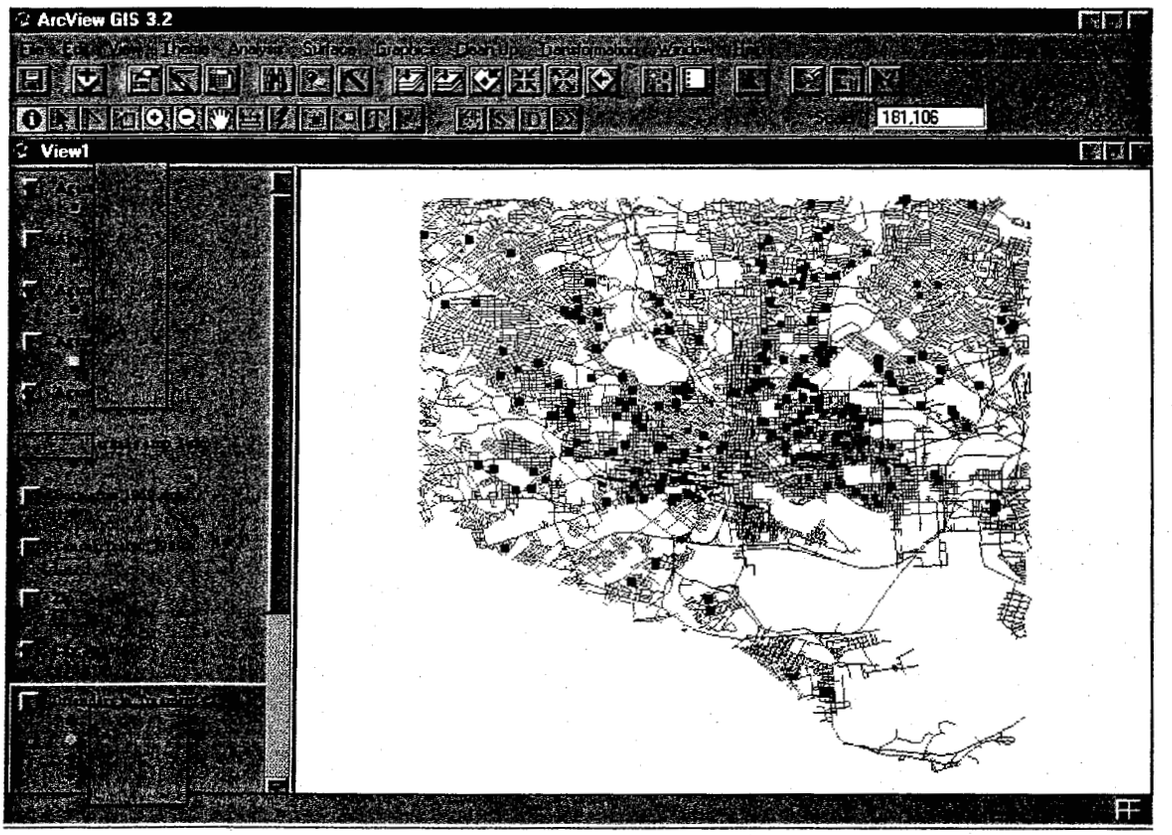


Figure 4. Agents xxxx, xxxx, and xxxx cases separated using individual queries. Agent names intentionally obscured.

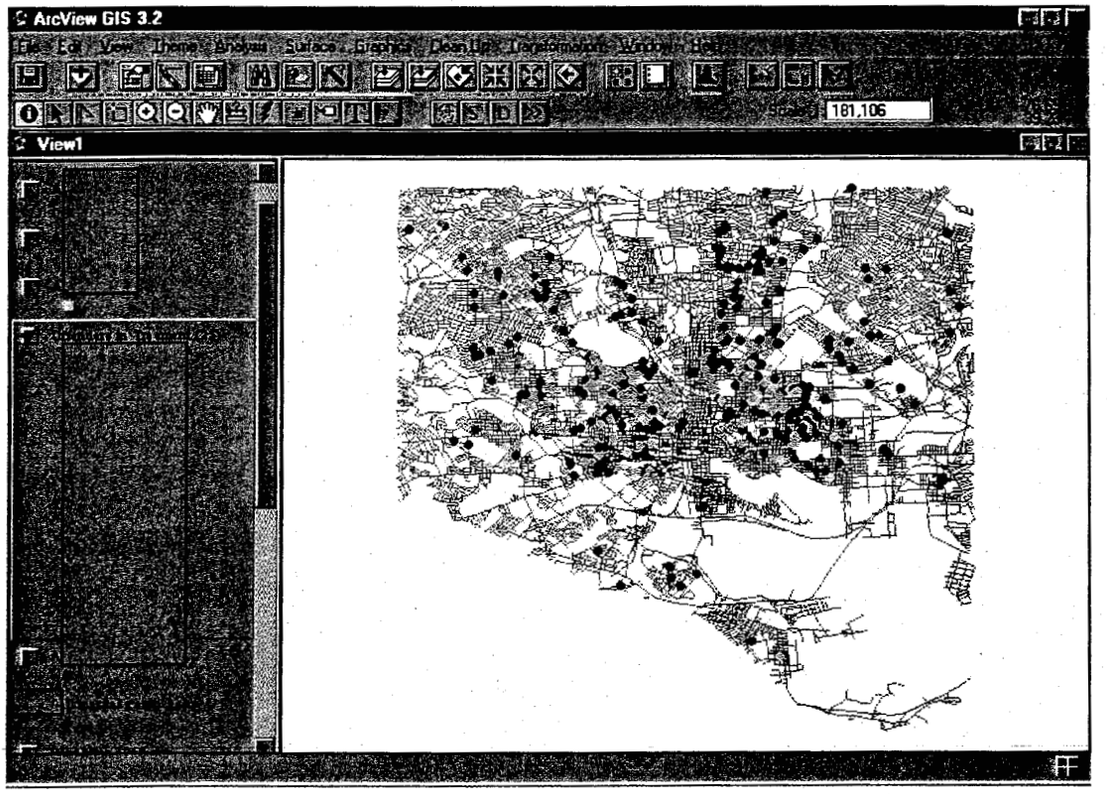


Figure 5. All cases mapped with uniquely colored symbols. Note that it is virtually impossible to discriminate among agents using this method, suggesting that it is better to separate them using individual queries. Agent names intentionally obscured.

3. USING DRUG TREATMENT DATA: OPTIMIZING THE LOCATIONS OF TREATMENT FACILITIES

OBJECTIVE

General background for the Drug treatment data was developed in the previous two sections involving geocoding the data, examining the general distribution, and isolating data for clients of specific agents.

In this example, approximate locations are established for treatment facilities that will satisfy the criteria of the ***fewest possible facilities serving the largest number of clients***

with the smallest possible travel distances. Locations are established initially by visual inspection based on a smoothed surface of client locations ("hot spots").

Facilities located at (approximately) 1300 N. Carey St., 1000 N. Chester St. and 3800 Yell St, with service areas extending 2 miles from each location as measured in the street network (not as the crow flies, but real street distance) would serve 66% of the 607 clients.

In this case study, two extensions of ArcView will be used: *Spatial Analyst* and *Network Analyst.*

STEPS

- Create a project called *Location* and add the *Treatment (25)* and *Streets* themes.
- *Make sure the Streets theme is indexed*; use the Theme-Properties-Geocoding dialog to do this if it has not already been done.
- Go to Analysis (this is the Spatial Analyst extension) and select Calculate Density. Accept the defaults.
- When this surface is turned on, the lowest class interval of the density layers will obscure the map. Turn this layer off by double clicking the theme, double clicking that class, and making the symbol (foreground) empty be selecting the "X" box in the Color Palette.
- You will now see a smoothed density surface of the drug treatment clients. This will be used to visually estimate centroids (central locations) with respect to these "hot spots." See Maps 1 and 2 in the sequence below.
- Temporarily, make Streets the top layer. Using the Info tool, and visual inspection, estimate three locations that look as if they would be

central to the largest number of clients. Make them in or near the hot spots as indicated on Map 2. Record these addresses to the nearest block. Add to map with View, Locate Address.

- Make the Streets theme active, and click on Network, Find Service Area. This box will come up:

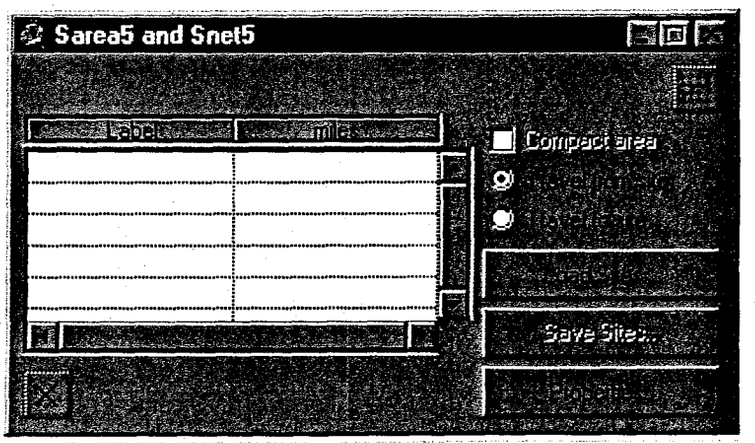


Figure 6. Service Area and Street Network dialog box.

- Two new themes are created, "Sarea" (Service Area) and "Snet" (Street Network). Click on the Add Location by Address button shown below:

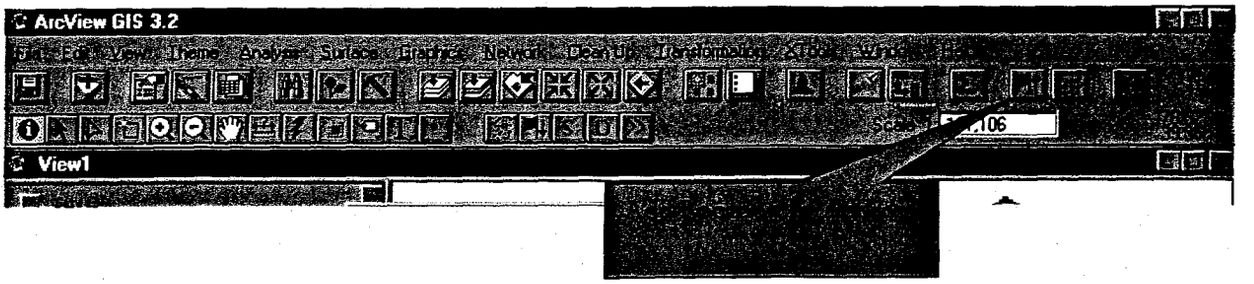


Figure 7. "Add location by address" location on ArcView button bar.

- The following window will come up. Enter the first of your three addresses and click OK.

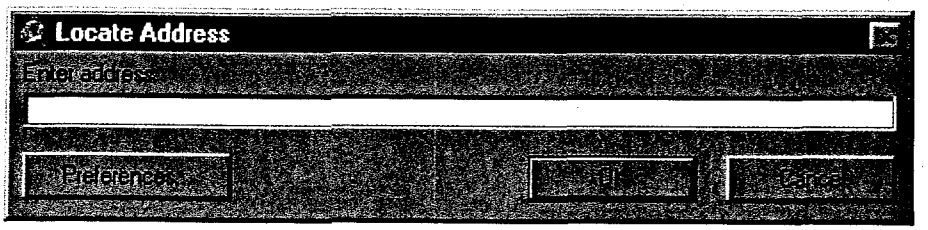


Figure 8. "Locate address" dialog box.

- The data will then be entered in the Sarea/Snet window, like this:

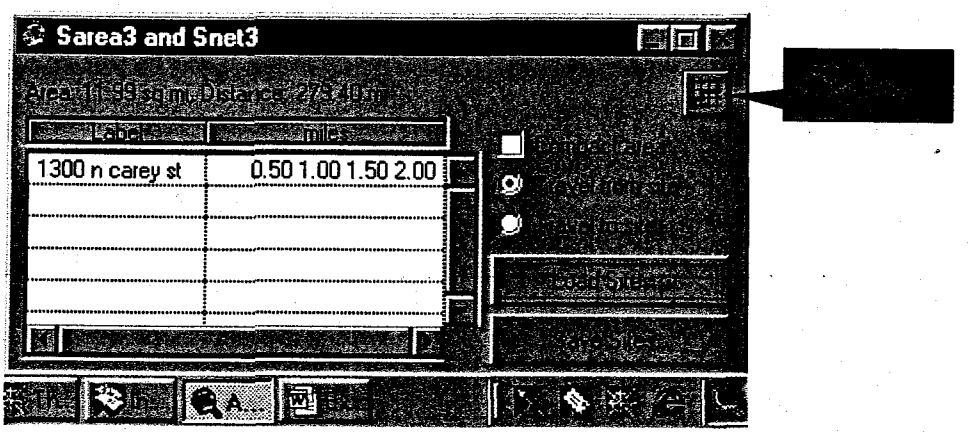


Figure 9. Ready to solve the Service Area and Street Network.

- Double click the "miles" field and change the values to those shown above, or other values you consider appropriate.

- Click the Solve button. The Service Area and related Street Network will now be available as themes (Figure 13).

- Find out how many Drug treatment clients would be served by making the Treatment theme active and then click Theme, Select by theme, making the result a shapefile, and then viewing the resulting Attribute table and reading the number of cases in the table, and recording that number.

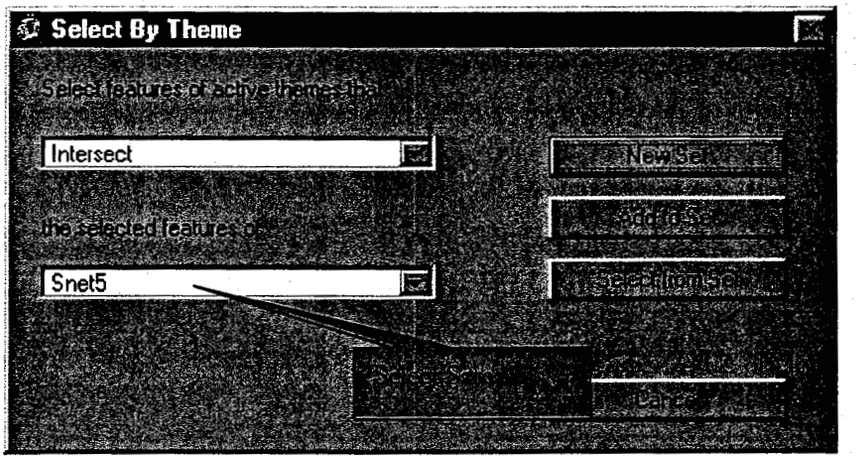


Figure 10. Selecting intersection between active theme and service area.

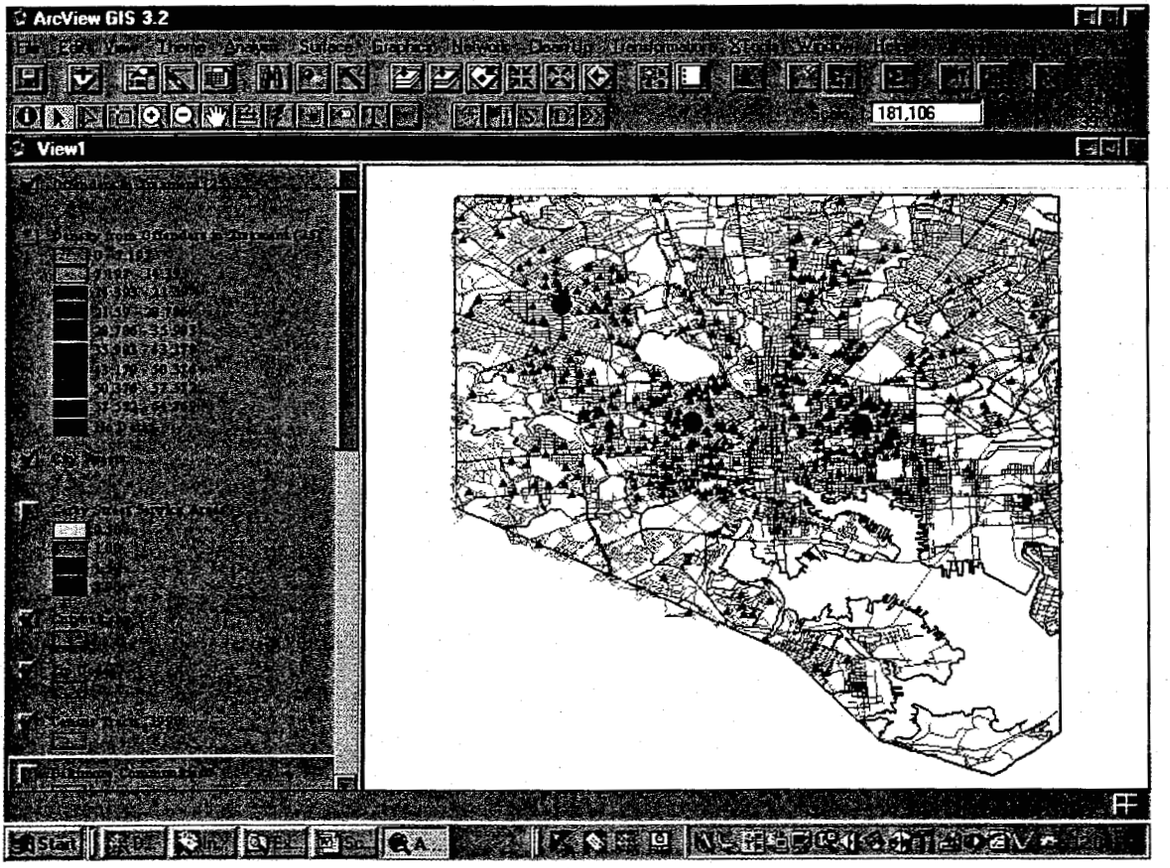


Figure 11. The "raw" data showing the domiciles of drug treatment clients.

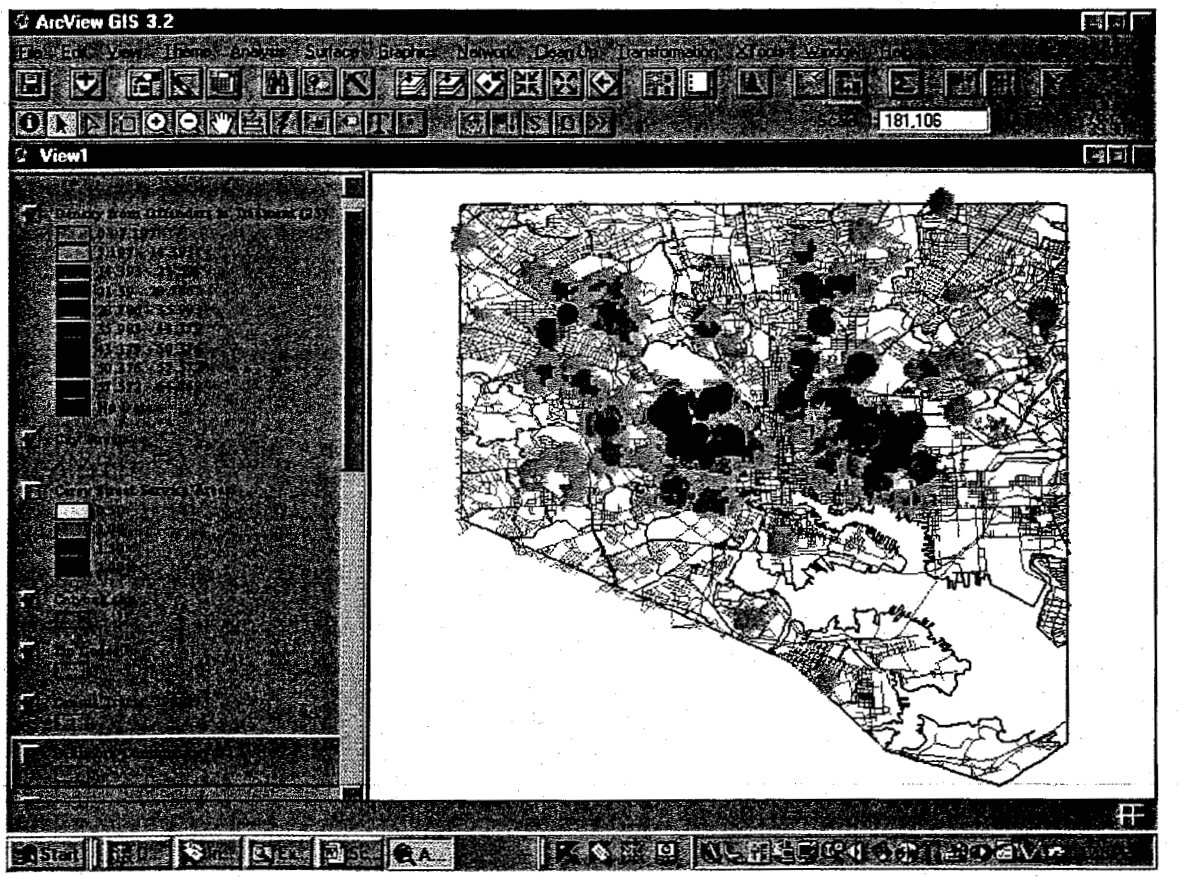


Figure 12. Density surface smoothes the point data to make it more legible and to reveal hot spots. Large dots represent approximate centroids as starting points for experimenting with optimal locations for drug treatment facilities.

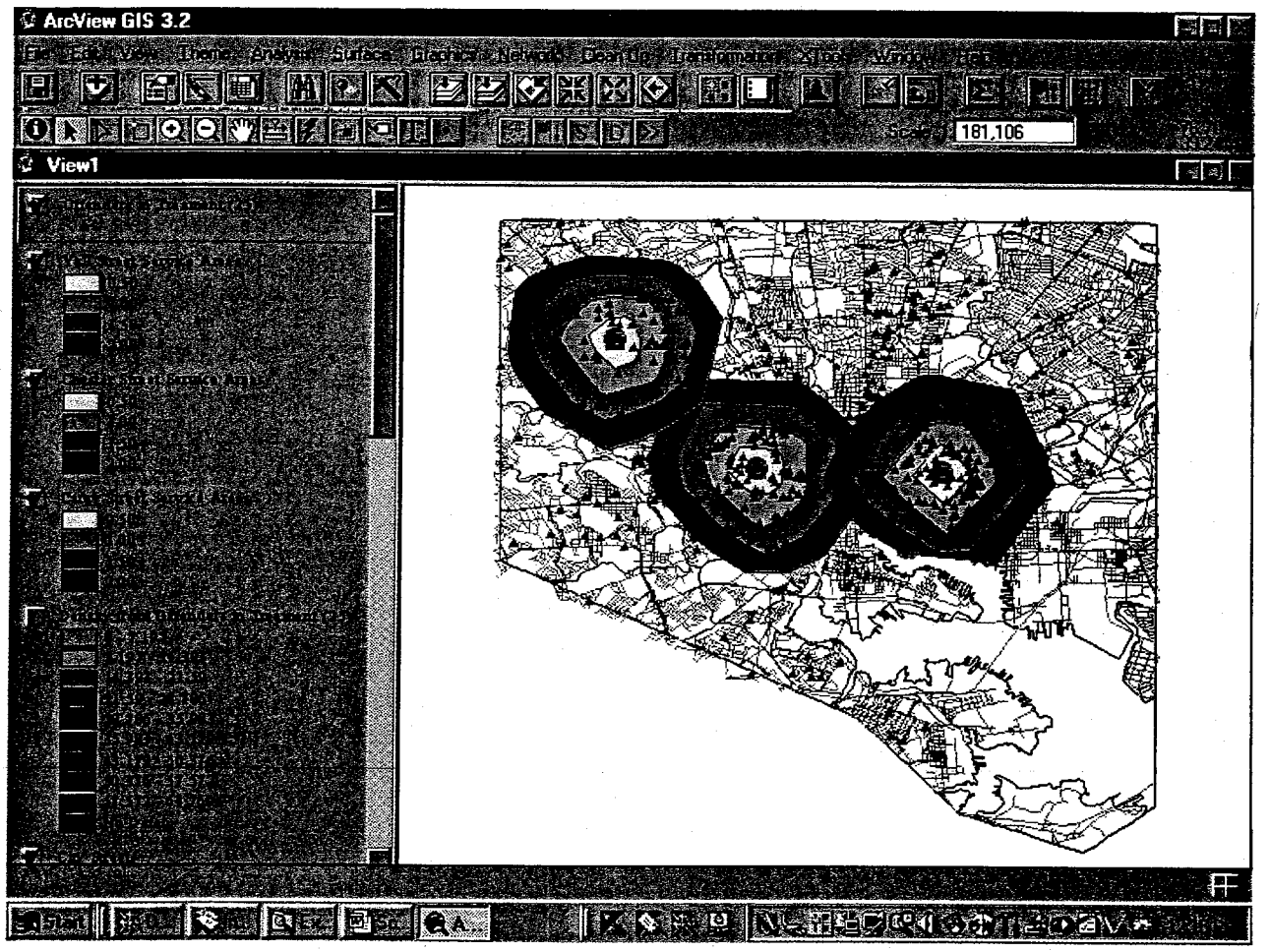


Figure 13. Three locations account for 401 (66%) of the 607 clients in treatment. Zones are located at 0.5, 1.0, 1.5, and 2.0 street miles from each hypothetical facility address. Points in zones represent clients within the 2-mile street distance. There is no double counting.

SEX OFFENDER DATA

1. SEX OFFENDERS: AGENTS, OFFENDERS, AND SCHOOLS

OBJECTIVES

Geocode raw data for sex offenders and create a report that shows offenders domiciled within half a mile of schools, and the agents assigned to them, in alphabetical order. This could provide the basis for information supplied to agents to advise them of the offenders in their caseload who represent the highest risk to school students, at least as represented by proximity to schools.

STEPS

- Take raw DPP data in text format, parse it, convert it to dBase format, and geocode it in order to make the data compatible with ArcView.
- Add themes for Baltimore City Schools, and
- Create separate themes (shapefiles) for each type of school (elementary, middle, high) and add these themes to the view.
- Create buffers at an approximately half mile radius (2500 feet) around each type of school and create new themes for each type of school that show the Sex Offender domiciles that intersect the buffers for each school type. Add these new themes to the view.
- In turn, make each theme table active and alphabetize (ascending order) the field that represents the agent currently responsible for offenders. This will have the effect of separating the offenders into groups for each agent.

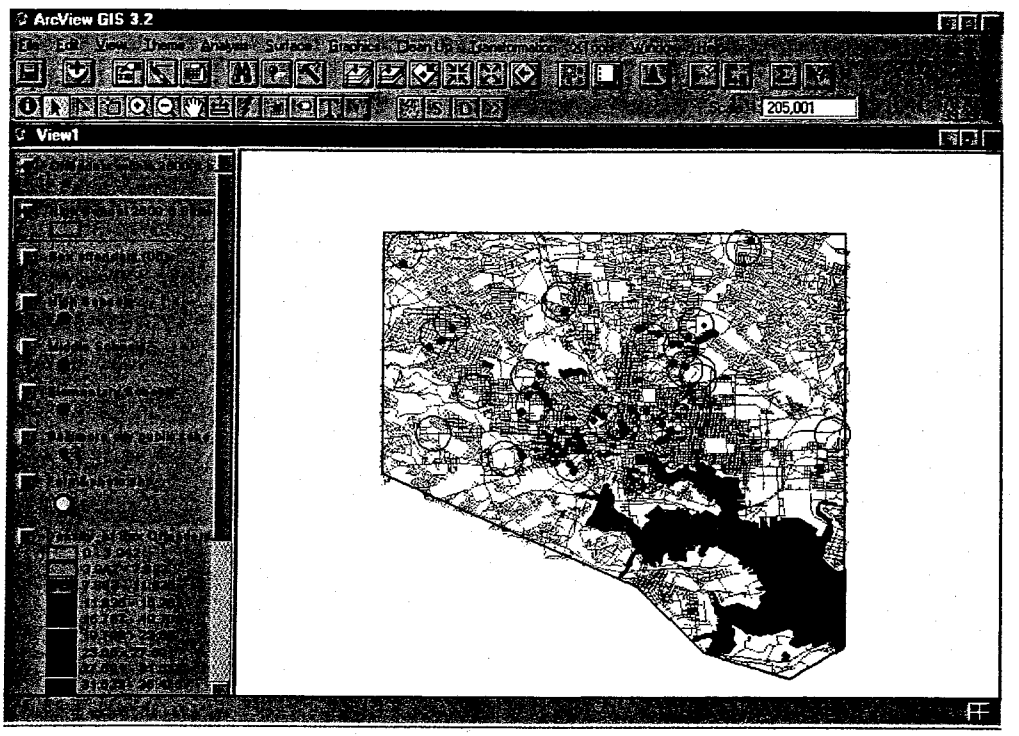


Figure 14. Sex Offenders within 2500 foot high school buffers, Baltimore City

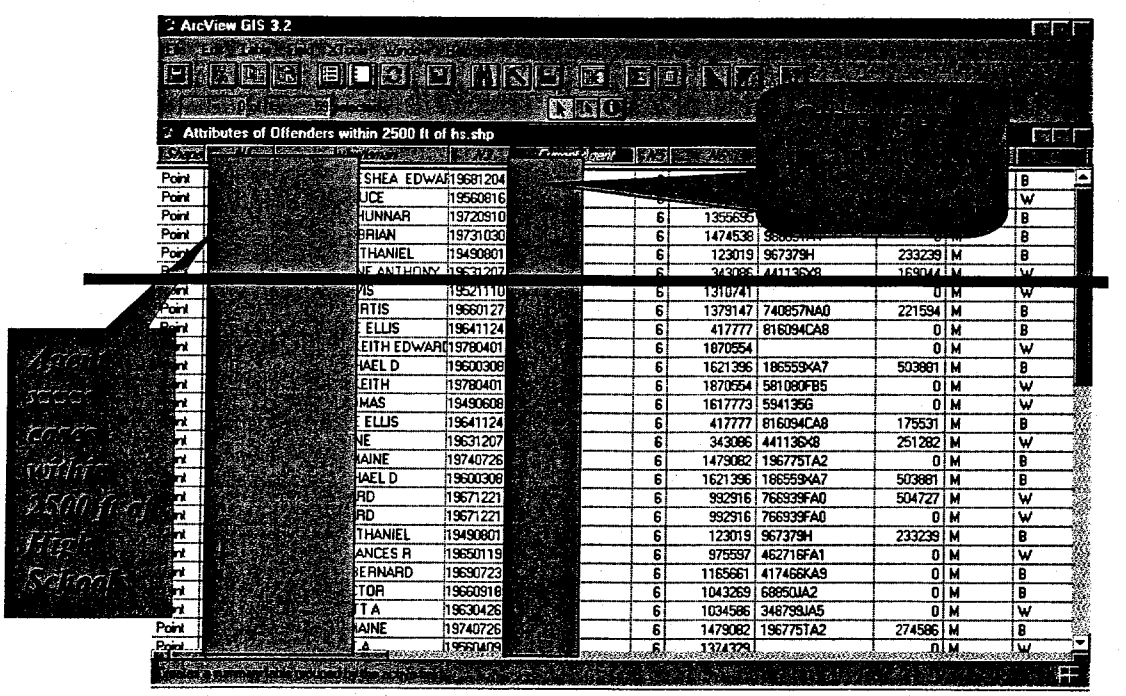


Figure 15. Sex offenders within 2500 ft high school buffers, sorted by current agent. Names of agents and offenders intentionally obscured.

2. SEX OFFENDERS: HOT SPOTS, HIGH SCHOOLS, AND LINKING INTAKE FORMS TO PLACES

OBJECTIVES

- Show official Hot Spots and find out which Sex Offenders are located in Hot Spots, and make a report of those names.
- Show where Hot Spots overlap with High School 2500 ft buffer zones.
- Show how Division of Parole & Probation forms and offender photos (or any other documents) can be linked to map points representing the addresses of those offenders so that the form and photo can be instantly recalled by clicking on the points.

STEPS

Objective: Which Offenders are located in Hot Spots?

- Add theme Hot Spots.shp
- Make Sex offenders(06).shp the active theme.
- Add theme: Hotspot.shp
- Theme > Select by theme > [Complete as indicated below] > New Set

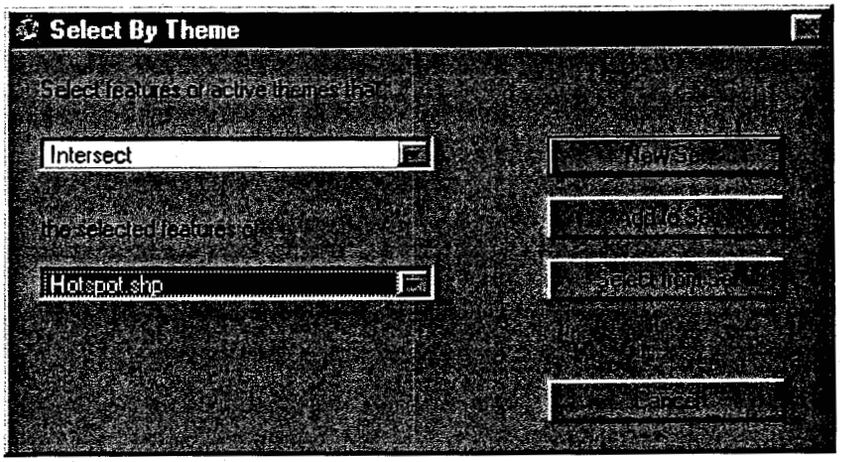


Figure 16. This new theme will show sex offenders located in official state Hot Spots. Theme table can be used to generate a report of the 32 offenders involved.

Objective: Where do Hot Spots overlap with High School Buffer Zones?

To show where Hot Spots overlap with High School 2500 ft buffer zones, it is necessary to find out where polygon themes intersect:

- In View mode, go to Tools > Intersect themes > Select: Hotspot.shp, Hotspot ID
- Select: High School 2500 ft Buffers
- ID
- New theme appears automatically, showing where Hot Spots overlap the High School buffer zones.

Objective: Link Offender Location on Map to Paper Record

- To show how Division of Parole and Probation or other DOC forms and photos can be linked, it is necessary to scan both the form and the photo(s). This is a simple matter, but we will skip this step and rely on previously scanned materials.

- Add theme Form&Photo.shp, select it, and move it to the top layer to make the four points visible.

- Adjust symbolization as necessary. Do not make symbol larger than 10 points. The target symbol may be best for reasons that will become clear.

- Go to Theme > Properties > Make window conform to the following:

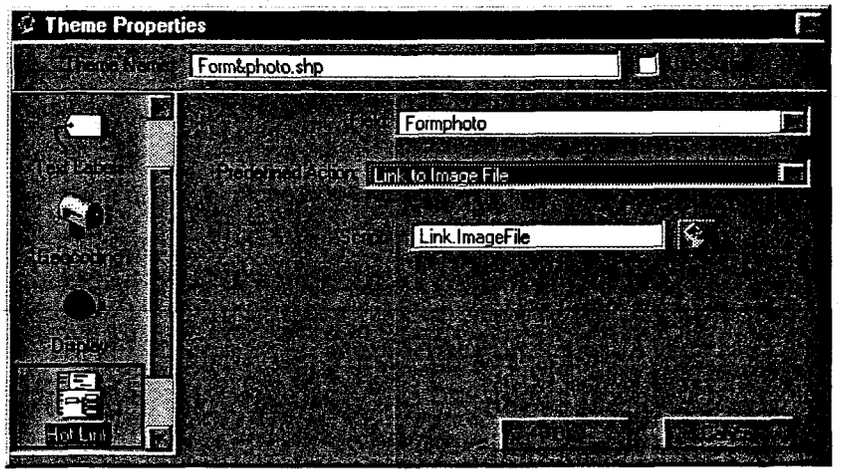


Figure 17. Hot link dialog window. This dialog links new "Formphoto" field in database to the location of the image file.

- Make sure the images to be used are in the same directory as the theme table. The image file in this example is man1.gif.

- When this is complete, the lightning symbol button on the tool bar will light up, as follows:

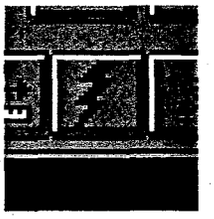
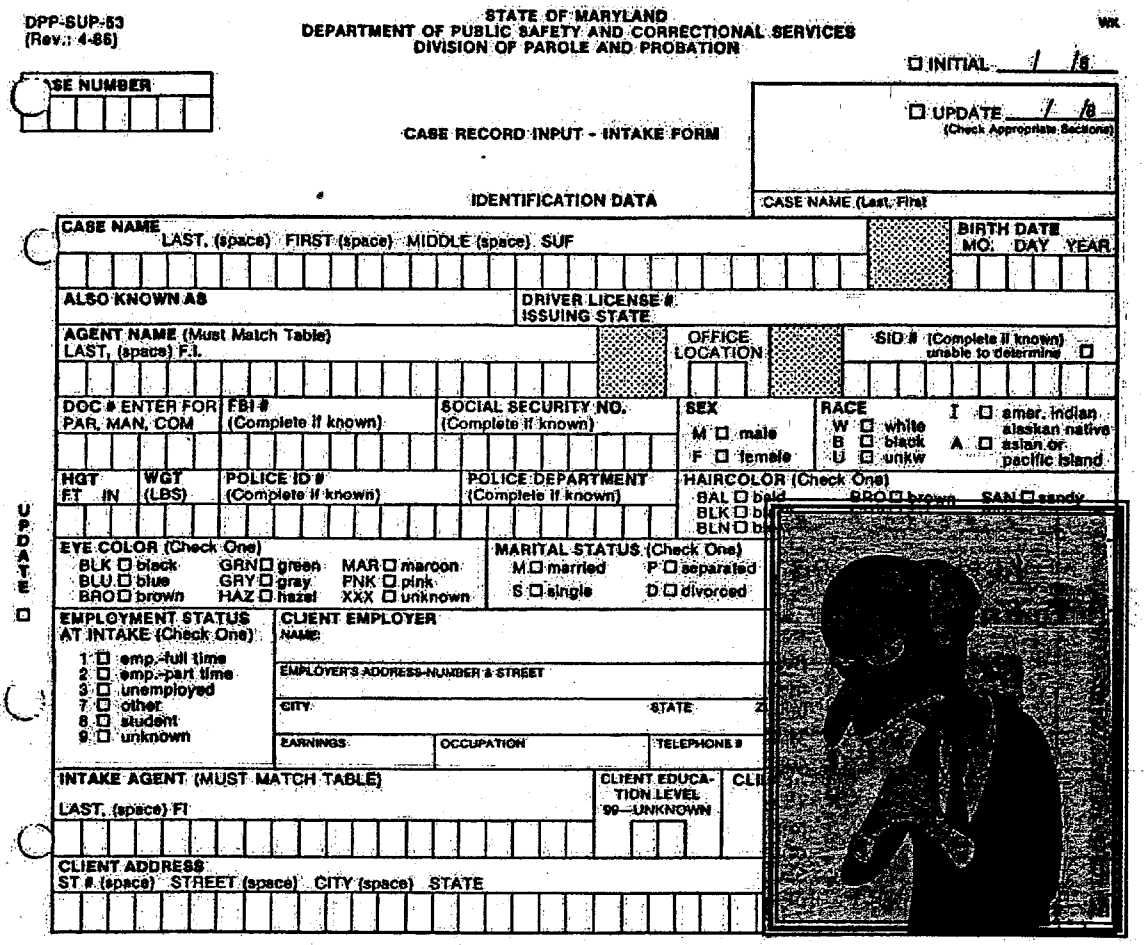


Figure 18. Hot link button on toolbar. When in use, the cursor turns into a lightning symbol which is then used to click on the points of interest.

- Click on it, and then click on the center of each of the "FormPhoto" points on the map, in turn. The form with the picture of each offender should pop up. Maximize each window as it comes up to reveal greater detail.


DPP-SUP-53
(Rev.: 4-86)

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES
DIVISION OF PAROLE AND PROBATION

☐ INITIAL / /

☐ UPDATE / /
(Check Appropriate Sections)

CASE NUMBER

CASE RECORD INPUT - INTAKE FORM

IDENTIFICATION DATA

CASE NAME (Last, First)

CASE NAME LAST, (space) FIRST (space) MIDDLE (space) SUF

BIRTH DATE MO. DAY YEAR

ALSO KNOWN AS

DRIVER LICENSE # ISSUING STATE

AGENT NAME (Must Match Table) LAST, (space) F.I.

OFFICE LOCATION

SID # (Complete if known) unable to determine ☐

DOC # ENTER FOR PAR, MAN, COM

FBI # (Complete if known)

SOCIAL SECURITY NO. (Complete if known)

SEX
M ☐ male
F ☐ female

RACE
W ☐ white
B ☐ black
U ☐ unkw
I ☐ amer. indian alaskan native
A ☐ asian or pacific island

HGT FT IN

WGT (LBS)

POLICE ID # (Complete if known)

POLICE DEPARTMENT (Complete if known)

HAIRCOLOR (Check One)
BAL ☐ bald
BLK ☐ bl
BLN ☐ bl
BRO ☐ brown
SAN ☐ sandy

UPDATE ☐

EYE COLOR (Check One)
BLK ☐ black
BLU ☐ blue
BRO ☐ brown
GRN ☐ green
GRY ☐ gray
HAZ ☐ hazel
MAR ☐ maroon
PNK ☐ pink
XXX ☐ unknown

MARITAL STATUS (Check One)
M ☐ married
S ☐ single
P ☐ separated
D ☐ divorced

EMPLOYMENT STATUS AT INTAKE (Check One)
1 ☐ emp.-full time
2 ☐ emp.-part time
3 ☐ unemployed
7 ☐ other
8 ☐ student
9 ☐ unknown

CLIENT EMPLOYER NAME

EMPLOYER'S ADDRESS-NUMBER & STREET

CITY

STATE

EARNINGS

OCCUPATION

TELEPHONE #

INTAKE AGENT (MUST MATCH TABLE) LAST, (space) FI

CLIENT EDUCATION LEVEL 99—UNKNOWN

CLIENT ADDRESS ST # (space) STREET (space) CITY (space) STATE

Figure 19. When the point representing the offender location is clicked on, the form image pops up. This image is a randomly selected television personality and does not represent any person associated with the Division of Parole and Probation.

2. SEX OFFENDERS: HOT SPOTS, HIGH SCHOOLS, AND LINKING INTAKE FORMS TO PLACES

OBJECTIVES

- Create shapefiles for the major offense categories.
- Create shapefiles for each case type.
- Create shapefiles for each supervision level.
- Create shapefiles for a specific agent and for cases involving maximum supervision for that agent.

Create a *Crystal Reports* report to summarize this information for the agent, including the two maps relevant to this agent. Include in the *Crystal Report* Client, Current Agent, Offense Code, Case Type, and Supervision Level, or other variables of your choice. See sample output attached.

STEPS

Create the following shapfiles, or equivalents:

- Supervision levels
- Major offense categories
- Case types
- Specific agent and category of supervision (Figure 20)

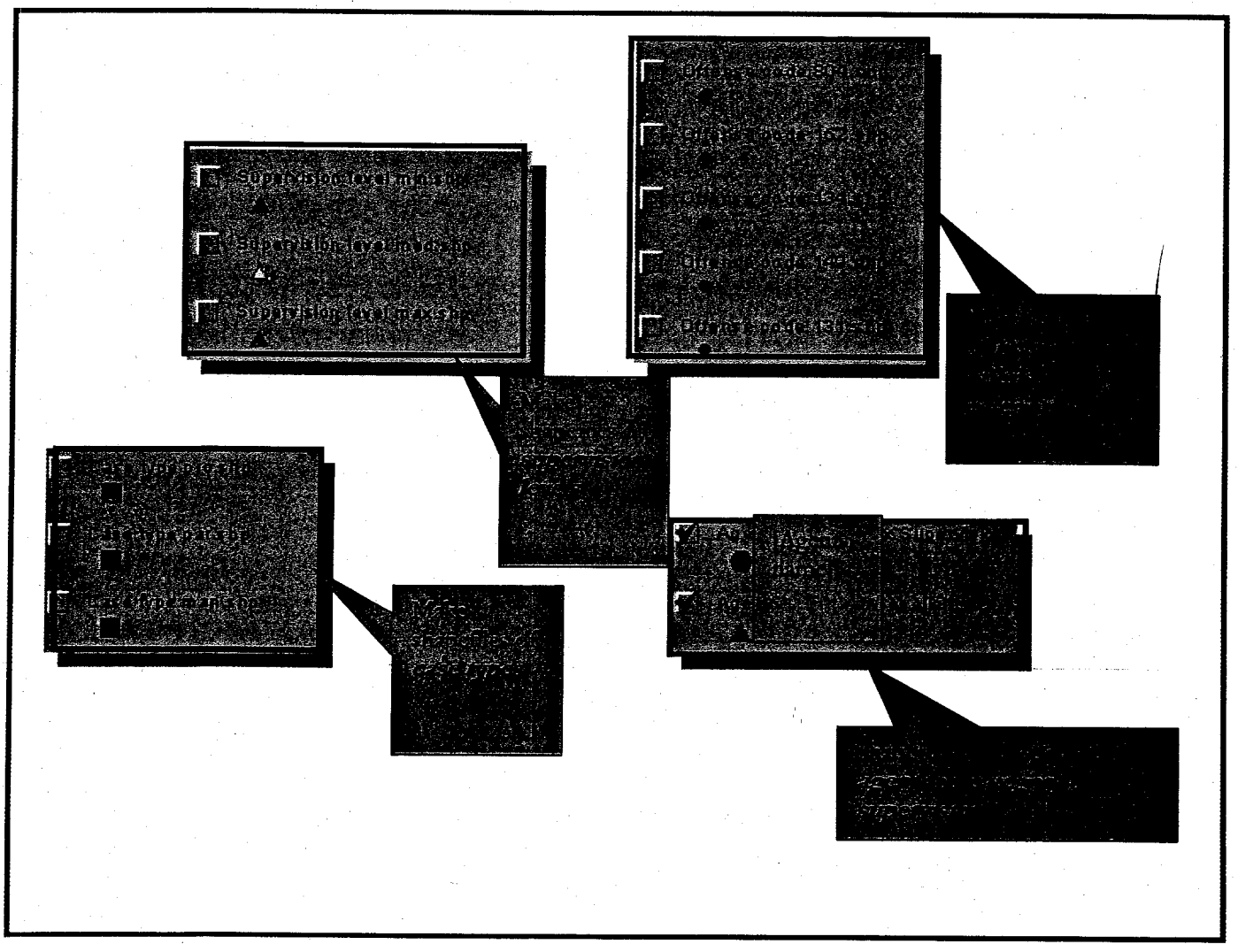


Figure 20. Multiple queries used to create multiple shapefiles as a basis for complex cross-classification and report preparation.

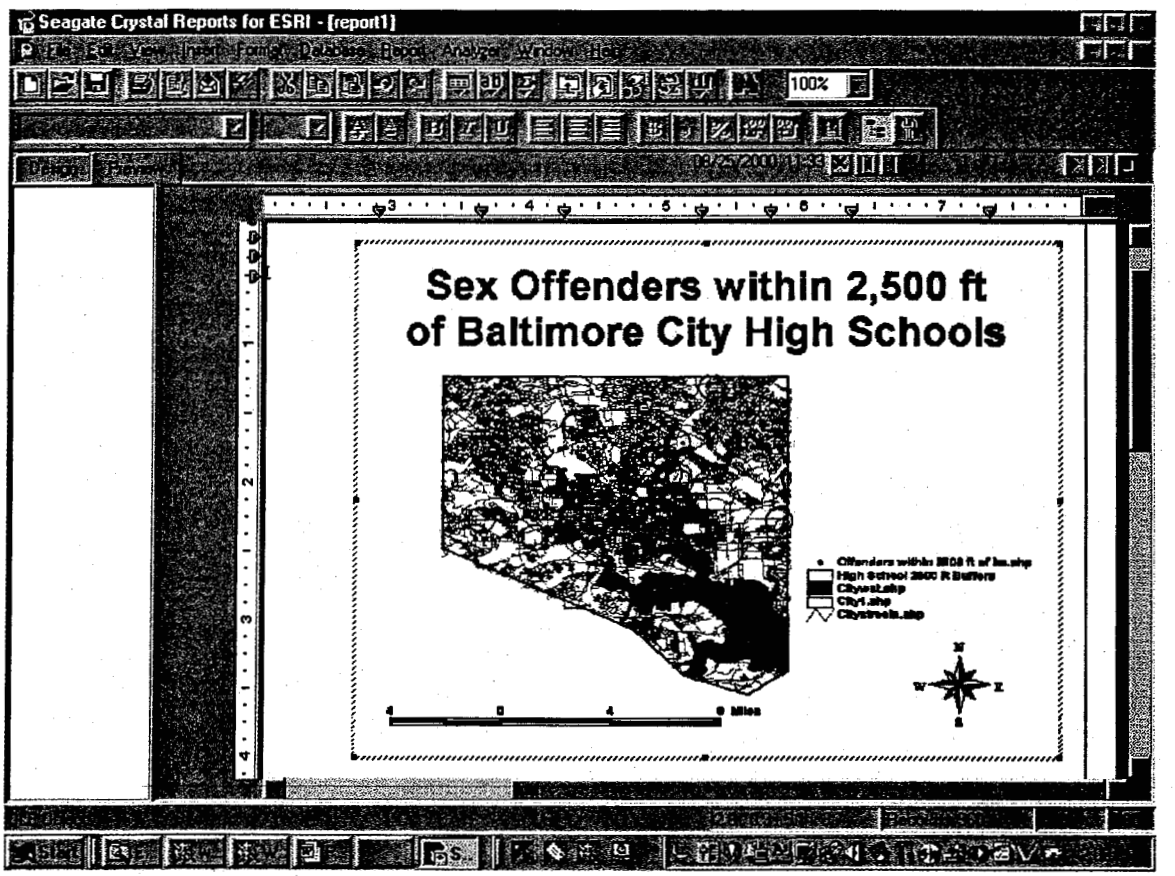


Figure 21. Crystal Reports screen with Object Linking and Embedding (OLE). In this example, the map generated in ArcView has been embedded in the report and would be dynamically updated as changed in ArcView. This could simplify and expedite the updating of regularly scheduled reports accompanied by maps.

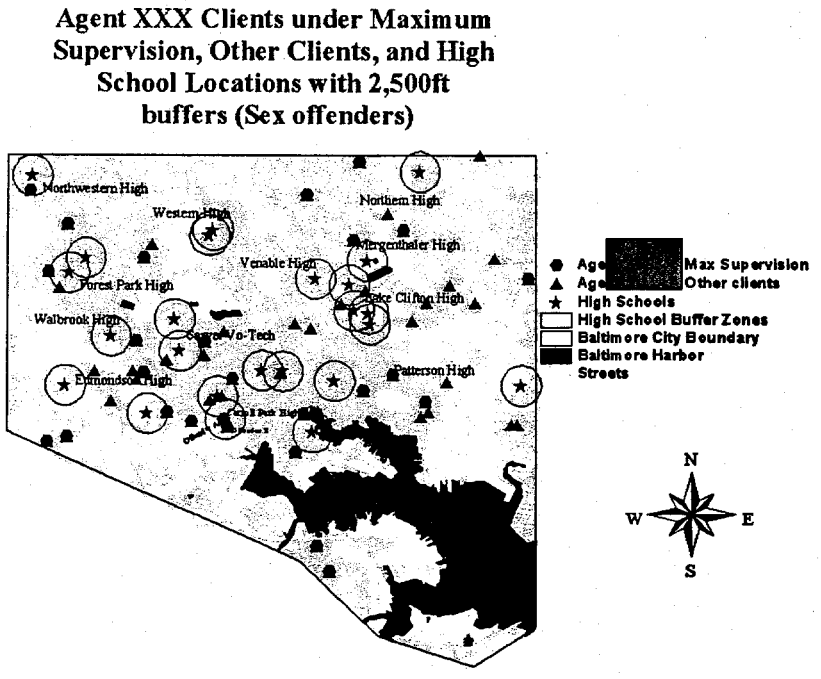


Figure 22. Maximum Supervision offenders from one agent's caseload with 2,500 foot buffers of all Baltimore City high schools, and agent's other clients. Agent's and offenders' names intentionally obscured.

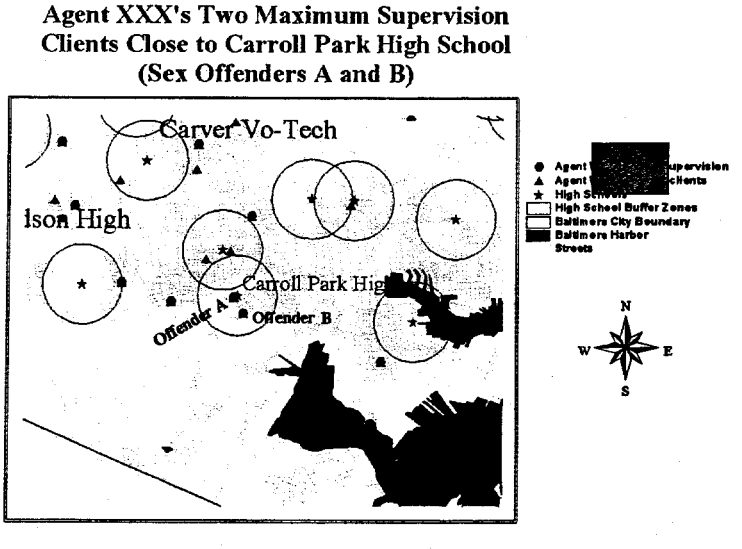


Figure 23. Detail from Figure 22. Maximum Supervision offenders from agent's caseload within 2,500 foot buffers at Carroll Park High School. Agent's and offenders' names intentionally obscured.

AGENT [redacted]
SUMMARY REPORT
CLIENTS UNDER MAXIMUM SUPERVISION
August 28, 2000

CLIENT	CURRENT AGENT	OFFENSE_CODE	CASE TYPE	SUPERVISION LEVEL
[redacted]	[redacted]	806	PRO	MAX
		135	PRO	MAX
		804	PRO	MAX
		134	PRO	MAX
		282	PRO	MAX
		641	MAN	MAX
		804	PRO	MAX
		804	PRO	MAX
		152	PRO	MAX
		152	PRO	MAX
		152	PRO	MAX
		152	PRO	MAX
		152	PRO	MAX
		152	PRO	MAX
		134	MAN	MAX
		201	PRO	MAX
		149	PRO	MAX
		152	PRO	MAX
		823	PRO	MAX
		152	PRO	MAX
		282	PRO	MAX
		706	PRO	MAX
		706	PRO	MAX
		964	PRO	MAX
		524	PRO	MAX
		155	PRO	MAX
		442	PRO	MAX
		155	PRO	MAX
		149	PRO	MAX
		152	PRO	MAX
		804	PRO	MAX
		158	PRO	MAX
		149	PRO	MAX

Figure 24. Crystal Reports list generated from an ArcView query. Part of Agent XXX's client list was queried to display those offenders under maximum supervision with offense code and type of supervision. Name of agent and names of offenders intentionally obscured.

CONCLUSION

As originally conceptualized, this project would have diffused ideas about applications of GIS tools primarily through a process of training trainers and presenting demonstrations for managers and agents. While the project limitations already described at some length reduced its effectiveness, it now seems that DPP will adopt GIS tools in the near future, but through an approach putting more emphasis on embedding GIS components in grant proposals that would acquire new resources, rather than building in-house capability from the ground up with existing resources. The latter course may have been impossible from the outset given the scarcity of resources and the intense competition for them.

This project generated three products:

- Hardware in the form of a computer, software, an external Zip drive, and other peripherals intended to ease the transition to applications of GIS
- A set of activities, most of which are embedded in this report, designed to illustrate how GIS tools could help streamline work in DPP
- Intangible benefits growing out of discussions with DPP management and staff in which the benefits of GIS were explained and reinforced on numerous occasions, sometimes with the support of GIS analysts from other agencies, including Baltimore City and Baltimore County PDs, Anne Arundel County PD, Howard County PD, and others who were invited to participate in round table discussions during year 2000.

In the long term it is likely that the intangibles will yield the most significant results. Training, while imparting short-term skills, is of little use if the skills are not practiced on a day-to-day basis. Everyone involved in the use of technology knows that skills left

unpracticed soon erode. When combined with changes in software systems, dormancy translates to paralysis. Continuous application had been the expectation when this project was planned; indeed, had that not been a reasonable expectation the project would have been designed quite differently.

REFERENCES

Davis, D.E. (2001) *GIS for Everyone*. Redlands, CA: ESRI Press.

Division of Parole and Probation (2000). *Proactive Community Supervision: A Plan for Making Maryland Communities Safer.* Report to the Budget Committees of the Maryland General Assembly. Baltimore, MD.

Ormsby, T. (Ed.), et al. (2001). *Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor, and ArcInfo*. Redlands, CA.

Sachwald, J. (2000?) *Proactive Community Supervision: Opening Windows to Effective Intervention*. Baltimore, MD: Maryland Division of Parole and Probation.

TABLE 1. ORGANIZATION AND MANAGEMENT PLAN (YEAR 2000)

(Shaded area represents time actually available on-site for the training element of this project.)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Events	Project start											Project conclusion
Activities	Team Meeting Acquire Equip-ment	Team Meeting Install & config-ure Equip-ment	DPP Training. Data Coding & analysis	Team Meeting DPP Training. Data Coding & analysis	DPP Training Data Coding & analysis	Team Meeting DPP Training Data Coding & analysis	DPP Training Data Coding & analysis	DPP Training Data Coding & analysis	Team Meeting Assess-ment	Team Meeting Assess-ment	Assess-ment Write Draft final report	Write final report
Products			Research report		Research report		Research report		Research report		Draft Final Report	Final Report

APPENDIX I. ADDENDUM TO AGENCY MEMORANDUM OF UNDERSTANDING INDICATING SPECIFIC RESPONSIBILITIES OF THE PARTIES TO THE AGREEMENT, WITH SIGNATORIES AND DATES

MEMORANDUM OF UNDERSTANDING

BETWEEN THE MARYLAND DIVISION OF PAROLE AND PROBATION,

THE INFORMATION TECHNOLOGY AND COMMUNICATIONS

DIVISION &

THE UNIVERSITY OF MARYLAND BALTIMORE COUNTY

PURPOSE AND PROPOSAL

Mapping offender data will assist the Division of Parole and Probation in its mission to create safer communities.

The purpose of this project is to establish modest geographic information systems (GIS) mapping capabilities "twinned" at the Division of Parole and Probation (DPP) and the University of Maryland Baltimore County (UMBC), with the goal of conducting a process of technology transfer, training, and analysis during the remainder of calendar year 2000.

Offender data will be transferred to UMBC for processing and analysis and interpretive information will be returned to DPP to provide immediate practical assistance in the caseload management process. In order to build in-house analytical capability at DPP, select agency personnel will be trained in the use of GIS and related programs.

PROJECT OBJECTIVES

This project is designed to analyze DPP geographical offender populations to make communities safer. The following are objectives of this project for the Division of Parole and Probation:

- *Training.* At least three individuals within the agency will be trained in the basic use of GIS technology.
- *Program Planning.* GIS will be used to determine its practical application for general program planning or special agency initiatives.
- *Resource Allocation.* Map analysis tools may be used for a resource allocation and

determining facility/office location.

- *Distribution of Workloads.* Caseloads could be optimized, or balanced, among regions or individual offices. A redistricting program could be used to draw and periodically redraw districts based on the distribution of cases to equalize the distribution of workloads. Similarly, districts could be drawn to facilitate the equalization of workloads for warrant service.

- *Community Supervision.* With the growing importance of community supervision, parole and probation agents are now more likely to be assigned to specific areas in the community so that they have more contact with offenders under supervision, community resources, and local and municipal police departments. GIS technology can be used to enhance law enforcement objectives and community safety.

- *Specialized Caseload Supervision.* Mapping technology can be used to enhance tracking of offenders in specialized caseloads or programs with special supervision requirements. This would not be real time "tracking" but a monitoring process over time.

- *Mapping Areas Restricted to Offenders.* This technology can be used to identify areas that offenders have been ordered to avoid for the protection of specific or potential victims in the community.

- *Mapping Dangerous or High Crime Areas.* Other applications in community supervision could include mapping areas where parole and probation agents may be vulnerable and should be partnered or accompanied by a police officer when conducting home or site visits.

- *Travel Plans.* Map analysis of offender geography can be used to determine the most efficient route for sequencing visits to homes/sites. If visits to specific individuals have to be made at certain times, a route can be designed to minimize travel time and distance from one address to the next.

AGREEMENTS

SOFTWARE LICENSING

The program to be used is known as ArcView, a product of Environmental Systems Research Institute, Inc. (ESRI). This software is available at UMBC, and the principal investigator has discussed licensing issues with the regional ESRI representative who regards the use of ArcView software at the Division of Parole and Probation as a temporary extension of the UMBC license for training purposes. However, at the termination of this project, it will be necessary for the Division of Parole and Probation to obtain its own free-standing license if it has not already done so.

Another key element of the project is the availability of up-to-date digital base-maps of Baltimore City, with associated "coverages" such as police district and post geography. The principal investigator has negotiated with the Baltimore Regional Council a 1-5 seat lab license on the ground that what we are dealing with is essentially a two seat lab with the two work stations in separate places. This will permit the properly licensed use of the Baltimore base map at both locations until the termination of the project. Subsequently, however, the Division of Parole and Probation will need to obtain a free standing license to continue to use this product. The appropriate base map has been acquired.

Sharing of Data Elements

The Information Technology and Communications Division of the Department of Public Safety and Correctional Services will provide the data elements from OBSCIS II, specifically intake entry data from the Case Record Input-Intake form (DPP-SUP-53), to Dr. Keith Harries for transfer of information.

Research

Under this agreement, the principal investigator may conduct limited research to provide analysis for data as requested by the Division of Parole and Probation. The principal investigator is also a signatory of a User Agreement between the Department of Public Safety and Correctional Services and a Non-Criminal Justice Agency, in the event that the transfer of data elements yield criminal history information. (See Attached)

SECURITY

At UMBC, the workstation to be dedicated to this project will be housed in a secure room not accessible to the general student or faculty population, protected with a motion sensing security system. In addition, the computer itself and individual files will be password protected. Only Keith Harries (Principal Investigator), Holly Warrenfeltz (Intern), and Greg Baker, Manager of Management Information Services for the Division of Parole and Probation, would have access to these files. Any security breach due to a criminal act, or act of God, such as fire or flood, would be immediately reported to the Division of Parole and Probation.

At the end of the project, all data and data files will be returned to the Division of Parole and Probation.

IN WITNESS WHEREOF, this Memorandum of Understanding is entered into on the date last below written.

Signatory Agencies:

The Division of Parole and Probation

Judith Sachwald
Director

6-14-00
Date

Information Technology and Communications Division

Judith A. Wood
~~Director~~ Chief Information Officer

6-15-00
Date

The University of Maryland Baltimore County

Alex Nathan

6/20/00
Date

Alex Nathan, Director of Contracts
Office of Sponsored Programs Administration
University of Maryland, Baltimore County

Approved as to form and legal sufficiency:

Susan Howe Baron

6/13/00

Susan Howe Baron
Assistant Attorney General

Date

APPENDIX II. LETTER OF SUPPORT FROM FORMER DIVISION DIRECTOR THOMAS H. WILLIAMS

DPP-ADM-4 (Rev. 3/97)

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES
DIVISION OF PAROLE AND PROBATION
SUITE 305 • 6776 REISTERSTOWN ROAD • BALTIMORE, MARYLAND 21215
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PARRIS N. GLENDENING
Governor

KATHLEEN KENNEDY TOWNSEND
Lt. Governor

6776 Reisterstown Road
Baltimore MD 21215
410-764-4305 * (fax) 410-764-4091

STUART O. SIMMS
Secretary

THOMAS H. WILLIAMS
Director

June 14, 1999

Dr. Keith Harries
Department of Geography and Environmental Systems
UMBC
1000 Hilltop Circle
Baltimore, MD 21250

Dear Dr. Harries:

I am pleased to offer the support of this agency to your response to the National Institute of Justice solicitation entitled "Research and Evaluation on Corrections and Sentencing (1999)," Part C, "Practitioner-Initiated Research Partnership." I recognize that geographic information systems (GIS) technology has proven itself in the realm of policing, and it would seem that it could be a valuable tool in parole and probation, also.

Your proposal is realistic in scope and purpose, facilitating technology transfer over a one-year period, in combination with analytical applications in several important areas. These include sex offenders in Region II (throughout Baltimore City, whether probationers, parolees, or mandatory releasees) and other special populations (as needed) such as Hot Spots, Drug Court (whether at the Circuit Court or District Court levels), the Correctional Options Program (COP), and Break the Cycle.

As you know, our analysis is presently conducted at the zip code level of aggregation. The greater geographic precision offered by GIS, plus additional analytical capabilities, such as pin mapping, analysis of change in areas, measures of proximity, and other possibilities, could bring a new dimension to our management program and could also contribute to policy development by providing greater analytical precision.

The fact that the program is "practitioner-initiated" means that problems would be generated in this Division and we would then have access to your support in terms of developing solutions. This process would facilitate transfer of the technology and the evolutionary acceptance of it within the agency. We also feel that GIS could be applied in useful ways in our community relations programs.

It is our understanding that the proposal includes funds in support of the acquisition of necessary hardware and software as well as salary support for part-time assistance with this project. We also endorse the concept of an intern from your department, with GIS skills, who would work with us on a part-time basis to facilitate the development of our in-house GIS program.

I understand that the project, if funded, would take place in calendar year 2000. The Organization and Management Plan appears to outline a logical series of achievable steps and we could accommodate this schedule.

Given that our work necessitates close cooperation with police agencies throughout Maryland, we are pleased to note that you have proposed acting as a catalyst to enhance the interface between our Region II and the Baltimore City Police Department with respect to the sharing of data amenable to analysis in a GIS. This would be helpful and we would encourage you to facilitate this type of interaction.

We look forward to working with you on this important project.

Cordially,

Thomas H. Williams
Director