RAMS

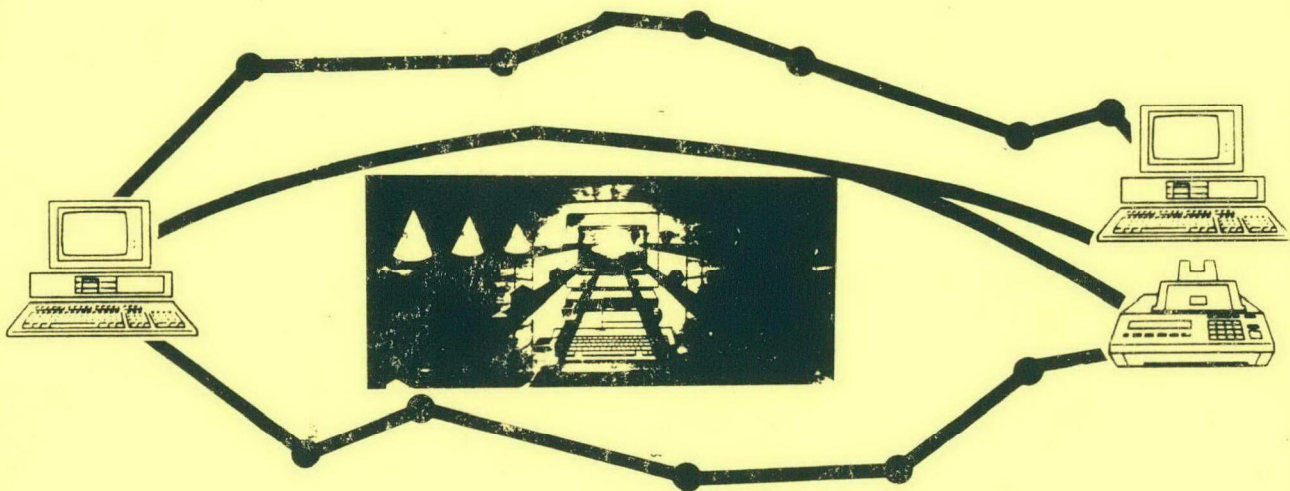## (RESULTS ANALYSIS AND MANAGEMENT SYSTEM)

AN AUTOMATED MANAGEMENT SYSTEM TO TRACK RESULTS AND TARGET RISKS

OFFICE OF INTEGRATED ENVIRONMENTAL ANALYSIS
345 Courtland Street, N.E.
Atlanta, Georgia 30365

RESULTS ANALYSIS AND MANAGEMENT SYSTEM (RAMS)

OBJECTIVES

The Environmental Protection Agency (EPA) has a management system to track enviornmental progress by counting documents processed, permits issued, etc. The National GIS Center of Excellence for EPA is establishing a management system based on environmental results. This system is the Results Analysis and Management System (RAMS) and has three components to: (1) identify and prioritize problems and risks, (2) target needed regulatory controls to these problems and risks, (3) track environmental trends. The system is built by integrating many different environmental data bases and automatically analyzing them to produce the above three types of reports.

PROJECTED USES

Targeting enforcement actions based on problems and risks. Preparing strategic planning. To prepare reginal water quality trends report.

PRESENT USES

Targeting Superfund pre-remedial activities for contractor assignment based on risk. Preparing 305(b) trend reports to Congress. Preparing water supply vulnerability reports. Targeting RCRA enforcement activities and site evaluations based on problems and risks. Used to prepare regional air status and trends report. Prepared regional report prioritizing all groundwater problems (RCRA, Superfund, Water Supply, etc.).

SUMMARY OF CAPABILITIES

See separate RAMS sheets for Air, Surface Water, and Groundwater

RAMS PROGRAMS INDEX

SURFACE WATER

GROUNDWATER

AIR

RAMS PROGRAMS FOR SURFACE WATER

305(B) REPORTING AND SURFACE WATER DATA INTEGRATION SYSTEM

PROTOTYPE ENVIRONMENTAL COMPLIANCE REPORTING SYSTEM

HAZARDOUS WASTE SITE ANALYSIS USING GEOCHEMICAL AND SPATIAL MODELS

SHAVER FARM'S SUPERFUND SITE

VULNERABILITY PRESCORE

TOXIC WASTE SITE PRIORITIZATION

SUPERFUND PRE-REMEDIAL RETRIEVAL SYSTEM

RETRIEVAL SYSTEM FOR STATE DRINKING WATER PROGRAMS

SUPERFUND RETRIEVAL SYSTEM

REGION GIS LIBRARY

SURFACE WATER PROGRAM (RAMS)

The surface water data which is needed consists of data on the pollutants being discharged (permit data stored in the Permit Compliance System (PCS), the water monitoring data (stored in STORET), and water quality standards file and the treatment plant construction data, (stored in Grants Information and Control System, (GICS).

These databases need to be integrated and then analyzed to produce a database for each of the elements of RAMS. These data sets have been integrated by Region IV's Office of Integrated Environmental Analysis (OIEA) and the needed analytical tool have been, and are being developed. These automated tools analyze all the monitoring data and compare the values to water quality criteria. Violations are identified and ranked. A digitized river system called the "Reach System" is utilized. The RAMS Computer programs displays monitoring stations on these rivers and colors them differently corresponding to the degree of the violations. Monitoring station numbers where streams are significantly exceeding standards (or not meeting uses) are colored red, monitoring station numbers where the data indicates the water body is partially meeting uses are colored green, and monitoring station numbers where uses are being met are colored blue. A printout can prioritize all violations. Discharge permit numbers (NPDES) are displayed on these digital maps, and construction grants are also designated by phases of the project-planning, construction, or completed.

The different colored monitoring stations indicating the degree of problems are used to identify and prioritize problems and risks, element #1 of RAMS. Element #2 of RAMS (relate problems and risks to needed regulatory controls) consists of spatially relating violations to nearest discharge which is causing the problem. By running the analysis program for different years and time frames, trends can be generated, which is element #3 of RAMS. Element #4 determines the effectiveness of regulatory controls and is obtained by overlaying regulatory controls with trend data.

GROUNDWATER PROGRAM (RAMS)

In the groundwater area, there are different regulatory programs—Superfund, UIC, RCRA, UST, Drinking Water, and Wellhead Protection. These Programs can all use the following same three factors to prioritize problems and risks and then relate these problems and risks back to needed regulatory controls: (1) the source of contamination (Superfund site, RCRA site, etc.), (2) the closeness of water supply wells and people served, and (3) the ease of movement between the contamination source and well (vunerability). The Office of Integrated Environmental Analysis (OIEA) of EPA, Region IV is integrating and analyzing the needed data to product these three above factor.

A digital database for contamination sources, RCRA and Superfund sites, etc., is being generated from the EPA databases for Superfund and RCRA, etc. Water supply locations and population served are being generated from the EPA water supply database and a USGS water supply database. Private well information from a census database is used to create a digital data-base of private wells.

Capability to evaluate vulnerability is being added. A soils database will be obtained from the soils maps being digitized for SCS. Plans are that depth to aquifer recharge areas and other components of vunerability.

These above three factors are analyzed together to prioritize needed regulatory controls - which RCRA and Superfund etc. sites pose the greatest risks to groundwater and water supplies. RAMS contains printouts of all contamination sources listed in priority order.

AIR PROGRAM (RAMS)

The Air Program stores their monitoring data in a database which is to be called AIRS. OIEA access this database and analyzes the monitoring data to compare data to criteria and determine exceedence. A digital database is created showing all monitoring stations and designating the ones with violations in red. Emissions data is being overlayed to determine sources needing controls. Population data is overlayed. By analyzing there together priority areas are developed and sources that need to be controlled are identified and prioritized. Trends can be tracked by running the analysis for different time frames.

GEORGIA PARTICULATE EMISSIONS
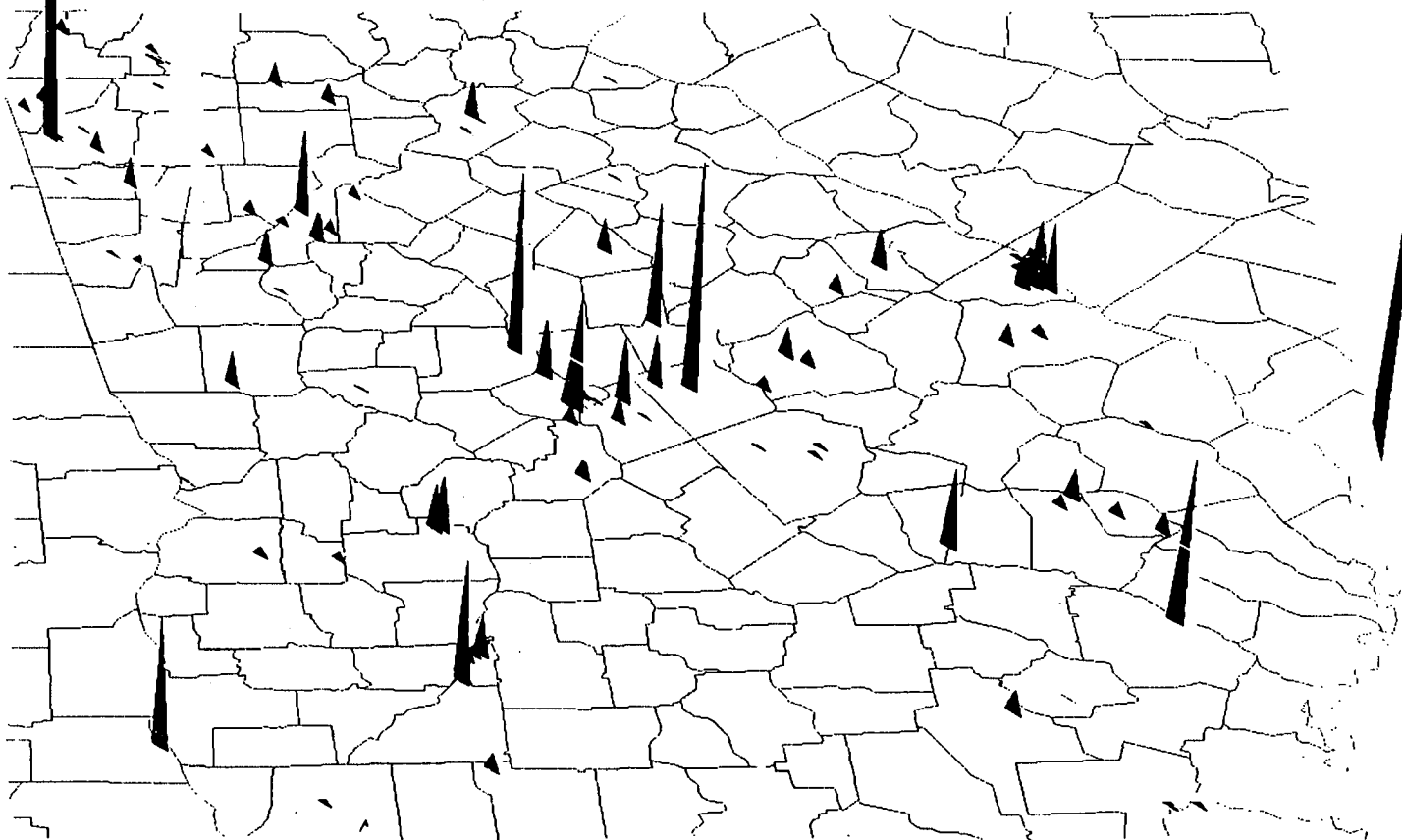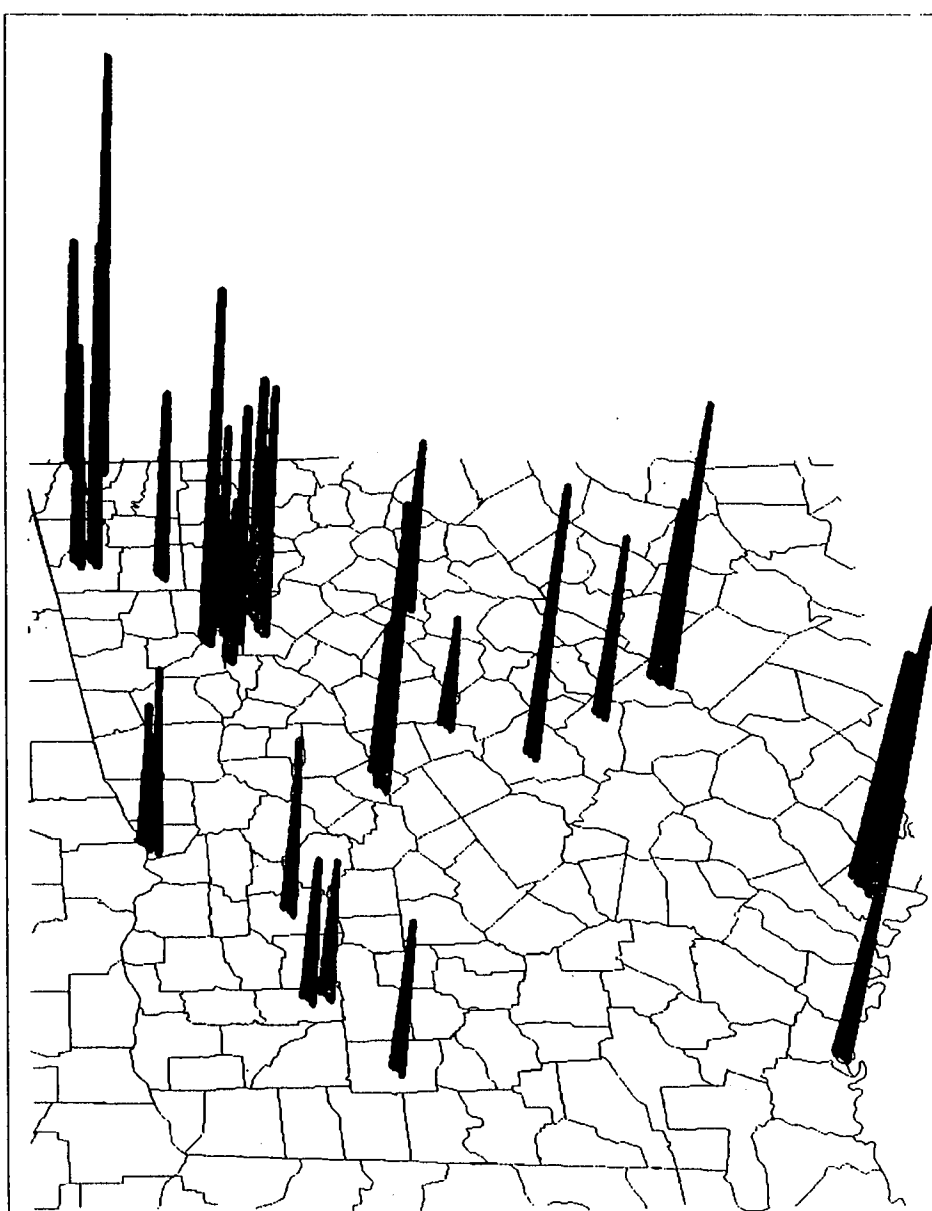
GEORGIA PARTICULATE MONITORING

1988 TSP DATA

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY

RAMS PROGRAMS FOR SURFACE WATER

OBJECTIVE

Develop software to analyze all Storet water quality data to develop computer maps integrating violations and trend data with permit discharge data. This gives us the capability to relate cause (permit) and effect (violations and trend).

PROJECTED USES

Use by states in preparing 305(b) reports. Use to relate point and non-point source activity to problems (violations).

PRESENT USES

Presently used by some states in Region IV and other regions in preparing 305(b) reports for Congress, status and trend reports required by section 305(b) of the Water Act.

SUMMARY OF CAPABILITIES

The system consists of programs that run on the 3090 IBM mainframe computer at RTP. They are accessed by getting on the Storet system and entering "REG4 RAMS" under the TSO ready prompt. These are menu driven and conversational with the final output being graphical. The product allows for 6 program options in retrieving information from the Storet database, followed by 17 options for data analysis and comparison. Utilizing these programs, the product calculates and displays water quality violations, percentage of time these are in violation and the extreme values. It presents the data on computer maps. Storet stations are colored according to the number of exceedance of the standard using the ASWIPCA/305(b) criteria (0-10% violation meeting uses, 11-25% partially meeting uses and greater than 25%, not meeting uses). The trends RAMS reports calculates trends at each storet station displaying them on a state wide map. The slope of the trend line is displayed at each station. The confidence level is calculated also. All the above programs are menu driven and can be accessed by all regions and states via the above procedures.

TEAM LEADER: James (Jim) Bricker   PHONE: 347-3402

RED COCKED WDP.-WKER MORTIAL
1960-1989 DATA

MAP OF SOUTH CAROLINA
DO MONITORING

305(B) REPORTING
AND
SURFACE WATER DATA INTEGRATION SYSTEM

OBJECTIVE

Integrate various databases with textual and spatial context to identify, target, and prioritize 305B, 3041L, and 307A reporting criteria.

PROJECTED USES

To target problem areas in conjunction with quarterly noncompliance reports to identify and prioritize permit violations. Identify areas where monitoring data should be collected.

PRESENT USES

Recognition of spatial relationships between discharge permits, monitor data, and noncompliances.

SUMMARY OF CAPABILITY ACHIEVED

Monitor parametric data target upstream sources of surface water contamination. Upstream sources have been cross referenced with various other data sets (IFS, PCS, NPS) to report probable causes. i.e., Point source discharge or non-point sources.

305B Criteria Data

Not Meeting Standards

Partially Meeting Standards

Meeting Standards

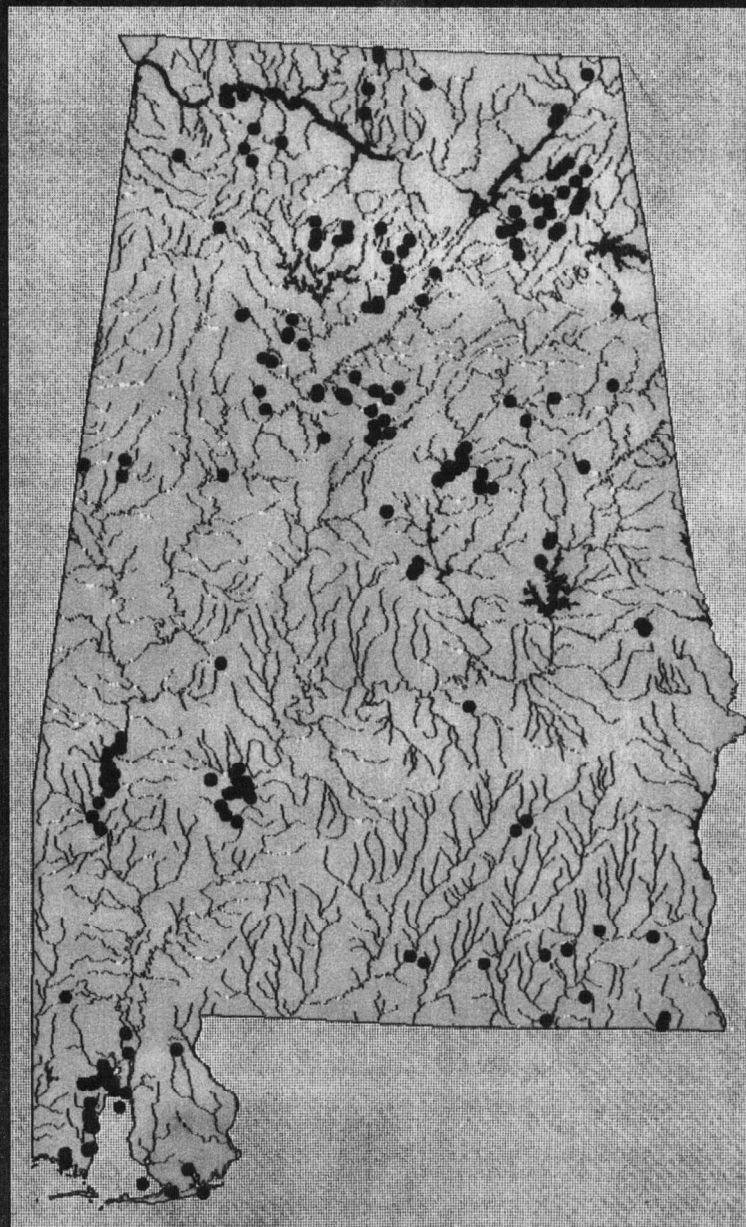Unavailable data

Nonpoint Source Identified
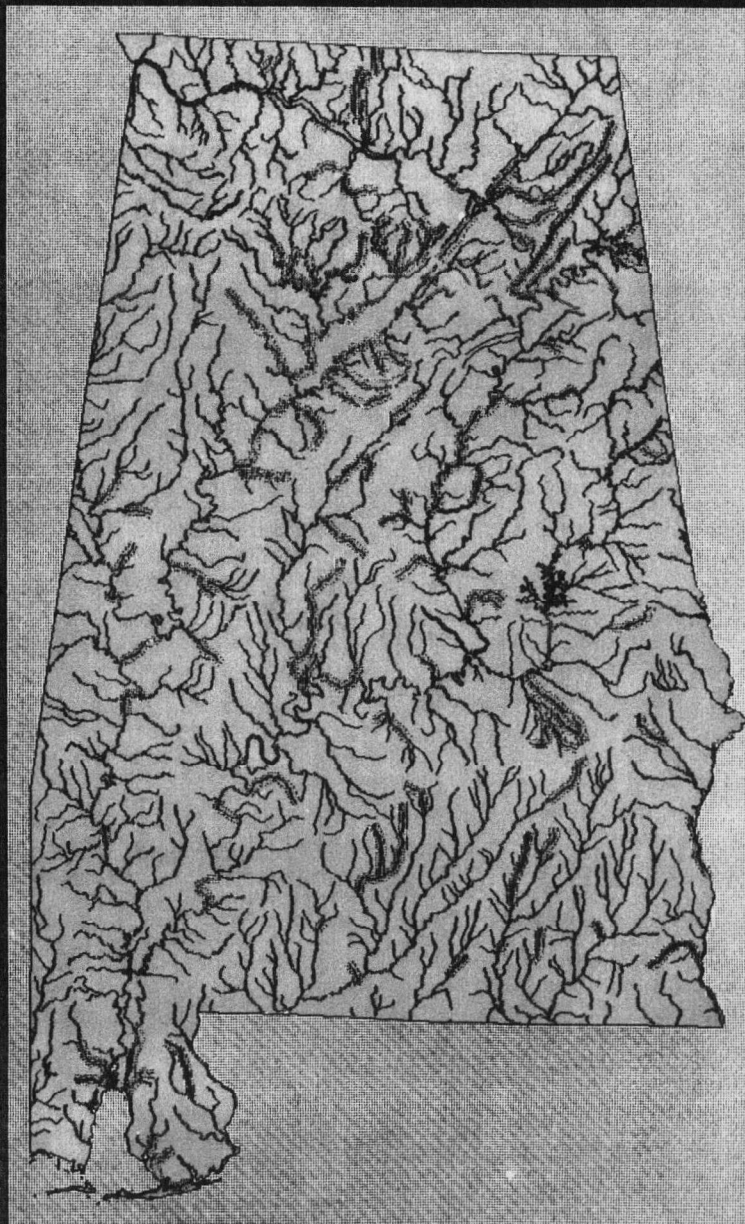
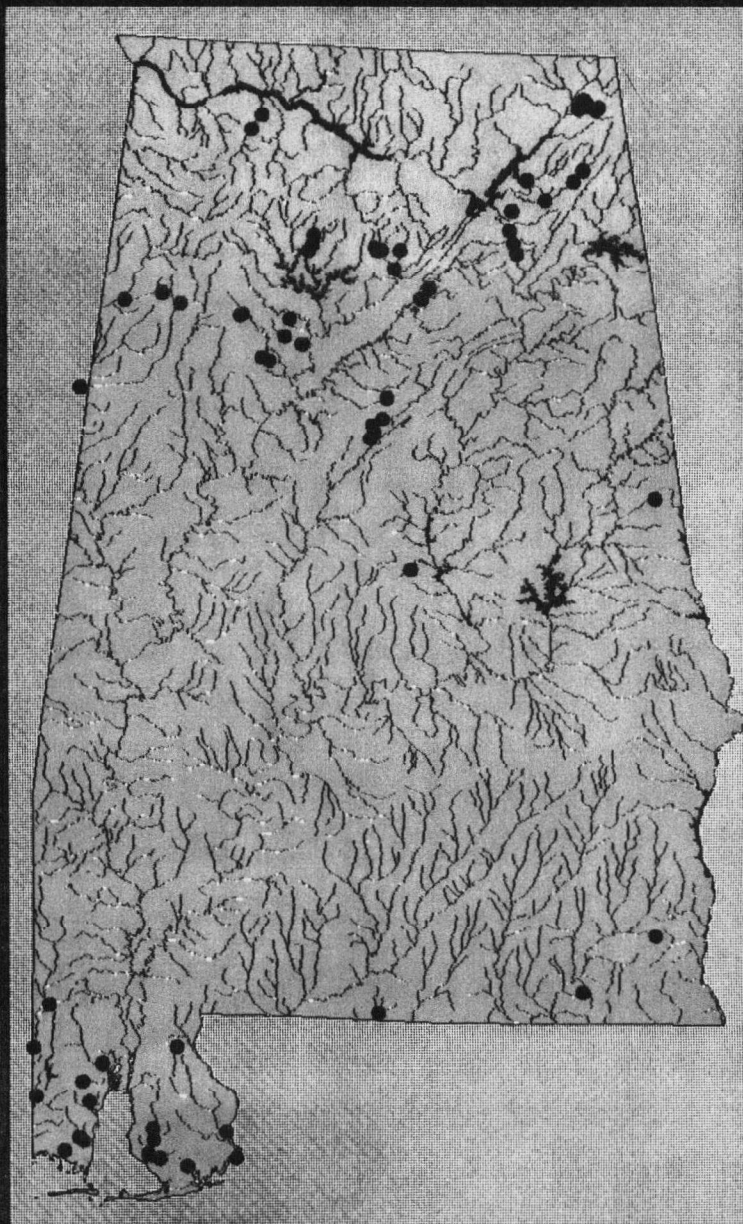Dissolved Oxygen
Monitor Data

● Not Meeting Standards

● Partially Meeting Standards

pH Monitor Data

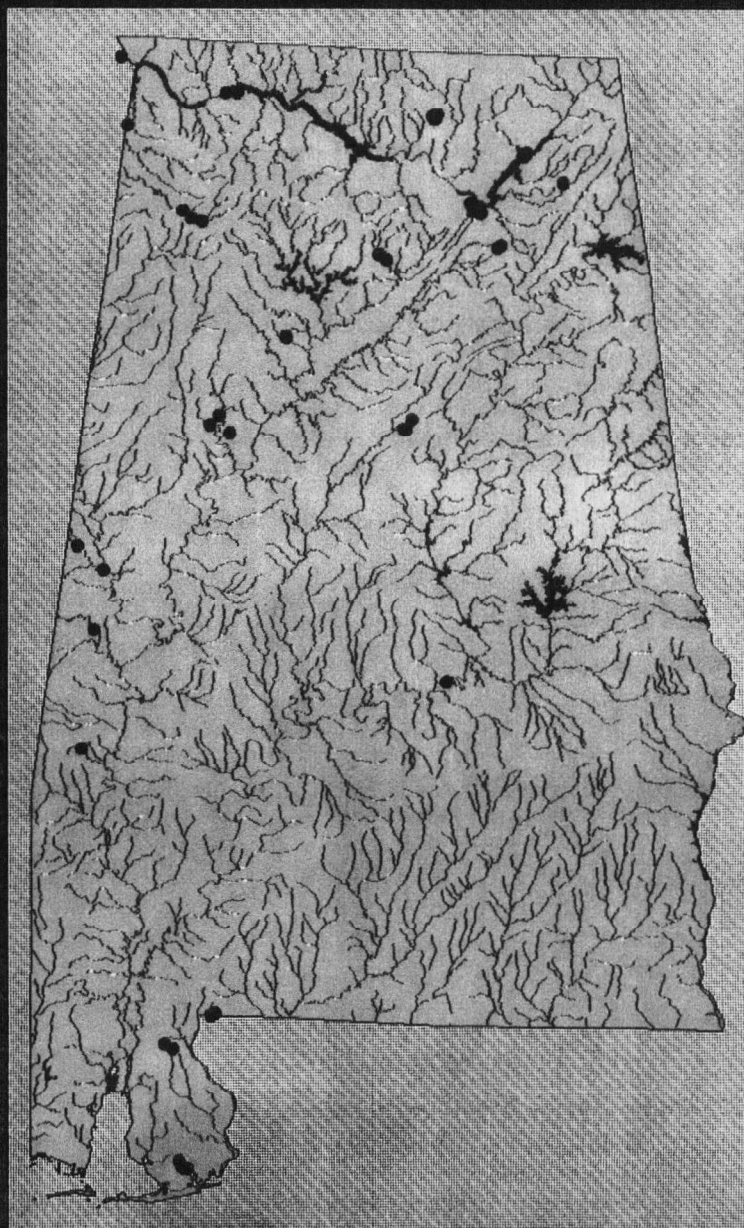● Not Meeting Standards

● Partially Meeting Standards

Fecal Coliform
Monitor Data

● Not Meeting Standards

● Partially Meeting Standards

NONCOMPLIANCES

● ONE
● TWO
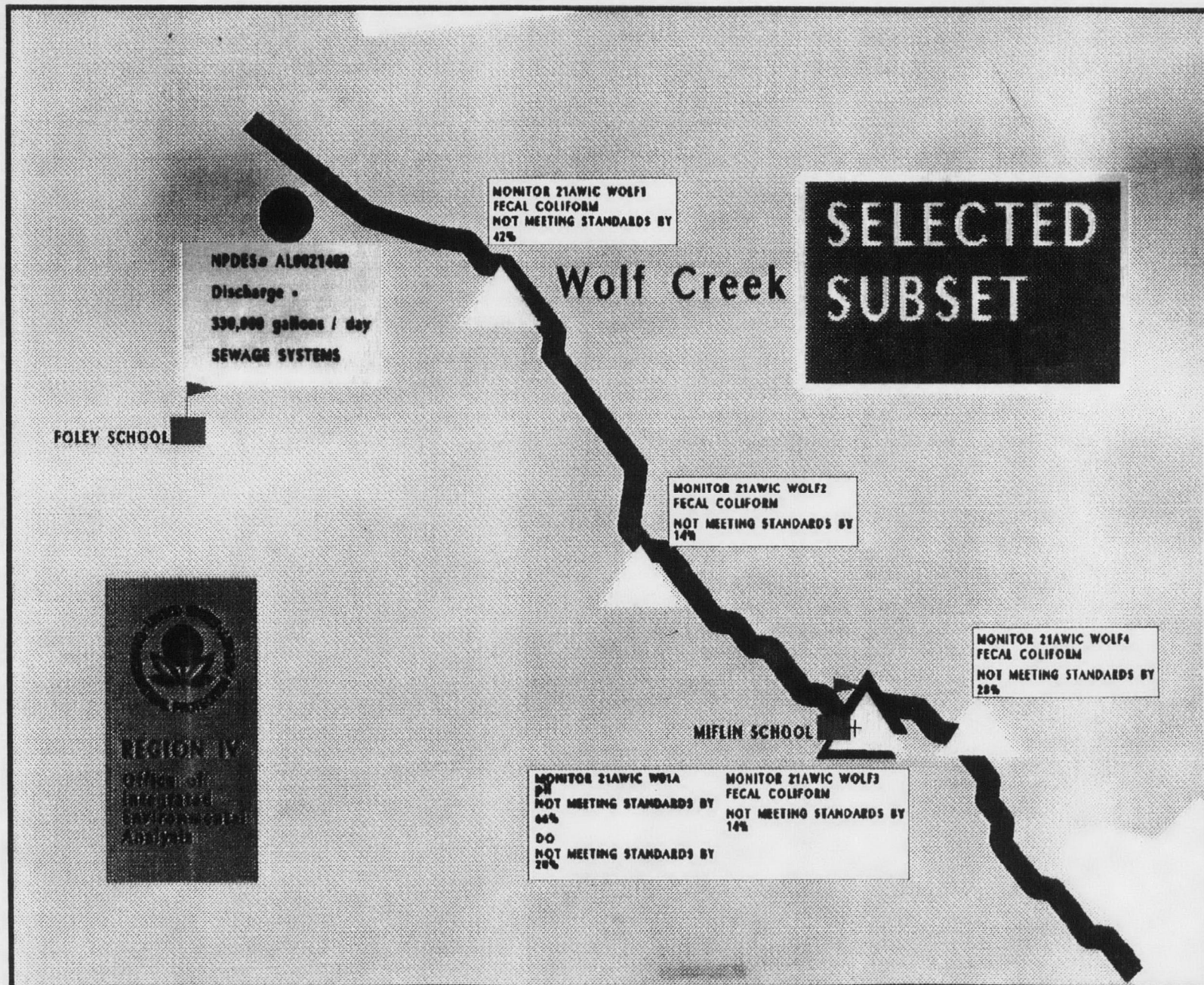● THREE OR MORE

305B Criteria Data

Not Meeting Standards
Partially Meeting Standards
Meeting Standards
Unavailable data
Nonpoint Source Identified

From Quarterly Noncompliance Report
Data October 1988 - April 1989

NONCOMPLIANCES

NOT MEETING STANDARDS

▲ pH ▲ FC ▲ DO

REGION IV
Office of
Integrated
Environmental
Analysis

HAZARDOUS WASTE SITE ANALYSIS
USING GEOCHEMICAL AND SPATIAL MODELS

OBJECTIVE

Groundwater contamination analysis and cleanup cost analysis on Superfund and RCRA.

PROJECTED USES

Determination of criteria cleanup elevations of metals with soil matrix and estimate removal volume and cost. Add groundwater analysis to determine plume extent and movement use to automate RIFS. Track cleanup levels and effectiveness.

PRESENT USES

System integration of various models with required databases. Have begun analyzing three (3) sites for cleanup coast and alternatives.

SUMMARY OF CAPABILITIES ACHIEVED

Data analysis using integration techniques that combined lab data, site groundwater and soils data and survey.

Integration of the MINTEQ and PRIZM geochemical models used in concert with the spatal capabilities of ARC/INFO to project contaminent levels. Analysis program have been developed to calculate the amount of soil that has to be removed to meet the clean up levels and cost. Alternatives levels and associated costs can be compared quickly.

PROTOTYPE ENVIRONMENTAL COMPLIANCE REPORTING SYSTEM

Objective

Improve the ability of EPA project managers to perform more complete and timely reviews of compliance monitoring data for RCRA sites, and of analytical results for CERCLA sites; and to allow the project managers to quickly perform site analyses using the reported data.

Projected Uses

RCRA project managers will require sites to report all compliance monitoring data and CERCLA project managers will require PRP's as well as EPA contractors to report sampling and analytical results from Superfund sites, in digital format for purposes of analysis, and in hardcopy format in order to meet legal requirements.
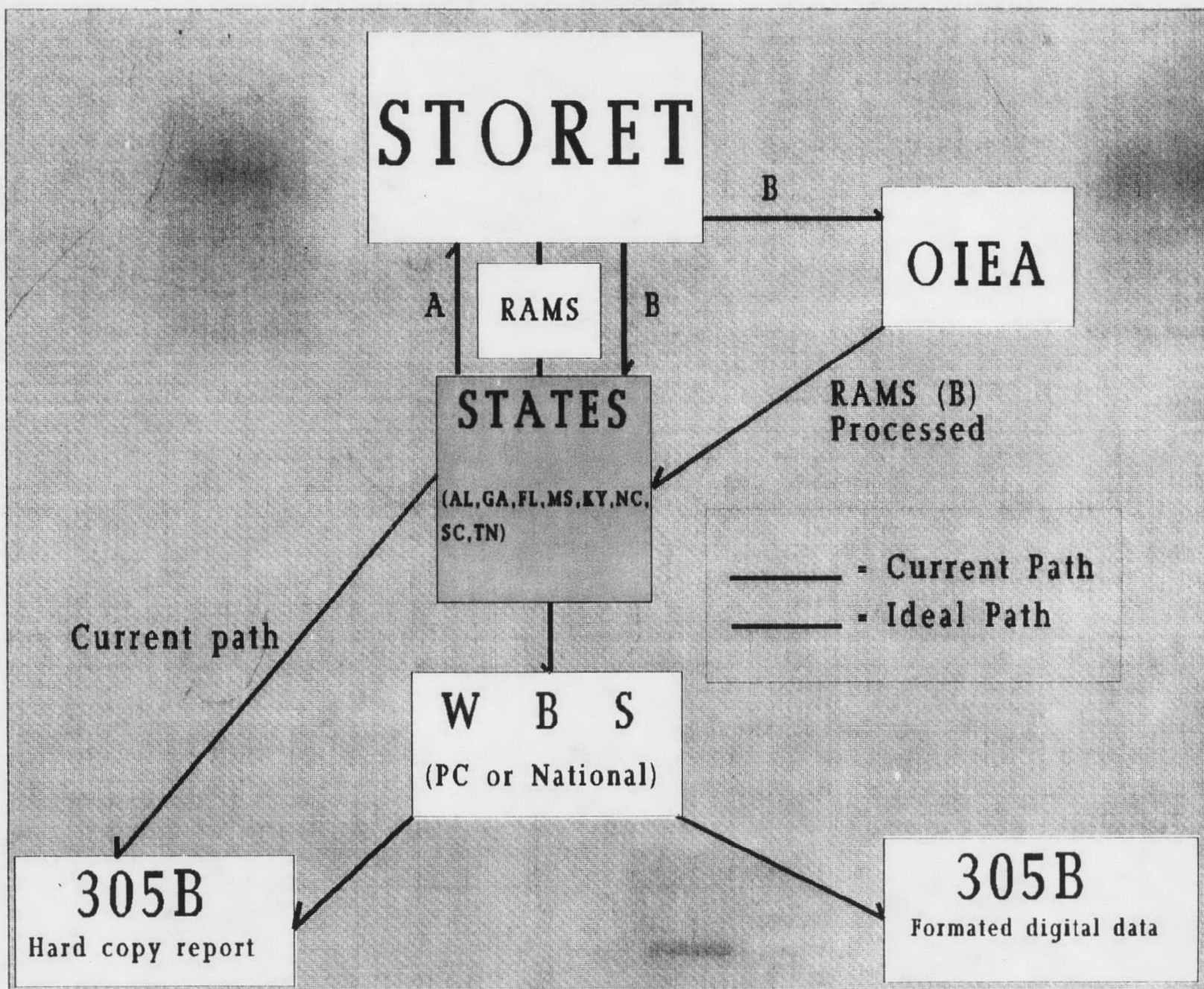
Present Uses

Region IV is currently conducting a pilot project with the DOE Oak Ridge facility to determine what changes, if any may be needed in the design of the electronic reporting system.

Summary of Capabilities Achieved

A standard interchange format has been adopted which provides for reporting the necessary information about the establishment of monitoring stations, acquisition of samples, and results of analyses. The format is in ASCII SDF format, which allows transfer of data between diverse hardware platforms ranging from personal computers to mainframes. Adoption of an interchange format, rather than a standard software package allows persons making the reports to utilize a database management package or spreadsheet with which they are already familiar, and in fact, the interchange format can be produced using many word-processing programs. As an adjunct to the interchange format, input and reporting systems have been developed in INFO (for use on minicomputers) and in compiled code for PC.
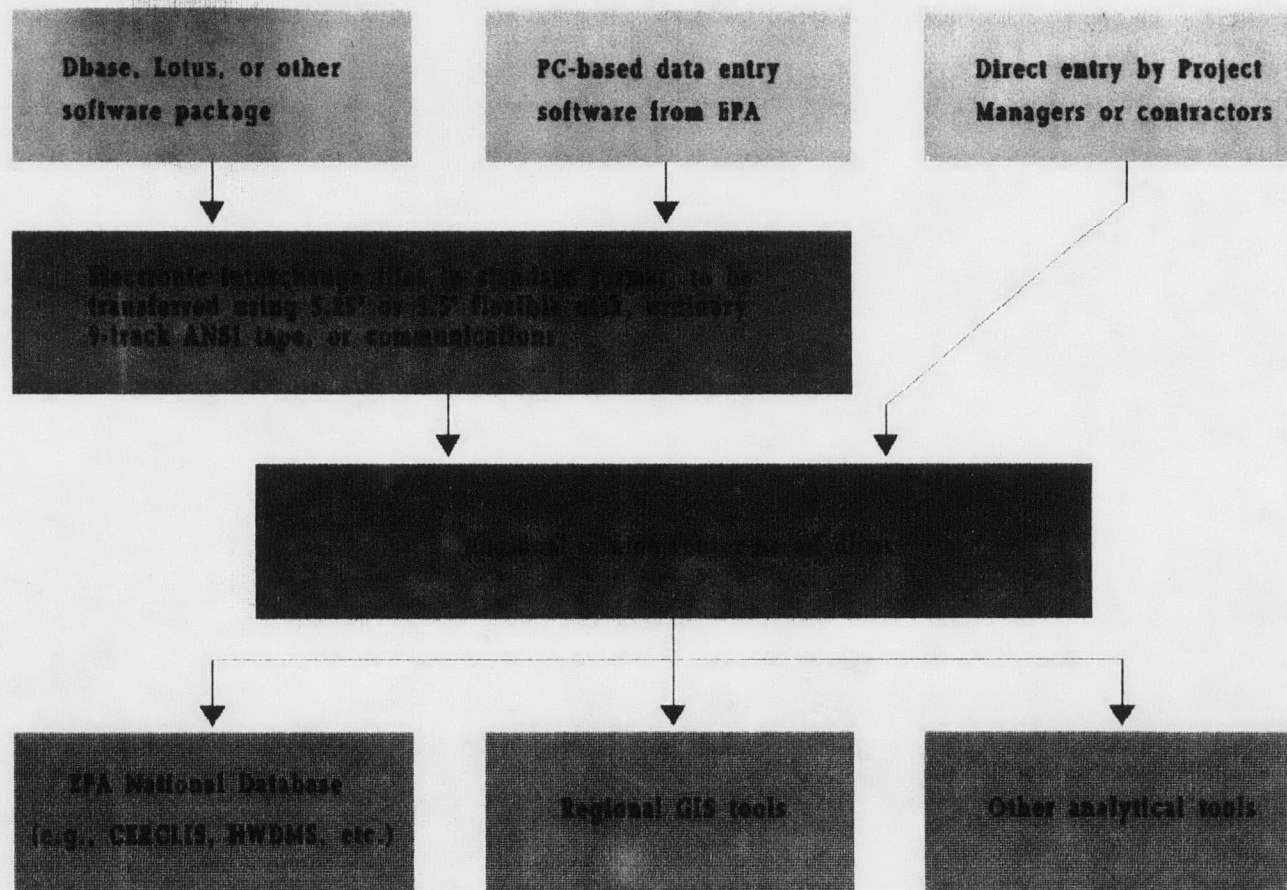

Project Team: Phyllis G. Mann   Phone: FTS 257-3402
                                              404-347-3402

Prototype Electronic Compliance Reporting System

Data Flow

| Dbase, Lotus, or other software package | PC-based data entry software from EPA | Direct entry by Project Managers or contractors |

Electronic interchange files in standard format, to be transferred using 5.25" or 3.5" flexible disk, ordinary 9-track ANSI tape, or communications

| EPA National Database (e.g., CERCLIS, HWDMS, etc.) | Regional GIS tools | Other analytical tools |

U.S. EPA Region IV - OIEA

Interchange Files

- ASCII characters
- SDF format
- May be generated from many different database systems, spreadsheets, word processors, or other software packages.
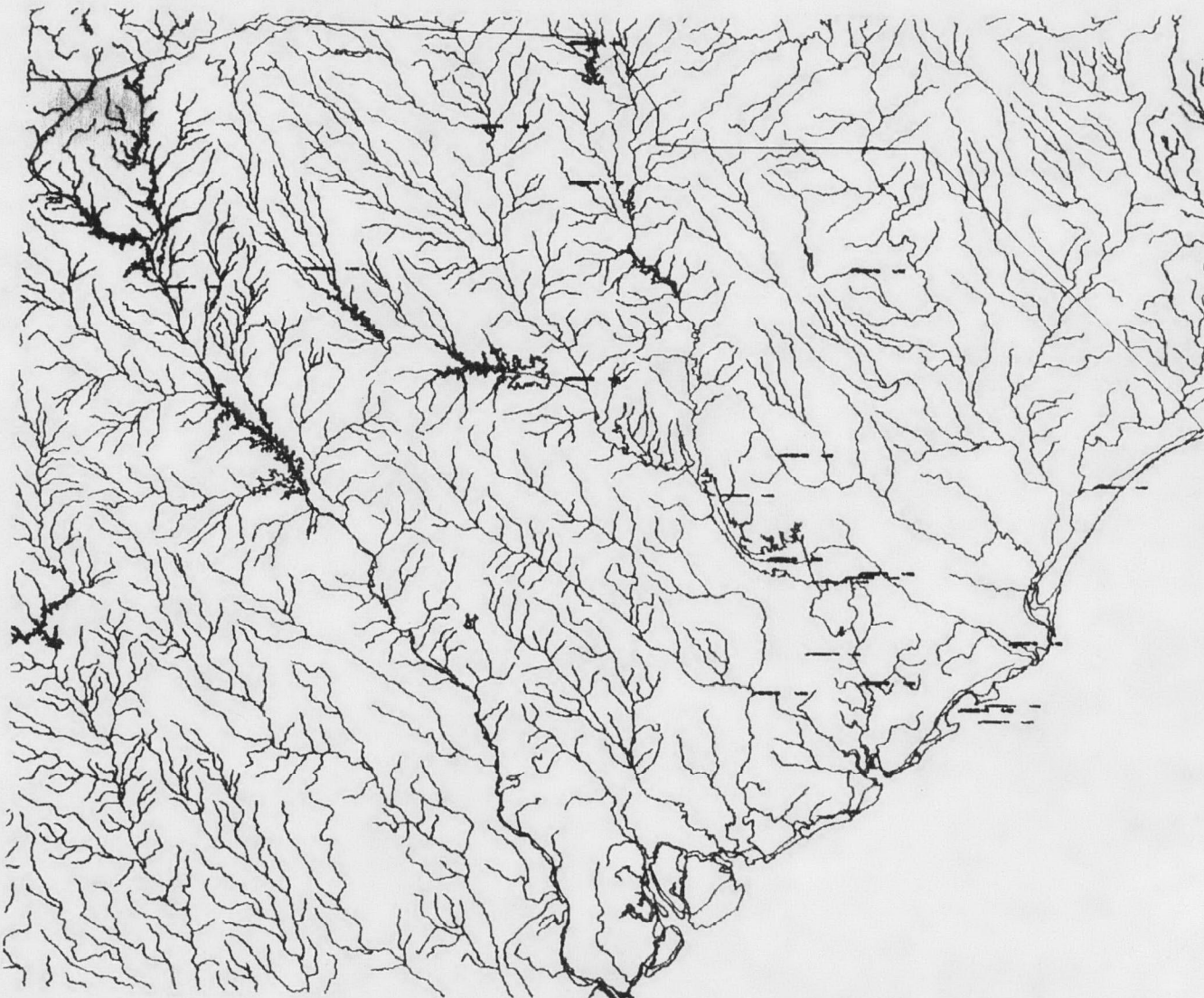- Transportable via flexible disk or 9-track ANSI tape, or even communications.

U.S. EPA Region IV - OIEA

RED DOWN TREND -GREEN UP TREND
1986-1989 DATA

MAP OF SOUTH CAROLINA
DO TREND

Elevation Data

Elevation Contours

Monitor Well Data

Soil Sample Data

MINTEQ and PRIZM

MODEL RESULTS

EXPLANATION

Elevation data from survey.

Soil Sample data from survey and lab results.

Monitor Well data from survey and lab results.

Resultant Data derived from PRIZM after MINTEQ results.
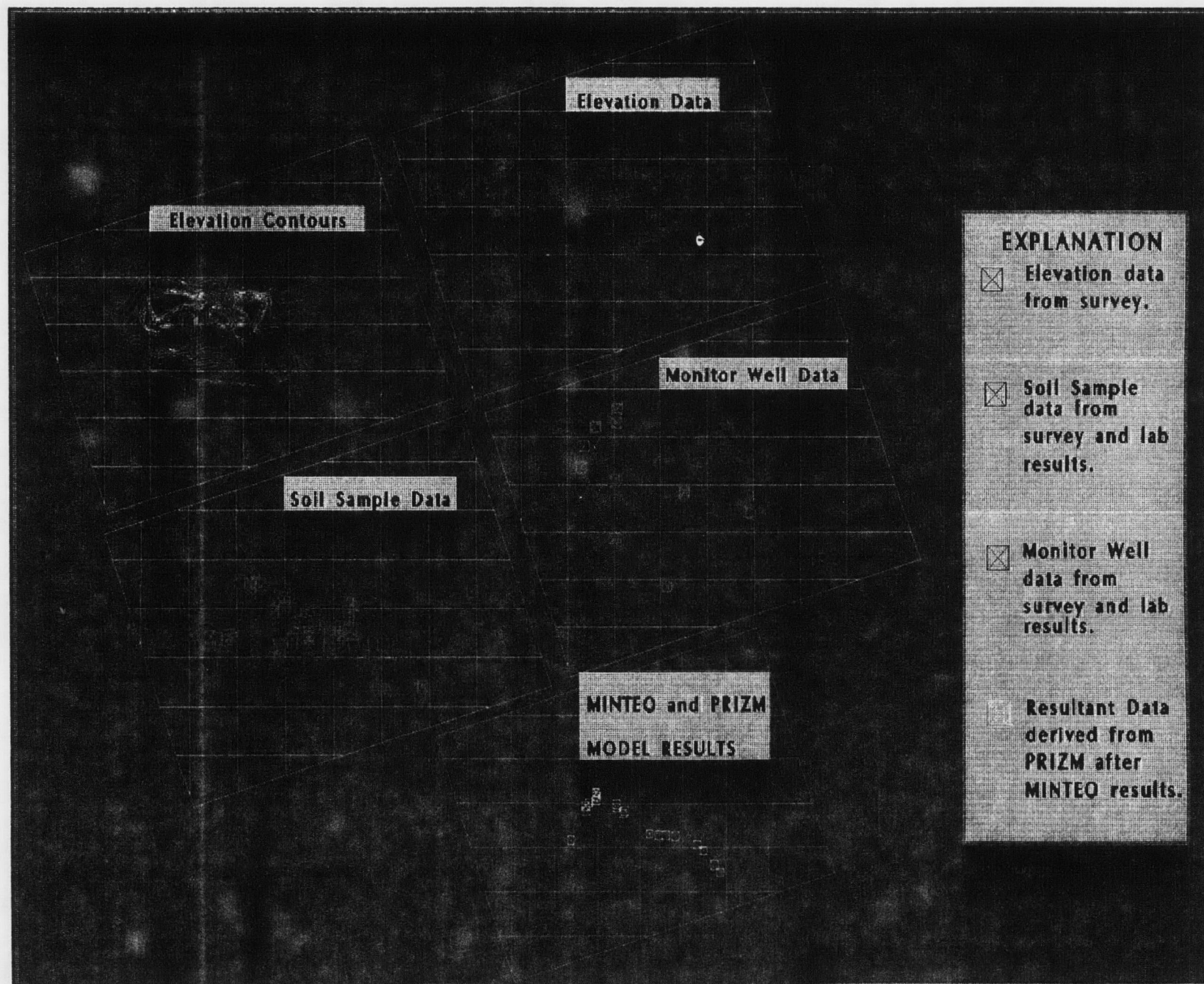
SHAVER FARM'S SUPERFUND SITE

OBJECTIVE

Develope background covers of the site and generate contours for geophysical log data (Proton Magnetometer, EM-34, and WADI) for Shaver farm. Gives the project manager the capability to use data gathered on site to support his professional judgement of what is needed for clean up.

PROJECTED USES

As cleanup begins, the data gathered will be used for field verification of the use of different geophysical logging techniques in finding anomylies which indicate buried drums. Also can be used to check cleanup progress.

PRESENT USES

The analysis of the geophysical logs was used in negotiations with the PRP to establish the workplan for clean up.

SUMMARY OF CAPABILITIES ACHIEVED

GIS capabilities were used to support the project manager's professional judgement that important data was being overlooked in the workplan for cleanup proposed by the PRP. Contours for each geophysical log were generated. Areas where anomylies overlapped between the three types of logs were found. These areas will be used to help determine areas to be cleaned up. Graphics of contours, 3-D views, sample locations, and points of high values were shown for each geophysical log. Graphics of the background were used for visual orientation and overlays were made to aid in the comparison of anomylies.

TEAM LEADER: Phyllis Mann   PHONE: 347-3402

Locating Buried Hazardous Waste Drums using
Very Low Frequency (VLF) Current Density Indication.
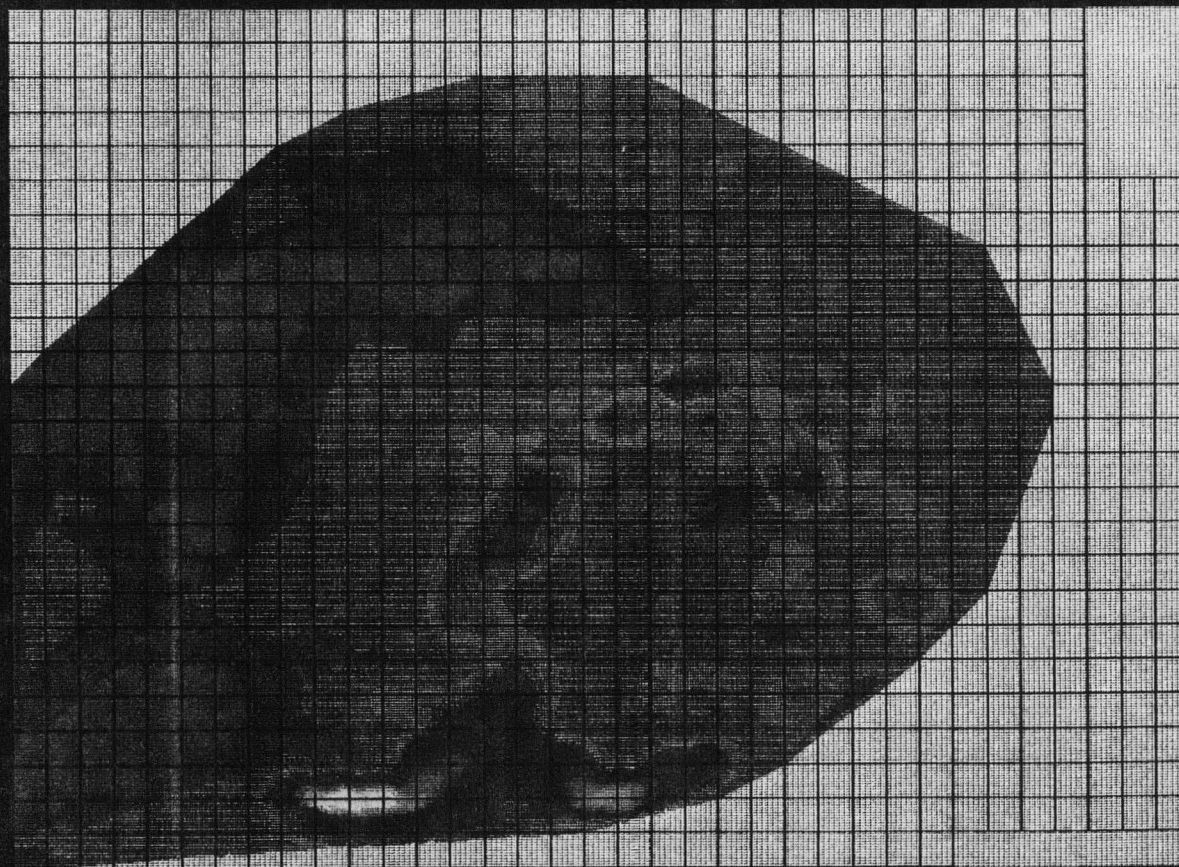WADI Geophysical Survey method.
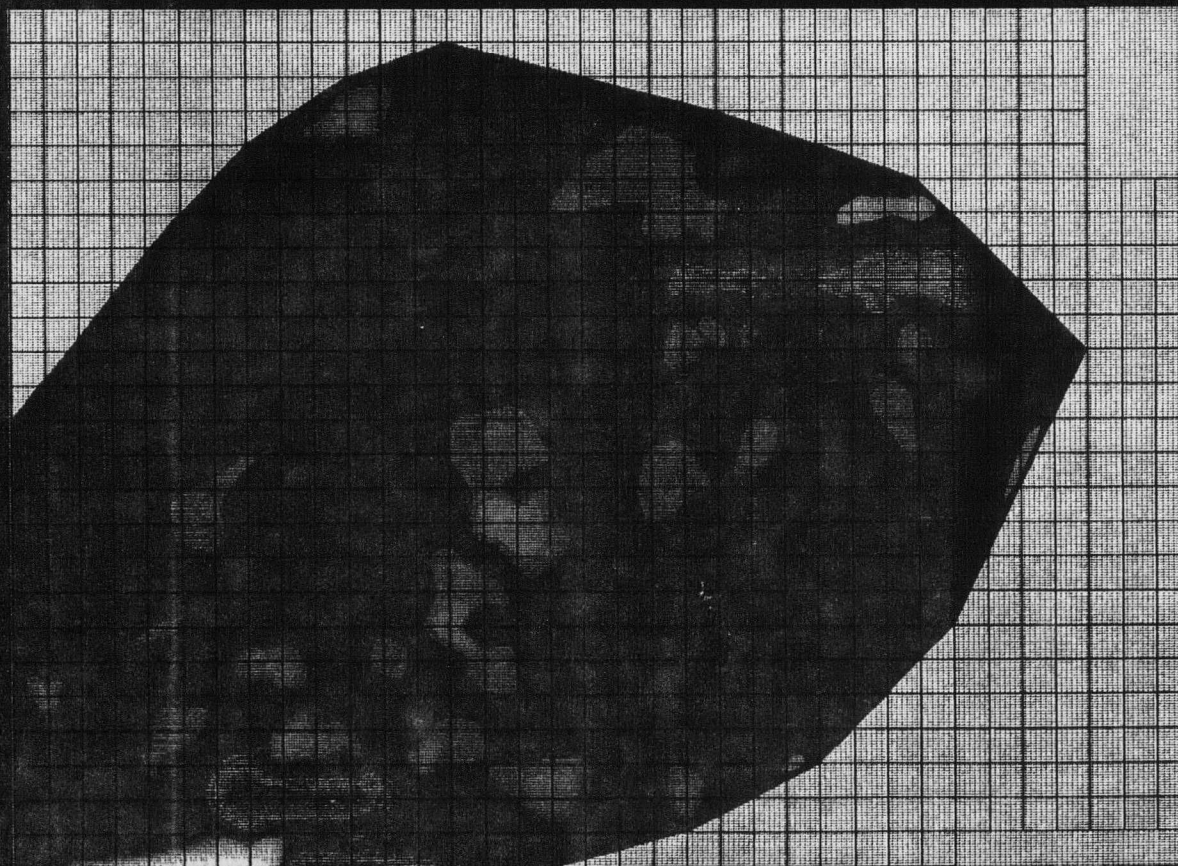
EXPLANATION

Measured Parameters:
- Vertical and
  horizontal in-phase
  and out-of-phase
  components.

Calculated Parameters:
- Current Density
  calculated from
  Vertical in-phase as
  a percentage of the
  of the horizontal
  field.

CURRENT DENSITY

Locating Buried Hazardous Waste Drums using Electromagnetic (EM) Geophysical Survey Method

EXPLANATION

Measured Parameters:

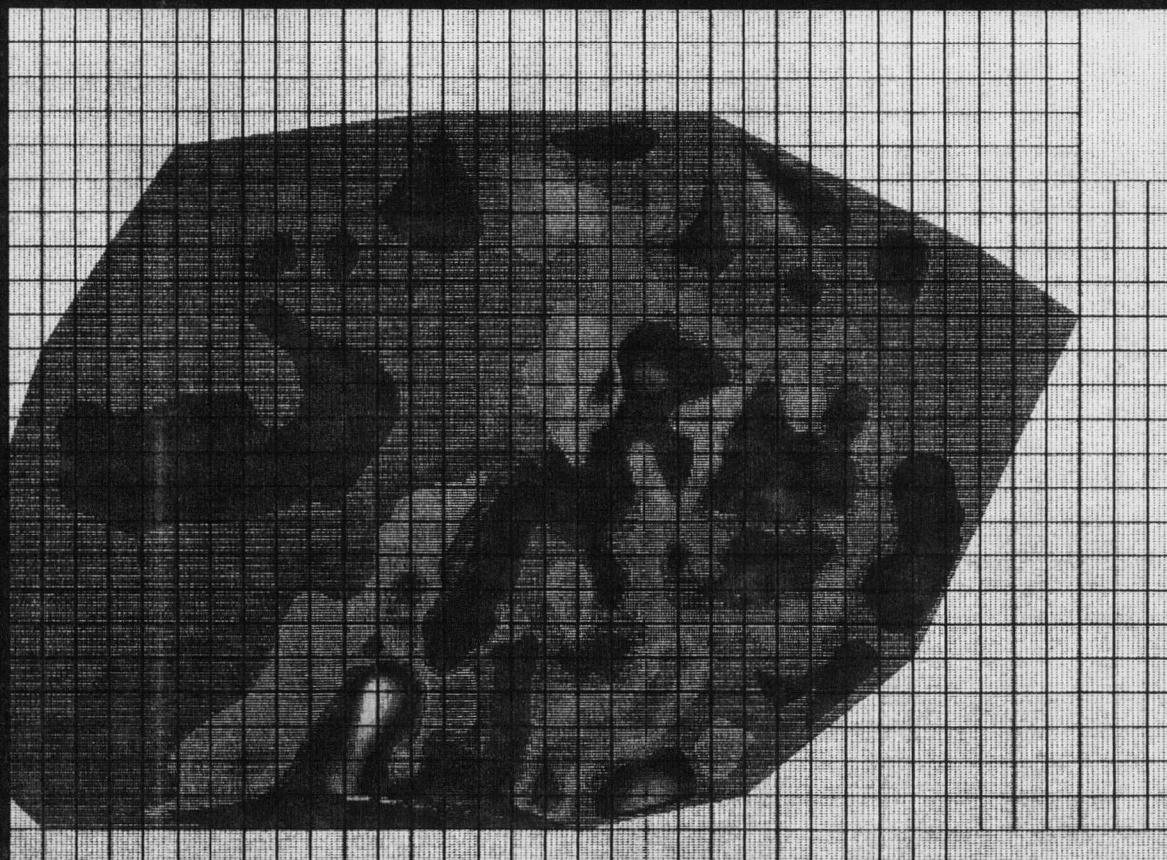-Subsurface conductivity measured in millimhos per meter (mm/m).

Calculated Parameters:

--porosity
--permeability
--dissolved electolytes
--dissolved colloids
--temperature
--phase state

4 ———— 56 mm/m

Locating Buried Hazardous Waste Drums using
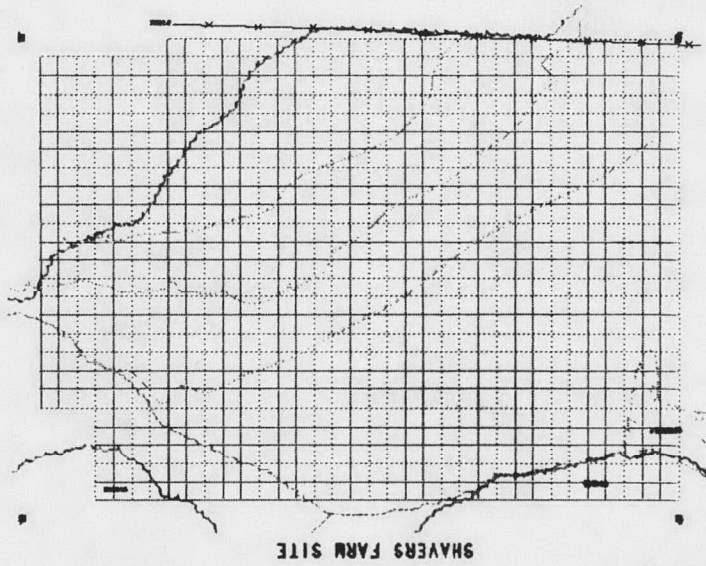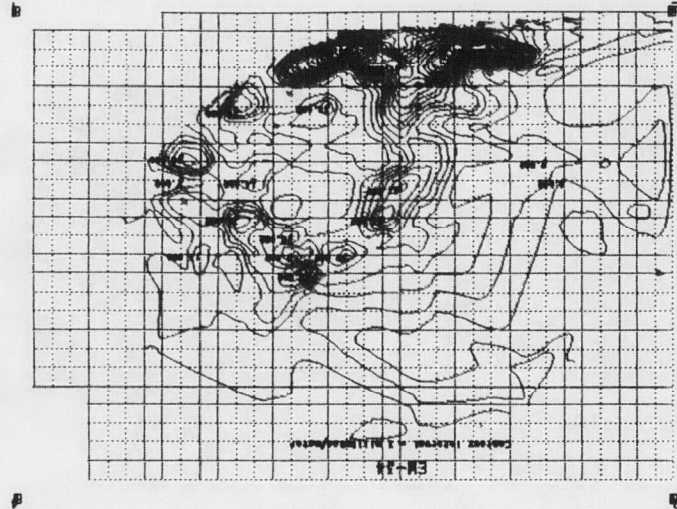Proton Magnetometer Geophysical Survey Method

EXPLANATION

Measured parameters:

- Intensity of the earth's magnetic field.

- Changes in the magnetic intensity caused by magnetic anomolies.

Calculated Parameters:

-Vertical components of magnetic strength calibrated from 50,000 nano teslas as datum.

52,000   53,600 nano teslas
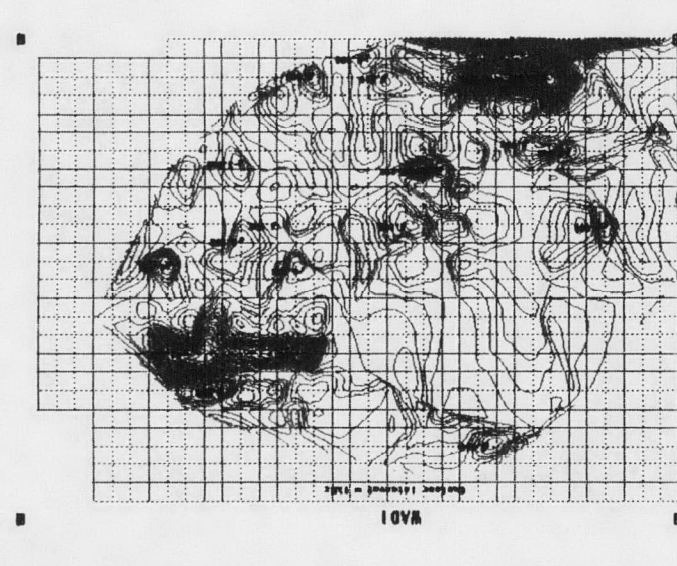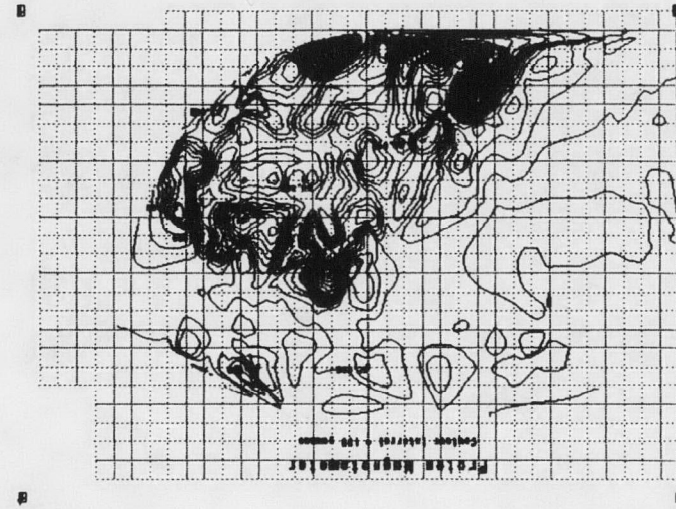
SHAVERS FARM SITE
EM-34
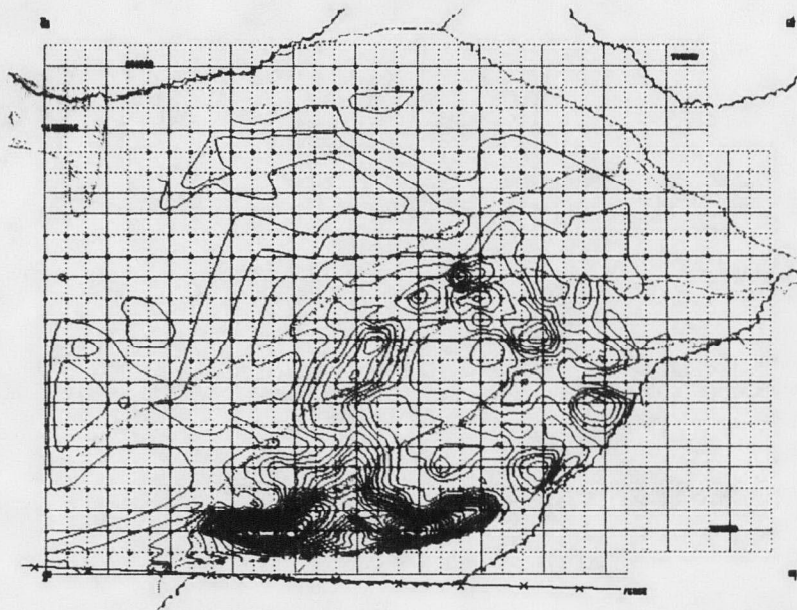
CONTOUR INTERVAL = 2.0

EM-34
TERRAIN
TREE LINE
SINK HOLE
STREAM
FENCE
SAMPLE

AZIMUTH = 2 DEGREES

AZIMUTH = 35 DEGREES

SHAVERS FARM SITE
WADI

CONTOUR INTERVAL = 1.0

WADI
TERRAIN
TREE LINE
SINK HOLE
STREAM
FENCE
SAMPLE
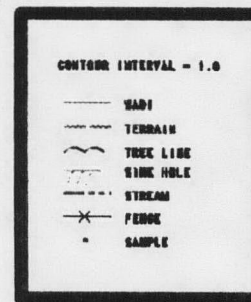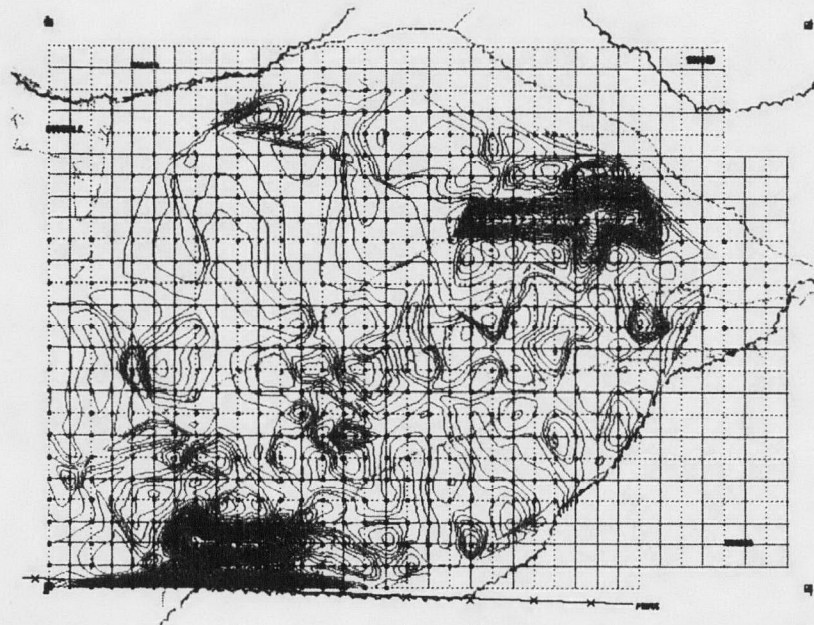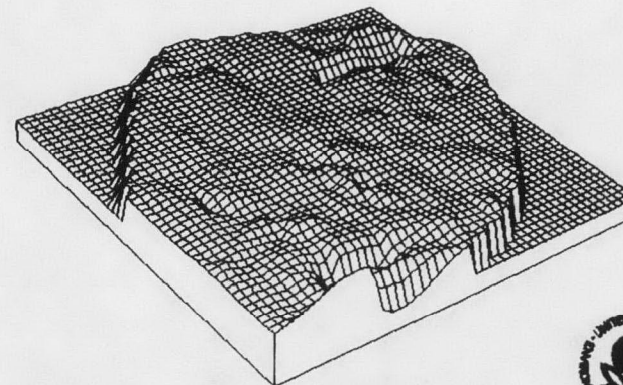
AZIMUTH = 2 DEGREES

AZIMUTH = 35 DEGREES

SHAVERS FARM SITE
PROTON MAGNETOMETER

CONTOUR INTERVAL = 100

— PRO-MAG
— TERRAIN
~ TREE LINE
— SINK HOLE
--- STREAM
—×— FENCE
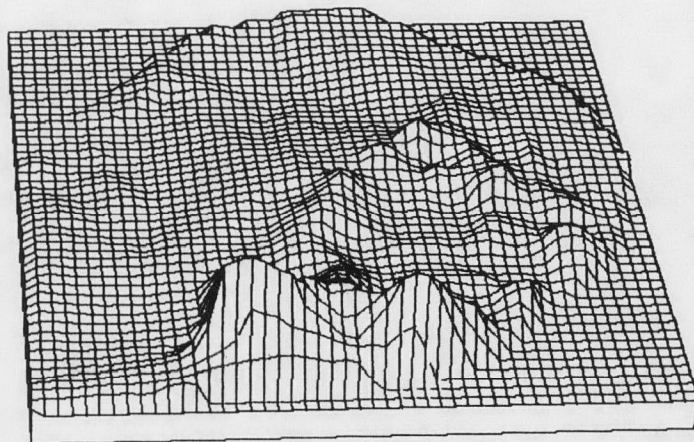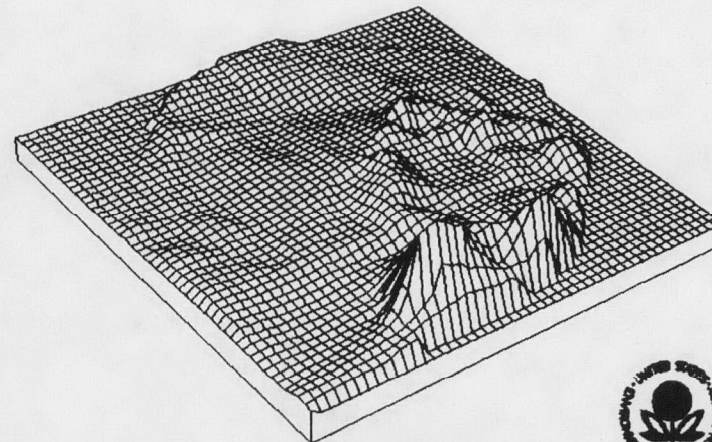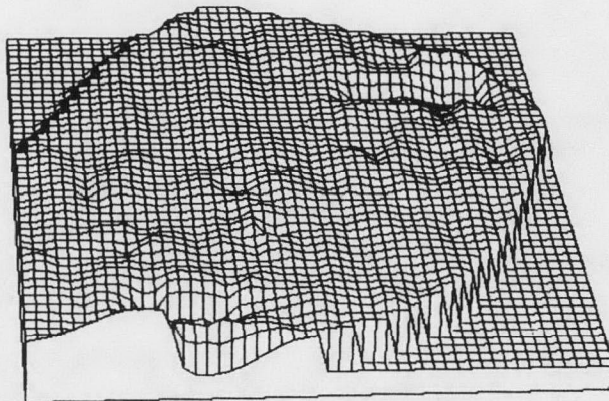· SAMPLE
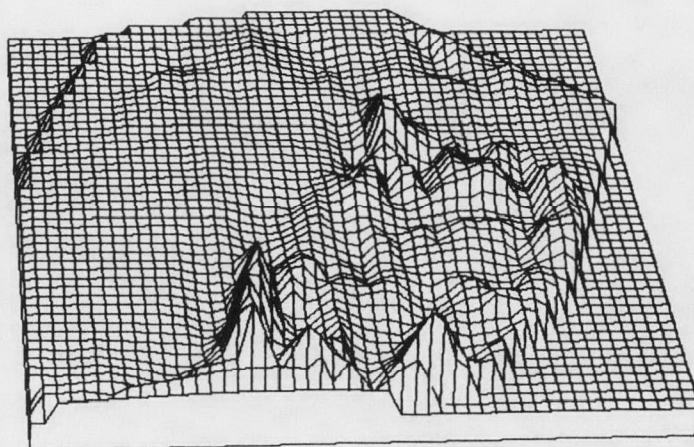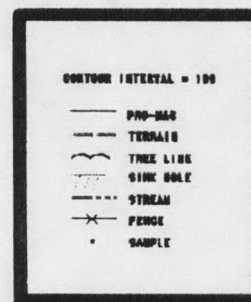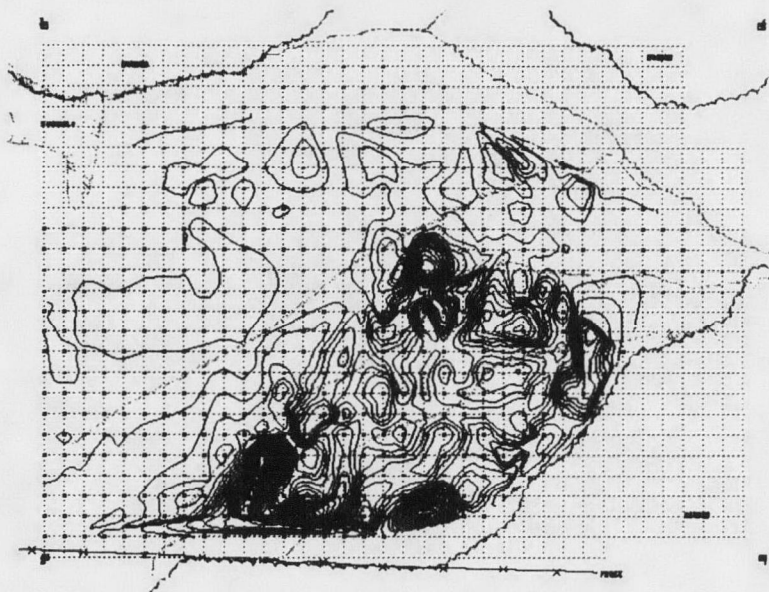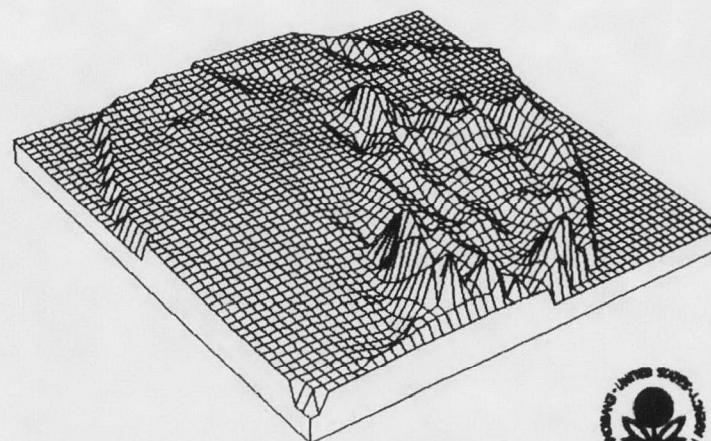
AZIMUTH = 2 DEGREES

AZIMUTH = 35 DEGREES

VULNERABILITY PRESCORE

OBJECTIVE

To identify, target and prioritize superfund sites, RCRA facilities and water supplies using the alogorithms of HRS II and DRASTIC.

PROJECTED USES

Risk analysis and site feasibility studies. To prioritize and target RCRA, Super-fund and water supply

PRESENT USES

Ranking Superfund sites based on prescorings.

SUMMARY OF CAPABILITIES ACHIEVED

Calculation of region wide DRASTIC scores from county databases. Modification of elements of scoring system to refine geologic, hydrogelogic, soils and elevation data. Using scoring system as a component of the HRS III prescore technique.

TOXIC WASTE SITE PRIORITIZATION

Objective

Obtain the most effective use of limited resources, including funds, manpower, and time, in addressing the monumental problems of toxic waste cleanup.

Projected Uses

Establish a priority order of unevaluated sites based on an estimate of relative risk to human health and the environment for each site. Periodically review and reassess this ranking based on new or more complete information.

Present Uses

Region IV has used the process for preliminary prioritization of 81 sites as part of the Environmental Priorities Initiative, as well as for 4,298 entries in the CERCLIS database. These relative rankings have been used by the Superfund program for purposes of assigning sites to contractors.

Summary of Capabilities Achieved

A compiled-code program has been written which interfaces directly with the Regional ARC/INFO GIS to determine realistic estimates of target population size for the groundwater component of HRS-II. Said program uses attribute data from the 1980 census to determine the probable number of persons using private water supplies within a series of concentric rings around each site. The rings themselves are map features which carry attributes, and one of these attributes is a dilution (or distance) weighting factor derived from the HRS-II model. A total weighted target population is derived for each site by combining the results of this analysis with those from an ARC POINTDISTANCE using public water supply intakes as targets. This target population is then combined with previously-prepared groundwater vulnerability data using a series of INFO programs based on the HRS-II algorithm for calculating the groundwater score. The score thus produced was used as the priority ranking factor.

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SUPERFUND PRE-REMEDIAL RETRIEVAL SYSTEM

OBJECTIVE

Gives pre-remedial managers additional information for public and domestic water supplies within four (4) miles radius of a CERCLA site. It is menu driven so GIS applications can be used without knowledge of ARC/INFO.

PROJECTED USES

Locations for single or multiple ssites can be entered and spatial analysis done using the available databases. The additional information can be used to established priorities when assigning sites.

PRESENT USES

This method has been used for assigning sites to FIT.

SUMMARY OF CAPABILITIES ACHIEVED

Can enter locations for sites or select data previously entered and saved. Can find public and domestic water supplies within 4 miles and get estimated total target populations for each site. The databases can be loaded at graphically and the various databases queried interactively. Reports can also be generated.

TEAM LEADER: Phyllis Mann   PHONE: 347-3402

RETRIEVAL SYSTEM FOR
STATE DRINKING WATER PROGRAMS

OBJECTIVE

This retrieval system gives the state drinking water program access to EPA data, provides them with GIS capabilities to help them in decision making, and reporting to EPA.

PROJECTED USES

All state drinking water programs will have access to the retrieval system and can use the available databases and GIS capabilities in decision making.

PRESENT USES

Alabama is acquiring equipment needed to allow themn to dial in to our system. The state of Tennessee is sending someone to learn how to dial in and to have some input in possible additions to the neru. All of the states in Region IV have expressed interested in bing able to access the system.

SUMMARY OF CAPABILITIES ACHIEVED

The menu now allows the user to view public water supplies, CERCLIS sites, HWDMS sites, NPEDS sites, reaches, and county bourdaries. The user can interactively query the datgabases of any layer selected for viewing. It is possible to zoom in on an area of concern. The user can also select a public watger supply, give a radius of concern and find any possible contaminant sources (CERCLIS, HWDMS, and NPDES) within that radius.

TEM LEADER: Phyllis Mann   PHONE: (404) 347-3402
                                                         (FTS) 257-3402

SUPERFUND RETRIEVAL SYSTEM

OBJECTIVE

Develop menu driven interfaces to allow RPM's to access site data, look at it graphically, perform some spatial analysis, and generate reports.

PROJECTED USES

The RPM will be able to use the retrieval system to manage their sites without being expert GIS users or having to wait for others to help them.

PRESENT USES

Data for Superfund sites are presently being entered using the electronic reporting database. The specific functions of the nenu will be developed with input from the RPM.

SUMMARY OF CAPABILITIES ACHIEVED

The retrieval system will allow the RPM to identify data gaps while work is still being done on site. They will be able to generate isopleths for various contaminats. This will enable them to track contaminant plumes and make decisions as data becomes available. The RPM will also have access to a variety of other databases to help them in their decision making.

TEAM LEADER: Phyllis Mann   PHONE: (404) 347-3402.
                                                     (FTS) 257-3402

REGION GIS LIBRARY

Objective

Provide a common frame of reference for all Regional GIS data, and a single source from which all such data may be accessed; allow for easier integration of different databases for which the only relational factor may be location; provide for periodic update of GIS information by specific map layer; provide for security against unauthorized modification of the Regional GIS database; and simplify management of spatial information databases.

Projected Uses

The GIS library will provide spatial data for user queries from all quarters of the Regional GIS user community, including all operating programs, management, service-oriented offices, and delegated states. It will also provide some support for the information requirements of the Regional Center of Excellence in GIS.

Present Uses

The GIS library is currently in use by the Region for purposes of map composition, interactive feature query, and input for spatial analysis procedures, such as the regionwide toxic waste site prioritization procedure.

Summary of Capabilities Achieved

The GIS library is a standard ARC/INFO library using the USGS 1:250,000 scale quadrangles for the tile scheme. The library uses an Albers projection which is centered on the Region to minimize distortion, and map units are in meters. This allows direct determination of distances without further manipulation of a map. Any GIS user can query the library, extracting portions for further processing, as well as simply using the map layers as background information for map composition. Security is implemented in two layers: (1) the ARC/INFO Librarian provides for query-only access for most users, while Library Managers have full access, and (2) system access control lists (ACLS) prevent unauthorized modification of the database.

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