CHAPTER IV
TECHNICAL SOFTWARE AND DATA MANAGEMENT

Many tools exist for collecting, storing and analyzing environmental data. Automated computer techniques can efficiently manage environmental data and predict potential impacts . This is accomplished using electronic data, database management systems and geographic information systems that are linked to other automated analytical tools such as statistical and geochemical analysis packages, surface- and ground-water models, and other spatial analysis software.

With the growth in the use of micro-computers and high speed graphical scientific work stations, there is a large selection of software available that aids in the management of hydrologic data, in the analysis of baseline hydrologic, geologic and other information, and in the quantification of PHC and CHIA . A careful and systematic approach is required in the selection of a suite of software and hardware to assure that the system can be effectively and efficiently used to store, manage and analyze hydrologic data . One such system available to OSM offices, states and Tribes with responsibilities under SMCRA is the OSM Technical Information Processing System (TIPS) . This chapter contains a brief summary of the suite of software available through TIPS that may be useful in evaluating baseline information . For more information on the TIPS program and on the current TIPS software, see the main TIPS website found at: www.tips.osmre.gov and the TIPS software and hardware support website found at: www.tips.osmre.gov/SoftwareHardware.htm.

The following software summary is an excerpt from the TIPS core software description website found at: http://www.tips.osmre.gov/coresoftware_2001.htm.

The TIPS websites will provide the most current information on the core software and hardware configuration; however, the following is provided for convenience and to illustrate the currently available software.

A. TIPS Core Software

1. AQTESOLV Professional

Description: A suite of tools to analyze movement and quantity of ground water, estimate aquifer parameters and to evaluate pump/slag well test results.

Used by: Hydrologists and geologists.

Additional Information: http://www.aqtesolv.com/

2.   AquaChem

Description: Water quality, typing and equilibrium water chemistry analyses.

Used by: Hydrologists, geochemists, and geologists.

Additional Information: http://www.flowpath.com/software/aquachem/aquachem.html

3.   ARC/INFO

Description: ArcInfo is a high-end GIS with capabilities for automation, modification, management, analysis, and display of geographic information. Because of its Open Development Environment, ArcInfo allows users to easily build custom applications and interfaces. Various extensions are available to extend core functionality. ArcInfo adheres to modern software engineering and computing standards and runs on a variety of hardware platforms, including UNIX workstations as well as Windows NT computers.

Used for: Spatial data analysis.

Used by: Technical or computer specialists.

Additional Information: http://www.esri.com/software/arcgis/arcinfo/index.html

4.   ArcView

Description: User-friendly interface with ArcInfo to allow the users to visualize, tabulate, chart and layout GIS data. Does not require ArcInfo to run.

Used for: Visualizing, querying and analyzing spatial data.

Used by: Regulatory or AML specialists, or managers working with maps and database applications in the ARC/INFO environment.

Additional Information: http://www.esri.com/software/arcview/

5.   AutoCAD Map 2000

Description: Map drafting. A professional automated mapping tool for creating, maintaining, and communicating mapping and GIS information

Used by: Regulatory or AML scientists specializing in geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

Additional information: http://www.autodesk.com/products/acadmap/index.htm

6.   EarthVision

Description: 3D modeling of both surface and sub-surface features and information to produce layered topographic and base maps, as well as detailed volumetric calculations.

Used for: Spatial analysis.

Used by: Geo-scientists, hydrologists, and engineers who model/ analyze spatial information such as overburden toxicity, water quality and quantity, geology, and topography, and those engaged in reclamation design and Approximate Original Contour (AOC) evaluation.

Additional Information: http://www.dgi.com/earthvision/index.shtml

7.   Galena

Description: GALENA is a simple, user-friendly yet very powerful slope stability software system, which allows for the simulation of complex geological, ground water and external force conditions. GALENA incorporates three methods of slope stability analysis in order to assess a wide range of ground stability problems in both soils and rocks -

- The BISHOP Simplified method determines the stability of circular failure surfaces.

- The SPENCER-WRIGHT method for either circular or non-circular failure surfaces.

- The SARMA method for problems where non-vertical slices are required or for more complex stability problems.

Used for: Slope stability analysis

Used by: Engineers, geotechnical specialists.

Additional Information: http://galena.clovertechnology.com.au

8.   Geochemist Workbench

Description: A collection of sophisticated modules for solving aqueous geochemistry problems.

Used by: Hydrologists, geochemists, and geologists.

Additional Information: http://www.rockware.com/

9. Groundwater Modeling System (GMS)

Description: Ground-water model design system that converts map data into MODFLOW, MODPATH and MT3D grid data.

Used by: Hydrologists, geochemists and geologists

Additional Information: http://www.ems-I.com/gms.htm

10. Ground Water Vistas

Description: Ground Water Vistas is a model-independent graphical design system for MODFLOW, MODPATH and MT3D.

Used by: Hydrologists and geologists

Additional Information under **Software** at **Groundwater Vistas** at:
http://www.groundwatermodels.com

11. HEC-RAS

Description: A water surface profile model for analyzing rivers of both natural and man-made channels, as well as flow hydraulics, and bridge and culvert hydraulic analysis.

Used by: Hydrologists and engineers.

Additional Information:
http://www.hec.usace.army.mil/software/software_distrib/hec-ras/hecrasprogram.html

12. KeyServer

KeyServer is not a general use, technical software application - It is software license management software that will work over a wide area network (WAN) which is available from Sassafras Software. In order to make the technical software more widely available, while limiting software procurement costs, TIPS uses KeyServer as a network software license manager. KeyServer monitors the use of technical software packages through the TIPS WAN and limits availability to

no more than the number of legitimately purchased licenses. The software application runs locally on the users computer for higher speed, but will only load when authorized by the KeyServer manager over the network. For more information on KeyServer, see the website found at: http://www.sassafras.com/

13. Pathfinder Office

Description: Software to assist in interpreting, correlating and plotting GPS unit data.

Used for: Verification of stream buffer zones, locating roads, outcrops, ponds, or other features relative to permit boundaries; inventory ground-water discharge locations, outcrops, etc.; mapping of AML site locations and acreage; measuring the size of minesite disturbance areas, etc.

Used by: Geo-scientists, inspectors hydrologists, and engineers who collect spatial information such as overburden toxicity, water quality and quantity, geology, topography, etc., and those engaged in reclamation design and approximate original contour (AOC) evaluation.

Additional Information: http://www.trimble.com/products/pd_gi.htm

14. Revised Universal Soil Loss Equation (RUSLE)

Description: Soil loss prediction software which includes a suite of modules for determining soil loss factors.

Used by: Engineers, geologists, hydrologists, soils scientists

Additional Information: http://www.sedlab.olemiss.edu/rusle/

15. Surface Deformation Prediction System (SDPS)

Description: SDPS is an integrated approach to the problem of calculating and predicting ground deformations above undermined areas. Based on empirical or site-specific regional parameters, the model quantifies a variety of ground deformation indices for both longwall and high extraction room-and-pillar mines such as subsidence profile, angle of draw, strain, slope, and curvature. The application includes a graphing program as well as a pillar stability program that can help evaluate the stability of pillars in room-and-pillar mines.

16. SEDCAD for Windows

Description: A suite of curve-number based watershed rainfall-runoff models, RUSLE-based sediment yield analysis, and channel and hydraulic structure design utilities.

Used by: Engineers, geologists, hydrologists, soils scientists.

Additional Information: Website - None.

17.　　Statgraphics

Description: Statgraphics is a statistical analysis software package that allows complex statistical evaluations and graphing of data.

Used for: Uses include comparison, summary statistics, time series analysis, prediction, hypothesis testing, sample-size determination, regression and other correlation of environmental data.

Used by: Geologists, hydrologists, soils and vegetation specialists to interpret data.

Additional Information: http://www.statgraphics.com

18.　　StratiFact

Description: StratiFact is designed to store and display borehole or well data. It also provides an effective tool for stratigraphy correlation. The program consists of two integrated components: a database manager paired with interactive graphics.

Used for: Storing, displaying and correlating borehole or well data.

Used by: Geologists and hydrologists.

Additional Information: http://stratifact.com/

19.　　SurvCADD 2000 for AutoCAD

Description: SurvCADD is application software for civil engineering, surveying, and mine engineering which runs with AutoCAD. It produces topography maps, base maps, and simulated 3D pictures of surface terrain. It also includes functions to model channel designs used in analyzing small watersheds and storm runoff.

Used for: Customizes AutoCAD for earthmoving and engineering additional commands and enhancements. SurvCADD consists of the following Modules: Cogo-Design, DTM-Contour, Section-Profile, Mining, Hydrology, SurvCOGO and Roadway & Sewer.

Used by: Regulatory or AML scientists in civil or mining engineering, geology, or related disciplines.

Additional Information: http://www.carlsonsw.com/survcadd.htm

20.　　Trimble Global Positioning System (GPS)

Description: GPS Hardware.

Used for: Satellite mapping. Uses include verification of stream buffer zones, locating roads, outcrops, ponds, or other features relative to permit boundaries; inventory ground-water discharge locations, outcrops, etc.; mapping of AML site locations and acreage; measuring the size of minesite disturbance areas, etc.

Used by: Geo-scientists, inspectors, hydrologists, and engineers who collect spatial information such as overburden toxicity, water quality and quantity, geology, topography, etc., and those engaged in reclamation design and AOC evaluation.

Additional Information: http://www.trimble.com/index.htm

B. Data Bases

The most significant national and state/tribal data bases are described in Appendices A and B, respectively. The applicability of national data bases to a proposed coal mine operation is generally limited. As a result, it may be desirable for RAs to consider establishing and using hydrologic data bases on a statewide, coal field, watershed, or aquifer basis from information commonly available in permit application files, inspection reports and monitoring reports.