

# YEAR END REVIEW 2001



There were many success stories for the Center throughout the year. However, one success stands above all others – and rightly so. Late in 2001, the Spatial Data Standards (SDSFIE) achieved ANSI approval. For nearly 7 years we have described the SDSFIE as the “de facto” standard for spatial data. With the ANSI label, it becomes “*the official*” standard for spatial data throughout the nation!



## **ANSI Approves New CD-Based Geographic Information Standard**

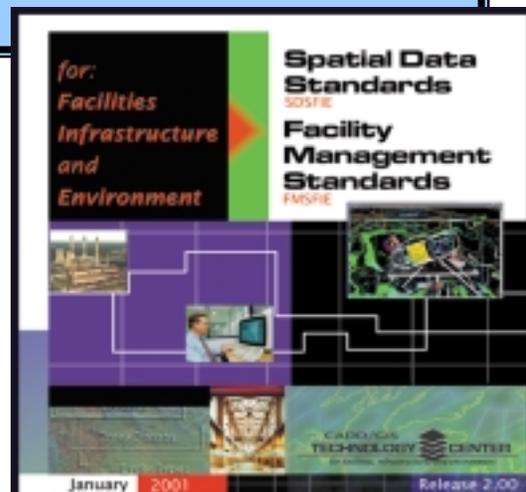
*Considered Integral to Homeland Security,  
Standard Will Be Used By Military Facilities And Commercial Airports*

**Washington, DC, November 15, 2001** - Today at a meeting of the National Committee for Information Technology Standards (NCITS), the Executive Committee approved the Spatial Data Standard for Facilities, Infrastructure & Environment (NCITS 353). The standard represents an important milestone, not only because of what it addresses, but also because of its database format, which makes it instantly usable.

## Spatial Data Standards

The completion of Release 2.00 of the SDSFIE continued the Center's tradition as the leader in data standards for GIS implementations. 3,000 CD-ROM's were published and distributed to GIS users and customers worldwide. Many more customers downloaded the SDSFIE from the Center's Internet web site (<http://tsc.wes.army.mil>).

Release 2.00 provided dramatic enhancements to the collection of software applications provided with the SDSFIE. In addition to enhancements for the "Browser," "Filter Maker," and "SQL



Release 2.00 also provided a substantial expansion to the Standards content with 11 new Entity Classes, 57 new Entity Types, 73 new Attribute Tables, 269 new Attributes, 71 new Domain Tables, and 216 new Domain values.

**Spatial Data Standards/Facility Management Standards**

**PURPOSE**

- Provide a standard for GIS and facility management (GAD and GIS) implementations at Department of Defense installations, Army Corps of Engineers Civil Works activities, and other Government organizations.
- Provide a nonproprietary standard designed for use with commercially available, off-the-shelf CAD, GIS, and relational database software.
- Provide a GIS implementation scheme for approved Federal Geographic Data Committee Data Standards.

**CD-ROM CONTENTS**

- Windows-based SDSFIE/FMSFIE Applications (95, 98, NT, and 2000) Release 2.00 and Tutorial (initially with SDSFMS Release 2.00 Installation Program). Applications include the Browser, SQL Generator, Filter Maker, Filter Eraser, Geomedia Builder, Access Builder, and Access Data Creator.
- SDSFIE Symbol Sets for MicroStation, AutoCAD, ArcInfo, and ArcView. (See ArcInfo/MapInfo, AutoCAD/MapInfo, ArcView/MapInfo, and MicroStation/MapInfo directories).
- SDSFIE/FMSFIE Release 2.00 XREF Models (.pdf and .art digital format). (See Models/XX directory).
- Technical guidance and documentation. See Guidance and Instructions Directories.
- GPS Tutorial: Compliments of Potomac River Naval Air Station, Maryland. See GPS Tutorial directory.

**Facilities - Infrastructure - Environment**

Important contributions have been made by many past and present Department of Defense, other Federal government, State government, local government, industry, and contractor personnel. All deserve our thanks and appreciation for their contributions to the SDSFIE and FMSFIE development effort. Of special note were the leadership and support of past and present CAD/CIM Technology Center organizations, including Board of Directors, Advisory Executive Steering Group, Corporate Staff Advisory Executive Working Group and Field Technical Advisory Group, Field User Groups, Industry Relationship Group, and contributing subject matter experts. Special appreciation goes to all reviewers and GIS technical experts who provided invaluable comments and recommendations on the first and second releases.

U.S. Army Corps of Engineers • U.S. Army • U.S. Air Force • U.S. Navy • U.S. Marines  
 U.S. Coast Guard • Defense Logistics Agency • Environmental Protection Agency  
 National Aeronautics & Space Administration • General Services Administration  
 State Department • National Institute of Building Sciences

**The SDS was recommended by ESRI as the preferred standard for GIS implementations, and featured in their brochure entitled “ESRI Military Installation Management GIS”.**

Generator" applications, new functionality was added including the "Filter Eraser" (permits the deletion of user-defined custom filters), "Access Builder" (permits the construction of SDSFIE/FMSFIE compliant Microsoft Access 97 database tables), and "Data Creator" (provides a data entry form for use with a Microsoft Access 97 database).

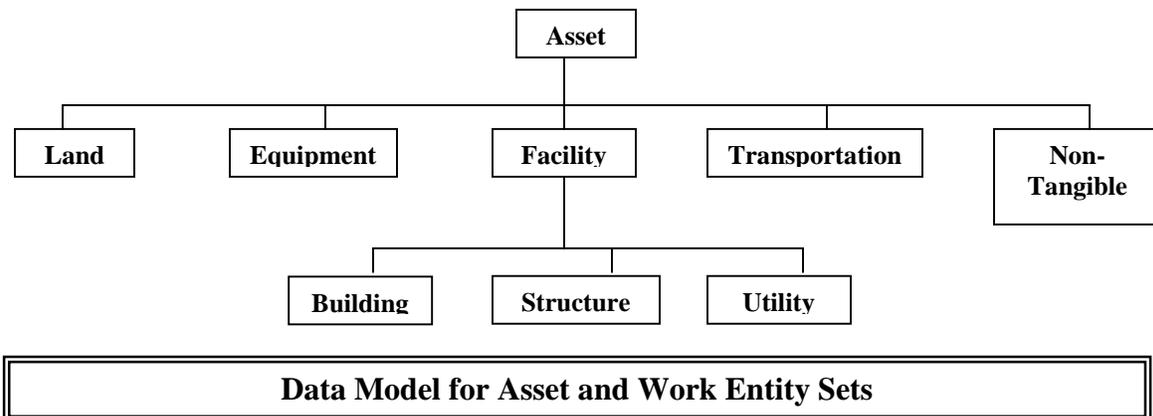
One significant accomplishment produced by partnering with ESRI, the Army National Guard Bureau, and numerous ESRI GIS users has been the development of an SDSFIE compliant ARC GIS Geodatabase Template and ARC Builder tool for distribution with the SDSFIE Release 2.10.

In addition, 2001 marked the third year the Center offered SDSFIE Implementation Workshops. Two workshops were offered, with a total of 73 students from various Department of Defense organizations, other Federal Government agencies, and local government organizations.

## Facility Management Standard

In early 2001, the Center’s Corporate Staff and Board of Directors approved an updated strategic plan for the Facility Management Standards (FMSFIE). The plan provides goals and objectives for development of the FMSFIE into a “transactional” FMSFIE. The “transactional” FMSFIE will provide a data standard designed specifically for use with 21<sup>st</sup> century technologies, and enterprise GIS and FM implementations.

Development of conceptual and logical data models for the Asset and Work Entity Sets began in 2001. A review of DoD facility management legal reporting requirements based upon existing DoD and Federal FM databases (e.g., Army IFS-M, Navy NFADB, Air Force IWIMS & ACES, OSD Real Property, Coast Guard CEDS, & GSA) was also completed in 2001.



## Expand SDSFIE/FMSFIE to Meet Clean Air Act (CAA) and SARA Title III Data Reporting Requirements

The objective of this 2001 project was to expand the SDSFIE and FMSFIE data structure and data dictionary to meet the legal reporting requirements under the Clean Air Act (CAA) and the Superfund Amendments and Reauthorization Act (SARA) Title III (Right-To-Know).

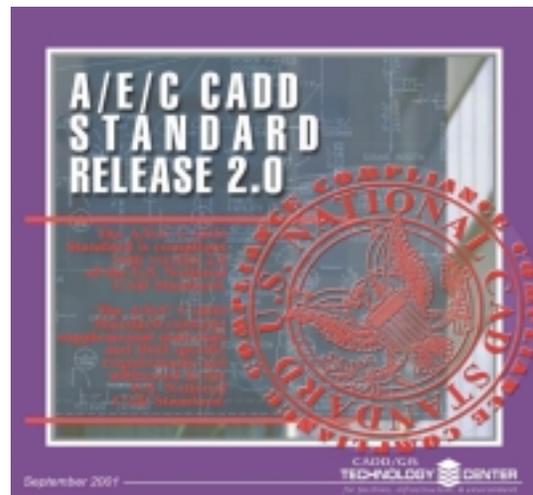


The project proposal was developed during FY01 at the Cherry Point Marine Base based upon actual CAA and SARA Title III regulations and data reporting requirements. Information concerning the project is available at:

[http://tsc.wes.army.mil/contacts/groups/FWG/Environmental/envprojects/01.016/01\\_016.htm](http://tsc.wes.army.mil/contacts/groups/FWG/Environmental/envprojects/01.016/01_016.htm)

## A/E/C CADD Standard, Workspace, and SWAT Visits

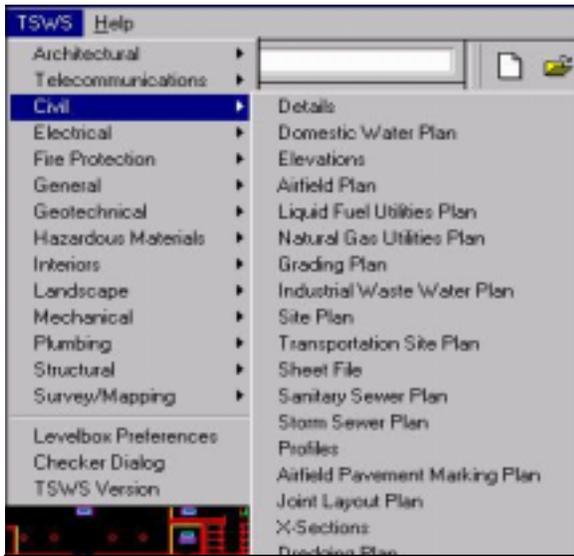
2001 was a pivotal year for the Architectural/Engineering/Construction (A/E/C) CADD Standard. Release 2.0 of the Standard was posted on the Internet and the Workspace, Checker, and File Manager tools were updated to reflect improvements suggested by field personnel. The Corps' Systems Field Action CADD (FAC), with the assistance of the Center, set up the Standard/Workspace Assistance Team (SWAT) that made two field visits during the year to help users implement the workspace.



Also this year, Version 2.0 of the U.S. National CAD Standard was released, with numerous revisions and updates. It was the Center's job to ensure that Release 2.0 of the A/E/C CADD Standard completely implemented the National CAD Standard, and also reflected changes submitted by field users.

The A/E/C Workspace tool was revised along with the A/E/C CADD Standard. The Workspace now is generated from an Access 2000 database that contains all Release 2.0 updates. In order to conform to Version 2.0 of the National CAD Standard, the Workspace has been modified to accept level names longer than 15 characters. The Workspace Checker has been adapted to scan a drawing against the discipline designator and model file type shown in the

drawing's file name (previously, the Checker only scanned against the discipline designator in the file name).



**Instead of two file-naming conventions for model files and sheet files, there is only one. Level/layer information that was duplicated across disciplines has been delegated to one discipline. Symbol libraries that contained rarely used symbols have been condensed to contain only symbols used on a regular basis.**

The File Manager program has also been updated to reflect a single method for model and sheet file naming, which conforms to the U.S. National CAD Standard. The File Manager has also been modified to manage project file data using an Oracle database.

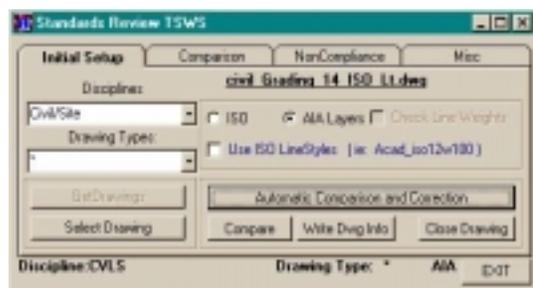
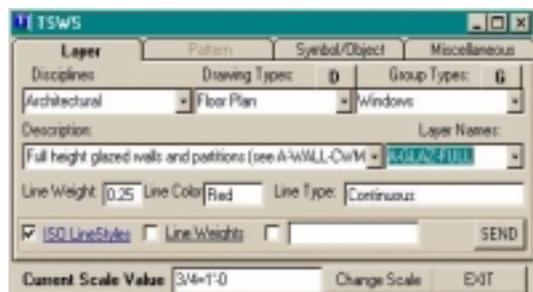
The Corps' Systems FAC organized the SWAT, which includes Systems FAC members and CADD Center personnel. The SWAT was created to assist sites in implementing the A/E/C CADD Standard. During a SWAT visit to a site, the A/E/C CADD Standard and Workspace were taught and interviews with site personnel were conducted regarding CADD implementation and exchange. Site personnel were able to learn about the Standard and Workspace tool, relate frustrations they felt with CADD implementation, and learn how other divisions have solved similar problems. All class attendees agreed that the implementation of a single CADD standard is worthwhile, as long as upper level management allows time for designers to become accustomed

to it. Attendees also agreed that the SWAT visit helped clear up any confusion or misconceptions about the A/E/C CADD Standard.

## Standards Workspace Programs for AutoCAD

The revised version of the Workspace for AutoCAD and the companion Review program for reviewing and correcting drawings were completed. Changes to the original program include an "Initialization" file to restore information from the previous session, the ability to change drawing scale factors "on the fly" for working with various drawings or Layouts of the drawing model. Automatic insertion of all layers associated with a specific "Discipline" and "Drawing Type" is possible by selection of a single button.

The drawing Review program allows the user to select a drawing from a browser window, and compares the drawing information (Layer names, colors, linetypes and line weights) with the standards information. An Excel report may be produced listing noncompliance items. Correction of





The Center has been working with the IAI and the development of the Industry Foundation Classification (IFC) Model. New involvements have been with the FM domain in the continued development of a Cost and Financial Element Model or CAFÉ. This production model is needed by both the European Council, the International Standards Organization (ISO) and the American Alliance. The project was voted on last year and approved by the IAI and cross approved by the European Council. Funds are being provided by industry, government and international venues to complete work on the model. A prototype of the model will be included in the next release of the IAI model standards in August 2002 (Version 3.0). The Project Management Domain has also started the development of the material selection, specification, and procurement project and finalized the initial model for IFC version 3.0. The requirements for the transaction and process specification project were also completed. The development process was enhanced on several Computerized Automated Facility Management (CAFM) Packages through the use of IFC's.

## Evaluate Quantity Take-off for CADD-Cost Software

The project to evaluate Quantity Take-off software was completed this year with a review of seven different software packages. The team of cost estimators developed a set of user criteria needed to perform quantity take-offs efficiently. Areas of focus included the software's ability to create an audit trail of the take-off process, read from standard graphics files, and export to standard spreadsheet files.

Analysis Matrix										
		A	B	D	E	F	G	H	I	J
<b>1.On Center Software Totals</b>										
	"On-Screen Takeoff"	4.5	3	3	4.5	4.5	4	4.5	4	
	Weighted Score	67.5	48	21	36	27	60	90	24	373.5
<b>2.Vertigraph, Inc.</b>										
	"BidScreen XL"	3	4.5	4	2	3	4.5	2	1.5	
	Weighted Score	45	72	28	16	18	67.5	40	9	295.5
<b>3.Eagle Point Software, Inc.</b>										
	Quantity Take-off	2.5	3.5	2.5	1.5	2	4	1.5	1.5	
	Weighted Score	37.5	56	17.5	12	12	60	30	9	234
<b>4.MaxView Corporation</b>										
	MaxTakeoff	3.5	2.5	1.5	3	2.5	1	4	2	
	Weighted Score	52.5	40	10.5	24	15	15	80	12	249
<b>5.Agtek</b>										
	Takeoff	3	2	2	1	2	3.5	1	1	
	Weighted Score	45	32	14	8	12	52.5	20	6	189.5
<b>6.Bentley Systems</b>										
	Power Scope	2	1	1	1	1	4.5	1.5	1	
	Weighted Score	30	16	7	8	6	67.5	30	6	170.5
<b>A</b> Audit Trail – ability to check, redline, layer on/off, backup, cross section, capture link, and symbology <b>B</b> Export to database – and intermediate steps <b>C</b> Work Breakdown Structure (WBS), fixed, open, template capability <b>D</b> Layers – viewing levels take-off <b>E</b> Ease of Use – multiple views, user friendly – capture vertical drops <b>F</b> Read Vector Format – allow for scaling <b>G</b> Read Tiff Format – allow for scaling <b>H</b> Open (not proprietary) – free viewer, open to third party, immediate modification <b>I</b> Read Tiff format - allow for scaling <b>J</b> Open not proprietary - free viewer, open to 3rd party, immediate modification										

As a result of this report, software purchases have already been made based upon information provided. A second result of this evaluation is providing information to software developers on the features that cost estimators are looking for in order to produce better software.

## Digital Topological Photogrammetric Recording Standards

In support of natural and cultural resources field users, the Center developed Digital Topological Photogrammetric Recording Standards in 2001. The project's initial objective was to investigate state-of-art technologies for recordation procedures and standards for geospatial photogrammetric documentation of complex three-dimensional (3-D) archaeological and architectural features.

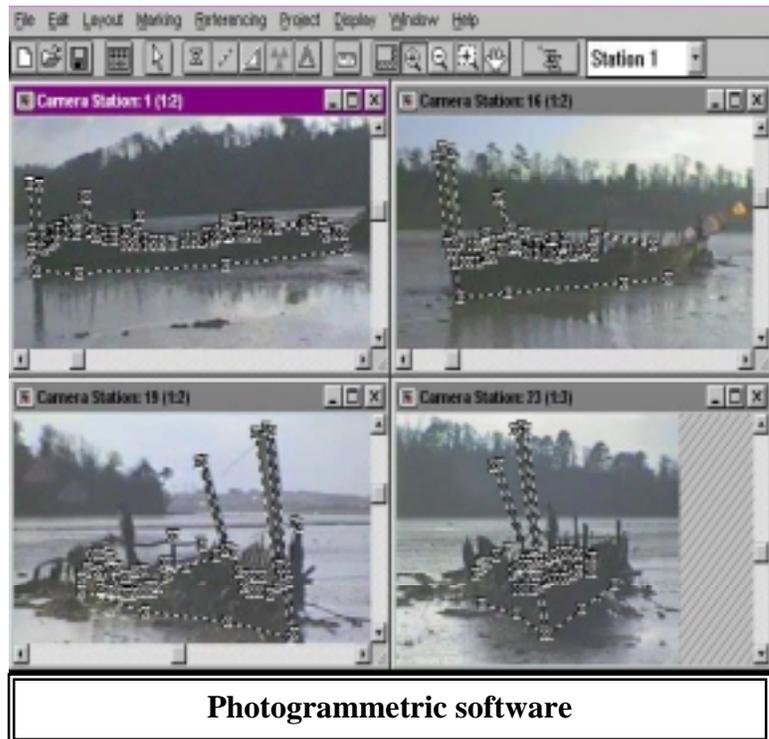
The results of this investigation are available on the Center's Web site (<http://tsc.wes.army.mil/>). In-depth discussions cover numerous facets of recordation technologies including:

- Softcopy photogrammetric methods and processes.
- Photogrammetry in cultural resources.
- Existing data content standards for natural/cultural resources monitoring.
- Development of industry standards for obtaining field and laboratory photographs.
- Development of standard procedures for analysis of geospatial-referenced photography.
- Standardized methods for storing and indexing geospatial-referenced data.

### Evaluation Criteria

Approach	Equipment*	Cost
Conventional equipment (VStars, etc)	Dedicated workstation, software, metric camera	\$100,000+
Low-end professional equipment (ERDAS Stereo Analyst, SurfaceMapper)	Video card, goggles, OTS camera	\$12,000-\$18,000
Low-end simple equipment (PhotoModeler Pro)	Software package, OTS camera	\$1000
Lasergrammetry (Cyrax, Cyberware)	Laser, notebook computer, software, CAD	\$150,000
Photo-textured geometric model (LightScribe, ShadowBox)	Custom lab setup, software, NURBS software	\$10,000

\*Equipment does not include basic hardware, such as a computer and monitor

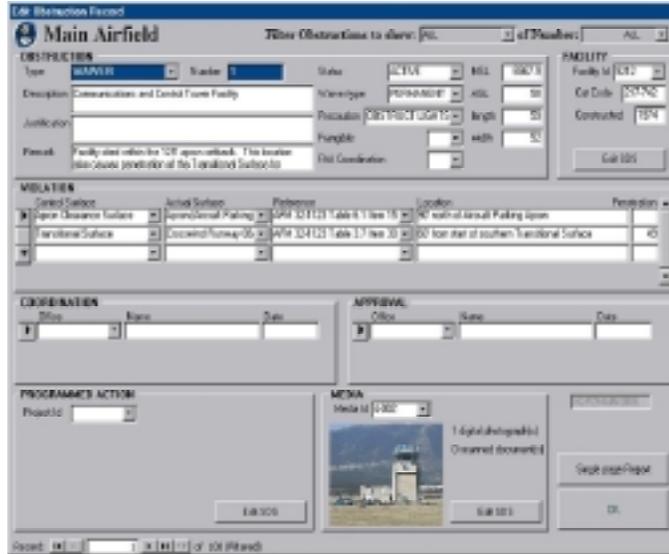


**Photogrammetric software**

This useful guide for the archaeologist practitioners and GIS personnel discusses the evaluation of three available software packages: PhotoModeler Pro, Light Scribe, and ERDAS. Four factors are considered in this evaluation: skill usability, cost, flexibility, and accuracy. Overview tables and figures showing application workflow are plentiful in this 165-page report.

## Airfield Obstructions Management System

2001 witnessed the proliferation of the Airfield Obstructions Management System (AOMS) program within the Air Force. The 2 dimensional version of the program, beta tested at the USAF Academy in Colorado Springs, CO and Kadena Air Base in Okinawa, Japan, was delivered to three air Combat Command bases - Barksdale AFB, LA; Shaw AFB, SC; and Davis-Monthan AFB, AZ. AOMS is an extension to ESRI's line of ArcView products and is fully compliant with the SDSFIE.



AOMS provides airfield managers with a better tool to depict the true nature of an airfield obstruction (a picture is worth a thousand words) allowing airfield managers to maintain a wide range of easily accessible data. Information that once required several man-hours searching through files to obtain can now be accessed by AOMS in a matter of seconds. Combined with the power of a common relational database, managers have a more effective and concise method of relaying accurate data to decision-makers. Siting decisions are also enhanced because airfield-related constraints can be shown on a single image.

AOMS is designed to link with existing map data - eliminating the need to maintain multiple electronic map sets. The user establishes the link to the organizational server supporting the "installation map." Each time the application is started, the user automatically accesses the most current version of the installation map. The database aspect of AOMS operates a little differently. Since most installations have yet to adopt the SDSFIE as their standard, existing data will require conversion to this structure. However, SDSFIE also allows for the use of "local tables" which can be linked and used "as is" to provide additional information for all users.

## EBS Web Hosting

The Center began offering an Electronic Bid Solicitations (EBS) Web Hosting service in 2001. The service offers an alternative to installations and other field operating activities that for various reasons do not want to host their own EBS Web Site. The site will soon go "live" with the Corps of Engineers' Pittsburgh District as our first customer.

The service offers several advantages including:

- Freeing up local resources.
- Freedom from firewalls.
- Automatic software updates.
- Direct input on future developments.
- One central site for agency solicitations.
- Automatic posting of solicitations to the Army's Website. Contact Elias Arredondo at [elias.arredondo@erdc.usace.army.mil](mailto:elias.arredondo@erdc.usace.army.mil).

## **Blanket Purchase Agreement With Environmental Systems Research Institute**

In May of 2001 year, the Center completed negotiations with the ESRI and awarded a Blanket Purchase Agreement (BPA), which became available immediately and will be renewable for four years. The BPA contains all ESRI products available on their General Services Administration (GSA) Schedule. All prices on our BPA are below the ESRI GSA Schedule prices. The initiative is part of a pilot project to evaluate acquisition vehicles for their suitability as eventual follow-on contracts for the IM/FCAD2 contracts. The contract is available to all Center partnering agencies including IM/FCAD2 customers.

Fourth Quarter Sales totaled \$375,546 with the Corps of Engineers being the largest customer and the Army and Marine Corps acquiring about \$10,000 each. The predominant purchases were from the ArcView product suite and associated upgrades. Approximately 90% of the sales total was product purchases or upgrades with maintenance accounting for the remaining 10%.

Orders may also be placed via direct fund site through the IM/FCAD2 ordering office. All relevant contract information is available on the Center's Web site at <http://tsc.wes.army.mil/>.

## **Research and Development Program**

In 2001, the Center initiated a presence in the Corps research and development (R&D) programs, Geographic Information Systems (GIS) and Regional Sediment Management (RSM), by teaming with other laboratories to submit proposals. Two projects (in which the Center is a team member) in the GIS program will be funded in FY02: Development of Automated Tool to Generate a Spatial Data Standard-compliant Oracle SDE Geodatabase and Enterprise GIS Environments for the U.S. Army Corps of Engineers (USACE). A third project, Object Modeling for Geospatial Databases, is tentatively scheduled as a new start in FY03. In the RSM program, the Center teamed with other ITL divisions to submit a proposal in the focus area of Information Architecture and Supporting Tools entitled "Database Tools for Data Storage and Mining." This proposal has also been selected for funding in FY02.

The Center submitted proposals to the DoD Technology to Combat Terrorism Task Force. A joint proposal with CERL, "The Force Protection Planning and Analysis System" will be a robust modeling and simulation environment, capable of evaluating all possible terrorist

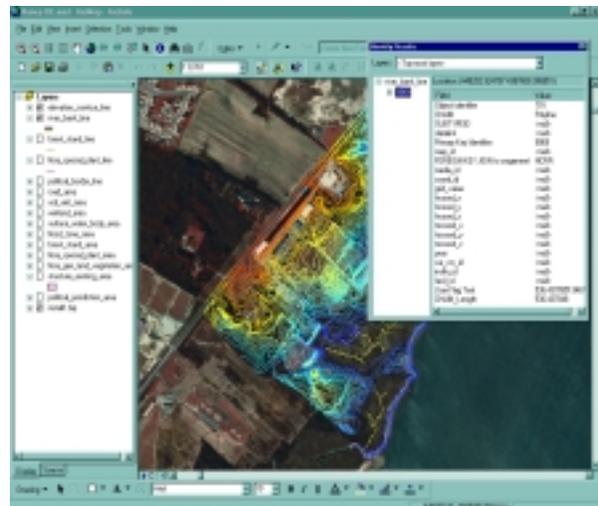
threats. This effort will adapt, develop, and integrate processes, technologies, and standards from a wide variety of sources to assess, mitigate, and prevent a wide variety of threats, while maintaining the functionality of the facility. The system will allow analysis at the building, installation, and regional level. Also, a joint proposal with TEC, “Rescue, Recovery, and Assault Tools for Homeland Defense,” will provide portable mission-planning and navigation tools georeferenced in 3-D space and access to amendable data required to conduct anti-terrorist missions and incident response in complex urban terrain. To date, no decision has been made regarding the funding of these proposals.

## 2001 Reimbursable Work

### National Guard Bureau

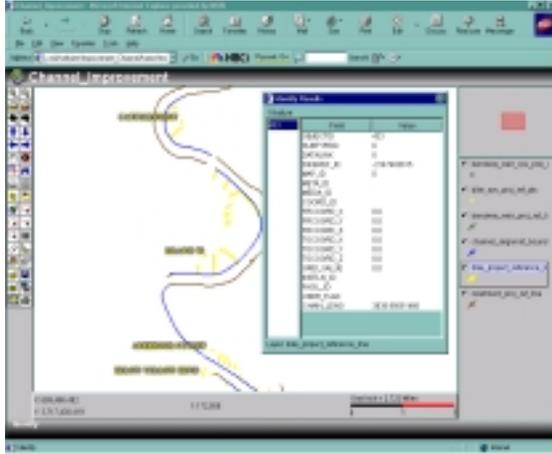
The purpose of the National Guard Bureau (NGB) reimbursable project was to enable all 250 NGB installations to have a common SDSFIE object-relational database and graphics. Each installation was using ESRI with no standards or common database. The project was broken down into four tasks:

- Identified the basic NGB GIS data requirements based upon Conservation Planning Level Surveys, Integrated Training Area Management (ITAM) Core GIS data requirements, and three selected individual NGB site requirements. These requirements were correlated to the SDSFIE by both feature and attribute level, with expansions to the SDSFIE. A conceptual and object database model were created. A Web-based forum for submission and tracking of specific questions and, resolutions in relation to this task was created (<http://tsc.wes.army.mil/discussions/forum.asp?fid=13&cid=1>).
- Provided migration assistance to the ITAM Western Regional Support Center Fort Collins, CO, and the National Guard Bureau, Arlington, VA. Migrated the correlated requirements’ GIS data sets of Orchard Training Area, Boise, ID; Camp Ripley, MN; and DE Armories to SDSFIE compliant geodatabases (ESRI ArcGIS 8.1). This included identification of specific NGB GIS data structure and content problems relative to migration to the SDSFIE format and geodatabase design requirements necessary to comply with SDSFIE. The SDSFIE Personal Geodatabase Generator tool was used.
- Provided training on the SDSFIE geodatabase implementation in the form of an SDSFIE Implementation Workshop tailored to the use of the UML object models to create a geodatabase using ArcGIS 8.1 for the NGB and ITAM program requirements.
- Provided guidance consisting of pamphlets, PowerPoint presentations, and posters, illustrating the major implementation phases of the SDSFIE, definitions of the SDSFIE, UML model diagrams, and requirements for implementation of the SDSFIE.



# Mississippi Valley Division

The purpose of the Mississippi Valley Division (MVD) reimbursable project was to create an enterprise GIS, eliminating the stovepipes that existed, and publishing the enterprise data on the Web. After achieving consensus, an enterprise system was created so that all the sections could share one common database and one common set of graphics.



All the MVD GIS data (Microstation graphics and Oracle and SQL Server attribute tables) were converted into the SDSFIE format. MVD chose ESRI as their enterprise GIS platform, so the Center converted all of the SDSFIE Intergraph data into ESRI Geodatabase format and created Web pages using ESRI ArcIMS 3.1 to enable the users to have access to the enterprise GIS from their desktops.

The purpose of the Geodatabase Development project was to ensure SDSFIE are embracing the new technology, particularly object-relational databases in GIS. Many of the Center's users are

moving to ESRI Geodatabases and in an effort to support them, the SDSFIE mapping to geodatabases was created:

- Geodatabase: installation
- Feature Data Set: SDS Entity Set/Class combination
- Feature Class: SDS Entity Type/Entity
- SubTypes: SDS discriminating attributes/type\_d attributes

The geodatabase model allows definition of features that more closely resemble the real world. This object data model is extensible for users with more specialized requirements, allowing for user-definable features.

A SDSFIE Personal Geodatabase Generator tool was created and will be released with SDSFIE 2.1. Several issues that need to be addressed were identified during this process, such as the handling of the non-graphic (FMSFIE) tables and the relationships between these and the graphic (SDSFIE) tables. These will be solved in the SDSFIE Multi-user Geodatabase effort.

