

Director's Comments

By Christopher N. Dunn, P.E.

It has been six months since our last HEC Newsletter and while we try to update the newsletter quarterly, a bi-annual newsletter may be more appropriate. Many activities have taken place over the last six months and while we would like to describe them all, the pace and volume of work sometimes prevents us from doing so.



On May 3, 2007, I completed my first year as the Director of HEC and it has definitely been an exciting time. In addition to the technical work, the entire HEC staff has migrated to the National Security Personnel System, NSPS, and we have withstood one of the longest CRA's in memory. The challenges in moving to a new performance system have been many and continue to create a certain amount of angst at the Center. It will take a cycle or two before we are truly comfortable with the new system but NSPS promises to be a better tool for communication, and performance evaluation and recognition. After we are through with our inaugural cycle, I'm sure we will be able to provide constructive feedback to others who will be entering NSPS at a later time.

Now that the CRA is over and funding is flowing, FY 2007 is turning out to be a nice year for HEC. Our funding levels are healthy as we work on interesting

continued on page 2

New Guidance for Certification of Levee Systems for the National Flood Insurance Program (NFIP)

By Michael K. Deering, P.E.

In response to challenges to flood damage reduction project proposals and justification documents emanating from the Office of Management and Budget (OMB) and an array of local and special interests, USACE developed a risk analysis (RA) based policy for flood damage reduction projects. USACE committed to application of these policies and methods in its flood damage reduction activities with the issuance of ER 1105-2-101 in 1997. This policy was reaffirmed with the issuance of an update of this ER in January 2006. The policy requires that a RA framework be adopted for flood damage reduction studies and decisions, specifically noting requirements for RA for all critical engineering, economic, and environmental aspects.

USACE recognized that its adopted RA policy and methods had implications for floodplain management and associated NFIP levee certification, and immediately engaged Federal Emergency Management Agency (FEMA) leadership in such discussions. In April 1997, USACE and FEMA agreed on an approach to levee certification that embraced risk analysis, and published a policy letter to USACE field offices. However, today's state of certification-related USACE technical guidance is out of date, incomplete, or contains substantial gaps.

An Engineer Technical Letter (ETL) is under development that will provide technical guidance for USACE levee certifications. It will document policy, study process and outreach, coordination, technical criteria and guidance for complete



engineering evaluation, and ITR and staffing/signature requirements. The applicability of RA for the various engineering components will be addressed with a multi-disciplinary USACE engineering team preparing the ETL. Levee systems assessments are being performed in association with the FEMA Map Modernization and NFIP efforts.

continued on page 4

In This Issue:

| | |
|--|--------|
| Director's Comments..... | Page 1 |
| Cover Story | Page 1 |
| Training | Page 3 |
| HEC Publications | Page 4 |
| Projects | |
| Hydrologic Engineering Center and ESRI Sign Cooperative Research and Development Agreement | Page 5 |
| International Activities | |
| Afghanistan - Helmand Valley Water Study Update..... | Page 6 |
| Combined Joint Task Force - Horn of Africa Training..... | Page 7 |
| Software | |
| RAS-MODFLOW Development and Application..... | Page 8 |
| HEC-RTS, Real-Time Simulation Program..... | Page 8 |



Director's Comments (continued)

and varied projects. A few are described below.

National Activities:

Along with IWR rehired annuitant Darryl Davis, HEC has been the lead for the development of a new ETL for Levee Certification. The new ETL reinforces a decade long policy on the use of risk analysis for levee certification. With this version of the ETL, however, only the hydrology and hydraulics analysis must be performed with risk analysis. Other analyses such as geotechnical and structural can still employ deterministic approaches. In most cases, the ETL describes how risk analysis may be used even for those disciplines that still employ deterministic approaches. In addition, the ETL emphasizes the need for emergency plans and residual risk calculations for the inevitable overtopping scenario. The ETL is to be released in the very near future.

International Activities:

While our water resources study in Iraq has been completed, we are still involved in Afghanistan and recently completed training in Kenya and Ethiopia (see articles in this newsletter). We need to complete our report for the Afghanistan Engineering District on the development of a water budget for the Helmand Watershed in Afghanistan. We have also developed an operations manual for the Kajakai Reservoir on the Helmand. Both the Cold Regions Research and Environmental Lab and the Portland District office assisted in the development of the operations manual.

In March, HEC, along with John Hazelton of the Wilmington District, provided three weeks of

hydrologic, hydraulic and reservoir modeling training in Kabul, Afghanistan for the Afghan Ministry of Energy and Water. They used HEC-HMS, HEC-RAS, and HEC-ResSim software during the training. According to reports from the U.S. Agency for International Development and the Afghan students themselves, our training was rated as some of the best training they have received to date. The students were very much engaged and appreciative.

In addition, Jeff Harris and Jon Fenske from HEC's Hydrologic and Hydraulic Technology Division recently spent three weeks in Africa providing hydrologic, hydraulic and groundwater modeling training. They split their trip between Nairobi, Kenya and Addis Ababa, Ethiopia. While they adapted their training nearly daily to meet the student's needs, the training went well and it is expected that more training will be requested.

CWMS:

The Corps' Water Management Systems Users Representative Group, CURG, met in Davis June 5th through 7th. The CWMS Advisory Group followed the three day CURG meeting with a meeting of their own on June 8th. Over sixty representatives from the CURG membership participated and overall the meetings went very well. There were many presentations and suggestions for current (Version 1.5) and future (Version 2.0) activities. For the remainder of FY 2007, HEC's CWMS focus will continue to be: customer support; enhanced data validation and transformation computations; Continuity of Operations Planning (COOP) and;

enhanced data dissemination capabilities. In addition, CWMS 24/7 user support from HEC is imminent. Version 2.0 is expected to be released by the end of this calendar year.

HEC Software:

Several pieces of software were released over the last few months. Version 3.1 of the Hydrologic Modeling Software HEC-HMS is now available from our website. It includes additional reservoir diversion features and other enhancements.

The Beta version of HEC-RAS, River Analysis System, 4.0 was also released. This version of RAS includes sediment transport and water temperature modeling capabilities. Thanks to those of you who tried the Beta version and supplied us with constructive comments. The official 4.0 release is expected this summer.

Another Beta version of our software, HEC-SSP, the Statistical Software Package, is also available on our website. We look forward to your comments on that piece of software as well.

The long awaited release of HEC-ResSim, Version 3.0, and its accompanying documentation can now be found on our website. This version of ResSim includes system power features and numerous other capabilities.

While progress is being made to both of our flood damage tools, neither is ready for release. The event analysis software HEC-FIA, Flood Impact Analysis, is being considered for use by the dam and levee safety teams to help determine the consequences of dam and levee

continued on page 3



US Army Corps
of Engineers
Hydrologic Engineering Center

<http://www.hec.usace.army.mil>

ADVANCES is an unofficial publication authorized under the provisions of AR 360-1 and published quarterly by the U.S. Army Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, 609 Second Street, Davis, CA 95616-4687. Telephone: (530) 756-1104; FAX: (530) 756-8250. Views and opinions expressed in this publication are not necessarily those of the Department of the Army.

Director:
Christopher N. Dunn, P.E.

Water Resource Systems Chief:
Michael K. Deering, P.E.

Director's Comments (continued)

failures. Because of its enhanced GIS capabilities, it is well positioned to work in combination with GIS tools such as GeoRAS.

Given that the flood damage reduction analysis software HEC-FDA has had many software revisions and a number of unofficial releases of Version 1.3, we have decided to make the next official release of FDA Version 1.4. The delay in the release of FDA is due to the fact that just when we believe it should be ready for release, another levee analysis or levee certification requirement is made of the program.

The Beta release of the comprehensive planning tool, HEC-WAT or the Watershed Analysis Tool, is nearly ready. If you are interested in trying the WAT, we would like to hear from you. We are testing it at HEC but the more testing the better. An article about

the WAT can be found in our previous Newsletter.

Finally, because the Corps will now evaluate the impacts of potential life lost due to design exceedance or failure of our projects, HEC has begun to work with others in trying to determine how to best analyze and express the impacts of life lost of our projects. Several possibilities exist including using FIA but another piece of software called LifeSIM is being considered for incorporation into the HEC suite of software as well.

Summary for FY 2007:

As we enter the fourth quarter of FY 2007, HEC's plate is becoming increasingly full. After the budget was finally passed, it became clear that the Corps' Civil Works R&D program was going to be healthy. Instead of receiving an expected one-third cut in R&D funds, the

the R&D program was actually increased. HEC again had one of its strongest R&D programs in years. Many of our work units were discussed during the Corps' Infrastructure Conference in Detroit. HEC was well represented at that conference as we have been at many other conferences this FY. We have made and will continue to make numerous presentations on the requirements of the pending levee certification ETL. In addition, with the full complement of training courses, the many and varied reimbursable projects, and the frequently requested ITR's, HEC has been busy and we anticipate we will continue to be so in the near future. Give us a call or send us an e-mail if there is anything we can do for you.

Training Program

FY 2008 Proposed PROSPECT Training Program

By Michael Deering, P.E.

The survey for HEC's proposed FY 2008 PROSPECT training schedule conducted by the Corps' Professional Development Support Center (PDSC) has been completed. The PDSC, located in Huntsville, AL, has compiled the results from this initial survey and sent the results to HEC. The results reveal that only one course is full (Course

Number 209), with the remaining ten courses having low interest. If these course continue to have low enrollments, PDSC will have to cancel them. PDSC will hold the enrollment period open until ninety (90) days prior to course date. If at that time there are not enough enrollees, the course will be cancelled.

In the table below, HEC has provided the proposed list of courses, to help ensure that all these classes will be taught, please sign up early if you are interested. To register for our classes, make sure you let the people responsible for the training program in your District or Division know. You can also directly contact PDSC either at the

| Course Number | Course Title | Dates | Current Number of Enrollees |
|---------------|---|---------------------|-----------------------------|
| 164 | Water and the Watershed (Davis, CA) | 5-9 Nov 2007 | 21 |
| 123 | Flood Frequency Analysis (Davis, CA) | 26-30 Nov 2007 | 14 |
| 155 | CWMS Modeling for Real-Time Water Management (Davis, CA) | 10-14 Dec 2007 | 11 |
| 320 | H&H for Dam Safety Studies (Davis, CA) | 21-25 Jan 2008 | 13 |
| 178 | Hydrologic Modeling with HEC-HMS (Davis, CA) | 25-29 Feb 2008 | 14 |
| 345 | Flood Warninig Preparedness (Omaha, NE) | 31 Mar - 4 Apr 2008 | 15 |
| 161 | Hydrologic Analysis for Ecosystem Restoration (Davis, CA) | 14-18 Apr 2008 | 22 |
| 188 | Unsteady Flow Analysis (Davis, CA) | 12-16 May 2008 | 20 |
| 209 | Risk-Based Analysis for Flood Damage Reduction Projects (Davis, CA) | 16-20 Jun 2008 | 33 |
| 57 | Hydrologic Engineering for Planning (Davis, CA) | 14-18 Jul 2008 | ** |
| 114 | Steady Flow with HEC-RAS (Davis, CA) | 18-22 Aug 2008 | 12 |

continued on page 4

Training Program (continued)

address below, or online at <http://pdsc.usace.army.mil>. Registration is handled by Training and Operations (CEHR-P-RG).

Course descriptions are provided in the "Purple Book" at the PDSC site (http://pdsc.usace.army.mil/Purple_

Book.aspx). A short description along with course agendas is also provided on HEC's website. To obtain enrollment information, please contact the Huntsville office. When doing so, please note the course number, name, data, and location, and contact:

CEHR-P-RG
USACE Professional Development Support Center (PDSC)
550 Sparkman Drive
Huntsville, AL 35817
Phone: (256) 895-7421
FAX: (256) 895-7465

FY 2007 PROSPECT Training Program

By Michael Deering, P.E.

The PROSPECT training program for FY 2007 is almost finished. The last two classes for FY 2007 are Sediment Transport Analysis with HEC-RAS (20-24 August 2007) and Risk Analysis for Flood Damage Reduction Projects (10-14 September 2007).

HEC has provided twelve classes; some basic and some advanced. The classes have ranged in topics from hydrology (Advanced Application of HEC-HMS) to hydraulics and hydrology (H&H for Dam Safety Studies) to ecosystem restoration (Hydrologic Analysis for

for Ecosystem Restoration) and risk analysis (Risk Analysis for Flood Damage Reduction Projects).

HEC Publications

HEC publications are now available electronically through the HEC web page (www.hec.usace.army.mil). FY 2007 has seen the inclusion of all types of HEC publications on the web page - International Hydrological Decade (IHD) Volumes, Training Documents, Research Documents, Seminar Proceedings, Project Reports, and Technical Papers. Computer Program Documentation for

currently available HEC software is on the web page, with work proceeding on the computer program documentation for the older and obsolete HEC software.

All documents are in Adobe® format (7.0 and later) and are for printing only. However, HEC is working on creating documents that will allow highlighting and searching in our publications. To

download and view the documents, a user will need to have the latest version of Adobe® Reader (8.1) from Adobe® (www.adobe.com). If you have any questions regarding HEC publications or this issue of the newsletter, please contact Ms. Penni Baker (email: penni_r.baker@usace.army.mil) of our office.

Projects

New Guidance for Certification of Levee Systems for the National Flood Insurance Program (NFIP)

continued from page 1

This ETL applies to existing and new levee systems. The finding to be determined is whether the levee system under study meets FEMA and USACE requirements for certifying that the system can be reasonably expected to provide flood protection from the up-to-date estimate of the 1% annual chance of exceedance flood. Initially, the risk framework is applicable for only the flow and stage-chance exceedance (still-water-level-frequency) aspect of risk assessment, and to a lesser degree other components. Risk-

based methodologies are under development and emerging for structural and geotechnical engineering elements but are not yet sufficiently mature for direct application in certification determinations. Risk assessment methods for coastal, estuarine, and lake settings are also being developed currently, and they should be applied to the greatest extent possible until they become more codified into engineering guidance. As methodologies for these and the remaining engineering

assessment elements mature, they will be incorporated into future versions of this ETL, with an anticipated update and revision cycle of one to two years. It is imperative that the USACE methods and policies for levee certification be updated and documented. Because of the nationwide implications, the ETL development is of the highest priority.

Projects (continued)

Hydrologic Engineering Center and ESRI Sign Cooperative Research and Development Agreement

By Thomas Evans

HEC and Environmental Systems Research Institute (ESRI) will continue to cooperate on developing a new generation of geographic information system (GIS) technology for hydrologic engineering and ecological analysis.

HEC and ESRI, the world leader in GIS software, have signed a three-year Cooperative Research and Development Agreement (CRADA) that will focus on:

- Adding a geospatial analysis component to HEC's software that analyzes how an ecosystem (i.e. plants, animals, and soil) reacts to water flow.
- Developing terrain models and terrain representation for hydrologic and hydraulic analyses.
- Placing HEC's modeling techniques onto ArcGIS Server.

The present CRADA is the third in a series of agreements between HEC and ESRI and reflects a mutual recognition of the importance of geospatial data and tools in hydrologic engineering. "Management of water resources is one of the most critical issues facing society today," said ESRI President Jack Dangermond. "The HEC is looked up to as the leader in water resources modeling and analysis. ESRI is pleased that we can support their work to understand and model this critical resource."

In cooperation with ESRI over the past six years, HEC has created geospatial pre- and post-processors in ArcGIS for HEC-RAS and HEC-HMS. These programs, HEC-GeoRAS and HEC-GeoHMS, have evolved from ArcInfo macros to ArcView extensions to ArcMap applications. This successful application of GIS technology has enabled HEC model users to incorporate terrain analysis and advanced geospatial processes in

the development of their models and the presentation of their results.

Under the new CRADA HEC and ESRI will expand their areas of common interest to include the complex problem of understanding and predicting water management's impact on ecosystems and land use activities.

ESRI and HEC plan to work together to:

- Develop an ArcGIS application for HEC's new Ecosystem Function Model (EFM). The EFM analyzes responses of the ecosystem to changes in water flow. GIS software will provide the spatial analysis, visually illustrating and quantifying the affects of flow changes on habitats within the watershed. This application will exploit the new capabilities of ESRI's ArcGIS 9.2, including managing large terrains and the geoprocessing capabilities of the ModelBuilder technology.
- Bring HEC's hydrological and ecosystems modeling technology, integrated with GIS, onto ArcGIS Server, opening up opportunities to share the technology with many different agencies, natural resource managers, and the public so they can build and run their own models.
- Implement models that exploit terrains, a new data type in ArcGIS 9.2, that permits the analysis of large, complex surface models – something that was not possible previously.
- Explore the possibility of cooperating in areas such as geographic data structures for water resources modeling and analysis, flood damage analysis, and spatial hydrologic data products.

Dean Djokic, a senior applications programmer and consultant in Water Resources and principal investigator for CRADA at ESRI, believes that the collaboration between ESRI and HEC will profoundly improve hydrologic and ecological modeling in the future.

"ESRI hopes that this cooperative agreement will result in the next generation of water resources tools to help handle the complex problems of environmental hydrologic analysis," Djokic said. "(This work) will advance the science of water resources engineering."

"There's a natural connection between hydrologic simulation modeling and GIS," adds Tom Evans, HEC's principal investigator on the CRADA. "Through our partnership with ESRI, HEC and the Corps have been able to provide GIS tools that the engineers in our field use every day. I look forward to improvements in those programs and working on entirely new ones, like the ArcGIS developments that will support our Ecosystem Functions Model."

About ESRI

Since 1969, ESRI has been giving customers around the world the power to think and plan geographically. The market leader in GIS, ESRI software is used in more than 300,000 organizations worldwide including each of the 200 largest cities in the United States, most national governments, more than two-thirds of Fortune 500 companies, and more than 7,000 colleges and universities. ESRI applications, running on more than one million desktops and thousands of Web and enterprise servers, provide the backbone for the world's mapping and spatial analysis. ESRI is the only vendor that provides complete technical solutions for desktop, mobile, server, and Internet platforms. Visit us at www.esri.com.

International Activities

As part of its mission, USACE engages in activities that support other federal agencies or international organizations to address issues of national significance to the United States. One of HEC's missions is to provide technical leadership and capacity in international water resource activities through technical assistance, training, and education

in collaboration with others that will support U.S. stability, reconstruction, and humanitarian goals. Areas addressed are water resources, infrastructure development, information technology, environmental protection and warfighter support. This section reviews some of the international activities that HEC is currently participating in.

Afghanistan - Helmand Valley Water Study Update

By Jason Needham, P.E.

In the last newsletter, we reported on HEC's involvement in the Helmand Valley Water Study. The goal of the study, which began mid-2004, was to improve the management of the limited water resources in the Helmand Valley by defining the most efficient balance of water demands between irrigation, power production and other downstream water requirements under current and various future conditions. Also, included in this study, was a capacity building component that facilitated turning over the methods and results used in this study to the Afghan engineers with the hope that they would continue to apply them as necessary to manage their water resources.

During the past twenty-five years of turmoil in Afghanistan, the infrastructure and institutional capacity for managing the nation's developed water resources has suffered neglect and deterioration. Clearly, one of the largest issues that need to be addressed is the development of an institutional knowledge base and the creation of technical expertise with regards to water resources.

Since the last newsletter, a team of engineers, three from HEC and one from Wilmington District, traveled to Kabul to provide training in various areas related to water resources and this study.

The effort provided training for thirteen engineers from the Ministry of Energy and Water as well as professors from Kabul University



Afghanistan Team

From left to right: Jason Needham (CEIWR-HEC), John Hazelton (CESAW), Stanford Gibson (CEIWR-HEC), and Beth Faber (CEIWR-HEC)

and Kabul Polytechnic. The training covered the following subjects:

- Basic hydrology, including rainfall-runoff theory and an introduction to the Corps' Hydrologic Modeling System (HEC-HMS).
- Basic hydraulics, including principles of open channel flow and an introduction to the Corps' River Analysis System (HEC-RAS).
- Basic reservoir operations, including reservoir operation theory, introduction to the Corps' Reservoir Simulation package (HEC-ResSim), and demonstration of the HEC-ResSim model of the Helmand

Valley Reservoirs that was developed by HEC staff.

The training was very well received. The Ministry Engineers were very engaged, and there were various requests made for additional training of a similar nature. Opportunities were identified for providing water resources training at the Afghanistan Information Management Systems (AIMS) building, as well as the universities in the city.

If you want to know more about HEC's work in Afghanistan, contact Jason Needham at Jason.t.needham@usace.army.mil.

International Activities (continued)

Combined Joint Task Force - Horn of Africa Training

By Jeff Harris

In May and June 2007, HEC provided training in Water Resources Engineering in Nairobi, Kenya and Addis Ababa, Ethiopia. The training mission was the result of a request from the Combined Joint Task Force – Horn of Africa (CJTF-HOA) to provide training in Water Resources Engineering in the Horn of Africa area. CJTF-HOA is headquartered in Djibouti and is a multi-force entity comprised of



Horn of Africa

Soldiers, Marines, Sailors, Airmen and Civilians. The mission of the CJTF is to provide military to military training, counterterrorism training and civil affairs capacity building. HEC was asked to participate as part of the capacity building mission. The CJTF initially contacted the Geological Survey of Ethiopia to offer training. The Ethiopians responded positively and since they were familiar with HEC software requested that HEC provide the training. While the course was being organized for Ethiopia, the Ministry of Water and Irrigation in Kenya also expressed interest and training was added for the Kenyans. HEC created draft course agendas that were then provided to the Ethiopians and Kenyans. The agenda basically consisted of basic HEC-HMS, HEC-RAS and groundwater training. Comments were received on the agenda topics

and the agenda was revised to reflect the desired instruction.

Jeff Harris and Jon Fenske departed on May 22nd. They met with the Kenya Ministry to discuss the course and look at the training site. In the first meeting, the agenda was revised. Fortunately, prior to leaving the States, it was perceived that the agenda may change and some additional instructional material was brought along, and ended up being put to use. Training in Nairobi took place at the Regional Center for Mapping of Resources for Development. This group is funded by several countries in Africa and is promoting the use of GIS. The class lasted four days, May 28th through May 31st. The majority of students were government employees in Kenya with many of them working for the Ministry of Water and Irrigation. On the last day the Permanent Secretary for the Ministry of Water and Irrigation was on hand to pass out certificates to all of the students. It was a very nice ceremony and they were all very excited to receive their certificates.



Kenya Training Participants

After a weekend photo safari, it was off to Addis Ababa on June 4th. The class was held at the University of Addis Ababa's Department of Earth Sciences. The class lasted from June 6th through June 11th. The majority of the students in the class were Graduate students at the university. The others worked in various government offices. The Ethiopian

group was more interested in surface water methods so only a little groundwater was covered. Three full days were spent on HEC-HMS. On the afternoon of the last day the Dean of the School of Geology presented certificates to all of the students.

Both countries have requested continued training and support. Discussions are currently ongoing in order to continue the training. Jon and Jeff returned home on June 12th after 22 long days. However, the experience, the hospitality of the hosts and the enthusiasm of the students helped time go by quickly.



Ethiopia Training Participants

HEC Software

RAS-MODFLOW Development and Application

By Jon Fenske, P.E.

The Hydrologic Engineering Center is engaged in an effort to couple the hydraulics model HEC-RAS with the groundwater flow model MODFLOW. The coupled model, entitled RAS-MODFLOW, will provide improved representation of water-exchange between groundwater and channel flow. Additionally, it will provide a more complete accounting of channel flow and groundwater flow regimes. There are a variety of specific applications for this new technology. This includes: projects

where changes in channel stage have direct impacts on groundwater; projects where stresses (such as groundwater pumping) affect flow in adjacent streams; and projects where hydraulic structures influence adjacent groundwater.

RAS-MODFLOW will be used to simulate surface-groundwater along the Russian River in Sonoma County, California. The study area encompasses the primary source of potable water for the county. Potential stresses in this application

include groundwater pumping, infiltration, changes in stream flow, the raising and lowering of gated structures, and seasonal changes in riverbed conductance. The model will serve as an operational tool for the Sonoma County Water Agency. Additionally, the model will provide a better understanding of system interrelationships, and help guide future data collection.

HEC-RTS, Real-Time Simulation Program

By William J., Charley, P.E.

HEC is preparing the model integration component of the Corps Water Management System (CWMS) real-time water control decision support system for public release. CWMS is a comprehensive data acquisition and hydrologic modeling system for short-term decision support of water control operations in real time. It encompasses data collection, validation and transformation, data storage, visualization, real time model simulation for decision-making support, and data dissemination. In its Corps implementation, CWMS uses an Oracle database and Sun Solaris workstations for data processes, storage and the execution of models, with a client application (the Control and Visualization Interface, or CAVI) that can run on a Windows PC.

HEC-RTS, the Hydrologic Engineering Center's Real-Time Simulation program, will be a publicly available version of CWMS's data visualization and modeling capabilities that will run on a single computer without requiring an Oracle database or a UNIX server.

HEC-RTS provides support for operational decision making by forecast simulation modeling using any combination of the following models. Rainfall-runoff modeling with HEC-HMS based on gaged precipitation, Quantitative Precipitation Forecasts (QPF) and other future precipitation scenarios provides forecasts of uncontrolled flows into and downstream of reservoirs. Simulation of reservoir operations with either HEC-ResSim or CADSWES's RiverWare provides operational decision information for the engineer. The river hydraulics program HEC-RAS computes river stages and water surface profiles for these scenarios. An inundation boundary and depth map of water in the flood plain can be calculated from the HEC-RAS results using ArcInfo. The economic impacts of the different flows are computed by HEC-FIA. The user-configurable sequence of modeling software allows engineers to evaluate operational decisions for reservoirs and other control structures, and view and compare hydraulic and economic impacts for various "what if?" scenarios.

HEC-RTS does not have the data processing, storage or dissemination capabilities of CWMS and uses HEC-DSS for management of time series data. An application programmer interface (API) is being built to provide users a customizable mechanism for the retrieval of real-time data from other types of databases.

HEC-RTS is currently in beta testing with the initial public release expected late 2007.