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DIVISION OF WATER RESOURCES
Office of the State Engineer

People, Water and Stewardship

**Engineering, Technology,
and Investigations**

1998 Annual Report

The Colorado Division of Water Resources

Vision for Success

The Colorado Division of Water Resources strives to be a leader in the water community of Colorado and the western United States. This is accomplished by focusing on the following areas: *people, water and stewardship*. *People*, because we recognize that the business of water involves our employees and the public. *Water*, because the administration, safety and use of the State of Colorado's water resources is something we are committed to and care deeply about. *Stewardship*, because we understand and accept our obligation to the taxpayers and ourselves, in using and protecting the resources in the most effective manner possible.

Our *Mission* is:

- To provide competent and dependable distribution of water in accordance with statutes, decrees and interstate compacts.
- To ensure public safety through safe dams and properly permitted and constructed water wells.
- To maintain and provide accurate and timely information concerning water.
- To promote stewardship of all human, fiscal and natural resources.
- To serve the public through the generation of creative solutions to problems.
- To help the public understand complex water issues.
- To promote stability in the use of the state's limited water resources.
- To apply modern technology to its greatest advantage.

These *Principle* statements will guide our actions:

- Treating each other and the public with dignity, respect, honesty and fairness.
- Assuming personal responsibility for individual and organizational actions.
- Fostering continuous improvement, innovative thought, learning and shared leadership.
- Promoting an open and honest communication environment that builds trust, respect and loyalty among ourselves and the diverse community in which we live and work.
- Recognizing our employees and the water community for the professional, competent services they provide.

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Engineering, Technology, and Investigations

Executive Summary

The Engineering, Technology, and Investigations (ETI) organization is comprised of a multi-disciplined staff of engineers, information technology specialists, geologists, hydrologists, technicians and support staff. We are an integral part of nearly every activity within the Division of Water Resources spanning a broad spectrum of technical and engineering responsibilities.

The key resource and critical component necessary for the accomplishment of all that is discussed in the following is the highly skilled, dedicated and innovative staff. An organization chart and staffing are provided as Exhibit A and B. Several of the Staff were recognized during 1998 for the outstanding performance and excellent contribution to DWR's mission. Gina Antonio and Dave McElhany were recognized in 1998 as the 1997 support and technical staff of the year respectively. DeWayne Schroeder and Brian Ahrens were recognized for their contribution and effort on the SB 96-74 studies. Alan Pearson was recognized through a Resolution of Appreciation by the Association of State Dam Safety Officials for his contributions and participation as President and four-year member of the Board of Directors. In addition, Alan continues to work nationally to improve public safety and Dam Safety Program. Glenn Graham and Chuck Roberts provided several educational presentations related to groundwater and geology. George Van Slyke presented programs on the Denver Basin Aquifers. Several other staff participated in activities to foster teamwork in the accomplishment of DWR's mission, Thanks to all of the staff.

The Information Technology Branch was incorporated into ETI during 1998. This provides the foundation to cultivate the seamless data-centered approach to data collection, storage, access and use. The IT staff has endured a tremendous turnover in staff, however, the accomplishments over 1998 have been astonishing. These include success in improving DWR and CWCB

Network; expanding and improving customer access to information on DWR Internet sites; decentralizing the GIS system including support of the Arkansas litigation, Republican River Compact, CRDSS and RGDSS projects; initiating the records Imaging project; and the development of technological tools to improve surface and groundwater administration. These accomplishments demonstrate the skill, dedication and teamwork of the IT staff.

The Dam Safety Branch also experienced a challenging and exciting 1998. With the decentralization of one-half FTE to the Division 2 office the dam inspection activities and determination of reservoir safe storage levels progressed well, including voluntary restructuring of commitments to help the overall accomplishment of 817 scheduled inspections. However, two dam failures and serious incidents at eleven other dams are of concern. A comprehensive review of Dam Safety Rules and Regulations and program procedures is projected during 1999. The nearly never-to-be-started audit of the Dam Safety Program by the State Auditor was completed in 1998. The findings were presented to the Legislative Audit Committee July 13, 1998. Program improvements as a result of the audit will increase effectiveness and allow the engineers to reallocate time and effort to higher priority activities. Significant progress was made on contracting phase 1 and 2 of the Extreme Precipitation Study which will be initiated in 1999 with an anticipated completion in 2001. In addition, several federal grants were applied for and obtained through the National Dam Safety Program. These grant funds were used for technical training, improved software and equipment. The State Engineer submitted an Annual Report on the Dam Safety Program to the Legislature November 1, 1998. The highly skilled engineers and support staff responsible for the accomplishment of the Dam Safety Program continue to be recognized as exceptional assets to DWR and State of Colorado through their accomplishments and teamwork.

The Modeling Branch, though small in number, continues to play an increasingly critical role in DWR activities. The completion of Senate Bill 96-74 Technical Study of the South Platte River Basin and Denver Basin Aquifers was a significant accomplishment. While the ink was still wet on the final report the modeling staff was working with a technical peer group to scope additional investigations intended to refine the Denver Basin Groundwater Model and groundwater interaction with surface water in the South Platte Basin. Continuing efforts to revise and update data to the Hydrologic Institutional Model (HIM) for the Kansas v. Colorado litigation and Arkansas River Administration occurred during 1998. Although the summary of these activities is abbreviated, the effort and importance immense. The high level of skill and technical competence of the staff is the key to success in this area.

The Geotechnical Services Branch staff provide expert advise to both internal and external customers in the disciplines of geology, hydrogeology, engineering geology, geophysics, well construction and satellite assisted surveying (GPS). The Geotechnical Services Branch provides assistance to staff throughout the DWR. Special investigation projects included Arkansas Repayment Water Sources, Jefferson County Mountain Ground Water Study, Denver Basin Deep Core Hole, and a cooperative Denver Basin Mapping with USGS. Several support activities to the Board of Examiners were accomplished including evaluation of 230 requests for variances from the Rules, development of a well observation program, and well completion report review. Support to the Division offices focused on three prominent water court cases, Dam failure analysis, GPS and well permitting and subdivision review. Other activities include technical support to the Ground Water Commission and Oil and Gas Commission.

The Hydrographic and Satellite Monitoring Branch is responsible for providing leadership and technical management and maintenance of the statewide network of stream gauges, stage/discharge relationships, stream flow records, and satellite-linked stream flow monitoring. Significant activities include the coordination with USGS, initiation of the conversion from the VAX to an NT platform, and organizational improvement. The 1997-1998 annual report on the Satellite-linked monitoring system was completed. Improvements to the data available over the Internet was accomplished. The consolidation of technology staff was accomplished through assignment of the VAX?NT/Internet support staff to the IT branch. The DWR hydrography staff continues to be dedicated to the improvement of data, information accessibility and increased effectiveness this cornerstone program.

Supporting the Board of Examiners for Water Well Construction and Pump installation Contractors has provided both great satisfaction and distress for the BOE staff team. A complaint procedure was approved by the Board. Seventy-nine complaints related to Rule violations were investigated with Seventy-four complaints resolved during 1998. The revision of the BOE Rules has progressed well though not without controversy. Substantial education and outreach occurred during 1998, strengthening the protection of the groundwater resources and public safety. Of particular noteworthiness is the support by the Division staff of water commissioners, well commissioners and other support staff to the DWR-AG team in accomplishing the Board's objectives.

Information Technology

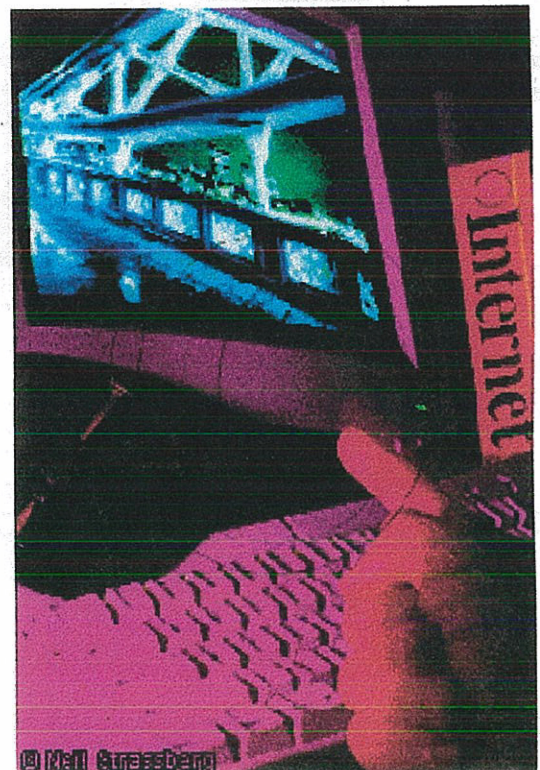
The Information Technology Branch has undergone many exciting changes this year, and looks forward to continuing to grow and evolve during the next year.

Organization and Personnel

Perhaps the most dramatic changes have been in personnel. Seven of the twelve IT positions have been vacant at some time during 1998. We have acquired four new employees, and three vacancies remain to be filled in 1999. The Satellite Monitoring technical support staff was merged with IT in order to integrate all IT technologies into one IT team. We have 3 excellent teams, the Networking/Satellite Monitoring Team, the Applications Development Team, and the GIS Team. The organizational chart is provided as Exhibit C. Together we will accomplish many things this year.

Networking

We now have a mature networking infrastructure to support all of our emerging applications. Remote access capabilities continue to grow. This has enabled employees that were traditionally isolated from the main office, access to data, and information.



Email, electronic calendars, and Internet access have become indispensable to our business functions. The new HydroBase applications, Well Tools, Imaging, and HydroBase Data Entry System are utilizing this technology to make our systems accessible statewide via our WAN.

To aid the public, we redesigned our Internet site this year, added the Board of Examiner's information, added Steamlines and other DWR publications. Currently we are adding Ground Water Rules and Regulations.

The Voice Over Internet Protocol (VOIP) project, which will eliminate the high cost telephone lines connecting Denver to the Field Offices, allows us to use our data network as a voice network. The research phase of this project was completed this year and VOIP should be implemented next year.

HydroBase

This year the foundation for HydroBase was laid and tested. The data-centered world envisioned 5 years ago has become a reality. The business applications that will capitalize on HydroBase: Well Tools, Imaging, and the HydroBase Data Entry System for water rights, diversions, dams and reservoirs, will all be in production early this spring.



Ground Water

The Well Tools application is a natural evolutionary step toward improving our Well Permitting processes. Imaging has and will continue to *revolutionize* our business; the Well Permitting functions are only the beginning. The first phase of the Well Tools known as "Well View" is already live, and the next phases are nearing completion.

Imaging

The Imaging Project is well underway and has already modernized our agency. The system is being built and will be live this March. The Backfile contract has been signed and work is scheduled to begin in July. Next year our goal is to fully integrate the Well Tools and Imaging technologies. These technological enhancements were just a vision only one year ago, now they are reality.

Surface Water

The HydroBase Data Entry System (HBDES) has changed the way our agency records surface water administration data. This system integrates, for the first time, all data for a single structure. For any single diversion, the structure information, water rights, locations, and diversion record information can all be tied together, and related to each other. This was a natural evolution from the disparate databases of the past. In the near future, we hope to revolutionize water administration by enabling whole surface water systems to be coded not by numbers and letters, but by pictures that represent the real world.

GIS

Our GIS system has also matured. This year marked a change from a centralized Denver-based GIS to a decentralized system empowering the local employees. Fourteen employees took advantage of GIS training, and are able to use the technology to improve their efficiency. Three new plotters have allowed large scale and color printing of maps for a variety of uses.

This year we focused on supporting the Decision Support Systems and litigation. The CRDSS, RGDSS, Republican River Compact, and Arkansas Litigation efforts were some of the primary projects.

The union of GIS and HydroBase is our challenge for next year. Building map layers on-the-fly using current data will make data quality efforts more efficient, will assist litigation more effectively and provide more powerful analysis capabilities to our Modeling and Decision Support Systems.

DWR's Technology at a Glance

Hardware and Networking

- DWR now has 34 Servers.
 - 20 Field Office servers,
 - 5 Denver servers (3 of which are new this year)
 - 3 GIS servers
 - 2 Internet Servers
 - 2 Database servers and
 - 2 Imaging servers
- DWR now has 22 Field Office RAS lines and welcomed Grand Junction and Craig this year.
- The Denver Office cabling was replaced with CAT 5 100MBit based Ethernet cables, and telephone style outlets were installed in every office.
- New equipment purchased this year:
 - 14 PC's and 1 GIS Server in Division 2
 - 15 PC's in Division 3
 - 20 Upgrades to machines on the West Slope
 - 1 GIS/Satellite Image Processing Server in Denver
 - 3 Denver Servers
 - 2 Imaging Servers
 - 2 Color Plotters
 - 1 Fax machine
 - 1 Laser Printer
 - 1 Color Printer

Training

- 40 employees took advantage of in-house Access training
- 14 employees took GIS training
- All Denver Records and permitting staff are currently taking training on Well Tools

Dam Safety Program

The mission of Colorado's Dam Safety Program, is to prevent loss of life and property damage, determine the safe storage level and protect the state's water supplies, from the failure of dams, within the resources available. A staff of twelve highly trained, well-qualified and dedicated engineers supports the Dam Safety Program. An organizational chart is provided on Exhibit D. The program assures a safe environment related to the design, construction, and operation of dams and reservoirs through working with dam owners and designers to achieve compliance with state statutes. A detailed annual report on all of the Dam Safety Program accomplishments and activities is provided to the Legislature each November.

The program includes the enforcement of a comprehensive set of regulations, policies, and procedures for the construction and maintenance of dams, the safe operation of reservoirs, and emergency preparedness. The public safety is provided by restricting the storage in the reservoir to a safe level. The safe storage level is determined by the review and approval of engineered plans for the construction and repair of dams, and regular safety evaluations of existing dams and reservoirs by professional engineers.

The Dam Safety Program currently schedules an engineering inspection of Class 1 (high hazard) dams annually, Class 2 (significant hazard) dams biannually, and Class 3 (low hazard) dams every six years. The scheduled inspections typically require that 700 to 800 inspections be completed each year. In addition, about 100 follow-up inspections and 50 to 75 construction inspections are accomplished each year. A total of 817 inspections occurred in 1998.

In spite of our dam safety program however, we continue to experience serious incidents at dams, including two dam failures in 1998. Fortunately, no lives were lost, but significant damage occurred. Eleven dams also experienced serious problems during 1998. One of the failures resulted in significant property damage to the public; while the other caused damage only to the owner's property.

The Carl Smith dam, a high hazard structure near Hotchkiss in Delta County failed on Saturday May 2, 1998, apparently due to a slope stability problem at the right abutment of the dam. The resulting flood, which occurred around 7 PM was witnessed by a Delta County highway crew working near the bridge where LeRoux Creek crosses State Highway 92 on the outskirts of Hotchkiss.

The flood caused the destruction of several diversion structures and road crossings, numerous livestock drownings, and flood damage to one house and several corrals and outbuildings. A report of the failure was published by the State Engineer, dated June 18, 1998, and is available for review. The breached area has been stabilized until the repair plans are prepared and approved.

The sudden, unexpected failure of the Carl Smith Dam, and the number of incidents involving outlet facilities are of concern. A review of the rules and regulations, evaluation of existing dams and other procedures are scheduled for 1999. The purpose of the review is to determine if modifications to the program are required to reduce the potential for dam failures and incidents.

Dam Safety Program Legislative Audit

The State Auditor completed a performance audit of the dam safety program in July 1998, and presented the audit findings to the Legislative Audit Committee on July 13, 1998. The auditor's interviews with dam owners, insurance providers, and managers of other state dam safety programs yielded positive comments about Colorado's Dam Safety Program. The auditors also found that the engineers in the branch exhibited professionalism and thoroughness in their inspections. Nevertheless, the audit made fourteen recommendations for improving the operations of the Dam Safety Program.

The recommendations cover three areas of the program. One is to require that all federal and cash-funded State and local agencies with qualified engineers who own, operate or license dams, to conduct routine dam safety inspections at their own expense; and for the Division of Water Resources to accept these reports in lieu of inspections performed by our own staff. Another is to fulfill our public safety responsibilities by enforcing state and federal laws to ensure prior notification of restrictions and timely access to dams on US Forest Service property for dam safety emergency response. Third is to include downstream designated recreation areas, without significant man-made improvements, in our evaluations for hazard classification because they are an attraction for people and a potential for loss of life hazard.

We agreed with all the recommendations, and have prepared plans for implementing the recommendations during 1999 and 2000. The summary of Audit recommendations are provided on Exhibit E.

Extreme Precipitation Study

The State Engineer and the Colorado Water Conservation Board (CWCB) continued the process to study extreme precipitation in the mountainous areas of Colorado. A volunteer committee of meteorologists, hydrologists, engineers, federal and state agencies, and private entities prepared the three phase proposal. The Department of Atmospheric Science, CSU (State Climatologist) was engaged for doing Phase I of the study, which was the collection and verification of data. A workshop was held to provide a forum for professionals in the field to determine which modeling technology should be used during Phase II of the plan.

The Phase I report was completed in May 1997, and it contains a list of recommended extreme storms that will be used for modeling research, and can be used for site specific analysis of extreme events for project studies. The Colorado Water Conservation Board, CWCB, approved \$300,000 for doing the Phase II study. They also approved the allocation of \$100,000 for updating the 100-year frequency atlas for Colorado. The National Weather Service, NOAA, will be requested to update the atlas.

The Phase II and Phase III parts of the project were combined in 1998 and a request for proposals was published on September 14, 1998. Two proposals were received by the submission date of October 21, 1998, from Applied Weather Associates (Group), Monument, CO (AWA); and from Colorado State University, Department of Atmospheric Science, Ft. Collins, CO. (CSU). The principal scientists for the Applied Weather proposal are Dr. Edward Tomlinson, AWA, and Mr. John Henz, Henz Meteorological Services. The principal scientists for CSU are Dr. William Cotton and Dr. Thomas McKee.

An Evaluation Committee (EC) was organized to review the proposals, who met on December 3, 1998 to review their ratings and to discuss the proposals. Both proposals were considered to meet our requirements. It was decided to request that CSU clarify its proposal in writing, specifically in regard to the milestones and schedule for Phase 3. CSU responded on December 15, 1998. After reviewing the response, the committee met with Drs. Cotton and McKee on January 5, 1999, to further discuss their proposal and seek clarification on accomplishing the work. The committee then decided to award the contract to CSU.

The project will take about three years, with the completion date set for June 30, 2001.

National Dam Safety Program Assistance Grants

The Water Resources Development Act of 1996, established the National Dam Safety Program (NDSP) under the Director of the Federal Emergency Management Agency (FEMA) as the coordinator of the Program. A primary goal of the program is to encourage the establishment and maintenance of effective State dam safety programs, and to provide financial assistance incentives to States that are moving towards improved safety of non-federal dams. Colorado applied for and received a grant for federal fiscal year 1998 in the amount of \$25, 162 in order to provide the dam safety engineering staff advanced training in dam safety engineering subjects, and to acquire computer hardware and software for the analysis of dam performance.

To date the funds have been used to send dam safety staff to the Association of State Dam Safety Officials (ASDSO) annual conference and technical seminar; to acquire the BOSS International dambreak program; and to acquire outlet inspection equipment.

A training and future computer/equipment needs plan was developed at the dam safety meeting in November 1998 that will direct the expenditure of the funds in accordance with the needs of the program. The needs were based upon a survey of the staff, and their input into the selection of the training and equipment. Some of the training planned is:

- Attendance of the ASDSO Technical Seminar on HEC-1 and HEC-HMS in February 1999 in San Antonio, Texas.
- An in-house training session on slope stability analysis and seepage/filter analysis.
- Attendance of the ASDSO Western Region annual conference and technical seminar on seepage and filter design.

Some of the acquisitions that are planned are:

- Computers for each division office and the Denver office with 433 processors and 256 megs of RAM which will be needed to run the BOSS International RiverCad program and DEM topographic data.
- Additional copies of the RiverCad program for each office.
- Cellular phones for emergency communications.

Additional funds of \$1700 for training and research was also received under the Act for participating in the National Inventory of Dams update with the US Army Corp of Engineers; and \$5600 for training was provided by ASDSO. Additional assistance grants will also be available for fiscal year 1999 under the program. We have applied for additional assistance grants for advanced training and acquisition of computer/office/field equipment to accomplish DWR and program goals.

Modeling Branch

The Modeling Branch provides technical expertise to DWR through reviewing, developing, analyzing and executing complex hydrologic computer models. The branch consists of three highly skilled engineers that independently or as a team conduct investigation and analysis of computer models designed to simulate surface and ground water systems. The investigations and analysis are conducted to forecast streamflow, determine stream depletions due to pumping ground water, determine diversion requirements, transmission losses, evaporation losses, determine historic consumptive use, and general characteristics of stream regime. The staff provides expert advice to other agencies, provides expert testimony in water court, and recommends plans for water use and development within Colorado through the use of computer modeling.

SB 96-74 Ground Water Model

The Modeling Section finished developing an improved ground water model of the Denver Basin aquifers to evaluate the assumptions embedded in the current statutes (SB 85-5) with respect to aquifer conditions, depletions to drainages, and replacement requirements. The intent was to determine if the two percent relinquishment for non-tributary (NT) and the four percent replacement for not non-tributary (NNT) ground water pumping are sufficient to replace injurious stream depletions now and in the future.

The theoretical maximum allowable annual pumping rate from the bedrock aquifers using a 100 year life criterion would be 1% of the estimated 300 million acre-feet of drainable storage or 3 million acre-feet per year. The estimated 59,000 acre-feet of pumping for 1996 was only about 2% of the maximum allowable. Based on the assumption that all pumping at the 1996 rate is not subject to SB 85-5 requirements and all of the projected pumping is subject to SB 85-5 requirements; the model results indicated 2% relinquishment and 4% replacement are not sufficient to offset depletions to drainages.

Several members of the Technical Peer Review Committee suggested the model was not unique because none of the input parameters are known with great certainty. In essence, they said that a model using different input parameters could be satisfactorily calibrated to the same pristine heads and measured water level changes. Such a model might give different values of depletions to drainages. Due to the expressed uncertainty and concern associated with riverbed conductance values, input parameters were modified and the model was recalibrated to steady state and transient conditions, thus

providing a second model. This effectively demonstrated that the original model is non-unique and provided another estimate of incremental depletions to drainages.

Predicted depletions are sensitive to river conductance. The model is probably more sensitive to river conductance than any of the other input parameters. The results of the original model and the second model suggest a range of values for incremental depletions to drainages. For NT pumping, incremental depletions to drainages may range from 2.2% to 2.9% and could be as low as 1.6%. For NNT pumping, incremental depletions to drainages may range from 14.6% to 20.7% and could be as low as 6.2%. The lower extreme values are probably not realistic because they were derived solely from a sensitivity analysis of riverbed conductance in the original model. The model predicted depletions to drainages will exceed the net discharge to the South Platte River Basin around the year 2040.

SB 96-74 included Legislative Advisory and Technical Review Committees that made suggestions and comments on the work during the project. Members of these committees requested the formation of a Technical Scope Committee (TSC). The TSC was formed in June of 1998 for the purpose of developing a scope of work and cost estimate for additional work needed to improve the ground water model of the Denver Basin aquifers.

The scope of work and cost estimates prepared by the TSC were presented to the Special Water Committee (SWC) by the State Engineer and CWCB Director for funding and implementation consideration in October, 1998. The scope of work provided details to accomplish seven tasks that if implemented would improve the State Engineer's ground water model:

1. Conduct field tests to obtain more reliable estimates of streambed conductance
2. Conduct biannual stream gain-loss measurements
3. Revise the model to improve the model stream-aquifer simulation procedures
4. Collect and interpret more accurate pumpage data for the Denver Basin aquifers
5. Collect and analyze aquifer-test data to better define the transmissivity of the Basin aquifers
6. Collect and analyze core samples to better define transmissivity and specific yield of the Basin aquifers
7. Continue and expand the ground water level measuring program in the Denver Basin.

The Special Water Committee drafted legislation, HB-1222, that continued the SWC through July 2001, authorized the recommended studies and delayed implementation of more stringent augmentation plans for pumping from the Denver Basin Aquifers to July 1, 2001 through July 1, 2004.

HI Model Upgrading and Updating

In 1998, revisions to the Hydrologic Institutional Model (HIM) for the Kansas v. Colorado litigation continued. The revisions included upgrading the program code by DeWayne Schroeder to better simulate conditions along the Arkansas River Basin mainstem, namely the ability to better predict diversions of the 24 major canal systems. It is also necessary to continue upgrading the program code to include "special waters" for the major augmentation plans that the HIM was not designed to handle. In addition, the updates to the 1995 and 1996 input data continued through negotiations with Kansas's consultants.

In June of 1998, a trial before the Special Master took place concerning the program revisions and 1995-96 data updates.

USGS Groundwater Model in Kansas

The Modeling Section analyzed revisions made by Kansas's consultants to the USGS ground water model in Kearney and Finney counties in Kansas. The revisions were made to upgrade the model to the standard MODFLOW program from the Trescott, Pinder, & Larson program which was the predecessor to MODFLOW. The purpose or objective of this effort was to use the model to assess drawdowns in Kansas as a result of reduced stateline streamflows caused by Colorado. The results of this ground water model will be used in the damages phase of the trial.

CRDSS and RGDSS

RGDSS

Following a review of Statements of Qualification and interviews conducted in early August 1998, five contractors were selected to execute the Rio Grande Decision Support System as follows:

Component	Contractor
Ground Water	HRS Water Consultants, Inc.
Surface Water	Hydrosphere Resource Consultants
Consumptive Use and Water Budget	Leonard Rice Consulting and Agro Engineering
Relational System Integration	Riverside Technology, inc.
Spatial System Integration	HDR Engineering, Inc.

Since their selection, each contractor worked diligently to negotiate a detailed contract that includes a scope of work (SOW), budget and schedule. Each contract has been submitted to the State's signature process and was fully executed on January 18, 1999. Following is a brief summary of each SOW:

Ground Water Component The Ground Water Component is expected to require approximately 3 years and nearly \$ 2,900,000 dollars to complete. Major objectives include:

- To document and critically review the existing ground water model developed by the State for the San Luis Valley in 1991.
- To develop a data-centered ground water modeling system that interacts with the State's existing database (HydroBase) and other RGDSS planning tools.
- To perform additional data collection activities (subsurface and potentially surface) that is required to better understand and manage the ground water resources of the San Luis Valley.
- To calibrate and test, via application, an enhanced San Luis Valley Ground Water Model that builds on the existing SLV model, is 100% data centered, and includes results of a focused groundwater data collection effort.
- To coordinate and share the ground water investigations, including the enhanced SLV Ground Water Model, with San Luis Valley water users, a technical subcommittee, the State, and other RGDSS Consultants.

Surface Water Component The Surface Water Component is expected to require approximately 3 years and \$ 390,000 dollars to complete. Note that most products will be available after year 2 with only minor enhancements expected in year 3. Major objectives of the Surface Water Component include:

- To develop data, enhance and apply an existing surface water model, StateMod, to the San Luis Valley that interacts with the State's central database (HydroBase) and other RGDSS planning tools.
- To coordinate and share the surface water investigations with San Luis Valley water users, the State, a technical subcommittee and other RGDSS contractors.

Consumptive Use and Water Budget Component The Consumptive Use and Water Budget Component is expected to require approximately 3 years and \$380,000 dollars to complete. Note that most products will be available after year 1 with only minor enhancements expected in years 2 and 3. Major objectives of the Surface Water Component include:

- To develop data, enhance and apply an existing consumptive use model, StateCU, to the San Luis Valley that interacts with the State's central database (HydroBase) and other RGDSS planning tools.

- To develop data, add a water budget component to the existing StateCU model, and apply the water budget model to the San Luis Valley that interacts with the State's central database (HydroBase) and other RGDSS planning tools.
- To coordinate and share the Consumptive Use and Water Budget investigations with the San Luis Valley water users, a technical subcommittee, the State and other RGDSS contractors.

Relational System Integration Component The Relational System Integration Component is expected to require approximately 3 years and \$ 209,000 dollars to complete. Note that most products will be available after year 1 with only minor enhancements expected in years 2 and 3. Major objectives of the Relational System Integration Component include:

- To enhance the existing Decision Support System to include data and tools required for application to the San Luis Valley.
- To provide maintenance and support of the System.
- To coordinate and share the Relational System Integration investigations with San Luis Valley water users, the State, and other RGDSS Contractors.

Spatial System Integration Component The Spatial System Integration Component is expected to require approximately 3 years and \$ 206,000 dollars to complete. Note that most products will be available after year 1 with only minor enhancements expected in years 2 and 3. Major objectives of the Relational System Integration Component include:

- To develop GIS coverages for the Rio Grande Basin.
- To evaluate and identify large capacity wells in the Rio Grande Basin by evaluating the well permit and water right data files.
- To perform ground water modeling system integration activities.
- To provide a project management assistant.
- To coordinate and share the Spatial System Integration investigations with San Luis Valley water users, a technical subcommittee, the State, and other RGDSS Contractors.

Other RGDSS Activities In addition to the consultant activities described above, other RGDSS activities include:

- The State has initiated the installation of 20 new stream gages in the Valley; 12 on streams and 8 on diversions.
- Under a joint funding agreement with the USGS, the existing confined observation well network is being geophysically logged.

CRDSS

In 1998, CRDSS began its final development phase. Following is a summary of the major components associated with the final development Phase while the sections that follow summarize current activities. Note the Phase II CRDSS components, which operate under a Unix operating system, are 100% complete and remain fully operational.

Component	% Complete
Administration Tool	100
Database & Sharing	100
Water Resource Planning Models	100
Division 5 Worksheet	90
Data Extension	20
CU Model	10
Big River Model	100 (1)

(1) Only the RiverWare software and hardware purchase remains.

Colorado Water Right Administration Tool (CWRAT)

The Colorado Water Right Administration Tool is approximately fully operational. Training was provided to divisions 1, 4, 5, 6, and 7 in the spring of 1998. Key deliverables include:

- Real time streamflow presentations are available for all gages in the State's satellite monitoring program in both graphical and tabular format.
- Data Viewer that allows users to view nearly all the information contained in the State's database (HydroBase) including water rights, diversions, streamflow, temperature, precipitation, etc.
- Water Information Sheet Real time river administration that uses streamflow observations and gain/loss calculations to assist with daily river administration (diversions and reservoir operations) and record management.
- Special Projects A mechanism to incorporate special, user defined spreadsheets into the central database and Water Information Sheets.
- Database Synchronization An automated procedure that insures the information that resides on the central (Denver based) database is the same as the information that resides on a local PC. Database synchronization is well suited for water commissioners and others that desire a local copy of selected information (e.g. all data for a water district or monthly data for a division) or do not have access to a high speed connection.

Database and Data Sharing

The CRDSS relational database, HydroBase was converted from Unix to Windows NT in order to provide PC compatibility. As part of that activity, HydroBase has been enhanced to accommodate information such as real time streamflow and water information sheets that are required by the CWRAT (described above).

CRDSS data sharing issues continued to be investigated by the Attorney General's office. Current State thinking is that all CRDSS products (except the proprietary Big River Model – RiverWare) will remain free in the foreseeable future. Access will be provided via the CRDSS FTP site. This site will allow most CRDSS products (models, data and documentation) to be distributed in a cost effective, efficient manner.

Water Resource Planning Model

Phase IIIa of the Water Resource Planning models, that allow 100% of a basin's CU to be included, have been calibrated for all basins on the western slope (Colorado, Gunnison, Yampa, White and San Juan). Documentation is completed for all basins and is available on the FTP site.

Additional activities related to the Water Resource Planning model, StateMod, include: the StateMod GUI is now fully operational on a PC, the Data Management Interfaces are now fully operational on a PC, and the StateMod program may be operated in a daily time. Note, the StateMod program has always operated on a PC. Applications by the CWCB to the Yampa River basin for endangered species analysis have begun by. Applications on the Colorado River and San Juan continue.

Division 5 Worksheet

The Division 5 Worksheet, which will enhance and replace the USBR's Colorado River Accounting spreadsheet is approximately 90% complete. Enhancements include new stream gages (e.g. Palisade), new reservoirs (e.g. Wolford) and new accounting procedures (e.g. Check Case Settlement). An Excel application, the Division 5 Worksheet will provide easy to use tabbed workbooks rather than the 132+ column CRA sheet. The development of this tool has occurred in cooperation with Division 5 staff and the Colorado River Surface Water Action Team (SWAT).

Study Period Extension and Stochastic Data Development

The study period used to calibrate the Water Resource Planning Models was 1975 to 1991, based on when the study began and the availability of digitized

diversion and reservoir records on the west slope. A feasibility study was completed in January, 1998 that concluded it is feasible to extend the available study period back to the early 1900's and to develop stochastic data. A cost effective approach to estimate historic diversion data prior to 1975 was scoped which will allow selected large structures to be digitized and others estimated. The estimation approach is expected to utilize a hydrologic condition (wet, dry or average), readily available gaged diversion records, and the appropriation date of a structures water rights. The stochastic model developed by the USBR and CSU (Salas, et al., 1996) named SAMS has been selected for application following the historic data extension. Both the historic data extension and stochastic model development are expected to be completed in 1999.

Consumptive Use Model

Activities have initiated to port the CRDSS Consumptive Use Model, StateCU, to a PC. The look and feel is expected to be similar to the recently completed StateMod GUI. In addition, a procedures manual and a consumptive use and losses report will be prepared for Divisions 4, 5, 6 and 7.

Big River Model Replacement

The USBR has completed the development of RiverWare (previously named PRYSM) to replace the existing CRSS model for the Colorado River Basin. CRDSS has completed an evaluation of the RiverWare purchase agreement which will allow Big River applications from Colorado River headwaters to the Sea of Cortez to be performed in house. Because of the proprietary nature of this product, it is expected to be available to the public through a licensing agreement with CU (303 492-2189) and not through CRDSS.

Maintenance Program

The CWCB and DWR had a \$490,000 maintenance program approved by the legislature. The program, which includes 1 FTE for DWR and 3 FTE's for the CWCB will allow future CRDSS maintenance and applications to occur under general funding rather than the CWCB construction fund.

Additional data on the RGDSS and CRDSS are provided on Exhibit G.

Geotechnical Services Branch

The Geotechnical Services Branch provides expertise in the disciplines of geology, hydrogeology, engineering geology, geophysics, well construction and satellite assisted surveying. The Branch includes three professional geologists, one professional engineer and one well drilling inspector. The branch primarily responds to requests by internal or external customers assisting in general investigations, ground water litigation, ground water data collection and reporting and technical assistance to the Board of Examiners and Groundwater Commission. The following is a summary of work done by the Geotechnical Services Branch in 1998.

General Investigations

- Denver Basin Deep Core Hole - Glenn Graham has been the liaison with the Denver Museum of Natural History and has been responsible for securing funding sources and coordination of hydro geologic work for a deep core hole in the eastern portion of the Denver Basin. The core hole is multi-purpose. Information to be developed for the Division includes analysis of the aquifer characteristics in the finer sediments of the eastern part of the basin. The core hole is to be completed as a permanent ground water monitoring hole. Total cost of the project is over \$1,000,000.
- Jefferson County Mountain Ground Water Study - Glenn is coordinating a study of the ground water in the mountainous area of Jefferson County. The project includes numerous agencies. The focus is to determine the ground water yield of fractured aquifers.
- Arkansas Repayment Water Sources - Chuck Roberts spearheaded the administration of a contract to determine potential sources of repayment water for the Kansas suit. The report will be used in the repayment phase of the Arkansas Compact Trial.
- Denver Basin Mapping - George VanSlyke and Glenn Graham are co-authors with Stan Robson of the USGS for HA-742. This is a new map of the western portion of the Denver Basin. The publication accurately maps the outcrops of the aquifers along the Front Range. This is the first step toward revision of the Denver Basin Hydrologic Atlases and is the culmination of several years of detailed work.

Ground Water Commission Support

- Monitoring of water levels in over 1500 wells covering almost 3/4 of the state are done annually and published by the Branch in a series of reports.
- Southern High Plains - Chuck Roberts has been assisting the Southern High Plains Ground Water Management District in organizing a detailed ground water study of the southeast portion of the state. The project is funded by the CWCB at about \$75,000. Completion is scheduled in 1999.
- The branch provides technical support on aquifer location and characteristics, groundwater availability and potential water supply for the permitting of wells.

Board of Examiners Support

- Well Completion Monitoring - Norm Hill checks all completion reports for compliance with standards for construction. Wells not adhering to the standards are referred for further action.
- Variances - Over 230 requests for variance from the well construction rules were processed during the year. A new procedure was implemented this year whereby Blanket Variances were issued to Environmental firms that routinely install monitoring holes and wells. In this procedure, standard designs are approved so that a separate variance will not be required for each installation. We estimate that an additional 200 requests would have been submitted if the 38 Blanket Variances had not been issued.
- Well Observation Program - George VanSlyke and Norm Hill developed a check-off form for Water Commissioners to use when observing well construction. Also a training presentation was developed. The purpose of this is to allow commissioners to observe well construction and report items concerning compliance without having to be enforcers.

General Support

- Water Court - three prominent cases in which the Branch was involved this year are 1) Lea Vista (we won big time), 2) Horse Creek and 3) City of Aurora, South Park.
- DAM Failure Analysis - George VanSlyke and Jim Norfleet of Division 4 co-authored a report concerning the failure of Carl Smith Dam. The investigation

showed possible modes of failure and the inadequate construction of the structure.

- GPS - Chuck Roberts continues as the in-house GPS expert answering questions of the field users and obtaining state-of-the-art equipment and software.

Hydrographic and Satellite Monitoring Branch

The Hydrographic and Satellite Monitoring Branch strives to provide accurate, high quality 'real time' stream flow data. The Branch also develops historic stream records in coordination with other state and federal entities and the water user community. Key staff record and check measurements, maintain equipment and improve the quantity and quality of data used to manage and administer water throughout the State of Colorado. An organizational plan was developed and approved in 1998 that improves long-term employee development, QA/QC program and coordination throughout DWR. An organizational chart depicting the DWR hydrographic staff structure is provided on Exhibit G.

Satellite-Linked Monitoring System

The satellite-linked monitoring system (SMS) provides the Division of Water Resources, other state and federal entities, and the water user community with access to real-time and historic stream-flow data from gaging stations across the State of Colorado. These data and software systems provide for more effective water rights administration, water resource management, computerized hydrologic record development, and flood warning.

The Satellite Monitoring System (SMS) allows the Division of Water Resources to collect, process, store, and distribute any kind of environmental data transmitted from remote locations. The data set of interest to the Division is the water level at rivers, streams, diversion structures, and reservoirs. The SMS converts these raw water level values into several "products" of use to various "clients". The "products" range from raw data passed on to other computer systems to the official Hydrographic Records of mean daily stream flows. Our "clients" include Division of Water Resources personnel and other water users wanting real-time administrative data, computer systems performing other analyses, and the varied user community of state and federal agencies, municipalities, canal companies, attorneys, and consulting engineers needing access to real-time and historic stream flow data.

The State Engineer's Office (SEO) began operating the SMS in 1985. The Colorado Water Resources and Power Development Authority provided initial funding for this project pursuant to Section 37-95-107(5), C.R.S. (1983), by enactment of Senate Joint Resolution No. 20. This system has become one of the most important and integral tools for the administration and management

of Colorado's water resources, not only for the Division of Water Resources, but for the entire water user community.

Initially, the State of Colorado operated 150 remote gaging stations linked to the SMS. The Division of Water Resources now operates 298 satellite gaging stations linked to the SMS. Federal agencies, water conservancy districts, municipalities, and private entities own other stations in Colorado and neighboring states. The Division collects and uses the data from 252 of these stations operated by others. The Colorado Water Conservation Board provided \$120,000 for the replacement of fifteen satellite installations with new electronic equipment and gaging station renovation.

Stream Flow Records

The Hydrographic and Satellite Monitoring Branch is also responsible for the development and publishing of annual stream flow records in accordance with USGS standards. The stream flow records are published in May of each year for the prior year stream flow.

Equipment Maintenance, Repair and Replacement

Substantial effort was invested in 1998 to maintain, repair and replace the equipment used to measure and transmit stream flow measurements.

Board of Examiners for Water Well Construction and Pump Installation Contractors

In Article 91 of Title 37, the Colorado legislature created the State Board of Examiners of Water Well Construction and Pump Installation Contractors "under the division of water resources in the department of natural resources". The Board consists of five members, one of which is the State Engineer who has historically provided staff to support the activities of the Board and to assist the Board in the efficient and effective discharge of its duties and responsibilities. At present, there are two staff members devoted full-time, from three to six other employees of the Office of the State Engineer in the Denver office that contribute part-time to supporting Board activities, and numerous water commissioners and personnel in the Division offices that provide invaluable assistance to the Denver staff to accomplish the Board's objectives.

General Support

Primary activities of the support staff are focused in three general areas; complaints/enforcement actions, variances from the requirements of the Water Well Construction Rules, and well construction and pump installation contractor licensing activities. In addition to the primary functions, the Staff provides technical and professional assistance to the Board in the development of its amended well construction rules. The Staff also reviews and presents to the Board new technology developed in the well construction industry, coordinates the activities of the Board with the objectives and requirements of the Division of Water Resources and other agencies, disseminates information to contractors, and provides education and general information concerning the Board's activities in a variety of public forums.

Licensing

The Board licensed a total of 329 contractors in 1998 and conducted 24 oral examinations with applicants for new licenses.

Complaints and Enforcement Actions

Support staff for the Board of Examiners are solely responsible for the investigation of complaints that allege well construction or pump installation that violates the provisions of Article 91 of title 37, C.R.S., and/or the Water Well Construction Rules. In many instances, the staff in the Denver office enlists the assistance of field personnel to accomplish investigations by providing reports on observations at well sites or by determining property ownership. The staff's investigation often results in bringing the issues before the Board of Examiners for resolution, while others are resolved by staff actions authorized by the Board. The staff also conducts all "follow-up" actions to ensure that contractors and well owners are complying with Decision and Orders of the Board, including pursuing a judicial remedy if necessary. The staff works closely with the Attorney General's Office to accomplish these tasks.

The following is a summary of complaint/enforcement actions brought before the Board or resolved by the Board or support staff during calendar year 1998.

New Complaints Investigated.....	79
Complaint Type: Construction violation.....	24
Permit violation.....	28
Unlicensed contractor.....	14
No Work Report Filed.....	1
Order to Fix or Plug	12
Complaints Resolved.....	74
1996/1997 complaints resolved in 1998.....	30
1998 complaints resolved in 1998.....	44
Resolution/Action: Dismissed, withdrawn, discontinued, or otherwise resolved.....	30
Court action (fines and fees).....	4
Letter of admonition.....	27
Letter of reprimand.....	4
Suspension/probation.....	2
Warning letters.....	7

Education and Outreach

The Division of Water Resources and the Colorado Water Well Contractors Association with the assistance of several cosponsors have teamed up to provide six 1-day seminars on groundwater and wells. The seminars have been held in Durango, Montrose, Steamboat Springs, Glenwood Springs, Sterling and Evergreen from March 1997 through 1998. The seminars include

presentations on basic information regarding groundwater resources, geology, well construction, groundwater statutes and rules, well permitting, and groundwater administration. Generally there are presentations on water quality and county regulations regarding residential development and wastewater treatment.

The meetings are informal and questions and discussion from the attendees are encouraged. The meetings have attracted a broad range of people including well construction contractors, pump installers, realtors, attorneys, water resource professionals, county planners, and private citizens. Additional information on the seminars can be obtained from the Division of water resources.

In addition, several informal meetings were held throughout the State with water well construction and pump installation contractors for education and general discussion on board and DWR activities. A web page was developed including an e-mail question section and several articles were provided to the CWWCA newsletter. BOE website @ <http://www.boe.state.co.us>.

Water Well Construction Rule's Revision

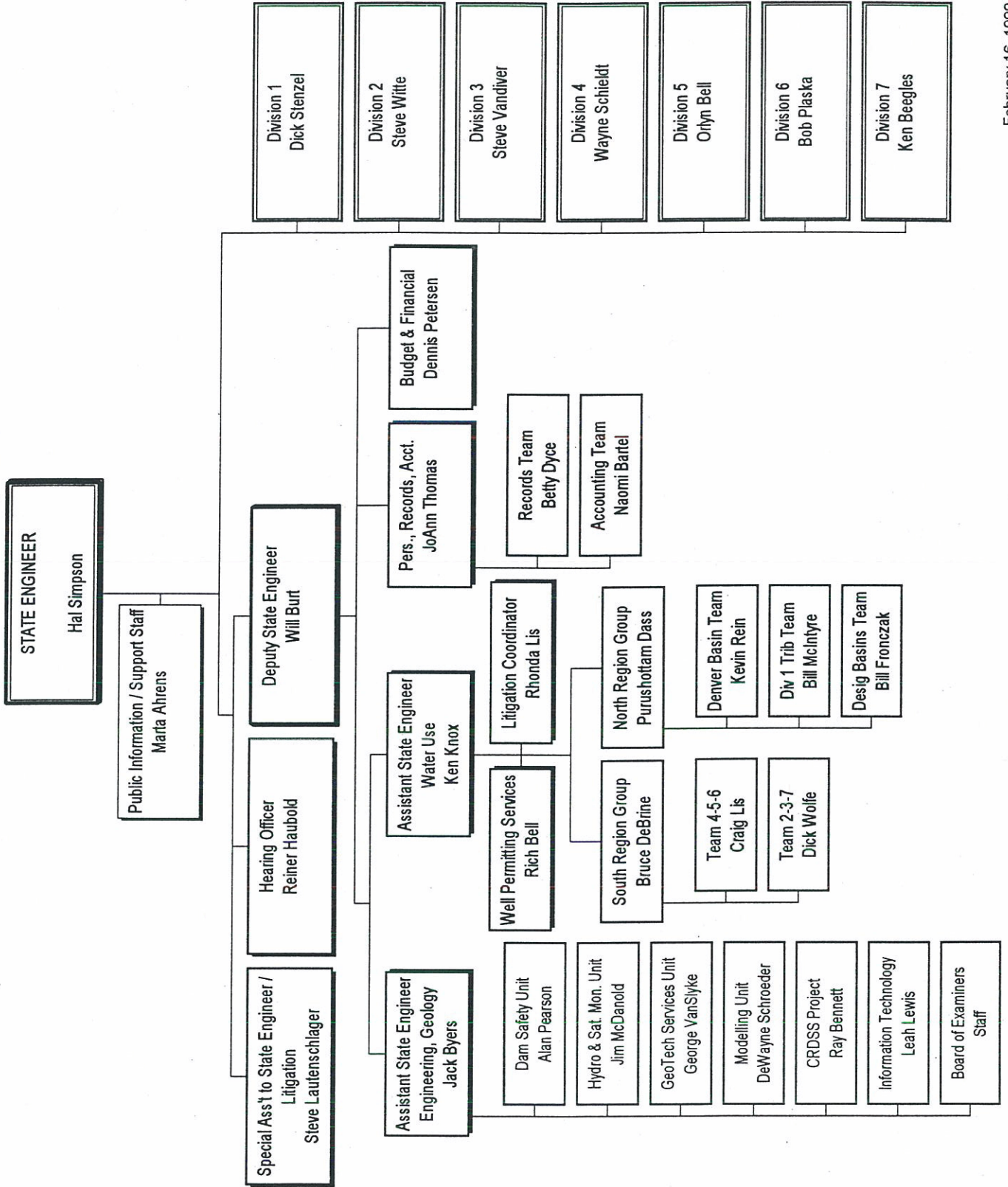
The Board and staff are currently working to improve the Rules and Regulations for Water Well Construction and Pump Installation. The intent of the revision of the Rules is to clarify the currently ambiguous rules, improve minimum construction standards, clarify environmental monitoring and observation well/hole minimum construction standards, improve the protection of the groundwater resource from contamination and protect public health.

The initial draft of the proposed revised Rules was developed with input from the Board, Licensed Contractors, Consulting Engineers and Geologists and others. The proposed revised rules were then sent to over 450 licensed contractors and interested parties to provide the opportunity for informal comments and proposed revisions. In addition, seven informal meetings around the state were held to discuss the proposed revisions and obtain input to further improve the Rules. Input was gathered and a substantial number of thoughtful constructive suggestions resulted from these meetings.

The initial draft was revised and provided it to the Board in December. The revised second draft was discussed at the annual CWWCA meeting in January. Several proposed changes continue to be reviewed by the staff and contractors and interested parties. A final proposed draft will be provided to the contractors and Board prior to the April Board meeting. The formal rulemaking process is proposed to begin in May or June, 1999. The effective date of the revised Rules is anticipated to be September, 1999.

The areas of major revision in the Rules include the separation of minimum construction standards for environmental monitoring and observation well/hole, grouting requirements for wells, annular space requirements with the use of tremie pipes for grouting, and licensing requirements.

Division of Water Resources / Office of the State Engineer Organization Units & Supervisors



ENGINEERING, TECHNOLOGY AND INVESTIGATIONS ORGANIZATIONAL CHART

February 1999

Jack Byers
Assistant State Engineer

264

Gina Antonio - Assistant

Mary Ann Cavanaugh – Support Staff

Dam Safety Unit

Alan Pearson
Professional Engineer III (168)

Mark Haynes
Prof. Engineer II (254)

Hydro & Satellite Monitoring

Jim McDanold
Professional Engineer III (191)

Dave Dzurovchin, Eng/Phys Sci Tech II (283)
Richard Poelker, Telecom/Elec Spec III (429)

Modeling Unit

DeWayne Schroeder
Professional Engineer III (259)

Brian Ahrens, Prof. Engineer III (370)

CRDSS & RGDSS Project

Ray Bennett
Professional Engineer III (446)

Information Technology

Leah Lewis
IT Manager, IT V (257)

Deb Bell, Infrastructure Supervisor IV (292)
Vacant, Network/Web Development, IT III (181)
Diana Melaragno, Network Analyst, Net II (337)
Greg Ibarra, Appl Prog II (333)
Vacant, Prog Analyst IV (428)
Lori Torikai, GIS Programmer, IT III (186)
Brian Romig, GIS Specialist (177)
Don Wambold, Application Dvlp. Mgr, IT IV (173)
Doug Stenzel, Database Administrator, IT III (476)
Don Lyman, Programmer, IT III (247)
Vacant, Programmer, IT II (193)

GeoTech Services Unit

George VanSlyke
PSRS IV (251)

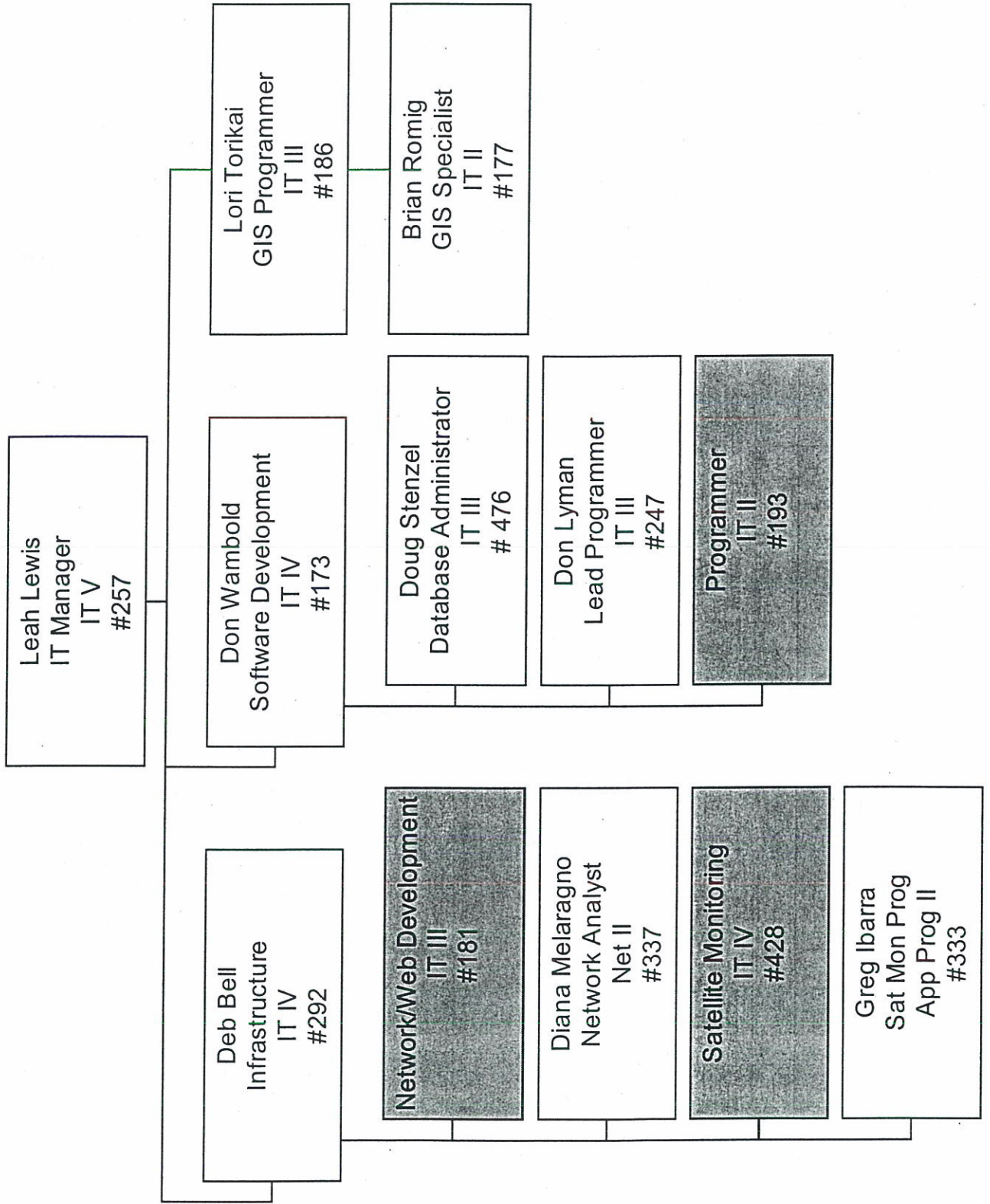
Chuck Roberts, Prof. Engineer III (253)
Glenn Graham, PSRS III (345)
Dave McElhaney, PSRS II (187)
Norm Hill, Eng/Phys Sci Tech I (288)

Board of Examiners

Jack Byers
Administrator

IT Staffing 2/99

EXHIBIT C



APPENDIX A

DAM SAFETY BRANCH

ASSISTANT STATE ENGINEER
ENGINEERING AND TECHNICAL SERVICES

DAM SAFETY PROGRAM

Professional Engineer III

DIVISION ENGINEERS
OFFICES

DESIGN REVIEW AND
CONSTRUCTION INSPECTION
UNIT

DIVISION 1
4 - Professional Engineer II

1 - Professional Engineer II

DIVISION 2
2 - Professional Engineer II

DIVISION 3-7
Professional Engineer II

DIVISION 4
Professional Engineer II

DIVISION 5
Professional Engineer II

DIVISION 6
Professional Engineer II

RECOMMENDATION LOCATOR

Rec. No.	Page No.	Recommendation Summary	Agency Addressed	Agency Response	Implementation Date
1	20	The Division of Water Resources should change DWR policy to accept Bureau of Reclamation and Army Corps of Engineers-performed routine safety inspection reports and reallocate the general fund resources used to perform routine inspections to higher-value/priority Dam Safety Program engineering activities.	Division of Water Resources	Agree	1999
2	21	The Division of Water Resources should develop guidelines requiring Dam Safety Program staff to determine risk, show cause and seek prior management approval to participate in each optional coinspection of a federal dam and related activities.	Division of Water Resources	Agree	1999
3	24	The Division of Water Resources should reduce general fund resources used to perform redundant routine safety inspections of Federal Energy Regulatory Commission-licensed dams by changing DWR policy to accept FERC safety inspection reports.	Division of Water Resources	Agree	1999
4	28	The Division of Water Resources should reduce general fund resources used to perform routine safety inspections of federally owned and operated dams by requiring that federal agencies operate a dam safety program at federal expense, provide the program with staff and provide the DWR with safety inspection reports in lieu of DSP inspection reports.	Division of Water Resources	Agree	2000
5	31	The Division of Water Resources should stop using general fund resources to provide dam safety evaluation services on federally owned, operated, and licensed dams and save or reallocate those general fund resources to higher-value/priority Dam Safety Program engineering activities.	Division of Water Resources	Agree	1999

RECOMMENDATION LOCATOR

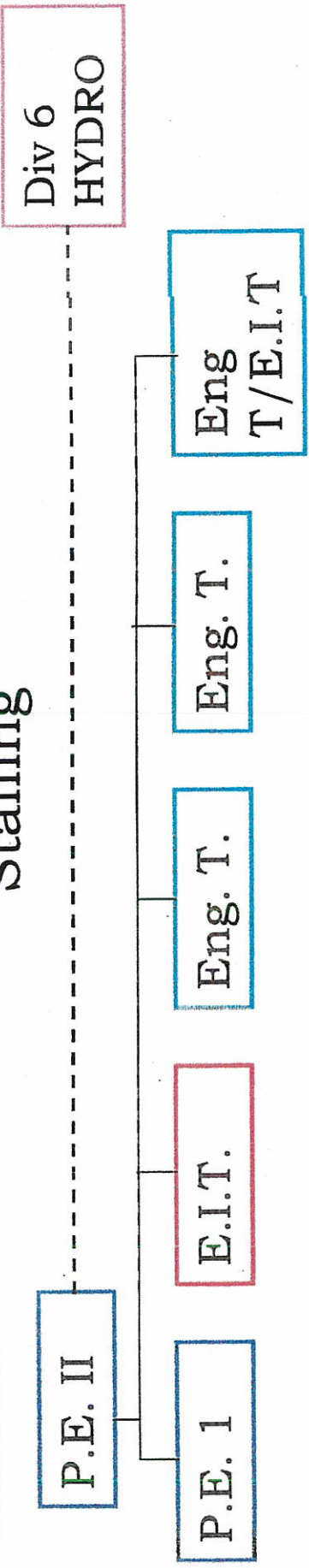
Rec. No.	Page No.	Recommendation Summary	Agency Addressed	Agency Response	Implementation Date
6	33	The Division of Water Resources should record and report in its <i>Dam Safety Program Annual Report</i> , the general fund cost and time Dam Safety Program staff spend on federal dams either by recommending an amendment to C.R.S. 37-87-114.4 or through State Engineer's rules and regulations.	Division of Water Resources	Agree	1999
7	35	The Division of Water Resources should work with the Denver Water Board to develop a routine dam safety inspection report acceptable to both agencies or obtain DWB inspection reports and use them in lieu of Dam Safety Program performed routine safety inspections.	Division of Water Resources	Agree	1999
8	36	The Division of Water Resources should work with the Division of Wildlife to develop an owner's engineer dam safety inspection report and related policies and procedures acceptable to both agencies and utilize Division of Wildlife routine safety inspection reports in order to reallocate general fund costs of duplicating routine safety inspections.	Division of Water Resources	Agree	1999
9	38	The Division of Water Resources should reduce costs of inspections performed by the owner's engineer, by amending Rule 14.D in the <i>Rules and Regulations for Dam Safety and Dam Construction</i> , to require similar inspection frequencies for both Division of Water Resources' Dam Safety Engineers and dam owner's engineers.	Division of Water Resources	Agree	2000

RECOMMENDATION LOCATOR

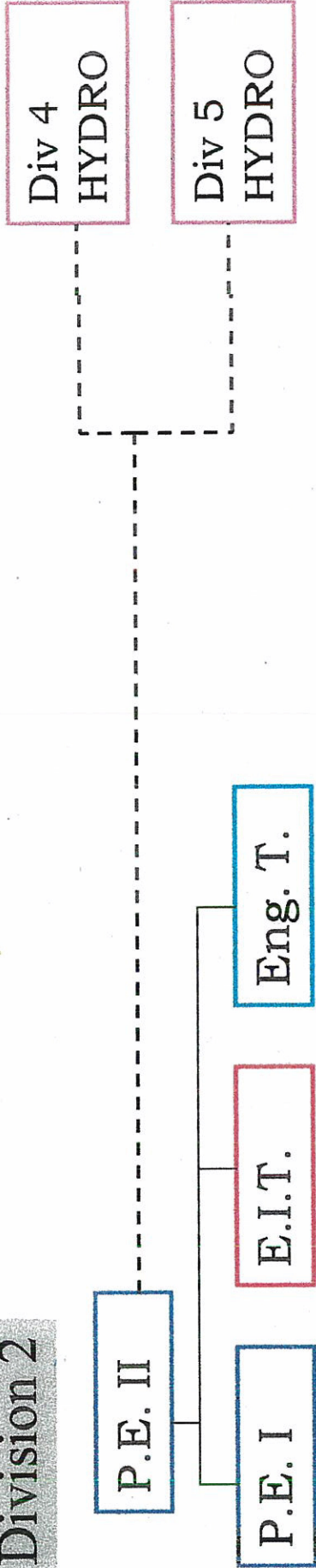
Rec. No.	Page No.	Recommendation Summary	Agency Addressed	Agency Response	Implementation Date
10	45	The Division of Water Resources should require adequate emergency access to dams on U.S. Forest Service property. This could be accomplished with locking gates on restricted roads and prior notification to the State Engineer about restrictions on USFS roads leading to dams.	Division of Water Resources	Agree	1999
11	46	The Division of Water Resources should add the potential for loss of life when designated recreation areas along streams and rivers do not feature man-made improvements or large established campgrounds to the criteria for evaluating the suitability of a Class I hazard rating.	Division of Water Resources	Agree	1999
12	48	The Division of Water Resources should enforce their rule requiring all owners of Class I and II dams to submit and keep current an Emergency Preparedness Plan.	Division of Water Resources	Agree	Currently being implemented.
13	49	The Division of Water Resources should modify the <i>Engineer's Inspection Report Form</i> to require the Dam Safety Engineer to document their review and verification of Emergency Preparedness Plan accuracy.	Division of Water Resources	Agree	1999
14	50	The Division of Water Resources should implement procedures to verify the accuracy of the data in the dam safety database.	Division of Water Resources	Agree	1999

Hydrographic Branch Staffing

Division 1



Division 2



Division 3

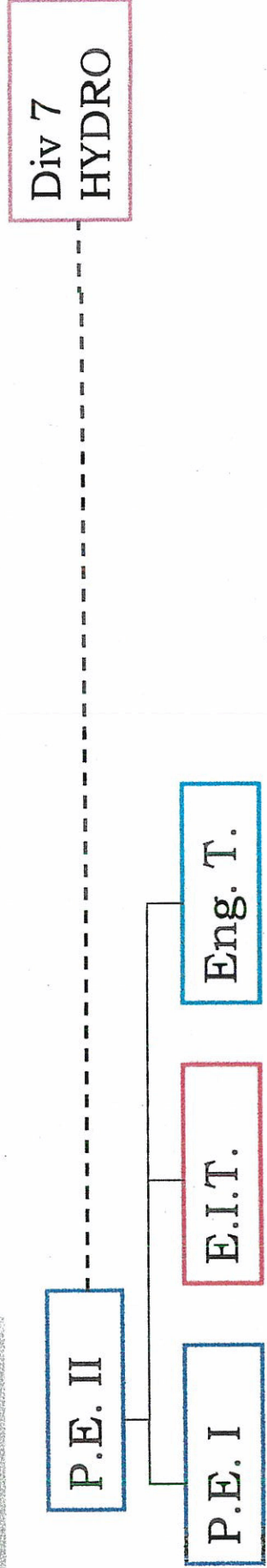


Table 1

RGDSS Progress Summary in 1998

April, 1998	Final Feasibility Study Completed
June, 1998	Solicitations published in Denver and San Luis Valley
August, 1998	Contractor Interviews and Selection (see Table 2)
August, 1998	USGS MOU prepared to log observation well network
December, 1998	Contractor Contracts Negotiated
January 18, 1999	Project Start Date

Table 2

RGDSS Contractors

Component	Contractor
Ground Water	HRS Water Consultants, Inc.
Surface Water	Hydrosphere Resource Consultants
Consumptive Use and Water Budget	Leonard Rice Consulting and Agro Engineering
Relational System Integration	Riverside Technology, inc.
Spatial System Integration	HDR Engineering, Inc.

Table 3

CRDSS Progress Summary in 1998

December , 1997	Colorado Water Right Administration Tool (CWRAT) Phase 1 presented to review team in Glenwood
February, 1998	Water Resource Planning (StateMod) Phase IIIa (100% CU) completed
February, 1998	Daily StateMod application in cooperation with USBR in Utah initiated
March, 1998	StateMod GUI for PC completed
April, 1998	Contract to Extend Water Resource Planning (StateMod) data back to 1909 approved for Boyle Eng. and Ayers Eng.
April, 1998	CWRAT phase 2 completed.
May, 1998	Web site completed
May, 1998	Final Technical Advisory Committee Meeting
May - Aug., 1998	Trained Divisions 1, 4, 5, 6, and 7 on CWRAT
June, 1998	Big River Model Replacement (RiverWare) Contract with USBR approved. Purchase is pending CWCB personnel decisions.
August, 1998	Water Resource Planning (StateMod) Automated Linking of Divisions 1-4 Completed. Implementation pending CWCB enhancements to planning models
August, 1998	Contract for CU Model (StateCU) conversion to PC initiated with Leonard Rice
September, 1998	Application of Water Resource Planning Model (StateMod) on Colorado River for Fish & Wildlife on Colorado River
September, 1998	Application of Water Resource Planning Model (StateMod) for minimum streamflows on San Juan continue.
September, 1998	Gunnison River Basin Historic CU Depletion Analysis Tool Completed
September, 1998	HydroBase phase III completed (includes real time data and CWRAT tables)
December, 1998	Data Management Interfaces (DMI's) for data extension 80% complete.
Feb - Nov. 1998	Miscellaneous presentations (see Table 4)

Table 4

CDSS Presentations

February, 1998	Presentation of StateMod application on Gunnison to USBR
February, 1998	Presentation of CRDSS to Colorado Water Congress
March, 1998	Presentation of CRDSS to Legislature
June, 1998	Presentations of CWRAT to Western State Engineers Workshop
November, 1998	Presentation of CRDSS to Garrison Irrigation District (North Dakota)