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DIVISION OF WATER RESOURCES
Office of the State Engineer

People, Water and Stewardship

**Engineering, Technology,
and Investigations**

1999 Annual Report

Contents

Executive Summary	3
Dam Safety Program	5
Legislative Audit	
Extreme Precipitation Study	
National DSP Assistance Grants	
Modeling Branch	8
SB-74 Ground Water Model	
HI Model Upgrading and Updating	
USGS Groundwater Model in Kansas	
South Park Conjunctive Use Project	
RGDSS and CRDSS	
RGDSS Progress 1999	
CRDSS Progress 1999	
Geotechnical Services Branch	16
General Investigations	
GW Commission Support	
Board of Examiners Support	
Division Support	
Where are we going	
Hydrographic and Satellite Monitoring Branch	20
Satellite-Linked Monitoring System	
Stream Flow Records	
Equipment	
Board of Examiners	22
General Support	
Licensing	
Complaints and Enforcement Actions	
Education and Outreach	
Water Well Construction Rule's Revision	
Well Observation Program	
Exhibits	
A-General Organization Chart	E-Hydrographic Organization
B-ETI Organization Chart	F-BOE Summary of Board Actions
C-Dam Safety Organization	G-BOE Tabulation of Actions
D-Dam Safety Audit Recommendations	H-Well Observation Program

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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 1999 for the outstanding performance and excellent contribution to DWR's mission. DeWayne Schroeder and Brian Ahrens were recognized for their contribution and effort on the SB 96-74 studies. In addition, Alan continues to work nationally to improve public safety and Dam Safety Program. George VanSlyke and Glenn Graham both gave presentations to the annual meeting of the Geological Society of America. The presentations dealt with the sustainability of the Ogallala Aquifer and the allocation of non-tributary ground water in the Denver Basin. Several staff shared their expertise with the records staff during 1999, Mark Haynes provided a training session and Dave Dzurovchin, Jim McDonald and Glenn Graham sponsored a variety of field trips. The sessions were reported to be interesting and very informative. Several other staff participated in activities to foster teamwork in the accomplishment of DWR's mission, Thanks to all of the ETI staff.

DeWayne Schroeder retired on January 1, 2000, after 30 years of service. Mr. Schroeder started his career with the DWR in 1970 in the Designated Basins Branch. He became Chief of the ground water section, and later appointed as Chief of the Computer Modeling Branch. He is recognized nationally for his expertise in surface and ground water modeling. He had an illustrious career and his contributions to the State of Colorado in the Kansas v. Colorado trial were nothing short of monumental. He has done an exemplary job and the DWR would like to wish DeWayne all the best in the future.

The Information Technology Branch, incorporated into ETI during 1998 and will provide a separate report on their 1999 activities.

The Dam Safety Branch also experienced a challenging and exciting 1999. A total of 985 inspections occurred in 1999. In spite of our best efforts in the dam safety program, we continue to experience serious incidents at dams. Eight dams experienced serious problems during 1999. The number of incidents involving dams is of concern. A review of the rules and regulations, evaluation of existing dams, and other procedures are scheduled during 2000. The purpose of the review is to determine if modifications to the program are required to reduce the potential for dam failures and incidents. The State Engineer submitted an Annual Report on the Dam Safety Program to the Legislature November 1, 1999. 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.

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 Federal Emergency Management Agency's Dam Safety Mitigation Directorate (FEMA), who manage the National Dam Safety Program, sent us their applications for assistance grants for FY 2000-2002. They requested we submit a three-year plan which would be funded at \$85K+ a year if the funds are fully appropriated by Congress. Our three-year plan includes the continued advanced training in Dam Safety Engineering which includes in-house training on risk analysis, engineering geology, hydrologic and hydraulic analysis, as well as needed training on software programs.

The Modeling Branch, though small in number, continues to play an increasingly critical role in DWR activities. The staff continued efforts to revise and update data to the Hydrologic Institutional Model (HIM) for the Kansas v. Colorado litigation and Arkansas River Administration. Significant effort was expended on the management of the RGDSS development, Ray Bennett continues to demonstrate his excellent management and technical skills in coordinating with the Division Office and contractors on this important project. 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 over 200 requests for variances from the Rules, development of a well observation program, and well completion report 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, conversion from the VAX to an NT platform, and organizational improvement. The 1998-1999 annual report on the Satellite-linked monitoring system was completed. 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. The revision of the BOE Rules has progressed well though not without controversy. The revised Rules are expected to have an effective date of June 1, 2000. A great deal of the success is due to the excellent work by Dave McElhaney, Gina Antonio, Linda Bassi and David Hayes of the Office of the Attorney General. Their knowledge, skills and dedication were and are greatly appreciated, thank you. 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.

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 trained, well-qualified engineers supports the Dam Safety Program. An organizational chart is provided on Exhibit C. The program protects the public in relation to the design, construction, and operation of dams and reservoirs by working with dam owners and designers to achieve compliance with state dam safety 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, operation, and maintenance of dams, 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 safety inspections be completed each year. In addition, about 100 to 200 follow-up inspections and 100 to 150 construction inspections are accomplished each year. A total of 985 inspections occurred in 1999.

In spite of our dam safety program however, we continue to experience serious incidents at dams. Eight dams experienced serious problems during 1999.

The number of incidents involving dams is of concern. A review of the rules and regulations, evaluation of existing dams, and other procedures are scheduled during 1999 and 2000. 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 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 are executing plans for implementing the recommendations during 1999 and 2000. The report on the progress of the Audit recommendations is provided on Exhibit D.

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 Phase I report was completed in May 1997 by the Department of Atmospheric Sciences, Colorado State University (CSU), 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, but no work has been done to date.

The Phase II and Phase III parts of the project were combined in 1998 and an Evaluation Committee (EC) awarded the contract to CSU. The principal scientists for CSU are Dr. William Cotton and Dr. Thomas McKee. The project will take about three years, with the completion date set for June 30, 2001. A Technical Review Group, which is made up of Mr. Jimmy Dudhia, National Center for Atmospheric Research; Dr. David Mathews and Mr. Louis Schriener, US Bureau of Reclamation; Mr. Stephen Spann, Consulting Engineer, and Alan Pearson, Principal Engineer of the Dam Safety Branch, met with CSU

on June 22, 1999 to review their progress. Drs Cotton and McKee reported their biggest problem was the time it was taking to get fully operational, and they were planning to test the Ft. Collins flood case with the RAMS Model.

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 grants for federal fiscal years 1998 and 1999 in the amount of \$25,162 and \$49,230 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) conferences and technical seminars; and to acquire new computers to enable the running of the BOSS International RiverCad/GIS programs. Other equipment was purchased such as Global Positioning Systems, digital cameras, and cell phones. In addition, an in-house training class was acquired and presented to the branch and other DWR staff, on slope stability analysis and seepage analysis by URS Griener, Woodward-Clyde.

Funds will also be used to cover the costs for updating the regulations, and to provide training to dam owners on the inspection of dams and emergency preparedness.

The Federal Emergency Management Agency's Dam Safety Mitigation Directorate (FEMA), who manage the National Dam Safety Program, sent us their applications for assistance grants for FY 2000-2002. They requested we submit a three-year plan which would be funded at \$85K+ a year if the funds are fully appropriated by Congress. Our three-year plan includes the continued advanced training in Dam Safety Engineering which includes in-house training on risk analysis, engineering geology, hydrologic and hydraulic analysis, as well as needed training on software programs.

These plans comport with the Division's Long Range Plan, as well as the Dam Safety Branch's workplan and goals and objectives.

Modeling Branch

The Modeling Branch provides technical expertise to the DWR through review, development, analysis and execution of 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.

DeWayne Schroeder retired on January 1, 2000, after 30 years of service. Mr. Schroeder started his career with the DWR in 1970 in the Designated Basins Branch. He became Chief of the ground water section, and later appointed as Chief of the Computer Modeling Branch. He is recognized nationally for his expertise in surface and ground water modeling. He had an illustrious career and his contributions to the State of Colorado in the Kansas v. Colorado trial were nothing short of monumental. He has done an exemplary job and the DWR would like to wish DeWayne all the best in the future.

HI Model Upgrading and Updating

In 1999, revisions to the Hydrologic Institutional Model (HIM) for the Kansas v. Colorado litigation continued. The revisions include modifications to the program code by Dewayne Schroeder to better simulate conditions along the Arkansas River Basin mainstem. More specifically, the ability to better predict diversions of the 24 major canal systems while matching streamflows at the major gauging stations was accomplished. In addition, the updates to the 1997 and 1998 input data continued in preparation for negotiations with Kansas's consultants.

It is necessary to continue upgrading the HIM to include "special waters" that the model was not designed to handle. As the major augmentation plans continue to evolve and be refined, they are included in the program code to demonstrate Colorado's compliance with the compact. The new Offset

Account in John Martin Reservoir to help 'offset' depletions at the stateline was reviewed but not included in the HIM because of the flexible nature of releasing water to Kansas. Accounting for the Offset Account will be performed externally.

The major revisions to the HIM include but are not limited to:

- 1) improved data of irrigated acres for 1998 supplied by Division 2 personnel based on a detailed study they performed;
- 2) The percent of acres supplemented with ground water based on the 1998 irrigated acre data.
- 3) Treatment of transit losses associated with transmountain water.
- 4) Rerouting portions of return flows around the Ft. Lyon headgate.
- 5) Allowing the Amity Canal to intercept some return flows from the Ft. Lyon Canal.
- 6) Adjustment of the XY/Graham demand by removing the amount of Graham pumping approved as alternate points of diversion.
- 7) Allowance for the amount of leakage occurring through, around, and under the Ft. Lyon diversion structure.
- 8) Adjustment of diversion reduction factors.
- 9) Revision of canal capacities.

In August of 2000, a trial before the Special Master is expected to take place concerning Compact compliance including the program revisions and 1997-98 data updates.

USGS Groundwater Model in Kansas

The Modeling Branch completed analysis of the 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 were used in the damages phase of the trial from November 1999 to January 2000.

South Park Conjunctive Use Project

The Modeling Branch began analysis of the ground water model associated with the application for water rights of Park County Sportsmen's Ranch, Case No. 96CW14 in Division 1 Water court. The application is for the right to divert surface waters from the headwaters west and north of Boreas Pass and west of Kenosha Pass. The surface waters will be delivered by ditch and pipeline to recharge areas located on and near Sportsmen's Ranch. The

recharged water will then be pumped from the South Park aquifers through a series of wells to meet the raw water demands of the City of Aurora.

The application raises a number of concerns including:

- 1) Colorado has not historically recognized the ability of an applicant to claim salvage credits derived from drying up preexisting natural vegetative cover on land not owned or controlled by the applicant.
- 2) The quantification of the amount of surface waters legally available to the applicant.
- 3) The ground water model developed to support the application is inaccurate and unreliable.
- 4) The application will be impossible to administer as currently proposed.

CRDSS and RGDSS

RGDSS Overview

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.

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.

The contractors worked diligently to negotiate a detailed contract that includes a scope of work (SOW), budget and schedule. The contracts were 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.

RGDSS Progress in 1999

Fiscal year 1999 was the first year of development for the Rio Grande Decision Support System (RGDSS). Following are key accomplishments:

Ground Water

Major accomplishments by the Ground Water Component being performed for the State by HRS Water Consultants include:

- The ground water model developed by the State for the San Luis Valley in 1991 was documented in order to serve as a foundation for enhancements.
- A data-centered ground water modeling system that interacts with the State's database (HydroBase), geographic coverages (GIS) and other RGDSS planning tools was begun.
- A database of geologic data was collected and constructed.
- A data collection program was designed to obtain additional subsurface data in the confined aquifer.

- Two new monitoring wells, averaging approximately 400 feet each, were constructed in the confined aquifer.

Surface Water

Major accomplishments by the Surface Water Component being performed for the State by Hydrosphere Resource Consultants include:

- A study period extending from 1950 to 1997 was selected based on hydrologic criteria, digital data availability and study needs.
- Approximately 20 major water users and administrators were interviewed in order to document historic water use and administration in Division 3.
- The surface water model, StateMod, was enhanced to accommodate conditions not previously required such as direct flow storage, well development and braided streams.
- Application of StateMod to the Rio Grande was initiated that includes 408 diversions, 12 reservoirs and 28 instream flows was initiated. These key structures represent over 90% of the water use in the Valley.

Consumptive Use and Water Budget

Major accomplishments by the Consumptive Use and Water Budget Component being performed for the State by Leonard Rice and AGRO Engineering include:

- Irrigated and native vegetation was estimated for 1998 using satellite imagery. In addition, each irrigated field was assigned a crop type and tied to a surface and/or a groundwater source.
- Locally calibrated crop consumptive use coefficients were developed for each of the 4 major crops grown in the valley; potatoes, pasture grass, alfalfa and small grains.
- The consumptive use model, StateCU, was enhanced to accommodate conditions not previously required such as well development and sprinkler irrigation.
- Application of the State's consumptive use model, StateCU, was initiated.

Relational System Integration

Major accomplishments by the Relational System Integration Component being performed for the State by Riverside Technology include:

- Incorporating well and geologic data into the State's database, HydroBase.
- Enhancement of the surface water models graphical user interface to accommodate a daily time step and wells.
- Software enhancements to the data management interfaces (DMI's) that allow wells and daily data to be accessed from HydroBase and used by the systems models were initiated.

Spatial System Integration

Major accomplishments by the Spatial System Integration Component being performed for the State by HDR Engineering include:

- Eleven GIS coverages (maps) of the Valley were developed. These include a basemap that contains highways, water districts, counties, hydrography and a public land survey; location maps for stream gages, climate gages, diversion stations, reservoirs, and wells; and other coverages such as land use, precipitation, soils, solar radiation and topology.
- A new application, Well Tool Analysis, was developed to assist in identifying unique large capacity wells by matching common data available from the water right and permit tabulations.
- The development of water information sheets required to implement the Colorado Water Right Administration Tool was initiated.

Other RGDSS Activities

Major accomplishments by Division 3 as part of RGDSS included:

- The installation of 20 new stream gages in the Valley; 12 on streams and 8 on diversions.
- Assistance with the irrigated acreage evaluation.
- Quality control reviews of well records, diversion records and irrigated lands.

CRDSS Progress in 1999

In 1999, CRDSS development was nearly completed. Major development activities included Data Extension for the Surface Water Model and a Consumptive Use model.

Data Extension for the Surface Water Model

The study period originally used to calibrate the Water Resource Planning Models was only 16 years (1975 to 1991). This relatively short time period was selected based on the availability of digitized diversion and reservoir records. To obtain a longer period of record with more extreme droughts and floods, historic records were extended and stochastic data is being developed. Major accomplishments performed under the data extension task in 1999 included the following:

- A historic record that extends from 1909 to 1997 was developed for Divisions 4, 5, 6 and 7.
- Surface water models in Divisions 4 and 7 were calibrated using the extended period of record.
- Stochastic data was developed using SAMS, the stochastic model developed by the USBR and CSU (Salas, et al., 1996).

Consumptive Use Model

The Consumptive Use Model, StateCU, was successfully ported to operate on a personal computer. The model was used to evaluate consumptive uses and losses in the Colorado River Basin. Results are significantly less (approximately 25%) than prior estimates published by a Federal agency because historic diversion records were used to evaluate water short systems.

Maintenance Program

The CWCB and DWR completed the first year of maintenance on CDSS. Key achievements included hardware upgrades, a database refresh and enhanced product delivery using the Internet.

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 1999.

General Investigations

- Denver Basin Deep Core Hole – The Geotechnical Services Section was a major contributor to the successful completion of the 2100-foot deep Denver Basin Core hole located on the Elbert County Fairgrounds in Kiowa. Glenn Graham was and continues to be the liaison with the Denver Museum of Natural History. Glenn spent many hours and many sleepless nights overseeing the coring and completion of the 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 has been completed as a permanent ground water monitoring hole and may be used to obtain water samples from the Denver aquifer. 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. The project is in its second year and will continue for at least one additional year.
- Raton Basin Coal Bed Methane – consultations and investigations were done for the interim legislative committee.

Ground Water Commission

- 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 continues to assist the Southern High Plains Ground Water Management District in contracting for a detailed ground water study of the southeast portion of the state. McLaughlin Water Engineers completed the feasibility study in December at a cost of \$10,000. The project is funded by the CWCB at about \$75,000. Completion is scheduled in the summer of 2000.
- Permitting technical support activities continue to be provided as necessary.

Board of Examiners

- Rules and Regulations. Dave McElhaney spent the better part of 1999 working on the new Rules for the Board. His work culminated in a series of public meetings and hearings. The proposed rules have been tentatively adopted and will become effective June 1, 2000.
- Well Completion Monitoring - Norm Hill checks all water well completion and pump installation reports for compliance with standards for construction. Wells not adhering to the standards are referred for further action.
- Variances – Approximately 200 requests for variance from the well construction rules were processed during the year. Due to the successful Blanket Variances procedure for environmental monitoring holes, the need for an additional 200 variances was averted.
- Complaints and enforcement – we continue to handle dozens of complaints and enforcement actions each year.

Division Support

- Water Court - Work continues on the City of Aurora, South Park case. Work was done for three other minor cases that were settled prior to trial. Periodic work is done on the on-going Oxley case in Huerfano County.

- We are currently working on the Pagosa Springs Geothermal case and are coordinating efforts with Division 7 and the Office of the Attorney General.
- 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. This fall saw the GPS date role-over as well as Y2K changes that required considerable work to obtain "patches" from the manufactures so that our software would function properly.
- Well Permitting and Subdivision Review Assistance - work continues on a daily basis with these activities.
- George VanSlyke and Glenn Graham both gave presentations to the annual meeting of the Geological Society of America. The presentations dealt with the sustainability of the Ogallala Aquifer and the allocation of non-tributary ground water in the Denver Basin.
- Chuck Roberts has been deeply involved with the Division Safety program and is the Division coordinator within the Departmental Safety Committee.
- Chuck Roberts again taught the class for the Well Tester Certification in the Arkansas Valley. This class takes considerable time and effort.
- An investigation of the Rio Grande Dam outlet tunnel was conducted in conjunction with the evaluation of the dam's safety.

Where We Are Going

- The Branch will continue to provide timely expert assistance to the division in all fields mentioned.
- Continued cooperation with the USGS in the hydrologic mapping of the state. A continuation of the Front Range and Denver Basin is underway.
- Elbert County Core Hole - we will remain deeply involved with the Museum as the hole and analysis progresses.
- The ground water monitoring network for the Denver Basin will be expanded as part of the SB-74 effort.

- Glenn Graham has been instrumental getting the Branch GIS capable. While this will take at least a year, we will be able to deliver a much better product.
- We are cooperating with the USGS concerning the proposed Cherry Creek Recharge Project.

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 inn 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 E.

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 over 300 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 1999 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 and three to six others in the Denver office that contribute part-time to supporting Board activities. In addition, numerous water commissioners and personnel in the Division offices provide invaluable assistance to the Denver staff in accomplishing 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 revised Water 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 336 contractors in 1999, including 15 new contractors. The Board conducted 22 oral examinations for new licenses. The BOE approved a written test on the Colorado Statutes and Rules that all applicants must pass prior to receiving their license. Gina Antonio now coordinates all of the licensing activity.

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 summary of Board's 1999 actions is presented in Exhibit F. For comparison purposes a tabulation of Board actions from 1996 through 1999 is provided in Exhibit G.

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 a 1-day seminar on groundwater and wells. The seminar included presentations on basic information regarding groundwater resources, geology, well construction, groundwater statutes and rules, well permitting, and groundwater administration. 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 worked very diligently 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, several 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 1998. The revised draft was discussed at the annual CWWCA meeting in January 1999 and July 2000. Several proposed changes continue to be reviewed by the staff and contractors and interested parties. A final proposed draft was provided to the contractors and Board prior to the April 1999 Board meeting. The formal rulemaking process began in July. However the formal hearings and Board deliberation was delayed to November 1999 and continued into early 2000. The effective date of the revised Rules is anticipated to be June 2000.

Well Observation Program

The well observation program summary is provided in Exhibit H.

Division of Water Resources / Office of the State Engineer

Organization Units & Supervisors

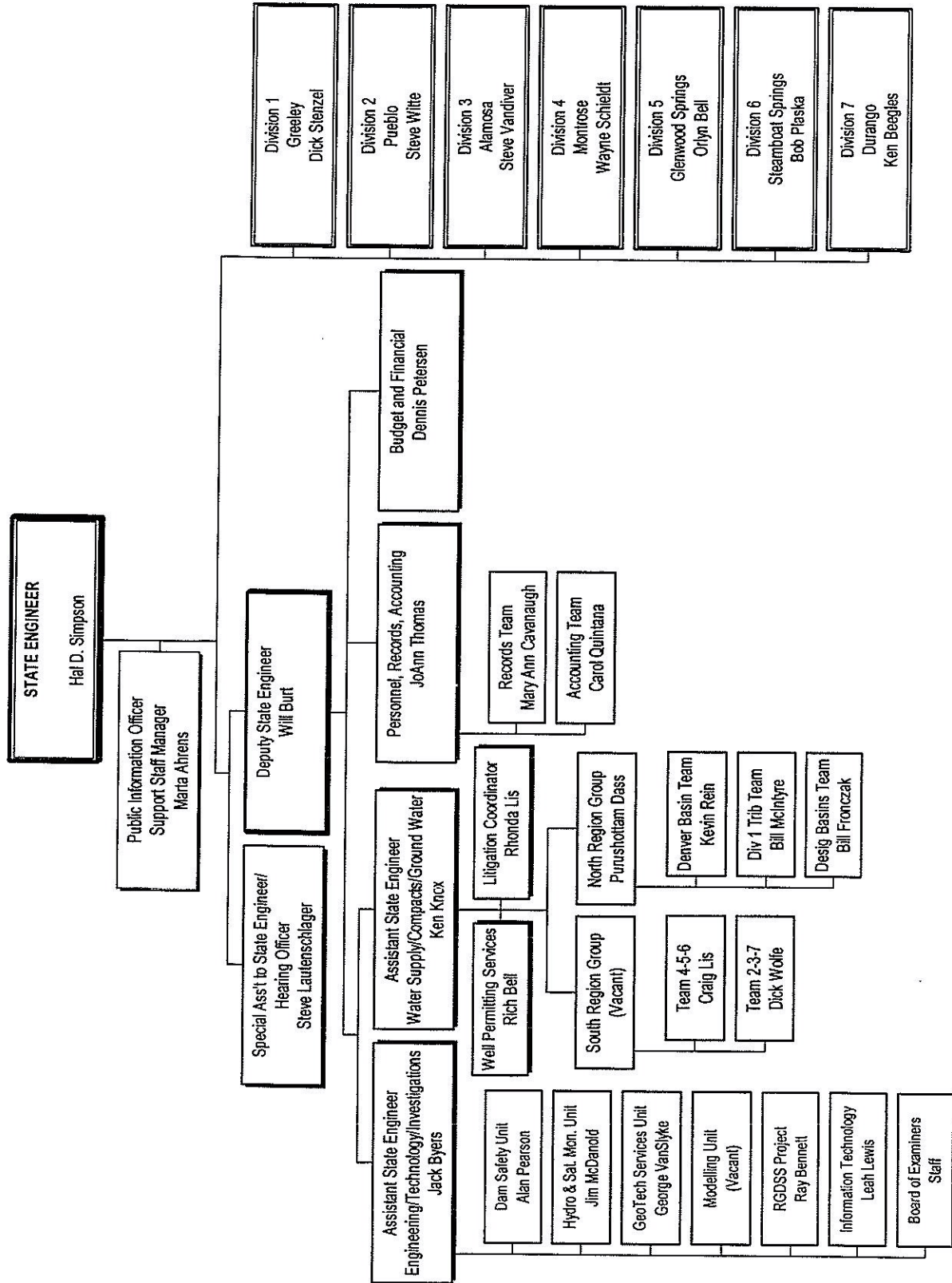


EXHIBIT A

ENGINEERING, TECHNOLOGY AND INVESTIGATIONS ORGANIZATIONAL CHART

February 2000

Jack Byers
Assistant State Engineer
284

Gina Antonio - Assistant

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

Brian Ahrens
Professional Engineer III (370)

Vacant, Professional Engineer III (259)
Vacant, Engineer- in-Training EIT II

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)
Vacant, IT II (193)
Tim Farris, Desktop Support/Trainer (333)
Don Wambold, Software Dvlp., IT IV (173)
Doug Stenzel, Database Administrator, IT III (476)
Vacant, Programmer, IT III (247)
Lori Torikai, Lead Programmer, IT III (186)
Vacant, GIS Specialist IT II (177)

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

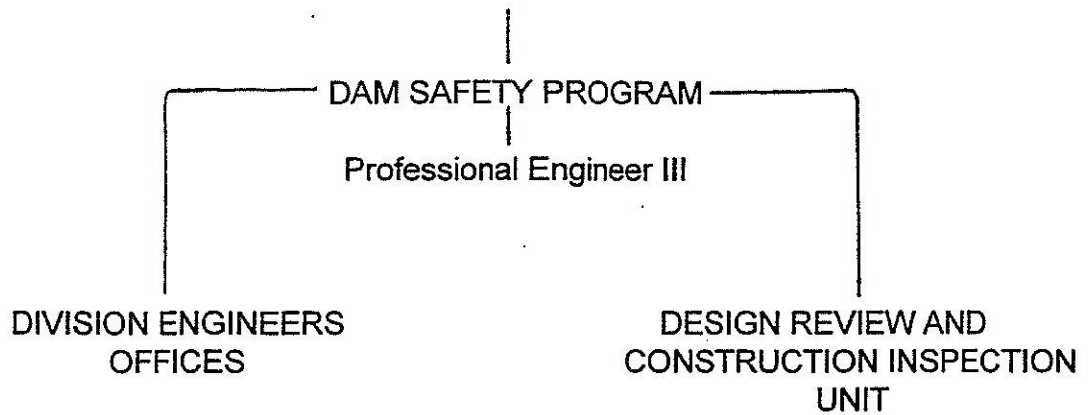
Jack Byers
Administrator

EXHIBIT B

APPENDIX A

DAM SAFETY BRANCH

ASSISTANT STATE ENGINEER
ENGINEERING AND TECHNICAL SERVICES



DIVISION 1
4 - 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

1 - 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 coinsection 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

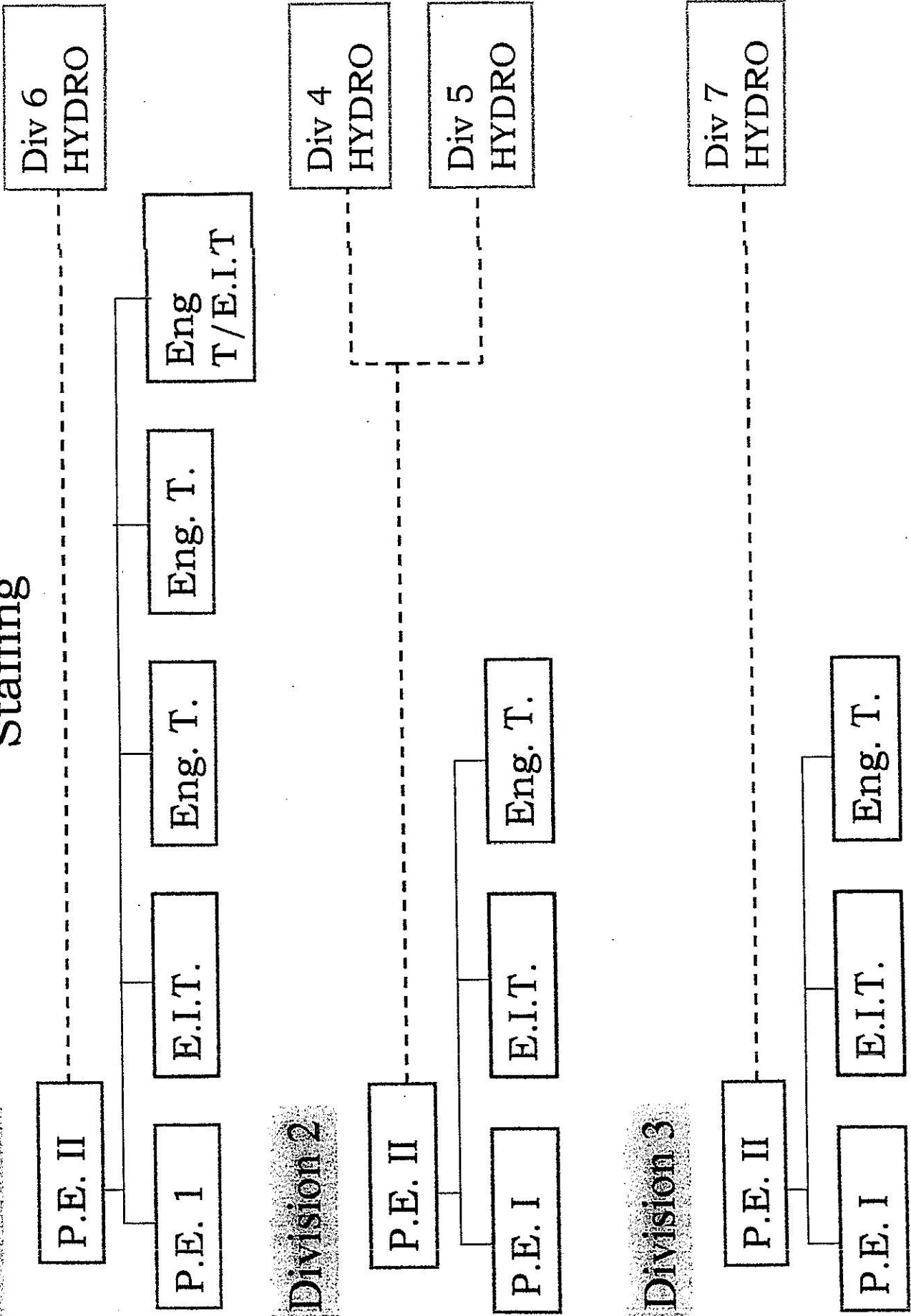
RECOMMENDATION LOCATOR

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



STAFF SUMMARY

BOARD ACTION

BOARD ACTION

1999

<u>MEETING</u>	<u>STIPULATIONS</u>	<u>PAPERS</u>	<u>HEARINGS</u>
February 2, 1999	0	4	0
April 6, 1999	4	0	0
June 1, 1999	4	1	0
August 3, 1999	1	3	0
October 5, 1999	1	0	0
December 14, 1999	1	0	0

Other Actions:

February 2, 1999

Complaints considered: 19 (12 continued; 7 new)
Authorized legal assistance: 8
Continue to investigate or follow up: 7
Monitor: 0
Dismiss/Close: 4

April 6, 1999

Complaints considered: 18 (14 continued; 4 new)
Authorized legal assistance: 2
Continue to investigate or follow up: 11
Monitor: 2
Dismiss/Close: 3

Board considered Staff's request regarding 3 wells that were apparently improperly constructed, but have construction reports received more than two years ago. A decision was postponed until additional information can be obtained.

The Board considered revisions to the Water Well Construction Rules and set the following schedule for rulemaking procedures for the proposed revision of the Rules.

- Application for party status by May 21, 1999
- Prehearing statements due by June 1, 1999
- Prehearing conference to be held June 8, 1999
- Rulemaking hearing on June 21 and 22, 1999

EXHIBIT F

June 1, 1999

Complaints considered: 12 (8 continued; 4 new)
Authorized legal assistance: 0
Continue to investigate or follow up: 10
Monitor: 0
Dismiss/Close: 2

Board considered Staff's request regarding 3 wells that were apparently improperly constructed, but have construction reports received more than two years ago. Board authorized sending an Order to the well owners to show that their well is properly constructed, have well repaired, or plug and abandon the well.

The Board considered the request of a well owner to allow their well to remain in use although the well had been constructed by an unlicensed contractor. The Board determined that, in the specific instance of the well and the circumstances of its construction, the gallery-type well could remain in use if the well owner submitted a Well Construction and Test Report for the structure. Staff was directed to send a Warning Letter to the unlicensed contractor.

August 3, 1999

Complaints considered: 12 (7 continued; 5 new)
Authorized legal assistance: 5
Continue to investigate or follow up: 3
Monitor: 2
Dismiss/Close: 2

Board considered Staff's request regarding a well that was apparently constructed without a well permit and by an unknown contractor. The Board approved the Staff's recommendation to issue an Order to show proper construction of the well or have it plugged and abandoned.

The Board considered a request for variance from David Smith and asked that the Staff try to obtain additional information. A decision on the matter was delayed until the additional information is received and can be evaluated.

The Board considered minor revisions to the Water Well Construction Rules and set the following schedule for rulemaking procedures for the proposed revision of the Rules.

- Application for party status by October 1, 1999
- Prehearing statements due by October 13, 1999
- Prehearing conference to be held October 27, 1999
- Rulemaking hearing on November 9 and 10, 1999

October 5, 1999

Complaints considered: 24 (10 continued; 14 new)
Authorized legal assistance: 3
Continue to investigate or follow up: 14
Monitor: 1
Dismiss/Close: 6

The Board considered a request from Irene Vernon of Pima LLC that asked the Board to rescind its Order in File No. 99-BC-015. The Board denied the request.

At the request of the well owners consultant, the Board vacated its Order in File No. 99-BC-011 and directed the Staff to monitor the status of the owner's efforts to permit the well.

Board considered Staff's request to pursue obtaining the required Pump Installation and Test Report from a well owner that has claimed to have installed his own pumping system. The Board authorized pursuing the well owner to obtain the required report.

The Board adopted Policy 99-1 regarding the written examination for the Water Well Construction Rules and Colorado Revised Statutes pertaining to well construction and pump installation.

December 14, 1999

Complaints considered: 21 (13 continued; 8 new)

Authorized legal assistance: 6

Continue to investigate or follow up: 12

Monitor: 2

Dismiss/Close: 2

The Board considered requests from Dayle Kull (99-BC-025) and Michael Keaton, on behalf of Gene House (99-BC-021) for extensions of time to comply with the Board's Orders. Mr. Kull was granted an extension until February 1, 2000, and Mr. House was granted an extension until July 1, 2000.

1999

Summary of Board Actions

[File Number] [Result] [Date of Conclusion]
[Description of Complaint] - Not all complaint issues noted were substantiated or within Board authority.
The Result reflects only those issues that were found to be violations.

99-BC-001	Complied with Order	4/6/1999
Monitoring well not constructed to prevent the intermingling of ground waters in different aquifers.		
99-BC-006	Complied with Order.	4/14/1999
Monitoring hole has been in existence (and in use) for more than one year.		
99-BC-007	Dismissed	6/1/1999
Replacement well drilled within 100 feet of leach field lacks sufficient grout (no variance).		
99-BC-008	Dismissed	8/3/1999
Drilled replacement without a permit, improperly grouted to separate aquifers (poured grout more than 30 feet and into a wet annulus).		
99-BC-011	Order Vacated	10/5/1999
Well improperly constructed by unlicensed contractor.		
99-BC-013	Complied with Order	8/3/1999
Steel casing not installed at surface.		
99-BC-017	Warning Letter	10/5/1999
Failed to comply with permit conditions, Improperly poured grout to depth greater than 30 feet and into a wet annulus, installed a filter pack that extends to the surface.		
99-BC-019	Warning Letter	10/5/1999
Unlicensed contractor installed pitless adapter and wiring.		
99-BC-020	Warning Letter	10/5/1999
Left well uncapped and has not filed or provided the well owner with a Well Construction and Test Report.		
99-BC-023	Complied with Order.	10/5/1999
Failed to grout uppermost part of well and has not plugged old well.		

99-BC-026 **Complied with Order.** **12/14/1999**
Well was constructed without a permit and may have been constructed by an unlicensed contractor.

99-BC-027 **Warning Letter** **10/25/1999**
Contractor failed to file a construction report for the well.

99-BC-031 **Complied with Order** **12/14/1999**
Had a second well drilled under his permit and did not abandon the first well.

**Tabulation of Results of Board Actions for Complaints
Initiated During 1996 through 1999**

	1996	1997	1998	1999	Total
<u>Fine/Attorney Fee/ Injunction</u>	<u>5</u>	<u>3</u>	<u>1</u>	<u>0</u>	<u>9</u>
<u>Complaint Withdrawn or Dismissed</u>	<u>6</u>	<u>16</u>	<u>12</u>	<u>3</u>	<u>37</u>
<u>Complied with Order</u>	<u>0</u>	<u>1</u>	<u>15</u>	<u>6</u>	<u>22</u>
<u>Discontinued (Out of State or Cannot Find)</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>3</u>
<u>Letter of Admonition (Most with Paper)</u>	<u>8</u>	<u>36</u>	<u>20</u>	<u>0</u>	<u>64</u>
<u>Letter of Reprimand</u>	<u>0</u>	<u>4</u>	<u>3</u>	<u>0</u>	<u>7</u>
<u>License Withheld</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
<u>License Suspended</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>2</u>
<u>License Suspended With Probation</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>10</u>
<u>Warning Letter</u>	<u>1</u>	<u>18</u>	<u>10</u>	<u>4</u>	<u>33</u>
<u>Total</u>	<u>28</u>	<u>82</u>	<u>65</u>	<u>13</u>	<u>188</u>

Well Observation Program - Statistics

Well observations performed by Division personnel during 1999. The program was implemented in March 1999. Observations are shown by Division and month. All reports for observations conducted during November and December may not have been received by the Staff at the time of this report.

	Division 1	2	3	4	5	6	7	Total
Mar	0	0	3	0	0	0	0	3
Apr	1	0	7	0	0	0	0	8
May	2	0	4	0	0	3	0	9
June	0	2	1	2	1	2	2	10
July	0	0	1	0	2	0	0	3
Aug	4	0	0	1	0	5	0	10
Sept	0	2	2	1	7	0	3	15
Oct	9	0	0	1	0	3	3	16
Nov	0	1	0	0	0	2	0	3
Dec	0	0	0	0	0	1	0	1
	16	5	18	5	10	16	8	78

Well observations have resulted in the identification of 2 unlicensed contractors and have advised the Staff of at least 2 dry holes that need to be plugged. Staff is continuing to review the information to determine if all wells observed were constructed pursuant to a valid well permit and that all Well Construction and Test Reports have been submitted.