DESIGN AND PILOT STUDY OF AN ARIZONA WATER INFORMATION SYSTEM

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A water information system may have highly different demands placed upon it depending upon the interest of the individual querying the system. Typical queries may be rainfall-runoff data for a research hydrologist, water level data for a perspective homeowner about to drill a well for domestic use, water quality data for a state agency or information from a water activity file pertaining to present and past work in water resources in a specific scientific or geographic area of interest.

Demands such as those listed above create a broad spectrum of response to be provided by an information system. Information in this discussion represents a broader term than data, and information is usually gleaned from analysis or some type of display of data; i.e., a hydrograph graphically displayed as streamflow rate versus time is information, whereas data is the specific streamflow rate recorded or measured at a specific time.

Prior to collection of data and recording on magnetic tape, the literature was searched for experiences others have encountered. A visit was also made to the State of Texas for a first hand review of their data system (Weiss, 1971). Several systems (Botz, 1970;

Cooper, 1967; Crouse and Maxey, 1967; Lang, J.M. & Leonard, 1967; Robinson, 1967, & Turner, 1967) are in some state of operation, but everyone developing such a system seems to have an approach peculiar to his needs.

The first step necessary in the design of an Arizona Water Information System (AWIS) was personal contact with those who would be data suppliers and/or information users of such a system. Emphasis was placed on benefits in time saved by researchers, planners, consultants and others seeking data to apply to an area of interest or convenience of an automated system to handle water data or information dissemination to the public by State agencies, and the convenience associated with the computer's capability to condense data via programmed computation and presentation of information in a desired format.

Several State of Arizona agencies were contacted to determine which would be interested in such a system. Currently, six Arizona State agencies* have specific statutory responsibilities or administrative needs for inventorying, conserving, developing, managing, operating, protecting, or monitoring the water resources and related facilities of the State. A potential use for the AWIS by state agencies lies with in-house manipulation of data. Each agency possesses different information needs to fulfill its objectives, but much of this information is based upon common data. For example,

* Arizona Highway Department, Arizona Game and Fish Department, Arizona Water Commission, Arizona State Health Department, Arizona State Land Department, and the Arizona Department of Economic Planning and Development.

the Arizona Highway Department conducts hydrologic studies pertaining to highway design; the State Health Department collects and analyzes water samples for chemical and bacteriological constituents; the State Land Department collects and files information dealing with ownership and legal description of groundwater wells; and the Water Commission generates additional data on groundwater. A means of disseminating this type of information in-house and between agencies could reduce redundant data collection efforts.

A survey of needs at the University of Arizona has resulted in an expressed interest for a water activity file and various data needs for research. A water activity file is descriptive information pertinent to each water resource activity.

The varied interests of Arizona water information users calls for a flexible operating system. A pilot program was developed with the premise that a knowledgeable base of information concerning ongoing and past water resource activities must be initially developed. Once this water activity file has been initiated, then data generation cumulating from the water activities may be sought. The location of data may not always result in its inclusion into AWIS, however, as many sources are capable of disseminating data themselves. In this case AWIS could provide users the location of data. In some instances the water activity will not generate data at all, however, the water resource information available on file will be valuable for reference.

The water activity file consists of title of project (this may

be a data collection program or a research project), person in charge of project, address of person in charge, period of operation, key words to describe activity, brief summary of the work, professional papers or articles resulting from activity, data availability (where data, if any, may be obtained), and province, county, river, basin, township, range and section where activity was conducted. Thus far many of the projects in the activity file lack information pertaining to data availability; however investigators are to be contacted to determine if data exists and how a potential user can best access it. If data resides with the AWIS for the project described, it may then be accessed. Water resource information and/or data, if it exists, may be retrieved by key words, or a broad range of geographic locations from Arizona's three provinces down to a quarter, quarter section or latitude-longitude designation.

Figure 1 is a Water Resources Questionnaire developed to collect the activity information for entry into the AWIS. The information collected to enter into the questionnaire was secured in several ways. These include: (1) personal contacts; (2) coordination with the Water Resources Research Center; (3) review of files of the coordinator of Research, University of Arizona; (4) utilization of the Current Research Information System (CRIS); (5) information provided by the Office of Water Data Coordination (OWDC), Washington D.C.; and (6) annual reports.

Although the pilot system is not truly statewide at this time, the continuing efforts include formal ties with Northern Arizona

ARIZONA WATER INFORMATION SYSTEM

WATER RESOURCES QUESTIONNAIRE

1. Project Code:		2. Title of Project:		
3. Principal Investigator or Personnel in charge:		4. Name and Address Where Activity conducted:		
5. Professional School	6. Period of Operation	7. Level of Funding		
8. Supporting Agency	9. Key Words:			
10. Brief Description of Project (include what data is being collected form, ie. charts, tables, punched card, tape; frequency of collection; will this data be available for introduction into a centralized water information system):				
11. Professional Papers of Articles Resulting from Project (Copies of Reprints would be helpful):				
12. Data Availability:	13. Province:	14. County:		
15. Basin:	16. Township:	17. Range:	18. Section:	19. Longitude-Latitude:

Figure 1, Water Resources Questionnaire

University and Arizona State University, as well as the Statewide Arizona Resource Information System (ARIS). Additional types of information, including legal decisions, will eventually be incorporated. Close ties with the U.S. Geological Survey, Office of Water Data Coordination, and the Department of Economic Planning and Development are essential to avoid duplication of federally or state derived data; however, work must still be done to maximize use of the federal STORET system.

The pilot study has involved a substantial amount of public relations and sales work. It is not uncommon that a potential user can be turned into an actual user by simply demonstrating the product As more data is stored, such capability demonstrations will most assuredly create new users. The reporting system has not been finalized, but progress is encouraging. Currently, a systems software package written for the University of Arizona CDC 6400 is in use and all information is stored on magnetic tapes for subsequent retrieval.

Once operational the long range structure of AWIS may appear as shown in Figure 2. The movement of data between agencies, universities, and planners working in the field of Arizona's water resources actually represents an exchange of data and information inasmuch as these groups may maintain active files that could benefit from previous work and data collection activities of others. The linkages as shown in Figure 2 are avenues for the movement of data requests and for the exchange of data between the various components. The major functions of AWIS will be: (1) to serve as a central con-

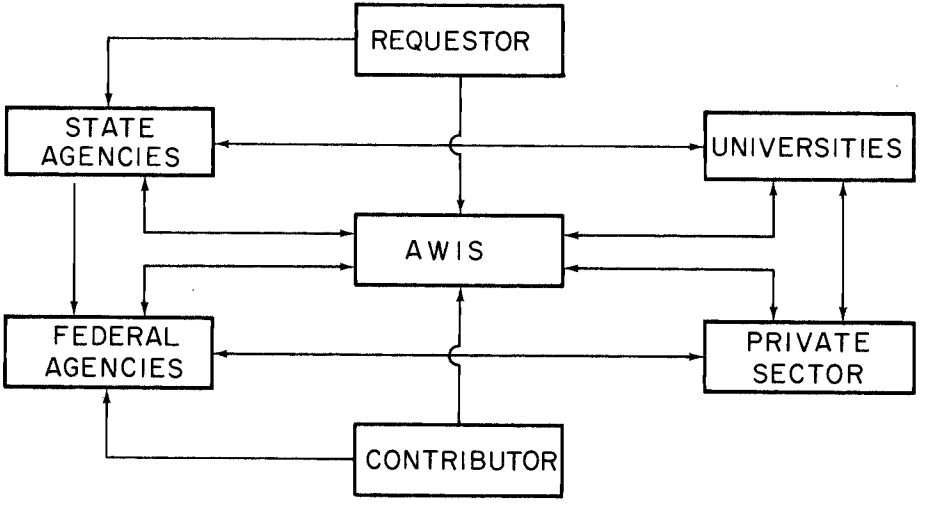

Figure 2. Linkage of Units Within the AWIS

tact point to which users of water resource information may direct requests; (2) to maintain a central bank of data and information for those wishing to delegate dissemination of their data to AWIS; (3) to refer requests to the proper agency disseminating their own data; and (4) to assemble knowledge as to the location of water data in the State. The above functions could have several advantages: (1) decrease data collection efforts of some agencies; (2) allow researchers to know of activities in the State, thus reducing duplication of effort, and (3) location of areas where additional emphasis should be placed on research.

Work will be conducted during FY 72/73 with the State of Arizona to determine how AWIS can best participate in the State source Information System (ARIS). AWIS may eventually become an operational subsystem of ARIS; but for the present time, the Office of Arid Lands Studies, representing AWIS, will serve as active member of the ARIS advisory work group.

Currently, the data base is small, limited to water quality data supplied AWIS by the State Department of Health for approximate 450 wells in the Tucson Basin, and to water level, storage, storage coefficient, and transmissibility data supplied by the Arizona Water Commission for the Tucson Basin and Avra Valley.

This year's study has brought to light two important considerations in the design of an information system. These are standardization techniques for:
(1) data-station identification and (2) data quality.

The techniques used by many of the collector agencies for identifying data stations vary. For data-station identification a definition is necessary for three descriptive terms: identifier, locator, and descriptor. An "identifier" is a code that is unique to a particular station and once assigned is never changed. A "locator" is a code or item of information that helps pinpoint the location of the station in the field. The AWIS is currently using two locators: the USGS range Township Section code and latitude-longitude correct to the nearest minute. A "descriptor" is a code or item of information that describes the station, its installation, or record.

Data quality is a subject of great importance to the overall value of a data-handling system. Users should be aware of any potential problems that might arise as a result of the quality of the data. The quality of a measurement is affected by not only the method used but also by the field conditions at the time of measurement. Hence, two codes should accompany the measurement--one to indicate methodology and the second to provide information on the field conditions that may have affected the application of the method or technique, and hence the quality of the parameter measurement. The two codes at this time have not been formulated; however, a method for successfully delineating and reporting data quality will receive greater attention this coming fiscal year.

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