

# V - DATA COLLECTION AND COMMUNICATION NETWORK

## 5-01. Hydrometeorological Stations.

a. **Facilities.** Precipitation, stream flow, reservoir water level, air temperature, evaporation, and wind data are collected and monitored by SPL and USGS equipment located throughout the Bill Williams watershed. Plate 5-01 shows the location of these data collection sites. All of the SPL sites are equipped with satellite telemetry data collection platforms (DCP). Except for evaporation and wind data which is manually recorded by the dam tender, all of the collected information is transmitted to the SPL Water Control Data Processing System (WCDS) by the DCPs every 4-hours. The WCDS processes and stores the data and makes the information immediately available to SPL staff and also to the general public via the SPL web page. The DCPs transmissions are also directly received and processed by other agencies such as the US Geological Survey and the National Weather Service's Colorado Basin River Forecast Center. Tables 5-01 and 5-02 list the active hydrometeorological stations in the Bill Williams watershed.

Also, the USGS has established two gages upstream and two downstream of Alamo Dam as shown on Plate 5-01. Water quality monitoring is also performed at these gaging stations by contract with the USGS. Currently, water quality samples are taken from the lake and the downstream channel during non-inflow events. The river upstream is dry most of the time for this project. The water quality program contract allows for sampling additional areas, including the river upstream, when necessary. Details on water quality monitoring are provided in section 5-02. Details for the USGS gages are provided on Table 5-02.

**Table 5-01  
Active Precipitation, Stream Flow, Reservoir, and  
Evaporation Stations in Bill Williams Basin**

Gage Name	Responsible Agency	COE ID	GOES ID	NCDC ID	USGS ID	County	Latitude	Longitude	Elev.	Parameters
Alamo Dam	SPL	ALMO	CE475D94	100		La Paz	34:14:00	113:35:00	1290	R, P, T, W, E
Bagdad	SPL	BAGD	CE474EE2			Yavapai	34:35:32	113:10:41		P, T
Bagdad	NCDC			586		Yavapai	34:34:00	113:10:00	3705	C
Big Sandy River near Wikieup	USGS	SAND	162AC7EA		9424450	Mohave	34:27:45	113:37:25	1400	S, P, T
Bill Williams River blw Alamo Dam	USGS/SPL	BWRA	CE227058		9426000	La Paz	34:13:51	113:36:29	967	S
Bill Williams River near Parker	USGS	BWRP	CE22A630		9426620	La Paz	34:15:45	114:01:37		S
Burro Creek near Bagdad	SPL	BURO	CE1367A4			Mohave	34:32:30	113:26:40	1880	P, T
Campwood	SPL	CAMP	CE2280DC			Yavapai	34:48:20	112:52:40	5710	P, T
Diamond M Ranch	NCDC			2527		Mohave	35:17:00	113:22:00	5480	C
Goodwin	BLM	GOOD	324C62BC			Yavapai	34:35:00	113:18:00		P
Lookout Wash near Fort Rock	SPL	LOKU	CE477B78			Mohave	35:11:51	113:21:47		P, T
Parker	NCDC			6250		La Paz	34:11:00	114:13:00	375	C
Santa Maria River near Bagdad	USGS	SMRB	CE134148		9424900	Mohave	34:18:21	113:20:47	1360	S, P, T
Skull Valley	SPL	SKLL	CE473872			Yavapai	34:35:37	112:37:46		P, T
Wikieup	SPL	WIKI	CE474030			Mohave	34:57:46	113:41:53		P, T
Wikieup	NCDC			9309		Mohave	34:42:00	113:36:00	2010	C
<u>Agency Notes</u>						<u>Parameter Notes:</u>				
SPL = Los Angeles District, Corps of Engineers						C = NCDC Weather Station				
NCDC = National Climatic Data Center						R = Reservoir Water Level				
USGS = US Geological Survey						P = Precipitation				
BLM = Bureau of Land Management						S = Stream Flow				
						T = Air Temperature				
						W = Wind				
						E = Evaporation				

**Table 5-02. Bill Williams Basin Precipitation, Streamflow and Evaporation Stations**

Station (abbr.)	Type	Latitude	Longitude	Elevation
		(Degrees-Minutes-Seconds)		
USGS4432 (4432)	Flow	34-45-42	113-15-34	3260
USGS4447 (4447)	Flow	34-32-30	113-26-40	1880
USGS4450 (4450)	Flow	34-27-45	113-37-25	1400
USGS6000 (6000)	Flow	34-13-51	113-36-29	967
Corps (CEVP)	Evap	34-14-00	113-35-00	1360
Alamo 1 (A1)	Prp.	34-16-00	112-24-00	1100
Alamo6ESE (A6)	Prp.	34-15-00	113-28-00	1480
Bagdad (BGD)	Prp.	34-35-00	113-10-00	3820
BagdadR (BGDR)	Prp.	34-35-00	113-11-00	3750
Hillside (HS)	Prp.	34-29-00	112-53-00	3320
Lookout Ranch (LR)	Prp.	35-12-00	113-27-00	5000
Perner Ranch (PR)	Prp.	35-22-00	113-17-00	5600
Round Valley (RV)	Prp.	35-06-00	113-40-00	3740
Signal (SG)	Prp.	34-28-00	113-38-00	1652
Signal13SW	Prp.	34-22-00	113-48-00	2500
Skull Valley (SV)	Prp.	34-30-00	112-41-00	4254
Trout Creek (TC)	Prp.	34-53-00	113-39-00	2850
Tonto Springs (TS)	Prp.	34-37-00	112-45-00	4800
Wikieup (WK)	Prp.	34-43-00	113-37-00	2009
Yava6ESE (Y6)	Prp.	34-27-00	112-48-00	3780

**b. Reporting.** The reporting of data to the District office is accomplished by the following means:

(1) **Manual.** The dam tender observes precipitation, reservoir water surface, downstream flow, gate settings, pan evaporation (see photo 5-01), air temperature, and wind measurements. The dam tender also notes general conditions around the dam. During flood events, the dam tender usually reports by telephone on a schedule established by the ROC. During non-flood periods, reports are given by telephone (or radio) to the ROC once per day on weekdays (weekends and holidays are exempt). Further reporting details for the dam tender are discussed in section 5-03 and 5-05.

(2) **The Geostationary Operational Environmental Satellite (GOES) Telemetry System.** SPL, USGS, and the BLM operate a network of GOES DCPs which provide SPL with real-time information about precipitation, stream flow, reservoir water level, and air temperature affecting regulation of Alamo Dam. The GOES satellite telemetry system is managed, operated, and maintained by the National Environmental Satellite, Data, and Information Service (NESDIS). The GOES primary mission is to continuously observe changing weather phenomena from satellite based sensors situated approximately 23,000 miles from Earth. As a collateral duty, the GOES system supports a radio relay or Data Collection System (DCS). The DCS enables a large variety of environmental data to be relayed from hydrologic ground stations, through GOES and back to a receiving station (DCS Automated Processing System) operated by NESDIS in Wallops, Virginia. Other users equipped with a GOES Direct Readout Ground Station (DRGS) can also receive these data transmissions. NESDIS then disseminates the data to SPL and other GOES system users by relaying the data through a commercial domestic satellite (DOMSAT) to a DOMSAT receiving station. SPL maintains a DOMSAT receiving station at the District office. GOES data collected at each station is transmitted to one of two GOES satellites, then to a ground station. Collected data include precipitation, air temperature, reservoir level, and river stage. SPL GOES DCPs collect data in regular time intervals ranging from fifteen minutes to one hour depending on the

parameter and site conditions. Eight hours of data is then transmitted every four hours. The eight-hour block of reported data includes the latest four hours of data plus the previous four-hour data block. The GOES data is collected and processed by a DOMSAT receive station located at the SPL office. After processing the data, the DOMSAT system stores the data in a HECDSS database system on the Water Control Data System (WCDS) computer. GOES data can be viewed using the WCDS menu system or from the Reservoir Regulation Section web site.

**(3) Automated Local Evaluation in Real-Time (ALERT) System.**

Yavapai County has jurisdiction over the operation of two ALERT rain gages within the Alamo Dam drainage that provides current or “real time” information about hydrologic conditions in the basin. The ALERT system is a network of rain, stream, and weather gages which provide current or “real time” information regarding hydrologic conditions in Arizona. Data is transmitted via VHF radio from these gages to an ALERT base computer whereupon the information is quickly compiled, stored, and made available for display and analysis. Additionally, the collected data can be relayed by VHF radio to the National Weather Service office for entry into their database. The Corps of Engineers, Los Angeles District, does not receive ALERT data for this project.

**(4) Weather Data.** Weather information is provided in forecasted and real-time formats. A contract meteorologist provides forecasted precipitation distributions called Quantitative Precipitation Forecasts (QPF) to the ROC so that proper preparations can be made to operate the reservoir in the upcoming flood event. Updates to the QPF are provided on an as needed basis.

The National Weather Service (NWS) provides an array of weather data, including short and long-range forecasts, precipitation totals, watches and warnings, and severe weather statements. Additionally, the NWS, through its Colorado River Forecast Center (CRFC) in Salt Lake City, Utah, provides flow forecasts encompassing the entire Lower Colorado River system including inflow to Alamo Lake.

Data Transmission Network (DTN) is a real-time, global, weather data system which provides the ROC with satellite loops, radar renderings, temperature dispersions, and forecast synopses for areas within SPL.

**c. Maintenance.** Each operating agency is responsible for the maintenance of its own gages. Gages under the Corps' responsibility are scheduled for normal bi-annual maintenance by the hydrographic technicians. Other visits to the stations (e.g., unscheduled repairs) are performed as required.

**d. Cooperative Stream Gage Program.** The Corps participates in a national program with the USGS Water Resources Division (WRD) known as the Cooperative Stream Gage Program. Funding for the upkeep of each station in the program is shared by federal, state, and local agencies. The USGS has established two stream gages upstream and two downstream of Alamo Dam as listed on Table 5-02, and shown on Plate 5-01. The Corps incurs all the cost of maintaining the two upstream gages and also the gage just downstream of the dam. The Bureau of Reclamation, the USFWS, and the Corps provide matching funds for the cost of maintenance at the station near Parker. Telemetry from these sites is transmitted by GOES satellite (as discussed earlier) thus providing current information to the District regarding areas under a possible flood threat.

#### **5-02. Water Quality Monitoring.**

**a. Facilities.** The office of U.S. Fish and Wildlife Service (USFWS), Region 2, Arizona FRO, Parker, Arizona has been contracted by the Corps to administer a program consisting of periodic sampling and analysis of ambient water quality at Alamo Dam. The sampling includes specimens from the reservoir and at the USGS gage just downstream of the dam. Four locations within the reservoir and at the downstream gage are sampled on a monthly basis: (1) closest to the dam; (2) mid-lake; (3) upper lake; and (4) at downstream USGS gaging station. The sampling schedule is presented in table 5-02 herein.

**Table 5-03  
Alamo Lake Water Quality Monitoring Schedule<sup>1</sup>**

Month	Parameters Sampled
October	lim chem chl phe bact
November	lim chem
December	lim
January	lim chem bact
February	lim
March	lim
April	lim chem bact
May	lim chem bact
June	lim chem chl phe bact
July	lim chem chl phe bact
August	lim chem chl phe bact
September	lim chem chl phe bact
Sampling Locations: (1) near dam; (2) mid-lake; (3) upper lake; and (4) d/s USGS gaging station.	
Legend: lim = limnology                      phe = pheophytin <u>a</u> chem = chemistry                    bact = bacteriology chl = chlorophyll <u>a</u>	
<sup>1</sup> Sampling schedule subject to change on an annual basis. Note: Sampling depths vary from surface, to 6 ft (4.9 m), or a maximum depth of 15 ft (4.6 m).	

**b. Reporting.** Tasks assigned to the USFWS are limited to sample collection and laboratory analysis only. The The U.S. Army Corps of Engineers, Los Angeles District (SPL) has the task of interpreting the data and preparing any associated written reports. The Corps prepares the “Annual Report on Water Quality Management” for each water year, in accordance with Engineering Regulation (ER) 1110-2-8154, “Water Quality and Environmental Management for Civil Works Projects”, which establishes reporting requirements and objectives for water quality programs at existing Corps of Engineers Civil Works Projects. Eventually, Access to the STORET for storage and retrieval of data will be available through the Internet. SPL plans on using the Environmental Protection Agency’s STORET water quality data base system on an as needed basis.

The following water quality information reported by the USFWS to the Corps are included within this report: (1) limnology; (2) general chemistry; (3) chlorophyll-

pheophytin chemistry; (4) additional chemistry; and (5) bacteriology. Required limnology parameters are lake elevation, temperatures, pH, dissolved oxygen, specific conductance, oxidation-reduction potential, and secchi disk readings. General chemistry parameters sampled are phosphorous, total suspended solids, orthophosphate, total dissolved solids, kjeldahl nitrogen, total residue, ammonia, alkalinity, sulfide and turbidity. Chlorophyll-pheophytin chemistry parameters include chlorophyll a, pheophytin a, and the chlorophyll a to pheophytin a ratio. Additional chemistry requirements are iron, manganese, sulfate, calcium, and total organic carbon. Bacteriological data includes total coliform, fecal coliform (fc), fecal streptococci (fs), and fc/fs ratio.

**c. Maintenance.** The U.S. Army Corps of Engineers, Los Angeles District, has no maintenance responsibilities with respect to water quality stations.

### **5-03. Sediment Stations.**

**a. Facilities.** In order to check the sedimentation periodically, six sedimentation stations in the reservoir and four along the downstream channel were established during the construction of the project. These stations are shown on plates 4-02 and 4-03, respectively, of the water control manual. They are respectively referred to as "'A' Index Ranges" and "'C' Index Ranges."

**b. Reporting.** At present, sedimentation data are not available at the Los Angeles District office. The USGS collects, compiles, and publishes sediment data on an annual basis in Water Resources Data for California.

**c. Maintenance.** The U.S. Army Corps of Engineers, Los Angeles District maintains the sediment stations by performing reconnaissance surveys after each major storm event to determine if an appreciable amount of sediment has accumulated in the reservoir and if a comprehensive survey is necessary. The advent of aerial mapping has



precluded the need to use the sediment stations as part of a comprehensive reservoir survey; however, the sediment stations are still useful for the reconnaissance surveys.

#### **5-04. Recording Hydrologic Data.**

Each agency maintains records of its own data. During storm events, reservoir reports from the SPL dam tender are received by telephone on a schedule established by the ROC. During the remainder of the year, the dam tender at Alamo Lake normally reports by telephone to the Reservoir Regulation Section by 0900 hours Pacific Standard Time (PST) each workday (excluding weekends and holidays) or as requested. The reservoir data reported to the ROC are recorded and immediately entered into an HECDSS database using the Los Angeles District's reservoir computation program (Rescal).

Data from GOES DCPs are collected every 4-hours and stored in an HECDSS database housed on the District Water Control Data System. The data can be viewed either on the Reservoir Regulation Section web site or through the WCDS menu system. The period of record collected and verified, to date, spans from 1927 to 1999.

Daily flows at the following selected gaging stations pertinent to the operation of Alamo Lake are published annually in the "United States Geological Survey Water Supply Papers" and on the Hydrodata CD-ROM from Hydrosphere, Inc.:

- (1) Big Sandy River near Wikieup, AZ
- (2) Santa Maria River near Bagdad, AZ
- (3) Bill Williams River blw Alamo Dam, AZ
- (4) Bill Williams River near Parker, AZ

Daily rainfall records for Alamo Dam and for other precipitation stations in the Bill Williams River basin are published in the U.S. Weather Service's monthly publication entitled "Climatological Data" and annually on CD-ROM (Hydrodata). This

rainfall data is archived at the NOAA, National Climatic Data Center in Asheville, North Carolina.

#### **5-05. Communication Network.**

The communication facilities at Alamo Lake are described as follow:

**a. Commercial Telephones** - are installed in the dam tender's residence and in the project office. Telephones are the principal communication device between the ROC and Alamo Dam.

**b. FM Radio Transceiver** - is installed in the project office to communicate with the Los Angeles District Office, the Los Angeles District Base Yard, and the Arizona office. Radio transmissions are conducted with the ROC through the Backbone Microwave Repeater System. Radio signals transmitted from either station are directed by line-of-sight mode to the repeater station on Smith Peak, Arizona, which then relays the signal on through a system of microwave repeater stations to the receiving destination. In the ROC, two radio consoles are capable of communicating with the dam: (1) Centracom Series I, located in back of the ROC; and (2) Zetron, located at the radio operator's station. Radio transmissions are received at the project site via an antenna located atop the control house (photo 5-02).

#### **5-06. Communication with Project.**

**a. Between ROC and Alamo Dam.** During the year when no storm events are occurring, a routine phone call is made at least once each weekday from Alamo to the ROC. This reservoir operation report is usually made prior to 0900 hours PST. During flood events, the reporting interval is more frequent as determined by the ROC. Reporting of the reservoir data is initiated by either the ROC or the dam operator depending on the mode selected by the ROC. Other routine or non-routine radio or telephone calls are made as necessary.

In the event that all communications with the District Office, including the Baseyard, should be interrupted, a set of “Standing Instructions to the Project Operator for Water Control” have been compiled and is presented as Exhibit A of this water control manual.

**b. Between Alamo Dam and Others.** No routine or non-routine communication between staff at Alamo Dam and other agencies is required. All notifications to other agencies affected by the regulation/operation of Alamo Dam are made by the LA District personnel.

**c. Between ROC and Others.** Flood operations at Alamo Lake are implemented with careful consideration given to the operation of dams on the Colorado River and the condition of the channel downstream of Alamo Lake. Flood releases are carefully determined after discussions with the U.S. Bureau of Reclamation (USBR) about reservoir operations on the Colorado River main stem. As previously mentioned, the NWS’s CRFC in Salt Lake City, Utah provides a rainfall and inflow forecast for Alamo Lake and the lower Colorado River basin from which Alamo Dam release considerations can be developed. During various reservoir release conditions, other federal, state, and local entities are notified as to proposed operational procedures. For riparian/wildlife releases, notifications are given to the Arizona State Parks, USGS, Bill Williams Refuge, Arizona Game and Fish Department, and Bureau of Land Management, in order to monitor each agency’s habitat concerns.

When flood control releases greater than 500 cfs or designated target reservoir elevations are expected, notifications are given to the Arizona Department of Water Resources, city of Scottsdale, Bureau of Reclamation, Mohave County, Arizona Public Service, Colorado River Board of California, International Boundary and Water Commission, La Paz County, Central Arizona Project, other personnel at the Corps of Engineers, U.S. Fish and Wildlife Service, Arizona Department of Environmental Quality, Bureau of Land Management, and Arizona Game and Fish. In the event of spillway flow, notification is given to National Weather Service, other personnel at the

Corps of Engineers, La Paz County, and Yuma County. The actual notification roster and conditions thereof are presented in the ROC's "Instructions for Reservoir Operations Center Personnel (the 'Orange Book')". This roster is updated once a year, and as needed, to maintain the most recent points of contacts.

**5-07. Project Reporting Instructions.**

The dam tender at Alamo Lake is required to perform the following:

- a. Be present at the dam when rainfall or runoff is occurring or furnish the ROC at the District Office a telephone number through which he or she can be reached.
- b. See that all equipment at the reservoir such as recorders, indicating gages, gate mechanisms, power units, radios, etc., is in operating condition.
- c. Operate gates in accordance with instructions from the ROC, then report back via telephone/radio to confirm.
- d. Keep ROC notified of any unusual developments such as trash accumulation, power failure, mechanical difficulties, etc.
- e. Follow the current fixed-gate operation schedule posted in the control house when a loss of communication with the ROC occurs.
- f. Assist engineers dispatched by the ROC during flood emergency.
- g. Maintain routine records such as water surface elevations, outflow gage heights, precipitation amounts, gate openings, and a daily log on prescribed forms.
- h. Notify local authorities and interested agencies of anticipated releases from the reservoir when instructed to do so by the ROC or if communications are interrupted.

i. Obtain hydrologic and hydraulic data from other agencies upon request of the ROC.

**5-08. Warnings.**

The responsibility for issuing all weather watches and warnings in addition to all flood and flash flood watches and warnings rests with the National Weather Service (NWS). Local emergency officials of cities and counties are responsible for issuing any public warnings regarding unusual overflows, evacuations, unsafe roads or bridges, toxic spills, etc. The SPL makes notifications to local authorities when critical water surface elevations are reached and critical release rates are initiated. The notifications list is updated on an annual basis and can be found in the SPL's "Instructions For Reservoir Operations Center Personnel" commonly referred to as the "Orange Book". In the event of a dam break or other emergency, the Emergency Action and Notification Subplan is used to determine appropriate actions. Copies are located in the ROC and the SPL's Emergency Operations Center (EOC), and at the dam site.



**Photo 5-01.** Evaporation pan at Alamo Dam and Lake.



**Photo 5-02.** Alamo Dam control house.