FINAL REPORT

THE INTERNATIONAL RESERVOIRS OPERATIONS AND DROUGHT CONTINGENCY PLANNING STUDY FOR THE MIDDLE AND LOWER RIO GRANDE

Phase I
Development, Testing and Application Of ROM/CPM Modeling System

Phase II
Extension of ROM/CPM Modeling System to Include Individual Municipal and Irrigation Water Rights Accounts

submitted to

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LOWER RIO GRANDE WATER COMMITTEE, INC.

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SECTION 1 INTRODUCTION

1.1 OVERVIEW

This study has been undertaken by R. J. Brandes Company (RJBCO) of Austin, Texas, in association with Michael Sullivan & Associates (MSA), for the purpose of developing a computerized reservoir operations model (ROM) for Amistad and Falcon Reservoirs on the Rio Grande in Texas. Basically, this ROM has the capability to simulate the time-varying (monthly) behavior of these reservoirs with regard to the amount of water stored and owned by the United States and by Mexico in each of the reservoirs, subject to specified hydrologic and climatic inputs, prioritized water demands for each country, and current international operating procedures and State of Texas water accounting and allocation rules. The ROM also includes routines to simulate monthly water accounting, including provisions for positive and negative water allocations, for up to three individual Texas water rights holders having specified amounts of authorized municipal water rights and Class A and Class B irrigation water rights. With MSA's assistance, a companion conditional probability model (CPM) also has been developed that processes the outputs from the ROM to provide information regarding the risks associated with meeting certain total United States water demands, given certain known beginning-of-the-year reservoir storage conditions, reservoir operating policies, and drought demand management procedures.

RJBCO has performed this work pursuant to an agreement with the Valley Water Policy and Management Council (VWPMC) of the Lower Rio Grande Water Committee, Inc. that was executed in October, 1995. This agreement was amended in March, 1997, to provide for additional services related to modeling of individual water right accounts. The VWPMC received funding support for this work through a research grant from the Texas Water Development Board (TWDB), with assistance from the Texas Natural Resource Conservation Commission (TNRCC) and the Texas Governor's Office. Throughout the course of this study, technical guidance and assistance and substantial data and information have been provided to RJBCO by the VWPMC, the TWDB, the TNRCC, the Rio Grande Watermaster, and the International Boundary and Water Commission (IBWC).

1.2 BACKGROUND

Historical demands for water in the Rio Grande basin by users in both the United States and Mexico have resulted in a variety of measures aimed at improving the management of the overall water resources of the system. Treaties and various orders have been signed by the two countries that allocate the waters of the basin between the two countries and set forth certain operating and accounting procedures regarding reservoir storage, river diversions, flood control and other water matters. The IBWC, an international Rio Grande regulatory agency with sections representing both the United States and Mexico, administers the treaties, implements the orders, and generally manages the operation of the river system. Amistad and Falcon Reservoirs have been constructed on the mainstem of the river through the joint efforts of the United States and Mexico, and these major impoundments have greatly enhanced the ability of the system to deliver an increased supply of water to users in both countries on a more dependable basis. In Texas, specific water rights regulations and water accounting and allocation rules have been implemented by the TNRCC and its predecessor agencies to provide for more effective utilization of the United States' share of the existing water supply from the river. The TNRCC's Rio Grande Watermaster is responsible for the day-to-day operation of the water delivery system in the Middle and Lower Rio Grande basins in Texas, including water accounting.

It is common knowledge that the Middle and Lower Rio Grande basins are over-appropriated with regard to existing water rights in Texas. The estimated firm annual yield of the United States share of Amistad and Falcon Reservoirs is not sufficient to fully supply the authorized diversions of existing water rights, should a severe drought occur such as that experienced throughout much of Texas during the 1950's. Certainly, the critical state of the currently available water supply in the Rio Grande reservoirs, for both the United States and Mexico, and the continuing extremely dry conditions in much of the watershed have caused municipal and irrigation water users in the Middle and Lower Rio Grande basins of Texas to be especially concerned with regard to water availability in the immediate future.

The fundamental question facing both water regulators and water users is what should be done now to assure an adequate future supply of water throughout the Middle and Lower Rio Grande system such that essential needs can be satisfied in the future. One of the things needed to effectively answer this question is a knowledge of the risks involved in doing nothing versus those associated with implementing certain reservoir operation and drought management measures that could, in effect, prolong the available water supply from the existing reservoirs. Specifically, information is needed that describes the likelihood that certain levels of demand can be satisfied in the future given that a known amount of water is currently in storage in Amistad and Falcon Reservoirs and that certain critical climatic and hydrologic conditions could occur. More importantly, the specific water resources development and conservation measures that may be needed to avoid a failure of the system, at some required level of probability, with regard to its ability to supply a certain amount of water in the future, need to be identified and evaluated and, if appropriate, implemented as soon as possible.

Reservoir operations modeling and conditional probability analyses of reservoir behavior and operations represent an important starting point for developing such information. These techniques and procedures have been applied to other reservoir systems in Texas, with results offering significant insight with regard to the most effective means for managing and operating the reservoirs prior to and during drought periods. The study described herein has been undertaken for the purpose of developing the basic analytical tools required to perform reservoir operations modeling and conditional probability analyses of Amistad and Falcon Reservoirs on the Rio Grande. The outputs and results from utilizing these tools have direct application in water supply planning throughout the Middle and Lower Rio Grande basins. Such applications will be made through future planning efforts.

1.3 SCOPE OF WORK

The work described herein represents the initial phases of a more comprehensive effort to investigate the operation of Amistad and Falcon Reservoirs and the water delivery system in the Middle and Lower Rio Grande basins of Texas within the overall context of regional water resources planning. Certainly, the potential development of revised reservoir operating rules and effective drought management measures will require extensive time and effort. However, the reservoir modeling undertaken in this study provides a solid framework for proceeding with the more comprehensive investigations. Much of the time and effort expended in this study has been spent just compiling and synthesizing the required data and information necessary to describe the current operation of the system and its physical characteristics and the historical long-term trends and extremes in hydrologic and climatic conditions throughout the watershed.

The tasks listed in Table 1-1 have been undertaken as the scope of work for Phase I of the overall ROM/CPM project. Basically, this Phase I effort provides for the development, testing and preliminary application of the ROM/CPM modeling system for Amistad and Falcon Reservoirs. Upon completion of the basic Phase I modeling work outlined in Table 1-1, the scope of this overall effort was expanded through Phase II to include extension of the ROM to provide for individual water rights accounting. This involved additional programming to include water accounting for three individual Texas water rights holders, each having specified authorized diversion amounts of municipal water rights and Class A and Class B irrigation water rights. Results from this Phase II work also are described in this report.

TABLE 1-1 PHASE I WORK TASKS

Task I.	Compilation and Analysis of Data and Information
Task II.	Compilation and Analysis of Current Operational Constraints
Task III.	Preliminary Drought Management Reservoir Operation and Demand Reduction Criteria
Task IV.	Development and Testing of a System Operation Model
Task V.	Development and Testing of a Conditional Probability Model
Task VI.	Application of ROM and CPM Models
Task VII.	Analysis and Evaluation of Existing and Proposed Operational Constraints
Task VIII.	Model Development and Evaluation Report Preparation
Task IX.	Project Coordination and Management

SECTION 2 GENERAL ROM MODELING APPROACH

2.1 SIMYLD-II RESERVOIR SYSTEM MODEL

As the basis for developing and structuring the reservoir operations model (ROM) for the Amistad-Falcon Reservoir system, the existing SIMYLD-II reservoir system model[1], or computer program, has been used. The original version of this program was formulated and coded by the Texas Water Development Board in the early 1970's as part of that agency's overall mathematical simulation capabilities for analyzing water resources systems. Extensive modifications of the original SIMYLD-II program have been made by RJBCO in this study to adapt the program to the specific features and characteristics of the Amistad-Falcon system that cannot otherwise be described with the normal SIMYLD-II input data.

The basic SIMYLD-II program can be applied to provide a multi-reservoir simulation model capable of describing the movement and storage of water through a system of river reaches, canals, reservoirs and non-storage river junctions over a specified period of time. The SIMYLD-II program, as applied in this study, utilizes a monthly time step to perform time-varying reservoir storage and river flow simulations subject to a specified sequence of water demands, river inflows and reservoir evaporation losses. During the simulation process, the model strives to meet a set of specified demands and target reservoir storage conditions in a given order of priority. If shortages occur during the operation, i. e., not all demands or storage conditions can be satisfied for a particular time period, the shortages are spatially located and assigned at the lowest-priority demand or storage nodes.

The SIMYLD-II program is designed to provide flexibility in selecting operating rules for each reservoir in the system being simulated. The operating rules are formulated as the percentage of each reservoir's capacity (either total or conservation) that is desired to be held in storage at the end of each computational time step (each month). The operating rules provide flexibility by allowing the desired reservoir storage levels and the priorities for allocating water between satisfying demands and maintaining storage in the reservoirs to be varied by month during the year. Furthermore, these priorities can be changed during a simulation according to the hydrologic state of the system being modeled, i. e., dry, normal or wet conditions based on system storage.

The fundamental concept in applying the SIMYLD-II program is that the physical reservoir system must be transformed into a capacitated network flow problem. In making this transformation, the real system's physical elements are represented as a combination of two possible network

[1] Texas Water Development Board; "Economic Optimization & Simulation Techniques for Management of Regional Water Resource Systems, River Basin Simulation Model, SIMYLD-II Program Description"; July, 1972; Austin, Texas.

components -- nodes and links. Given the proper parametric description of these two network components, it becomes a straightforward task to develop the necessary network. Once properly developed, the network system can be analyzed as a direct analog of the real system.

As the nomenclature implies, a node is a connection and/or branching point within the network. Therefore, a node is analogous to a reservoir or a non-storage junction, e. g., a canal junction, major river confluence, etc., in the physical system. Additionally, a node is a network component that is considered to have the capacity to store a finite and bounded amount of the water moving within the network. In the case of SIMYLD-II, reservoirs are represented by nodes which have storage capacity, as well as, the ability to serve as branching points. A non-storage capacitated junction is handled similarly to a capacitated junction (reservoir) except that its storage capacity is always zero. Demands placed on the system must be located at nodal points. Also, any water entering the system, such as might occur naturally from upstream river inflows or artificially by import, must be introduced at nodal points.

The transfer of water among the various network nodes is accomplished by transfer components called links. Typically, a link is a river reach, canal or closed conduit with a specified direction of flow and a fixed maximum and minimum capacity. The specified maximum capacity represents the upper limit on the amount of water that can be conveyed through a link. The minimum capacity establishes a required minimum flow that must be conveyed through a link at all times.

The physical system and its basic time step operation, in this case one month, is formulated as a network flow problem. The set of solutions to this network flow problem provides the sequential operation of the system with the set of monthly operations becoming the operation of the system over the entire length of the desired hydrologic sequence, i. e., the simulation period.

2.2 AMISTAD-FALCON ROM STRUCTURE

2.2.1 ROM Link-Node Network

The initial step in the application of the SIMYLD-II program is the construction of the link-node network describing the physical system. The network used in this study for representing the various components of the Amistad-Falcon Reservoir system as simulated with SIMYLD-II is shown in Figure 2-1. As illustrated by this diagram, the Amistad-Falcon SIMYLD-II model consists basically of two separate water storage and conveyance systems; one for the United States and one for Mexico. In this network, the physical system elements for each of the two countries are represented by the network elements in the following manner:

For the United States:

1. The portions of Amistad and Falcon Reservoirs used to store United States water are represented by triangles identified as Nodes 1 and 2, respectively;
2. The United States total municipal water demand between Amistad and Falcon Reservoirs is specified at a non-storage junction identified as Node 5;
3. The United States total irrigation water demand between Amistad and Falcon Reservoirs is specified at a non-storage junction identified as Node 6;
4. The United States total municipal water demand below Falcon Reservoir, including channel losses, is specified at the United States Falcon Reservoir storage junction identified as Node 2;
5. The United States total irrigation water demand below Falcon Reservoir, including channel losses, is specified at a non-storage junction identified as Node 7; and
6. River reaches between the United States Amistad and Falcon Reservoir storage nodes and the various United States demand nodes are represented by solid lines showing the direction of flow and numbered 1, 2, 3 and 4.

For Mexico:

1. The portions of Amistad and Falcon Reservoirs used to store Mexican water are represented by triangles identified as Nodes 3 and 4, respectively;
2. The Mexican total municipal and irrigation water demand between Amistad and Falcon Reservoirs is specified at a non-storage junction identified as Node 8;
3. The Mexican total municipal and irrigation water demand below Falcon Reservoir, including channel losses, is specified at the Mexican Falcon Reservoir storage junction identified as Node 4; and
4. River reaches between the Mexican Amistad and Falcon Reservoir storage nodes and the various Mexican demand nodes are represented by solid lines showing the direction of flow and numbered 5 and 6.

The inflows to the reservoir system, which are comprised of Rio Grande inflows to Amistad Reservoir and tributary inflows to the river from the watershed between Amistad and Falcon Reservoirs (referred to as side inflows or incremental inflows), for both the United States and Mexico are indicated on the network diagram by inward arrows at Nodes 1, 3, 5 and 8. Flood spills from Amistad Reservoir are allowed in the model at the Amistad Reservoir storage nodes, i.

e., at Node 1 for the United States and Node 3 for Mexico. These flood spills enter each country's respective storage pool in Falcon Reservoir through Link 7 for the United States and Link 8 for Mexico. Spills from the system into the Lower Rio Grande can occur at the Falcon Reservoir storage nodes, i. e., at Node 2 for the United States and Node 4 for Mexico. The dashed lines with double arrows between Nodes 1 and 3 (Amistad Reservoir) and Nodes 2 and 4 (Falcon Reservoir) indicate the capability of the model for transferring one country's excess inflows to the other country's conservation pool when the first country's conservation pool is full. This feature is provided for in the 1944 Treaty between the United States and Mexico.

2.2.2 ROM Storage/Demand Priorities

Each of the storage nodes and the demand nodes in the SIMYLD-II model network also has been assigned a set of priority numbers that establish the relative priorities among nodes for either storing water or meeting specified water demands during the simulation process. The highest priority for storing water and/or meeting a demand is assigned the lowest number, i. e., a value of one. Sequential higher priority numbers then are assigned in accordance with the order in which storage and/or demands at specific nodes are to be shorted, or left unsatisfied, in the event there is not sufficient water in the system to satisfy all desired storage and demand requirements. The specific priorities assigned to the individual nodes and their respective storage/demand activities in the Amistad-Falcon ROM are indicated on the link-node diagram in Figure 2-1, and they are described in more detail in the next section of this report.

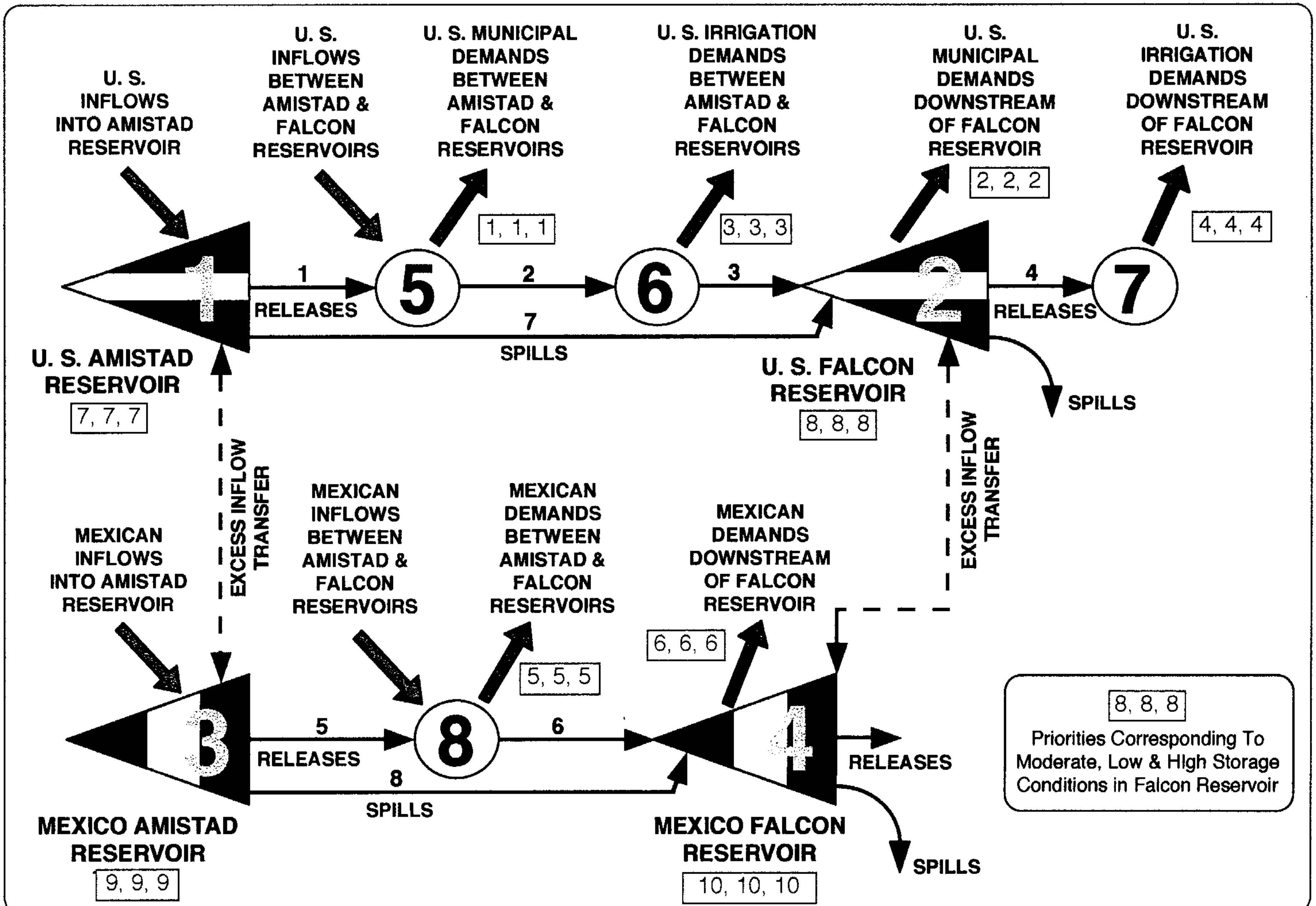
2.3 SIMYLD-II SOLUTION PROCESS

With the model network defined to approximate the components and features of the real physical system, the solution procedure in the SIMYLD-II model progresses stepwise in moving from a known set of state variables, i. e., nodal storage volumes and link flow values, at the beginning of a time step (end of Month J), to the solution for the required set of state variables at the end of the time step (end of Month J+1). The four-step solution process that is repeated each month during a simulation period is as follows:

1. The present status of the network is evaluated, and all system elements are given an appropriate parametric description.

2. All specified hydraulic and hydrologic inputs and demands are accounted for, and the

FIGURE 2-1 LINK-NODE NETWORK FOR AMISTAD-FALCON RESERVOIR OPERATIONS MODEL



mass balance for the entire network system is determined. Bounds are placed on system demands, spills and storage levels.

3. The flows necessary to meet the levels required by Step 2 and, at the same time, to minimize the system's total cost of water transport are determined through the application of an optimization procedure.

4. All necessary state variables have now been determined, and the status of the system at the conclusion of the current time step becomes the status at the beginning of the next time step.

This solution procedure is repeated in a stepwise fashion until the specified simulation period has been spanned. The resulting outputs from the SIMYLD-II program, when operated in this manner, are the time variations in reservoir storage and channel or conduit flow for all of the network elements over the duration of the simulation period. Hence, the basic results from the ROM for the Amistad-Falcon Reservoir system are: (1) the end-of-month values of storage in the United States and the Mexican portions of Amistad and Falcon Reservoirs; (2) the monthly volumes of United States and Mexican water released from Amistad Reservoir to meet downstream demands or Falcon storage requirements; (3) the monthly volumes of United States and Mexico water spilled from Amistad Reservoir when the conservation storage of both countries is full; (4) the monthly volumes of United States and Mexican water released from Falcon Reservoir to meet downstream demands; and (5) the monthly volumes of United States and Mexico water spilled from Falcon Reservoir when the conservation storage of both countries is full.

SECTION 3 AMISTAD-FALCON ROM FEATURES

3.1 SEPARATE UNITED STATES AND MEXICO WATER ACCOUNTING

As indicated by the structure of the Amistad-Falcon SIMYLD-II model illustrated in Figure 2-1, the ROM accounts for water stored in the reservoirs and used by the United States and Mexico separately. Inflows to the system are specified separately for each country in the model, and then simulations are made separately for each country taking into consideration each country's available storage in Amistad and Falcon Reservoirs and separate water demands in the Middle and Lower Rio Grande basins. Total evaporation losses from each of the reservoirs are charged proportionally against each country's reservoir storage amount. At the end of each month of the overall simulation period, the amount of water owned and stored by each country in each of the reservoirs is determined by the ROM. Each country's releases from Amistad Reservoir and the amounts of water that each country has flowing in various reaches (between nodes) of the Rio Grande between Amistad Reservoir and Falcon Reservoir also are simulated each month. Releases from Falcon Reservoir for each country are reported each month, but these releases are not simulated. They only reflect the water demands of each country in the Lower Rio Grande basin as specified as input to the model.

3.2 CURRENT RESERVOIR ELEVATION-AREA-CAPACITY RELATIONSHIPS

Since construction of Falcon Reservoir in the early 1950's and Amistad Reservoir in the late 1960's, the storage capacity of these impoundments has changed, actually has been reduced, as sediments carried with river inflows have been deposited and accumulated in the reservoirs. Periodically, the IBWC has performed sedimentation surveys of each of the reservoirs to establish current storage conditions. The results from such surveys are expressed as elevation-area-capacity tables that indicate the surface area and storage capacity of the reservoirs at different water surface elevations ranging from the bottom of the impoundments, i. e., near the zero area and storage condition, up to near the maximum design water surface elevation, i. e., at the top of the flood pool. Typically, increments of 0.005 meters (0.016 feet) in elevation are used for reporting in the IBWC elevation-area-capacity tables.

The most recent elevation-area-capacity tables[1,2] developed by the IBWC have been incorporated into the Amistad-Falcon ROM data input file. These tables reflect 1992 sedimentation conditions in both of the reservoirs. It should be noted that the IBWC officially adopted these elevation-area-capacity

[1] International Boundary and Water Commission, United States Section; "Amistad International Reservoir Elevation-Area-Capacity Table Based on Survey of 1992"; October, 1994; El Paso, Texas.

[2] International Boundary and Water Commission, United States Section; "International Falcon Reservoir Elevation-Area-Capacity Table Based on Survey of May 1992"; November, 1992; El Paso, Texas.

tables for water accounting purposes on May 1, 1993, for Falcon Reservoir and January 1, 1995, for Amistad Reservoir. Prior to these times, previous versions of these tables corresponding to earlier sedimentation conditions in the reservoirs were used by the IBWC; however, only the most recent elevation-area-capacity tables have been used in the ROM for all simulations. Figures 3-1 and 3-2 present plots of the current elevation-area and elevation-capacity relationships, respectively, for Amistad Reservoir. Current elevation-area and elevation-capacity plots for Falcon Reservoir are shown in Figures 3-3 and 3-4, respectively.

3.3 CURRENT UNITED STATES AND MEXICO STORAGE ALLOCATIONS

The ROM for the Amistad-Falcon Reservoir system incorporates allocations of reservoir storage in accordance with agreements made between the United States and Mexico prior to construction of the impoundments. These agreements stipulate that each country shall have control and use of the following shares, or percentages, of the total silt and conservation storage capacity of Amistad and Falcon Reservoirs[3].

	UNITED STATES' PERCENTAGE OF SILT & CONSERVATION STORAGE CAPACITY	MEXICO'S PERCENTAGE OF SILT & CONSERVATION STORAGE CAPACITY
AMISTAD RESERVOIR	56.2 %	43.8 %
FALCON RESERVOIR	58.6 %	41.4 %

The IBWC reports[4] that the top of the silt and conservation pool in Amistad Reservoir is set at elevation 340.462 meters above mean sea level (MSL), which is equal to 1,117.00 feet MSL. For Falcon Reservoir, it is set at 91.805 meters MSL, or 301.20 feet MSL. The maximum silt and conservation storage capacities and associated surface areas of the two reservoirs that correspond to these elevations, based on the most recent IBWC elevation-area-capacity tables for the reservoirs as described and referenced above, are listed in the following table, along with the corresponding silt and conservation storage capacities currently allocated to the United States and to Mexico in accordance with the originally agreed upon shares:

[3] International Boundary and Water Commission, United States Section; "An Appraisal of Potential Rio Grande Channel Dams In Hidalgo and Cameron Counties, Texas for Water Conservation"; Prepared for the Texas Department of Water Resources; April, 1983; El Paso, Texas.

[4] United States of America, Department of State, International Boundary and Water Commission, United States and Mexico; "Flow of the Rio Grande and Related Data, From Elephant Butte Dam, New Mexico to the Gulf of Mexico"; Water Bulletin Number 65; 1995; El Paso, Texas.

FIGURE 3-1 CURRENT ELEVATION-AREA RELATIONSHIP FOR AMISTAD RESERVOIR

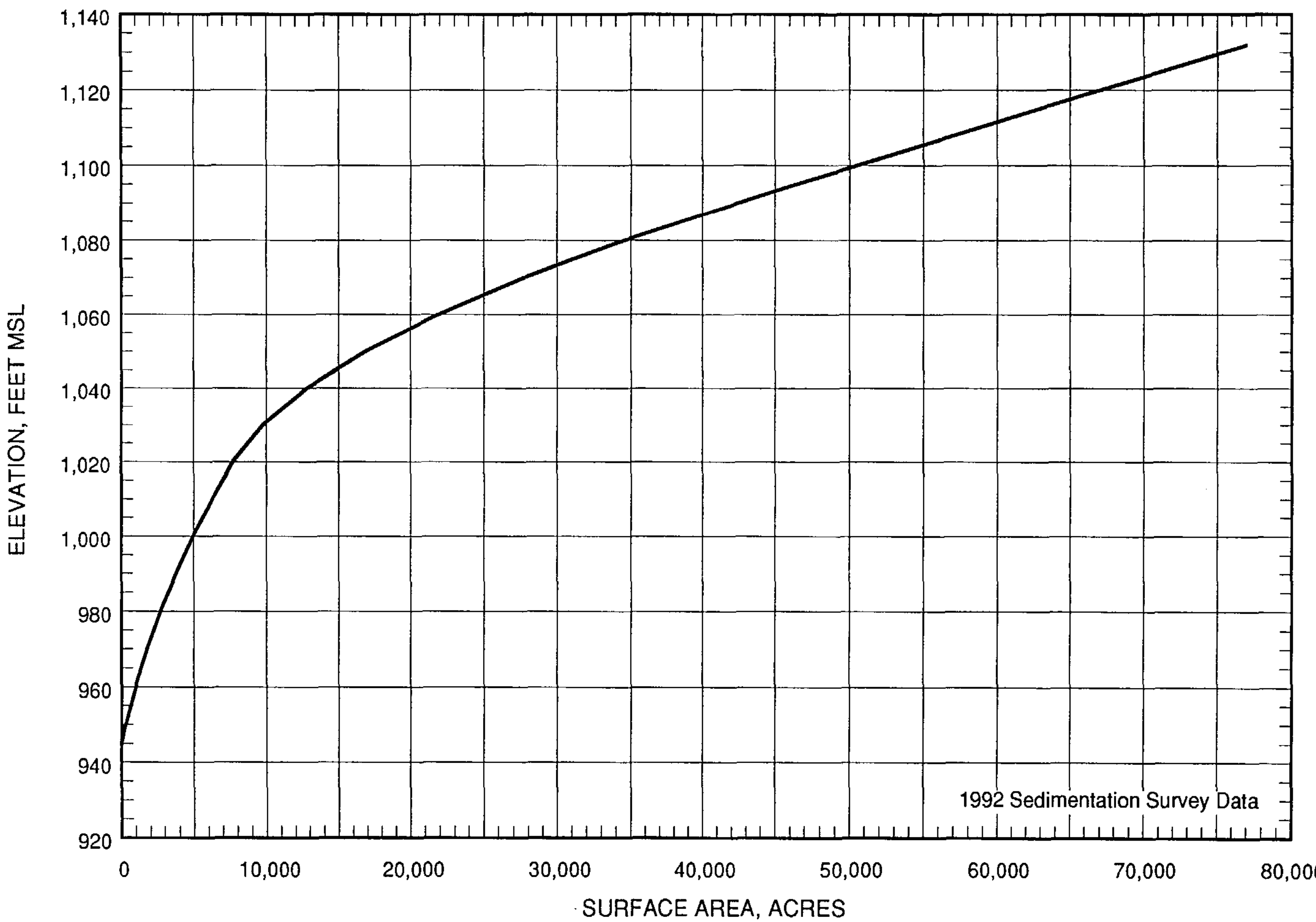


FIGURE 3-2   CURRENT ELEVATION-CAPACITY RELATIONSHIP FOR AMISTAD RESERVOIR

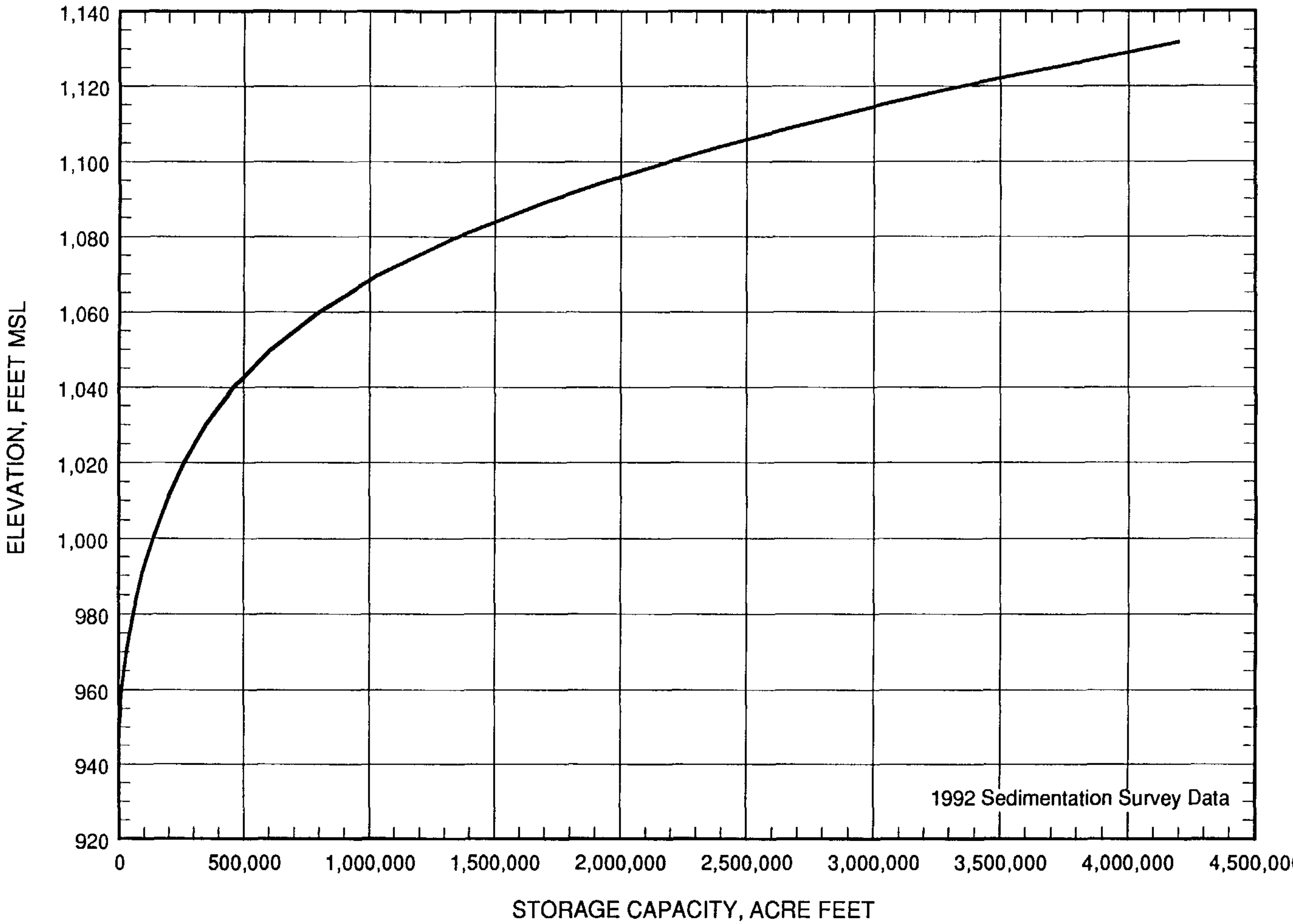


FIGURE 3-3 CURRENT ELEVATION-AREA RELATIONSHIP FOR FALCON RESERVOIR

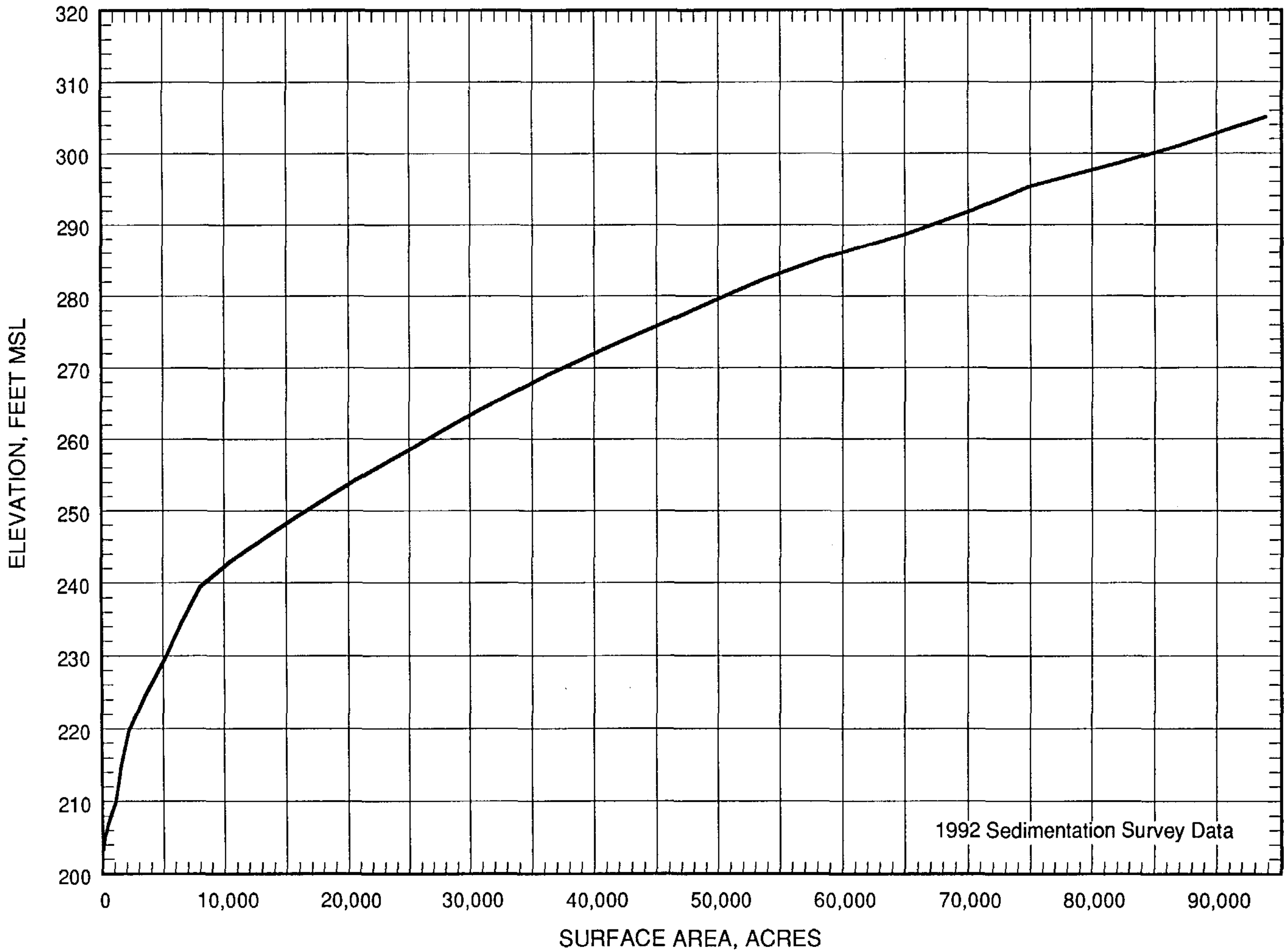
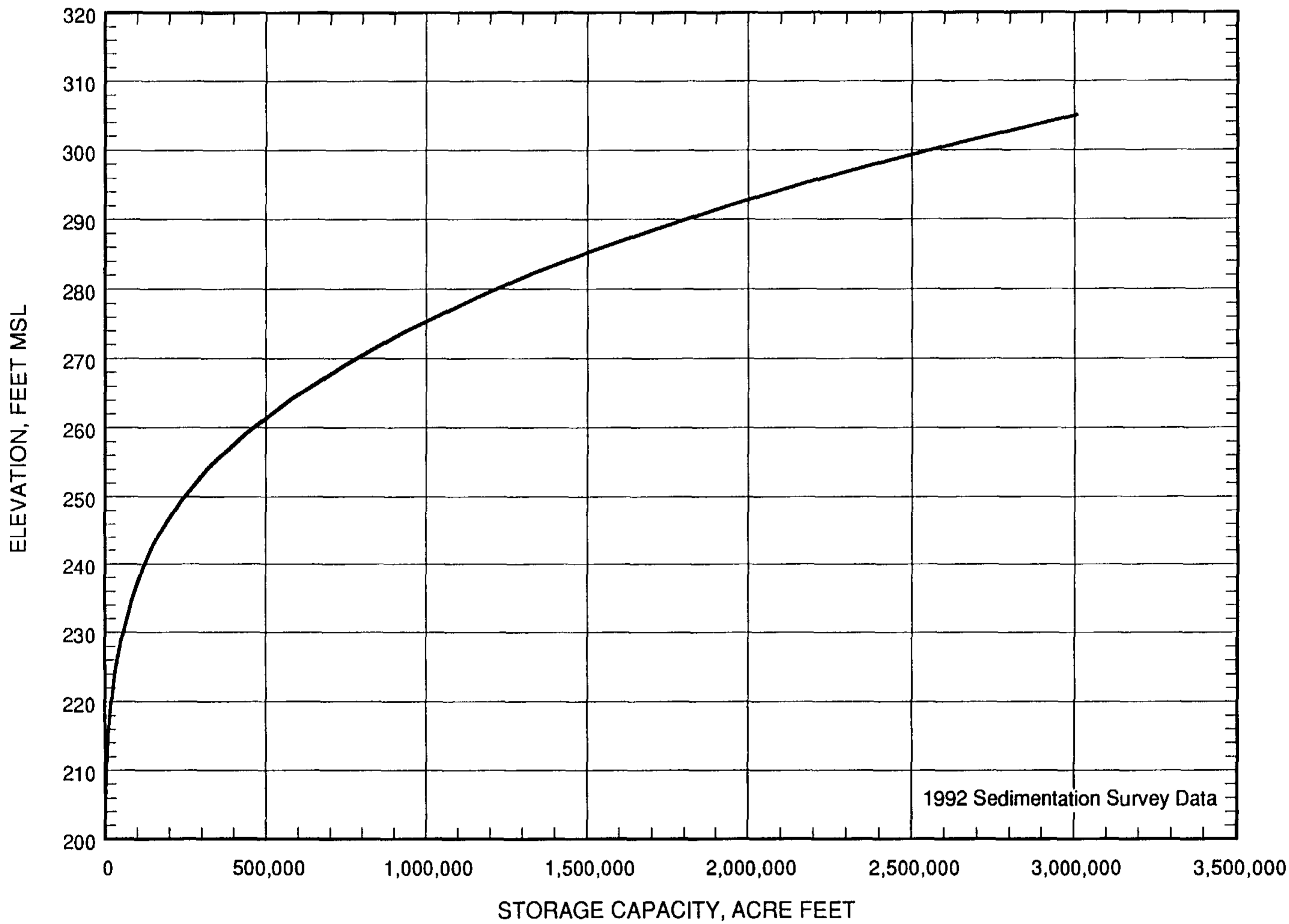


FIGURE 3-4 CURRENT ELEVATION-CAPACITY RELATIONSHIP FOR FALCON RESERVOIR



	SILT & CONSERVATION STORAGE CAPACITY		RESERVOIR SURFACE AREA	
	Acre-Feet	1,000 Cu. M.	Acres	Hectares
AMISTAD RESERVOIR	3,151,319	3,887,094	64,438	26,077
United States Share	1,771,041	2,184,547	-	-
Mexico Share	1,380,278	1,702,547	-	-
FALCON RESERVOIR	2,653,803	3,273,418	87,181	35,281
United States Share	1,555,129	1,918,223	-	-
Mexico Share	1,098,674	1,355,195	-	-

3.4 CURRENT RESERVOIR STORAGE/DEMAND OPERATIONS

The current operation of Amistad and Falcon Reservoirs with regard to desired storage levels and the distribution of stored water between the reservoirs appears to follow general guidelines that are utilized by both the United States and Mexico. The allocation of stored water among users in Texas is established by rules promulgated by the TNRCC and its predecessor agencies. Certainly, Mexico recognizes the importance of assuring its municipal water supply before allowing releases and diversions for irrigation of agricultural land.

As described earlier, the Amistad-Falcon ROM incorporates these various reservoir operational rules and guidelines through the assignment of priorities to each storage/demand activity at each node in the model. These priorities are listed in the following table for each country in order from the highest priority to the lowest priority. It should be noted that because storage in the reservoirs is accounted for separately for the two countries, the demand and storage priorities specified in the ROM also are applicable to the two countries individually. Hence, a priority assigned to one country's demand or storage operation has no effect on the demand or storage operations of the other country.

The definition of the storage/demand priorities for the nodes in the Amistad-Falcon ROM generally reflect current operating procedures for the reservoir system and current demand priorities established by both the United States and Mexico. For example, both countries recognize the higher priority of meeting human water needs, i. e., municipal demands, before irrigation water needs. Hence, all of the municipal demands for each country that are included in the ROM are assigned a higher priority (lower priority number) than the irrigation demands. The use of higher priorities for water demands below Falcon Reservoir in the Lower Rio Grande basin than those specified for demands along the Middle Rio Grande is purely arbitrary and actually makes little difference with regard to the ability of the reservoirs to supply water to users in either the Lower or the Middle Rio Grande basins.

PRIORITY			STORAGE/DEMAND NODE ACTIVITY	NODE
Storage Condition				
Low	Mod	High		
For the United States				
1	1	1	U. S. Municipal Demands Along Middle Rio Grande	5
2	2	2	U. S. Municipal Demands Below Falcon Reservoir	2
3	3	3	U. S. Irrigation Demands Along Middle Rio Grande	6
4	4	4	U. S. Irrigation Demands Below Falcon Reservoir	7
11	10	10	U. S. Storage in Amistad Reservoir	1
10	11	11	U. S. Storage in Falcon Reservoir	2
For Mexico				
5	5	5	Mexican Total Demands Along Middle Rio Grande	8
6	6	6	Mexican Total Demands Below Falcon Reservoir	4
13	12	12	Mexican Storage in Amistad Reservoir	3
12	13	13	Mexican Storage in Falcon Reservoir	4

The higher priority assigned to the storage of river inflows in Amistad Reservoir during non-drought conditions, rather than in Falcon Reservoir, is consistent with accepted water conservation and reservoir system operation practices in that it results in less overall evaporation losses from the reservoirs and tends to optimize the river flow capture ability of the two impoundments. Furthermore, Article 8, §(a), of the 1944 Treaty between the United States and Mexico[5] stipulates that "storage in all major international reservoirs above the lowest shall be maintained at the maximum possible water level, consistent with flood control, irrigation use and power requirements". According to IBWC, Falcon Reservoir is the "lowest international reservoir" on the Rio Grande for purposes of the treaty; therefore, it is the policy of IBWC to maximize the storage of water in Amistad Reservoir upstream.

As indicated in the above table of ROM priorities, three priority assignments are specified for each node in the ROM with regard to storage/demand activities. The three priority assignments reflect the priorities that are active in the model under three different prescribed hydrologic conditions which

[5] "Treaty Between the United States of America and Mexico, Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande"; February 3, 1944; Washington, D. C.

are defined based on the amount of water in reservoir storage, i. e., a "Mod" (Moderate) storage condition, a "Low" storage condition, and a "High" storage condition. As the Amistad-Falcon ROM is presently structured, the particular hydrologic state of the reservoir system for either the United States or Mexico is determined by the amount of water stored only in Falcon Reservoir, i. e., the most-downstream reservoir. Since the normal reservoir operation practice is to maintain Amistad Reservoir as full as possible, the hydrologic state of the system at any point in time is better reflected by the amount of water stored in Falcon Reservoir, since its storage tends to fluctuate more directly with variations in inflows and demands.

For purposes of establishing the hydrologic state of the reservoir system for each country in the model, the Moderate storage condition is defined by lower and upper percentages of the maximum conservation storage capacity allocated to each country in Falcon Reservoir as follows.

PERCENTAGE AND AMOUNT OF FALCON RESERVOIR MAXIMUM CONSERVATION STORAGE USED TO DEFINE MODERATE RESERVOIR SYSTEM STORAGE CONDITIONS

	Lower Limit		Upper Limit	
	Percent	Acre-Feet	Percent	Acre-Feet
UNITED STATES	9.65	150,000	75.00	1,166,347
MEXICO	10.00	109,867	75.00	824,006

The lower values of these Falcon Reservoir storage figures are of most significance because they define the cutoff points between the "Low" storage condition and the "Moderate" storage condition of the two countries' reservoir systems. As indicated by the storage priorities listed previously, this is the point in the ROM at which storage of river inflows in Falcon Reservoir is given a higher priority than storage of river inflows in Amistad Reservoir. As noted previously, the normal practice in the real system and in the ROM is to maximize the storage of river inflows in Amistad Reservoir since it is the most upstream reservoir in the system; however, when the storage in Falcon Reservoir falls below the lower limits shown above, the reservoir storage priorities are switched in the ROM in order to assure a minimum supply of water in Falcon Reservoir for both countries. While this appears to be consistent with actual reservoir operations, there is no documented minimum level of storage for the United States in Falcon Reservoir that reflects the desired storage condition that is supposed to be maintained during extremely dry periods. However, based on actual reservoir storage records for the current drought period, the lowest that the United States storage in Falcon Reservoir has been allowed to fall has been approximately 176,000 acre-feet, which occurred in July, 1996. Therefore, for purposes of specifying reservoir operating procedures in the ROM, the minimum desired storage condition of 150,000 acre-feet, or 9.65 percent of the United States maximum conservation storage capacity, has been adopted as the minimum dry-period storage level for the United States in Falcon Reservoir. When the quantity of United States water stored in the reservoir falls to this minimum level of storage, additional releases of United States water from Amistad Reservoir are initiated in the ROM to satisfy downstream water demands, even those below Falcon Reservoir. The minimum desired dry-period storage level for Mexico in Falcon Reservoir has been established at 109,867 acre-feet in the ROM, which represents approximately the same fraction (ten percent) of the Mexican total conservation capacity.

Of course, when the simulated storage of either country in Amistad Reservoir is drawn to near zero during extremely dry periods, releases of water from the minimum storage pools in Falcon Reservoir also are made to meet water demands. The upper storage limits indicated in the above table as the upper bound on the Moderate storage condition actually have no real meaning with respect to the ROM simulations since the storage/demand priorities of the nodes do not change between the Moderate storage condition and the High storage condition.

Another important feature of the ROM with regard to effectively simulating current storage/demand operations for the Amistad-Falcon system is the capability of the model to define target storage levels in each of the reservoirs for both the United States and Mexico for each of the three previously described hydrologic storage conditions. This means that once a particular hydrologic state is determined in the model for either country during the simulation process, the model attempts to maintain prescribed storage levels for that country in the conservation pools of both reservoirs. The assigned storage priorities for each of the reservoirs under the three hydrologic storage conditions determine which of the reservoirs is to be allowed to store water first in order to satisfy its target storage level.

In the current version of the ROM, the target storage levels specified in the following table, expressed in terms of percentages of the maximum conservation storage capacities and corresponding storage amounts, are defined for each country in Amistad and Falcon Reservoirs for each of the three hydrologic storage conditions. It should be noted that the target storage amounts based on the indicated percentages are increased in the model as the maximum conservation storage capacities of the reservoirs are operationally increased during the non-hurricane season as described in Section 3.8.

	PERCENTAGE OF CONSERVATION STORAGE CAPACITY %	TARGET STORAGE AMOUNT Acre-Feet
AMISTAD RESERVOIR		
UNITED STATES		
Low Storage Condition	75.0	1,328,281
Moderate Storage Condition	100.0	1,771,041
High Storage Condition	100.0	1,771,041
MEXICO		
Low Storage Condition	75.0	1,035,209
Moderate Storage Condition	100.0	1,380,278
High Storage Condition	100.0	1,380,278
FALCON RESERVOIR		
UNITED STATES		
Low Storage Condition	9.65	150,070
Moderate Storage Condition	75.0	1,166,347
High Storage Condition	100.0	1,555,129
MEXICO		
Low Storage Condition	0.1	1,099
Moderate Storage Condition	75.0	824,006
High Storage Condition	100.0	1,098,674

3.5 MONTHLY STORAGE-BASED EVAPORATION ALLOCATIONS

In accordance with Article 8, §(d), of the 1944 Treaty between the United States and Mexico, current water accounting procedures employed by the IBWC allocate evaporation losses from Amistad and Falcon Reservoirs to the United States and Mexico proportional to the average amount of water stored in each of the reservoirs by each country. In the monthly water accounting process, the IBWC calculates total monthly evaporation losses for each reservoir based on observed gross evaporation rates as measured at several evaporation pans located around the reservoirs. To arrive at the total monthly evaporation losses for the reservoirs, the observed monthly gross evaporation rates are applied to the average surface area of the reservoirs as determined from the elevation-area-capacity tables using the actual reservoir stages as measured by IBWC during each month. The resulting total evaporation losses for each reservoir then are allocated by IBWC to each country in proportion to each country's average amount of storage in each of the reservoirs.

This same evaporation allocation procedure has been incorporated into the SIMYLD-II computer program for the Amistad-Falcon ROM. For each month during a given simulation period, the observed monthly gross evaporation rates for each reservoir as reported by the IBWC have been included in the ROM data input file. These gross evaporation rates then are used in an iterative process with the simulated reservoir surface areas to determine total evaporation losses. These losses are proportionally allocated to each country's share of the reservoirs' storage, i. e., the allocated evaporation losses are subtracted from each country's storage amount.

It should be noted that the monthly river inflows specified in the ROM for each of the reservoirs have been determined by IBWC through water balance calculations based on observed monthly changes in historical reservoir storage, calculated gross evaporation losses and known reservoir releases, with no adjustment for direct rainfall on the reservoirs themselves. Hence, the IBWC river inflows inherently include the effective inflows to each reservoir due to direct rainfall on the reservoirs' surface. This is why, in the ROM, the simulated evaporation losses are based on gross evaporation rates and not net evaporation rates.

3.6 SPECIFIED UNITED STATES AND MEXICO WATER DEMANDS

As noted previously, the Amistad-Falcon ROM includes provisions for specifying water demands on the reservoir system by both the United States and Mexico. The demand arrows identified on the ROM network diagram in Figure 2-1 and described in Section 2.2 indicate the locations and types of demands that are accounted for in the model. These include the following demands at the indicated nodes:

<u>For the United States:</u>

Node 2 United States total municipal water demand below Falcon Reservoir
Node 5 United States total municipal water demand between Amistad and Falcon Reservoirs
Node 6 United States total irrigation water demand between Amistad and Falcon Reservoirs
Node 7 United States total irrigation water demand below Falcon Reservoir

<u>For Mexico:</u>

Node 4 Mexican total municipal and irrigation water demand below Falcon Reservoir
Node 8 Mexican total municipal and irrigation water demand between Amistad and Falcon Reservoirs

For purposes of developing and testing the ROM, current average values of these demands and their typical monthly distributions throughout a given year have been determined and included in the basic ROM data input file. As described in Sections 4.3 and 4.4 of this report, these values have been established based on available historical water use information and Falcon Reservoir release data compiled from records and publications of the TWDB, the TNRCC and the IBWC. For the ROM simulations described herein, both average and actual monthly demands have been used.

3.7 MINIMUM OPERATIONAL RELEASES FROM AMISTAD RESERVOIR

In the recent past, it appears that certain minimum amounts of water have been released, or possibly leaked, from Amistad Reservoir during non-flood periods to provide sufficient water for hydropower generation at the dam and/or to provide adequate river flows downstream to supply existing municipal, industrial and irrigation diverters and to offset miscellaneous channel losses along the Middle Rio Grande. According to IBWC and the TNRCC Watermaster's Office, there are no established rules regarding the amounts and timing of these minimum releases; although, consideration certainly is given to the specific diversion requirements and requests of known downstream water users.

During the normal process of simulating storage conditions in Amistad and Falcon Reservoirs with the ROM, specified minimum releases from Amistad Reservoir for either the United States or Mexico can be made. In the data input file for the ROM, either a set of twelve minimum monthly Amistad release values can be specified for each country, which are repeated each year of a simulation, or individual monthly values can be specified for every year. All or part of these minimum monthly release amounts may be automatically satisfied by the simulated releases that are determined to be required for satisfying downstream water demands and/or Falcon Reservoir storage conditions.

3.8 NON-HURRICANE SEASON FLOOD POOL STORAGE

According to current IBWC operating procedures for Amistad and Falcon Reservoirs, a portion of the designated flood water storage capacity (flood pool) in each reservoir occasionally may be used to temporarily store excess inflows when the reservoirs' conservation pools are full. In effect, flood water inflows are stored, rather than spilled. The purpose of this practice is to increase the amount of water stored in the reservoirs above their maximum conservation storage capacity in order to increase available short-term water supplies for downstream users. Since this practice effectively reduces the flood control abilities of the reservoirs by reducing their available flood storage capacity, the IBWC only has implemented this procedure during the non-hurricane season when the flooding risks due to major hurricane-generated flood flows in the river are minimal. The non-hurricane season is defined by IBWC as the period November through May, inclusive, of each year.

Ideally, under this procedure, excess river inflows are stored in the flood pools of the reservoirs only to the extent that such water can be utilized by downstream water users during the non-hurricane season. Any of the stored excess inflows that remains in the flood pools of the reservoirs at the end of April normally is evacuated through releases during the month of May in order to restore the fully allocated flood storage capacity of the reservoirs by June 1. When the magnitude of such deliberate releases from the reservoirs exceeds the required water demands of downstream users, the released flood waters ultimately flow into the Gulf of Mexico.

According to IBWC, there are no set rules regarding the storage of excess river inflows in the reservoir flood pools during the non-hurricane season; however, there are some general guidelines that have been incorporated into the Amistad-Falcon ROM. Apparently, the maximum amount of storage utilized in either reservoir for temporarily storing excess inflows in the flood pools is on the order of 100,000 acre-feet; although, this figure has varied considerably between the reservoirs and from year to year. For purposes of the ROM, the available temporary flood storage capacity has been set at 100,000 acre-feet in each reservoir, and this amount has been allocated to the two countries in proportion to their maximum conservation storage capacity. These amounts of flood pool storage, which are listed below for each of the reservoirs, then are utilized in the ROM as additional temporary conservation storage capacity for each of the countries during the non-hurricane season.

TEMPORARY NON-HURRICANE SEASON
FLOOD POOL STORAGE CAPACITY
Acre-Feet

	United States	Mexico
AMISTAD RESERVOIR	56,200	43,800
FALCON RESERVOIR	58,600	41,400

3.9 OWNERSHIP TRANSFER OF EXCESS RESERVOIR INFLOWS

The 1944 Treaty between the United States and Mexico contains the following stipulation in Article 8, §(c):

> "In any reservoir the ownership of water belonging to the country whose conservation capacity therein is filled, and in excess of that needed to keep it filled, shall pass to the other country to the extent that such country may have unfilled conservation capacity, except that the one country may at its option temporarily use the conservation capacity of the other country not currently being used in any of the upper reservoirs; provided that in the event of flood discharge or spill occurring while one country is using the conservation capacity of the other, all of such flood discharge or spill shall be charged to the country using the other's capacity, and all inflow shall be credited to the other country until the flood discharge or spill ceases or until the capacity of the other country becomes filled with its own water."

The first portion of this paragraph dealing with the transfer of ownership of excess reservoir inflows from the country with a full conservation pool to the other country with available unused conservation storage capacity applies to Falcon Reservoir under all circumstances, since it is the lowest international reservoir on the Rio Grande, i. e., not an "upper" reservoir subject to the exception clause in the above citation. For Amistad Reservoir, which is an "upper" reservoir, the same transfer of ownership of excess inflows is automatic, unless the country with the excess inflows exercises its "option" to temporarily store the excess inflows in the other country's available unused conservation pool. If this occurs, as noted above, flood discharges from the reservoir are charged first against the storage of the country using the temporary conservation storage capacity, and inflows to the reservoir are credited to the country with the available conservation storage capacity until such flood discharges and spills cease.

Examination of historical storage conditions for Amistad Reservoir indicates that the situation described above under which the temporary inflow-storage option might be exercised by either the United States or Mexico have occurred fairly infrequently. For example, since 1968 when Amistad Reservoir was completed, there have been only five or six periods of time when the conservation storage capacity of the reservoir has been full or exceeded, with excess inflows either stored in the flood pool of the reservoir or discharged or spilled downstream. Furthermore, since most of the historical flood events have extended over several months or even years with continuous flood releases or spills occurring over much of these periods, any amount of excess inflows that was temporarily stored by one country in the available conservation storage capacity of the other country at the outset of a flood event very likely was entirely evacuated from the reservoir as flood spills and/or releases. Hence, it is unlikely that any of the temporarily stored water was effectively utilized for meeting downstream water demands by the country temporarily storing the water.

For these reasons, the current version of the Amistad-Falcon ROM incorporates for both reservoirs the ability to transfer ownership of excess inflows from the country with a full conservation pool to the other country when it has available unused conservation storage capacity, but the model does not include the provision for the temporary storage of excess inflows. Discussions with IBWC personnel have confirmed that excluding the temporary storage of excess inflows in the reservoirs is not normally of great significance with regard to water ownership.

On the link-node diagram for the Amistad-Falcon ROM shown in Figure 2-1, the dashed lines connecting the two countries' conservation storage pools in Amistad Reservoir and in Falcon Reservoir are intended to indicate the ability of the model to transfer excess reservoir inflows, and ownership of the water, from either country with a full conservation pool to the other country when it has available unused conservation storage capacity. The separate individual links connecting Amistad Reservoir directly to Falcon Reservoir for both the United States and Mexico in the model network, i. e., Links 7 and 8, respectively, are included specifically to convey flood spills and releases from Amistad Reservoir to Falcon Reservoir and to facilitate the transfer of excess inflows and the ownership of the water, between the two countries. Normal releases from Amistad Reservoir to meet downstream demands and/or storage requirements in Falcon Reservoir are made primarily through the other two sets of links, i. e., Links 1, 2 and 3 for the United States and Links 5 and 6 for Mexico.

The ROM program includes provisions that determine when and how much of the excess inflows of one country in Amistad Reservoir or Falcon Reservoir are transferred to the storage pool of the other country. Of course, the amount transferred is always limited by the amount of available storage capacity of the country receiving the water in the reservoir where the excess inflows occur. Also, in Amistad Reservoir, when one country has its conservation storage full and therefore has excess inflows available for transfer to the other country's pool, a check is made first to determine whether or not there is storage capacity available in Falcon Reservoir for the country with the excess inflows. if there is, then all or or part of the excess inflows into Amistad Reservoir are allowed to pass downstream into Falcon Reservoir for storage, thus maximizing the water supply of the country with the excess inflows. In the model, the amount of excess inflows passed to Falcon Reservoir is limited by the available storage capacity in Falcon Reservoir or by the average release rate through the penstocks at Amistad Reservoir, whichever is smaller. As presently structured, the average release rate through the penstocks at Amistad Reservoir is specified in the ROM at 120,000 acre-feet per month, which is about 2,000 cfs (cubic feet per second).

3.10 TNRCC RIO GRANDE WATER ACCOUNTING RULES

Fundamental to any computer modeling approach for describing the operation and behavior of Amistad and Falcon Reservoirs on the Rio Grande, particularly with regard to the United States' share of water stored in these impoundments, is the set of water accounting rules adopted and administered by the TNRCC. These rules determine the amounts of water available for diversion and use from the Middle and Lower Rio Grande for domestic, municipal, industrial and irrigation purposes, and they establish storage accounts in the reservoirs for domestic, municipal and industrial water, irrigation and mining water, and an operations reserve.

The underlying basis and authority for the TNRCC's Rio Grande operating and accounting rules is the decision of the Thirteenth Court of Civil Appeals in the landmark case styled "State of Texas, et al. vs. Hidalgo County Water Control and Improvement District No. 18, et al.", which is commonly referred to as the Lower Rio Grande Valley Water Case. The original suit was filed by the State of Texas in 1956 to restrain the diversion of water from the Rio Grande for irrigation when the share of water due the United States from water impounded in Falcon Reservoir was 50,000 acre-feet or less. The 50,000 acre-feet was the amount of water that the Texas Board of Water Engineers (predecessor agency to the TNRCC) had determined to be necessary to meet municipal, domestic and livestock demands for only a three-month period without additional inflow into Falcon Reservoir. Earlier efforts to apply voluntary restrictions on diversions of water had collapsed due to severe drought conditions and the consequent shortage of water supplies.

The original trial of the Valley Water Case lasted from January, 1964 to August, 1966, and the final judgment of the Appellate Court was entered in 1969. In 1971, the Texas Water Rights Commission (predecessor agency to the TNRCC) adopted rules and regulations implementing the court decision. Based on the judgment rendered in this case, a storage reserve in Falcon Reservoir equal to 60,000 acre-feet was established to meet municipal and industrial demands, and a total of approximately 155,000 acre-feet of water per year were allocated for municipal, industrial and domestic uses. Irrigation water from the Rio Grande was allocated for 742,808.6 acres of agricultural use below Falcon Dam. Of this amount, 641,221 acres were assigned Class A irrigation rights, and the remaining acres were awarded Class B irrigation rights.

Whereas municipal and industrial uses were granted the highest water supply priority, the result of the Valley Water Case was to establish a weighted priority system in the Lower Rio Grande Valley for allocating the remaining surface water supply to irrigation uses. The two classes of irrigation water rights that were established provide a means for differentiating the rates at which water is credited to the individual Amistad-Falcon storage accounts of the irrigators during the year. The Class A water right accrues water at a rate 1.7 times higher than the Class B water right. Although this weighted priority system for irrigation users generally has little significance during years of plentiful water, its effect in water-short years is to distribute the shortage among all users, with the greater shortages occurring on lands with the Class B water rights.

Pursuant to the TNRCC's rules, the Rio Grande Watermaster is responsible for allocating the amount of United States water which can be diverted by each Class A and Class B irrigator and for administering the use of all United States water in the Middle and Lower Rio Grande basins. This includes determining on a monthly basis the amounts of water allocated and stored in the various accounts in Amistad and Falcon Reservoirs.

The current TNRCC rules and regulations[6] provide a reserve of 225,000 acre-feet of storage in Amistad and Falcon Reservoirs for domestic, municipal, and industrial uses, which is referred to as the "municipal pool" or the "D-M-I" reserve, and an operating reserve that fluctuates between 380,000 acre-feet and 275,000 acre-feet, depending on the amount of water in conservation storage in Amistad and Falcon Reservoirs. The operating reserve is necessary to provide for: (1) loss of water by seepage, evaporation and conveyance; (2) emergency requirements; and (3) adjustments of amounts in storage, as may be necessary by finalization of IBWC provisional United States-Mexico water ownership computations. The operating reserve is calculated monthly by multiplying the percentage of the total United States conservation storage capacity containing water in Amistad and Falcon Reservoirs times the maximum operating reserve of 380,000 acre-feet. The amount of the calculated operating reserve cannot be less than 275,000 acre-feet.

The TNRCC rules also specify procedures for allocating United States water in storage to the domestic-municipal-industrial reserve, the operating reserve, and the agricultural and mining accounts. Such allocations are based on the amount of United States water considered to be "usable storage" in Falcon and Amistad Reservoirs, as reported by the IBWC on the last Saturday of each month. Usable storage is defined as the amount of United States water stored in the conservation pools of the reservoirs less dead storage, which currently is assumed to be 4,600 acre-feet by the

[6] "Chapter 303: Operation of the Rio Grande"; 31 Texas Administrative Code, §§ 303.1-303.73; Texas Water Commission Rules; August 26, 1987; Austin, Texas.

Rio Grande Watermaster. To determine the amounts of United States water to be allocated to the specified reserves and accounts each month, the following computations are made:

1. From the amount of water in usable storage, 225,000 acre-feet are deducted to reestablish the reserve for domestic, municipal and industrial uses, i. e., the municipal pool; hence, storage for these uses is given the highest priority;

2. From the remaining storage, the total end-of-month account balances for all Lower and Middle Rio Grande irrigation and mining allottees are deducted; and

3. From the remaining storage, the operating reserve is deducted.

If the balance available for the operating reserve is less than 275,000 acre-feet, but greater than 150,000 acre-feet, that amount is allocated to the operating reserve. If the balance is less than 150,000 acre-feet, then deductions (negative allocations) are made from the individual irrigation and mining water rights accounts in amounts proportional to their respective storage balances to provide 150,000 acre-feet for the operating reserve.

If there is water remaining in the United States usable storage after the above three sets of allocations are made, the remaining storage amount, provided it is greater than 50,000 acre-feet, is further allocated to the individual irrigation and mining water rights accounts. If the remaining storage amount is less than 50,000 acre-feet, the excess storage is simply unallocated and held until the beginning of the following month. The allotment of the remaining storage amount for irrigation and mining uses is divided into Class A and Class B categories. Class A water rights (allottees) receive 1.7 times as much water as that allotted to Class B rights. Under the rules, an irrigation allottee cannot accumulate in storage more than 1.41 times its annual authorized diversion amount, and, if an allottee does not use water for two consecutive years, its account is reduced to zero.

The Rio Grande Watermaster maintains records of daily, weekly and monthly diversions and usage by all existing water rights holders along the Middle and Lower Rio Grande. Using this information and the amount of United States storage reported by the IBWC at the end of each month for Amistad and Falcon Reservoirs, the Watermaster performs the monthly water accounting and makes the necessary allocations. Monthly and annual reports indicating water usage and account balances are provided by the Watermaster to all water rights holders and diverters on the Middle and Lower Rio Grande.

The Amistad-Falcon ROM as currently structured incorporates the above water accounting rules and procedures for allocating the simulated end-of-month United States storage in Amistad and Falcon

Reservoirs among the domestic-municipal-industrial reserve, the operating reserve, and the total irrigation and mining accounts. Provisions for determining positive and negative allocations to the total irrigation and mining storage pool are included in the model. The model also includes the ability to simulate the account balances of three individual water rights holders, with each having a municipal water right, a Class A irrigation water right and a Class B irrigation water right. In the model, these individual accounts are debited as water is used in specified monthly amounts. Each account is restored to its full authorized diversion amount at the beginning of each calendar year. When irrigation and mining allocations are made, irrigation and mining storage accounts are credited with water in accordance with the Class A/Class B allotment procedure and in relative proportion to annual authorized diversion amounts. Negative irrigation and mining account allocations, when required because the reservoir operating reserve falls below 150,000 acre-feet, are deducted from the individual irrigation and mining accounts on a prorata basis depending on the amount of water in each storage account.

SECTION 4 AMISTAD-FALCON ROM DATA INPUT DEVELOPMENT

4.1 HISTORICAL MONTHLY RESERVOIR INFLOWS

As indicated on the link-node network diagram for the current version of the Amistad-Falcon ROM, inflows to the reservoir system in the model are accounted for separately for the United States and Mexico, with each country's individual inflows specified for the Rio Grande upstream of Amistad Reservoir and for the Rio Grande between Amistad and Falcon Reservoirs. Monthly values of these inflows are used in the model.

For operating the ROM in this investigation, historical hydrologic conditions for the Rio Grande corresponding to the 1945 through 1996 historical period have been utilized. The historical monthly inflows to the Rio Grande for this period at the four inflow locations in the ROM, i. e., one for each country above Amistad Reservoir and one for each country between Amistad and Falcon Reservoirs, have been compiled from information obtained from the IBWC. For the period from 1954 through 1996, tabular lists of the four sets of monthly inflows were obtained directly from the IBWC. For the period prior to that time, the monthly inflows were extracted from a previous reservoir operations model of Amistad and Falcon Reservoirs that was developed and operated by the IBWC in the 1970's for special studies requested by the Texas Department of Water Resources. This earlier model considered only United States water in the system. These United States inflow values were subtracted from the total inflow values for the reservoirs (based on streamflow gage records) as reported by the IBWC to derive the corresponding sets of Mexican monthly inflows to the reservoirs. Recent discussions with IBWC staff have indicated that the Mexican inflows to Amistad Reservoir that have been derived for the period prior to 1954 may not be correct and may need further refinement. Such refinements have not been undertaken in this present study, but they are scheduled to be made during the next year as part of the Senate Bill 1 regional water supply planning study for the Middle and Lower Rio Grande basins. It is not expected that these refinements in the Mexican inflows to Amistad Reservoir will appreciably change the modeling results presented in this report.

Table 4-1 presents a listing of the annual amounts of historical Rio Grande inflows for both the United States and Mexico from the watershed upstream of Amistad Reservoir and from the watershed between Amistad and Falcon Reservoirs over the period 1945 through 1996. The monthly values comprising these annual totals, which have been specified in the ROM for all simulations, are listed in the tables in Appendix 1. The total United States annual inflows and the total Mexican annual inflows also are listed in Table 4-1 in descending order. As indicated, over the 52-year period, the total United States annual inflows have ranged from over four million acre-feet in 1954 to just under 700,000 acre-feet in 1952. It is significant to note that the inflows to the Rio

TABLE 4-1 HISTORICAL ANNUAL UNITED STATES AND MEXICAN INFLOWS TO AMISTAD AND FALCON RESERVOIRS ON THE RIO GRANDE

(Acre-Feet)

YEAR	UNITED STATES INFLOWS			MEXICAN INFLOWS			INFLOWS RANKED IN DESCENDING ORDER				
	Above Amistad Reservoir	Below Amistad Reservoir	Total Annual Inflows	Above Amistad Reservoir	Below Amistad Reservoir	Total Annual Inflows	Year	Total U. S. Inflows	RNK	Year	Total Mexican Inflows
1945	1,100,000	285,000	1,385,000	1,703,000	278,000	1,981,000	1954	4,120,503	1	1958	4,606,524
1946	1,117,000	506,000	1,623,000	1,635,000	521,000	2,156,000	1971	3,984,106	2	1971	3,794,271
1947	875,000	426,000	1,301,000	1,571,000	371,000	1,942,000	1958	3,473,823	3	1981	2,668,849
1948	1,384,000	595,000	1,979,000	1,349,000	702,000	2,051,000	1974	3,317,228	4	1976	2,467,179
1949	1,589,000	783,000	2,372,000	1,612,000	442,000	2,054,000	1981	2,882,903	5	1978	2,318,495
1950	1,035,000	248,000	1,283,000	1,626,000	128,000	1,754,000	1976	2,669,234	6	1990	2,226,809
1951	691,000	371,000	1,062,000	1,214,000	326,000	1,540,000	1957	2,525,340	7	1991	2,215,340
1952	598,000	92,000	690,000	1,276,000	64,000	1,340,000	1990	2,495,386	8	1953	2,191,000
1953	457,000	380,000	837,000	1,188,000	1,003,000	2,191,000	1987	2,428,644	9	1946	2,156,000
1954	3,704,101	416,402	4,120,503	779,350	474,065	1,253,415	1949	2,372,000	10	1949	2,054,000
1955	1,103,803	492,704	1,596,507	680,494	494,774	1,175,267	1991	2,336,391	11	1948	2,051,000
1956	515,774	268,064	783,838	303,177	247,474	550,652	1964	2,312,055	12	1945	1,981,000
1957	1,610,739	914,601	2,525,340	566,668	839,072	1,405,738	1978	2,299,662	13	1987	1,952,464
1958	1,881,826	1,591,997	3,473,823	1,559,946	3,046,578	4,606,524	1986	2,264,727	14	1947	1,942,000
1959	1,279,514	707,063	1,986,577	653,034	684,289	1,337,326	1992	2,220,265	15	1992	1,906,696
1960	1,096,226	595,785	1,692,011	845,465	473,986	1,319,450	1988	2,009,094	16	1988	1,761,931
1961	1,090,303	771,455	1,861,758	620,768	786,956	1,407,723	1959	1,986,577	17	1950	1,754,000
1962	841,972	527,290	1,369,262	515,482	396,565	912,048	1948	1,979,000	18	1986	1,748,591
1963	713,470	502,426	1,215,896	487,817	430,318	918,138	1975	1,974,648	19	1967	1,733,630
1964	1,602,311	709,744	2,312,055	675,919	692,882	1,368,802	1966	1,938,452	20	1975	1,662,148
1965	973,545	656,638	1,630,183	490,504	507,366	997,873	1967	1,931,281	21	1966	1,596,129
1966	1,249,166	689,286	1,938,452	1,002,479	593,653	1,596,129	1972	1,876,700	22	1979	1,566,852
1967	894,820	1,036,461	1,931,281	605,373	1,128,259	1,733,630	1961	1,861,758	23	1951	1,540,000
1968	933,727	570,101	1,503,828	876,137	574,792	1,450,927	1979	1,839,699	24	1974	1,517,156
1969	843,864	346,676	1,190,540	705,083	382,759	1,087,843	1980	1,738,551	25	1972	1,473,292
1970	844,695	297,120	1,141,815	620,385	283,218	903,604	1960	1,692,011	26	1968	1,450,927
1971	1,783,089	2,201,017	3,984,106	692,998	3,101,272	3,794,271	1965	1,630,183	27	1973	1,420,825
1972	1,307,088	569,612	1,876,700	802,803	670,492	1,473,292	1977	1,627,565	28	1961	1,407,723
1973	918,028	707,828	1,625,856	679,907	740,920	1,420,825	1973	1,625,856	29	1957	1,405,738
1974	3,029,423	287,805	3,317,228	1,211,470	305,682	1,517,156	1946	1,623,000	30	1964	1,368,802
1975	1,284,972	689,676	1,974,648	748,604	913,544	1,662,148	1955	1,596,507	31	1980	1,361,638
1976	1,607,050	1,062,184	2,669,234	773,967	1,693,211	2,467,179	1968	1,503,828	32	1952	1,340,000
1977	1,163,283	464,282	1,627,565	550,896	554,875	1,105,771	1985	1,467,746	33	1959	1,337,326
1978	1,743,638	556,024	2,299,662	1,517,216	801,281	2,318,495	1982	1,458,930	34	1960	1,319,450
1979	1,275,063	564,636	1,839,699	878,202	688,648	1,566,852	1993	1,431,890	35	1954	1,253,415
1980	1,329,313	409,238	1,738,551	817,103	544,535	1,361,638	1945	1,385,000	36	1955	1,175,267
1981	1,888,274	994,629	2,882,903	1,238,430	1,430,420	2,668,849	1962	1,369,262	37	1985	1,146,181
1982	1,118,780	340,150	1,458,930	664,349	338,840	1,003,190	1989	1,333,316	38	1977	1,105,771
1983	910,765	342,907	1,253,672	497,472	291,291	788,762	1984	1,320,549	39	1969	1,087,843
1984	1,086,407	234,142	1,320,549	775,321	243,487	1,018,806	1947	1,301,000	40	1984	1,018,806
1985	1,043,484	424,262	1,467,746	682,379	463,802	1,146,181	1950	1,283,000	41	1993	1,018,710
1986	1,887,478	377,249	2,264,727	1,208,462	540,129	1,748,591	1983	1,253,672	42	1982	1,003,190
1987	1,797,750	630,894	2,428,644	1,203,973	748,490	1,952,464	1994	1,219,854	43	1965	997,873
1988	1,469,121	539,973	2,009,094	929,864	831,771	1,761,931	1963	1,215,896	44	1963	918,138
1989	1,055,062	278,254	1,333,316	589,071	285,024	874,096	1969	1,190,540	45	1962	912,048
1990	2,076,817	418,569	2,495,386	1,728,668	498,141	2,226,809	1996	1,184,139	46	1970	903,604
1991	2,027,658	308,733	2,336,391	1,892,590	322,749	2,215,340	1970	1,141,815	47	1989	874,096
1992	1,702,861	517,404	2,220,265	1,283,085	623,610	1,906,696	1995	1,113,964	48	1983	788,762
1993	1,181,767	250,123	1,431,890	788,586	230,123	1,018,710	1951	1,062,000	49	1994	744,396
1994	924,654	295,200	1,219,854	488,813	255,581	744,396	1953	837,000	50	1996	701,431
1995	895,126	218,838	1,113,964	387,891	240,841	613,077	1956	783,838	51	1995	613,077
1996	956,466	227,673	1,184,139	441,577	259,854	701,431	1952	690,000	52	1956	550,652

Grande for both the United States and Mexico during the most recent drought, i. e., since 1993, have been some of the lowest experienced in the basin since 1945. For the United States, only the drought of the early 1950's exhibited lower inflows to the Rio Grande, and Mexico's inflows were lower only in 1956.

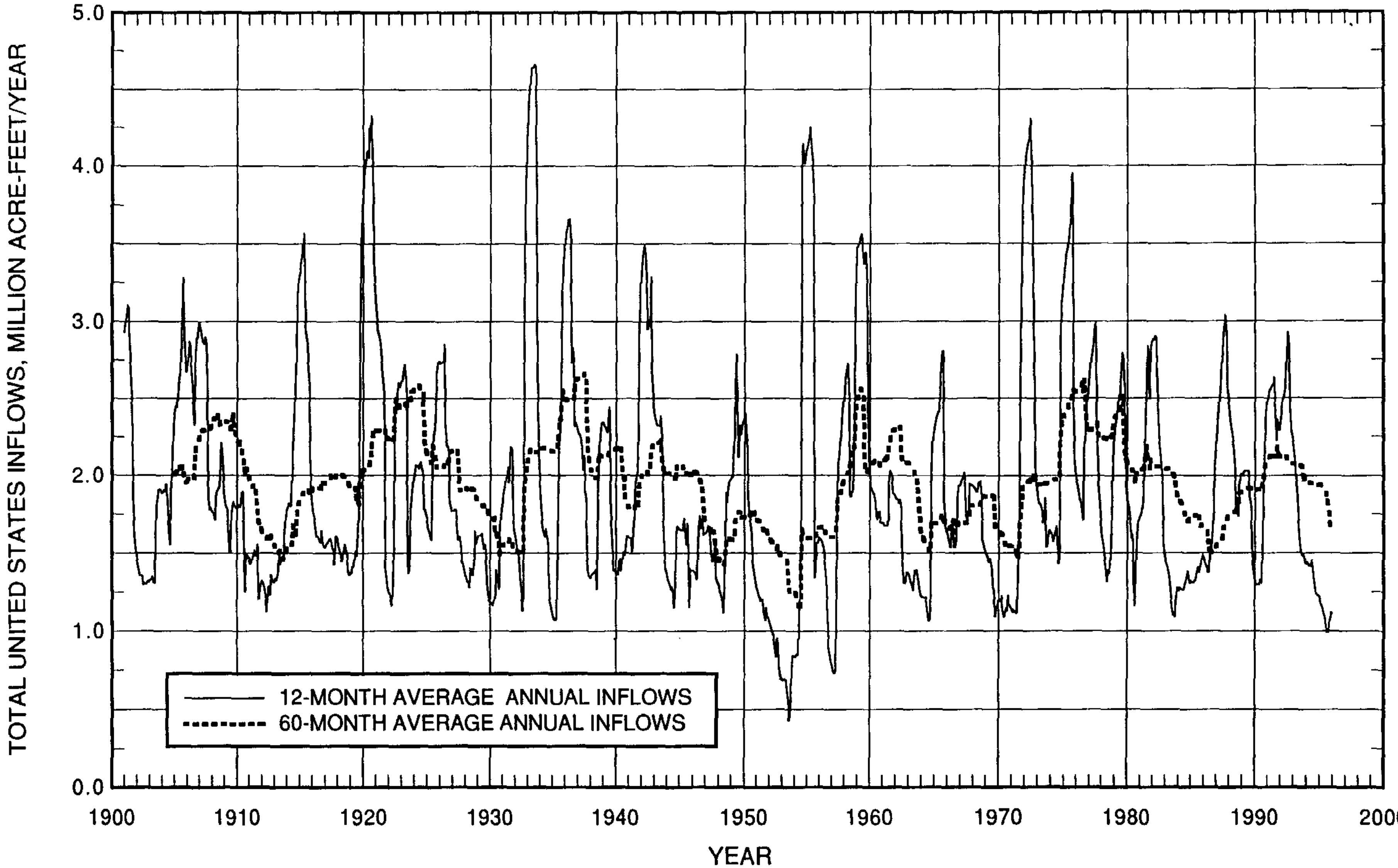
Another illustration of how the United States inflows to the Rio Grande have varied historically is presented in Figure 4-1. This graph plots the time variation of the 12-month average annual inflow and the 60-month average annual inflow for the total United States inflows to the Rio Grande beginning in the year 1900 and extending through 1996. These monthly inflow quantities are based on the same United States inflows used as input to the ROM as contained in Appendix 1 for the 1945-1996 period. For the period prior to 1945, monthly United States inflows extracted from the IBWC reservoir operations model of Amistad and Falcon Reservoirs previously referenced above have been used. The 12-month average annual inflows are indicative of relatively short-term inflow variations with regard to the available water supply from the Rio Grande, whereas the 60-month average annual inflows illustrate the more long-term trends in flow conditions. Of particular interest are the extended low-flow periods, such as during the early 1950's, when the United States' inflows remained depressed for several consecutive years. These conditions define the critical drought of record for the United States with regard to its inflows to the Rio Grande and the associated available water supply. The plot of the 60-month average annual inflows also illustrates the relative severity of the current drought in the Rio Grande basin for the United States compared to the record drought of the 1950's.

4.2 HISTORICAL MONTHLY RESERVOIR EVAPORATION

For simulations with the Amistad-Falcon ROM, evaporation losses from the reservoirs are determined each month by multiplying the surface area of the reservoirs times a gross reservoir evaporation rate. In these calculations, the surface area used is the average of the simulated reservoir surface areas at the beginning and the end of each month, and the gross evaporation rate is used because the inflow effects of direct rainfall on the reservoirs already are accounted for in the IBWC river inflow values.

For the 1945-1996 simulation period considered in this investigation, the monthly values of gross reservoir evaporation have been derived from two sources. Actual monthly pan evaporation data provided by the IBWC have been used to establish the reservoir evaporation rates since 1957 for Amistad Reservoir and since 1954 for Falcon Reservoir. These data reflect actual evaporation

FIGURE 4-1 12-MONTH AND 60-MONTH AVERAGE ANNUAL INFLOWS OF UNITED STATES WATER INTO AMISTAD AND FALCON RESERVOIRS



conditions at the reservoirs, and they have been adjusted to reservoir evaporation rates using pan evaporation coefficients provided by the IBWC. For the historical periods prior to these years, historical monthly gross reservoir evaporation rates developed by the TWDB[1] have been used. Specifically, the TWDB monthly evaporation rates for Quadrangles H-6 and K-8 have been used for Amistad Reservoir and for Falcon Reservoir, respectively.

The historical monthly gross reservoir evaporation rates for the entire simulation period, i. e., 1945-1996, as used in the ROM are presented in Table 4-2 for Amistad Reservoir and in Table 4-3 for Falcon Reservoir.

4.3 CURRENT AVERAGE ANNUAL WATER DEMANDS AND DIVERSIONS

For purposes of developing and operating the Amistad-Falcon ROM, typical water demands for the United States and Mexico have been developed and specified as inputs to the model. As noted previously in Section 3.6 and as indicated on the ROM link-node network diagram in Figure 2-1, the current version of the ROM has the capability to specify water demands for different types of uses and at different locations for each country.

To develop these demands, information describing historical monthly water usage and actual Falcon Reservoir monthly releases have been compiled from the records of the TWDB, the TNRCC Rio Grande Watermaster, and the IBWC. Based on these data, average annual demand quantities have been determined that are generally representative of the last five years for municipal use and the last ten years for irrigation use. For the Lower Rio Grande demands, the actual historical releases from Falcon Reservoir for each country have been used as the basis for establishing the annual water demands specified in the ROM for users downstream of Falcon Reservoir. The average monthly distributions of the various categories of annual water demands also have been derived from the historical data.

Results from the average historical water demand analyses for the Middle and Lower Rio Grande, including the average annual demands and their average monthly demand distributions, are summarized in Table 4-4. The average annual water demands and their node assignments as specified in the ROM for the different types of water uses and locations accounted for in the model are listed below.

[1] Texas Water Development Board; "Monthly Reservoir Evaporation Rates for Texas, 1940 Through 1965"; Report 64; October, 1967; Austin, Texas.

TABLE 4-2 HISTORICAL MONTHLY GROSS RESERVOIR EVAPORATION RATES USED IN ROM FOR AMISTAD RESERVOIR

(Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1945	0.26	0.28	0.54	0.64	0.87	1.06	0.76	1.17	0.88	0.38	0.39	0.37	7.60
1946	0.26	0.34	0.58	0.66	0.54	0.71	1.07	0.82	0.72	0.44	0.40	0.30	6.84
1947	0.23	0.33	0.42	0.58	0.76	0.91	1.15	0.92	0.86	0.73	0.38	0.25	7.52
1948	0.22	0.25	0.52	0.69	0.83	1.03	0.95	1.03	0.76	0.45	0.48	0.36	7.57
1949	0.13	0.26	0.47	0.51	0.62	0.85	0.93	0.76	0.75	0.43	0.43	0.29	6.43
1950	0.16	0.23	0.55	0.45	0.63	0.85	0.93	0.88	0.73	0.66	0.59	0.42	7.08
1951	0.37	0.29	0.45	0.58	0.61	0.65	1.09	1.13	0.94	0.73	0.46	0.38	7.68
1952	0.33	0.40	0.49	0.54	0.64	0.77	1.03	1.19	0.93	0.78	0.45	0.29	7.84
1953	0.43	0.38	0.37	0.70	0.83	1.05	1.24	1.08	0.80	0.66	0.46	0.35	8.35
1954	0.25	0.39	0.56	0.43	0.65	0.88	1.14	1.11	1.09	0.68	0.58	0.58	8.34
1955	0.27	0.34	0.55	0.62	0.75	0.87	1.19	0.93	0.71	0.93	0.53	0.40	8.09
1956	0.28	0.34	0.45	0.61	0.82	1.16	1.26	1.10	1.21	0.78	0.49	0.35	8.85
1957	0.28	0.28	0.53	0.55	0.52	0.77	1.23	1.21	0.71	0.48	0.23	0.30	7.09
1958	0.22	0.27	0.34	0.61	0.75	0.81	0.84	1.07	0.43	0.26	0.22	0.25	6.07
1959	0.27	0.24	0.54	0.54	0.66	0.79	0.78	0.66	0.75	0.45	0.33	0.28	6.29
1960	0.21	0.34	0.43	0.59	0.80	1.22	0.65	0.79	0.75	0.54	0.25	0.21	6.78
1961	0.21	0.24	0.53	0.72	0.78	0.77	0.76	0.69	0.69	0.40	0.35	0.28	6.42
1962	0.27	0.47	0.64	0.57	0.95	0.86	1.11	1.15	0.99	0.71	0.36	0.29	8.37
1963	0.31	0.37	0.61	0.61	0.64	0.77	1.03	1.01	0.75	0.60	0.40	0.20	7.30
1964	0.34	0.33	0.63	0.74	0.75	0.93	1.11	0.94	0.63	0.42	0.30	0.22	7.34
1965	0.29	0.24	0.42	0.61	0.50	0.71	0.99	0.91	0.68	0.49	0.29	0.22	6.35
1966	0.21	0.25	0.49	0.59	0.49	0.71	1.02	0.73	0.50	0.23	0.19	0.29	5.70
1967	0.30	0.33	0.53	0.58	0.88	1.01	1.12	0.85	0.49	0.51	0.25	0.24	7.09
1968	0.14	0.22	0.33	0.46	0.52	0.74	0.76	0.92	0.54	0.46	0.34	0.27	5.70
1969	0.23	0.28	0.56	0.58	0.66	0.83	1.07	0.97	0.55	0.37	0.22	0.16	6.48
1970	0.16	0.25	0.38	0.49	0.72	0.70	0.83	0.81	0.63	0.33	0.35	0.23	5.88

TABLE 4-2 CONT'D.

(Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1971	0.30	0.38	0.66	0.70	0.71	0.65	0.70	0.62	0.52	0.25	0.26	0.19	5.94
1972	0.24	0.27	0.54	0.70	0.57	0.76	0.83	0.62	0.58	0.40	0.32	0.24	6.07
1973	0.25	0.17	0.52	0.57	0.76	0.58	0.71	0.77	0.56	0.34	0.27	0.32	5.82
1974	0.25	0.42	0.40	0.73	0.70	0.96	0.99	0.73	0.50	0.39	0.23	0.22	6.52
1975	0.21	0.30	0.52	0.56	0.57	0.74	0.63	0.69	0.49	0.47	0.35	0.27	5.80
1976	0.27	0.39	0.52	0.48	0.49	0.79	0.59	0.71	0.53	0.37	0.20	0.18	5.52
1977	0.20	0.30	0.46	0.54	0.41	0.77	0.88	1.03	0.75	0.52	0.37	0.32	6.55
1978	0.24	0.25	0.55	0.68	0.69	0.86	0.95	0.76	0.45	0.33	0.20	0.23	6.19
1979	0.20	0.24	0.35	0.51	0.64	0.69	0.78	0.76	0.72	0.69	0.36	0.24	6.18
1980	0.24	0.31	0.55	0.76	0.65	0.92	1.11	0.88	0.62	0.47	0.28	0.18	6.97
1981	0.23	0.21	0.43	0.43	0.56	0.60	0.81	0.76	0.72	0.52	0.34	0.27	5.88
1982	0.28	0.28	0.37	0.57	0.58	0.79	0.94	0.94	0.81	0.56	0.34	0.23	6.69
1983	0.22	0.28	0.47	0.72	0.77	0.71	0.96	0.85	0.71	0.61	0.36	0.11	6.77
1984	0.20	0.39	0.54	0.90	0.85	0.85	0.97	1.00	0.85	0.38	0.33	0.21	7.47
1985	0.23	0.19	0.38	0.52	0.70	0.71	0.82	0.97	0.66	0.43	0.26	0.23	6.10
1986	0.25	0.38	0.69	0.67	0.72	0.60	1.05	0.88	0.53	0.27	0.20	0.19	6.43
1987	0.23	0.23	0.38	0.47	0.44	0.53	0.77	0.82	0.54	0.68	0.47	0.23	5.79
1988	0.21	0.28	0.58	0.71	0.71	0.77	0.79	0.79	0.73	0.38	0.40	0.24	6.59
1989	0.23	0.22	0.43	0.59	0.85	0.95	1.07	1.30	0.91	0.83	0.51	0.16	8.05
1990	0.35	0.45	0.49	0.52	0.75	1.24	0.80	0.76	0.53	0.50	0.30	0.35	7.04
1991	0.23	0.37	0.70	0.73	0.86	0.86	1.00	0.98	0.73	0.70	0.47	0.20	7.83
1992	0.19	0.30	0.43	0.53	0.73	0.78	0.92	0.83	0.81	0.69	0.41	0.25	6.87
1993	0.29	0.30	0.57	0.77	0.89	0.81	1.10	1.14	0.60	0.68	0.41	0.41	7.97
1994	0.34	0.33	0.55	0.67	0.65	1.15	1.11	1.16	0.70	0.55	0.34	0.28	7.83
1995	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32	8.46
1996	0.41	0.46	0.62	0.89	1.01	1.29	1.30	1.01	0.57	0.70	0.39	0.27	8.92

TABLE 4-3 HISTORICAL MONTHLY GROSS RESERVOIR EVAPORATION RATES USED IN ROM FOR FALCON RESERVOIR

(Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1945	0.34	0.41	0.52	0.58	0.83	0.92	1.03	0.94	1.02	0.77	0.65	0.51	8.52
1946	0.30	0.30	0.50	0.50	0.58	0.71	1.02	0.93	0.63	0.61	0.54	0.38	7.00
1947	0.31	0.36	0.48	0.52	0.67	0.91	1.03	0.78	0.95	0.78	0.58	0.24	7.61
1948	0.35	0.23	0.52	0.71	0.61	0.87	0.93	1.05	0.73	0.68	0.74	0.43	7.85
1949	0.32	0.20	0.34	0.37	0.56	0.73	0.88	0.88	0.68	0.65	0.55	0.35	6.51
1950	0.49	0.45	0.58	0.64	0.97	0.83	1.19	1.33	0.95	0.80	0.76	0.52	9.51
1951	0.53	0.51	0.60	0.62	0.69	0.84	1.14	0.95	0.93	0.86	0.58	0.51	8.76
1952	0.46	0.53	0.53	0.69	0.75	0.83	0.91	1.23	1.03	0.93	0.51	0.38	8.78
1953	0.44	0.37	0.49	0.61	0.67	0.97	1.04	0.99	0.92	0.66	0.54	0.39	8.09
1954	0.20	0.49	0.55	0.63	0.80	0.82	0.90	0.89	0.70	0.47	0.36	0.33	7.14
1955	0.31	0.28	0.56	0.63	0.80	0.89	0.96	0.84	0.51	0.55	0.38	0.25	6.96
1956	0.28	0.32	0.49	0.66	0.88	0.81	1.06	0.91	0.77	0.64	0.43	0.32	7.57
1957	0.28	0.37	0.61	0.57	0.68	0.75	1.01	0.94	0.68	0.49	0.39	0.33	7.10
1958	0.23	0.24	0.35	0.54	0.70	0.71	0.86	0.90	0.44	0.25	0.23	0.18	5.63
1959	0.18	0.16	0.40	0.47	0.75	0.76	0.86	0.36	0.67	0.44	0.31	0.27	5.63
1960	0.18	0.35	0.37	0.53	0.71	0.83	0.98	0.76	0.49	0.43	0.23	0.15	6.01
1961	0.17	0.32	0.57	0.72	0.77	0.78	0.87	0.69	0.57	0.43	0.24	0.19	6.32
1962	0.28	0.43	0.55	0.63	0.86	0.79	1.04	0.91	0.65	0.56	0.34	0.21	7.25
1963	0.24	0.36	0.58	0.71	0.66	0.81	0.90	0.96	0.61	0.47	0.38	0.17	6.85
1964	0.28	0.30	0.51	0.62	0.67	0.72	0.89	1.00	0.64	0.46	0.34	0.22	6.65
1965	0.30	0.30	0.43	0.57	0.65	0.89	1.01	0.84	0.72	0.39	0.28	0.18	6.56
1966	0.15	0.20	0.38	0.54	0.50	0.58	0.78	0.80	0.58	0.44	0.40	0.31	5.66
1967	0.26	0.32	0.53	0.74	0.77	0.88	1.04	0.72	0.43	0.35	0.17	0.18	6.39
1968	0.16	0.21	0.39	0.41	0.55	0.69	0.66	0.77	0.42	0.37	0.31	0.27	5.21
1969	0.22	0.23	0.47	0.55	0.66	0.73	0.98	0.75	0.51	0.45	0.29	0.20	6.04
1970	0.15	0.26	0.45	0.59	0.62	0.72	0.77	0.76	0.55	0.39	0.37	0.29	5.92

TABLE 4-3 CONT'D.

(Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1971	0.33	0.40	0.63	0.72	0.74	0.84	0.87	0.61	0.54	0.32	0.29	0.20	6.49
1972	0.24	0.28	0.43	0.64	0.49	0.57	0.63	0.75	0.59	0.39	0.23	0.20	5.43
1973	0.21	0.19	0.43	0.45	0.62	0.64	0.70	0.55	0.48	0.33	0.26	0.27	5.12
1974	0.18	0.39	0.43	0.55	0.64	0.76	0.84	0.86	0.54	0.41	0.27	0.17	6.03
1975	0.26	0.30	0.51	0.58	0.60	0.72	0.67	0.55	0.39	0.41	0.37	0.25	5.61
1976	0.25	0.41	0.41	0.48	0.53	0.72	0.55	0.66	0.50	0.33	0.14	0.15	5.12
1977	0.13	0.28	0.41	0.50	0.55	0.71	0.84	0.81	0.56	0.39	0.31	0.25	5.73
1978	0.18	0.23	0.53	0.61	0.67	0.77	0.91	0.77	0.41	0.29	0.21	0.21	5.78
1979	0.20	0.22	0.42	0.47	0.67	0.72	0.79	0.78	0.46	0.52	0.33	0.17	5.76
1980	0.19	0.20	0.45	0.60	0.59	0.94	0.98	0.71	0.64	0.43	0.27	0.17	6.18
1981	0.16	0.20	0.37	0.40	0.50	0.53	0.69	0.63	0.49	0.41	0.28	0.22	4.88
1982	0.28	0.22	0.39	0.45	0.39	0.69	0.89	0.79	0.61	0.38	0.26	0.22	5.56
1983	0.17	0.25	0.44	0.63	0.58	0.68	0.64	0.69	0.53	0.42	0.34	0.19	5.55
1984	0.14	0.34	0.51	0.57	0.68	0.76	0.80	0.84	0.50	0.35	0.33	0.23	6.04
1985	0.17	0.21	0.44	0.50	0.57	0.68	0.80	0.85	0.64	0.46	0.30	0.19	5.80
1986	0.24	0.33	0.59	0.51	0.59	0.59	0.86	0.80	0.62	0.39	0.20	0.14	5.85
1987	0.21	0.27	0.33	0.45	0.51	0.57	0.75	0.81	0.53	0.48	0.29	0.20	5.40
1988	0.21	0.23	0.47	0.55	0.61	0.74	0.78	0.62	0.51	0.42	0.33	0.25	5.73
1989	0.22	0.25	0.54	0.55	0.76	0.80	0.83	0.71	0.63	0.48	0.31	0.21	6.30
1990	0.31	0.33	0.41	0.48	0.71	0.93	0.87	0.76	0.48	0.48	0.32	0.27	6.38
1991	0.19	0.28	0.60	0.55	0.61	0.71	0.68	0.81	0.41	0.42	0.26	0.20	5.71
1992	0.15	0.24	0.34	0.43	0.47	0.67	0.92	0.74	0.63	0.43	0.28	0.20	5.49
1993	0.20	0.24	0.37	0.58	0.65	0.57	0.87	0.88	0.54	0.46	0.27	0.27	5.92
1994	0.26	0.28	0.49	0.50	0.62	0.74	1.00	0.72	0.57	0.45	0.35	0.23	6.21
1995	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20	6.12
1996	0.28	0.34	0.51	0.67	0.81	0.87	0.99	0.69	0.56	0.39	0.34	0.24	6.69

TABLE 4-4 SUMMARY OF CURRENT WATER DEMANDS AND DIVERSIONS FOR THE MIDDLE AND LOWER RIO GRANDE

UNITED STATES DEMANDS AND DIVERSIONS FROM THE MIDDLE RIO GRANDE

DOMESTIC, MUNICIPAL AND INDUSTRIAL USE [1]

Average Annual Demand: 34,044 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6.11%	6.10%	7.60%	8.26%	8.92%	9.61%	10.86%	11.08%	8.80%	8.51%	7.24%	6.91%

IRRIGATION AND MINING USE [2,3]

Average Annual Demand: 126,804 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4.25%	4.09%	9.27%	10.20%	8.35%	10.39%	11.86%	13.66%	8.07%	8.09%	6.66%	5.11%

DATA BASE:

[1] Historical Monthly Surface Water Diversions for Seven Cities in the Middle Rio Grande Basin for 1985-1994 10-Year Period as Reported by IBWC in 1996 (Eagle Pass, Del Mar, Laredo, San Ygnacio, Rio Bravo, New Zapata and Falcon Village)

[2] Historical Monthly Surface Water Diversions and Return Flows for Maverick Canal and Power Plant for 1985-1994 10-Year Period as Reported by IBWC in 1996

[3] Historical Monthly Surface Water Diversions for Other United States Irrigators in the Middle Rio Grande Basin for 1985-1994 10-Year Period as Reported by IBWC in 1996

TABLE 4-4, CONT'D.

UNITED STATES RELEASES FROM FALCON RESERVOIR TO THE LOWER RIO GRANDE

DOMESTIC, MUNICIPAL AND INDUSTRIAL USE [1,2,3]

Average Annual Demand: 125,412 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7.20%	6.66%	7.77%	8.94%	8.66%	9.00%	10.04%	10.39%	8.50%	8.03%	7.44%	7.38%

IRRIGATION AND MINING USE [1,2]

Average Annual Demand: 1,078,030 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7.47%	4.41%	7.80%	14.37%	13.42%	12.66%	10.63%	9.67%	5.71%	5.93%	4.02%	3.91%

DATA BASE:

[1] IBWC-Reported Historical Monthly United States Falcon Reservoir Releases for Non-Floodspill Years (1980, 1984, 1985, 1986, 1989, 1990 and 1993)

[2] TWDB-Reported Historical Annual Surface Water Use for Cameron, Willacy, Hidalgo and Starr Counties for Falcon Reservoir Non-Floodspill Years (1980, 1984, 1985, 1986, 1989, 1990 and 1993)

[3] TWDB-Reported Historical Monthly Surface Water Use for Nine Selected Cities in Lower Rio Grande Valley for Falcon Reservoir Non-Floodspill Years (1980, 1984, 1985, 1986, 1989, 1990 and 1993) (McAllen, Edinburg, Weslaco, Mercedes, Harlingen, San Benito, Brownsville, Mission and Donna)

TABLE 4-4, CONT'D.

MEXICO DEMANDS AND DIVERSIONS FROM THE MIDDLE RIO GRANDE

DOMESTIC, MUNICIPAL, INDUSTRIAL AND IRRIGATION USE [1,2]

Average Annual Demand: 65,819 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7.85%	7.27%	7.45%	8.49%	7.99%	8.30%	9.15%	9.10%	8.96%	8.60%	8.25%	8.59%

DATA BASE: [1] Historical Monthly Surface Water Diversions for Four Selected Cities in the Middle Rio Grande Basin
for 1985-1994 10-Year Period as Reported by IBWC in 1996
(Ciudad Acuna, Piedras Negras, Nuevo Laredo and Nueva Cd. Guerrero)
[2] Historical Monthly Surface Water Diversions for Other Mexico Irrigators in the Middle Rio Grande Basin
for 1985-1994 10-Year Period as Reported by IBWC in 1996

MEXICO RELEASES FROM FALCON RESERVOIR TO THE LOWER RIO GRANDE

DOMESTIC, MUNICIPAL, INDUSTRIAL AND IRRIGATION USE [1]

Average Annual Demand: 1,223,672 Acre-Feet

Percentage Monthly Demand Distribution:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
16.20%	6.49%	2.43%	24.13%	26.51%	6.53%	2.95%	5.92%	2.27%	3.44%	1.21%	1.92%

DATA BASE: [1] IBWC-Reported Historical Monthly Mexico Falcon Reservoir Releases for Non-Floodspill Years
(1980, 1984, 1985, 1986, 1989, 1990 and 1993)

		AVERAGE DEMAND Acre-Feet/Year
For the United States:		
Node 2	United States total municipal water demand below Falcon Reservoir	125,000
Node 5	United States total municipal water demand between Amistad and Falcon Reservoirs	34,000
Node 6	United States total irrigation water demand between Amistad and Falcon Reservoirs	127,000
Node 7	United States total irrigation water demand below Falcon Reservoir	1,078,000
For Mexico:		
Node 4	Mexican total municipal and irrigation water demand below Falcon Reservoir	1,224,000
Node 8	Mexican total municipal and irrigation water demand between Amistad and Falcon Reservoirs	66,000

It should be noted that the ROM has the capability to accept as input data specified monthly water demands at any node. For example, if, during a particular simulation, it is desired to specify individual monthly values of water demand at any or all demand nodes in the model, this can be accomplished by appropriately including such monthly demands in the data input file as discrete values. However, for the 1945-1996 simulation period that has been used for operating the Amistad-Falcon ROM, complete historical water use data are not available for developing the entire array of actual monthly water demands for each node in the model. Actually, the historical monthly water demands are not required for the types of model development, testing and operational simulations that have been performed to date in this study. As an alternative, the average annual water demands for each node as listed above have been specified in the model with the corresponding monthly demand distributions. These data then have been used in the ROM to calculate the required monthly demands at each node, with the 12-month sets of demands repeated for each node for each year of the 1945-1996 simulation period.

Another point to note relates to the demands that are specified in the ROM for purposes of simulating storage variations in Amistad and Falcon Reservoirs for each country. For the water demands in the Lower Rio Grande basin below Falcon Reservoir, the releases from Falcon Reservoir actually are specified in the ROM, as opposed to the downstream river diversions. Referring to the ROM link-node network in Figure 2-1, these demands are specified at Nodes 2 and

7 for the United States and at Node 4 for Mexico. However, for purposes of water accounting and allocating the United States storage in the reservoirs each month to the different reserves and storage accounts prescribed under the TNRCC Rio Grande operating rules, the amounts of the actual river diversions, and not the reservoir releases, are required.

In the real system, the historical differences between the quantities of river diversions that are actually made along the Lower Rio Grande and the corresponding amounts of releases from Falcon Reservoir that are made to satisfy the downstream diversions are attributable primarily to such channel losses as seepage, evaporation and unauthorized pumping. Results from analyses of historical annual quantities of corresponding river diversions and Falcon Reservoir releases for the Lower Rio Grande and other information from the IBWC and the Rio Grande Watermaster[2] indicate that channel losses along the Lower Rio Grande typically range from near zero up to about fifteen percent of the flow in the river. Therefore, for purposes of the water accounting process incorporated in the ROM, channel losses in the Lower Rio Grande have been assumed to average eight percent of the releases from Falcon Reservoir, i. e., of the demands specified at Nodes 2, 4 and 7. Consequently, the amounts used for river diversions in the Lower Rio Grande in debiting the total irrigation and mining account balance are calculated as 92 percent of the United States irrigation demand specified at Node 7, i. e., the Falcon Reservoir release amount. Channel losses for the Middle Rio Grande are not considered in the water accounting process in the ROM because the Middle Rio Grande water demands specified in the ROM for the United States at Nodes 5 and 6 reflect actual river diversions, and not reservoir releases.

4.4 1995-1996 MONTHLY TOTAL WATER DEMANDS AND DIVERSIONS

For testing the simulation accuracy of the Amistad-Falcon ROM, actual historical hydrologic and demand conditions as they occurred during the drought period covered by calendar years 1995 and 1996 have been used. For these simulations, the actual quantities of historical water use by category and location and the corresponding Falcon Reservoir releases as reported by the TWDB, the TNRCC Rio Grande Watermaster and the IBWC have been examined to develop the monthly water demands required at each of the nodes in the model. These historical monthly water demands for 1995 and 1996 for the United States and for Mexico for the different use categories and locations (nodes) specified in the ROM are listed in Table 4-5.

[2] International Boundary and Water Commission, United States Section; "An Appraisal of Potential Rio Grande Channel Dams In Hidalgo and Cameron Counties, Texas for Water Conservation"; Prepared for the Texas Department of Water Resources; April, 1983; El Paso, Texas.

TABLE 4-5 SUMMARY OF 1995-1996 MONTHLY WATER DEMANDS FOR THE MIDDLE AND LOWER RIO GRANDE

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
UNITED STATES													
NODE 2. TOTAL MUNICIPAL WATER DEMAND BELOW FALCON RESERVOIR													
1995	8,653	14,554	8,368	10,116	19,233	8,356	12,953	6,731	6,530	6,620	3,677	4,954	110,745
1996	5,465	13,419	12,802	12,175	13,569	9,763	10,263	7,648	4,598	5,496	9,263	8,122	112,583
NODE 5. TOTAL MUNICIPAL WATER DEMAND BETWEEN AMISTAD AND FALCON RESERVOIRS													
1995	1,497	1,574	1,813	2,167	2,451	2,463	2,503	2,402	1,956	2,185	2,053	1,497	24,561
1996	1,667	1,839	2,112	2,398	2,775	2,653	2,730	2,192	1,739	2,018	2,232	1,495	25,850
NODE 6. TOTAL IRRIGATION WATER DEMAND BETWEEN AMISTAD AND FALCON RESERVOIRS													
1995	5,251	5,100	5,363	12,485	10,532	9,950	9,481	12,808	6,404	3,923	1,728	6,219	89,244
1996	6,010	5,005	12,205	9,892	10,583	10,499	11,511	14,169	6,629	6,244	5,387	3,839	101,973
NODE 7. TOTAL IRRIGATION WATER DEMAND BELOW FALCON RESERVOIRS													
1995	80,060	84,616	74,419	136,002	254,151	106,440	118,448	50,237	37,578	43,027	16,967	21,736	1,023,681
1996	50,561	78,014	113,855	163,689	179,310	124,367	93,601	57,084	26,457	35,723	42,746	35,628	1,001,035
MEXICO													
NODE 4. TOTAL MUNICIPAL AND IRRIGATION WATER DEMANDS BELOW FALCON RESERVOIR													
1995	179,835	46,531	78,080	300,801	126,402	1,605	4,452	4,630	245	3,266	2,976	5,720	754,543
1996	6,132	4,994	7,634	166,134	27,162	15,935	14,526	9,411	2,981	3,603	16,832	4,263	279,607
NODE 8. TOTAL MUNICIPAL AND IRRIGATION WATER DEMANDS BETWEEN AMISTAD AND FALCON RESERVOIRS													
1995	6,435	6,547	9,564	10,222	11,766	5,998	5,967	6,047	5,890	6,568	6,128	5,901	87,033
1996	6,176	5,978	6,963	9,743	9,445	6,740	7,105	6,903	6,209	6,593	6,045	5,486	83,386

4.5 1995-1996 MONTHLY DEMANDS FOR INDIVIDUAL WATER RIGHTS

In Phase II of this modeling effort, the Amistad-Falcon ROM has been extended to include the capability to simulate water accounting for individual water rights pursuant to the TNRCC Rio Grande operating rules. As described previously, the current version of the ROM now performs monthly accounting for up to three individual water rights owners, each with a municipal water right, a Class A irrigation or mining water right and a Class B irrigation or mining water right. In order to simulate the water accounting for these water rights, certain information must be included in the ROM data input file. This includes the maximum annual authorized diversion amount for each type of water right and the monthly demands over the simulation period for each type of water right.

For purposes of demonstrating the individual water rights accounting capability of the ROM, three existing water rights owners in the Lower Rio Grande basin, each with a municipal water right and Class A and Class B irrigation water rights, have been selected. These water rights owners are listed in Table 4-6, along with pertinent characteristics regarding their individual water rights and the actual monthly diversion amounts for the 1995-1996 period as used in the modeling analysis. These data have been compiled from the monthly water accounting reports that are regularly prepared and issued by the Rio Grande Watermaster's Office.

For the long-term 1945-1996 ROM simulations, the annual demands for the selected individual water rights have been set equal to their respective authorized annual diversion amounts as listed in Table 4-6. These annual demands then have been distributed to monthly values using the Lower Rio Grande current average monthly demand factors for municipal uses and for irrigation uses presented in Table 4-4. These 12-month sets of water demands for each of the individual water rights, which are listed in Table 4-7, then have been repeated in the ROM each year over the entire 1945-1996 simulation period.

4.6 MINIMUM RELEASES FROM AMISTAD RESERVOIR

Discussions with representatives from the IBWC and the TNRCC Rio Grande Watermaster's Office indicate that historically certain minimum releases have been made from Amistad Reservoir generally to supply downstream water demands along the river and/or to generate hydropower electricity. However, specific procedures regarding how much water is released and when by each country are not documented and do not appear to be standardized. There is some indication, based

TABLE 4-6 INDIVIDUAL WATER RIGHTS AND ACTUAL MONTHLY DEMANDS USED IN 1995-1996 ROM SIMULATIONS

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
UNITED IRRIGATION DISTRICT													
MUNICIPAL WATER RIGHT, ADJ. NO. 0849-000									AUTHORIZED ANNUAL DIVERSION:				5,300
1995	489	657	595	874	766	657	642	496	125	0	0	0	5,301
1996	599	748	790	695	874	1,017	575	0	0	0	0	0	5,298
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. A847-001									AUTHORIZED ANNUAL DIVERSION:				69,464
1995	756	2,371	2,179	4,283	4,387	26,188	3,734	2,110	2,148	3,016	149	1,336	52,657
1996	1,367	3,377	5,238	3,880	3,858	5,441	3,730	3,257	1,435	1,822	2,897	533	36,835
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. B769-00									AUTHORIZED ANNUAL DIVERSION:				4,009
1995	100	300	226	191	120	108	74	27	24	178	16	60	1,424
1996	0	0	0	410	52	20	0	0	0	0	0	0	482
SANTA CRUZ IRRIGATION DISTRICT NO. 15													
MUNICIPAL WATER RIGHT, ADJ. NO. 0240-000									AUTHORIZED ANNUAL DIVERSION:				3,967
1995	239	145	182	248	308	589	406	613	499	268	289	100	3,886
1996	354	437	463	443	706	702	761	0	0	0	0	133	3,999
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. 0810-000									AUTHORIZED ANNUAL DIVERSION:				4,857
1995	187	87	82	53	268	118	230	24	69	254	0	0	1,372
1996	131	151	226	189	252	96	1,111	113	45	206	148	70	2,738
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. B804-00									AUTHORIZED ANNUAL DIVERSION:				4,828
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	1,949	2,879	0	0	0	0	0	0	4,828

TABLE 4-6, cont'd.

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
HIDALGO COUNTY IRRIGATION DISTRICT NO. 2													
MUNICIPAL WATER RIGHT, ADJ. NO. 0808-001									AUTHORIZED ANNUAL DIVERSION:				6,140
1995	0	0	3	100	56	90	181	120	0	0	1,377	1,843	3,770
1996	0	0	941	507	733	724	556	426	241	242	803	967	6,140
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. 0808-005									AUTHORIZED ANNUAL DIVERSION:				147,775
1995	2,663	8,039	8,845	10,112	17,240	7,093	11,385	4,441	5,227	4,099	97	0	79,241
1996	3,998	7,202	9,636	9,490	13,280	14,946	7,571	0	2,405	2,132	3,234	2,293	76,187
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. 0573-001									AUTHORIZED ANNUAL DIVERSION:				470
1995	0	48	0	0	0	0	0	0	28	0	0	0	76
1996	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4-7 MONTHLY DEMANDS FOR INDIVIDUAL WATER RIGHTS BASED ON DISTRIBUTED ANNUAL AUTHORIZED DIVERSIONS

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
UNITED IRRIGATION DISTRICT													
MUNICIPAL WATER RIGHT, ADJ. NO. 0849-000													
	382	353	412	474	459	477	532	550	450	426	394	391	5,300
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. A847-001													
	5,189	3,063	5,418	9,982	9,322	8,794	7,384	6,717	3,967	4,119	2,793	2,716	69,464
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. B769-00													
	299	177	313	576	538	507	426	388	229	238	161	157	4,009
SANTA CRUZ IRRIGATION DISTRICT NO. 15													
MUNICIPAL WATER RIGHT, ADJ. NO. 0240-000													
	286	264	308	355	343	357	398	412	337	319	295	293	3,967
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. 0810-000													
	363	214	379	698	652	615	516	470	277	288	195	190	4,857
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. B804-00													
	361	213	376	694	648	611	513	467	276	286	194	189	4,828
HIDALGO COUNTY IRRIGATION DISTRICT NO. 2													
MUNICIPAL WATER RIGHT, ADJ. NO. 0808-001													
	442	409	477	549	532	553	616	637	522	493	457	453	6,140
CLASS A IRRIGATION WATER RIGHT, ADJ. NO. 0808-005													
	11,039	6,517	11,526	21,235	19,831	18,708	15,709	14,290	8,438	8,763	5,941	5,778	147,775
CLASS B IRRIGATION WATER RIGHT, ADJ. NO. 0573-001													
	35	21	37	68	63	59	50	45	27	28	19	18	470

on information from IBWC and the Rio Grande Watermaster's Office, that in the early to mid 1990's under relatively normal hydrologic conditions the minimum release by the United States was on the order of 25 cubic meters per second (880 cfs) and the minimum release by Mexico was about 10 cubic meters per second (350 cfs). Because of the uncertainties regarding current minimum release procedures, all of the long-term simulations with the ROM, i. e., the 1945-1996 simulations, have been made with no minimum releases specified for Amistad Reservoir. Monthly releases from Amistad Reservoir for each country, therefore, have been simulated by the ROM based solely on downstream water demands and/or storage requirements in Falcon Reservoir, with no consideration of minimum release amounts.

For some simulations with the ROM, the actual historical monthly releases from Amistad Reservoir for specific periods, such the 1995-1996 simulation period, have been specified in the model. These historical release data have been obtained from the records of IBWC. For the 1995-1996 period, they are listed in Table 4-8 for both the United States and Mexico. It is interesting to note that the actual monthly releases from Amistad Reservoir for the United States in 1995 and 1996 were somewhat greater than the minimum releases indicated above corresponding to normal hydrologic conditions. The higher water demands downstream during this drought period and the relatively low storage in Falcon Reservoir are obvious reasons for these higher-than-normal releases.

Mexico's actual monthly releases from Amistad Reservoir during January through May of 1995 were significantly greater the normal minimum releases indicated above, but beginning in June and continuing throughout 1995 and 1996, Mexico's actual releases were about equal to or somewhat less than the normal minimum release amounts. Mexico's available storage in both Amistad and Falcon Reservoirs reached critically low levels in about mid-1995, at which time, out of necessity to extend its available water supply, Mexico substantially reduced its overall water deliveries, particularly for irrigation. Hence, Mexico reduced its Amistad releases.

4.7 STORAGE ACCOUNTS FOR TOTAL WATER RIGHTS

For performing water accounting in accordance with the TNRCC Rio Grande operating rules, the Amistad-Falcon ROM requires that the authorized amounts of Texas water rights (annual diversion amounts) on the Middle and Lower Rio Grande be specified as input data. This includes the annual authorized (permitted) diversion amounts for: (1) total domestic, municipal and industrial water rights; (2) total Class A irrigation and mining water rights on the Middle Rio Grande; (3) total Class

TABLE 4-8 HISTORICAL 1995-1996 MONTHLY RELEASES FROM AMISTAD RESERVOIR FOR THE UNITED STATES AND MEXICO

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
UNITED STATES													
1995	67,452	61,300	69,425	58,726	69,665	69,639	68,000	66,034	66,317	65,061	63,354	66,114	791,087
1996	65,689	54,830	57,313	89,764	154,787	147,757	63,930	64,243	60,874	60,473	61,433	68,800	949,893
MEXICO													
1995	32,953	29,947	92,837	177,441	120,667	21,894	21,502	21,083	21,229	20,803	20,346	21,311	602,013
1996	14,911	10,155	11,408	13,681	14,033	11,206	11,605	11,731	11,288	11,433	11,727	12,102	145,280

B irrigation and mining water rights on the Middle Rio Grande; (4) total Class A irrigation and mining water rights on the Lower Rio Grande; and (5) total Class B irrigation and mining water rights on the Lower Rio Grande. The Rio Grande Watermaster's office maintains records of the current amounts of authorized diversions for all water rights in the Texas portion of the Rio Grande basin.

As of January, 1998,[3] the amounts listed in the following table reflect the total authorized annual diversions from the Middle and Lower Rio Grande for all existing water rights on record according to the Rio Grande Watermaster's Office. These total amounts have been used for all ROM simulations in this study.

WATER RIGHTS CLASSIFICATION	MIDDLE RIO GRANDE Acre-Feet	LOWER RIO GRANDE Acre-Feet
Municipal & Domestic	51,931.583	208,485.110
Industrial	2,308.120	8,854.505
Irrigation (Class A)	161,550.943	1,500,319.364
Irrigation (Class B)	17,254.382	195,369.119
Mining (Class A)	1,252.177	400.000
Mining (Class B)	1,472.900	139.875
Total Authorized Diversions	235,770.105	1,913,567.973

It should be noted that, in addition to these water rights, there are also significant hydropower water rights associated with Amistad and Falcon Reservoirs, as well as, other facilities. However, since hydroelectric power is generated by run-of-the-river water or by water released from reservoir storage for other downstream uses, the total quantity of water rights attributed to hydropower generation reflects only an accumulation of the permitted use of water and does not represent consumptive use.

Excluding hydropower uses, it is apparent that the vast majority of all of the existing water rights on the Middle and Lower Rio Grande are used for irrigation purposes, whereas, municipal uses comprise less than ten percent of the total amounts authorized. Historically, irrigation demands in the basin have been on the order of about a million acre-feet per year, which represents about forty-five percent of the total authorized irrigation diversions.

[3] Rio Grande Watermaster, Texas Natural Resource Conservation Commission; Copies of Monthly Accounting Reports; Provided to R. J. Brandes Company; January, 1998; McAllen, Texas.

In addition to the above authorized diversion amounts for existing water rights, information on the initial total storage balance for the combined irrigation and mining accounts is required as input to the ROM. Again, such information is available from the Rio Grande Watermaster's Office and has been obtained for purposes of this study. For all of the long-term simulations using the 1945-1996 data base, the initial storage balance for the combined irrigation and mining accounts has been set equal to the maximum allowed under current TNRCC rules because both Amistad and Falcon Reservoirs are assumed to be full at the beginning of these simulation periods. This storage balance amount is equal to 1.41 times the total authorized annual diversion amounts of all irrigation and mining water rights[4], i. e., 1.41 x (161,551 + 1,500,319 + 17,254 + 195,369 + 1,252 + 400 + 1,473 + 140) = 2,647,639 acre-feet.

For the 1995-1996 ROM simulations, the actual storage balance of the combined irrigation and mining accounts as of the end of December, 1994, has been used as the initial storage balance condition. Based on information provided by the Rio Grande Watermaster's Office[5], the December, 1994, irrigation and mining storage balance specified in the ROM is 1,747,743 acre-feet.

4.8 STORAGE ACCOUNTS FOR INDIVIDUAL WATER RIGHTS

For the ROM simulations of water accounting for the three individual water rights owners over the 1995-1996 period, the beginning storage balances of their Class A and Class B irrigation and mining water rights also must be specified in the ROM data input file at the beginning of the simulation period. These storage balances have been obtained from the records of the Rio Grande Watermaster as of the end of December, 1994, and they are listed in Table 4-9 for each of the three selected water rights owners and their individual irrigation accounts.

4.9 SAMPLE ROM DATA INPUT FILE LISTING

Presented in Table 4-10 is a sample of the data input file required by the Amistad-Falcon ROM. This particular data input file corresponds to the test case simulation based on actual 1995 and 1996 hydrologic and water demand conditions for both the United States and Mexico. This case is referred to as the "1995-1998" simulation because the basic 1995 input data are repeated for

[4] "Chapter 303: Operation of the Rio Grande"; 31 Texas Administrative Code, §303.22(d); Texas Water Commission Rules; August 26, 1987; Austin, Texas.

[5] Rio Grande Watermaster, Texas Natural Resource Conservation Commission; Fax Report of 1995 Irrigation and Mining Account Storage Balances, Lower and Middle Rio Grande Segments; Provided to R. J. Brandes Company; July 29, 1996; McAllen, Texas.

TABLE 4-9 - STORAGE BALANCES FOR INDIVIDUAL IRRIGATION ACCOUNTS

	DECEMBER 1994 STORAGE BALANCE Acre-Feet
UNITED IRRIGATION DISTRICT	
Class A Irrigation Water Right, Adj. No. A847-001	87,300
Class B Irrigation Water Right, Adj. No. B769-00	3,331
SANTA CRUZ IRRIGATION DISTRICT NO. 15	
Class A Irrigation Water Right, Adj. No. 0810-000	6,599
Class B Irrigation Water Right, Adj. No. B804-00	6,807
HIDALGO COUNTY IRRIGATION DISTRICT NO. 2	
Class A Irrigation Water Right, Adj. No. 0808-005	150,104
Class B Irrigation Water Right, Adj. No. 0573-001	14

TABLE 4-10 DATA INPUT FILE LISTING FOR 1995-1998 ROM SIMULATION

```
CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS
 TEST ROM SIMULATION WITH ACTUAL MONTHLY DEMANDS AND AMISTAD RESERVOIR RELEASES
CARD 01  NJ - NUMBER OF NODES IN THE MODEL NETWORK                                    8
CARD 02  NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK                             4
CARD 03  NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK                      8
CARD 04  NR - NUMBER OF LINKS THAT ARE RIVER REACHES                                  8
CARD 05  NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD                          04
CARD 06  ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK                             8
CARD 07  NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK                         2
CARD 08  IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD                      1995
CARD 09  IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT                           1
CARD 10  ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT                             04
CARD 11  INPUT DATA SOURCE ("CARD" OR "TAPE")                                      CARD
CARD 12  FIRM ANNUAL YIELD ITERATION CONVERGENCE LIMIT                            0.040
CARD 13  IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT                 1
CARD 14  IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS                     1948
CARD 15  IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS                        1972
CARD 16  IFLYLD=0, NO FAY; IFLYLD =1, DETERMINE FAY FOR CRITICAL PERIOD               0
CARD 17  MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS               271579
CARD 18  MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE             1696228
CARD 19  MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE           1500719
CARD 20  MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE            195509
CARD 21  MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE             181530
CARD 22  MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE           162803
CARD 23  MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE            18727
CARD 24  MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL           225000
CARD 25  IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE            1747743
CARD 26  NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING                 3
CARD 27  IRLFLG=0, READ ALL MONTHLY RELEASES; =1, READ AVG. MON RELEASES              0
CARD 28  IWRFLG=0, READ ALL MONTHLY DEMANDS;  =1, READ AVG. MON DEMANDS               0
U.S. AMISTAD    1   1827241   1771041     1771   1205614
U.S. FALCON     2   1613729   1555129     1555    937652
MEX AMISTAD     3   1424078   1380278     1380    420666
MEX FALCON      4   1140074   1098674     1099    320826
U.S.MRG MUNI    5         0         0        0
U.S.MRG IRRI    6         0         0        0
U.S.LRG IRRI    7         0         0        0
MEX MRG M&IR    8         0         0        0
SPILL RESR    2    4
AMISTAD       1    1     930.0       0        0
AMISTAD       1    2     945.0       5        1
AMISTAD       1    3     946.5      87      294
AMISTAD       1    4     948.2     180      823
AMISTAD       1    5     949.1     237     1180
AMISTAD       1    6     950.1     297     1684
AMISTAD       1    7     951.4     376     2782
AMISTAD       1    8     961.3    1045    13873
AMISTAD       1    9     971.1    1843    33110
AMISTAD       1   10     981.0    2770    59404
AMISTAD       1   11     990.8    3823    93556
AMISTAD       1   12    1000.7    5004   138573
AMISTAD       1   13    1010.5    6314   195568
AMISTAD       1   14    1020.3    7722   264663
AMISTAD       1   15    1030.2    9758   350120
AMISTAD       1   16    1040.0   12751   458690
AMISTAD       1   17    1049.9   16734   605456
AMISTAD       1   18    1059.7   21627   790919
AMISTAD       1   19    1069.6   27399  1029250
AMISTAD       1   20    1079.4   34051  1328996
AMISTAD       1   21    1089.2   41702  1699411
AMISTAD       1   22    1094.2   45665  1911714
AMISTAD       1   23    1099.1   49658  2142942
```

TABLE 4-10, cont'd.

```
AMISTAD      1   24    1104.0     53679   2393700
AMISTAD      1   25    1108.9     57729   2664077
AMISTAD      1   26    1115.5     63173   3055670
AMISTAD      1   27    1117.0     64438   3151319
AMISTAD      1   28    1118.8     65915   3265037
AMISTAD      1   29    1122.0     68671   3483939
AMISTAD      1   30    1131.9     77013   4199954
FALCON       2    1     203.3         0         0
FALCON       2    2     203.4        35        57
FALCON       2    3     205.1       195       235
FALCON       2    4     206.7       425       735
FALCON       2    5     207.3       539      1050
FALCON       2    6     208.3       727      1670
FALCON       2    7     210.0      1100      3158
FALCON       2    8     214.9      1559      9631
FALCON       2    9     219.8      2202     18806
FALCON       2   10     224.7      3526     32732
FALCON       2   11     229.7      5169     54000
FALCON       2   12     234.6      6531     82799
FALCON       2   13     239.5      8061    118624
FALCON       2   14     242.8     10341    148482
FALCON       2   15     244.4     11654    166516
FALCON       2   16     249.3     15894    234115
FALCON       2   17     254.3     20562    323644
FALCON       2   18     259.2     25677    437240
FALCON       2   19     264.1     30775    576159
FALCON       2   20     269.0     36184    740751
FALCON       2   21     274.0     42448    933844
FALCON       2   22     278.9     48929   1158684
FALCON       2   23     282.2     53474   1326587
FALCON       2   24     285.4     58443   1509829
FALCON       2   25     288.7     65021   1712296
FALCON       2   26     292.0     70235   1935151
FALCON       2   27     295.3     74804   2172702
FALCON       2   28     298.6     82000   2429861
FALCON       2   29     301.2     87181   2653803
FALCON       2   30     305.1     93809   3008297
US AMISTAD  1      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON   2   000000  2  2  2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD  3      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON   4 0000000  6  6  6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI  5    00000  1  1  1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI  6   000000  3  3  3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI  7 0000000  4  4  4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR  8    00000  5  5  5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859
US MODERAT     9.65      75.00
MX MODERAT    10.00      75.00
RESERVOIR     1 1 AVERAGE   10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    1 2 DRY       11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       1 3 WET       10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     2 1 AVERAGE   11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    2 2 DRY       10 9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65
  RULES       2 3 WET       11 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     3 1 AVERAGE   12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    3 2 DRY       13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       3 3 WET       12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     4 1 AVERAGE   13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    4 2 DRY       12  0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
  RULES       4 3 WET       13 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
LINK1         1    1    5   9000000         0
LINK2         2    5    6   9000000         0
LINK3         3    6    2   9000000         0
```

TABLE 4-10, cont'd.

LINK4	4	2	7	9000000		0								
LINK5	5	3	8	9000000		0								
LINK6	6	8	4	9000000		0								
LINK7	7	1	2	9000000		0								
LINK8	8	3	4	9000000		0								
US AMS REL		1995	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114
US AMS REL		1996	65689	54830	57313	89764	154787	147757	63930	64243	60874	60473	61433	68800
US AMS REL		1997	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114
US AMS REL		1998	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114
MEX AMS REL		1995	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311
MEX AMS REL		1996	14911	10155	11408	13681	14033	11206	11605	11731	11288	11433	11727	12102
MEX AMS REL		1997	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311
MEX AMS REL		1998	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311
UNITED I.D.	1													
MUN ADJ NO		0849-000		CL A ADJ NO		A847-001		CL B ADJ NO		B769-000				
MUN ANN AUTH		5300		CL A ANN AUTH		69464		CL B ANN AUTH		4009				
IRRIG ACCT START BALANCES				CL A BALANCE		87300		CL B BALANCE		3331				
MUNICIPAL	1	1995	489	657	595	874	766	657	642	496	125	0	0	0
MUNICIPAL	1	1996	599	748	790	695	874	1017	575	0	0	0	0	0
MUNICIPAL	1	1997	489	657	595	874	766	657	642	496	125	0	0	0
MUNICIPAL	1	1998	489	657	595	874	766	657	642	496	125	0	0	0
CLASS A IRR	1	1995	756	2371	2179	4283	4387	26188	3734	2110	2148	3016	149	1336
CLASS A IRR	1	1996	1367	3377	5238	3880	3858	5441	3730	3257	1435	1822	2897	533
CLASS A IRR	1	1997	756	2371	2179	4283	4387	26188	3734	2110	2148	3016	149	1336
CLASS A IRR	1	1998	756	2371	2179	4283	4387	26188	3734	2110	2148	3016	149	1336
CLASS B IRR	1	1995	100	300	226	191	120	108	74	27	24	178	16	60
CLASS B IRR	1	1996	0	0	0	410	52	20	0	0	0	0	0	0
CLASS B IRR	1	1997	100	300	226	191	120	108	74	27	24	178	16	60
CLASS B IRR	1	1998	100	300	226	191	120	108	74	27	24	178	16	60
SANTACRUZ 15	2													
MUN ADJ NO		0240-000		CL A ADJ NO		0810-000		CL B ADJ NO		B804-000				
MUN ANN AUTH		3967		CL A ANN AUTH		4857		CL B ANN AUTH		4828				
IRRIG ACCT START BALANCES				CL A BALANCE		6599		CL B BALANCE		6807				
MUNICIPAL	2	1995	239	145	182	248	308	589	406	613	499	268	289	100
MUNICIPAL	2	1996	354	437	463	443	706	702	761	0	0	0	0	133
MUNICIPAL	2	1997	239	145	182	248	308	589	406	613	499	268	289	100
MUNICIPAL	2	1998	239	145	182	248	308	589	406	613	499	268	289	100
CLASS A IRR	2	1995	187	87	82	53	268	118	230	24	69	254	0	0
CLASS A IRR	2	1996	131	151	226	189	252	96	1111	113	45	206	148	70
CLASS A IRR	2	1997	187	87	82	53	268	118	230	24	69	254	0	0
CLASS A IRR	2	1998	187	87	82	53	268	118	230	24	69	254	0	0
CLASS B IRR	2	1995	0	0	0	0	0	0	0	0	0	0	0	0
CLASS B IRR	2	1996	0	0	0	0	1949	2879	0	0	0	0	0	0
CLASS B IRR	2	1997	0	0	0	0	0	0	0	0	0	0	0	0
CLASS B IRR	2	1998	0	0	0	0	0	0	0	0	0	0	0	0
HCID2 S.JUAN	3													
MUN ADJ NO		0808-001		CL A ADJ NO		0808-005		CL B ADJ NO		0573-001				
MUN ANN AUTH		6140		CL A ANN AUTH		147775		CL B ANN AUTH		470				
IRRIG ACCT START BALANCES				CL A BALANCE		150104		CL B BALANCE		14				
MUNICIPAL	3	1995	0	0	3	100	56	90	181	120	0	0	1377	1843
MUNICIPAL	3	1996	0	0	941	507	733	724	556	426	241	242	803	967
MUNICIPAL	3	1997	0	0	3	100	56	90	181	120	0	0	1377	1843
MUNICIPAL	3	1998	0	0	3	100	56	90	181	120	0	0	1377	1843
CLASS A IRR	3	1995	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS A IRR	3	1996	3998	7202	9636	9490	13280	14946	7571	0	2405	2132	3234	2293
CLASS A IRR	3	1997	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS A IRR	3	1998	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS B IRR	3	1995	0	48	0	0	0	0	0	0	28	0	0	0
CLASS B IRR	3	1996	0	0	0	0	0	0	0	0	0	0	0	0
CLASS B IRR	3	1997	0	48	0	0	0	0	0	0	28	0	0	0
CLASS B IRR	3	1998	0	48	0	0	0	0	0	0	28	0	0	0

TABLE 4-10, cont'd.

FLOW	1	1995	67892	56680	61812	75819	101801	79903	80026	89329	95852	66988	62195	56829
FLOW	1	1996	55280	55444	54797	60455	77853	82278	69082	101372	194441	83591	61439	60434
FLOW	1	1997	67892	56680	61812	75819	101801	79903	80026	89329	95852	66988	62195	56829
FLOW	1	1998	67892	56680	61812	75819	101801	79903	80026	89329	95852	66988	62195	56829
FLOW	2	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	3	1995	28687	21287	23319	26625	38768	29252	37006	49855	43976	35154	30206	23756
FLOW	3	1996	23037	22888	20943	19311	17171	26255	34280	60233	88867	79094	25897	23601
FLOW	3	1997	28687	21287	23319	26625	38768	29252	37006	49855	43976	35154	30206	23756
FLOW	3	1998	28687	21287	23319	26625	38768	29252	37006	49855	43976	35154	30206	23756
FLOW	4	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	5	1995	7832	7386	2433	0	57403	8711	1299	3501	73473	17386	33696	5718
FLOW	5	1996	7807	10255	4586	0	5213	10551	18724	30928	82151	36792	12953	7713
FLOW	5	1997	7832	7386	2433	0	57403	8711	1299	3501	73473	17386	33696	5718
FLOW	5	1998	7832	7386	2433	0	57403	8711	1299	3501	73473	17386	33696	5718
FLOW	6	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	8	1995	3906	3825	0	0	58914	10260	3913	5330	98882	18370	33717	3724
FLOW	8	1996	6958	9093	4786	0	12781	20695	27018	40713	88400	33031	11824	4555
FLOW	8	1997	3906	3825	0	0	58914	10260	3913	5330	98882	18370	33717	3724
FLOW	8	1998	3906	3825	0	0	58914	10260	3913	5330	98882	18370	33717	3724
DEMAND	1	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1997	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1998	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1995	8653	14554	8368	10116	19233	8356	12953	6731	6530	6620	3677	4954
DEMAND	2	1996	5465	13419	12802	12175	13569	9763	10263	7648	4598	5496	9263	8122
DEMAND	2	1997	8653	14554	8368	10116	19233	8356	12953	6731	6530	6620	3677	4954
DEMAND	2	1998	8653	14554	8368	10116	19233	8356	12953	6731	6530	6620	3677	4954
DEMAND	3	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1997	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1998	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1995	179835	46531	78080	300801	126402	1605	4452	4630	245	3266	2976	5720
DEMAND	4	1996	6132	4994	7634	166134	27162	15935	14526	9411	2981	3603	16832	4263
DEMAND	4	1997	179835	46531	78080	300801	126402	1605	4452	4630	245	3266	2976	5720
DEMAND	4	1998	179835	46531	78080	300801	126402	1605	4452	4630	245	3266	2976	5720
DEMAND	5	1995	1497	1574	1813	2167	2451	2463	2503	2402	1956	2185	2053	1497
DEMAND	5	1996	1667	1839	2112	2398	2775	2653	2730	2192	1739	2018	2232	1495
DEMAND	5	1997	1497	1574	1813	2167	2451	2463	2503	2402	1956	2185	2053	1497
DEMAND	5	1998	1497	1574	1813	2167	2451	2463	2503	2402	1956	2185	2053	1497
DEMAND	6	1995	5251	5100	5363	12485	10532	9950	9481	12808	6404	3923	1728	6219
DEMAND	6	1996	6010	5005	12205	9892	10583	10499	11511	14169	6629	6244	5387	3839
DEMAND	6	1997	5251	5100	5363	12485	10532	9950	9481	12808	6404	3923	1728	6219
DEMAND	6	1998	5251	5100	5363	12485	10532	9950	9481	12808	6404	3923	1728	6219
DEMAND	7	1995	80060	84616	74419	136002	254151	106440	118448	50237	37578	43027	16967	21736
DEMAND	7	1996	50561	78014	113855	163689	179310	124367	93601	57084	26457	35723	42746	35628
DEMAND	7	1997	80060	84616	74419	136002	254151	106440	118448	50237	37578	43027	16967	21736
DEMAND	7	1998	80060	84616	74419	136002	254151	106440	118448	50237	37578	43027	16967	21736
DEMAND	8	1995	6435	6547	9564	10222	11766	5998	5967	6047	5890	6568	6128	5901
DEMAND	8	1996	6176	5978	6963	9743	9445	6740	7105	6903	6209	6593	6045	5486

TABLE 4-10, cont'd.

DEMAND	8	1997	6435	6547	9564	10222	11766	5998	5967	6047	5890	6568	6128	5901
DEMAND	8	1998	6435	6547	9564	10222	11766	5998	5967	6047	5890	6568	6128	5901
EVAP	1	1995	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	1	1996	0.41	0.46	0.62	0.89	1.01	1.29	1.30	1.01	0.57	0.70	0.39	0.27
EVAP	1	1997	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	1	1998	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	2	1995	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	2	1996	0.28	0.34	0.51	0.67	0.81	0.87	0.99	0.69	0.56	0.39	0.34	0.24
EVAP	2	1997	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	2	1998	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	3	1995	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	3	1996	0.41	0.46	0.62	0.89	1.01	1.29	1.30	1.01	0.57	0.70	0.39	0.27
EVAP	3	1997	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	3	1998	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	4	1995	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	4	1996	0.28	0.34	0.51	0.67	0.81	0.87	0.99	0.69	0.56	0.39	0.34	0.24
EVAP	4	1997	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	4	1998	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20

calendar years 1997 and 1998 to provide a four-year simulation of the Amistad-Falcon Reservoir system under actual 1995-1996 conditions and assumed 1997-1998 conditions equal to those for 1995. The results from this simulation provide a projection of the behavior and performance of the reservoirs assuming that the 1995 drought conditions reoccur in 1997 and 1998.

The purpose of presenting the data input file listing in Table 4-10 for the 1995-1998 four-year simulation is to provide an idea of the amount of data and information needed to operate the ROM and the overall data file structure and general formatting requirements. For the long-term 1945-1996 simulations, the data input file includes monthly reservoir inflows and evaporation rates for the entire 52-year simulation period.

SECTION 5 AMISTAD-FALCON ROM SIMULATIONS

5.1 SAMPLE AMISTAD-FALCON ROM OUTPUT LISTING

A sample output listing from the current version of the Amistad-Falcon ROM is contained in Appendix 2. This listing has been generated by operation of the ROM for the four-year 1995-1998 data set presented in Table 4-9. Hence, the first two years of this simulation correspond to actual hydrologic and demand conditions for the Middle and Lower Rio Grande. The second two years of the simulation, i. e., 1997 and 1998, reflect assumed conditions with the 1995 monthly river inflows, reservoir evaporation rates, and actual water demands repeated to provide a hypothetical projection of reservoir behavior and performance. Basically, the simulated 1997 and 1998 results reflect the reoccurrence of two years of 1995 hydrologic and demand conditions beyond 1996.

The first four pages of the output present basic data and information that are read into the ROM from the data input file and that describe the simulated conditions and reservoir system characteristics. Nodes and links are defined, demand and storage priorities are identified, specified monthly minimum releases from Amistad Reservoir are printed, reservoir elevation-area-storage characteristics are established, and water rights information for the Middle and Lower Rio Grande is tabulated. Following these initial data input listings are four-page sets of simulated results for each calendar year simulated with the ROM. In this case, there are a total of 16 total pages of simulated reservoir operation results, four four-page sets for the four years simulated.

Each four-page set of yearly results from the ROM includes monthly listings of the simulated reservoir conditions for the United States' storage in Amistad Reservoir (Node 1), the United States' storage in Falcon Reservoir (Node 2), Mexico's storage in Amistad Reservoir (Node 3), and Mexico's storage in Falcon Reservoir (Node 4). The listed parameters include monthly watershed inflows, total reservoir inflows, reservoir releases, end-of-month reservoir surface area, reservoir evaporation rates, reservoir evaporation losses, downstream municipal and irrigation water demands, simulated shortages, flood spills, and simulated end-of-month reservoir content or storage. All parameters are expressed in acre-feet, except for the reservoir surface area, which is expressed in acres, and the evaporation rate, which is expressed in feet. Following the reservoir parameter listings is a matrix of the simulated monthly flows in the links between the nodes in the model.

A listing of the simulated monthly water accounting results for United States water stored in the reservoirs is printed at the bottom of the second page of each four-page set of yearly results. In accordance with TNRCC Rio Grande operating rules, values listed for each month of each year include the simulated beginning-of-month usable storage balance (which is defined a the total amount of United States water stored in the reservoirs less dead storage, which is assumed to be 4,600 acre-feet by the Rio Grande Watermaster), total watershed inflows, total domestic-municipal-industrial demands or usage, total irrigation and mining demands or usage, any simulated demand shortages, the simulated total reservoir evaporation losses, the simulated end-of-month usable storage balance, the end-of-month percentage of the United States' total conservation storage capacity in the reservoirs containing stored water, the domestic-municipal-industrial reserve (225,000 acre-feet), the simulated operating reserve, any excess unallocated usable storage, the simulated total positive and negative allocations to irrigation and mining accounts, the simulated end-of-month total irrigation and mining account balance, and the end-of-month percentage of the maximum total irrigation and mining storage capacity occupied by the end-of-month total irrigation and mining account balance.

Pages three and four of each four-page set of yearly output contain the simulated water accounting results for the three selected individual water rights owners. As described previously, monthly accounting is simulated with the ROM for a municipal water right and for separate Class A and Class B irrigation/mining water rights for each of the three water rights owners. For each of these different water rights, the printout contains the name of the water rights owner, the adjudication number, the authorized annual diversion amount, and monthly listings of specified monthly water demands, any simulated shortages, the Class A and Class B allocation rates calculated in accordance with TNRCC Rio Grande operating rules, simulated monthly positive or negative allocation amounts, the simulated end-of-month storage balance for the Class A and Class B water rights, and the simulated end-of-month usable balance.

Finally, following the end of the yearly sets of results, the ROM output contains an annual summary for each of the four reservoir nodes. These summaries present annual totals and end-of-year values for the basic reservoir operation parameters.

5.2 1995-1996 RESERVOIR STORAGE VERIFICATION

The results from the 1995-1998 ROM simulation contained in Appendix 2 provide the basis for evaluating the simulation accuracy of the Amistad-Falcon model. Figures 5-1 and 5-2 present graphical comparisons of the simulated end-of-month storage for the United States and Mexico during 1995 and 1996 with the corresponding actual historical storage amounts in Amistad and Falcon Reservoirs, respectively. On these plots, the lines represent monthly storage values simulated with the ROM, and the historical storage amounts are represented by the discrete data

FIGURE 5-1 COMPARISON OF 1995-1996 SIMULATED AND OBSERVED MONTHLY STORAGE IN AMISTAD AND FALCON RESERVOIRS FOR THE UNITED STATES

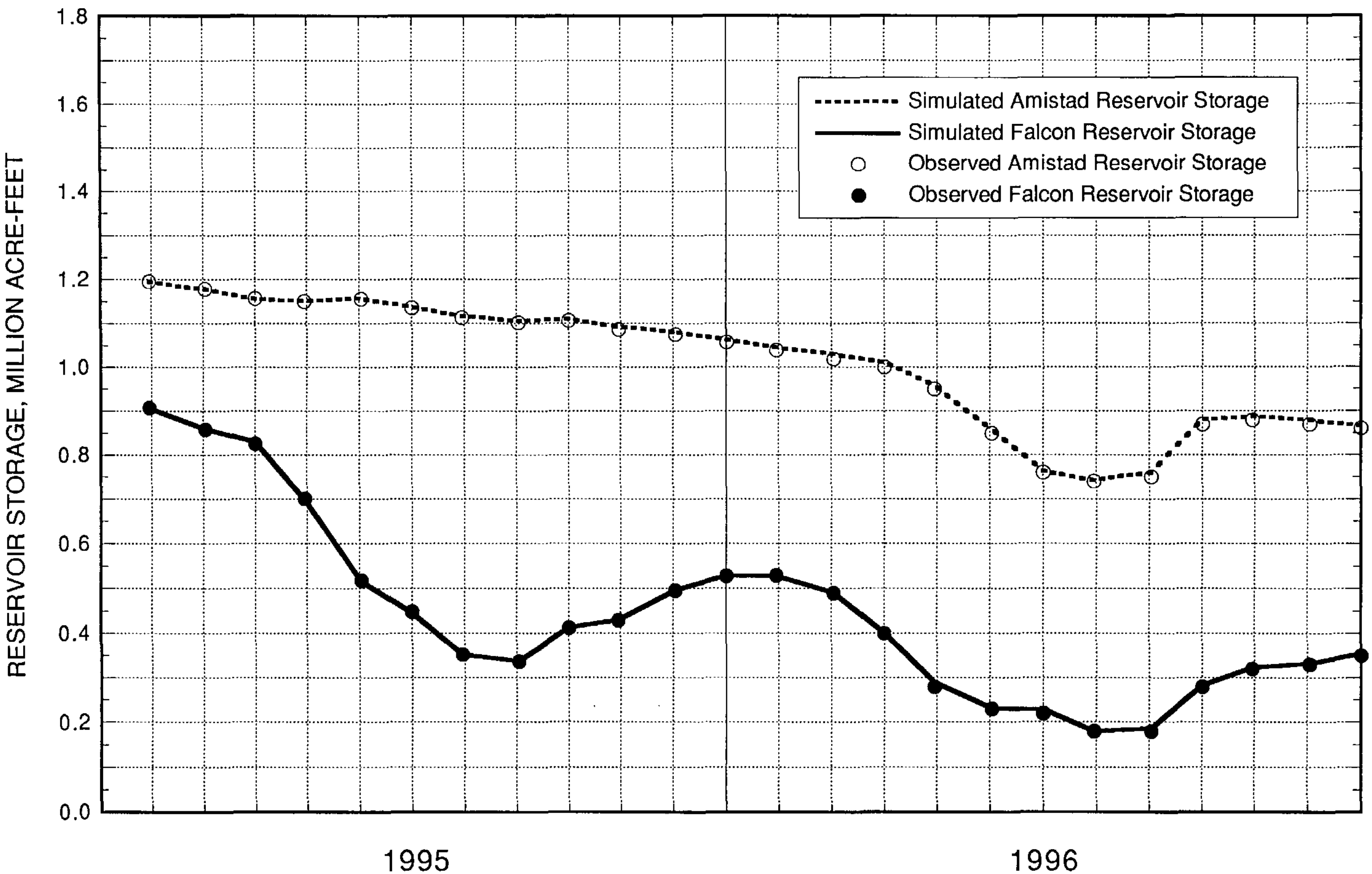
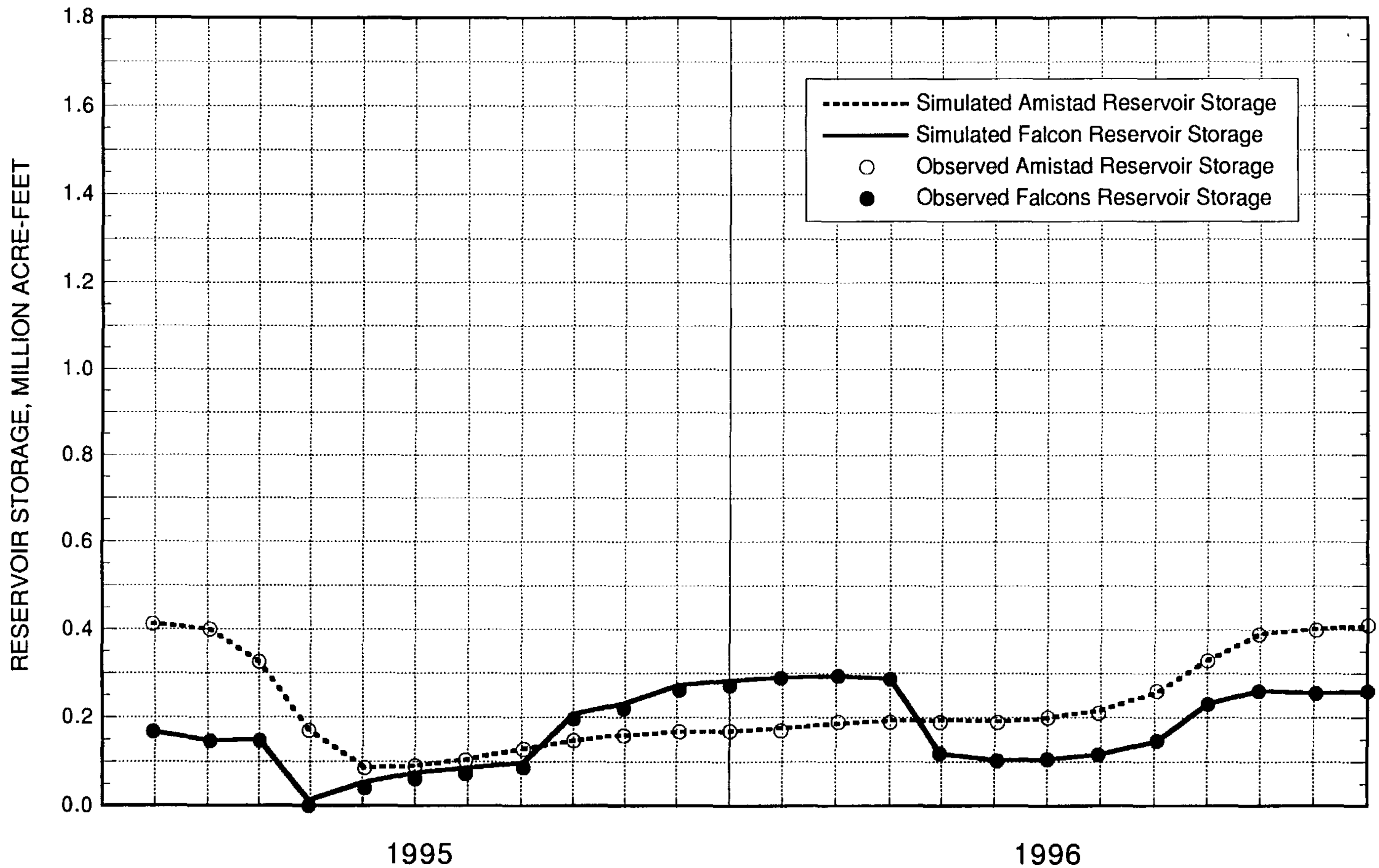


FIGURE 5-2 COMPARISON OF 1995-1996 SIMULATED AND OBSERVED MONTHLY STORAGE IN AMISTAD AND FALCON RESERVOIRS FOR MEXICO



points. The agreement between the two sets of reservoir storage values is considered excellent.

The close agreement between the simulated and observed reservoir storage values in these plots illustrates that the ROM does properly simulate the overall water balance for each of the countries for both of the reservoirs. This is a fundamental requirement of the ROM in order to demonstrate its general simulation capabilities and to provide confidence in the model when applying it for such purposes as investigating different reservoir operating procedures or examining the effectiveness of alternative water development and management programs.

5.3 LONG-TERM RESERVOIR STORAGE SIMULATION

Results from the long-term ROM simulation of the Amistad-Falcon Reservoir system provide insight with regard to the performance and behavior of the reservoirs in terms of their storage variations in response to historical hydrologic conditions and current average water demands. As described in the previous section, the 1945-1996 data input file for the ROM includes historical inflows to the Rio Grande for both the United States and Mexico (see Table 4-1 and Appendix 1) and current average water demands for both countries (see Section 4.3). In effect, using these data as input to the ROM results in a reservoir system simulation that provides an indication of water availability for both countries under current demands assuming that the historical hydrologic trace of the last 50 years or so is repeated.

A portion of the output listing from this simulation is contained in Appendix 3. To reduce the number of pages contained in this output listing, the detailed yearly summaries of monthly reservoir operations and water rights accounting are included only for the years 1949 through 1955. This period has been selected because it encompasses critical drought conditions that demonstrate the various functions and capabilities of the Amistad-Falcon ROM, including reservoir storage accounting.

Figures 5-3 and 5-4 present time plots of the simulated monthly storage in Amistad Reservoir and Falcon Reservoir, respectively, for the United States and Mexico over the entire 1945-1996 simulation period. It is apparent from examination of these plots that the ROM is effectively simulating the higher priority for maintaining storage in Amistad Reservoir, rather in than Falcon Reservoir. The simulated storage levels in Amistad Reservoir, relative to the maximum conservation storage capacities, generally are higher than those in Falcon Reservoir. The storage levels in Falcon Reservoir also tend to exhibit more extreme variations as they respond to releases

FIGURE 5-3 SIMULATED 1945-1996 MONTHLY STORAGE IN AMISTAD RESERVOIR FOR THE UNITED STATES AND MEXICO WITH HISTORICAL INFLOWS AND CURRENT DEMANDS

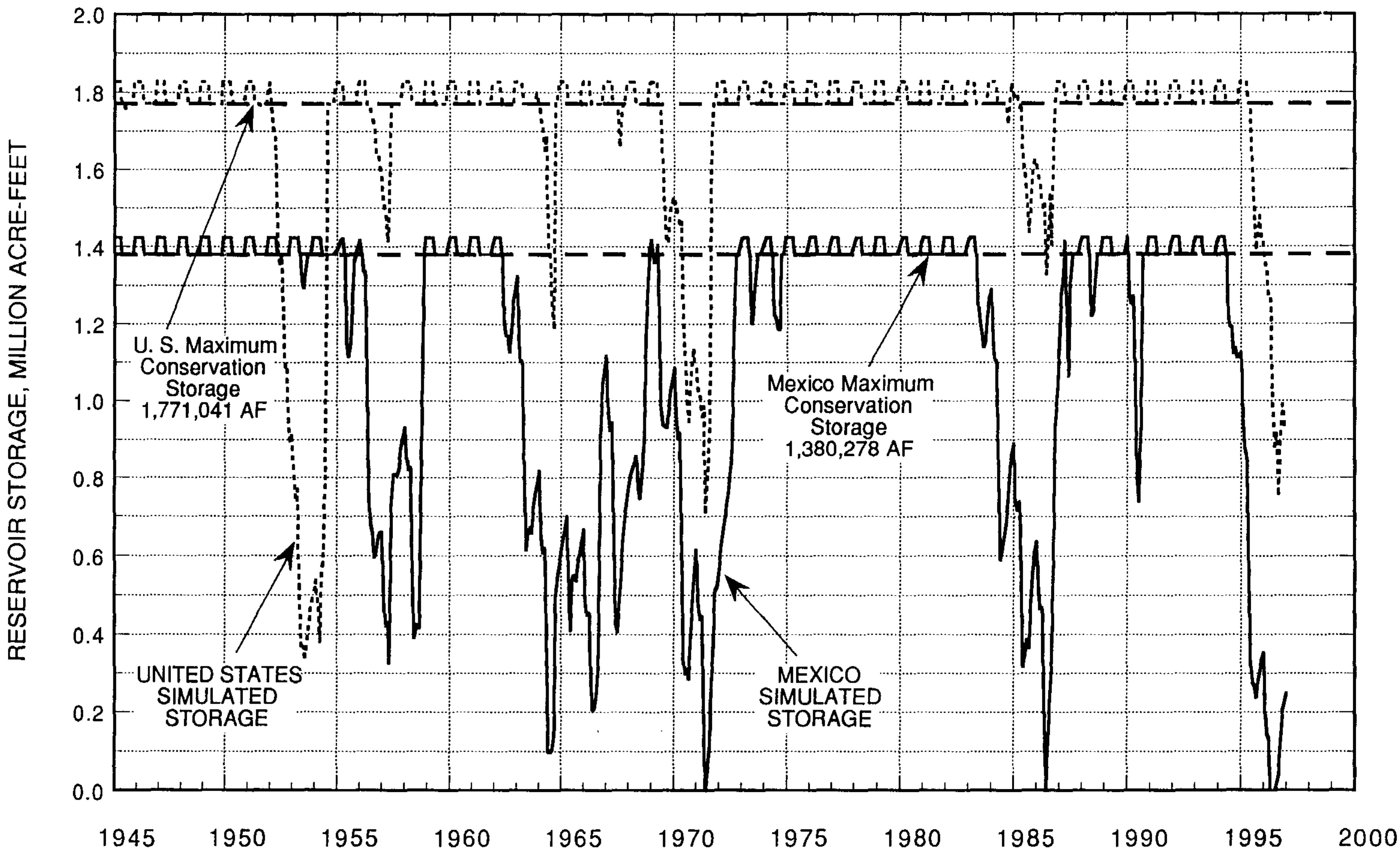
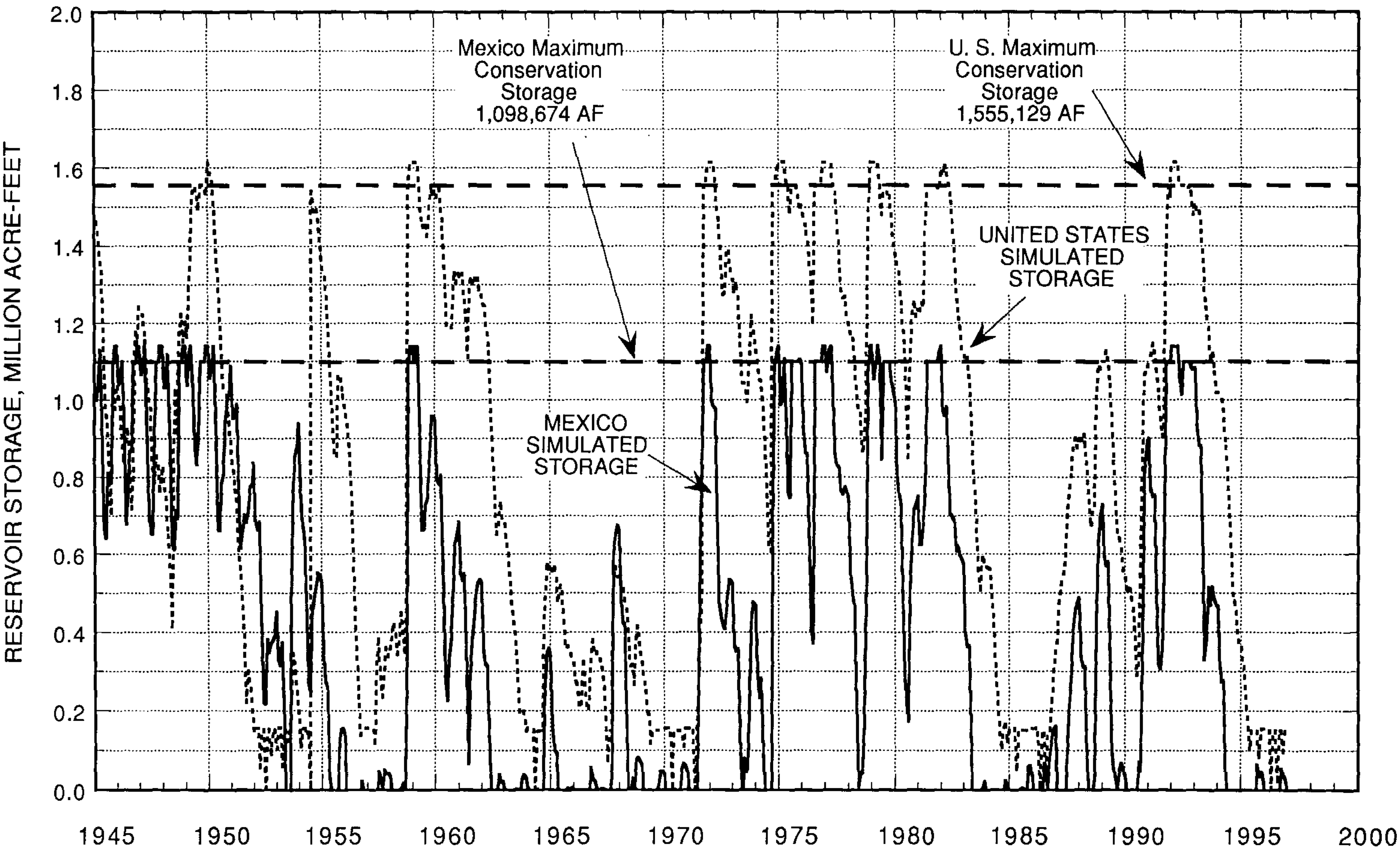


FIGURE 5-4 SIMULATED 1945-1996 MONTHLY STORAGE IN FALCON RESERVOIR FOR THE UNITED STATES AND MEXICO WITH HISTORICAL INFLOWS AND CURRENT DEMANDS



for downstream demands without the full benefit of compensating inflows, which often are stored in Amistad Reservoir upstream. The effect of storing water in the reservoirs above the designated conservation pools during the non-hurricane season also is readily illustrated by the stepped variations in the storage levels for both the United States and Mexico in Amistad Reservoir.

Summaries of annual quantities of pertinent variables from the 1945-1996 long-term reservoir storage simulation are presented in Tables 5-1 and 5-2 for the United States' pools in Amistad and Falcon Reservoirs, respectively, and in Tables 5-3 and 5-4 for Mexico's pools in Amistad and Falcon Reservoirs, respectively. These tables are reproductions of portions of the output listing from the ROM simulation, and they also are contained at the end of the output in Appendix 3. The column headings in these tables generally are self-explanatory, with the possible exception of "FLDWATER TRANSFR", which is the amount of water transferred within either Amistad or Falcon Reservoirs from one country (negative values) with excess inflows and a full conservation pool to the other country (positive values) with available conservation storage capacity, and "SHORTAGE", which is the portion of the municipal (D-M-I) or irrigation (IRRIG) demands (in the columns immediately to the left in the tables) that cannot be satisfied with the available water in the reservoir system. The "MINIMUM STORAGE" parameter refers to the minimum end-of-month storage simulated for each reservoir during each year. All of the quantities listed in the tables represent either annual totals or end-of-year values in acre-feet.

The results shown in Tables 5-1 and 5-2 for the United States indicate that the current average annual demands specified in the simulation (see Section 4.3) are not satisfied in 1953 and 1954. Shortages occur with respect to the specified United States irrigation demands below Amistad Reservoir (Table 5-1, 44,767 and 11,128 acre-feet of shortages in 1953 and 1954, respectively, out of 126,998 acre-feet of irrigation demand) and below Falcon Reservoir (Table 5-2, 347,796 and 133,076 acre-feet of shortages in 1953 and 1954, respectively, out of 1,078,002 acre-feet of irrigation demand). As expected, the simulated storage levels in Amistad and Falcon Reservoirs also fall to their lowest values during these drought years. The occurrence of the simulated shortages and minimum reservoir storage levels in the early 1950's is consistent with the ranking of the available annual inflows to the Rio Grande for the United States as listed in Table 4-1.

It is important to note that when the simulated United States irrigation shortages occur in 1953 and 1954 as indicated in Tables 5-1 and 5-2, there is water remaining in storage for the United States in both Amistad and Falcon Reservoirs; however, under the TNRCC Rio Grande operating rules, which allocate the United States available storage among the different reserves and accounts as

TABLE 5-1 ANNUAL SUMMARY OF 1945-1996 ROM SIMULATION RESULTS FOR UNITED STATES POOL IN AMISTAD RESERVOIR

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 1 U.S. AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1771041	1100000	1100000	43	189389	276426	33998	0	126998	0	578028	1827241	1758253
1946	1827241	1117000	1117000	0	13099	249172	33998	0	126998	0	854729	1827241	1771041
1947	1827241	875000	875000	0	54879	273503	33998	0	126998	0	546640	1827219	1771041
1948	1827219	1384000	1384000	0	68861	275508	33998	0	126998	0	1039623	1827227	1771041
1949	1827227	1589000	1589000	1	14754	234041	33998	0	126998	0	1340192	1827241	1771041
1950	1827241	1035000	1035000	0	76372	257611	33998	0	126998	0	701065	1827193	1771041
1951	1827193	691000	691000	0	82400	279294	33998	0	126998	0	331960	1824539	1760873
1952	1824539	598000	598000	0	1289892	216731	33998	0	126998	0	0	915916	891681
1953	915916	457000	457000	0	763479	95646	33998	0	126998	44767	0	513791	340704
1954	513791	3704101	3704101	7615	1960290	220210	33998	0	126998	11128	217800	1827207	383292
1955	1827207	1103803	1103803	0	604775	298178	33998	0	126998	0	200816	1827241	1769710
1956	1827241	515774	515774	0	438761	337121	33998	0	126998	0	0	1567133	1567133
1957	1567133	1610739	1610739	-305589	244487	269173	33998	0	126998	0	531382	1827241	1411132
1958	1827241	1881826	1881826	-244378	0	242471	33998	0	126998	0	1394977	1827241	1771041
1959	1827241	1279514	1279514	0	14093	229115	33998	0	126998	0	1036306	1827241	1771040
1960	1827241	1096226	1096226	-10	31144	246732	33998	0	126998	0	818340	1827241	1771025
1961	1827241	1090303	1090303	-1	0	233837	33998	0	126998	0	856465	1827241	1771041
1962	1827241	841972	841972	0	340131	309410	33998	0	126998	0	192670	1827002	1770287
1963	1827002	713470	713470	0	231469	285244	33998	0	126998	0	245934	1777825	1770642
1964	1777825	1602311	1602311	-128939	864215	265878	33998	0	126998	0	293863	1827241	1187045
1965	1827241	973545	973545	-92708	0	255532	33998	0	126998	0	625305	1827241	1771041
1966	1827241	1249166	1249166	-208051	55946	234188	33998	0	126998	0	750987	1827235	1771041
1967	1827235	894820	894820	0	258346	280126	33998	0	126998	0	356342	1827241	1657582
1968	1827241	933727	933727	-23762	97292	219107	33998	0	126998	0	593889	1826918	1770865
1969	1826918	843864	843864	0	913310	226854	33998	0	126998	0	0	1530618	1409437
1970	1530618	844695	844695	0	1122683	169914	33998	0	126998	0	0	1082716	947258
1971	1082716	1783089	1783089	-48059	597985	167320	33998	0	126998	0	225200	1827241	706804
1972	1827241	1307088	1307088	-258287	0	234240	33998	0	126998	0	814561	1827241	1771041
1973	1827241	918028	918028	732	406858	213047	33998	0	126998	0	301167	1824929	1770358
1974	1824929	3029423	3029423	-599	284434	239730	33998	0	126998	0	2502348	1827241	1769907
1975	1827241	1284972	1284972	0	9019	211382	33998	0	126998	0	1064571	1827241	1771041
1976	1827241	1607050	1607050	0	31586	201156	33998	0	126998	0	1374308	1827241	1771041
1977	1827241	1163283	1163283	0	461	238493	33998	0	126998	0	924329	1827241	1771040
1978	1827241	1743638	1743638	2	444896	225378	33998	0	126998	0	1073366	1827241	1769800
1979	1827241	1275063	1275063	0	7690	224821	33998	0	126998	0	1042552	1827241	1771041
1980	1827241	1329313	1329313	-15	60122	253781	33998	0	126998	0	1015395	1827241	1771023
1981	1827241	1888274	1888274	0	3482	214053	33998	0	126998	0	1670739	1827241	1771041
1982	1827241	1118780	1118780	0	21115	243427	33998	0	126998	0	854238	1827241	1771041
1983	1827241	910765	910765	0	411265	249920	33998	0	126998	0	249663	1827158	1770282
1984	1827158	1086407	1086407	0	526594	291574	33998	0	126998	0	299999	1795398	1719121
1985	1795398	1043484	1043484	0	959452	228833	33998	0	126998	0	37798	1612799	1437879
1986	1612799	1887478	1887478	-203148	914666	232988	33998	0	126998	0	322234	1827241	1330007
1987	1827241	1797750	1797750	-123360	938738	212431	33998	0	126998	0	523221	1827241	1770290
1988	1827241	1469121	1469121	953	739349	241106	33998	0	126998	0	489619	1827241	1769885
1989	1827241	1055062	1055062	0	345584	292563	33998	0	126998	0	417112	1827044	1769345
1990	1827044	2076817	2076817	-130759	733406	265495	33998	0	126998	0	946960	1827241	1770434
1991	1827241	2027658	2027658	0	62602	285132	33998	0	126998	0	1679924	1827241	1771041
1992	1827241	1702861	1702861	0	4242	250028	33998	0	126998	0	1448591	1827241	1771041
1993	1827241	1181767	1181767	0	30221	290243	33998	0	126998	0	861303	1827241	1771041
1994	1827241	924654	924654	0	343797	289940	33998	0	126998	0	290981	1827177	1769978
1995	1827177	895126	895126	0	774520	317488	33998	0	126998	0	222759	1407536	1389956
1996	1407536	956466	956466	0	1192572	242373	33998	0	126998	0	0	929057	753135

TABLE 5-2 ANNUAL SUMMARY OF 1945-1996 ROM SIMULATION RESULTS FOR UNITED STATES POOL IN FALCON RESERVOIR

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 2 U.S. FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1555129	285000	891421	117316	1203001	322630	124999	0	1078002	0	0	1038235	700736
1946	1038235	506000	1212832	427547	1203001	231693	124999	0	1078002	0	0	1243920	719155
1947	1243920	426000	866523	182693	1203001	261489	124999	0	1078002	0	0	828646	758001
1948	828646	595000	1542488	286634	1203001	250787	124999	0	1078002	0	0	1203980	409464
1949	1203980	783000	1976950	66697	1203001	324158	124999	0	1078002	0	106739	1613729	1164225
1950	1613729	248000	864441	16876	1203001	406307	124999	0	1078002	0	0	885738	885738
1951	885738	371000	624364	0	1203001	164223	124999	0	1078002	0	0	142878	142878
1952	142878	92000	1220896	0	1203001	58001	124999	0	1078002	0	0	102772	1822
1953	102772	380000	1027250	0	855205	81071	124999	0	1078002	347796	0	193746	59877
1954	193746	416402	2444624	0	1069925	198679	124999	0	1078002	133076	0	1369766	1876
1955	1369766	492704	1137299	0	1203001	311328	124999	0	1078002	0	0	992736	853311
1956	992736	268064	545829	0	1203001	179840	124999	0	1078002	0	0	155724	137063
1957	155724	914601	1529474	0	1203001	124230	124999	0	1078002	0	0	357967	110877
1958	357967	1591997	2825978	111366	1203001	149832	124999	0	1078002	0	328749	1613729	343218
1959	1613729	707063	1596466	-120792	1203001	286953	124999	0	1078002	0	58427	1541022	1424175
1960	1541022	595785	1284273	0	1203001	292981	124999	0	1078002	0	0	1329313	1180926
1961	1329313	771455	1466924	0	1203001	306538	124999	0	1078002	0	0	1286698	1110382
1962	1286698	527290	899095	0	1203001	294034	124999	0	1078002	0	0	688758	651808
1963	688758	502426	818833	0	1203001	149013	124999	0	1078002	0	0	155577	149179
1964	155577	709744	1706826	0	1203001	85752	124999	0	1078002	0	0	573650	1582
1965	573650	656638	1120947	0	1203001	170498	124999	0	1078002	0	0	321098	321098
1966	321098	689286	1335223	0	1203001	102038	124999	0	1078002	0	0	351282	200475
1967	351282	1036461	1490153	0	1203001	93278	124999	0	1078002	0	0	545156	66528
1968	545156	570101	1100286	0	1203001	112449	124999	0	1078002	0	0	329992	266011
1969	329992	346676	1098990	0	1203001	70484	124999	0	1078002	0	0	155497	118336
1970	155497	297120	1258807	0	1203001	55978	124999	0	1078002	0	0	155325	1581
1971	155325	2201017	2863206	560957	1203001	116430	124999	0	1078002	0	649017	1613729	1587
1972	1613729	569612	1223177	-37070	1203001	279847	124999	0	1078002	0	0	1319355	1275630
1973	1319355	707828	1254857	0	1203001	235265	124999	0	1078002	0	0	1135946	995495
1974	1135946	287805	2913591	-701628	1203001	248184	124999	0	1078002	0	283593	1613729	605787
1975	1613729	689676	1602270	-96903	1203001	290297	124999	0	1078002	0	121492	1504306	1480576
1976	1504306	1062184	2307082	979	1203001	254359	124999	0	1078002	0	741297	1613729	1196374
1977	1613729	464282	1228076	-157036	1203001	280675	124999	0	1078002	0	0	1201093	1201093
1978	1201093	556024	1913290	25964	1203001	245977	124999	0	1078002	0	77640	1613729	867419
1979	1613729	564636	1453882	-69223	1203001	292374	124999	0	1078002	0	121055	1381958	1381958
1980	1381958	409238	1323759	0	1203001	266010	124999	0	1078002	0	0	1236706	844367
1981	1236706	994629	2507854	-102283	1203001	243536	124999	0	1078002	0	598689	1597051	1233410
1982	1597051	340150	1054507	-46493	1203001	275797	124999	0	1078002	0	0	1126267	1126267
1983	1126267	342907	842839	0	1203001	200372	124999	0	1078002	0	0	565733	502215
1984	565733	234142	899739	0	1203001	106853	124999	0	1078002	0	0	155618	101028
1985	155618	424262	1260516	0	1203001	57679	124999	0	1078002	0	0	155454	47314
1986	155454	377249	1453153	0	1203001	53983	124999	0	1078002	0	0	351623	1576
1987	351623	630894	1931857	0	1203001	175605	124999	0	1078002	0	0	904874	391522
1988	904874	539973	1607945	0	1203001	210891	124999	0	1078002	0	0	1098927	669896
1989	1098927	278254	879954	0	1203001	235058	124999	0	1078002	0	0	540822	540822
1990	540822	418569	1937939	0	1203001	176264	124999	0	1078002	0	0	1099496	290009
1991	1099496	308733	1890263	87814	1203001	236593	124999	0	1078002	0	26137	1611842	903211
1992	1611842	517404	1809241	-124952	1203001	281695	124999	0	1078002	0	299670	1511765	1481160
1993	1511765	250123	980651	0	1203001	270951	124999	0	1078002	0	0	1018464	1017726
1994	1018464	295200	768982	0	1203001	210118	124999	0	1078002	0	0	374327	373565
1995	374327	218838	1055121	0	1203001	70954	124999	0	1078002	0	0	155493	76945
1996	155493	227673	1259249	0	1203001	56214	124999	0	1078002	0	0	155527	1583

TABLE 5-3 ANNUAL SUMMARY OF 1945-1996 ROM SIMULATION RESULTS FOR MEXICO POOL IN AMISTAD RESERVOIR

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 3 MEX AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1380278	1703000	1703000	-43	81692	215620	65999	0	0	0	1361845	1424078	1380217
1946	1424078	1635000	1635000	0	5273	194195	65999	0	0	0	1435532	1424078	1380278
1947	1424078	1571000	1571000	0	86845	213261	65999	0	0	0	1270894	1424078	1380278
1948	1424078	1349000	1349000	0	69994	214780	65999	0	0	0	1064226	1424078	1380278
1949	1424078	1612000	1612000	-1	11081	182399	65999	0	0	0	1418519	1424078	1380278
1950	1424078	1626000	1626000	0	86410	200980	65999	0	0	0	1338610	1424078	1380278
1951	1424078	1214000	1214000	0	213392	218057	65999	0	0	0	782551	1424078	1380243
1952	1424078	1276000	1276000	0	553711	236183	65999	0	0	0	486106	1424078	1379568
1953	1424078	1188000	1188000	0	248672	274734	65999	0	0	0	664594	1424078	1294847
1954	1424078	779350	779350	-7615	5478	253265	65999	0	0	0	544471	1392599	1380278
1955	1392599	680494	680494	0	441064	214825	65999	0	0	0	0	1417204	1118278
1956	1417204	303177	303177	0	905517	154397	65999	0	0	0	0	660467	598286
1957	660467	566668	566668	305589	492370	109890	65999	0	0	0	0	930464	327206
1958	930464	1559946	1559946	244378	1104752	84607	65999	0	0	0	121351	1424078	391532
1959	1424078	653034	653034	0	12019	178463	65999	0	0	0	462579	1424051	1380278
1960	1424051	845465	845465	10	108320	192237	65999	0	0	0	544891	1424078	1377648
1961	1424078	620768	620768	1	8447	182145	65999	0	0	0	430201	1424054	1380278
1962	1424054	515482	515482	0	297341	217012	65999	0	0	0	100503	1324680	1126767
1963	1324680	487817	487817	0	868090	126696	65999	0	0	0	0	817711	614775
1964	817711	675919	675919	128939	953585	55718	65999	0	0	0	0	613266	98520
1965	613266	490504	490504	92708	449726	80922	65999	0	0	0	0	665830	410412
1966	665830	1002479	1002479	208051	705067	54061	65999	0	0	0	0	1117232	205851
1967	1117232	605373	605373	0	845401	99180	65999	0	0	0	0	778024	407729
1968	778024	876137	876137	23762	146754	113520	65999	0	0	0	0	1417649	747923
1969	1417649	705083	705083	0	887796	149574	65999	0	0	0	0	1085362	933347
1970	1085362	620385	620385	0	1020706	69292	65999	0	0	0	0	615749	286538
1971	615749	692998	692998	48059	750788	39986	65999	0	0	0	0	566032	1422
1972	566032	802803	802803	258287	21899	118786	65999	0	0	0	64672	1421765	626024
1973	1421765	679907	679907	-732	255611	160236	65999	0	0	0	275134	1409959	1202507
1974	1409959	1211470	1211470	599	526311	174928	65999	0	0	0	496711	1424078	1186006
1975	1424078	748604	748604	0	978	164596	65999	0	0	0	583066	1424042	1380278
1976	1424042	773967	773967	0	15525	156703	65999	0	0	0	601722	1424059	1380278
1977	1424059	550896	550896	0	0	185664	65999	0	0	0	379373	1409918	1380278
1978	1409918	1517216	1517216	-2	56907	175656	65999	0	0	0	1270491	1424078	1380276
1979	1424078	878202	878202	0	2269	175100	65999	0	0	0	712516	1412395	1380278
1980	1412395	817103	817103	15	249236	197639	65999	0	0	0	358573	1424065	1377308
1981	1424065	1238430	1238430	0	0	166824	65999	0	0	0	1071593	1424078	1380278
1982	1424078	664349	664349	0	6006	189622	65999	0	0	0	474720	1418079	1380278
1983	1418079	497472	497472	0	362680	176613	65999	0	0	0	85595	1290663	1141885
1984	1290663	775321	775321	0	1047630	129122	65999	0	0	0	0	889232	592246
1985	889232	682379	682379	0	866727	67443	65999	0	0	0	0	637441	316616
1986	637441	1208462	1208462	203148	832401	52089	65999	0	0	0	0	1164561	1523
1987	1164561	1203973	1203973	123360	672094	157454	65999	0	0	0	238286	1424060	1064640
1988	1424060	929864	929864	-953	357760	182260	65999	0	0	0	388875	1424076	1223371
1989	1424076	589071	589071	0	22193	228019	65999	0	0	0	338871	1424064	1380275
1990	1424064	1728668	1728668	130759	848855	162324	65999	0	0	0	848234	1424078	739778
1991	1424078	1892590	1892590	0	45082	222129	65999	0	0	0	1625395	1424062	1380278
1992	1424062	1283085	1283085	0	14354	194769	65999	0	0	0	1073965	1424059	1380278
1993	1424059	788586	788586	0	24534	226103	65999	0	0	0	537957	1424051	1380278
1994	1424051	488813	488813	0	425149	200662	65999	0	0	0	162314	1124739	1112634
1995	1124739	387891	387891	0	1075201	83687	65999	0	0	0	0	353742	238653
1996	353742	441577	441577	0	527977	18019	65999	0	0	0	0	249323	1357

TABLE 5-4 ANNUAL SUMMARY OF 1945-1996 ROM SIMULATION RESULTS FOR MEXICO POOL IN FALCON RESERVOIR

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 4 MEX FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1098674	278000	1655538	-117316	1224000	272822	1224000	0	0	0	0	1140074	640146
1946	1140074	521000	1895806	-427547	1224000	244259	1224000	0	0	0	0	1140074	677509
1947	1140074	371000	1662740	-182693	1224000	256069	1224000	0	0	0	0	1140074	652171
1948	1140074	702000	1770221	-286634	1224000	259601	1224000	0	0	0	0	1140074	612578
1949	1140074	442000	1805601	-66697	1224000	221568	1224000	0	0	0	293336	1140074	833013
1950	1140074	128000	1487021	-16876	1224000	299603	1224000	0	0	0	0	1086616	661947
1951	1086616	326000	1255944	0	1224000	282022	1224000	0	0	0	0	836538	617263
1952	836538	64000	1037818	0	1224000	198283	1224000	0	0	0	0	452073	217368
1953	452073	1003000	1850267	0	1224000	139084	1224000	0	0	0	0	939256	1115
1954	939256	474065	958015	0	1224000	151874	1224000	0	0	0	0	521397	246217
1955	521397	494774	869839	0	1224000	26581	1224000	0	0	0	0	140655	1101
1956	140655	247474	1086992	0	1224000	2507	1224000	0	0	0	0	1140	1103
1957	1140	839072	1265443	0	1224000	9037	1224000	0	0	0	0	33546	1114
1958	33546	3046578	4206682	-111366	1224000	26833	1224000	0	0	0	1737955	1140074	1119
1959	1140074	684289	1092888	120792	1224000	160620	1224000	0	0	0	19132	950002	662590
1960	950002	473986	1061198	0	1224000	103860	1224000	0	0	0	0	683340	225648
1961	683340	786956	1159605	0	1224000	93243	1224000	0	0	0	0	525702	65962
1962	525702	396565	728410	0	1224000	27415	1224000	0	0	0	0	2697	1103
1963	2697	430318	1232409	0	1224000	3251	1224000	0	0	0	0	7855	1113
1964	7855	692882	1580468	0	1224000	20339	1224000	0	0	0	0	343984	1098
1965	343984	507366	891093	0	1224000	9837	1224000	0	0	0	0	1240	1120
1966	1240	593653	1232721	0	1224000	3405	1224000	0	0	0	0	6556	1129
1967	6556	1128259	1907661	0	1224000	27746	1224000	0	0	0	0	662471	1157
1968	662471	574792	655547	0	1224000	30726	1224000	0	0	0	0	63292	1136
1969	63292	382759	1204556	0	1224000	3476	1224000	0	0	0	0	40372	1098
1970	40372	283218	1237925	0	1224000	6034	1224000	0	0	0	0	48263	1098
1971	48263	3101272	3786061	-560957	1099188	94153	1224000	124812	0	0	939952	1140074	1135
1972	1140074	670492	691064	37070	1224000	116530	1224000	0	0	0	0	527678	408818
1973	527678	740920	1205666	0	1224000	39548	1224000	0	0	0	0	469796	1422
1974	469796	305682	1262705	701628	1224000	46280	1224000	0	0	0	23775	1140074	1105
1975	1140074	913544	1431589	96903	1224000	183744	1224000	0	0	0	163659	1097163	745677
1976	1097163	1693211	2244459	-979	1224000	144983	1224000	0	0	0	831586	1140074	371754
1977	1140074	554875	868249	157036	1224000	171579	1224000	0	0	0	28647	741133	741133
1978	741133	801281	2062680	-25964	1224000	65989	1224000	0	0	0	347786	1140074	8722
1979	1140074	688648	1337434	69223	1224000	201343	1224000	0	0	0	122808	998580	846078
1980	998580	544535	1086345	0	1224000	110220	1224000	0	0	0	0	750705	173492
1981	750705	1430420	2436014	102283	1224000	160538	1224000	0	0	0	764390	1140074	623678
1982	1140074	338840	753567	46493	1224000	142251	1224000	0	0	0	0	573883	573883
1983	573883	291291	673567	0	1224000	22103	1224000	0	0	0	0	1347	1103
1984	1347	243487	1225118	0	1224000	1219	1224000	0	0	0	0	1246	1110
1985	1246	463802	1264530	0	1224000	3501	1224000	0	0	0	0	38275	1100
1986	38275	540129	1306531	0	1168593	15099	1224000	55407	0	0	0	161114	1121
1987	161114	748490	1592871	0	1224000	41495	1224000	0	0	0	0	488490	1109
1988	488490	831771	1512407	0	1224000	48727	1224000	0	0	0	0	728170	1110
1989	728170	285024	580089	0	1224000	48935	1224000	0	0	0	0	35324	3433
1990	35324	498141	2129231	0	1224000	38473	1224000	0	0	0	0	902082	1111
1991	902082	322749	1927227	-87814	1224000	130366	1224000	0	0	0	247055	1140074	305613
1992	1140074	623610	1645930	124952	1224000	196508	1224000	0	0	0	406941	1083507	1013955
1993	1083507	230123	726615	0	1224000	120248	1224000	0	0	0	0	465874	330457
1994	465874	255581	777045	0	1224000	17768	1224000	0	0	0	0	1151	1108
1995	1151	240841	1250043	0	1224000	4368	1224000	0	0	0	0	22826	1098
1996	22826	259854	721832	0	734651	4132	1224000	489349	0	0	0	5875	943

described previously and which are incorporated into the ROM, very little of this water is available for irrigation or mining uses. At the minimum storage condition, which occurs during the simulation period at the end of July, 1953, the simulated total amount of water remaining in United States storage in both reservoirs is 490,756 acre-feet. Because of provisions in the TNRCC Rio Grande operating rules, practically all of this remaining storage either is considered dead storage (4,600 acre-feet) and unavailable for use or is allocated to the domestic-municipal-industrial reserve (225,000 acre-feet) or the operating reserve (261,097 acre-feet). Hence, only 59 acre-feet are contained in the irrigation and mining account balance. With only this amount of water available for irrigation uses and with the summer irrigation demands for the United States specified in the model at about 130,000 acre-feet per month, simulated shortages obviously occur. This demonstrates, of course, the higher priority given to satisfying municipal water needs, as opposed to irrigation demands, in the current Rio Grande operating rules for the United States share of Amistad and Falcon Reservoirs.

Whereas the United States experiences simulated demand shortages in 1953 and 1954, Mexico's specified current average demands in the 1945-1996 long-term ROM simulation are shorted in 1971, 1986 and 1996. As indicated by the annual summaries of Mexico's reservoir operation parameters in Tables 5-3 and 5-4, the simulated minimum storage in Mexico's conservation pools in Amistad and Falcon Reservoirs during these years is essentially zero. What is of most significance is that the greatest demand shortage for Mexico occurs in 1996, i. e., 489,349 acre-feet, suggesting that the Rio Grande inflow conditions for the current drought period may be the most severe for Mexico since 1945.

5.4 RESERVOIR SYSTEM FIRM ANNUAL YIELD ANALYSIS

The firm annual yield of a reservoir or reservoir system is defined as the maximum amount of water that can be withdrawn each year during the occurrence of the worst drought of record without causing storage in the reservoirs to be reduced to zero. Often, the firm annual yield of a reservoir or a system of reservoirs is considered to be the dependable supply of water that can be reasonably relied upon for future water planning purposes, provided allowances are made for future reductions in reservoir storage capacity due to sedimentation. Sometimes, in performing reservoir yield analyses, it is appropriate to maintain during the critical drought period a minimum amount of storage in the reservoir system equal to one year's demand. The yield produced by the reservoir or reservoir system under this storage condition is referred to as the safe yield. Reservoir yield analyses typically are performed using computerized reservoir operation models applied to long-term hydrologic sequences that are known to include severe drought conditions. Hence, the Amistad-Falcon ROM provides the means for analyzing and determining the yield of the Amistad-Falcon Reservoir system.

In this study, the 1945-1996 ROM data set as described previously has been used to determine the firm annual yield of the reservoir system. For this purpose, the individual water demands specified in the ROM for the United States and for Mexico at the various demand nodes have been adjusted proportionally in accordance with the current average demands developed in Section 4.3 of this report. Adjustments in these demands for each country have been made in successive ROM simulations until the resulting simulated reservoir storage amounts have been reduced to minimum levels with no demand shortages.

The final firm annual yield results from these analyses are summarized in Table 5-5 for both the United States and Mexico. As indicated, the total firm annual yield figures for the United States and for Mexico, under current operating procedures as incorporated in the ROM for the Amistad-Falcon Reservoir system and based on historical river inflows as used in this study, are 1,261,670 and 1,122,280 acre-feet per year, respectively. The individual firm annual yield demands for each of the demand nodes in the ROM also are listed in the table, along with the corresponding current average water demands developed in Section 4.3. As indicated, the total and the individual firm annual yield demands are somewhat lower than the current average water demands for both countries. These lower firm annual yield demands are expected since the long-term ROM simulations with the current average water demands imposed on the system, as described in Section 5.3, result in demand shortages for both the United States and Mexico.

Also indicated in Table 5-5 are the critical drought periods which, based on the ROM results, include the critical hydrologic conditions that determine the firm annual yield amounts. By definition, the critical drought period encompasses the minimum reservoir storage condition, and it extends from the end of one reservoir flood spill period, or maximum storage condition, to the beginning of the next flood spill period, with the minimum reservoir storage level occurring in between. For the United States, the critical drought period as simulated with the ROM occurs from November, 1949, through October, 1958, a period of exactly nine years. This period, of course, encompasses the severe drought of the 1950's. The simulated minimum storage condition during this critical drought period for the United States occurs in August, 1953, when the total United States storage in the two reservoirs is 646,028 acre-feet. The minimum storage condition simulated for the United States during the current drought is 1,197,550 acre-feet, and it occurs in August,

TABLE 5-5 FIRM ANNUAL YIELD RESULTS FROM AMISTAD-FALCON ROM SIMULATIONS

	FIRM ANNUAL YIELD DEMANDS Acre-Feet	CRITICAL DROUGHT PERIOD	CURRENT AVERAGE ANNUAL DEMANDS Acre-Feet
UNITED STATES			
D-M-I Demand Between Amistad and Falcon Dams	31,440		34,000
Irrigation Demand Between Amistad and Falcon Dams	117,470		127,000
D-M-I Demand Downstream of Falcon Dam	115,620		125,000
Irrigation Demand Downstream of Falcon Dam	997,140		1,078,000
TOTAL FIRM YIELD	1,261,670	Nov. 1949 through October 1958	1,364,000
MEXICO			
Total Demand Between Amistad and Falcon Dams	57,410		66,000
Total Demand Downstream of Falcon Dam	1,064,870		1,224,000
TOTAL FIRM YIELD	1,122,280	October 1992 through Present	1,290,000

1996. Hence, based on the ROM firm annual yield simulation, the 1950's drought appears to be considerably more severe for the United States than the current drought.

As indicated in Table 5-5, the simulated critical drought period for Mexico actually corresponds to the current drought, which, based on the ROM simulation, begins in October, 1992, and extends through 1996, i. e., the end of the period for which inflow data were available for this study. The simulated minimum storage condition during this current drought period for Mexico occurs in June, 1996, when the total Mexican storage in the two reservoirs is 5,546 acre-feet. The next lowest minimum storage condition simulated for Mexico during the entire 1945-1996 period is 582,670 acre-feet, which occurs in May, 1986. In 1995 of the firm annual yield simulation, Mexico's minimum storage condition is 624,405 acre-feet, and it occurs in August. Based on these results, it appears that the current drought definitely is more severe for Mexico than any previous drought since 1945.

It should be recognized that the firm annual yield figures for the United States and for Mexico as presented in Table 5-5 and discussed herein are based on an analysis of historical river inflow conditions dating back over approximately 50 years. Certainly, there have been many modifications made during the last 50 years throughout the Rio Grande basin in both countries that have had significant influences on flows in the river. Reservoirs and flood control structures have been constructed on tributaries, municipal water demands and tributary diversions have substantially increased, wastewater return flows have changed, and land use modifications have altered runoff patterns. Because of these types of historical changes, the historical river inflows used in this study may not accurately reflect current watershed and hydrologic conditions. The resulting firm annual yield figures for the United States and for Mexico, therefore, also may not accurately reflect current watershed and hydrologic conditions. Considering the types of changes that have affected river inflows, it is likely that the actual firm annual yields for the current Amistad-Falcon Reservoir system are somewhat less than those presented in this study.

Also, as indicated in Section 4.1 of this report, the Mexican inflows to Amistad Reservoir for the period prior to 1954 may not be correct and may need to be refined. These inflow refinements are scheduled to be made as part of the Senate Bill 1 regional water supply planning study for the Middle and Lower Rio Grande basins during the next year, and the resulting revised Mexican inflows, when incorporated into the ROM data base, could produce somewhat different results with regard to the firm annual yields of the reservoir system for the United States and Mexico. It is anticipated that these yield figures will be revised and updated as part of the regional planning study.

5.5 TNRCC RESERVOIR STORAGE ACCOUNTING

Results from the 1949-1955 ROM output listing in Appendix 3 are plotted in Figures 5-5 and 5-6 to illustrate the performance of the TNRCC reservoir storage accounting routine incorporated in the Amistad-Falcon ROM. Again, these results reflect drought conditions during the 1950's as simulated with the ROM assuming historical river inflows as used in this study and current average water demands for both countries. The specific monthly quantities used to construct the plots in Figures 5-5 and 5-6 are printed as part of the ROM output listing for the 1949-1955 period contained in Appendix 3. These results are tabulated at the bottom of the second page of each annual output set under the main heading "ALLOCATION OF U. S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES". The column headings of this section of the output are consistent with the various operations of the TNRCC water accounting process and should be self explanatory. For convenience, Table 5-6 presents a sample of the TNRCC total reservoir storage accounting portion of the ROM output listing for the year 1954.

As shown by the curves on the graph in the upper part of Figure 5-5, the sum of the total United States water demands and the simulated evaporation losses from the reservoirs during the period from early 1950 through about March, 1954, generally exceed the available United States inflows to the Rio Grande. As a result, the simulated storage in both reservoirs gradually falls from a full condition in late 1949 to relatively low levels in late 1953 and early 1954 as illustrated by the curves on the graph in the lower part of Figure 5-5. The effect of significant United States inflows into the Rio Grande in mid-1954 is indicated by the sudden increases in the simulated storage levels of both reservoirs, which again rise to the full conservation pool condition.

The simulated quantities of stored United States water in Amistad and Falcon Reservoirs that are allocated to the domestic-municipal-industrial (D-M-I) reserve, the operating reserve, and the total irrigation and mining accounts during the 1950-1955 period are indicated by the graphs in the upper part of Figure 5-6. These allocations are made at the end of each month of the simulation period in the ROM in accordance with the TNRCC Rio Grande operating rules. As described previously in Section 3.10, the D-M-I reserve is allocated first (225,000 acre-feet), next the operating reserve (150,000 to 380,000 acre-feet), and finally, the balance of the irrigation and mining accounts. The effect of this allocation sequence is evident in the upper plot in Figure 5-6, where the D-M-I reserve and the operating reserve remain relatively constant throughout the duration of the 1950-1954 low

FIGURE 5-5 RESULTS FROM 1950'S DROUGHT SIMULATION
SHOWING UNITED STATES STORAGE IN AMISTAD AND FALCON RESERVOIRS
WITH HISTORICAL INFLOWS AND EVAPORATION AND CURRENT DEMANDS

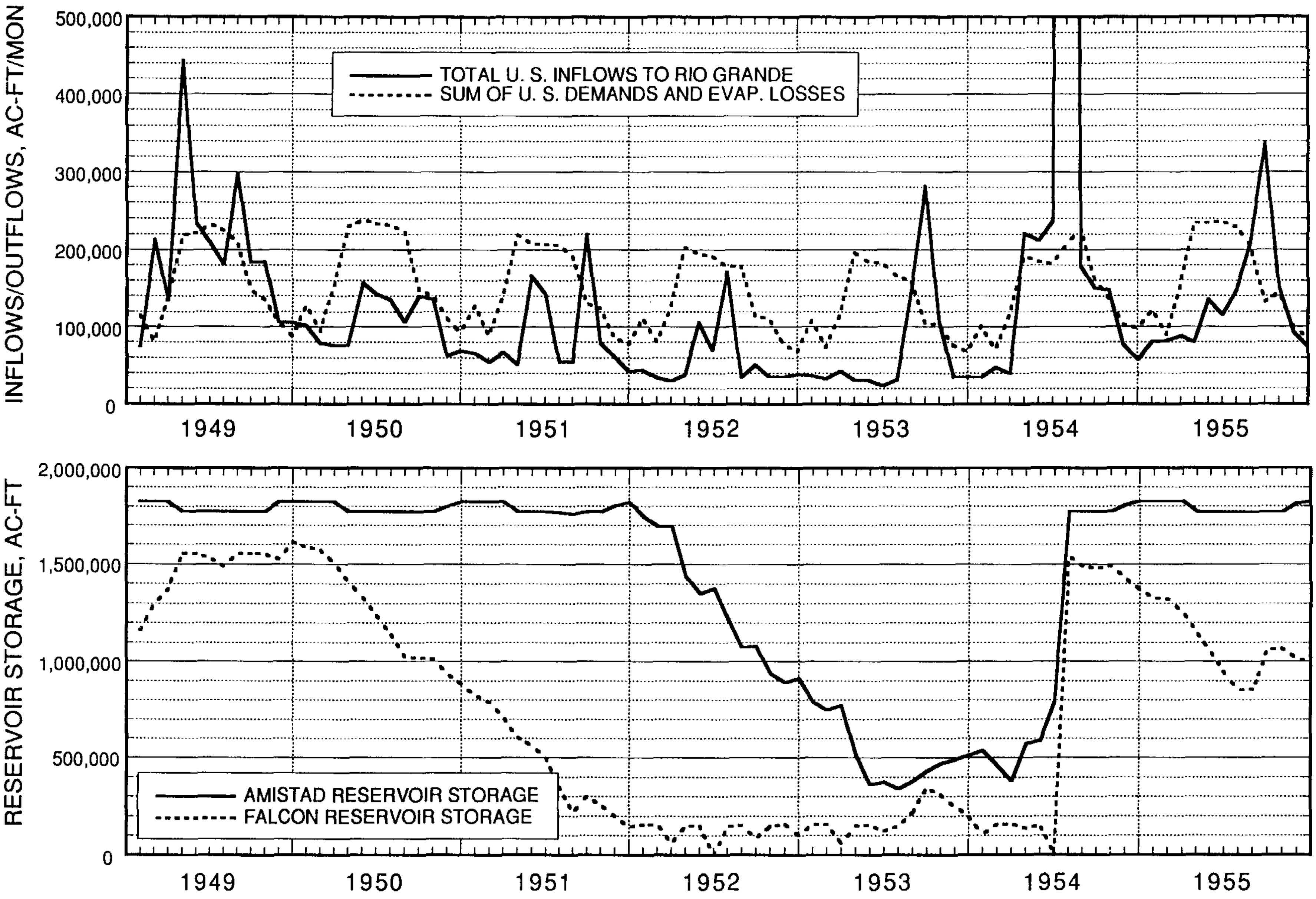


FIGURE 5-6 RESULTS FROM 1950'S DROUGHT SIMULATION
SHOWING UNITED STATES RESERVOIR STORAGE RESERVES AND ACCOUNTS
AND CORRESPONDING DEMAND SHORTAGES

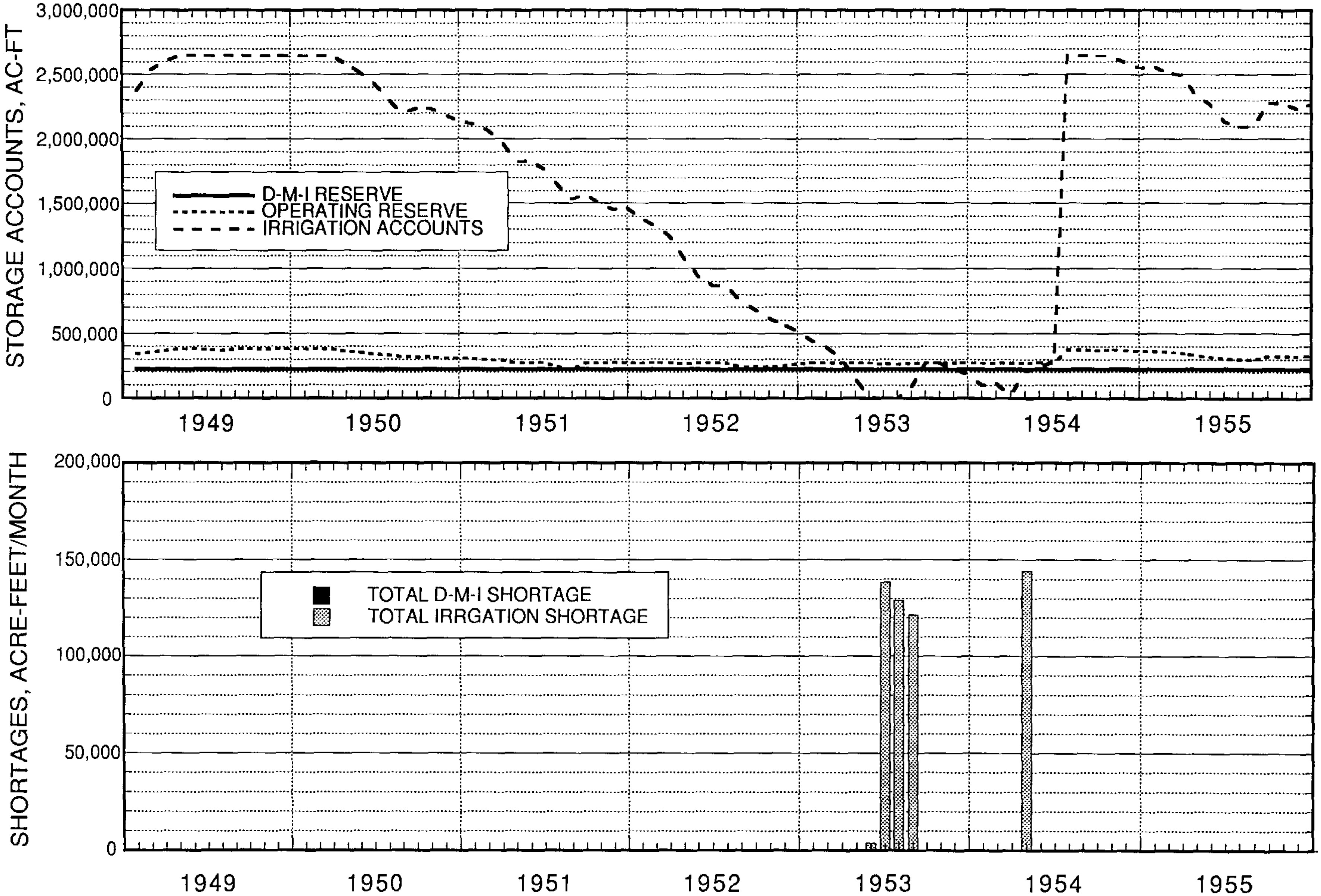


TABLE 5-6 SAMPLE ROM OUTPUT LISTING SHOWING THE SIMULATED TOTAL RESERVOIR STORAGE ACCOUNTING RESULTS FOR 1954

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	702937	34734	11077	85924	0	4443	636227	19.3	225000	275000	34046	0	79481	102181	3.9
2	636227	47311	10399	52734	0	7616	612789	18.6	225000	275000	0	59538	48930	112789	4.3
3	612789	39793	12296	95857	0	9749	534680	16.2	225000	275000	11021	0	89130	23659	.9
4	534680	221066	13983	167863	144204	9550	708554	21.4	225000	275000	0	206807	21912	208554	7.9
5	708554	211640	13858	155272	0	15385	735679	22.3	225000	275000	0	170823	143698	235679	8.9
6	735679	237073	14517	149670	0	18165	790400	23.9	225000	275000	0	193473	138752	290400	11.0
7	790400	2715700	16242	129653	0	60970	3306850	99.6	225000	378318	55893	2477724	120485	2647639	100.0
8	3306850	179155	16742	121591	0	88584	3259088	98.1	225000	372862	13587	113251	113251	2647639	100.0
9	3259088	150565	13617	71803	0	76773	3247460	97.8	225000	371533	3288	66878	66878	2647639	100.0
10	3247460	148146	12930	74199	0	49470	3259007	98.1	225000	372852	13516	69085	69085	2647639	100.0
11	3259007	77615	11762	51794	0	39927	3233139	97.3	225000	369897	38930	0	48327	2599312	98.2
12	3233139	57705	11574	48640	0	38257	3192373	96.1	225000	365240	48089	0	45268	2554044	96.5

flow period, but the irrigation and mining pool steadily declines in response to the overall decline in reservoir storage.

As expected, the higher priority D-M-I and operating reserves of the reservoir system, as simulated with the ROM, always are satisfied first at the end of each month, and with only limited inflows into the reservoirs during the 1950-1953 period, no additional allocations are made to the lower priority irrigation and mining accounts. As demands continue, the irrigation and mining pool steadily declines until little or no water is available for irrigation and mining uses. This results in demand shortages, which are indicated by the bar chart in the lower part of Figure 5-6. The monthly amounts of irrigation shortages are shown, and, of course, they occur when the total irrigation and mining account balance is near zero, as indicated by the graph in the upper part of Figure 5-6. No municipal demand shortages are simulated since the D-M-I reserve always is full.

5.6 INDIVIDUAL WATER RIGHTS ACCOUNTING

As described previously, the Amistad-Falcon ROM has the ability to simulate the water accounting process for individual water rights as set forth in the TNRCC Rio Grande operating rules. Monthly water accounting is simulated for up to three individual water rights owners, each of which can have a domestic-municipal-industrial water right, a Class A irrigation or mining water right, and a Class B irrigation or mining water right. The water accounting for individual water rights is performed in the ROM after the total reservoir storage accounting has been completed, thereby allowing any required allocations (positive or negative) to be made in the storage accounts of the individual irrigation and mining water rights.

To demonstrate the capabilities of the Amistad-Falcon ROM for simulating the individual water rights accounting process, the simulated individual water rights accounting results for the year 1954 from the ROM output listing for the 1945-1996 long-term simulation with historical Rio Grande inflows and current average total water demands are presented in Table 5-7. These pages of output also are included in the ROM output listing contained in Appendix 3. As illustrated by the tabulated figures in Table 5-7, simulated water rights accounting information is presented for each of the three individual water rights owners, i. e., United Irrigation District (UNITED I.D.) , Santa Cruz Irrigation District No. 15 (SANTACRUZ 15), and Hidalgo County Irrigation District No. 2 (HCID2 S.JUAN). For each of the owners, the simulated accounting results are presented for their D-M-I water rights and their Class A and Class B irrigation (or mining) water rights.

TABLE 5-7 SAMPLE ROM OUTPUT LISTING SHOWING THE SIMULATED INDIVIDUAL WATER RIGHTS ACCOUNTING RESULTS FOR 1954

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	2582	.00000	0	0	66857	299	299	.00000	0	0	4009
2	353	0	4565	3063	3063	.03327	2311	2311	66857	177	177	.01957	78	78	4009
3	412	0	4153	5418	3107	.00000	0	0	64546	313	235	.00000	0	0	3931
4	474	0	3679	9982	9982	.11556	8028	8028	64546	576	576	.06798	273	273	3931
5	459	0	3220	9322	1294	.09546	6631	6631	56518	538	265	.05615	225	225	3658
6	477	0	2743	8794	2163	.10811	7510	7510	49887	507	282	.06360	255	255	3433
7	532	0	2211	7384	0	1.38456	96177	96303	42503	426	171	.81445	3265	3265	3178
8	550	0	1661	6717	0	.06328	4396	93982	35786	388	0	.03723	149	3026	2790
9	450	0	1211	3967	0	.03737	2596	92611	31819	229	0	.02198	88	2885	2561
10	426	0	785	4119	0	.03860	2682	91174	27700	238	0	.02271	91	2738	2323
11	394	0	391	2793	0	.00000	0	88381	24907	161	0	.00000	0	2577	2162
12	391	0	0	2716	0	.00000	0	85665	22191	157	0	.00000	0	2420	2005
ANNUAL	5300	0		69464	22191		130331			4009	2005		4424		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	180	.00000	0	0	4674	361	361	.00000	0	0	4828
2	264	0	3417	214	214	.03327	162	162	4674	213	213	.01957	94	94	4828
3	308	0	3109	379	217	.00000	0	0	4512	376	282	.00000	0	0	4734
4	355	0	2754	698	698	.11556	561	561	4512	694	694	.06798	328	328	4734
5	343	0	2411	652	91	.09546	464	464	3951	648	320	.05615	271	271	4406
6	357	0	2054	615	151	.10811	525	525	3487	611	340	.06360	307	307	4135
7	398	0	1656	516	0	1.38456	6725	6734	2971	513	206	.81445	3932	3932	3828
8	412	0	1244	470	0	.06328	307	6571	2501	467	0	.03723	180	3645	3361
9	337	0	907	277	0	.03737	182	6476	2224	276	0	.02198	106	3475	3085
10	319	0	588	288	0	.03860	188	6376	1936	286	0	.02271	110	3299	2799
11	295	0	293	195	0	.00000	0	6181	1741	194	0	.00000	0	3105	2605
12	293	0	0	190	0	.00000	0	5991	1551	189	0	.00000	0	2916	2416
ANNUAL	3967	0		4857	1551		9114			4828	2416		5328		

TABLE 5-7, cont.

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	5494	.00000	0	0	142230	35	35	.00000	0	0	470
2	409	0	5289	6517	6517	.03327	4916	4916	142230	21	21	.01957	9	9	470
3	477	0	4812	11526	6610	.00000	0	0	137314	37	28	.00000	0	0	461
4	549	0	4263	21235	21235	.11556	17077	17077	137314	68	68	.06798	32	32	461
5	532	0	3731	19831	2754	.09546	14106	14106	120237	63	31	.05615	26	26	429
6	553	0	3178	18708	4602	.10811	15976	15976	106131	59	33	.06360	30	30	403
7	616	0	2562	15709	0	1.38456	204603	204870	90422	50	20	.81445	383	383	373
8	637	0	1925	14290	0	.06328	9352	199932	76132	45	0	.03723	17	355	328
9	522	0	1403	8438	0	.03737	5523	197017	67694	27	0	.02198	10	338	301
10	493	0	910	8763	0	.03860	5705	193959	58931	28	0	.02271	11	321	273
11	457	0	453	5941	0	.00000	0	188018	52990	19	0	.00000	0	302	254
12	453	0	0	5778	0	.00000	0	182240	47212	18	0	.00000	0	284	236
ANNUAL	6140	0		147775	47212		277258			470	236		518		

For each of the individual water rights, the monthly demand amounts (DEMAND AMOUNT) as specified in the ROM data input file are listed. For this simulation, the annual demands for all of the individual water rights are set equal to their authorized annual diversion amounts, i. e., their full water rights. Also listed are any simulated shortages (SHORT AMOUNT) that occur with respect to the specified demands because of insufficient available water supplies as simulated with the model. In the accounting process, the net amount of the specified demand and shortage (demand minus shortage) in any given month is deducted (debited) from the usable and the storage account balances for each of the water rights. For the irrigation and mining water rights, allocations (ALLOC AMOUNT) to the individual storage account balances (STORAGE BALANCE) are made in accordance with the TNRCC Rio Grande operating rules regarding Class A and Class B allocation rates (RATE A and RATE B). In the model, the allocation rates are determined based on the simulated results from the total reservoir storage accounting process as described in the previous section, in particular, the simulated total irrigation and mining allocation amounts. The amount of water remaining in a particular water right account that can be diverted and used in a given year is referred to as the USABLE BALANCE. In the accounting process, the usable balance is determined at the end of each month by subtracting from the beginning-of-the-month user balance the specified amount of monthly water usage (demands) less any shortages. Of course, at the beginning of each year, the usable balance for each water right is fully restored to the authorized (permitted) annual diversion or use amount.

The simulated monthly amounts of the various water accounting parameters for each of the individual water rights as listed in Table 5-7 illustrate the expected changes in these quantities as they would occur under the river inflow conditions of 1954. In the first half of this year, as indicated by the total reservoir storage accounting results presented in Table 5-6, the simulated total irrigation and mining account balance (IRRIG ACCOUNT BALANCE) is extremely low. Likewise, the corresponding simulated storage balances of the individual irrigation water rights (STORAGE BALANCE) also are low, with the storage balance of each irrigation water right equal to zero at the beginning of the year. Consequently, the specified demands for the individual irrigation water rights cannot be satisfied, and shortages are simulated for the individual Class A irrigation water rights in the first six months of the year and for the individual Class B irrigation water rights in the first seven months of the year. The difference in the simulated allocations (ALLOC AMOUNT) to the Class A water rights as compared to those for the Class B water rights results in the additional month of shortages for the Class B water rights. No shortages occur in any of the months during the year for the individual D-M-I (municipal) water rights since, in accordance with the TNRCC Rio Grande operating rules, the D-M-I reserve for the reservoir system is refilled to its designated amount, i. e., 225,000 acre-feet, each month as part of the total reservoir storage accounting process.

As indicated by the simulated storage amounts for the overall reservoir system in Table 5-6, significant inflows enter the United States portions of the reservoirs in July of 1954. Just as the simulated total irrigation and mining pool is restored to its maximum level at the end of July, the storage balances of the individual irrigation water rights also are restored to near their full storage capacities, i. e., 1.41 times their annual authorized diversion amounts. After July, the storage balances of the individual irrigation water rights gradually decline as monthly demands exceed the simulated monthly allocations for the remainder of the year. At the end of the year, the simulated storage balances are carried forward to January of the following year, and the usable balances are restored to their maximum levels, i. e., to the annual authorized diversion amounts.

SECTION 6 CONDITIONAL PROBABILITY MODELING

6.1 INTRODUCTION

Conditional Probability Analysis (CPA) is a tool that allows resource managers to analyze the current supply and demand conditions of a single or multiple reservoir system, and to develop and evaluate water management policies which may result in more efficient use of the available water resources and provide drought condition management. Through the development and application of a Conditional Probability Model (CPM), a wide variety of potential reservoir operating rules and demand management options can be examined and evaluated, taking into consideration the entire range of possible beginning-of-the-year storage conditions for the reservoir, as well as historical reservoir inflows.

Complex operating rules governing reservoir storage, withdrawals, allocations, releases and diversions can be included in the CPM, just as they have been included in the Amistad-Falcon ROM. The CPM can also be used to evaluate potential management options that provide for reservoir diversions in excess of the firm annual yield of a reservoir system when storage and inflow conditions are higher than normal, and it can provide guidance with regard to the systematic reduction of certain diversions during potential or anticipated drought conditions.

For the Amistad-Falcon Reservoir system, the CPM has been developed as an extension of the previously described Reservoir Operations Model (ROM). Basically, the ROM computer program has been modified to include the various calculations and statistical analyses required for the CPA. The resulting computer program as applied to Amistad and Falcon Reservoirs is referred to as the Amistad-Falcon CPM.

6.2 BASIC CONDITIONAL PROBABILITY ANALYSIS

For any set of reservoir operating rules, the CPA begins by assuming or specifying a known reservoir storage level (the "condition") at the beginning of a year. The ability, or the inability (failure), of the reservoir to satisfy certain prescribed user demands during this year then is calculated or simulated with the ROM, taking into account the assumed start-of-year storage in the reservoir and all of the annual traces of historical reservoir inflows that have occurred over the period of record of available data. This process then is repeated for a sequential series of assumed start-of-year reservoir storage conditions ranging from empty to full. The result of this calculation process is a set of data describing the number of months during each year of the period of record of historical reservoir inflows that the reservoir could not satisfy the specified demands assuming that the reservoir began each year at varying levels of storage. This set of data then can be analyzed to determine the probability that the reservoir will begin any given year at or below a certain storage level and the probability that the reservoir will not be able to satisfy the specified demands in any given year for the entire range of start-of-year storage conditions.

The probability information from the CPA can be useful for developing and applying reservoir management plans that will allow for optimal use of available water supplies. For example, if the probability of failing to satisfy certain prescribed demands is high for a certain start-of-year storage condition, demands during the upcoming year can be reduced through implementation of drought management or demand management rules. Conversely, if the probability of meeting the prescribed demands is high for a certain start-of-year storage condition, then provisions for increasing the reservoir diversions above the prescribed demands may be considered. Such procedures can be incorporated into the reservoir operating plan so that water supplies in the future can be fully utilized, but not threatened at an unacceptable level of risk.

An advantage of the CPM approach to reservoir management is that it allows water users to predict at the beginning of a year, knowing the amount of water in storage, the quantity of water that potentially will be available for diversion and use in the coming year, with a known level of risk or probability of failure. With CPA information, users have some idea as to how much the reservoir system can be overdrafted during high storage periods and how much conservation is necessary during drought periods in order to avoid future water supply shortfalls for a given level of risk.

The CPM uses historical monthly reservoir inflow sequences, specified reservoir storage and withdrawal (release) rules, and a set of prescribed monthly water demands for a given reservoir or reservoir system to develop information for two relationships. One relationship describes the probability that the amount of water stored in the reservoir or reservoir system at the beginning of any given year, or management period, will be at or below a specified level of storage under the specified rules of operation and demands. Any point along this relationship represents a "start condition" for the upcoming year or management period. The second relationship represents the corresponding probability of meeting the specified demands under the given rules of operation for any start-of-year storage condition. Thus, the "condition" is the system storage at the beginning of the management period, and the "probability" represents the level of risk associated with satisfying certain prescribed demands for a given start-of-year storage condition. The "start condition" probability often is expressed as the probability of starting a management period at or below a specified level, and the demand probability may be expressed as the probability of "failure" to meet certain specified demands.

6.3 AMISTAD-FALCON CPM DEVELOPMENT

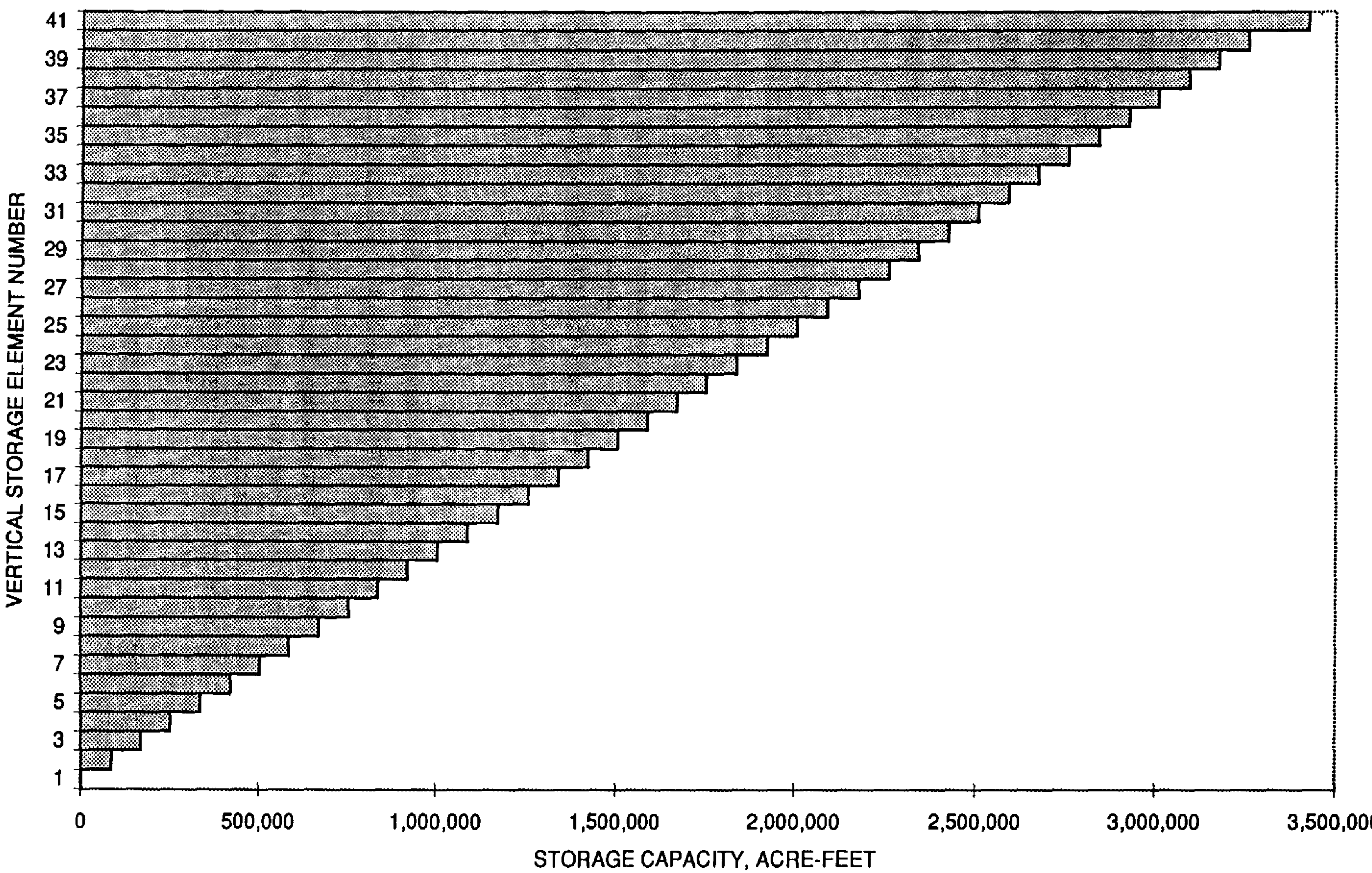
The first step in the CPA process is to divide the reservoir or reservoir system into horizontal layers of equal volume. In this study, the elevation-area-capacity relationships for Amistad and Falcon Reservoirs have been examined, and based on these relationships, the combined storage capacity of these impoundments has been divided into 40 horizontal layers (elements) of equal volume. Because of the inverted trapezoidal shape of natural reservoir cross-sections, the elements near the bottom of the impoundments are much thicker than those near the surface. The resulting cumulative storage-per-element relationship for the Amistad-Falcon system is shown in Figure 6-1. As indicated, the CPA process requires that the first element be assigned a volume of zero.

Selection of an appropriate management period for any reservoir system starts with the examination of the historically recorded reservoir inflows. Recorded inflows generally exhibit intra-year serial correlation. The inflows in any month of the year are somewhat related to the inflows of the previous month. Normally, a one-year management period is used for the CPA; however, when statistical analysis reveals significant serial correlations for periods in excess of twelve months, the management period generally must be extended to the next highest whole year interval to be conservative in the CPA. For purposes of analyzing the Amistad-Falcon system, the historical inflow record has been divided into traces with interval lengths ranging from one to five years. Thus, for a management interval of two years, the 1945-1994 hydrologic record that has been used for the CPA has been grouped into independent hydrologic traces corresponding to the periods 1945-1946, 1946-1947, 1947-1948 and so on through 1993-94.

For each selected management interval, the ROM has been operated with specified demands to simulate the storage behavior of the reservoir system for each independent hydrologic trace as a separate hydrologic condition, assuming that the storage in the reservoir system at the beginning of each hydrologic trace is at one of the 41 predefined storage levels. These simulations have been performed beginning with the bottom storage level (Element 1) and proceeding upwards through the top storage level (Element 41). Hence, for the one-year management interval, 41 sets of simulations have been made, with each comprised of 50 independent simulations corresponding to the 50 one-year periods of hydrologic traces for the 1945-1994 analysis period.

From the results of these simulations, two statistical parameters have been derived and recorded in separate arrays. The first array contains the element number corresponding to the simulated storage level of the reservoir system at the end of each hydrologic trace analyzed as a function of the starting

FIGURE 6-1 CUMULATIVE STORAGE OF THE AMISTAD AND FALCON RESERVOIR SYSTEM BY STORAGE ELEMENT



element number (storage condition) that was assumed at the beginning of each hydrologic trace. The second array includes the number of months during each hydrologic trace that the prescribed demands could not be supplied as a function of the starting element number (storage condition) that was assumed at the beginning of each hydrologic trace. For the one-year management interval, each of these arrays represents a 41 x 50 matrix corresponding to the 41 storage elements and the 50 years of independent hydrologic traces.

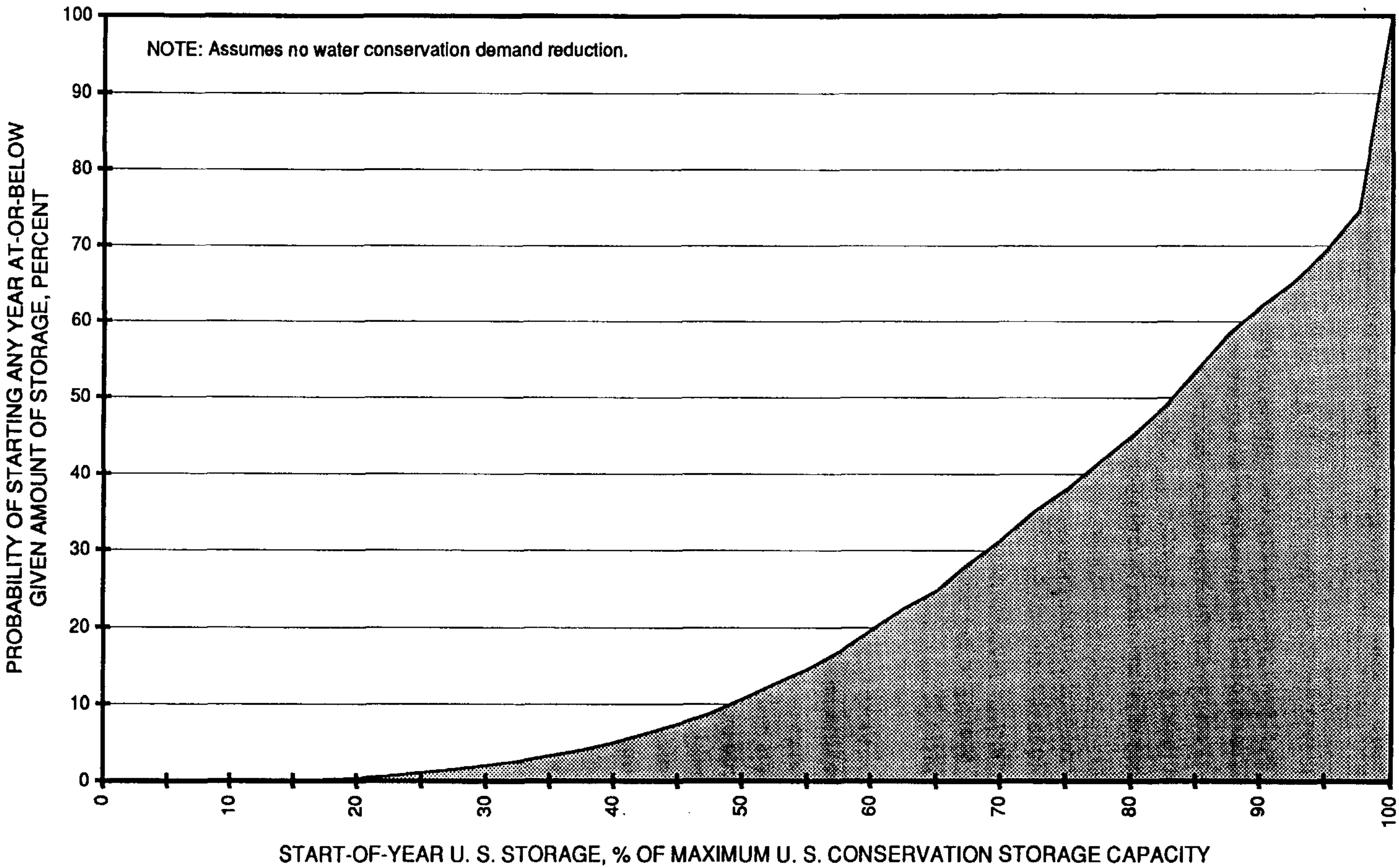
Through the application of matrix algebra, the starting-ending element array has been reduced to a simple column matrix. Based on historical hydrology and the specified demands, this matrix defines the probability of starting any management period at or below any specified storage volume. If starting at the bottom element, a cumulative sum of probabilities is recorded. This matrix represents the probability of starting any year at or below the specified storage level.

The above sets or matrices of reservoir storage information represent the fundamental outputs from the CPA, and they provide useful data for managing reservoir operations. By observing the level of storage in the reservoir system at the beginning of a year or some other management interval, water users will know the relative frequency of occurrence for that level of storage. Knowing that frequency, they also will know in advance if the system is in a normal or uniquely good or bad storage condition entering the management period. Based on the current level of storage and the desired amount of diversions through the management period, the probability of failure (the inability to supply the desired diversions at least one month during the management period) also will be known. The acceptable level of risk associated with the desired diversions can then be weighed against the potential gains associated with increasing or decreasing diversions during the management period.

6.4 AMISTAD-FALCON CPM APPLICATION

For the Amistad and Falcon Reservoir system, the CPM first has been exercised using the current average annual total United States demand of 1,364,000 acre-feet and the current average annual total Mexican demand of 1,290,000 acre-feet as determined in this study. This first scenario assumes that no water conservation demand reductions are applied during drought conditions to either the United States or Mexican diversions. Each country attempts to divert its full monthly demand each and every year, in accordance with the demands specified in the ROM. Under these conditions, the probability of starting any one-year management interval at any given United States storage level is shown in Figure 6-2. This curve indicates that the probability of starting any year

FIGURE 6-2 PROBABILITY OF STARTING ANY YEAR AT-OR-BELOW A GIVEN AMOUNT OF UNITED STATES STORAGE IN THE AMISTAD-FALCON SYSTEM



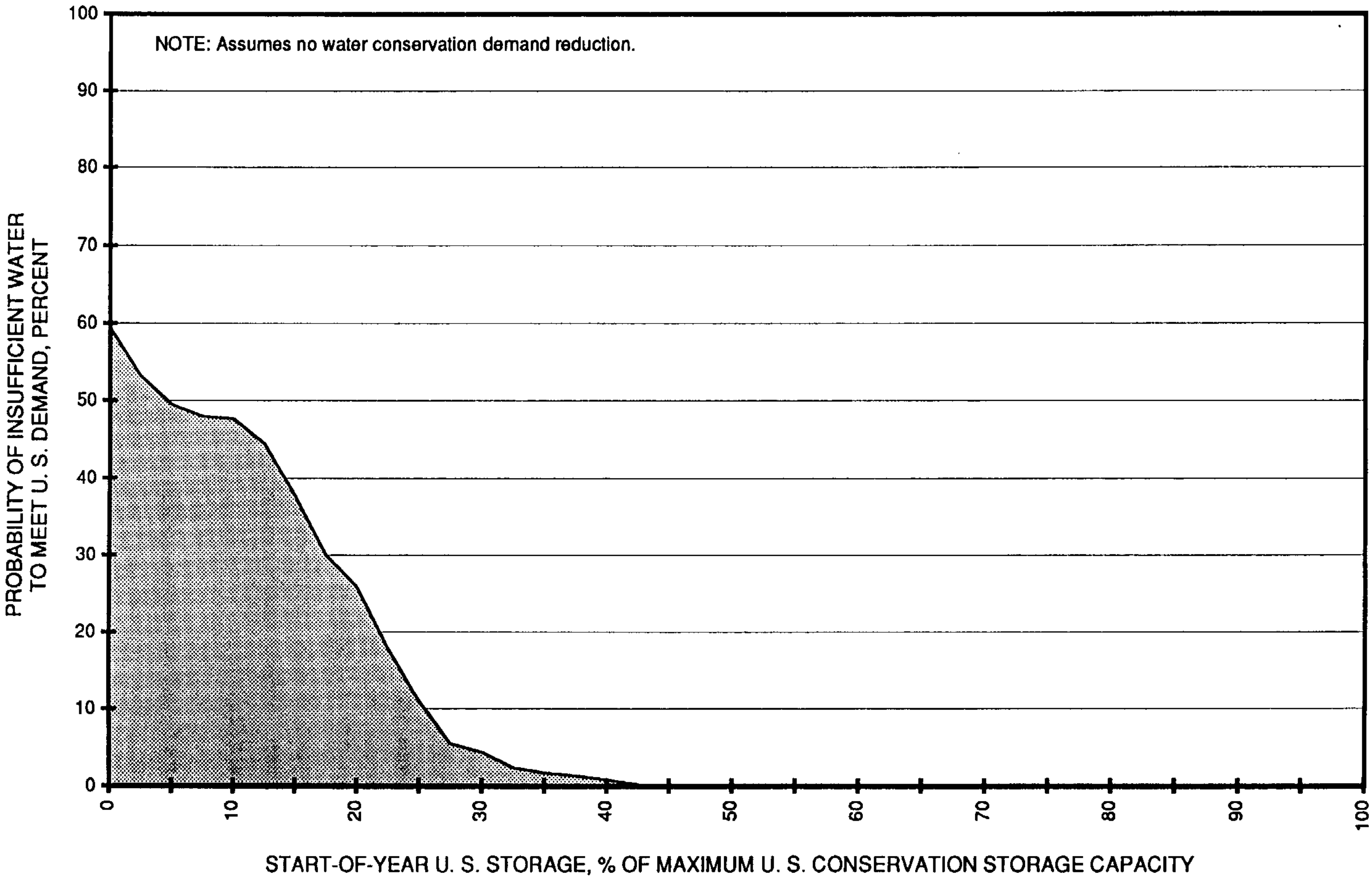
with United States storage less than 20 percent of the combined maximum conservation capacity of Amistad and Falcon Reservoirs is extremely low, and starting any year with less than 50 percent of maximum conservation capacity is likely to occur only about 10 percent of the time. The curve also suggests that approximately 30 percent of the time, the United States storage at the beginning of any year will be at least 90 percent of the maximum conservation storage. Thus, with current average annual United States and Mexican demands and current rules of reservoir operation, the system tends to operate toward the full storage condition.

The probability of failure to meet the current average annual United States demand, with the current Mexican demand also imposed on the reservoir system, as a function of start-of-year United States storage is presented in Figure 6-3. The probability of failure, which is defined as the probability that the full United States demand can not be satisfied at least one month during any year for a particular start-of-year storage condition, is extremely low for all years where the United States storage starts greater than about 45 percent of the full conservation capacity. In fact, the probability of failure is less than five percent all the way down to a start-of-year storage level of about 28 percent of the maximum capacity. If the start-of-year United States storage is less than 25 percent of capacity, the probability of failure increases dramatically.

The total or compound probability of failure of the reservoir system to supply the specified United States demand is the product of the probability of starting any year with a given storage volume and the probability of failure associated with that start-of-year storage. For example, Figure 6-3 indicates that with the current average annual United States demand and a start-of-year storage level at about 20 percent of the full conservation storage capacity, there is about a 25-percent probability of failure in any given year. However, Figure 6-2 indicates that with the current demand, there is an extremely low probability that any year will start with a storage capacity equal to or less than about 20 percent. Thus, at the 20-percent storage level, the probability of failure to satisfy demands is high, but the probability of occurrence of this reservoir storage condition is low. At the other extreme, these figures show that there is zero probability of failure with the current average annual United States demand if the start-of-year storage is greater than about 50 percent of full capacity, and there is about a 90-percent chance that any given year will start with storage levels above 50 percent. Hence, under these conditions, the probability of failure is low and the probability of occurrence is high.

Figure 6-4 shows the compound probability of failure with respect to satisfying the United States demand under current reservoir operating rules and current average annual United States and

FIGURE 6-3 PROBABILITY OF INSUFFICIENT WATER TO MEET CURRENT AVERAGE UNITED STATES DEMAND FOR ANY GIVEN START-OF-YEAR UNITED STATES STORAGE CONDITION

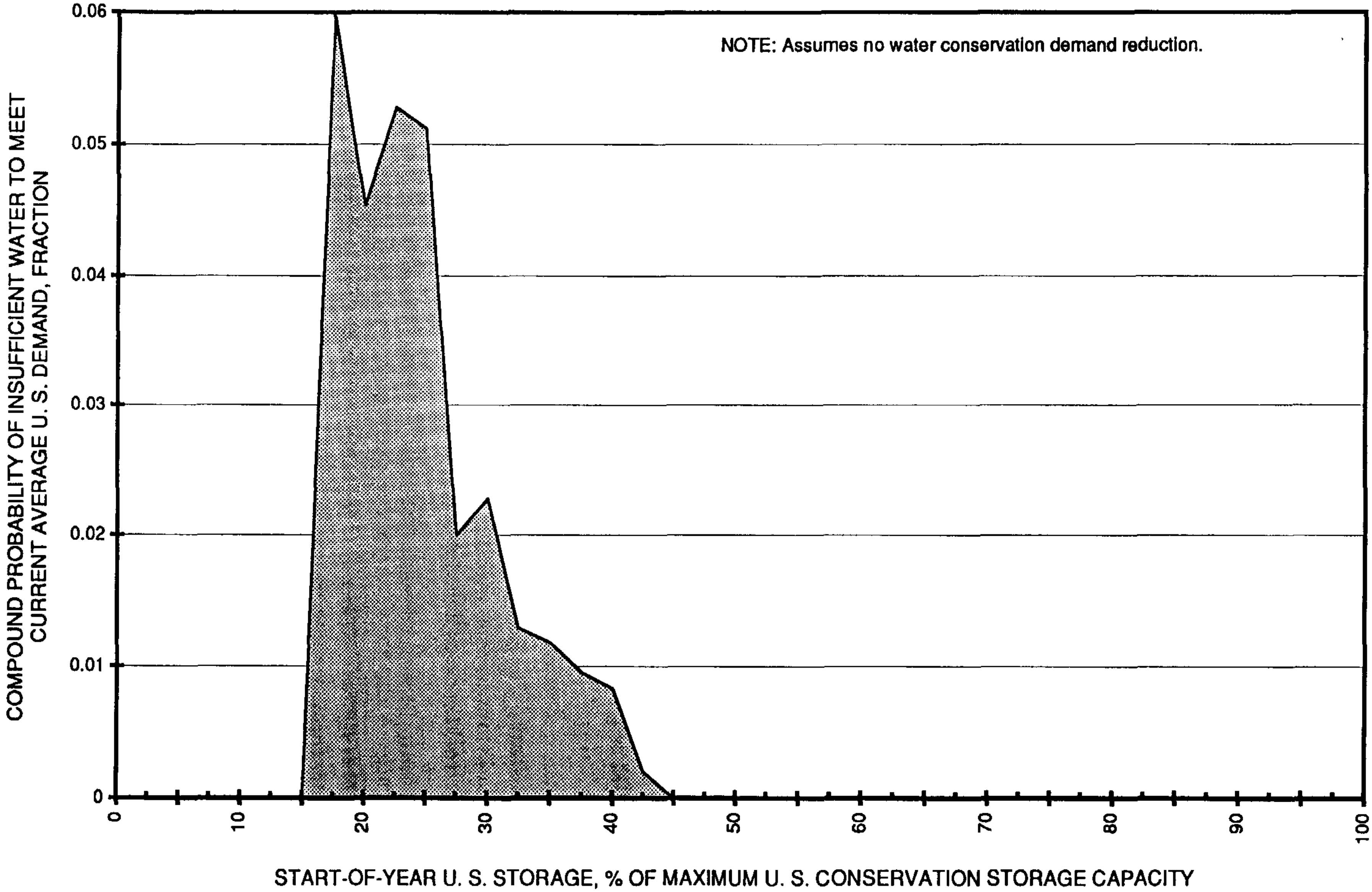


Mexican demands. Note that below about 15 percent start-of-year capacity for the United States, there is nearly a zero probability of failure. This occurs primarily because, as indicated in Figure 6-2, there is nearly a zero probability that the start-of-year storage in the reservoir system will be less than 15-percent full. A storage level equal to 15 percent of the total conservation storage capacity for the United States is about 500,000 acre-feet. The United States water accounting procedures, in accordance with current TNRCC Rio Grande operating rules, reserve on a priority basis each month 225,000 acre-feet of storage for the domestic, municipal and industrial (DMI) pool and another 275,000 to 380,000 acre-feet of storage for the operating reserve. Although current operating rules do allow for irrigation and mining usage when the total United States storage is less than 500,000 acre-feet, negative allocations of water stored in the irrigation and mining accounts are authorized to be made as necessary to restore and maintain the DMI and operating reserves at their authorized capacities, even under extreme drought conditions when storage in the reservoirs is at low levels and when inflows are minimal.

Under these conditions, such negative allocations can result in significant reductions in the amount of water available for irrigation and mining uses. In practice, however, when drought conditions occur or, to some extent, are anticipated, the projected demands for irrigation water from the reservoir system generally are reduced, usually voluntarily by individual irrigators, at the beginning of a year or prior to planting seasons in anticipation of future limited water supplies. The effect of such action, is, of course, to extend the available supply of water stored in the reservoirs. In the ROM as it is presently structured, the total United States irrigation demand is not reduced at the beginning of each year in response to the projected available water supply stored in the reservoirs; rather, it is maintained constant at the maximum level specified in the input data for any particular simulation. The same is true for Mexico. Hence, the United States irrigation water shortages, and failures to satisfy specified demands, simulated with the ROM reflect the theoretical water shortages that would occur as if the full irrigation demand were to be satisfied.

Figure 6-4 also shows that above a start-of-year reservoir storage condition of about 45 percent, there is approximately a zero probability of failure for satisfying current average annual United States demands under current reservoir operating rules. Hence, it is when the start-of-year storage levels are above 45 percent that there may be opportunities to divert and use water in excess of the current average annual demands. Obviously, these opportunities increase as the start-of-year storage levels approach the full-reservoir condition. For start-of-year storage volumes between 15 percent and 45 percent, the curve in Figure 6-4 indicates that drought management rules and water conservation measures are likely to be necessary in order to extend available supplies and to reduce the risk of curtailment of irrigation diversions. When the start-of-year storage is less than about 15

FIGURE 6-4 COMPOUND PROBABILITY OF INSUFFICIENT WATER TO MEET CURRENT AVERAGE UNITED STATES DEMAND FOR ANY GIVEN START-OF-YEAR UNITED STATES STORAGE CONDITION



to 20 percent, drought management measures are automatically implemented through reductions of the available water for irrigation and mining uses through the existing TNRCC operating rules.

Figure 6-5 illustrates conceptually the various components and procedures that might comprise a staged drought management and reservoir operations program for a system such as Amistad and Falcon Reservoirs. Various conditions of demand, reservoir storage, and reservoir inflows are identified, each relating to different levels of water availability. The results from CPM analyses as described and presented above can be useful for defining meaningful reservoir storage and inflow conditions and corresponding demand levels that can provide the basis for developing an effective reservoir management plan. Some of these types of information are described below.

Figure 6-6 presents a graph showing the probabilities of starting a year with a given amount of United States storage in the reservoir system for annual United States demands ranging from 600,000 to 1,800,000 acre-feet/year. These curves have been developed by operating the Amistad-Falcon CPM for the specific annual United States demands indicated. As the demands increase, the probability (or percentage of time) that the United States storage in the reservoir system at the beginning of a year will be at or below any given storage level increases dramatically. The probability of starting any year at-or-below 50 percent of the maximum conservation storage capacity is less than one percent with a United States demand of 600,000 acre-feet/year (approximately half of the current demand), but it increases to more than 55 percent with a demand of 1.8 million acre-feet/year (roughly a 30-percent increase over the total current demand). Figure 6-7 shows the corresponding probabilities of failure for the same 600,000 to 1,800,000 acre-feet/year demand range.

The Amistad-Falcon CPM also has been operated to investigate the dependable yield of the reservoir system as a function of start-of-year storage levels. For purposes of this study, the dependable annual yield (DAY) is defined as the maximum amount of annual United States diversions that can be made from the reservoirs for each start-of-year storage level without failures (shortages) during the worst year of the drought of record. Figure 6-8 is a graph showing the variation of the DAY's for the Amistad-Falcon Reservoir system for one-year through five-year hydrologic traces (management intervals) as a function of start-of-year (or period) storage condition as derived with the CPM. Also plotted on the graph are the United States firm annual yield (FAY) for the reservoir system and the current average annual United States demands. As indicated, all five DAY curves start at 225,000 acre-feet/year for start-of-year storage levels less than 10 percent of the maximum conservation storage capacity. When storage volumes fall below 500,000 acre-feet, irrigation diversions are typically suspended, leaving only the 225,000 acre-feet/year domestic, municipal and

FIGURE 6-5 CONCEPTUAL COMPONENTS AND PROCEDURES
FOR EXAMPLE STAGED DROUGHT MANAGEMENT AND RESERVOIR OPERATIONS PROGRAM

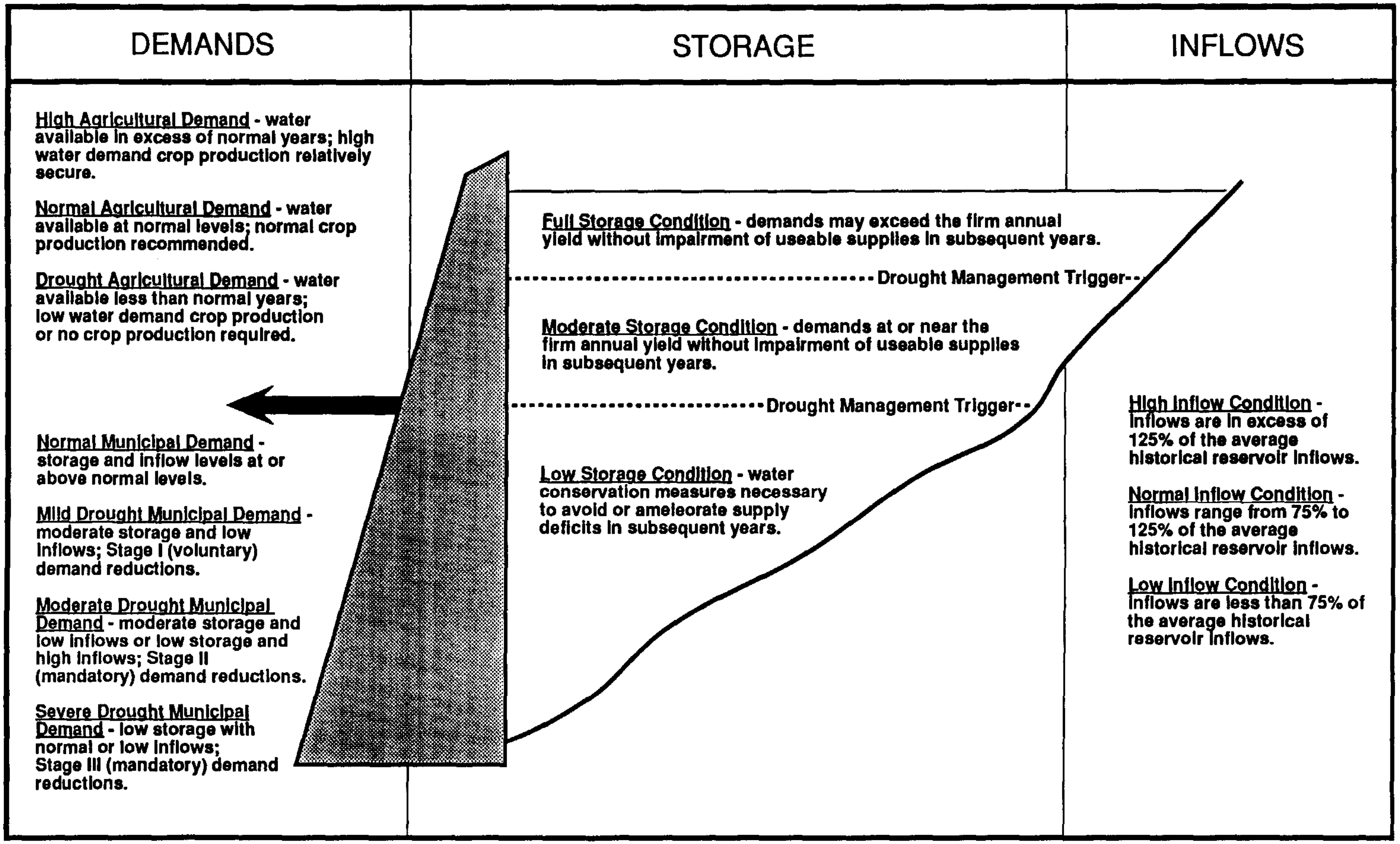


FIGURE 6-6 PROBABILITY OF STARTING ANY YEAR AT-OR-BELOW A GIVEN AMOUNT OF UNITED STATES STORAGE WITH UNITED STATES DEMANDS BETWEEN 600,000 AND 1,800,000 ACRE-FEET/YEAR

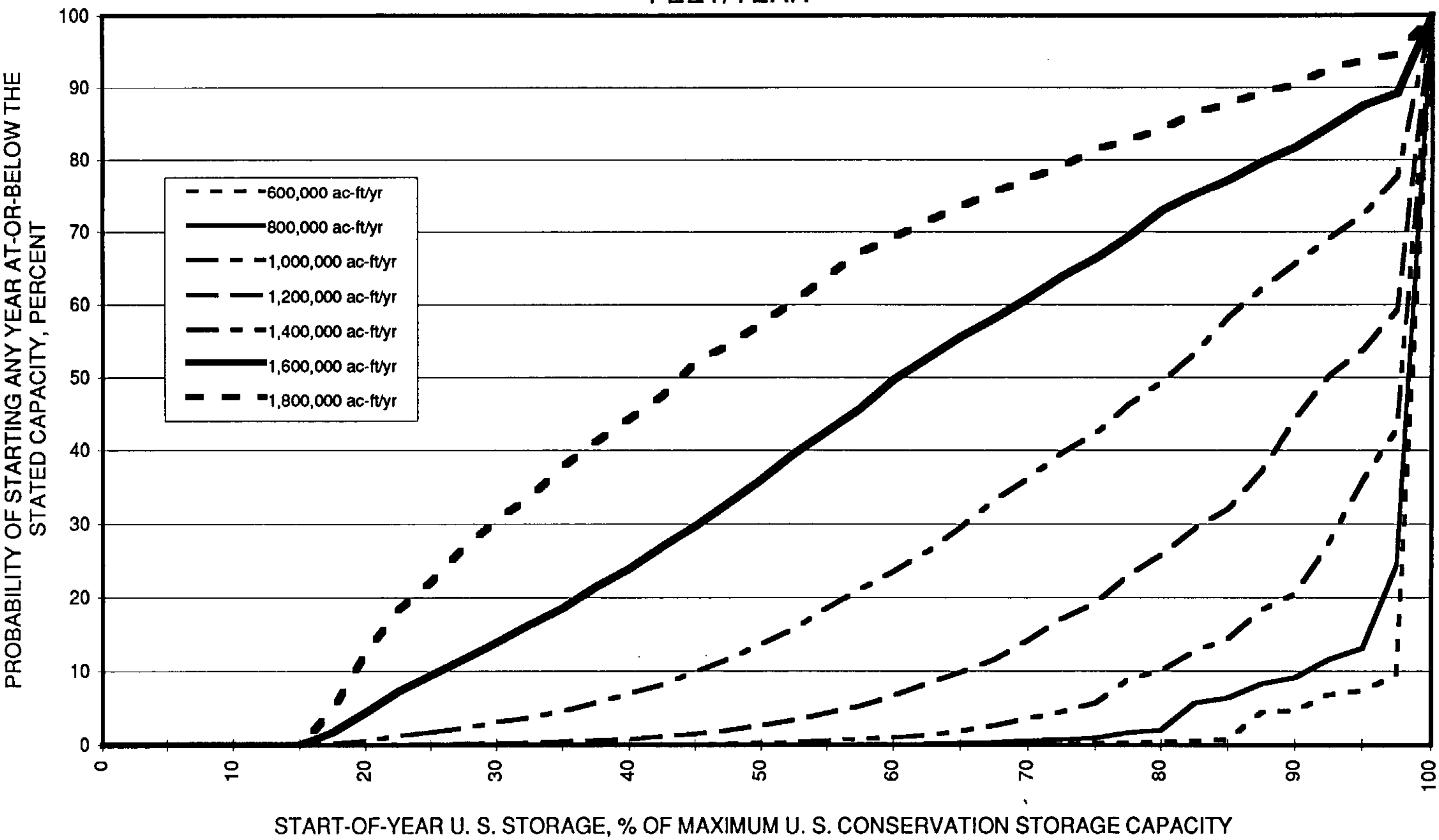
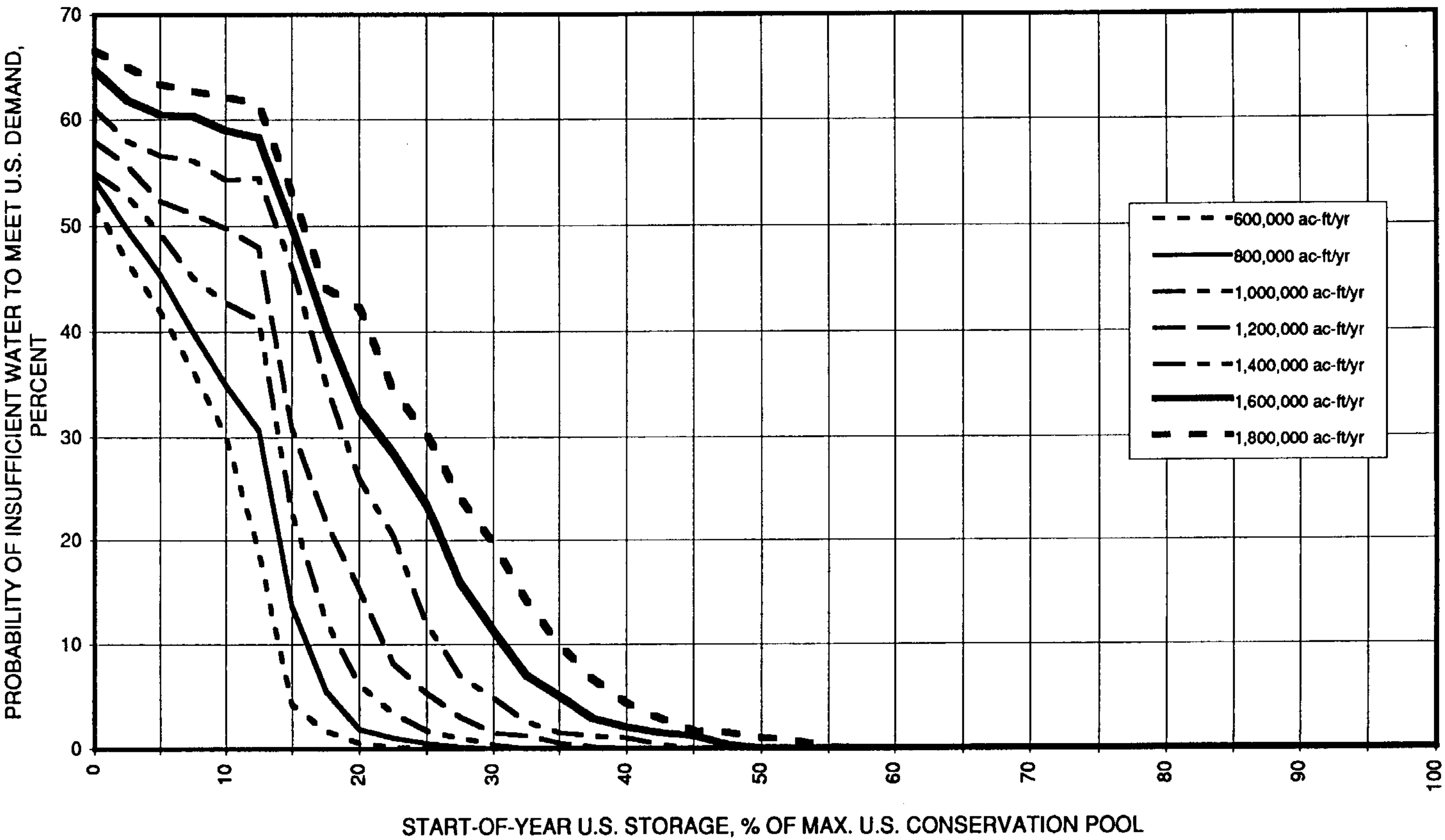


FIGURE 6-7 PROBABILITY OF INSUFFICIENT WATER TO MEET UNITED STATES DEMANDS BETWEEN 600,000 AND 1,800,000 ACRE-FEET/YEAR



industrial reserve. As expected, as the start-of-year (period) storage condition increases, the DAY curves also steadily increase, with the curve for the one-year management interval increasing more rapidly than those for the two- through five-year hydrologic traces. The DAY curve for the one-year hydrologic trace crosses the firm annual yield line at about 37 percent of maximum capacity and the current average annual demand line at about 42 percent of maximum capacity. Thus, if one year is selected as the management interval, for all start-of-year storage levels less than about 42 percent, the maximum drought condition demands that could be satisfied would be less than current demands, and at start-of-year storage less than about 37 percent, the maximum DAY would be less than the firm annual yield.

For start-of-year capacities greater than about 42 percent, Figure 6-8 suggests that for a one-year management interval, diversions well above current demands, up to 3,200,000 acre-feet/year, possibly could be made with proper management policies. However, examination of the DAY curves for the two-year through five-year management intervals, which generally are grouped together, indicates that this may be too optimistic. The four- and five-year management intervals are approaching the duration of the drought of record for this portion of the Rio Grande (eight years), and the corresponding DAY curves validate the previously-determined FAY for the United States (1,261,670 acre-feet/year) at a start-of-year storage capacity of 100 percent. The maximum three-year DAY is approximately equal to the current average annual demand. The three- through five-year DAY curves suggest that, for all start-of-year storage levels less than about 85 percent of capacity, the Amistad and Falcon Reservoir system should be operated under conservation rules. However, just as selection of a one-year management interval may be too optimistic, three-, four- or five-year management intervals may be too restrictive.

The DAY curve produced by the two-year trace simulations appears to offer the most reasonable management interval for the United States portion of the Amistad-Falcon system under their current rules of operation. At start-of-year storage volumes greater than about 70 percent of capacity, this curve suggests that the system could be moderately overdrafted by the United States, i. e., up to about 180,000 acre-feet/year (30 percent more than current average annual demands). At start-of-year storage levels less than about 70 percent, conservation demand reductions would be required to compensate for the overdrafting in order to avoid shortages during the critical drought period.

Figure 6-9 presents an example of how the DAY curve for a two-year management interval could be used to develop drought definitions and a demand reduction (management) plan for the United States' use of water from Amistad and Falcon Reservoirs. Under this plan, if the start-of-year

FIGURE 6-8 UNITED STATES DEPENDABLE ANNUAL YIELD FROM THE AMISTAD AND FALCON RESERVOIR SYSTEM AS A FUNCTION OF START-OF-YEAR U. S. STORAGE FOR DIFFERENT MANAGEMENT INTERVALS

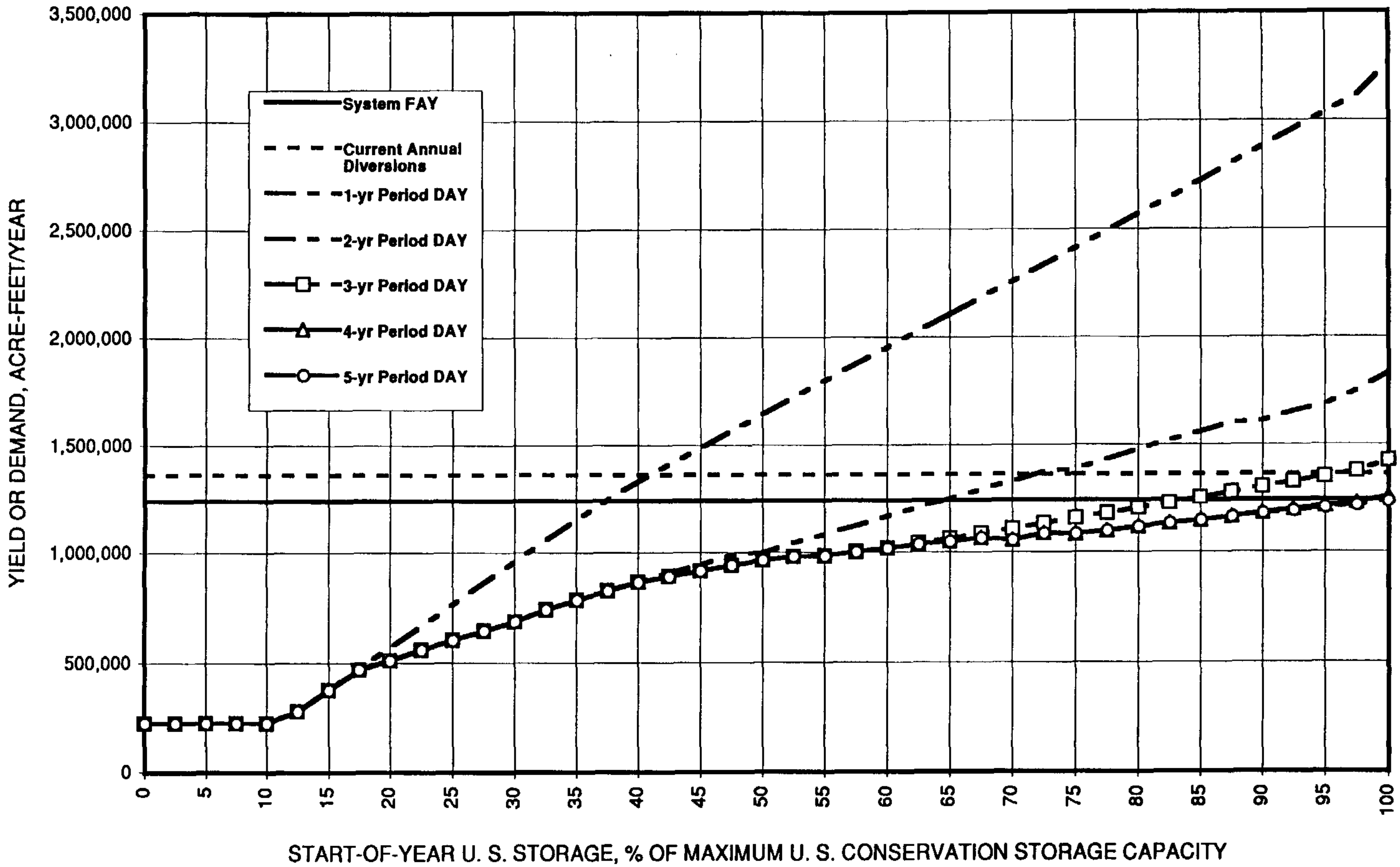
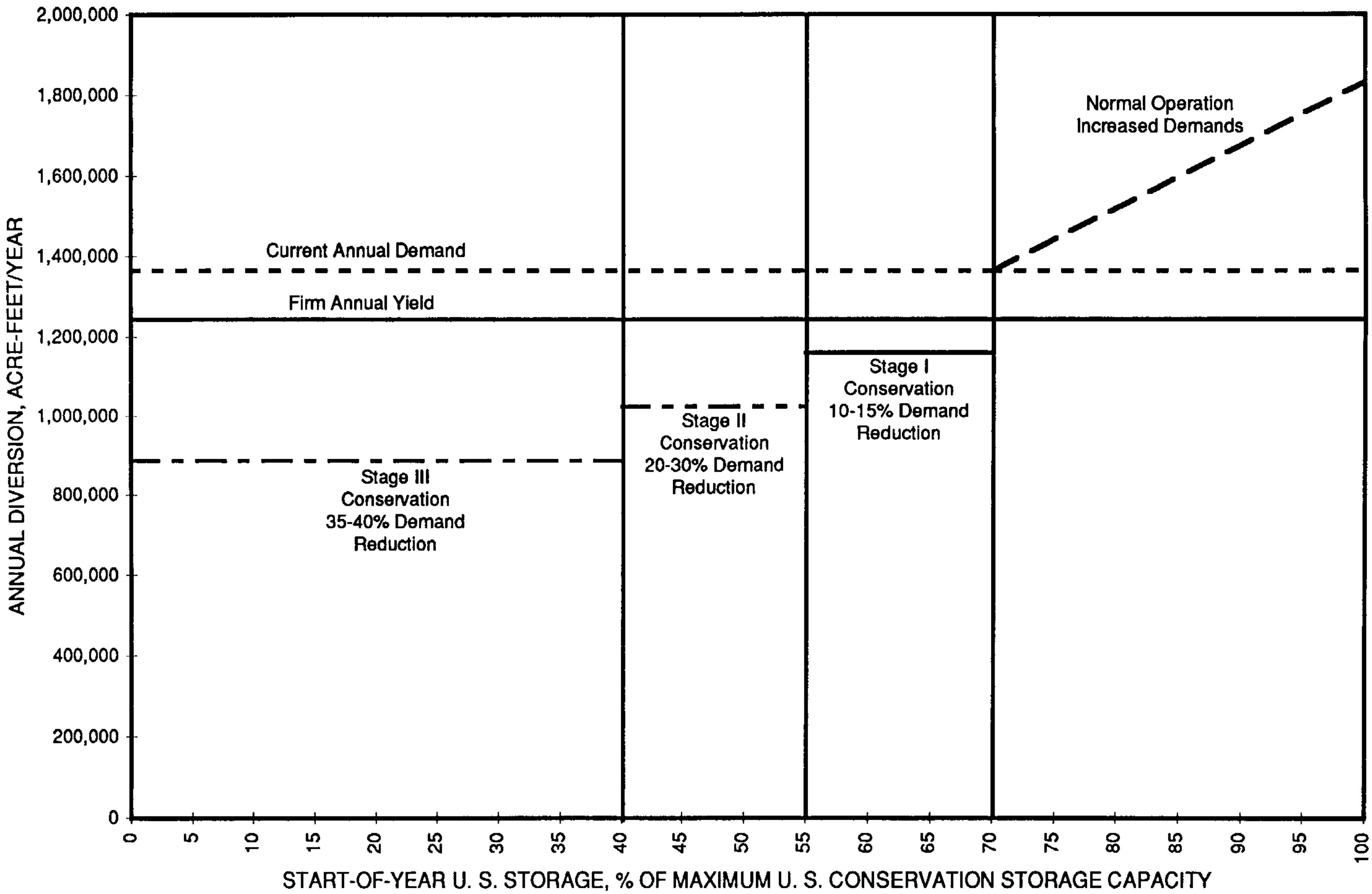


FIGURE 6-9 EXAMPLE AMISTAD-FALCON CONSERVATION MANAGEMENT PLAN AS A FUNCTION OF START-OF-YEAR UNITED STATES STORAGE

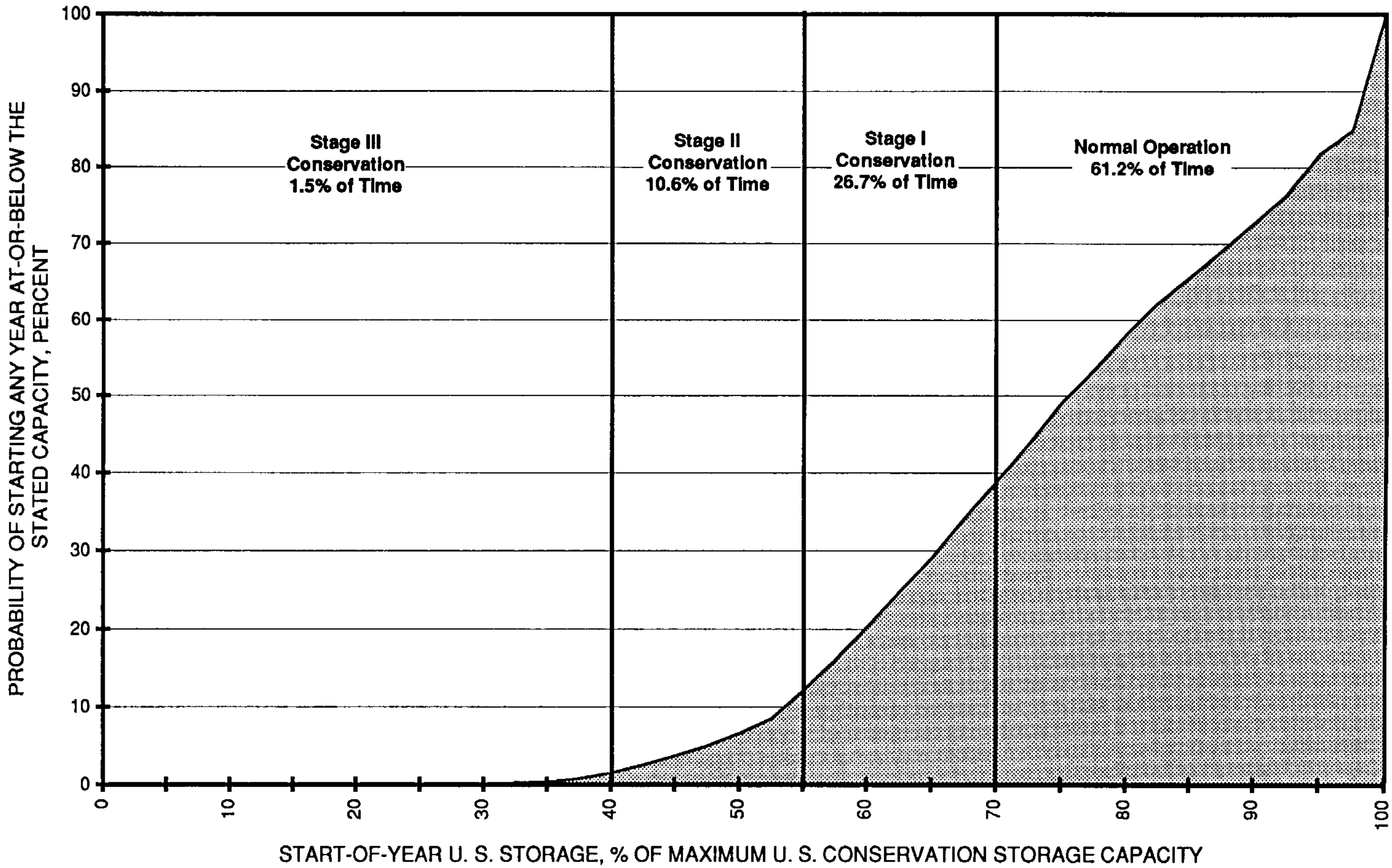


storage volume for the United States is greater than 70 percent, which is defined as the "normal storage" condition, the system could be safely overdrafted commensurate with the initial volume and inflow conditions. At start-of-year storage volumes between 55 percent and 70 percent of capacity, which is defined as a "partial hydrologic drought" condition, Stage I Conservation measures could be instituted requiring a 10-15 percent demand reduction. In the case of irrigation demands, the percentage of demand reduction should not be interpreted to mean that the amount of irrigation water supplied to all fields would be reduced by the same fraction. Instead, the reductions in irrigation water would be allocated among all irrigators, much as they are today. Depending on the amounts of the irrigation water reductions, individual irrigators could choose to plant either less irrigated acreage or non-irrigated or less water-demanding crops.

For those years when the beginning reservoir storage is between 40 percent and 55 percent of maximum capacity, which is defined as a "full hydrologic drought" condition, Stage II Conservation measures could be instituted, which would result in an additional 10-15 percent reduction in water usage. Finally, when the total United States reservoir storage at the beginning of a year falls below 40 percent of maximum capacity, there is a high probability that there will be insufficient water to meet all irrigation demands. This condition is defined as an "extreme hydrologic drought" and would require Stage III Conservation measures to be implemented, i. e., total demand reductions on the order of 35-40 percent. Under this example management scenario, much as is practiced now, irrigators and agricultural interests would have to decide which crops, if any, should be grown to most effectively and efficiently use the remaining available water supply.

As noted previously, the Amistad and Falcon Reservoir system operated under current rules and with current demands tends to be in the normal storage condition, i. e., greater than 70-percent full at the beginning of any year. Figure 6-10 shows the percentages of time that the Normal Storage condition (overdrafting) and Stages I, II and III Conservation conditions (demand reductions) would occur for the above example. As indicated, diversions from the reservoir system could meet or exceed current demands under the Normal Operation condition approximately 61 percent of the time. In the case of partial hydrologic droughts, Stage I Conservation would be in effect approximately 27 percent of the time. Thus, the system could be operated at or near current demand levels about 88 percent of the time. Stage II Conservation and Stage III Conservation would be in effect only 11 percent and two percent of the time, respectively. While the demand reductions associated with the Stage II and III Conservation levels would be significant, i. e., reductions on the order of 25-40 percent of current demands, these conditions would occur relatively infrequently.

FIGURE 6-10 PROBABILITY OF STARTING ANY YEAR AT OR BELOW THE STATED CAPACITY AND PERCENT OF TIME EXAMPLE CONSERVATION MANAGEMENT CONDITIONS WOULD APPLY



APPENDIX 1

MONTHLY RIO GRANDE INFLOWS FOR THE UNITED STATES AND MEXICO AS SPECIFIED IN THE ROM

HISTORICAL UNITED STATES MONTHLY RIO GRANDE INFLOWS INTO AMISTAD RESERVOIR
AS ASSIGNED AT ROM NODE 1

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1945	67,000	58,000	55,000	72,000	50,000	40,000	187,000	57,000	61,000	295,000	77,000	81,000
1946	81,000	58,000	58,000	71,000	90,000	177,000	71,000	55,000	77,000	229,000	73,000	77,000
1947	90,000	68,000	69,000	56,000	96,000	74,000	57,000	44,000	130,000	70,000	52,000	69,000
1948	57,000	53,000	46,000	44,000	55,000	411,000	380,000	69,000	66,000	70,000	65,000	68,000
1949	65,000	137,000	98,000	161,000	164,000	126,000	178,000	225,000	132,000	138,000	81,000	84,000
1950	85,000	67,000	65,000	59,000	66,000	82,000	135,000	97,000	132,000	116,000	62,000	69,000
1951	64,000	55,000	63,000	46,000	79,000	84,000	55,000	45,000	57,000	53,000	52,000	38,000
1952	38,000	34,000	30,000	37,000	65,000	53,000	170,000	34,000	27,000	35,000	36,000	39,000
1953	37,000	33,000	43,000	31,000	30,000	24,000	32,000	50,000	58,000	48,000	35,000	36,000
1954	34,614	30,275	30,977	197,344	116,639	237,073	2,622,785	141,349	96,082	84,666	57,034	55,263
1955	53,265	46,070	46,460	38,188	91,475	77,149	112,166	137,761	262,213	121,255	63,095	54,706
1956	51,698	46,324	42,584	35,356	39,771	34,332	28,392	36,898	37,058	86,838	39,032	37,491
1957	37,596	47,316	41,800	136,538	659,505	177,265	73,927	75,096	76,050	140,350	78,115	67,181
1958	63,009	67,306	62,519	49,886	88,405	165,714	77,970	69,672	368,294	627,571	145,989	95,491
1959	86,964	70,142	70,196	62,285	91,215	97,881	159,542	94,683	127,497	259,847	82,364	76,898
1960	77,578	82,910	78,171	60,722	49,659	54,643	153,709	145,031	119,889	119,400	74,599	79,915
1961	75,479	64,525	61,028	43,264	61,780	250,977	146,310	107,238	78,170	73,880	64,597	63,055
1962	59,058	51,903	50,216	47,126	44,670	66,515	82,407	47,154	112,122	149,367	69,901	61,533
1963	54,323	45,290	43,948	44,657	72,860	78,232	69,548	77,256	81,927	55,644	42,633	47,152
1964	56,642	43,785	46,516	78,145	56,652	86,591	46,508	63,682	855,709	118,850	76,906	72,325
1965	67,986	61,973	60,398	52,426	93,262	241,613	59,086	73,252	83,221	70,950	56,061	53,317
1966	51,052	43,226	45,316	115,240	100,037	102,287	74,195	137,367	303,118	146,858	68,020	62,450
1967	64,656	54,448	58,577	51,990	44,969	79,005	110,504	83,361	142,669	84,122	61,720	58,799
1968	57,237	45,586	46,743	69,553	77,852	54,662	131,994	93,447	164,133	94,458	59,908	38,154
1969	59,631	54,983	56,636	95,899	81,456	69,074	65,326	48,985	63,267	122,658	64,670	61,279
1970	54,181	56,541	59,979	46,572	56,565	82,176	74,870	65,609	133,861	103,064	59,300	51,977
1971	47,456	74,064	51,354	59,800	57,118	122,660	122,555	769,277	169,876	178,262	61,741	68,926
1972	74,371	62,622	73,565	67,437	89,356	91,731	80,713	401,460	166,768	95,550	53,831	49,684

HISTORICAL UNITED STATES MONTHLY RIO GRANDE INFLOWS INTO AMISTAD RESERVOIR, CONT'D.
AS ASSIGNED AT ROM NODE 1

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1973	48,704	57,063	65,390	54,551	74,438	65,044	122,131	121,412	146,629	87,150	39,735	35,781
1974	49,979	40,836	87,326	90,485	103,805	78,188	58,187	155,061	1,690,713	395,996	162,287	116,560
1975	96,081	104,061	147,536	131,421	107,960	85,401	154,811	126,916	97,082	83,108	75,802	74,793
1976	67,703	74,070	80,445	82,235	102,453	81,918	455,057	164,994	184,622	120,053	95,102	98,398
1977	89,008	85,013	101,136	147,229	148,707	106,444	101,933	95,317	89,932	74,485	61,999	62,080
1978	60,420	61,575	75,543	91,355	134,599	168,315	107,300	154,627	118,017	445,622	240,779	85,486
1979	71,806	78,664	121,406	103,579	128,394	235,341	142,118	136,697	80,578	60,607	53,330	62,543
1980	67,160	62,311	75,471	75,331	102,078	77,657	68,958	281,384	245,093	127,441	73,919	72,510
1981	83,096	74,848	96,882	220,281	174,608	150,108	110,515	147,960	179,909	443,195	112,126	94,746
1982	93,576	91,846	98,486	102,927	152,460	135,910	108,229	83,599	73,987	60,019	55,632	62,109
1983	64,240	63,752	62,000	65,647	90,020	71,170	60,444	80,636	54,696	162,207	84,295	51,658
1984	71,795	65,832	70,138	73,716	85,155	127,691	112,178	122,723	103,037	114,561	65,828	73,753
1985	80,817	59,997	73,653	69,616	83,746	99,230	88,313	80,917	155,521	128,097	70,269	53,308
1986	63,429	59,928	76,810	70,322	128,185	170,631	151,349	149,990	215,841	499,780	146,111	155,102
1987	156,284	140,452	143,562	143,294	179,545	236,029	186,572	185,032	132,521	121,320	91,033	82,106
1988	79,165	76,343	87,264	99,944	114,589	94,284	212,892	167,090	278,705	101,198	80,012	77,635
1989	84,613	84,150	88,669	90,840	97,514	89,478	75,820	113,492	111,571	90,729	76,017	52,169
1990	70,810	71,819	84,714	87,094	125,922	82,381	237,328	409,204	350,926	338,661	129,731	88,227
1991	98,305	92,208	108,985	113,656	117,755	109,018	145,834	230,821	497,082	318,888	94,443	100,663
1992	145,135	182,132	144,066	135,629	217,972	213,410	194,327	119,361	102,339	91,789	72,315	84,386
1993	67,435	72,192	87,821	80,034	97,834	111,852	187,126	118,431	127,818	80,203	73,798	77,223
1994	83,071	67,994	80,523	72,772	104,279	87,619	88,168	71,032	74,270	63,971	62,796	68,159
1995	67,892	56,680	61,812	75,819	101,801	79,903	80,026	89,329	95,852	66,988	62,195	56,829
1996	55,280	55,444	54,797	60,455	77,853	82,278	69,082	101,372	194,441	83,591	61,439	60,434

HISTORICAL MEXICO MONTHLY RIO GRANDE INFLOWS INTO AMISTAD RESERVOIR
AS ASSIGNED AT ROM NODE 3

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1945	143,000	132,000	139,000	94,000	95,000	101,000	247,000	112,000	89,000	297,000	148,000	106,000
1946	105,000	108,000	108,000	116,000	94,000	67,000	125,000	93,000	325,000	235,000	134,000	125,000
1947	128,000	129,000	107,000	85,000	92,000	95,000	90,000	232,000	254,000	100,000	136,000	123,000
1948	106,000	111,000	118,000	80,000	82,000	123,000	147,000	102,000	137,000	112,000	122,000	109,000
1949	102,000	153,000	124,000	87,000	89,000	81,000	153,000	227,000	177,000	145,000	151,000	123,000
1950	126,000	131,000	130,000	98,000	96,000	124,000	200,000	156,000	180,000	144,000	125,000	116,000
1951	85,000	107,000	92,000	75,000	133,000	86,000	130,000	109,000	102,000	94,000	94,000	107,000
1952	76,000	78,000	77,000	76,000	93,000	117,000	248,000	105,000	107,000	98,000	99,000	102,000
1953	101,000	82,000	104,000	92,000	93,000	98,000	118,000	100,000	109,000	91,000	100,000	100,000
1954	17,390	16,551	14,764	70,432	45,584	99,035	236,329	122,108	67,878	44,157	23,250	21,872
1955	22,309	20,812	18,282	13,271	55,394	44,002	67,429	137,336	126,021	112,111	36,852	26,675
1956	25,889	23,731	20,463	14,986	17,946	20,610	14,865	28,622	31,319	55,076	25,670	24,000
1957	24,736	27,696	24,061	66,730	142,728	63,618	23,395	40,202	31,206	62,726	31,001	28,569
1958	23,940	22,878	20,651	12,641	20,969	23,527	15,297	29,713	372,761	838,948	121,126	57,495
1959	45,789	29,629	28,854	25,637	43,957	44,065	85,372	83,306	118,100	75,133	36,772	36,420
1960	48,657	63,913	53,837	31,339	22,238	32,120	129,271	138,806	125,662	80,427	54,580	64,615
1961	58,196	46,153	40,262	19,605	35,729	95,189	81,651	74,157	52,368	47,267	35,408	34,783
1962	33,890	29,220	27,332	22,269	23,263	36,660	55,335	30,233	83,620	94,028	40,701	38,931
1963	33,529	25,755	23,684	19,802	31,184	51,736	45,292	66,192	78,759	45,441	32,669	33,774
1964	31,819	27,405	31,982	42,084	31,161	67,232	34,790	55,504	229,645	52,529	36,964	34,804
1965	34,962	35,577	31,635	21,932	40,716	90,784	22,906	39,714	61,798	42,215	36,124	32,141
1966	29,563	24,308	24,469	28,101	27,908	57,307	55,388	132,447	431,243	110,927	44,308	36,510
1967	36,690	28,670	30,543	22,954	23,163	44,749	90,038	67,081	107,022	69,327	45,904	39,232
1968	34,377	20,830	20,146	25,712	31,187	21,142	83,759	90,739	292,200	139,723	83,816	32,506
1969	85,209	80,154	84,419	82,467	46,984	50,851	58,830	35,350	52,029	61,180	35,225	32,385
1970	29,729	29,280	27,597	18,748	28,634	47,680	47,475	44,817	111,656	120,358	67,719	46,692
1971	33,484	38,445	30,716	28,061	29,026	52,730	52,470	181,580	85,533	98,933	21,006	41,014
1972	63,187	35,598	42,476	40,524	47,942	68,874	63,929	112,324	194,565	75,961	30,647	26,776

HISTORICAL MEXICO MONTHLY RIO GRANDE INFLOWS INTO AMISTAD RESERVOIR, CONT'D.
AS ASSIGNED AT ROM NODE 3

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1973	25,789	27,363	25,781	18,269	29,477	38,917	92,508	152,806	166,534	56,001	25,263	21,199
1974	28,270	22,809	51,064	65,280	93,690	72,342	36,392	70,322	345,406	297,838	80,137	47,920
1975	39,053	67,640	152,322	95,620	50,347	38,996	82,148	70,278	54,822	34,986	30,274	32,118
1976	31,054	26,043	26,135	33,893	43,999	58,258	209,414	126,796	93,956	54,289	30,968	39,162
1977	33,941	29,435	56,352	81,031	83,134	49,961	45,395	54,238	39,298	28,899	25,077	24,135
1978	22,719	24,852	27,504	50,868	93,956	79,482	59,410	135,160	196,318	549,428	227,771	49,748
1979	45,558	47,475	83,573	82,227	92,494	182,466	96,608	124,367	44,682	27,348	25,017	26,387
1980	31,670	27,459	38,983	42,772	72,049	34,680	28,340	234,986	127,781	99,558	39,131	39,694
1981	52,936	61,796	85,932	139,227	76,729	82,394	58,659	111,812	212,626	214,082	79,190	63,047
1982	46,492	52,387	55,228	73,876	108,660	91,900	59,594	45,538	44,351	32,322	28,943	25,058
1983	26,633	28,357	29,212	26,353	63,540	38,608	27,203	58,365	37,393	80,429	54,508	26,871
1984	38,405	39,992	34,140	30,578	44,382	105,591	91,301	132,843	79,074	92,897	39,830	46,288
1985	44,361	38,288	42,656	39,042	57,737	51,125	47,111	53,823	115,025	109,010	50,043	34,158
1986	37,309	35,791	46,058	38,600	51,933	115,227	118,409	110,897	246,970	200,219	96,427	110,622
1987	104,036	84,667	112,280	100,241	131,421	169,964	122,162	129,300	84,640	82,205	43,218	39,839
1988	39,143	35,653	38,000	47,346	66,499	68,397	121,618	146,122	201,853	66,692	53,970	44,571
1989	45,068	42,725	43,500	35,329	50,394	41,753	36,386	72,419	82,548	68,873	41,090	28,986
1990	31,532	41,127	48,500	45,920	49,205	31,075	106,713	434,169	280,507	499,003	119,755	41,162
1991	55,727	54,954	65,690	74,159	70,030	64,513	115,050	286,483	681,512	322,515	43,267	58,690
1992	158,556	165,946	91,560	82,462	164,866	239,963	122,761	81,921	53,835	44,256	41,577	35,382
1993	47,753	31,236	36,274	33,152	46,992	93,704	215,840	69,832	78,181	47,182	43,768	44,672
1994	50,832	36,937	44,798	40,202	86,549	41,047	40,014	29,349	31,169	28,947	28,074	30,895
1995	28,687	21,287	23,319	26,625	38,768	29,252	37,006	49,855	43,976	35,154	30,206	23,756
1996	23,037	22,888	20,943	19,311	17,171	26,255	34,280	60,233	88,867	79,094	25,897	23,601

HISTORICAL UNITED STATES MONTHLY RIO GRANDE INFLOWS BETWEEN AMISTAD AND FALCON RESERVOIRS
AS ASSIGNED AT ROM NODE 5

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1945	20,000	15,000	19,000	65,000	14,000	2,000	0	10,000	0	124,000	9,000	7,000
1946	7,000	7,000	2,000	32,000	177,000	69,000	37,000	41,000	33,000	72,000	18,000	11,000
1947	14,000	13,000	10,000	7,000	57,000	133,000	19,000	108,000	33,000	17,000	9,000	6,000
1948	6,000	6,000	9,000	1,000	18,000	164,000	101,000	22,000	177,000	61,000	16,000	14,000
1949	10,000	76,000	37,000	283,000	70,000	83,000	4,000	73,000	52,000	47,000	26,000	22,000
1950	17,000	12,000	11,000	17,000	91,000	61,000	0	10,000	8,000	20,000	1,000	0
1951	2,000	0	4,000	5,000	87,000	59,000	0	10,000	163,000	27,000	9,000	5,000
1952	6,000	0	0	1,000	41,000	17,000	1,000	1,000	24,000	1,000	0	0
1953	0	0	0	0	1,000	0	0	97,000	223,000	59,000	0	0
1954	120	17,036	8,816	23,722	95,001	0	92,915	37,806	54,483	63,480	20,581	2,442
1955	27,719	36,136	41,745	42,016	44,340	38,884	35,364	71,120	76,243	30,353	30,308	18,476
1956	24,027	22,890	22,304	22,667	33,004	8,166	28,351	12,254	45,630	26,178	9,088	13,505
1957	666	6,848	29,984	142,237	264,991	137,469	55,042	57,381	102,026	51,840	33,630	32,487
1958	83,612	44,490	43,508	54,526	165,740	128,223	83,150	67,382	143,882	413,093	245,106	119,285
1959	67,446	75,360	65,020	59,620	55,930	109,521	71,734	48,999	57,361	37,185	33,655	25,232
1960	19,768	36,185	42,607	52,326	57,286	52,010	56,436	47,524	61,801	113,260	36,126	20,456
1961	24,492	36,355	55,070	70,773	63,554	167,818	93,676	66,355	86,250	50,534	36,089	20,489
1962	25,220	43,950	42,641	88,637	45,422	49,322	37,995	49,533	69,781	32,091	30,000	12,698
1963	12,919	20,308	30,999	48,488	86,717	96,671	41,856	31,699	50,143	55,549	18,178	8,899
1964	8,227	20,520	28,305	19,004	42,062	29,108	33,132	64,686	265,141	140,329	38,818	20,412
1965	32,411	31,768	44,802	51,659	159,441	60,866	66,561	56,049	54,302	36,222	34,971	27,586
1966	14,454	22,264	30,980	77,746	214,078	48,993	50,045	47,479	96,837	32,833	29,631	23,946
1967	30,020	27,311	53,604	78,908	48,490	49,296	57,694	120,387	427,295	80,031	41,238	22,187
1968	26,307	33,630	44,122	56,440	73,556	58,875	61,234	43,391	94,012	49,042	13,828	15,664
1969	5,789	10,559	5,162	49,017	48,003	12,375	0	52,548	39,826	78,384	22,435	22,578
1970	18,045	0	34,368	16,673	18,877	20,269	28,017	15,646	69,273	48,326	13,009	14,617
1971	0	576	21,342	16,018	0	271,318	312,041	248,103	573,395	575,018	113,862	69,344
1972	61,254	44,969	36,899	41,065	94,037	52,021	24,181	62,881	72,089	36,880	16,987	26,349

HISTORICAL UNITED STATES MONTHLY RIO GRANDE INFLOWS BETWEEN AMISTAD AND FALCON RESERVOIRS, CONT'D.
AS ASSIGNED AT ROM NODE 5

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1973	30,905	47,598	37,312	21,719	24,901	148,819	67,508	33,623	109,434	124,198	40,856	20,955
1974	26,575	11,647	48,845	22,314	21,661	21,798	11,801	24,445	0	51,818	15,978	30,923
1975	24,878	17,755	14,770	13,543	115,397	68,352	201,670	76,265	82,873	22,632	29,707	21,834
1976	16,454	11,975	30,678	34,540	55,709	25,411	359,476	115,155	134,023	95,134	96,819	86,810
1977	53,404	54,556	41,583	22,609	86,065	44,932	31,825	20,654	17,762	55,146	16,643	19,103
1978	19,140	19,949	8,399	28,187	19,673	57,260	6,580	52,531	126,670	47,404	98,407	71,824
1979	49,334	42,905	21,934	90,334	22,395	167,177	75,880	23,690	43,476	11,487	4,910	11,114
1980	11,983	14,518	0	26,503	71,293	6,934	12,155	159,815	27,787	33,057	24,209	20,984
1981	26,295	25,960	30,930	166,158	289,492	199,381	121,898	34,733	9,759	47,777	22,080	20,166
1982	9,489	32,572	26,535	34,189	93,272	28,362	19,944	0	38,836	18,059	15,529	23,363
1983	20,840	31,006	24,576	32,158	32,078	29,165	19,884	14,393	37,266	57,406	33,260	10,875
1984	35,650	18,978	8,161	31,527	32,981	6,317	0	0	16,755	65,476	12,632	5,665
1985	19,161	21,194	18,312	39,286	71,939	63,669	41,702	5,797	17,189	91,810	26,710	7,493
1986	15,834	2,132	0	0	30,473	120,162	26,243	12,285	67,776	54,315	22,767	25,262
1987	21,540	34,500	21,548	39,399	68,855	182,132	55,017	54,281	65,639	34,741	29,598	23,644
1988	20,628	28,825	23,820	25,371	27,614	36,659	29,221	31,023	126,924	112,110	55,598	22,180
1989	29,811	25,920	23,516	34,875	45,249	34,662	8,975	18,321	23,890	19,335	3,198	10,502
1990	5,050	40,402	21,258	49,495	42,125	21,899	94,819	50,854	37,435	12,530	31,079	11,623
1991	29,965	27,328	15,154	29,803	54,953	41,735	11,485	0	24,682	0	27,828	45,800
1992	35,804	35,357	11,232	46,393	72,989	80,871	69,496	53,437	41,465	21,961	22,773	25,626
1993	27,011	20,357	29,487	21,487	17,471	61,463	9,805	12,271	27,953	3,339	9,876	9,603
1994	23,445	15,648	16,847	27,793	48,520	53,964	28,394	11,543	32,073	10,878	8,365	17,730
1995	7,832	7,386	2,433	0	57,403	8,711	1,299	3,501	73,473	17,386	33,696	5,718
1996	7,807	10,255	4,586	0	5,213	10,551	18,724	30,928	82,151	36,792	12,953	7,713

HISTORICAL MEXICO MONTHLY RIO GRANDE INFLOWS BETWEEN AMISTAD AND FALCON RESERVOIRS
AS ASSIGNED AT ROM NODE 8

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1945	24,000	18,000	17,000	0	21,000	11,000	17,000	1,000	24,000	106,000	19,000	20,000
1946	17,000	8,000	11,000	26,000	0	175,000	51,000	43,000	81,000	55,000	28,000	26,000
1947	20,000	11,000	12,000	8,000	34,000	0	7,000	177,000	62,000	10,000	15,000	15,000
1948	11,000	8,000	20,000	13,000	9,000	0	47,000	12,000	501,000	34,000	29,000	18,000
1949	15,000	26,000	41,000	0	104,000	0	45,000	114,000	43,000	23,000	16,000	15,000
1950	16,000	10,000	8,000	0	0	0	24,000	7,000	42,000	0	11,000	10,000
1951	14,000	8,000	11,000	27,000	55,000	77,000	25,000	11,000	8,000	75,000	8,000	7,000
1952	6,000	10,000	7,000	9,000	16,000	0	6,000	1,000	0	2,000	3,000	4,000
1953	6,000	5,000	11,000	22,000	7,000	1,000	9,000	566,000	215,000	118,000	26,000	17,000
1954	12,996	24,383	19,969	38,335	135,435	0	73,957	25,816	47,928	62,864	21,169	11,213
1955	20,735	28,170	30,598	32,995	38,570	28,463	29,715	75,716	139,724	27,584	27,606	14,898
1956	19,998	19,693	20,084	21,419	33,621	5,065	23,713	5,098	57,211	20,529	9,193	11,850
1957	0	3,975	24,791	135,428	318,218	131,583	29,282	30,220	82,680	39,922	22,987	19,986
1958	73,996	33,020	27,773	33,207	145,772	91,583	55,378	32,749	336,015	1,638,061	388,384	190,640
1959	93,710	100,837	68,993	52,452	47,348	85,690	63,652	39,231	47,557	36,344	29,378	19,097
1960	12,268	25,383	27,317	38,143	41,857	29,855	34,518	38,158	57,197	117,814	34,219	17,257
1961	22,094	32,656	40,836	55,942	51,089	234,049	96,564	63,673	89,339	52,439	33,238	15,037
1962	17,511	32,550	27,938	77,524	26,352	33,861	13,859	32,436	73,549	29,645	23,825	7,515
1963	8,665	15,397	21,083	37,211	79,242	87,221	27,846	13,268	61,536	58,505	13,566	6,778
1964	4,480	18,531	24,363	14,991	36,415	16,596	17,723	66,218	274,377	164,696	37,144	17,348
1965	25,659	23,601	32,150	35,906	162,425	45,839	36,084	35,512	38,605	23,820	26,472	21,293
1966	7,562	15,756	20,125	67,321	239,170	37,546	30,526	36,275	90,076	21,451	16,746	11,099
1967	20,206	17,107	38,531	63,707	23,793	29,587	37,466	123,841	599,489	103,929	48,558	22,045
1968	27,382	30,907	39,149	49,318	63,523	49,933	72,895	45,158	106,076	57,125	14,265	19,061
1969	7,463	12,749	6,707	48,940	58,291	14,705	0	61,047	44,360	83,431	22,934	22,132
1970	15,122	0	31,513	10,956	8,590	4,552	15,650	13,371	86,786	63,622	16,034	17,022
1971	0	926	19,747	10,471	0	326,517	464,146	313,217	861,701	788,216	202,357	113,974
1972	52,444	58,559	44,777	47,119	105,531	63,846	31,101	78,548	87,772	50,583	22,877	27,335

HISTORICAL MEXICO MONTHLY RIO GRANDE INFLOWS BETWEEN AMISTAD AND FALCON RESERVOIRS, CONT'D.
AS ASSIGNED AT ROM NODE 8

(Acre-Feet)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1973	29,847	48,711	36,021	21,673	25,964	166,431	10,192	32,730	118,885	172,487	51,931	26,048
1974	28,295	13,213	49,656	19,315	18,767	23,691	4,848	23,330	0	65,290	24,321	34,956
1975	25,382	16,856	13,035	14,549	119,189	70,655	325,522	100,315	117,641	40,012	41,754	28,634
1976	21,040	17,091	31,731	37,731	66,432	26,177	613,827	232,922	204,504	146,887	153,781	141,088
1977	82,341	78,369	49,815	29,152	98,027	49,766	36,403	21,094	17,272	61,562	14,856	16,218
1978	15,038	16,421	5,549	22,041	11,956	64,016	15,852	68,719	192,724	109,521	167,112	112,332
1979	78,260	54,649	27,705	97,091	24,548	221,257	89,746	26,591	46,059	8,989	3,176	10,577
1980	11,215	14,203	0	24,294	76,365	3,405	7,968	234,132	44,963	54,945	39,663	33,382
1981	34,142	34,949	37,041	253,568	438,750	297,231	170,120	43,826	15,091	56,896	26,872	21,934
1982	6,954	29,023	27,603	36,133	105,173	27,068	16,728	0	38,369	17,207	13,939	20,643
1983	17,595	31,829	28,355	30,870	26,985	19,462	6,041	4,528	27,747	51,699	38,010	8,170
1984	29,926	12,813	3,946	24,218	55,034	12,610	0	0	22,287	71,668	8,118	2,867
1985	19,931	20,762	18,517	49,636	76,989	71,436	47,557	6,934	17,243	104,559	26,962	3,276
1986	14,080	0	0	0	23,904	155,485	34,114	16,766	124,050	89,078	43,226	39,426
1987	32,161	44,593	30,263	41,181	31,687	190,066	97,968	72,925	90,496	48,307	38,803	30,040
1988	24,985	30,643	21,676	23,952	27,909	46,658	30,118	43,196	277,506	182,655	90,303	32,170
1989	35,881	30,167	25,595	31,318	50,654	25,956	9,952	18,517	26,016	19,763	2,131	9,074
1990	0	32,965	16,719	53,902	37,287	15,060	114,041	57,849	65,956	45,551	42,909	15,902
1991	31,390	23,863	9,409	25,304	53,173	39,924	7,660	0	40,150	7,379	34,116	50,381
1992	39,062	39,748	13,890	49,775	85,743	94,973	104,991	67,637	52,173	25,106	23,703	26,809
1993	23,361	15,343	25,194	17,303	12,163	72,790	6,816	10,590	29,366	2,384	7,627	7,186
1994	21,670	13,312	14,748	21,721	43,575	47,246	27,416	8,770	32,969	6,979	4,198	12,977
1995	3,906	3,825	0	0	58,914	10,260	3,913	5,330	98,882	18,370	33,717	3,724
1996	6,958	9,093	4,786	0	12,781	20,695	27,018	40,713	88,400	33,031	11,824	4,555

APPENDIX 2

AMISTAD-FALCON ROM SAMPLE OUTPUT LISTING FROM 1995-1998 SIMULATION

RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD DATE: 2-14-1998
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES FILE: USMX96G2
R. J. BRANDES COMPANY SEPT. 1997

ECHO PRINT OF INPUT DATA FILE PARAMETERS WITHOUT FLOW, DEMAND, OR EVAPORATION DATA

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS
TEST ROM SIMULATION WITH ACTUAL MONTHLY DEMANDS AND AMISTAD RESERVOIR RELEASES

CARD 01	NJ - NUMBER OF NODES IN THE MODEL NETWORK	8
CARD 02	NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK	4
CARD 03	NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK	8
CARD 04	NR - NUMBER OF LINKS THAT ARE RIVER REACHES	8
CARD 05	NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD	04
CARD 06	ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK	8
CARD 07	NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK	2
CARD 08	IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD	1995
CARD 09	IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT	1
CARD 10	ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT	04
CARD 11	INPUT DATA SOURCE ("CARD" OR "TAPE")	CARD
CARD 12	FIRM ANNUAL YIELD ITERATION CONVERGENCE LIMIT	0.040
CARD 13	IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT	1
CARD 14	IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1948
CARD 15	IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1972
CARD 16	IFLYLD=0, NO FAY; IFLYLD =1, DETERMINE FAY FOR CRITICAL PERIOD	0
CARD 17	MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS	271579
CARD 18	MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE	1696228
CARD 19	MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE	1500719
CARD 20	MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE	195509
CARD 21	MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE	181530
CARD 22	MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	162803
CARD 23	MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	18727
CARD 24	MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL	225000
CARD 25	IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE	1747743
CARD 26	NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING	3
CARD 27	IRLFLG=0, READ ALL MONTHLY RELEASES; =1, READ AVG. MON RELEASES	0
CARD 28	IWRFLG=0, READ ALL MONTHLY DEMANDS; =1, READ AVG. MON DEMANDS	0

U.S. AMISTAD	1	1827241	1771041	1771	1205614
U.S. FALCON	2	1613729	1555129	1555	937652
MEX AMISTAD	3	1424078	1380278	1380	420666
MEX FALCON	4	1140074	1098674	1099	320826
U.S.MRG MUNI	5	0	0	0	
U.S.MRG IRRI	6	0	0	0	
U.S.LRG IRRI	7	0	0	0	
MEX MRG M&IR	8	0	0	0	

SPILL RESR 2 4

AMISTAD	1	1	930.0	0	0
AMISTAD	1	2	945.0	5	1
AMISTAD	1	3	946.5	87	294
AMISTAD	1	4	948.2	180	823
AMISTAD	1	5	949.1	237	1180
AMISTAD	1	6	950.1	297	1684
AMISTAD	1	7	951.4	376	2782
AMISTAD	1	8	961.3	1045	13873
AMISTAD	1	9	971.1	1843	33110
AMISTAD	1	10	981.0	2770	59404
AMISTAD	1	11	990.8	3823	93556

```
AMISTAD       1   12    1000.7       5004     138573
AMISTAD       1   13    1010.5       6314     195568
AMISTAD       1   14    1020.3       7722     264663
AMISTAD       1   15    1030.2       9758     350120
AMISTAD       1   16    1040.0      12751     458690
AMISTAD       1   17    1049.9      16734     605456
AMISTAD       1   18    1059.7      21627     790919
AMISTAD       1   19    1069.6      27399    1029250
AMISTAD       1   20    1079.4      34051    1328996
AMISTAD       1   21    1089.2      41702    1699411
AMISTAD       1   22    1094.2      45665    1911714
AMISTAD       1   23    1099.1      49658    2142942
AMISTAD       1   24    1104.0      53679    2393700
AMISTAD       1   25    1108.9      57729    2664077
AMISTAD       1   26    1115.5      63173    3055670
AMISTAD       1   27    1117.0      64438    3151319
AMISTAD       1   28    1118.8      65915    3265037
AMISTAD       1   29    1122.0      68671    3483939
AMISTAD       1   30    1131.9      77013    4199954
FALCON        2    1     203.3          0          0
FALCON        2    2     203.4         35         57
FALCON        2    3     205.1        195        235
FALCON        2    4     206.7        425        735
FALCON        2    5     207.3        539       1050
FALCON        2    6     208.3        727       1670
FALCON        2    7     210.0       1100       3158
FALCON        2    8     214.9       1559       9631
FALCON        2    9     219.8       2202      18806
FALCON        2   10     224.7       3526      32732
FALCON        2   11     229.7       5169      54000
FALCON        2   12     234.6       6531      82799
FALCON        2   13     239.5       8061     118624
FALCON        2   14     242.8      10341     148482
FALCON        2   15     244.4      11654     166516
FALCON        2   16     249.3      15894     234115
FALCON        2   17     254.3      20562     323644
FALCON        2   18     259.2      25677     437240
FALCON        2   19     264.1      30775     576159
FALCON        2   20     269.0      36184     740751
FALCON        2   21     274.0      42448     933844
FALCON        2   22     278.9      48929    1158684
FALCON        2   23     282.2      53474    1326587
FALCON        2   24     285.4      58443    1509829
FALCON        2   25     288.7      65021    1712296
FALCON        2   26     292.0      70235    1935151
FALCON        2   27     295.3      74804    2172702
FALCON        2   28     298.6      82000    2429861
FALCON        2   29     301.2      87181    2653803
FALCON        2   30     305.1      93809    3008297
US AMISTAD  1      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON   2  000000  2  2  2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD  3      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON   4 0000000  6  6  6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI  5   00000  1  1  1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI  6  000000  3  3  3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI  7 0000000  4  4  4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR  8   00000  5  5  5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859
US MODERAT      9.65      75.00
MX MODERAT     10.00      75.00
RESERVOIR     1 1 AVERAGE   10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
```

```
 OPERATING    1 2 DRY       11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       1 3 WET       10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     2 1 AVERAGE   11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    2 2 DRY       10 9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65
  RULES       2 3 WET       11 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     3 1 AVERAGE   12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    3 2 DRY       13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       3 3 WET       12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     4 1 AVERAGE   13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    4 2 DRY       12  0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
  RULES       4 3 WET       13 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
LINK1         1    1    5   9000000         0
LINK2         2    5    6   9000000         0
LINK3         3    6    2   9000000         0
LINK4         4    2    7   9000000         0
LINK5         5    3    8   9000000         0
LINK6         6    8    4   9000000         0
LINK7         7    1    2   9000000         0
LINK8         8    3    4   9000000         0
US AMS REL      1995    67452  61300  69425  58726  69665  69639  68000  66034  66317  65061  63354  66114
US AMS REL      1996    65689  54830  57313  89764 154787 147757  63930  64243  60874  60473  61433  68800
US AMS REL      1997    67452  61300  69425  58726  69665  69639  68000  66034  66317  65061  63354  66114
US AMS REL      1998    67452  61300  69425  58726  69665  69639  68000  66034  66317  65061  63354  66114
MEX AMS REL     1995    32953  29947  92837 177441 120667  21894  21502  21083  21229  20803  20346  21311
MEX AMS REL     1996    14911  10155  11408  13681  14033  11206  11605  11731  11288  11433  11727  12102
MEX AMS REL     1997    32953  29947  92837 177441 120667  21894  21502  21083  21229  20803  20346  21311
MEX AMS REL     1998    32953  29947  92837 177441 120667  21894  21502  21083  21229  20803  20346  21311
UNITED I.D.   1
MUN ADJ NO    0849-000         CL A ADJ NO    A847-001        CL B ADJ NO    B769-000
MUN ANN AUTH      5300         CL A ANN AUTH     69464        CL B ANN AUTH      4009
IRRIG ACCT START BALANCES      CL A BALANCE      87300        CL B BALANCE       3331
MUNICIPAL    1  1995      489    657    595    874    766    657    642    496    125      0      0      0
MUNICIPAL    1  1996      599    748    790    695    874   1017    575      0      0      0      0      0
MUNICIPAL    1  1997      489    657    595    874    766    657    642    496    125      0      0      0
MUNICIPAL    1  1998      489    657    595    874    766    657    642    496    125      0      0      0
CLASS A IRR 1   1995      756   2371   2179   4283   4387  26188   3734   2110   2148   3016    149   1336
CLASS A IRR 1   1996     1367   3377   5238   3880   3858   5441   3730   3257   1435   1822   2897    533
CLASS A IRR 1   1997      756   2371   2179   4283   4387  26188   3734   2110   2148   3016    149   1336
CLASS A IRR 1   1998      756   2371   2179   4283   4387  26188   3734   2110   2148   3016    149   1336
CLASS B IRR 1   1995      100    300    226    191    120    108     74     27     24    178     16     60
CLASS B IRR 1   1996        0      0      0    410     52     20      0      0      0      0      0      0
CLASS B IRR 1   1997      100    300    226    191    120    108     74     27     24    178     16     60
CLASS B IRR 1   1998      100    300    226    191    120    108     74     27     24    178     16     60
SANTACRUZ 15  2
MUN ADJ NO    0240-000         CL A ADJ NO    0810-000        CL B ADJ NO    B804-000
MUN ANN AUTH      3967         CL A ANN AUTH      4857        CL B ANN AUTH      4828
IRRIG ACCT START BALANCES      CL A BALANCE       6599        CL B BALANCE       6807
MUNICIPAL    2  1995      239    145    182    248    308    589    406    613    499    268    289    100
MUNICIPAL    2  1996      354    437    463    443    706    702    761      0      0      0      0    133
MUNICIPAL    2  1997      239    145    182    248    308    589    406    613    499    268    289    100
MUNICIPAL    2  1998      239    145    182    248    308    589    406    613    499    268    289    100
CLASS A IRR 2   1995      187     87     82     53    268    118    230     24     69    254      0      0
CLASS A IRR 2   1996      131    151    226    189    252     96   1111    113     45    206    148     70
CLASS A IRR 2   1997      187     87     82     53    268    118    230     24     69    254      0      0
CLASS A IRR 2   1998      187     87     82     53    268    118    230     24     69    254      0      0
CLASS B IRR 2   1995        0      0      0      0      0      0      0      0      0      0      0      0
CLASS B IRR 2   1996        0      0      0      0   1949   2879      0      0      0      0      0      0
CLASS B IRR 2   1997        0      0      0      0      0      0      0      0      0      0      0      0
CLASS B IRR 2   1998        0      0      0      0      0      0      0      0      0      0      0      0
HCID2 S.JUAN  3
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MUN ADJ NO 0808-001 CL A ADJ NO 0808-005 CL B ADJ NO 0573-001

MUN ANN AUTH 6140 CL A ANN AUTH 147775 CL B ANN AUTH 470

IRRIG ACCT START BALANCES CL A BALANCE 150104 CL B BALANCE 14

MUNICIPAL	3	1995	0	0	3	100	56	90	181	120	0	0	1377	1843
MUNICIPAL	3	1996	0	0	941	507	733	724	556	426	241	242	803	967
MUNICIPAL	3	1997	0	0	3	100	56	90	181	120	0	0	1377	1843
MUNICIPAL	3	1998	0	0	3	100	56	90	181	120	0	0	1377	1843
CLASS A IRR	3	1995	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS A IRR	3	1996	3998	7202	9636	9490	13280	14946	7571	0	2405	2132	3234	2293
CLASS A IRR	3	1997	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS A IRR	3	1998	2663	8039	8845	10112	17240	7093	11385	4441	5227	4099	97	0
CLASS B IRR	3	1995	0	48	0	0	0	0	0	0	28	0	0	0
CLASS B IRR	3	1996	0	0	0	0	0	0	0	0	0	0	0	0
CLASS B IRR	3	1997	0	48	0	0	0	0	0	0	28	0	0	0
CLASS B IRR	3	1998	0	48	0	0	0	0	0	0	28	0	0	0

RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD DATE: 2-14-1998
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN TIME: 16: 6:30
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES FILE: USMX96G2
R. J. BRANDES COMPANY SEPT. 1997

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS
TEST ROM SIMULATION WITH ACTUAL MONTHLY DEMANDS AND AMISTAD RESERVOIR RELEASES

NUMBER OF NODES = 8 NUMBER OF RESERVOIRS = 4

NUMBER OF LINKS = 8 NUMBER OF RIVER REACHES = 8

CALENDAR YEAR OPERATION STARTS = 1995 NUMBER OF YEARS TO SIMULATE = 4

NUMBER OF DEMAND NODES = 8 NUMBER OF SPILL NODES = 2

NUMBER OF INDIVIDUAL WATER RIGHTS = 3

SYSTEM NODE CHARACTERISTICS

NODE NO.	NODE NAME	------------- CAPACITIES --------------				YEARLY
		FLOOD (AC-FT)	CONSERV (AC-FT)	MINIMUM (AC-FT)	STARTING (AC-FT)	DEMAND (AC-FT)
1	U.S. AMISTAD	1827241	1771041	1771	1205614	0
2	U.S. FALCON	1613729	1555129	1555	937652	0
3	MEX AMISTAD	1424078	1380278	1380	420666	0
4	MEX FALCON	1140074	1098674	1099	320826	0
5	U.S.MRG MUNI	0	0	0	0	0
6	U.S.MRG IRRI	0	0	0	0	0
7	U.S.LRG IRRI	0	0	0	0	0
8	MEX MRG M&IR	0	0	0	0	0

NOTE: FLOOD POOL IS AVAILABLE FOR CONSERVATION STORAGE DURING NOVEMBER-APRIL NON-HURRICANE SEASON

SYSTEM LINK CONFIGURATION

LINK NO.	FROM NODE	TO NODE	MAX. CAPACITY (AC-FT/MON)	MIN. CAPACITY (AC-FT/MON)
1	1	5	9000000	0
2	5	6	9000000	0
3	6	2	9000000	0
4	2	7	9000000	0
5	3	8	9000000	0
6	8	4	9000000	0
7	1	2	9000000	0
8	3	4	9000000	0

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1995	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114
1996	65689	54830	57313	89764	154787	147757	63930	64243	60874	60473	61433	68800
1997	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114
1998	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114

MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1995	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311
1996	14911	10155	11408	13681	14033	11206	11605	11731	11288	11433	11727	12102
1997	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311
1998	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

U.S. SPILL RESERVOIR NODE: 2

MEXICO SPILL RESERVOIR NODE: 4

U.S. 'MODERATE' STORAGE CONDITION DEFINED AS 9.65 TO 75.00 PERCENT OF FALCON U.S. CONSERVATION CAPACITY

MEXICO 'MODERATE' STORAGE CONDITION DEFINED AS 10.00 TO 75.00 PERCENT OF FALCON MEXICAN CONSERVATION CAPACITY

NODE MONTHLY DEMAND DISTRIBUTIONS AND DEMAND PRIORITIES

NODE NO.	MONTHLY FRACTIONS OF ANNUAL DEMAND												PRIORITIES		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MOD	LO	HI
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
2	.0720	.0666	.0777	.0894	.0866	.0900	.1004	.1038	.0850	.0803	.0744	.0738	2	2	2
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
4	.1620	.0649	.0243	.2413	.2651	.0653	.0295	.0592	.0227	.0344	.0121	.0192	6	6	6
5	.0611	.0610	.0760	.0826	.0892	.0961	.1086	.1108	.0880	.0851	.0724	.0691	1	1	1
6	.0425	.0409	.0927	.1020	.0835	.1039	.1186	.1366	.0807	.0809	.0666	.0511	3	3	3
7	.0747	.0441	.0780	.1437	.1342	.1266	.1063	.0967	.0571	.0593	.0402	.0391	4	4	4
8	.0785	.0727	.0745	.0849	.0799	.0830	.0915	.0910	.0896	.0860	.0825	.0859	5	5	5

RESERVOIR MONTHLY STORAGE TARGETS AND STORAGE PRIORITIES

RESERVOIR		DESIRED MONTHLY STORAGE LEVEL (PERCENT OF MAXI MUM STORAGE CAPACITY)												
NO.		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	PRIORITIES
1	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
2	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	LO	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	10
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	11
3	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
4	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	LO	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	12
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	13

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

STAGE-AREA-CAPACITY RELATIONSHIPS FOR TOTAL STORAGE IN AMISTAD AND FALCON RESERVOIRS

	AMISTAD RESERVOIR			FALCON RESERVOIR		
POINT NO.	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)
1	930.0	0	0	203.3	0	0
2	945.0	5	1	203.4	35	57
3	946.5	87	294	205.1	195	235
4	948.2	180	823	206.7	425	735
5	949.1	237	1180	207.3	539	1050
6	950.1	297	1684	208.3	727	1670
7	951.4	376	2782	210.0	1100	3158
8	961.3	1045	13873	214.9	1559	9631
9	971.1	1843	33110	219.8	2202	18806
10	981.0	2770	59404	224.7	3526	32732
11	990.8	3823	93556	229.7	5169	54000
12	1000.7	5004	138573	234.6	6531	82799
13	1010.5	6314	195568	239.5	8061	118624
14	1020.3	7722	264663	242.8	10341	148482
15	1030.2	9758	350120	244.4	11654	166516
16	1040.0	12751	458690	249.3	15894	234115
17	1049.9	16734	605456	254.3	20562	323644
18	1059.7	21627	790919	259.2	25677	437240
19	1069.6	27399	1029250	264.1	30775	576159
20	1079.4	34051	1328996	269.0	36184	740751
21	1089.2	41702	1699411	274.0	42448	933844
22	1094.2	45665	1911714	278.9	48929	1158684
23	1099.1	49658	2142942	282.2	53474	1326587
24	1104.0	53679	2393700	285.4	58443	1509829
25	1108.9	57729	2664077	288.7	65021	1712296
26	1115.5	63173	3055670	292.0	70235	1935151
27	1117.0	64438	3151319	295.3	74804	2172702
28	1118.8	65915	3265037	298.6	82000	2429861
29	1122.0	68671	3483939	301.2	87181	2653803
30	1131.9	77013	4199954	305.1	93809	3008297

SUMMARY OF TEXAS WATER RIGHTS IN MIDDLE AND LOWER RIO GRANDE AND
MAXIMUM STORAGE ALLOCATIONS IN AMISTAD AND FALCON RESERVOIRS

TOTAL DOMESTIC, MUNICIPAL AND INDUSTRIAL WATER RIGHTS	(AC-FT/YR):	271579
TOTAL IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	181530
CLASS A IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	162803
CLASS B IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	18727
TOTAL IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1696228
CLASS A IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1500719
CLASS B IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	195509
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON D-M-I POOL	(AC-FT):	225000
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON IRRIGATION POOL	(AC-FT):	2647639
TOTAL RESERVOIR DEAD STORAGE USED IN WATER RIGHTS ACCOUNTING	(AC-FT):	4600
MAXIMUM STORAGE CAPACITY ALLOTTED TO OPERATING RESERVE	(AC-FT):	380000
MAXIMUM USABLE STORAGE AVAILABLE FOR WATER RIGHTS ACCOUNTING	(AC-FT):	3321570
TOTAL IRRIGATION & MINING ACCOUNT BALANCE AT BEGINNING OF SIMULATION	(AC-FT):	1747743

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 1 CALENDAR YEAR 1995

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	67892	67892	0	67452	40024	.31	9210	1497	0	5251	0	0	1196844	1827241
2	56680	56680	0	61300	39539	.44	12961	1574	0	5100	0	0	1179263	1827241
3	61812	61812	0	69425	38240	.47	13711	1813	0	5363	0	0	1157939	1827241
4	75819	75819	0	58726	35594	.77	22555	2167	0	12485	0	0	1152477	1771041
5	101801	101801	0	69665	33050	.87	25881	2451	0	10532	0	0	1158732	1771041
6	79903	79903	0	69639	32022	.99	29437	2463	0	9950	0	0	1139559	1771041
7	80026	80026	0	68000	31759	1.17	34210	2503	0	9481	0	0	1117375	1771041
8	89329	89329	0	66034	31814	1.18	33991	2402	0	12808	0	0	1106679	1771041
9	95852	95852	0	66317	32247	.86	24652	1956	0	6404	0	0	1111562	1771041
10	66988	66988	0	65061	32434	.74	21056	2185	0	3923	0	0	1092433	1771041
11	62195	62195	0	63354	32323	.34	9549	2053	0	1728	0	0	1081725	1827241
12	56829	56829	0	66114	32107	.32	8877	1497	0	6219	0	0	1063563	1827241
ANNUAL	895126	895126	0	791087			246090	24561	0	89244	0	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	7832	68536	0	88713	49162	.26	10102	8653	0	80060	0	0	907373	1210297
2	7386	62012	0	99170	45545	.29	11203	14554	0	84616	0	0	859012	1210297
3	2433	64682	0	82787	44087	.42	15739	8368	0	74419	0	0	825168	1210297
4	0	44074	0	146118	39526	.68	24274	10116	0	136002	0	0	698850	1166347
5	57403	114085	0	273384	32924	.73	22771	19233	0	254151	0	0	516780	1166347
6	8711	65937	0	114796	29688	.80	20940	8356	0	106440	0	0	446981	1166347
7	1299	57315	0	131401	27287	.87	19741	12953	0	118448	0	0	353154	1166347
8	3501	54325	0	56968	25719	.61	12370	6731	0	50237	0	0	338141	1166347
9	73473	131430	0	44108	29056	.58	11965	6530	0	37578	0	0	413498	1166347
10	17386	76339	0	49647	32954	.43	9312	6620	0	43027	0	0	430878	1166347
11	33696	93269	0	20644	35429	.25	5730	3677	0	16967	0	0	497773	1210297
12	5718	64116	0	26690	37904	.20	4909	4954	0	21736	0	0	530290	1210297
ANNUAL	218838	896120	0	1134426			169056	110745	0	1023681	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	28687	28687	0	32953	40024	.31	3197	6435	0	0	0	0	413203	1424078
2	21287	21287	0	29947	39539	.44	4436	6547	0	0	0	0	400107	1424078
3	23319	23319	0	92837	38240	.47	4262	9564	0	0	0	0	326327	1424078
4	26625	26625	0	177441	35594	.77	4852	10222	0	0	0	0	170659	1380278
5	38768	38768	0	120667	33050	.87	2873	11766	0	0	0	0	85887	1035209
6	29252	29252	0	21894	32022	.99	2265	5998	0	0	0	0	90980	1035209
7	37006	37006	0	21502	31759	1.17	2948	5967	0	0	0	0	103536	1035209
8	49855	49855	0	21083	31814	1.18	3550	6047	0	0	0	0	128758	1035209
9	43976	43976	0	21229	32247	.86	3080	5890	0	0	0	0	148425	1035209
10	35154	35154	0	20803	32434	.74	2945	6568	0	0	0	0	159831	1380278
11	30206	30206	0	20346	32323	.34	1441	6128	0	0	0	0	168250	1424078
12	23756	23756	0	21311	32107	.32	1397	5901	0	0	0	0	169298	1424078
ANNUAL	387891	387891	0	602013			37246	87033	0	0	0	0		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 1 CALENDAR YEAR 1995

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	3906	30424	0	179835	49162	.26	2680	179835	0	0	0	0	168735	855056
2	3825	27225	0	46531	45545	.29	2005	46531	0	0	0	0	147424	855056
3	0	83273	0	78080	44087	.42	2778	78080	0	0	0	0	149839	855056
4	0	167219	0	300801	39526	.68	2604	300801	0	0	0	0	13653	824006
5	58914	167815	0	126402	32924	.73	1264	126402	0	0	0	0	53802	1099
6	10260	26156	0	1605	29688	.80	2810	1605	0	0	0	0	75543	1099
7	3913	19448	0	4452	27287	.87	3999	4452	0	0	0	0	86540	1099
8	5330	20366	0	4630	25719	.61	3319	4630	0	0	0	0	98957	1099
9	98882	114221	0	245	29056	.58	4887	245	0	0	0	0	208046	1099
10	18370	32605	0	3266	32954	.43	4858	3266	0	0	0	0	232527	824006
11	33717	47935	0	2976	35429	.25	3127	2976	0	0	0	0	274359	855056
12	3724	19134	0	5720	37904	.20	2672	5720	0	0	0	0	285101	855056
ANNUAL	240841	755821	0	754543			37003	754543	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH / LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114	65918
2	73787	67112	70045	56559	124617	75887	66796	67133	137834	80262	94997	70335	82108
3	68536	62012	64682	44074	114085	65937	57315	54325	131430	76339	93269	64116	74672
4	80060	84616	74419	136002	254151	106440	118448	50237	37578	43027	16967	21736	85301
5	32953	29947	92837	177441	120667	21894	21502	21083	21229	20803	20346	21311	50161
6	30424	27225	83273	167219	167815	26156	19448	20366	114221	32605	47935	19134	62979
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	2138666	75724	10150	85311	0	19312	2099617	63.3	225000	205780	0	0	78906	1668837	63.0
2	2099617	64066	16128	89716	0	24164	2033675	61.3	225000	222784	0	0	82946	1585891	59.9
3	2033675	64245	10181	79782	0	29450	1978507	59.6	225000	241444	0	0	73828	1512063	57.1
4	1978507	75819	12283	148487	0	46829	1846727	55.7	225000	247270	0	0	137606	1374457	51.9
5	1846727	159204	21684	264683	0	48652	1670912	50.4	225000	275000	40805	0	244350	1130107	42.7
6	1670912	88614	10819	116390	0	50377	1581940	47.7	225000	275000	0	59707	107874	1081940	40.9
7	1581940	81325	15456	127929	0	53951	1465929	44.2	225000	275000	2442	0	118453	963487	36.4
8	1465929	92830	9133	63045	0	46361	1440220	43.4	225000	275000	35759	0	59026	904461	34.2
9	1440220	169325	8486	43982	0	36617	1520460	45.9	225000	275000	0	156974	40975	1020460	38.5
10	1520460	84374	8805	46950	0	30368	1518711	45.8	225000	275000	41758	0	43507	976953	36.9
11	1518711	95891	5730	18695	0	15279	1574898	47.5	225000	275000	0	115282	17337	1074898	40.6
12	1574898	62547	6451	27955	0	13786	1589253	47.9	225000	275000	40571	0	26216	1048682	39.6

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 1 CALENDAR YEAR 1995

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	489	0	4811	756	0	.00000	0	86544	68708	100	0	.00000	0	3231	3909
2	657	0	4154	2371	0	.00000	0	84173	66337	300	0	.00000	0	2931	3609
3	595	0	3559	2179	0	.00000	0	81994	64158	226	0	.00000	0	2705	3383
4	874	0	2685	4283	0	.00000	0	77711	59875	191	0	.00000	0	2514	3192
5	766	0	1919	4387	0	.00000	0	73324	55488	120	0	.00000	0	2394	3072
6	657	0	1262	26188	0	.03336	2318	49454	29300	108	0	.01963	79	2365	2964
7	642	0	620	3734	0	.00000	0	45720	25566	74	0	.00000	0	2291	2890
8	496	0	124	2110	0	.00000	0	43610	23456	27	0	.00000	0	2264	2863
9	125	1	0	2148	0	.08772	6093	47555	21308	24	0	.05160	207	2447	2839
10	0	0	0	3016	0	.00000	0	44539	18292	178	0	.00000	0	2269	2661
11	0	0	0	149	0	.06442	4475	48865	18143	16	0	.03789	152	2405	2645
12	0	0	0	1336	0	.00000	0	47529	16807	60	0	.00000	0	2345	2585
ANNUAL	5301	1		52657	0		12886			1424	0		438		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	239	0	3728	187	0	.00000	0	6412	4670	0	0	.00000	0	6807	4828
2	145	0	3583	87	0	.00000	0	6325	4583	0	0	.00000	0	6807	4828
3	182	0	3401	82	0	.00000	0	6243	4501	0	0	.00000	0	6807	4828
4	248	0	3153	53	0	.00000	0	6190	4448	0	0	.00000	0	6807	4828
5	308	0	2845	268	0	.00000	0	5922	4180	0	0	.00000	0	6807	4828
6	589	0	2256	118	0	.03336	162	5966	4062	0	0	.01963	0	6807	4828
7	406	0	1850	230	0	.00000	0	5736	3832	0	0	.00000	0	6807	4828
8	613	0	1237	24	0	.00000	0	5712	3808	0	0	.00000	0	6807	4828
9	499	0	738	69	0	.08772	426	6069	3739	0	0	.05160	0	6807	4828
10	268	0	470	254	0	.00000	0	5815	3485	0	0	.00000	0	6807	4828
11	289	0	181	0	0	.06442	313	6128	3485	0	0	.03789	0	6807	4828
12	100	0	81	0	0	.00000	0	6128	3485	0	0	.00000	0	6807	4828
ANNUAL	3886	0		1372	0		901			0	0		0		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 1 CALENDAR YEAR 1995

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	0	0	6140	2663	0	.00000	0	147441	145112	0	0	.00000	0	14	470
2	0	0	6140	8039	0	.00000	0	139402	137073	48	34	.00000	0	0	456
3	3	0	6137	8845	0	.00000	0	130557	128228	0	0	.00000	0	0	456
4	100	0	6037	10112	0	.00000	0	120445	118116	0	0	.00000	0	0	456
5	56	0	5981	17240	0	.00000	0	103205	100876	0	0	.00000	0	0	456
6	90	0	5891	7093	0	.03336	4930	101042	93783	0	0	.01963	9	9	456
7	181	0	5710	11385	0	.00000	0	89657	82398	0	0	.00000	0	9	456
8	120	0	5590	4441	0	.00000	0	85216	77957	0	0	.00000	0	9	456
9	0	0	5590	5227	0	.08772	12962	92951	72730	28	19	.05160	24	24	447
10	0	0	5590	4099	0	.00000	0	88852	68631	0	0	.00000	0	24	447
11	1377	0	4213	97	0	.06442	9520	98275	68534	0	0	.03789	18	42	447
12	1843	0	2370	0	0	.00000	0	98275	68534	0	0	.00000	0	42	447
ANNUAL	3770	0		79241	0		27412			76	53		51		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 2 CALENDAR YEAR 1996

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	6958	15693	0	6132	38743	.28	3811	6132	0	0	0	0	290851	855056
2	9093	13270	0	4994	38266	.34	4730	4994	0	0	0	0	294397	855056
3	4786	9231	0	7634	36095	.51	7272	7634	0	0	0	0	288722	855056
4	0	3938	0	166134	29808	.67	7407	166134	0	0	0	0	119119	824006
5	12781	17369	0	27162	22753	.81	5518	27162	0	0	0	0	103808	824006
6	20695	25161	0	15935	21119	.87	5771	15935	0	0	0	0	107263	1099
7	27018	31518	0	14526	20252	.99	7082	14526	0	0	0	0	117173	1099
8	40713	45541	0	9411	20194	.69	5824	9411	0	0	0	0	147479	824006
9	88400	93479	0	2981	25114	.56	6278	2981	0	0	0	0	231699	824006
10	33031	37871	0	3603	29814	.39	5206	3603	0	0	0	0	260761	824006
11	11824	17506	0	16832	31151	.34	4664	16832	0	0	0	0	256771	855056
12	4555	11171	0	4263	31670	.24	3258	4263	0	0	0	0	260421	855056
ANNUAL	259854	321748	0	279607			66821	279607	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	65689	54830	57313	89764	154787	147757	63930	64243	60874	60473	61433	68800	79153
2	71829	63246	59787	87366	157225	155655	79924	92979	141286	95247	72154	75018	95971
3	65819	58241	47582	77474	146642	145156	68413	78810	134657	89003	66767	71179	87473
4	50561	78014	113855	163689	179310	124367	93601	57084	26457	35723	42746	35628	83414
5	14911	10155	11408	13681	14033	11206	11605	11731	11288	11433	11727	12102	12101
6	15693	13270	9231	3938	17369	25161	31518	45541	93479	37871	17506	11171	26805
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	1589253	63087	7132	56571	0	18222	1570415	47.4	225000	275000	0	74259	52526	1070415	40.4
2	1570415	65699	15258	83019	0	20642	1517195	45.8	225000	275000	23557	0	76777	993638	37.5
3	1517195	59383	14914	126060	0	27565	1408039	42.5	225000	275000	31352	0	116951	876687	33.1
4	1408039	60455	14573	173581	0	35414	1244926	37.6	225000	275000	28724	0	160485	716202	27.1
5	1244926	83066	16344	189893	0	37074	1084681	32.7	225000	275000	44027	0	175548	540654	20.4
6	1084681	92829	12416	134866	0	40518	989710	29.9	225000	275000	0	73972	124916	489710	18.5
7	989710	87806	12993	105112	0	39227	920184	27.8	225000	275000	28097	0	97623	392087	14.8
8	920184	132300	9840	71253	0	28402	942989	28.5	225000	275000	0	117588	66686	442989	16.7
9	942989	276592	6337	33086	0	20083	1160075	35.0	225000	275000	0	248055	30969	660075	24.9
10	1160075	120383	7514	41967	0	22437	1208540	36.5	225000	275000	0	87574	39109	708540	26.8
11	1208540	74392	11495	48133	0	14808	1208496	36.5	225000	275000	44669	0	44713	663827	25.1
12	1208496	68147	9617	39467	0	10411	1217148	36.7	225000	275000	0	89937	36616	717148	27.1

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 2 CALENDAR YEAR 1996

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	55280	55280	0	65689	31748	.41	11185	1667	0	6010	0	0	1041969	1827241
2	55444	55444	0	54830	31565	.46	12362	1839	0	5005	0	0	1030221	1827241
3	54797	54797	0	57313	31414	.62	16429	2112	0	12205	0	0	1011276	1827241
4	60455	60455	0	89764	30710	.89	22850	2398	0	9892	0	0	959117	1771041
5	77853	77853	0	154787	29000	1.01	24162	2775	0	10583	0	0	858021	1771041
6	82278	82278	0	147757	26867	1.29	27915	2653	0	10499	0	0	764627	1771041
7	69082	69082	0	63930	25768	1.30	26260	2730	0	11511	0	0	743519	1771041
8	101372	101372	0	64243	26413	1.01	20292	2192	0	14169	0	0	760356	1771041
9	194441	194441	0	60874	29307	.57	12297	1739	0	6629	0	0	881626	1771041
10	83591	83591	0	60473	32222	.70	16016	2018	0	6244	0	0	888728	1771041
11	61439	61439	0	61433	32994	.39	8881	2232	0	5387	0	0	879853	1827241
12	60434	60434	0	68800	32944	.27	6068	1495	0	3839	0	0	865419	1827241
ANNUAL	956466	956466	0	949893			204717	25850	0	101973	0	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	7807	65819	0	56026	38743	.28	7037	5465	0	50561	0	0	533046	1210297
2	10255	58241	0	91433	38266	.34	8280	13419	0	78014	0	0	491574	1210297
3	4586	47582	0	126657	36095	.51	11136	12802	0	113855	0	0	401363	1210297
4	0	77474	0	175864	29808	.67	12564	12175	0	163689	0	0	290409	1166347
5	5213	146642	0	192879	22753	.81	12912	13569	0	179310	0	0	231260	1166347
6	10551	145156	0	134130	21119	.87	12603	9763	0	124367	0	0	229683	1166347
7	18724	68413	0	103864	20252	.99	12967	10263	0	93601	0	0	181265	1166347
8	30928	78810	0	64732	20194	.69	8110	7648	0	57084	0	0	187233	1166347
9	82151	134657	0	31055	25114	.56	7786	4598	0	26457	0	0	283049	1166347
10	36792	89003	0	41219	29814	.39	6421	5496	0	35723	0	0	324412	1166347
11	12953	66767	0	52009	31151	.34	5927	9263	0	42746	0	0	333243	1210297
12	7713	71179	0	43750	31670	.24	4343	8122	0	35628	0	0	356329	1210297
ANNUAL	227673	1049743	0	1113618			110086	112583	0	1001035	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	23037	23037	0	14911	31748	.41	1832	6176	0	0	0	0	175592	1424078
2	22888	22888	0	10155	31565	.46	2158	5978	0	0	0	0	186167	1424078
3	20943	20943	0	11408	31414	.62	3048	6963	0	0	0	0	192654	1424078
4	19311	19311	0	13681	30710	.89	4482	9743	0	0	0	0	193802	1380278
5	17171	17171	0	14033	29000	1.01	5128	9445	0	0	0	0	191812	1380278
6	26255	26255	0	11206	26867	1.29	6743	6740	0	0	0	0	200118	1035209
7	34280	34280	0	11605	25768	1.30	7238	7105	0	0	0	0	215555	1035209
8	60233	60233	0	11731	26413	1.01	6385	6903	0	0	0	0	257672	1380278
9	88867	88867	0	11288	29307	.57	4408	6209	0	0	0	0	330843	1380278
10	79094	79094	0	11433	32222	.70	6539	6593	0	0	0	0	391965	1380278
11	25897	25897	0	11727	32994	.39	3987	6045	0	0	0	0	402148	1424078
12	23601	23601	0	12102	32944	.27	2827	5486	0	0	0	0	410820	1424078
ANNUAL	441577	441577	0	145280			54775	83386	0	0	0	0		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 2 CALENDAR YEAR 1996

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	0	0	6140	3998	0	.04150	6132	100409	143777	0	0	.02441	11	53	470
2	0	0	6140	7202	0	.00000	0	93207	136575	0	0	.00000	0	53	470
3	941	0	5199	9636	0	.00000	0	83571	126939	0	0	.00000	0	53	470
4	507	0	4692	9490	0	.00000	0	74081	117449	0	0	.00000	0	53	470
5	733	0	3959	13280	0	.00000	0	60801	104169	0	0	.00000	0	53	470
6	724	0	3235	14946	0	.04134	6108	51963	89223	0	0	.02432	11	64	470
7	556	0	2679	7571	0	.00000	0	44392	81652	0	0	.00000	0	64	470
8	426	0	2253	0	0	.06571	9710	54102	81652	0	0	.03865	18	82	470
9	241	0	2012	2405	0	.13861	20484	72181	79247	0	0	.08154	38	120	470
10	242	0	1770	2132	0	.04894	7232	77281	77115	0	0	.02879	14	134	470
11	803	0	967	3234	0	.00000	0	74047	73881	0	0	.00000	0	134	470
12	967	0	0	2293	0	.05026	7427	79181	71588	0	0	.02956	14	148	470
ANNUAL	6140	0		76187	0		57093			0	0		106		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 2 CALENDAR YEAR 1996

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	599	0	4701	1367	0	.04150	2882	49044	68097	0	0	.02441	98	2443	4009
2	748	0	3953	3377	0	.00000	0	45667	64720	0	0	.00000	0	2443	4009
3	790	0	3163	5238	0	.00000	0	40429	59482	0	0	.00000	0	2443	4009
4	695	0	2468	3880	0	.00000	0	36549	55602	410	0	.00000	0	2033	3599
5	874	0	1594	3858	0	.00000	0	32691	51744	52	0	.00000	0	1981	3547
6	1017	0	577	5441	0	.04134	2871	30121	46303	20	0	.02432	97	2058	3527
7	575	0	2	3730	0	.00000	0	26391	42573	0	0	.00000	0	2058	3527
8	0	0	2	3257	0	.06571	4564	27698	39316	0	0	.03865	155	2213	3527
9	0	0	2	1435	0	.13861	9629	35892	37881	0	0	.08154	327	2540	3527
10	0	0	2	1822	0	.04894	3399	37469	36059	0	0	.02879	115	2655	3527
11	0	0	2	2897	0	.00000	0	34572	33162	0	0	.00000	0	2655	3527
12	0	0	2	533	0	.05026	3491	37530	32629	0	0	.02956	119	2774	3527
ANNUAL	5298	0		36835	0		26836			482	0		911		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	354	0	3613	131	0	.04150	202	6199	4726	0	0	.02441	0	6807	4828
2	437	0	3176	151	0	.00000	0	6048	4575	0	0	.00000	0	6807	4828
3	463	0	2713	226	0	.00000	0	5822	4349	0	0	.00000	0	6807	4828
4	443	0	2270	189	0	.00000	0	5633	4160	0	0	.00000	0	6807	4828
5	706	0	1564	252	0	.00000	0	5381	3908	1949	0	.00000	0	4858	2879
6	702	0	862	96	0	.04134	201	5486	3812	2879	0	.02432	117	2096	0
7	761	0	101	1111	0	.00000	0	4375	2701	0	0	.00000	0	2096	0
8	0	0	101	113	0	.06571	319	4581	2588	0	0	.03865	187	2283	0
9	0	0	101	45	0	.13861	673	5209	2543	0	0	.08154	394	2677	0
10	0	0	101	206	0	.04894	238	5241	2337	0	0	.02879	139	2816	0
11	0	0	101	148	0	.00000	0	5093	2189	0	0	.00000	0	2816	0
12	133	32	0	70	0	.05026	244	5267	2119	0	0	.02956	143	2959	0
ANNUAL	3999	32		2738	0		1877			4828	0		980		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 3   CALENDAR YEAR 1997

RESERVOIR NO. 4   MEX FALCON   MAX FLOOD POOL: 1140074   MAX CONSERVATION POOL: 1098674   DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	3906	30424	0	179835	29014	.26	2634	179835	0	0	0	0	108376	855056
2	3825	27225	0	46531	24354	.29	1695	46531	0	0	0	0	87375	1140
3	0	83273	0	78080	22421	.42	2292	78080	0	0	0	0	90276	1140
4	0	218014	0	300801	17012	.68	2164	300801	0	0	0	0	5325	1099
5	58914	129885	0	126402	6570	.73	394	126402	0	0	0	0	8414	1099
6	10260	26156	0	1605	7017	.80	1198	1605	0	0	0	0	31767	1099
7	3913	19448	0	4452	12880	.87	2296	4452	0	0	0	0	44467	1099
8	5330	20366	0	4630	13797	.61	2150	4630	0	0	0	0	58053	1099
9	98882	114221	0	245	19460	.58	4214	245	0	0	0	0	167815	1099
10	18370	32605	0	3266	24909	.43	4593	3266	0	0	0	0	192561	824006
11	33717	47935	0	2976	27912	.25	2991	2976	0	0	0	0	234529	855056
12	3724	19134	0	5720	30761	.20	2564	5720	0	0	0	0	245379	855056
ANNUAL	240841	768686	0	754543			29185	754543	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114	65918
2	73787	67112	70045	56559	124617	75887	66796	67133	137834	80262	94997	70335	82108
3	68536	62012	64682	44074	114085	65937	57315	54325	131430	76339	93269	64116	74672
4	80060	84616	74419	136002	254151	106440	118448	50237	37578	43027	16967	21736	85301
5	32953	29947	92837	177441	82737	21894	21502	21083	21229	20803	20346	21311	47000
6	30424	27225	83273	167219	129885	26156	19448	20366	114221	32605	47935	19134	59818
7	0	0	0	0	13329	198112	85891	8969	0	0	0	0	25523
8	0	0	0	50795	0	0	0	0	0	0	0	0	4232

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	1217148	75724	10150	85311	0	11801	1185610	35.8	225000	275000	47368	0	78906	638242	24.1
2	1185610	64066	16128	89716	0	15054	1128778	34.1	225000	275000	0	73482	82946	628778	23.7
3	1128778	64245	10181	79782	0	17348	1085712	32.8	225000	275000	30762	0	73828	554950	21.0
4	1085712	75819	12283	148487	0	26324	974437	29.4	225000	275000	0	57093	137606	474437	17.9
5	974437	159204	21684	264683	0	23767	823507	24.9	225000	275000	0	93420	244350	323507	12.2
6	823507	88614	10819	116390	0	23982	760930	23.0	225000	275000	45297	0	107874	215633	8.1
7	760930	81325	15456	127929	0	27378	671492	20.3	225000	275000	0	74312	118453	171492	6.5
8	671492	92830	9133	63045	0	23378	668766	20.2	225000	275000	0	56300	59026	168766	6.4
9	668766	169325	8486	43982	0	19687	765936	23.2	225000	275000	0	138145	40975	265936	10.0
10	765936	84374	8805	46950	0	17039	777516	23.5	225000	275000	0	55087	43507	277516	10.5
11	777516	95891	5730	18695	0	8933	840049	25.4	225000	275000	0	79870	17337	340049	12.8
12	840049	62547	6451	27955	0	8157	860033	26.0	225000	275000	46200	0	26216	313833	11.9

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 3 CALENDAR YEAR 1997

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	67892	67892	0	67452	32725	.31	6891	1497	0	5251	0	0	858968	1827241
2	56680	56680	0	61300	32265	.44	9686	1574	0	5100	0	0	844662	1827241
3	61812	61812	0	69425	30943	.47	10223	1813	0	5363	0	0	826826	1827241
4	75819	75819	0	58726	27642	.77	16920	2167	0	12485	0	0	826999	1771041
5	101801	101801	0	82994	24609	.87	19365	2451	0	10532	0	0	826441	1771041
6	79903	79903	0	267751	21598	.99	19566	2463	0	9950	0	0	619027	1328281
7	80026	80026	0	153891	17889	1.17	18468	2503	0	9481	0	0	526694	1328281
8	89329	89329	0	75003	17144	1.18	17112	2402	0	12808	0	0	523908	1328281
9	95852	95852	0	66317	17932	.86	12614	1956	0	6404	0	0	540829	1328281
10	66988	66988	0	65061	18453	.74	10921	2185	0	3923	0	0	531835	1771041
11	62195	62195	0	63354	18519	.34	4946	2053	0	1728	0	0	525730	1827241
12	56829	56829	0	66114	18383	.32	4569	1497	0	6219	0	0	511876	1827241
ANNUAL	895126	895126	0	1097388			151281	24561	0	89244	0	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	7832	68536	0	88713	29014	.26	4910	8653	0	80060	0	0	331242	1210297
2	7386	62012	0	99170	24354	.29	5368	14554	0	84616	0	0	288716	1210297
3	2433	64682	0	82787	22421	.42	7125	8368	0	74419	0	0	263486	1210297
4	0	44074	0	146118	17012	.68	9404	10116	0	136002	0	0	152038	1166347
5	57403	127414	0	273384	6570	.73	4402	19233	0	254151	0	0	1666	1166347
6	8711	264049	0	114796	7017	.80	4416	8356	0	106440	0	0	146503	150070
7	1299	143206	0	131401	12880	.87	8910	12953	0	118448	0	0	149398	150070
8	3501	63294	0	56968	13797	.61	6266	6731	0	50237	0	0	149458	150070
9	73473	131430	0	44108	19460	.58	7073	6530	0	37578	0	0	229707	150070
10	17386	76339	0	49647	24909	.43	6118	6620	0	43027	0	0	250281	1166347
11	33696	93269	0	20644	27912	.25	3987	3677	0	16967	0	0	318919	1210297
12	5718	64116	0	26690	30761	.20	3588	4954	0	21736	0	0	352757	1210297
ANNUAL	218838	1202421	0	1134426			71567	110745	0	1023681	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	28687	28687	0	32953	32725	.31	3254	6435	0	0	0	0	403300	1424078
2	21287	21287	0	29947	32265	.44	4511	6547	0	0	0	0	390129	1068059
3	23319	23319	0	92837	30943	.47	4320	9564	0	0	0	0	316291	1068059
4	26625	26625	0	228236	27642	.77	4364	10222	0	0	0	0	110316	1035209
5	38768	38768	0	82737	24609	.87	2045	11766	0	0	0	0	64302	1035209
6	29252	29252	0	21894	21598	.99	1816	5998	0	0	0	0	69844	1035209
7	37006	37006	0	21502	17889	1.17	2462	5967	0	0	0	0	82886	1035209
8	49855	49855	0	21083	17144	1.18	3118	6047	0	0	0	0	108540	1035209
9	43976	43976	0	21229	17932	.86	2808	5890	0	0	0	0	128479	1035209
10	35154	35154	0	20803	18453	.74	2734	6568	0	0	0	0	140096	1380278
11	30206	30206	0	20346	18519	.34	1350	6128	0	0	0	0	148606	1424078
12	23756	23756	0	21311	18383	.32	1314	5901	0	0	0	0	149737	1424078
ANNUAL	387891	387891	0	614878			34096	87033	0	0	0	0		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 3 CALENDAR YEAR 1997

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	0	0	6140	2663	0	.00000	0	76518	145112	0	0	.00000	0	148	470
2	0	0	6140	8039	0	.04106	6068	74547	137073	48	0	.02415	11	111	422
3	3	0	6137	8845	0	.00000	0	65702	128228	0	0	.00000	0	111	422
4	100	0	6037	10112	0	.03190	4715	60305	118116	0	0	.01877	9	120	422
5	56	0	5981	17240	0	.05220	7714	50779	100876	0	0	.03071	14	134	422
6	90	0	5891	7093	0	.00000	0	43686	93783	0	0	.00000	0	134	422
7	181	0	5710	11385	0	.04153	6136	38437	82398	0	0	.02443	11	145	422
8	120	0	5590	4441	0	.03146	4649	38645	77957	0	0	.01851	9	154	422
9	0	0	5590	5227	0	.07720	11408	44826	72730	28	0	.04541	21	147	394
10	0	0	5590	4099	0	.03078	4549	45276	68631	0	0	.01811	9	156	394
11	1377	0	4213	97	0	.04463	6595	51774	68534	0	0	.02625	12	168	394
12	1843	0	2370	0	0	.00000	0	51774	68534	0	0	.00000	0	168	394
ANNUAL	3770	0		79241	0		51834			76	0		96		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 3 CALENDAR YEAR 1997

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	489	0	4811	756	0	.00000	0	36774	68708	100	0	.00000	0	2674	3909
2	657	0	4154	2371	0	.04106	2852	37255	66337	300	0	.02415	97	2471	3609
3	595	0	3559	2179	0	.00000	0	35076	64158	226	0	.00000	0	2245	3383
4	874	0	2685	4283	0	.03190	2216	33009	59875	191	0	.01877	75	2129	3192
5	766	0	1919	4387	0	.05220	3626	32248	55488	120	0	.03071	123	2132	3072
6	657	0	1262	26188	0	.00000	0	6060	29300	108	0	.00000	0	2024	2964
7	642	0	620	3734	0	.04153	2885	5211	25566	74	0	.02443	98	2048	2890
8	496	0	124	2110	0	.03146	2185	5286	23456	27	0	.01851	74	2095	2863
9	125	1	0	2148	0	.07720	5362	8500	21308	24	0	.04541	182	2253	2839
10	0	0	0	3016	0	.03078	2138	7622	18292	178	0	.01811	73	2148	2661
11	0	0	0	149	0	.04463	3100	10573	18143	16	0	.02625	105	2237	2645
12	0	0	0	1336	0	.00000	0	9237	16807	60	0	.00000	0	2177	2585
ANNUAL	5301	1		52657	0		24364			1424	0		827		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	239	0	3728	187	0	.00000	0	5080	4670	0	0	.00000	0	2959	4828
2	145	0	3583	87	0	.04106	199	5192	4583	0	0	.02415	117	3076	4828
3	182	0	3401	82	0	.00000	0	5110	4501	0	0	.00000	0	3076	4828
4	248	0	3153	53	0	.03190	155	5212	4448	0	0	.01877	91	3167	4828
5	308	0	2845	268	0	.05220	254	5198	4180	0	0	.03071	148	3315	4828
6	589	0	2256	118	0	.00000	0	5080	4062	0	0	.00000	0	3315	4828
7	406	0	1850	230	0	.04153	202	5052	3832	0	0	.02443	118	3433	4828
8	613	0	1237	24	0	.03146	153	5181	3808	0	0	.01851	89	3522	4828
9	499	0	738	69	0	.07720	375	5487	3739	0	0	.04541	219	3741	4828
10	268	0	470	254	0	.03078	150	5383	3485	0	0	.01811	87	3828	4828
11	289	0	181	0	0	.04463	217	5600	3485	0	0	.02625	127	3955	4828
12	100	0	81	0	0	.00000	0	5600	3485	0	0	.00000	0	3955	4828
ANNUAL	3886	0		1372	0		1705			0	0		996		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 4 CALENDAR YEAR 1998

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	3906	30424	0	179835	28335	.26	2449	179835	0	0	0	0	93519	855056
2	3825	27225	0	46531	23529	.29	1456	46531	0	0	0	0	72757	1140
3	0	83273	0	78080	21609	.42	1946	78080	0	0	0	0	76004	1140
4	0	77386	0	150471	16346	.68	1766	300801	150330	0	0	0	1153	1099
5	58914	85918	0	85937	10481	.73	57	126402	40465	0	0	0	1077	1099
6	10260	5285	0	1605	10663	.80	158	1605	0	0	0	0	4599	1099
7	3913	19448	0	4452	11373	.87	714	4452	0	0	0	0	18881	1099
8	5330	20366	0	4630	12093	.61	1114	4630	0	0	0	0	33503	1099
9	98882	114221	0	245	17861	.58	3384	245	0	0	0	0	144095	1099
10	18370	32605	0	3266	23561	.43	4069	3266	0	0	0	0	169365	824006
11	33717	47935	0	2976	26829	.25	2726	2976	0	0	0	0	211598	855056
12	3724	19134	0	5720	29688	.20	2359	5720	0	0	0	0	222653	855056
ANNUAL	240841	563220	0	563748			22198	754543	190795	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	67452	61300	69425	58726	69665	69639	68000	66034	66317	65061	63354	66114	65918
2	73787	67112	70045	56559	124617	75887	66796	67133	137834	80262	94997	70335	82108
3	68536	62012	64682	44074	120600	65937	63612	54325	131430	76339	93269	64116	75740
4	80060	84616	74419	136002	96941	106440	39773	50237	37578	43027	16967	21736	65644
5	32953	29947	92837	47303	1050	1023	21502	21083	21229	20803	20346	21311	27609
6	30424	27225	83273	37081	48198	5285	19448	20366	114221	32605	47935	19134	40428
7	0	0	0	0	4727	57229	0	0	0	0	0	0	5162
8	0	0	0	40305	37720	0	0	0	0	0	0	0	6501

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	860033	75724	10150	85311	0	9271	831025	25.1	225000	275000	0	96098	78906	331025	12.5
2	831025	64066	16128	89716	0	11463	777784	23.5	225000	275000	29705	0	82946	248079	9.4
3	777784	64245	10181	79782	0	13502	738564	22.3	225000	275000	0	64313	73828	238564	9.0
4	738564	75819	12283	148487	0	19737	633876	19.2	225000	275000	32918	0	137606	100958	3.8
5	633876	159204	21684	264683	163725	19607	650831	19.7	225000	275000	0	143075	93202	150831	5.7
6	650831	88614	10819	116390	0	21434	590802	17.9	225000	275000	47845	0	107874	42957	1.6
7	590802	81325	15456	127929	84972	23610	590104	17.9	225000	275000	0	86922	39775	90104	3.4
8	590104	92830	9133	63045	0	20902	589854	17.9	225000	275000	0	58776	59026	89854	3.4
9	589854	169325	8486	43982	0	17953	688758	20.8	225000	275000	0	139879	40975	188758	7.1
10	688758	84374	8805	46950	0	15612	701765	21.2	225000	275000	0	56514	43507	201765	7.6
11	701765	95891	5730	18695	0	8307	764924	23.1	225000	275000	0	80496	17337	264924	10.0
12	764924	62547	6451	27955	0	7568	785497	23.8	225000	275000	46789	0	26216	238708	9.0

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 4 CALENDAR YEAR 1998

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	67892	67892	0	67452	18091	.31	4353	1497	0	5251	0	0	507963	1827241
2	56680	56680	0	61300	17689	.44	6096	1574	0	5100	0	0	497247	1827241
3	61812	61812	0	69425	16280	.47	6372	1813	0	5363	0	0	483262	1827241
4	75819	75819	0	58726	14384	.77	10388	2167	0	12485	0	0	489967	1771041
5	101801	101801	0	74392	13846	.87	12013	2451	0	10532	6515	0	505363	1328281
6	79903	79903	0	126868	13618	.99	13062	2463	0	9950	0	0	445336	1328281
7	80026	80026	0	68000	13342	1.17	14429	2503	0	9481	6297	0	442933	1328281
8	89329	89329	0	66034	13986	1.18	14639	2402	0	12808	0	0	451589	1771041
9	95852	95852	0	66317	15003	.86	10978	1956	0	6404	0	0	470146	1328281
10	66988	66988	0	65061	15602	.74	9550	2185	0	3923	0	0	462523	1771041
11	62195	62195	0	63354	15712	.34	4326	2053	0	1728	0	0	457038	1827241
12	56829	56829	0	66114	15597	.32	3989	1497	0	6219	0	0	443764	1827241
ANNUAL	895126	895126	0	853043			110195	24561	0	89244	12812	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	7832	68536	0	88713	28335	.26	4918	8653	0	80060	0	0	327662	1210297
2	7386	62012	0	99170	23529	.29	5367	14554	0	84616	0	0	285137	1210297
3	2433	64682	0	82787	21609	.42	7130	8368	0	74419	0	0	259902	1210297
4	0	44074	0	146118	16346	.68	9349	10116	0	136002	0	0	148509	1166347
5	57403	125327	0	116174	10481	.73	7594	19233	0	254151	157210	0	150068	150070
6	8711	123166	0	114796	10663	.80	8372	8356	0	106440	0	0	150066	150070
7	1299	63612	0	52726	11373	.87	9181	12953	0	118448	78675	0	151771	150070
8	3501	54325	0	56968	12093	.61	6263	6731	0	50237	0	0	142865	1166347
9	73473	131430	0	44108	17861	.58	6975	6530	0	37578	0	0	223212	150070
10	17386	76339	0	49647	23561	.43	6062	6620	0	43027	0	0	243842	1166347
11	33696	93269	0	20644	26829	.25	3981	3677	0	16967	0	0	312486	1210297
12	5718	64116	0	26690	29688	.20	3579	4954	0	21736	0	0	346333	1210297
ANNUAL	218838	970888	0	898541			78771	110745	0	1023681	235885	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	28687	28687	0	32953	18091	.31	1255	6435	0	0	0	0	144216	1424078
2	21287	21287	0	29947	17689	.44	1687	6547	0	0	0	0	133869	1068059
3	23319	23319	0	92837	16280	.47	1280	9564	0	0	0	0	63071	1068059
4	26625	26625	0	87608	14384	.77	688	10222	0	0	0	0	1400	1035209
5	38768	38768	0	38770	13846	.87	33	11766	0	0	0	0	1365	1035209
6	29252	29252	0	1023	13618	.99	420	5998	0	0	0	0	29174	1035209
7	37006	37006	0	21502	13342	1.17	1181	5967	0	0	0	0	43497	1035209
8	49855	49855	0	21083	13986	1.18	1864	6047	0	0	0	0	70405	1035209
9	43976	43976	0	21229	15003	.86	1925	5890	0	0	0	0	91227	1035209
10	35154	35154	0	20803	15602	.74	1995	6568	0	0	0	0	103583	1380278
11	30206	30206	0	20346	15712	.34	1016	6128	0	0	0	0	112427	1424078
12	23756	23756	0	21311	15597	.32	1002	5901	0	0	0	0	113870	1424078
ANNUAL	387891	387891	0	409412			14346	87033	0	0	0	0		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 4 CALENDAR YEAR 1998

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	0	0	6140	2663	0	.05370	7935	57046	145112	0	0	.03159	15	183	470
2	0	0	6140	8039	0	.00000	0	49007	137073	48	0	.00000	0	135	422
3	3	0	6137	8845	0	.03594	5311	45473	128228	0	0	.02114	10	145	422
4	100	0	6037	10112	0	.00000	0	35361	118116	0	0	.00000	0	145	422
5	56	0	5981	17240	0	.07995	11815	29936	100876	0	0	.04703	22	167	422
6	90	0	5891	7093	0	.00000	0	22843	93783	0	0	.00000	0	167	422
7	181	0	5710	11385	0	.04857	7178	18636	82398	0	0	.02857	13	180	422
8	120	0	5590	4441	0	.03284	4854	19049	77957	0	0	.01932	9	189	422
9	0	0	5590	5227	0	.07816	11551	25373	72730	28	0	.04598	22	183	394
10	0	0	5590	4099	0	.03158	4667	25941	68631	0	0	.01858	9	192	394
11	1377	0	4213	97	0	.04498	6647	32491	68534	0	0	.02646	12	204	394
12	1843	0	2370	0	0	.00000	0	32491	68534	0	0	.00000	0	204	394
ANNUAL	3770	0		79241	0		59958			76	0		112		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION YEAR 4 CALENDAR YEAR 1998

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

D-M-I WATER RIGHTS, ADJ. NO. 0849-000, ANNUAL AUTH: 5300 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE
1	489	0	4811
2	657	0	4154
3	595	0	3559
4	874	0	2685
5	766	0	1919
6	657	0	1262
7	642	0	620
8	496	0	124
9	125	1	0
10	0	0	0
11	0	0	0
12	0	0	0
ANNUAL	5301	1	

CLASS A IRRIGATION WATER RIGHTS, ADJ. NO. A847-001, ANNUAL AUTH: 69464 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	756	0	.05370	3730	12211	68708
2	2371	0	.00000	0	9840	66337
3	2179	0	.03594	2496	10157	64158
4	4283	0	.00000	0	5874	59875
5	4387	0	.07995	5554	7041	55488
6	26188	19147	.00000	0	0	48447
7	3734	3734	.04857	3374	3374	48447
8	2110	0	.03284	2281	3545	46337
9	2148	0	.07816	5430	6827	44189
10	3016	0	.03158	2194	6005	41173
11	149	0	.04498	3125	8981	41024
12	1336	0	.00000	0	7645	39688
ANNUAL	52657	22881		28184		

CLASS B IRRIGATION WATER RIGHTS, ADJ. NO. B769-000, ANNUAL AUTH: 4009 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	100	0	.03159	127	2204	3909
2	300	0	.00000	0	1904	3609
3	226	0	.02114	85	1763	3383
4	191	0	.00000	0	1572	3192
5	120	0	.04703	189	1641	3072
6	108	0	.00000	0	1533	2964
7	74	0	.02857	115	1574	2890
8	27	0	.01932	77	1624	2863
9	24	0	.04598	184	1784	2839
10	178	0	.01858	74	1680	2661
11	16	0	.02646	106	1770	2645
12	60	0	.00000	0	1710	2585
ANNUAL	1424	0		957		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

D-M-I WATER RIGHTS, ADJ. NO. 0240-000, ANNUAL AUTH: 3967 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE
1	239	0	3728
2	145	0	3583
3	182	0	3401
4	248	0	3153
5	308	0	2845
6	589	0	2256
7	406	0	1850
8	613	0	1237
9	499	0	738
10	268	0	470
11	289	0	181
12	100	0	81
ANNUAL	3886	0	

CLASS A IRRIGATION WATER RIGHTS, ADJ. NO. 0810-000, ANNUAL AUTH: 4857 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	187	0	.05370	261	5674	4670
2	87	0	.00000	0	5587	4583
3	82	0	.03594	175	5680	4501
4	53	0	.00000	0	5627	4448
5	268	0	.07995	388	5747	4180
6	118	0	.00000	0	5629	4062
7	230	0	.04857	236	5635	3832
8	24	0	.03284	160	5771	3808
9	69	0	.07816	380	6082	3739
10	254	0	.03158	153	5981	3485
11	0	0	.04498	218	6199	3485
12	0	0	.00000	0	6199	3485
ANNUAL	1372	0		1971		

CLASS B IRRIGATION WATER RIGHTS, ADJ. NO. B804-000, ANNUAL AUTH: 4828 AF

MONTH	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	0	0	.03159	153	4108	4828
2	0	0	.00000	0	4108	4828
3	0	0	.02114	102	4210	4828
4	0	0	.00000	0	4210	4828
5	0	0	.04703	227	4437	4828
6	0	0	.00000	0	4437	4828
7	0	0	.02857	138	4575	4828
8	0	0	.01932	93	4668	4828
9	0	0	.04598	222	4890	4828
10	0	0	.01858	90	4980	4828
11	0	0	.02646	128	5108	4828
12	0	0	.00000	0	5108	4828
ANNUAL	0	0		1153		

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 2 U.S. FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1995	937652	218838	896120	0	1134426	169056	110745	0	1023681	0	0	530290	338141
1996	530290	227673	1049743	0	1113618	110086	112583	0	1001035	0	0	356329	181265
1997	356329	218838	1202421	0	1134426	71567	110745	0	1023681	0	0	352757	1666
1998	352757	218838	970888	0	898541	78771	110745	0	1023681	235885	0	346333	142865

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 1 U.S. AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1995	1205614	895126	895126	0	791087	246090	24561	0	89244	0	0	1063563	1063563
1996	1063563	956466	956466	0	949893	204717	25850	0	101973	0	0	865419	743519
1997	865419	895126	895126	0	1097388	151281	24561	0	89244	0	0	511876	511876
1998	511876	895126	895126	0	853043	110195	24561	0	89244	12812	0	443764	442933

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 4 MEX FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1995	320826	240841	755821	0	754543	37003	754543	0	0	0	0	285101	13653
1996	285101	259854	321748	0	279607	66821	279607	0	0	0	0	260421	103808
1997	260421	240841	768686	0	754543	29185	754543	0	0	0	0	245379	5325
1998	245379	240841	563220	0	563748	22198	754543	190795	0	0	0	222653	1077

CURRENT 1995-1996 AND EXTENDED 1997-1998 DROUGHT SIMULATION WITH 1995 CONDITIONS

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 3 MEX AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1995	420666	387891	387891	0	602013	37246	87033	0	0	0	0	169298	85887
1996	169298	441577	441577	0	145280	54775	83386	0	0	0	0	410820	175592
1997	410820	387891	387891	0	614878	34096	87033	0	0	0	0	149737	64302
1998	149737	387891	387891	0	409412	14346	87033	0	0	0	0	113870	1365

APPENDIX 3

AMISTAD-FALCON ROM SAMPLE OUTPUT LISTING FOR 1949-1955 FROM 1945-1996 SIMULATION

ECHO PRINT OF INPUT DATA FILE PARAMETERS WITHOUT FLOW, DEMAND, OR EVAPORATION DATA

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY
AVERAGE CURRENT HISTORICAL DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

CARD 01	NJ - NUMBER OF NODES IN THE MODEL NETWORK	8
CARD 02	NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK	4
CARD 03	NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK	8
CARD 04	NR - NUMBER OF LINKS THAT ARE RIVER REACHES	8
CARD 05	NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD	52
CARD 06	ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK	8
CARD 07	NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK	2
CARD 08	IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD	1945
CARD 09	IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT	1
CARD 10	ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT	52
CARD 11	INPUT DATA SOURCE ("CARD" OR "TAPE")	CARD
CARD 12	FIRM ANNUAL YIELD ITERATION CONVERGENCE LIMIT	0.040
CARD 13	IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT	1
CARD 14	IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1948
CARD 15	IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1972
CARD 16	IFLYLD=0, NO FAY; IFLYLD =1, DETERMINE FAY FOR CRITICAL PERIOD	0
CARD 17	MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS	271579
CARD 18	MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE	1696228
CARD 19	MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE	1500719
CARD 20	MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE	195509
CARD 21	MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE	181530
CARD 22	MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	162803
CARD 23	MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	18727
CARD 24	MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL	225000
CARD 25	IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE	0000000
CARD 26	NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING	3
CARD 27	IRLFLG=0, READ ALL MONTHLY RELEASES; =1, READ AVG. MON RELEASES	1
CARD 28	IWRFLG=0, READ ALL MONTHLY DEMANDS; =1, READ AVG. MON DEMANDS	1

U.S. AMISTAD	1	1827241	1771041	1771	1771041
U.S. FALCON	2	1613729	1555129	1555	1555129
MEX AMISTAD	3	1424078	1380278	1380	1380278
MEX FALCON	4	1140074	1098674	1099	1098674
U.S.MRG MUNI	5	0	0	0	
U.S.MRG IRRI	6	0	0	0	
U.S.LRG IRRI	7	0	0	0	
MEX MRG M&IR	8	0	0	0	

SPILL RESR 2 4

AMISTAD	1	1	930.0	0	0
AMISTAD	1	2	945.0	5	1
AMISTAD	1	3	946.5	87	294
AMISTAD	1	4	948.2	180	823
AMISTAD	1	5	949.1	237	1180
AMISTAD	1	6	950.1	297	1684
AMISTAD	1	7	951.4	376	2782
AMISTAD	1	8	961.3	1045	13873
AMISTAD	1	9	971.1	1843	33110
AMISTAD	1	10	981.0	2770	59404
AMISTAD	1	11	990.8	3823	93556

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AMISTAD      1   12     1000.7      5004      138573
AMISTAD      1   13     1010.5      6314      195568
AMISTAD      1   14     1020.3      7722      264663
AMISTAD      1   15     1030.2      9758      350120
AMISTAD      1   16     1040.0     12751      458690
AMISTAD      1   17     1049.9     16734      605456
AMISTAD      1   18     1059.7     21627      790919
AMISTAD      1   19     1069.6     27399     1029250
AMISTAD      1   20     1079.4     34051     1328996
AMISTAD      1   21     1089.2     41702     1699411
AMISTAD      1   22     1094.2     45665     1911714
AMISTAD      1   23     1099.1     49658     2142942
AMISTAD      1   24     1104.0     53679     2393700
AMISTAD      1   25     1108.9     57729     2664077
AMISTAD      1   26     1115.5     63173     3055670
AMISTAD      1   27     1117.0     64438     3151319
AMISTAD      1   28     1118.8     65915     3265037
AMISTAD      1   29     1122.0     68671     3483939
AMISTAD      1   30     1131.9     77013     4199954
FALCON       2    1      203.3         0           0
FALCON       2    2      203.4        35          57
FALCON       2    3      205.1       195         235
FALCON       2    4      206.7       425         735
FALCON       2    5      207.3       539        1050
FALCON       2    6      208.3       727        1670
FALCON       2    7      210.0      1100        3158
FALCON       2    8      214.9      1559        9631
FALCON       2    9      219.8      2202       18806
FALCON       2   10      224.7      3526       32732
FALCON       2   11      229.7      5169       54000
FALCON       2   12      234.6      6531       82799
FALCON       2   13      239.5      8061      118624
FALCON       2   14      242.8     10341      148482
FALCON       2   15      244.4     11654      166516
FALCON       2   16      249.3     15894      234115
FALCON       2   17      254.3     20562      323644
FALCON       2   18      259.2     25677      437240
FALCON       2   19      264.1     30775      576159
FALCON       2   20      269.0     36184      740751
FALCON       2   21      274.0     42448      933844
FALCON       2   22      278.9     48929     1158684
FALCON       2   23      282.2     53474     1326587
FALCON       2   24      285.4     58443     1509829
FALCON       2   25      288.7     65021     1712296
FALCON       2   26      292.0     70235     1935151
FALCON       2   27      295.3     74804     2172702
FALCON       2   28      298.6     82000     2429861
FALCON       2   29      301.2     87181     2653803
FALCON       2   30      305.1     93809     3008297
US AMISTAD  1      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON   2  125000  2  2  2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD  3      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON   4 1224000  6  6  6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI  5   34000  1  1  1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI  6  127000  3  3  3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI  7 1078000  4  4  4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR  8   66000  5  5  5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859
US MODERAT     9.65      75.00
MX MODERAT    10.00      75.00
RESERVOIR      1 1 AVERAGE   10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
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 OPERATING    1 2 DRY       11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       1 3 WET       10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     2 1 AVERAGE   11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    2 2 DRY       10 9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65
  RULES       2 3 WET       11 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     3 1 AVERAGE   12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    3 2 DRY       13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       3 3 WET       12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     4 1 AVERAGE   13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    4 2 DRY       12  0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
  RULES       4 3 WET       13 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
LINK1         1    1    5   9000000         0
LINK2         2    5    6   9000000         0
LINK3         3    6    2   9000000         0
LINK4         4    2    7   9000000         0
LINK5         5    3    8   9000000         0
LINK6         6    8    4   9000000         0
LINK7         7    1    2   9000000         0
LINK8         8    3    4   9000000         0
US AMS REL                 0      0      0      0      0      0      0      0      0      0      0      0
MEX AMS REL                0      0      0      0      0      0      0      0      0      0      0      0
UNITED I.D.   1
MUN ADJ NO    0849-000         CL A ADJ NO     A847-001         CL B ADJ NO     B769-000
MUN ANN AUTH       5300        CL A ANN AUTH      69464         CL B ANN AUTH       4009
IRRIG ACCT START BALANCES      CL A BALANCE       97944         CL B BALANCE        5653
MUNICIPAL    1  1945     382    353    412    474    459    477    532    550    450    426    394    391
CLASS A IRR 1   1945    5189   3063   5418   9982   9322   8794   7384   6717   3967   4119   2793   2716
CLASS B IRR 1   1945     299    177    313    576    538    507    426    388    229    238    161    157
SANTACRUZ 15  2
MUN ADJ NO    0240-000         CL A ADJ NO     0810-000         CL B ADJ NO     B804-000
MUN ANN AUTH       3967        CL A ANN AUTH       4857         CL B ANN AUTH       4828
IRRIG ACCT START BALANCES      CL A BALANCE        6848         CL B BALANCE        6807
MUNICIPAL    2  1945     286    264    308    355    343    357    398    412    337    319    295    293
CLASS A IRR 2   1945     363    214    379    698    652    615    516    470    277    288    195    190
CLASS B IRR 2   1945     361    213    376    694    648    611    513    467    276    286    194    189
HCID2 S.JUAN  3
MUN ADJ NO    0808-001         CL A ADJ NO     0808-005         CL B ADJ NO     0573-001
MUN ANN AUTH       6140        CL A ANN AUTH     147775         CL B ANN AUTH        470
IRRIG ACCT START BALANCES      CL A BALANCE      208363         CL B BALANCE         663
MUNICIPAL    3  1945     442    409    477    549    532    553    616    637    522    493    457    453
CLASS A IRR 3   1945   11039   6517  11526  21235  19831  18708  15709  14290   8438   8763   5941   5778
CLASS B IRR 3   1945      35     21     37     68     63     59     50     45     27     28     19     18
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RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES
R. J. BRANDES COMPANY SEPT. 1997

DATE: 2-14-1998
TIME: 15:56:59
FILE: UM4596G2

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY
AVERAGE CURRENT HISTORICAL DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

NUMBER OF NODES = 8 NUMBER OF RESERVOIRS = 4

NUMBER OF LINKS = 8 NUMBER OF RIVER REACHES = 8

CALENDAR YEAR OPERATION STARTS = 1945 NUMBER OF YEARS TO SIMULATE = 52

NUMBER OF DEMAND NODES = 8 NUMBER OF SPILL NODES = 2

NUMBER OF INDIVIDUAL WATER RIGHTS = 3

SYSTEM NODE CHARACTERISTICS

NODE NO.	NODE NAME	------------- CAPACITIES --------------				YEARLY
		FLOOD (AC-FT)	CONSERV (AC-FT)	MINIMUM (AC-FT)	STARTING (AC-FT)	DEMAND (AC-FT)
1	U.S. AMISTAD	1827241	1771041	1771	1771041	0
2	U.S. FALCON	1613729	1555129	1555	1555129	125000
3	MEX AMISTAD	1424078	1380278	1380	1380278	0
4	MEX FALCON	1140074	1098674	1099	1098674	1224000
5	U.S.MRG MUNI	0	0	0	0	34000
6	U.S.MRG IRRI	0	0	0	0	127000
7	U.S.LRG IRRI	0	0	0	0	1078000
8	MEX MRG M&IR	0	0	0	0	66000

NOTE: FLOOD POOL IS AVAILABLE FOR CONSERVATION STORAGE DURING NOVEMBER-APRIL NON-HURRICANE SEASON

SYSTEM LINK CONFIGURATION

LINK NO.	FROM NODE	TO NODE	MAX. CAPACITY (AC-FT/MON)	MIN. CAPACITY (AC-FT/MON)
1	1	5	9000000	0
2	5	6	9000000	0
3	6	2	9000000	0
4	2	7	9000000	0
5	3	8	9000000	0
6	8	4	9000000	0
7	1	2	9000000	0
8	3	4	9000000	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

U.S. SPILL RESERVOIR NODE: 2

MEXICO SPILL RESERVOIR NODE: 4

U.S. 'MODERATE' STORAGE CONDITION DEFINED AS 9.65 TO 75.00 PERCENT OF FALCON U.S. CONSERVATION CAPACITY

MEXICO 'MODERATE' STORAGE CONDITION DEFINED AS 10.00 TO 75.00 PERCENT OF FALCON MEXICAN CONSERVATION CAPACITY

NODE MONTHLY DEMAND DISTRIBUTIONS AND DEMAND PRIORITIES

NODE NO.	MONTHLY FRACTIONS OF ANNUAL DEMAND												PRIORITIES		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MOD	LO	HI
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
2	.0720	.0666	.0777	.0894	.0866	.0900	.1004	.1038	.0850	.0803	.0744	.0738	2	2	2
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
4	.1620	.0649	.0243	.2413	.2651	.0653	.0295	.0592	.0227	.0344	.0121	.0192	6	6	6
5	.0611	.0610	.0760	.0826	.0892	.0961	.1086	.1108	.0880	.0851	.0724	.0691	1	1	1
6	.0425	.0409	.0927	.1020	.0835	.1039	.1186	.1366	.0807	.0809	.0666	.0511	3	3	3
7	.0747	.0441	.0780	.1437	.1342	.1266	.1063	.0967	.0571	.0593	.0402	.0391	4	4	4
8	.0785	.0727	.0745	.0849	.0799	.0830	.0915	.0910	.0896	.0860	.0825	.0859	5	5	5

RESERVOIR MONTHLY STORAGE TARGETS AND STORAGE PRIORITIES

RESERVOIR NO.		DESIRED MONTHLY STORAGE LEVEL (PERCENT OF MAXI MUM STORAGE CAPACITY)												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	PRIORITIES
1	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
2	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	LO	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	10
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	11
3	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
4	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	LO	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	12
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	13

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

STAGE-AREA-CAPACITY RELATIONSHIPS FOR TOTAL STORAGE IN AMISTAD AND FALCON RESERVOIRS

	AMISTAD RESERVOIR			FALCON RESERVOIR		
POINT NO.	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)
1	930.0	0	0	203.3	0	0
2	945.0	5	1	203.4	35	57
3	946.5	87	294	205.1	195	235
4	948.2	180	823	206.7	425	735
5	949.1	237	1180	207.3	539	1050
6	950.1	297	1684	208.3	727	1670
7	951.4	376	2782	210.0	1100	3158
8	961.3	1045	13873	214.9	1559	9631
9	971.1	1843	33110	219.8	2202	18806
10	981.0	2770	59404	224.7	3526	32732
11	990.8	3823	93556	229.7	5169	54000
12	1000.7	5004	138573	234.6	6531	82799
13	1010.5	6314	195568	239.5	8061	118624
14	1020.3	7722	264663	242.8	10341	148482
15	1030.2	9758	350120	244.4	11654	166516
16	1040.0	12751	458690	249.3	15894	234115
17	1049.9	16734	605456	254.3	20562	323644
18	1059.7	21627	790919	259.2	25677	437240
19	1069.6	27399	1029250	264.1	30775	576159
20	1079.4	34051	1328996	269.0	36184	740751
21	1089.2	41702	1699411	274.0	42448	933844
22	1094.2	45665	1911714	278.9	48929	1158684
23	1099.1	49658	2142942	282.2	53474	1326587
24	1104.0	53679	2393700	285.4	58443	1509829
25	1108.9	57729	2664077	288.7	65021	1712296
26	1115.5	63173	3055670	292.0	70235	1935151
27	1117.0	64438	3151319	295.3	74804	2172702
28	1118.8	65915	3265037	298.6	82000	2429861
29	1122.0	68671	3483939	301.2	87181	2653803
30	1131.9	77013	4199954	305.1	93809	3008297

SUMMARY OF TEXAS WATER RIGHTS IN MIDDLE AND LOWER RIO GRANDE AND
MAXIMUM STORAGE ALLOCATIONS IN AMISTAD AND FALCON RESERVOIRS

TOTAL DOMESTIC, MUNICIPAL AND INDUSTRIAL WATER RIGHTS	(AC-FT/YR):	271579
TOTAL IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	181530
CLASS A IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	162803
CLASS B IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	18727
TOTAL IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1696228
CLASS A IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1500719
CLASS B IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	195509
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON D-M-I POOL	(AC-FT):	225000
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON IRRIGATION POOL	(AC-FT):	2647639
TOTAL RESERVOIR DEAD STORAGE USED IN WATER RIGHTS ACCOUNTING	(AC-FT):	4600
MAXIMUM STORAGE CAPACITY ALLOTTED TO OPERATING RESERVE	(AC-FT):	380000
MAXIMUM USABLE STORAGE AVAILABLE FOR WATER RIGHTS ACCOUNTING	(AC-FT):	3321570
TOTAL IRRIGATION & MINING ACCOUNT BALANCE AT BEGINNING OF SIMULATION	(AC-FT):	2647639

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 5 CALENDAR YEAR 1949

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	65000	65000	0	0	65737	.13	4803	2077	0	5397	0	60183	1827241	1827241
2	137000	137000	0	0	65737	.26	9606	2074	0	5194	0	127394	1827241	1827241
3	98000	98000	0	0	65737	.47	17364	2584	0	11773	0	80636	1827241	1827241
4	161000	161000	0	0	65087	.51	18655	2808	0	12954	0	198545	1771041	1771041
5	164000	164000	0	0	64438	.62	22453	3033	0	10604	0	141547	1771041	1771041
6	126000	126000	0	0	64438	.85	30782	3267	0	13195	0	95218	1771041	1771041
7	178000	178000	0	14754	64438	.93	33679	3692	0	15062	0	129567	1771041	1771041
8	225000	225000	0	0	64438	.76	27523	3767	0	17348	0	197477	1771041	1771041
9	132000	132000	1	0	64438	.75	27161	2992	0	10249	0	104840	1771041	1771041
10	138000	138000	0	0	64438	.43	15572	2893	0	10274	0	122428	1771041	1771041
11	81000	81000	0	0	65087	.43	15729	2462	0	8458	0	9071	1827241	1827241
12	84000	84000	0	0	65737	.29	10714	2349	0	6490	0	73286	1827241	1827241
ANNUAL	1589000	1589000	1	14754			234041	33998	0	126998	0	1340192		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	10000	62709	0	89527	77614	.32	12937	9000	0	80527	0	0	1164225	1210297
2	76000	196126	0	55865	78593	.20	8378	8325	0	47540	0	0	1296108	1210297
3	37000	103279	81672	93796	81799	.34	14850	9712	0	84084	0	0	1372413	1613729
4	283000	465783	-98883	166084	83730	.37	18100	11175	0	154909	0	0	1555129	1555129
5	70000	197910	-13325	155493	83864	.56	29092	10825	0	144668	0	0	1555129	1555129
6	83000	161756	0	147725	81189	.73	38093	11250	0	136475	0	0	1531067	1555129
7	4000	129567	0	127141	81009	.88	44950	12550	0	114591	0	0	1488543	1555129
8	73000	249362	0	117218	84532	.88	44591	12975	0	104243	0	20967	1555129	1555129
9	52000	143599	0	72179	87181	.68	34740	10625	0	61554	0	36680	1555129	1555129
10	47000	156261	0	73962	87181	.65	33207	10037	0	63925	0	49092	1555129	1555129
11	26000	24151	29047	52636	87009	.55	27615	9300	0	43336	0	0	1528076	1613729
12	22000	86447	68186	51375	87614	.35	17605	9225	0	42150	0	0	1613729	1613729
ANNUAL	783000	1976950	66697	1203001			324158	124999	0	1078002	0	106739		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	102000	102000	0	0	65737	.13	3743	5181	0	0	0	98257	1424078	1424078
2	153000	153000	0	0	65737	.26	7486	4798	0	0	0	145514	1424078	1424078
3	124000	124000	0	0	65737	.47	13532	4917	0	0	0	110468	1424078	1424078
4	87000	87000	0	5603	65087	.51	14539	5603	0	0	0	110658	1380278	1380278
5	89000	89000	0	0	64438	.62	17499	5273	0	0	0	71501	1380278	1380278
6	81000	81000	0	5478	64438	.85	23990	5478	0	0	0	51532	1380278	1380278
7	153000	153000	0	0	64438	.93	26248	6039	0	0	0	126752	1380278	1380278
8	227000	227000	0	0	64438	.76	21450	6006	0	0	0	205550	1380278	1380278
9	177000	177000	-1	0	64438	.75	21168	5914	0	0	0	155831	1380278	1380278
10	145000	145000	0	0	64438	.43	12136	5676	0	0	0	132864	1380278	1380278
11	151000	151000	0	0	65087	.43	12258	5445	0	0	0	94942	1424078	1424078
12	123000	123000	0	0	65737	.29	8350	5669	0	0	0	114650	1424078	1424078
ANNUAL	1612000	1612000	-1	11081			182399	65999	0	0	0	1418519		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 5 CALENDAR YEAR 1949

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	15000	108076	0	198288	77614	.32	11899	198288	0	0	0	0	1037963	1140074
2	26000	166716	0	79438	78593	.20	7341	79438	0	0	0	0	1117900	1140074
3	41000	146551	-81672	29743	81799	.34	12962	29743	0	0	0	0	1140074	1140074
4	0	110658	98883	295351	83730	.37	12880	295351	0	0	0	0	1041384	1098674
5	104000	170228	13325	324482	83864	.56	17872	324482	0	0	0	0	882583	1098674
6	0	51532	0	79927	81189	.73	21175	79927	0	0	0	0	833013	1098674
7	45000	165713	0	36108	81009	.88	26338	36108	0	0	0	0	936280	1098674
8	114000	313544	0	72461	84532	.88	29797	72461	0	0	0	48892	1098674	1098674
9	43000	192917	0	27785	87181	.68	24543	27785	0	0	0	140589	1098674	1098674
10	23000	150188	0	42106	87181	.65	23461	42106	0	0	0	84621	1098674	1098674
11	16000	105497	-29047	14810	87009	.55	20240	14810	0	0	0	0	1140074	1140074
12	15000	123981	-68186	23501	87614	.35	13060	23501	0	0	0	19234	1140074	1140074
ANNUAL	442000	1805601	-66697	1224000			221568	1224000	0	0	0	293336		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	0	0	0	0	0	0	14754	0	0	0	0	0	1229
2	7923	73926	34416	280192	66967	79733	15062	69233	49008	44107	23538	19651	63642
3	2526	68732	22643	267238	56363	66538	0	51885	38759	33833	15080	13161	53055
4	80527	47540	84084	154909	144668	136475	114591	104243	61554	63925	43336	42150	89828
5	0	0	0	5603	0	5478	0	0	0	0	0	0	922
6	9819	21202	36083	0	98727	0	38961	107994	37086	17324	10555	9331	32251
7	60183	127394	80636	198545	141547	95218	129567	197477	104840	122428	9071	73286	111677
8	98257	145514	110468	110658	71501	51532	126752	205550	155831	132864	94942	114650	118205

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	3026607	75000	11077	85924	0	17740	2986866	89.9	225000	341762	44280	0	79481	2375824	89.7
2	2986866	213000	10399	52734	0	17984	3118749	93.9	225000	356829	0	210026	48930	2536920	95.8
3	3118749	135000	12296	95857	0	32214	3195054	96.2	225000	365546	0	156718	89130	2604508	98.4
4	3195054	444000	13983	167863	0	36755	3321570	100.0	225000	380000	68931	198601	155470	2647639	100.0
5	3321570	234000	13858	155272	0	51545	3321570	100.0	225000	380000	68931	143698	143698	2647639	100.0
6	3321570	209000	14517	149670	0	68875	3297508	99.3	225000	377251	47618	138752	138752	2647639	100.0
7	3297508	182000	16242	129653	0	78629	3254984	98.0	225000	372393	9952	120485	120485	2647639	100.0
8	3254984	298000	16742	121591	0	72114	3321570	100.0	225000	380000	68931	113251	113251	2647639	100.0
9	3321570	184000	13617	71803	0	61901	3321570	100.0	225000	380000	68931	66878	66878	2647639	100.0
10	3321570	185000	12930	74199	0	48779	3321570	100.0	225000	380000	68931	69085	69085	2647639	100.0
11	3321570	107000	11762	51794	0	43344	3350717	100.0	225000	380000	98078	48327	48327	2647639	100.0
12	3350717	106000	11574	48640	0	28319	3436370	100.0	225000	380000	183731	45268	45268	2647639	100.0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 5 CALENDAR YEAR 1949

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	0	.00000	0	20949	64275	299	70	.00000	0	0	3780
2	353	0	4565	3063	0	.11736	8152	26038	61212	177	177	.06904	277	277	3780
3	412	0	4153	5418	0	.08757	6083	26703	55794	313	36	.05151	207	207	3503
4	474	0	3679	9982	0	.11098	7709	24430	45812	576	369	.06528	262	262	3296
5	459	0	3220	9322	0	.08030	5578	20686	36490	538	276	.04723	189	189	3034
6	477	0	2743	8794	0	.07753	5386	17278	27696	507	318	.04561	183	183	2845
7	532	0	2211	7384	0	.06733	4677	14571	20312	426	243	.03960	159	159	2662
8	550	0	1661	6717	0	.06328	4396	12250	13595	388	229	.03723	149	149	2503
9	450	0	1211	3967	0	.03737	2596	10879	9628	229	80	.02198	88	88	2354
10	426	0	785	4119	0	.03860	2682	9442	5509	238	150	.02271	91	91	2266
11	394	0	391	2793	0	.02701	1876	8525	2716	161	70	.01589	64	64	2175
12	391	0	0	2716	0	.02530	1757	7566	0	157	93	.01488	60	60	2111
ANNUAL	5300	0		69464	0		50892			4009	2111		1729		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	0	.00000	0	1466	4494	361	85	.00000	0	0	4552
2	264	0	3417	214	0	.11736	570	1822	4280	213	213	.06904	333	333	4552
3	308	0	3109	379	0	.08757	425	1868	3901	376	43	.05151	249	249	4219
4	355	0	2754	698	0	.11098	539	1709	3203	694	445	.06528	315	315	3970
5	343	0	2411	652	0	.08030	390	1447	2551	648	333	.04723	228	228	3655
6	357	0	2054	615	0	.07753	377	1209	1936	611	383	.04561	220	220	3427
7	398	0	1656	516	0	.06733	327	1020	1420	513	293	.03960	191	191	3207
8	412	0	1244	470	0	.06328	307	857	950	467	276	.03723	180	180	3016
9	337	0	907	277	0	.03737	182	762	673	276	96	.02198	106	106	2836
10	319	0	588	288	0	.03860	188	662	385	286	180	.02271	110	110	2730
11	295	0	293	195	0	.02701	131	598	190	194	84	.01589	77	77	2620
12	293	0	0	190	0	.02530	123	531	0	189	112	.01488	72	72	2543
ANNUAL	3967	0		4857	0		3559			4828	2543		2081		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 5 CALENDAR YEAR 1949

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	0	.00000	0	44566	136736	35	9	.00000	0	0	444
2	409	0	5289	6517	0	.11736	17343	55392	130219	21	21	.06904	32	32	444
3	477	0	4812	11526	0	.08757	12941	56807	118693	37	5	.05151	24	24	412
4	549	0	4263	21235	0	.11098	16400	51972	97458	68	44	.06528	31	31	388
5	532	0	3731	19831	0	.08030	11866	44007	77627	63	32	.04723	22	22	357
6	553	0	3178	18708	0	.07753	11458	36757	58919	59	37	.04561	21	21	335
7	616	0	2562	15709	0	.06733	9949	30997	43210	50	29	.03960	19	19	314
8	637	0	1925	14290	0	.06328	9352	26059	28920	45	26	.03723	17	17	295
9	522	0	1403	8438	0	.03737	5523	23144	20482	27	10	.02198	10	10	278
10	493	0	910	8763	0	.03860	5705	20086	11719	28	18	.02271	11	11	268
11	457	0	453	5941	0	.02701	3991	18136	5778	19	8	.01589	7	7	257
12	453	0	0	5778	0	.02530	3738	16096	0	18	11	.01488	7	7	250
ANNUAL	6140	0		147775	0		108266			470	250		201		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 6 CALENDAR YEAR 1950

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	85000	85000	0	0	65737	.16	5911	2077	0	5397	0	79089	1827241	1827241
2	67000	67000	0	0	65737	.23	8497	2074	0	5194	0	58503	1827241	1827241
3	65000	65000	0	3357	65737	.55	20319	2584	0	11773	0	41324	1827241	1827241
4	59000	59000	0	0	65087	.45	16460	2808	0	12954	0	98740	1771041	1771041
5	66000	66000	0	0	64438	.63	22815	3033	0	10604	0	43185	1771041	1771041
6	82000	82000	0	0	64438	.85	30782	3267	0	13195	0	51218	1771041	1771041
7	135000	135000	0	18754	64438	.93	33679	3692	0	15062	0	82567	1771041	1771041
8	97000	97000	0	11115	64438	.88	31868	3767	0	17348	0	54017	1771041	1771041
9	132000	132000	0	5241	64438	.73	26436	2992	0	10249	0	100323	1771041	1771041
10	116000	116000	0	0	64438	.66	23901	2893	0	10274	0	92099	1771041	1771041
11	62000	62000	0	9920	65087	.59	21514	2462	0	8458	0	0	1801607	1827241
12	69000	69000	0	27985	65570	.42	15429	2349	0	6490	0	0	1827193	1827241
ANNUAL	1035000	1035000	0	76372			257611	33998	0	126998	0	701065		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	17000	88615	0	89527	88021	.49	25578	9000	0	80527	0	0	1587239	1613729
2	12000	63235	0	55865	87158	.45	23349	8325	0	47540	0	0	1571260	1613729
3	11000	41324	16876	93796	86993	.58	29187	9712	0	84084	0	0	1506477	1613729
4	17000	99978	0	166084	83640	.64	31206	11175	0	154909	0	0	1409165	1555129
5	91000	120548	0	155493	74879	.97	45704	10825	0	144668	0	0	1328516	1555129
6	61000	95756	0	147725	70480	.83	38538	11250	0	136475	0	0	1238009	1555129
7	0	82567	0	127141	69740	1.19	51596	12550	0	114591	0	0	1141839	1555129
8	10000	54017	0	117218	68954	1.33	52859	12975	0	104243	0	0	1025779	1166347
9	8000	100323	0	72179	69360	.95	35489	10625	0	61554	0	0	1018434	1166347
10	20000	98932	0	73962	71204	.80	29158	10037	0	63925	0	0	1014246	1166347
11	1000	0	0	52636	71146	.76	26582	9300	0	43336	0	0	935028	1210297
12	0	19146	0	51375	70800	.52	17061	9225	0	42150	0	0	885738	1210297
ANNUAL	248000	864441	16876	1203001			406307	124999	0	1078002	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	126000	126000	0	0	65737	.16	4607	5181	0	0	0	121393	1424078	1424078
2	131000	131000	0	0	65737	.23	6623	4798	0	0	0	124377	1424078	1424078
3	130000	130000	0	0	65737	.55	15836	4917	0	0	0	114164	1424078	1424078
4	98000	98000	0	5603	65087	.45	12829	5603	0	0	0	123368	1380278	1380278
5	96000	96000	0	5273	64438	.63	17781	5273	0	0	0	72946	1380278	1380278
6	124000	124000	0	5478	64438	.85	23990	5478	0	0	0	94532	1380278	1380278
7	200000	200000	0	0	64438	.93	26248	6039	0	0	0	173752	1380278	1380278
8	156000	156000	0	0	64438	.88	24837	6006	0	0	0	131163	1380278	1380278
9	180000	180000	0	0	64438	.73	20604	5914	0	0	0	159396	1380278	1380278
10	144000	144000	0	5676	64438	.66	18628	5676	0	0	0	119696	1380278	1380278
11	125000	125000	0	64380	65087	.59	16887	5445	0	0	0	0	1424011	1424078
12	116000	116000	0	0	65570	.42	12110	5669	0	0	0	103823	1424078	1424078
ANNUAL	1626000	1626000	0	86410			200980	65999	0	0	0	1338610		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 6 CALENDAR YEAR 1950

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	16000	132212	0	198288	88021	.49	17552	198288	0	0	0	0	1056446	1140074
2	10000	129579	0	79438	87158	.45	15872	79438	0	0	0	0	1090715	1140074
3	8000	117247	-16876	29743	86993	.58	21269	29743	0	0	0	0	1140074	1140074
4	0	123368	0	295351	83640	.64	22324	295351	0	0	0	0	945767	1098674
5	0	72946	0	324482	74879	.97	26929	324482	0	0	0	0	667302	1098674
6	0	94532	0	79927	70480	.83	19960	79927	0	0	0	0	661947	824006
7	24000	191713	0	36108	69740	1.19	31395	36108	0	0	0	0	786157	824006
8	7000	132157	0	72461	68954	1.33	38850	72461	0	0	0	0	807003	824006
9	42000	195482	0	27785	69360	.95	30403	27785	0	0	0	0	944297	824006
10	0	119696	0	42106	71204	.80	27805	42106	0	0	0	0	994082	1098674
11	11000	69935	0	14810	71146	.76	27489	14810	0	0	0	0	1021718	1140074
12	10000	108154	0	23501	70800	.52	19755	23501	0	0	0	0	1086616	1140074
ANNUAL	128000	1487021	-16876	1224000			299603	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	0	0	3357	0	0	0	18754	11115	5241	0	9920	8839	4765
2	14923	9926	11773	14192	87967	57733	15062	17348	10249	17107	8458	6490	22597
3	9526	4732	0	1238	77363	44538	0	0	0	6833	0	0	12016
4	80527	47540	84084	154909	144668	136475	114591	104243	61554	63925	43336	42150	89828
5	0	0	0	5603	5273	5478	0	0	0	5676	0	0	1834
6	10819	5202	3083	0	0	0	17961	994	36086	0	5555	4331	6997
7	79089	58503	41324	98740	43185	51218	82567	54017	100323	92099	0	19146	60012
8	121393	124377	114164	123368	72946	94532	173752	131163	159396	119696	64380	103823	116910

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	3436370	102000	11077	85924	0	31489	3409880	100.0	225000	380000	157241	79481	79481	2647639	100.0
2	3409880	79000	10399	52734	0	31846	3393901	100.0	225000	380000	141262	48930	48930	2647639	100.0
3	3393901	76000	12296	95857	0	49506	3329118	100.0	225000	380000	76479	89130	89130	2647639	100.0
4	3329118	76000	13983	167863	0	47666	3175606	95.6	225000	363324	0	95113	155470	2587282	97.7
5	3175606	157000	13858	155272	0	68519	3094957	93.2	225000	354110	0	72263	143698	2515847	95.0
6	3094957	143000	14517	149670	0	69320	3004450	90.5	225000	343770	0	58585	138752	2435680	92.0
7	3004450	135000	16242	129653	0	85275	2908280	87.6	225000	332783	35302	0	120485	2315195	87.4
8	2908280	107000	16742	121591	0	84727	2792220	84.1	225000	319524	45752	0	113251	2201944	83.2
9	2792220	140000	13617	71803	0	61925	2784875	83.9	225000	318685	0	106124	66878	2241190	84.6
10	2784875	136000	12930	74199	0	53059	2780687	83.7	225000	318207	0	65375	69085	2237480	84.5
11	2780687	63000	11762	51794	0	48096	2732035	82.3	225000	312648	5234	0	48327	2189153	82.7
12	2732035	69000	11574	48640	0	32490	2708331	81.6	225000	309940	29506	0	45268	2143885	81.0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 6 CALENDAR YEAR 1950

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	0	.04441	3085	5462	64275	299	239	.02613	105	105	3949
2	353	0	4565	3063	0	.02734	1899	4298	61212	177	72	.01608	64	64	3844
3	412	0	4153	5418	1120	.04981	3460	3460	56914	313	249	.02930	117	117	3780
4	474	0	3679	9982	6522	.05315	3692	3692	53454	576	459	.03126	125	125	3663
5	459	0	3220	9322	5630	.04038	2805	2805	49762	538	413	.02375	95	95	3538
6	477	0	2743	8794	5989	.03274	2274	2274	46957	507	412	.01926	77	77	3443
7	532	0	2211	7384	5110	.00000	0	0	44683	426	349	.00000	0	0	3366
8	550	0	1661	6717	6717	.00000	0	0	44683	388	388	.00000	0	0	3366
9	450	0	1211	3967	3967	.05930	4119	4119	44683	229	229	.03488	140	140	3366
10	426	0	785	4119	0	.03653	2538	2538	40564	238	98	.02149	86	86	3226
11	394	0	391	2793	255	.00000	0	0	38026	161	75	.00000	0	0	3140
12	391	0	0	2716	2716	.00000	0	0	38026	157	157	.00000	0	0	3140
ANNUAL	5300	0		69464	38026		23872			4009	3140		809		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	0	.04441	216	384	4494	361	289	.02613	126	126	4756
2	264	0	3417	214	0	.02734	133	303	4280	213	87	.01608	78	78	4630
3	308	0	3109	379	76	.04981	242	242	3977	376	298	.02930	141	141	4552
4	355	0	2754	698	456	.05315	258	258	3735	694	553	.03126	151	151	4411
5	343	0	2411	652	394	.04038	196	196	3477	648	497	.02375	115	115	4260
6	357	0	2054	615	419	.03274	159	159	3281	611	496	.01926	93	93	4145
7	398	0	1656	516	357	.00000	0	0	3122	513	420	.00000	0	0	4052
8	412	0	1244	470	470	.00000	0	0	3122	467	467	.00000	0	0	4052
9	337	0	907	277	277	.05930	288	288	3122	276	276	.03488	168	168	4052
10	319	0	588	288	0	.03653	177	177	2834	286	118	.02149	104	104	3884
11	295	0	293	195	18	.00000	0	0	2657	194	90	.00000	0	0	3780
12	293	0	0	190	190	.00000	0	0	2657	189	189	.00000	0	0	3780
ANNUAL	3967	0		4857	2657		1669			4828	3780		976		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 6 CALENDAR YEAR 1950

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	0	.04441	6563	11620	136736	35	28	.02613	12	12	463
2	409	0	5289	6517	0	.02734	4040	9143	130219	21	9	.01608	8	8	451
3	477	0	4812	11526	2383	.04981	7360	7360	121076	37	29	.02930	14	14	443
4	549	0	4263	21235	13875	.05315	7854	7854	113716	68	54	.03126	15	15	429
5	532	0	3731	19831	11977	.04038	5967	5967	105862	63	48	.02375	11	11	414
6	553	0	3178	18708	12741	.03274	4838	4838	99895	59	48	.01926	9	9	403
7	616	0	2562	15709	10871	.00000	0	0	95057	50	41	.00000	0	0	394
8	637	0	1925	14290	14290	.00000	0	0	95057	45	45	.00000	0	0	394
9	522	0	1403	8438	8438	.05930	8763	8763	95057	27	27	.03488	16	16	394
10	493	0	910	8763	0	.03653	5398	5398	86294	28	12	.02149	10	10	378
11	457	0	453	5941	543	.00000	0	0	80896	19	9	.00000	0	0	368
12	453	0	0	5778	5778	.00000	0	0	80896	18	18	.00000	0	0	368
ANNUAL	6140	0		147775	80896		50783			470	368		95		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 7 CALENDAR YEAR 1951

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	64000	64000	0	5474	65737	.37	13669	2077	0	5397	0	44809	1827241	1827241
2	55000	55000	0	7268	65737	.29	10714	2074	0	5194	0	37018	1827241	1827241
3	63000	63000	0	10357	65737	.45	16625	2584	0	11773	0	36018	1827241	1827241
4	46000	46000	0	10762	65087	.58	21215	2808	0	12954	0	70223	1771041	1771041
5	79000	79000	0	0	64438	.61	22091	3033	0	10604	0	56909	1771041	1771041
6	84000	84000	0	0	64438	.65	23539	3267	0	13195	0	60461	1771041	1771041
7	55000	55000	0	18754	64438	1.09	39458	3692	0	15062	0	0	1767829	1771041
8	45000	45000	0	11115	64417	1.13	40841	3767	0	17348	0	0	1760873	1771041
9	57000	57000	0	12911	64371	.94	33963	2992	0	10249	0	0	1770999	1771041
10	53000	53000	0	0	64438	.73	26436	2893	0	10274	0	26522	1771041	1771041
11	52000	52000	0	1920	65087	.46	16779	2462	0	8458	0	0	1804342	1827241
12	38000	38000	0	3839	65588	.38	13964	2349	0	6490	0	0	1824539	1827241
ANNUAL	691000	691000	0	82400			279294	33998	0	126998	0	331960		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	2000	44809	0	89527	68809	.53	16638	9000	0	80527	0	0	824382	1210297
2	0	37018	0	55865	66159	.51	15467	8325	0	47540	0	0	790068	1210297
3	4000	36018	0	93796	65320	.60	17099	9712	0	84084	0	0	715191	1210297
4	5000	70223	0	166084	59812	.62	15755	11175	0	154909	0	0	603575	1166347
5	87000	130272	0	155493	52469	.69	16363	10825	0	144668	0	0	561991	1166347
6	59000	102999	0	147725	49124	.84	18767	11250	0	136475	0	0	498498	1166347
7	0	0	0	127141	47324	1.14	20765	12550	0	114591	0	0	350592	1166347
8	10000	0	0	117218	43747	.95	12138	12975	0	104243	0	0	221236	1166347
9	163000	162670	0	72179	43041	.93	10946	10625	0	61554	0	0	300781	1166347
10	27000	40355	0	73962	44894	.86	10562	10037	0	63925	0	0	256612	1166347
11	9000	0	0	52636	44531	.58	5837	9300	0	43336	0	0	198139	1210297
12	5000	0	0	51375	43760	.51	3886	9225	0	42150	0	0	142878	1210297
ANNUAL	371000	624364	0	1203001			164223	124999	0	1078002	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	85000	85000	0	0	65737	.37	10654	5181	0	0	0	74346	1424078	1424078
2	107000	107000	0	0	65737	.29	8350	4798	0	0	0	98650	1424078	1424078
3	92000	92000	0	0	65737	.45	12957	4917	0	0	0	79043	1424078	1424078
4	75000	75000	0	0	65087	.58	16535	5603	0	0	0	102265	1380278	1380278
5	133000	133000	0	0	64438	.61	17216	5273	0	0	0	115784	1380278	1380278
6	86000	86000	0	0	64438	.65	18346	5478	0	0	0	67654	1380278	1380278
7	130000	130000	0	99236	64438	1.09	30779	6039	0	0	0	0	1380263	1380278
8	109000	109000	0	77070	64417	1.13	31950	6006	0	0	0	0	1380243	1380278
9	102000	102000	0	0	64371	.94	26546	5914	0	0	0	75419	1380278	1380278
10	94000	94000	0	0	64438	.73	20604	5676	0	0	0	73396	1380278	1380278
11	94000	94000	0	37086	65087	.46	13161	5445	0	0	0	0	1424031	1424078
12	107000	107000	0	0	65588	.38	10959	5669	0	0	0	95994	1424078	1424078
ANNUAL	1214000	1214000	0	213392			218057	65999	0	0	0	782551		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 7 CALENDAR YEAR 1951

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	14000	83165	0	198288	68809	.53	19831	198288	0	0	0	0	951662	1140074
2	8000	101852	0	79438	66159	.51	18274	79438	0	0	0	0	955802	1140074
3	11000	85126	0	29743	65320	.60	22093	29743	0	0	0	0	989092	1140074
4	27000	123662	0	295351	59812	.62	21328	295351	0	0	0	0	796075	1098674
5	55000	165511	0	324482	52469	.69	19841	324482	0	0	0	0	617263	824006
6	77000	139176	0	79927	49124	.84	22497	79927	0	0	0	0	654015	824006
7	25000	118197	0	36108	47324	1.14	33184	36108	0	0	0	0	702920	824006
8	11000	82064	0	72461	43747	.95	29422	72461	0	0	0	0	683101	824006
9	8000	77505	0	27785	43041	.93	29082	27785	0	0	0	0	703739	824006
10	75000	142720	0	42106	44894	.86	28047	42106	0	0	0	0	776306	824006
11	8000	39641	0	14810	44531	.58	19991	14810	0	0	0	0	781146	855056
12	7000	97325	0	23501	43760	.51	18432	23501	0	0	0	0	836538	855056
ANNUAL	326000	1255944	0	1224000			282022	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	5474	7268	10357	10762	0	0	18754	11115	0	0	1920	3839	5787
2	5397	5194	11773	12954	83967	55733	15062	17348	160008	24107	8458	6490	33868
3	0	0	0	0	73363	42538	0	0	149759	13833	0	0	23288
4	80527	47540	84084	154909	144668	136475	114591	104243	61554	63925	43336	42150	89828
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8819	3202	6083	21397	49727	71522	18961	4994	2086	69324	2555	1331	21660
7	44809	37018	36018	70223	56909	60461	0	0	12911	26522	0	0	28735
8	74346	98650	79043	102265	115784	67654	99236	77070	75419	73396	37086	95994	82988

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	2708331	66000	11077	85924	0	30307	2647023	79.7	225000	302936	0	54683	79481	2119087	80.0
2	2647023	55000	10399	52734	0	26181	2612709	78.7	225000	299016	18536	0	48930	2070157	78.2
3	2612709	67000	12296	95857	0	33724	2537832	76.4	225000	290461	41344	0	89130	1981027	74.8
4	2537832	51000	13983	167863	0	36970	2370016	71.4	225000	275000	44459	0	155470	1825557	69.0
5	2370016	166000	13858	155272	0	38454	2328432	70.1	225000	275000	0	146573	143698	1828432	69.1
6	2328432	143000	14517	149670	0	42306	2264939	68.2	225000	275000	0	75259	138752	1764939	66.7
7	2264939	55000	16242	129653	0	60223	2113821	63.7	225000	244367	0	0	120485	1644454	62.1
8	2113821	55000	16742	121591	0	52979	1977509	59.6	225000	221306	0	0	113251	1531203	57.8
9	1977509	220000	13617	71803	0	44909	2067180	62.3	225000	275000	0	102855	66878	1567180	59.2
10	2067180	80000	12930	74199	0	36998	2023053	61.0	225000	275000	24958	0	69085	1498095	56.6
11	2023053	61000	11762	51794	0	22616	1997881	60.2	225000	275000	48113	0	48327	1449768	54.8
12	1997881	43000	11574	48640	0	17850	1962817	59.1	225000	275000	0	58317	45268	1462817	55.2

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 7 CALENDAR YEAR 1951

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	5189	.03056	2123	2123	69464	299	299	.01797	72	72	4009
2	353	0	4565	3063	940	.00000	0	0	67341	177	105	.00000	0	0	3937
3	412	0	4153	5418	5418	.00000	0	0	67341	313	313	.00000	0	0	3937
4	474	0	3679	9982	9982	.00000	0	0	67341	576	576	.00000	0	0	3937
5	459	0	3220	9322	9322	.08191	5689	5689	67341	538	538	.04818	193	193	3937
6	477	0	2743	8794	3105	.04205	2921	2921	61652	507	314	.02474	99	99	3744
7	532	0	2211	7384	4463	.00000	0	0	58731	426	327	.00000	0	0	3645
8	550	0	1661	6717	6717	.00000	0	0	58731	388	388	.00000	0	0	3645
9	450	0	1211	3967	3967	.05748	3992	3992	58731	229	229	.03381	136	136	3645
10	426	0	785	4119	127	.00000	0	0	54739	238	102	.00000	0	0	3509
11	394	0	391	2793	2793	.00000	0	0	54739	161	161	.00000	0	0	3509
12	391	0	0	2716	2716	.03259	2264	2264	54739	157	157	.01917	77	77	3509
ANNUAL	5300	0		69464	54739		16989			4009	3509		577		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	363	.03056	148	148	4857	361	361	.01797	87	87	4828
2	264	0	3417	214	66	.00000	0	0	4709	213	126	.00000	0	0	4741
3	308	0	3109	379	379	.00000	0	0	4709	376	376	.00000	0	0	4741
4	355	0	2754	698	698	.00000	0	0	4709	694	694	.00000	0	0	4741
5	343	0	2411	652	652	.08191	398	398	4709	648	648	.04818	233	233	4741
6	357	0	2054	615	217	.04205	204	204	4311	611	378	.02474	119	119	4508
7	398	0	1656	516	312	.00000	0	0	4107	513	394	.00000	0	0	4389
8	412	0	1244	470	470	.00000	0	0	4107	467	467	.00000	0	0	4389
9	337	0	907	277	277	.05748	279	279	4107	276	276	.03381	163	163	4389
10	319	0	588	288	9	.00000	0	0	3828	286	123	.00000	0	0	4226
11	295	0	293	195	195	.00000	0	0	3828	194	194	.00000	0	0	4226
12	293	0	0	190	190	.03259	158	158	3828	189	189	.01917	93	93	4226
ANNUAL	3967	0		4857	3828		1187			4828	4226		695		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 7 CALENDAR YEAR 1951

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	11039	.03056	4516	4516	147775	35	35	.01797	8	8	470
2	409	0	5289	6517	2001	.00000	0	0	143259	21	13	.00000	0	0	462
3	477	0	4812	11526	11526	.00000	0	0	143259	37	37	.00000	0	0	462
4	549	0	4263	21235	21235	.00000	0	0	143259	68	68	.00000	0	0	462
5	532	0	3731	19831	19831	.08191	12104	12104	143259	63	63	.04818	23	23	462
6	553	0	3178	18708	6604	.04205	6215	6215	131155	59	36	.02474	12	12	439
7	616	0	2562	15709	9494	.00000	0	0	124940	50	38	.00000	0	0	427
8	637	0	1925	14290	14290	.00000	0	0	124940	45	45	.00000	0	0	427
9	522	0	1403	8438	8438	.05748	8493	8493	124940	27	27	.03381	16	16	427
10	493	0	910	8763	270	.00000	0	0	116447	28	12	.00000	0	0	411
11	457	0	453	5941	5941	.00000	0	0	116447	19	19	.00000	0	0	411
12	453	0	0	5778	5778	.03259	4816	4816	116447	18	18	.01917	9	9	411
ANNUAL	6140	0		147775	116447		36144			470	411		68		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 8 CALENDAR YEAR 1952

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	38000	38000	0	106814	65174	.33	11961	2077	0	5397	0	0	1743764	1370431
2	34000	34000	0	67428	64336	.40	14080	2074	0	5194	0	0	1696256	1370431
3	30000	30000	0	14357	64017	.49	17050	2584	0	11773	0	0	1694849	1827241
4	37000	37000	0	273697	61975	.54	17668	2808	0	12954	0	0	1440484	1328281
5	65000	65000	0	136328	59272	.64	19073	3033	0	10604	0	0	1350083	1328281
6	53000	53000	0	2514	58851	.77	22525	3267	0	13195	0	0	1378044	1771041
7	170000	170000	0	293380	57977	1.03	28988	3692	0	15062	0	0	1225676	1328281
8	34000	34000	0	153635	55734	1.19	30157	3767	0	17348	0	0	1075884	1328281
9	27000	27000	0	0	54670	.93	22298	2992	0	10249	0	0	1080586	1771041
10	35000	35000	0	158265	53631	.78	17677	2893	0	10274	0	0	939644	1328281
11	36000	36000	0	74635	52469	.45	9328	2462	0	8458	0	0	891681	1370431
12	39000	39000	0	8839	52634	.29	5926	2349	0	6490	0	0	915916	1827241
ANNUAL	598000	598000	0	1289892			216731	33998	0	126998	0	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	6000	105340	0	89527	41754	.46	3141	9000	0	80527	0	0	155550	155725
2	0	60160	0	55865	39186	.53	3882	8325	0	47540	0	0	155963	155725
3	0	0	0	93796	37508	.53	2739	9712	0	84084	0	0	59428	1210297
4	1000	258935	0	166084	34285	.69	3604	11175	0	154909	0	0	148675	150070
5	41000	163691	0	155493	27892	.75	6290	10825	0	144668	0	0	150583	150070
6	17000	3052	0	147725	19080	.83	4088	11250	0	136475	0	0	1822	1166347
7	1000	275626	0	127141	22823	.91	4112	12550	0	114591	0	0	146195	150070
8	1000	133520	0	117218	28515	1.23	10174	12975	0	104243	0	0	152323	150070
9	24000	10759	0	72179	27184	1.03	6917	10625	0	61554	0	0	83986	1166347
10	1000	146098	0	73962	27729	.93	6118	10037	0	63925	0	0	150004	150070
11	0	63715	0	52636	29457	.51	4266	9300	0	43336	0	0	156817	155725
12	0	0	0	51375	29906	.38	2670	9225	0	42150	0	0	102772	1210297
ANNUAL	92000	1220896	0	1203001			58001	124999	0	1078002	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	76000	76000	0	66930	65174	.33	9546	5181	0	0	0	0	1423602	1424078
2	78000	78000	0	66353	64336	.40	11654	4798	0	0	0	0	1423595	1424078
3	77000	77000	0	0	64017	.49	14318	4917	0	0	0	62199	1424078	1424078
4	76000	76000	0	104711	61975	.54	15799	5603	0	0	0	0	1379568	1380278
5	93000	93000	0	73780	59272	.64	18861	5273	0	0	0	0	1379927	1380278
6	117000	117000	0	5478	58851	.77	22790	5478	0	0	0	88381	1380278	1380278
7	248000	248000	0	217749	57977	1.03	30728	6039	0	0	0	0	1379801	1380278
8	105000	105000	0	5006	55734	1.19	36166	6006	0	0	0	63351	1380278	1380278
9	107000	107000	0	5914	54670	.93	28545	5914	0	0	0	72541	1380278	1380278
10	98000	98000	0	3676	53631	.78	24155	5676	0	0	0	70169	1380278	1380278
11	99000	99000	0	2445	52469	.45	14283	5445	0	0	0	38472	1424078	1424078
12	102000	102000	0	1669	52634	.29	9338	5669	0	0	0	90993	1424078	1424078
ANNUAL	1276000	1276000	0	553711			236183	65999	0	0	0	486106		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 8 CALENDAR YEAR 1952

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	6000	67749	0	198288	41754	.46	16066	198288	0	0	0	0	689933	855056
2	10000	71555	0	79438	39186	.53	16887	79438	0	0	0	0	665163	855056
3	7000	64282	0	29743	37508	.53	17140	29743	0	0	0	0	682562	855056
4	9000	108108	0	295351	34285	.69	20053	295351	0	0	0	0	475266	824006
5	16000	84507	0	324482	27892	.75	14629	324482	0	0	0	0	220662	824006
6	0	88381	0	79927	19080	.83	11748	79927	0	0	0	0	217368	824006
7	6000	217710	0	36108	22823	.91	16657	36108	0	0	0	0	382313	824006
8	1000	63351	0	72461	28515	1.23	24899	72461	0	0	0	0	348304	824006
9	0	72541	0	27785	27184	1.03	21083	27785	0	0	0	0	371977	824006
10	2000	70169	0	42106	27729	.93	19670	42106	0	0	0	0	380370	824006
11	3000	38472	0	14810	29457	.51	10757	14810	0	0	0	0	393275	855056
12	4000	90993	0	23501	29906	.38	8694	23501	0	0	0	0	452073	855056
ANNUAL	64000	1037818	0	1224000			198283	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	1474	7268	14357	14762	0	0	17754	20115	0	12167	10920	8839	8967
2	5397	5194	11773	12954	37967	13733	15062	17348	21008	10274	8458	6490	13798
3	0	0	0	0	27363	538	0	0	10759	0	0	0	3220
4	80527	47540	84084	154909	144668	136475	114591	104243	61554	63925	43336	42150	89828
5	0	0	0	0	0	5478	39	5006	5914	3676	2445	1669	2016
6	819	5202	2083	3397	10727	0	0	0	0	0	0	0	1850
7	105340	60160	0	258935	136328	2514	275626	133520	0	146098	63715	0	98514
8	66930	66353	62199	104711	73780	88381	217710	63351	72541	70169	38472	90993	84628

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	1962817	44000	11077	85924	0	15102	1894714	57.1	225000	275000	11378	0	79481	1383336	52.2
2	1894714	34000	10399	52734	0	17962	1847619	55.7	225000	275000	13213	0	48930	1334406	50.4
3	1847619	30000	12296	95857	0	19789	1749677	52.7	225000	275000	4401	0	89130	1245276	47.0
4	1749677	38000	13983	167863	0	21272	1584559	47.8	225000	269753	0	0	155470	1089806	41.2
5	1584559	106000	13858	155272	0	25363	1496066	45.1	225000	275000	49958	0	143698	946108	35.7
6	1496066	70000	14517	149670	0	26613	1375266	41.5	225000	275000	0	67910	138752	875266	33.1
7	1375266	171000	16242	129653	0	33100	1367271	41.2	225000	275000	0	112490	120485	867271	32.8
8	1367271	35000	16742	121591	0	40331	1223607	36.9	225000	244587	0	0	113251	754020	28.5
9	1223607	51000	13617	71803	0	29215	1159972	35.0	225000	247830	0	0	66878	687142	26.0
10	1159972	36000	12930	74199	0	23795	1085048	32.8	225000	241991	0	0	69085	618057	23.3
11	1085048	36000	11762	51794	0	13594	1043898	31.5	225000	249168	0	0	48327	569730	21.5
12	1043898	39000	11574	48640	0	8596	1014088	30.6	225000	264626	0	0	45268	524462	19.8

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 8 CALENDAR YEAR 1952

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	2925	.00000	0	0	67200	299	222	.00000	0	0	3932
2	353	0	4565	3063	3063	.00000	0	0	67200	177	177	.00000	0	0	3932
3	412	0	4153	5418	5418	.00000	0	0	67200	313	313	.00000	0	0	3932
4	474	0	3679	9982	9982	.00000	0	0	67200	576	576	.00000	0	0	3932
5	459	0	3220	9322	9322	.00000	0	0	67200	538	538	.00000	0	0	3932
6	477	0	2743	8794	8794	.03795	2636	2636	67200	507	507	.02232	89	89	3932
7	532	0	2211	7384	4748	.06286	4366	4366	64564	426	337	.03698	148	148	3843
8	550	0	1661	6717	2351	.00000	0	0	60198	388	240	.00000	0	0	3695
9	450	0	1211	3967	3967	.00000	0	0	60198	229	229	.00000	0	0	3695
10	426	0	785	4119	4119	.00000	0	0	60198	238	238	.00000	0	0	3695
11	394	0	391	2793	2793	.00000	0	0	60198	161	161	.00000	0	0	3695
12	391	0	0	2716	2716	.00000	0	0	60198	157	157	.00000	0	0	3695
ANNUAL	5300	0		69464	60198		7002			4009	3695		237		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	205	.00000	0	0	4699	361	268	.00000	0	0	4735
2	264	0	3417	214	214	.00000	0	0	4699	213	213	.00000	0	0	4735
3	308	0	3109	379	379	.00000	0	0	4699	376	376	.00000	0	0	4735
4	355	0	2754	698	698	.00000	0	0	4699	694	694	.00000	0	0	4735
5	343	0	2411	652	652	.00000	0	0	4699	648	648	.00000	0	0	4735
6	357	0	2054	615	615	.03795	184	184	4699	611	611	.02232	108	108	4735
7	398	0	1656	516	332	.06286	305	305	4515	513	405	.03698	179	179	4627
8	412	0	1244	470	165	.00000	0	0	4210	467	288	.00000	0	0	4448
9	337	0	907	277	277	.00000	0	0	4210	276	276	.00000	0	0	4448
10	319	0	588	288	288	.00000	0	0	4210	286	286	.00000	0	0	4448
11	295	0	293	195	195	.00000	0	0	4210	194	194	.00000	0	0	4448
12	293	0	0	190	190	.00000	0	0	4210	189	189	.00000	0	0	4448
ANNUAL	3967	0		4857	4210		489			4828	4448		287		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 8 CALENDAR YEAR 1952

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	6223	.00000	0	0	142959	35	26	.00000	0	0	461
2	409	0	5289	6517	6517	.00000	0	0	142959	21	21	.00000	0	0	461
3	477	0	4812	11526	11526	.00000	0	0	142959	37	37	.00000	0	0	461
4	549	0	4263	21235	21235	.00000	0	0	142959	68	68	.00000	0	0	461
5	532	0	3731	19831	19831	.00000	0	0	142959	63	63	.00000	0	0	461
6	553	0	3178	18708	18708	.03795	5608	5608	142959	59	59	.02232	10	10	461
7	616	0	2562	15709	10101	.06286	9289	9289	137351	50	40	.03698	17	17	451
8	637	0	1925	14290	5001	.00000	0	0	128062	45	28	.00000	0	0	434
9	522	0	1403	8438	8438	.00000	0	0	128062	27	27	.00000	0	0	434
10	493	0	910	8763	8763	.00000	0	0	128062	28	28	.00000	0	0	434
11	457	0	453	5941	5941	.00000	0	0	128062	19	19	.00000	0	0	434
12	453	0	0	5778	5778	.00000	0	0	128062	18	18	.00000	0	0	434
ANNUAL	6140	0		147775	128062		14897			470	434		27		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 9 CALENDAR YEAR 1953

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	37000	37000	0	153013	51827	.43	8353	2077	0	5397	0	0	791550	1370431
2	33000	33000	0	67515	50501	.38	6740	2074	0	5194	0	0	750295	1370431
3	43000	43000	0	14357	50356	.37	6491	2584	0	11773	0	0	772447	1827241
4	31000	31000	0	274982	48022	.70	10593	2808	0	12954	0	0	517872	1328281
5	30000	30000	0	174887	43368	.83	8875	3033	0	10604	261	0	364110	1328281
6	24000	24000	0	4262	41180	1.05	9536	3267	0	13195	12200	0	374312	1771041
7	32000	32000	0	54704	41192	1.24	10904	3692	0	15062	14966	0	340704	1328281
8	50000	50000	0	0	42200	1.08	9559	3767	0	17348	17340	0	381145	1328281
9	58000	58000	0	0	43396	.80	7894	2992	0	10249	0	0	431251	1771041
10	48000	48000	0	0	44229	.66	7197	2893	0	10274	0	0	472054	1771041
11	35000	35000	0	10920	45175	.46	5311	2462	0	8458	0	0	490823	1827241
12	36000	36000	0	8839	45943	.35	4193	2349	0	6490	0	0	513791	1827241
ANNUAL	457000	457000	0	763479			95646	33998	0	126998	44767	0		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	0	145539	0	89527	28763	.44	3137	9000	0	80527	0	0	155647	155725
2	0	60247	0	55865	27250	.37	3280	8325	0	47540	0	0	156749	155725
3	0	0	0	93796	26262	.49	3076	9712	0	84084	0	0	59877	1210297
4	0	259220	0	166084	23561	.61	3849	11175	0	154909	0	0	149164	150070
5	1000	162511	0	151933	16743	.67	6768	10825	0	144668	3560	0	152974	150070
6	0	0	0	21544	9607	.97	9233	11250	0	136475	126181	0	122197	1166347
7	0	50916	0	13278	9489	1.04	9783	12550	0	114591	113863	0	150052	150070
8	97000	93225	0	13026	25533	.99	10761	12975	0	104243	104192	0	219490	150070
9	223000	209759	0	72179	41300	.92	11939	10625	0	61554	0	0	345131	1166347
10	59000	45833	0	73962	47807	.66	9199	10037	0	63925	0	0	307803	1166347
11	0	0	0	52636	48487	.54	6373	9300	0	43336	0	0	248794	1210297
12	0	0	0	51375	48105	.39	3673	9225	0	42150	0	0	193746	1210297
ANNUAL	380000	1027250	0	855205			81071	124999	0	1078002	347796	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	101000	101000	0	0	51827	.43	13933	5181	0	0	0	87067	1424078	1424078
2	82000	82000	0	0	50501	.38	12450	4798	0	0	0	69550	1424078	1424078
3	104000	104000	0	0	50356	.37	12141	4917	0	0	0	91859	1424078	1424078
4	92000	92000	0	0	48022	.70	23022	5603	0	0	0	112778	1380278	1380278
5	93000	93000	0	131123	43368	.83	27120	5273	0	0	0	0	1315035	1380278
6	98000	98000	0	84485	41180	1.05	33703	5478	0	0	0	0	1294847	1035209
7	118000	118000	0	33064	41192	1.24	40174	6039	0	0	0	0	1339609	1035209
8	100000	100000	0	0	42200	1.08	36017	6006	0	0	0	23314	1380278	1035209
9	109000	109000	0	0	43396	.80	26823	5914	0	0	0	82177	1380278	1380278
10	91000	91000	0	0	44229	.66	21994	5676	0	0	0	69006	1380278	1380278
11	100000	100000	0	0	45175	.46	15470	5445	0	0	0	40730	1424078	1424078
12	100000	100000	0	0	45943	.35	11887	5669	0	0	0	88113	1424078	1424078
ANNUAL	1188000	1188000	0	248672			274734	65999	0	0	0	664594		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 9 CALENDAR YEAR 1953

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	6000	87886	0	198288	28763	.44	9519	198288	0	0	0	0	332152	855056
2	5000	69752	0	79438	27250	.37	6802	79438	0	0	0	0	315664	855056
3	11000	97942	0	29743	26262	.49	9792	29743	0	0	0	0	374071	855056
4	22000	129175	0	295351	23561	.61	10523	295351	0	0	0	0	197372	824006
5	7000	132850	0	324482	16743	.67	4450	324482	0	0	0	0	1290	824006
6	1000	80007	0	79927	9607	.97	86	79927	0	0	0	0	1284	1099
7	9000	36025	0	36108	9489	1.04	86	36108	0	0	0	0	1115	1099
8	566000	583308	0	72461	25533	.99	14517	72461	0	0	0	0	497445	1099
9	215000	291263	0	27785	41300	.92	26057	27785	0	0	0	0	734866	824006
10	118000	181330	0	42106	47807	.66	22354	42106	0	0	0	0	851736	824006
11	26000	61285	0	14810	48487	.54	19810	14810	0	0	0	0	878401	855056
12	17000	99444	0	23501	48105	.39	15088	23501	0	0	0	0	939256	1140074
ANNUAL	1003000	1850267	0	1224000			139084	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	7474	7268	14357	15762	12376	4262	3788	0	0	0	10920	8839	7083
2	5397	5194	11773	12954	10343	995	96	93233	220008	56107	8458	6490	35914
3	0	0	0	0	0	0	0	93225	209759	45833	0	0	29066
4	80527	47540	84084	154909	141108	10294	728	51	61554	63925	43336	42150	60846
5	0	0	0	0	0	4478	0	0	0	0	0	0	373
6	819	202	6083	16397	1727	0	2961	559994	209086	112324	20555	11331	78450
7	145539	60247	0	259220	162511	0	50916	0	0	0	0	0	56534
8	87067	69550	91859	112778	131123	80007	33064	23314	82177	69006	40730	88113	75726

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	1014088	37000	11077	85924	0	11490	942597	28.5	225000	272616	0	0	79481	444981	16.8
2	942597	33000	10399	52734	0	10020	902444	27.3	225000	275000	6393	0	48930	396051	15.0
3	902444	43000	12296	95857	0	9567	827724	25.0	225000	275000	20803	0	89130	306921	11.6
4	827724	31000	13983	167863	0	14442	662436	20.1	225000	275000	10985	0	155470	151451	5.7
5	662436	31000	13858	155272	3821	15643	512484	15.5	225000	275000	1195	0	140162	11289	.4
6	512484	24000	14517	149670	138381	18769	491909	14.9	225000	266085	0	0	10465	824	.0
7	491909	32000	16242	129653	128829	20687	486156	14.8	225000	261097	0	0	765	59	.0
8	486156	147000	16742	121591	121532	20320	596035	18.1	225000	275000	0	96030	54	96035	3.6
9	596035	281000	13617	71803	0	19833	771782	23.3	225000	275000	0	242625	66878	271782	10.3
10	771782	107000	12930	74199	0	16396	775257	23.4	225000	275000	0	72560	69085	275257	10.4
11	775257	35000	11762	51794	0	11684	735017	22.2	225000	275000	8087	0	48327	226930	8.6
12	735017	36000	11574	48640	0	7866	702937	21.3	225000	275000	21275	0	45268	181662	6.9

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 9   CALENDAR YEAR 1953

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	5189	.00000	0	0	69464	299	299	.00000	0	0	4009
2	353	0	4565	3063	3063	.00000	0	0	69464	177	177	.00000	0	0	4009
3	412	0	4153	5418	5418	.00000	0	0	69464	313	313	.00000	0	0	4009
4	474	0	3679	9982	9982	.00000	0	0	69464	576	576	.00000	0	0	4009
5	459	0	3220	9322	9322	.00000	0	0	69464	538	538	.00000	0	0	4009
6	477	0	2743	8794	8794	.00000	0	0	69464	507	507	.00000	0	0	4009
7	532	0	2211	7384	7384	.00000	0	0	69464	426	426	.00000	0	0	4009
8	550	0	1661	6717	6717	.05366	3728	3728	69464	388	388	.03157	127	127	4009
9	450	0	1211	3967	239	.13558	9418	9418	65736	229	102	.07975	320	320	3882
10	426	0	785	4119	0	.04055	2817	8116	61617	238	0	.02385	96	178	3644
11	394	0	391	2793	0	.00000	0	5323	58824	161	0	.00000	0	17	3483
12	391	0	0	2716	0	.00000	0	2607	56108	157	140	.00000	0	0	3466
ANNUAL	5300	0		69464	56108		15963			4009	3466		543		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	363	.00000	0	0	4857	361	361	.00000	0	0	4828
2	264	0	3417	214	214	.00000	0	0	4857	213	213	.00000	0	0	4828
3	308	0	3109	379	379	.00000	0	0	4857	376	376	.00000	0	0	4828
4	355	0	2754	698	698	.00000	0	0	4857	694	694	.00000	0	0	4828
5	343	0	2411	652	652	.00000	0	0	4857	648	648	.00000	0	0	4828
6	357	0	2054	615	615	.00000	0	0	4857	611	611	.00000	0	0	4828
7	398	0	1656	516	516	.00000	0	0	4857	513	513	.00000	0	0	4828
8	412	0	1244	470	470	.05366	261	261	4857	467	467	.03157	152	152	4828
9	337	0	907	277	16	.13558	659	659	4596	276	124	.07975	385	385	4676
10	319	0	588	288	0	.04055	197	568	4308	286	0	.02385	115	214	4390
11	295	0	293	195	0	.00000	0	373	4113	194	0	.00000	0	20	4196
12	293	0	0	190	0	.00000	0	183	3923	189	169	.00000	0	0	4176
ANNUAL	3967	0		4857	3923		1117			4828	4176		652		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 9 CALENDAR YEAR 1953

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	11039	.00000	0	0	147775	35	35	.00000	0	0	470
2	409	0	5289	6517	6517	.00000	0	0	147775	21	21	.00000	0	0	470
3	477	0	4812	11526	11526	.00000	0	0	147775	37	37	.00000	0	0	470
4	549	0	4263	21235	21235	.00000	0	0	147775	68	68	.00000	0	0	470
5	532	0	3731	19831	19831	.00000	0	0	147775	63	63	.00000	0	0	470
6	553	0	3178	18708	18708	.00000	0	0	147775	59	59	.00000	0	0	470
7	616	0	2562	15709	15709	.00000	0	0	147775	50	50	.00000	0	0	470
8	637	0	1925	14290	14290	.05366	7930	7930	147775	45	45	.03157	15	15	470
9	522	0	1403	8438	508	.13558	20035	20035	139845	27	12	.07975	37	37	455
10	493	0	910	8763	0	.04055	5992	17264	131082	28	0	.02385	11	20	427
11	457	0	453	5941	0	.00000	0	11323	125141	19	0	.00000	0	1	408
12	453	0	0	5778	0	.00000	0	5545	119363	18	17	.00000	0	0	407
ANNUAL	6140	0		147775	119363		33957			470	407		63		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10   CALENDAR YEAR 1954

RESERVOIR NO. 1   U.S. AMISTAD   MAX FLOOD POOL: 1827241   MAX CONSERVATION POOL: 1771041   DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	34614	34614	0	7354	46342	.25	3124	2077	0	5397	0	0	537927	1827241
2	30275	30275	0	101426	45895	.39	4652	2074	0	5194	0	0	462124	1370431
3	30977	30977	0	104110	44412	.56	5699	2584	0	11773	0	0	383292	1370431
4	197344	197344	0	0	45102	.43	4948	2808	0	12954	11128	0	575688	1771041
5	116639	116639	0	93654	46575	.65	8987	3033	0	10604	0	0	589686	1328281
6	237073	237073	0	19397	48481	.88	14238	3267	0	13195	0	0	793124	1771041
7	2622785	2622785	7615	1620864	57685	1.14	31619	3692	0	15062	0	0	1771041	1328281
8	141349	141349	0	0	64438	1.11	40198	3767	0	17348	0	101151	1771041	1771041
9	96082	96082	0	0	64438	1.09	39473	2992	0	10249	0	56609	1771041	1771041
10	84666	84666	0	0	64438	.68	24626	2893	0	10274	0	60040	1771041	1771041
11	57034	57034	0	0	64716	.58	21165	2462	0	8458	0	0	1806910	1827241
12	55263	55263	0	13485	65365	.58	21481	2349	0	6490	0	0	1827207	1827241
ANNUAL	3704101	3704101	7615	1960290			220210	33998	0	126998	11128	217800		

RESERVOIR NO. 2   U.S. FALCON   MAX FLOOD POOL: 1613729   MAX CONSERVATION POOL: 1555129   DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	120	0	0	89527	44155	.20	1319	9000	0	80527	0	0	102900	1210297
2	17036	111194	0	55865	39495	.49	2964	8325	0	47540	0	0	155265	155725
3	8816	98569	0	93796	38656	.55	4050	9712	0	84084	0	0	155988	155725
4	23722	19088	0	33008	34838	.63	4602	11175	0	154909	133076	0	137466	1166347
5	95001	175018	0	155493	28407	.80	6398	10825	0	144668	0	0	150593	150070
6	0	2935	0	147725	21143	.82	3927	11250	0	136475	0	0	1876	1166347
7	92915	1695025	0	127141	47825	.90	29351	12550	0	114591	0	0	1540409	150070
8	37806	117842	0	117218	71232	.89	48386	12975	0	104243	0	0	1492647	1555129
9	54483	97851	0	72179	71256	.70	37300	10625	0	61554	0	0	1481019	1555129
10	63480	110353	0	73962	71927	.47	24844	10037	0	63925	0	0	1492566	1555129
11	20581	9661	0	52636	71684	.36	18762	9300	0	43336	0	0	1430829	1613729
12	2442	7088	0	51375	70205	.33	16776	9225	0	42150	0	0	1369766	1613729
ANNUAL	416402	2444624	0	1069925			198679	124999	0	1078002	133076	0		

RESERVOIR NO. 3   MEX AMISTAD   MAX FLOOD POOL: 1424078   MAX CONSERVATION POOL: 1380278   DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	17390	17390	0	0	46342	.25	8461	5181	0	0	0	8929	1424078	1424078
2	16551	16551	0	0	45895	.39	13247	4798	0	0	0	3304	1424078	1424078
3	14764	14764	0	0	44412	.56	19172	4917	0	0	0	0	1419670	1424078
4	70432	70432	0	0	45102	.43	14446	5603	0	0	0	95378	1380278	1380278
5	45584	45584	0	0	46575	.65	21287	5273	0	0	0	24297	1380278	1380278
6	99035	99035	0	5478	48481	.88	28425	5478	0	0	0	65132	1380278	1380278
7	236329	236329	-7615	0	57685	1.14	34142	6039	0	0	0	194572	1380278	1380278
8	122108	122108	0	0	64438	1.11	31328	6006	0	0	0	90780	1380278	1380278
9	67878	67878	0	0	64438	1.09	30764	5914	0	0	0	37114	1380278	1380278
10	44157	44157	0	0	64438	.68	19192	5676	0	0	0	24965	1380278	1380278
11	23250	23250	0	0	64716	.58	16370	5445	0	0	0	0	1387158	1424078
12	21872	21872	0	0	65365	.58	16431	5669	0	0	0	0	1392599	1424078
ANNUAL	779350	779350	-7615	5478			253265	65999	0	0	0	544471		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	12996	16744	0	198288	44155	.20	7512	198288	0	0	0	0	750200	1140074
2	24383	22889	0	79438	39495	.49	16389	79438	0	0	0	0	677262	855056
3	19969	15052	0	29743	38656	.55	17211	29743	0	0	0	0	645360	855056
4	38335	128110	0	295351	34838	.63	17346	295351	0	0	0	0	460773	824006
5	135435	154459	0	324482	28407	.80	16328	324482	0	0	0	0	274422	824006
6	0	65132	0	79927	21143	.82	13410	79927	0	0	0	0	246217	824006
7	73957	262490	0	36108	47825	.90	13691	36108	0	0	0	0	458908	824006
8	25816	110590	0	72461	71232	.89	15010	72461	0	0	0	0	482027	824006
9	47928	79128	0	27785	71256	.70	12579	27785	0	0	0	0	520791	824006
10	62864	82153	0	42106	71927	.47	8962	42106	0	0	0	0	551876	824006
11	21169	15724	0	14810	71684	.36	7044	14810	0	0	0	0	545746	855056
12	11213	5544	0	23501	70205	.33	6392	23501	0	0	0	0	521397	855056
ANNUAL	474065	958015	0	1224000			151874	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	7354	0	5541	0	0	16462	0	0	0	0	0	6397	2977
2	5397	14962	11773	20914	91968	13195	89223	34039	51491	60587	18119	6490	34839
3	0	9768	0	19088	81364	0	74161	16691	41242	50313	9661	0	25187
4	80527	47540	84084	21833	144668	136475	114591	104243	61554	63925	43336	42150	78738
5	0	0	0	0	0	5478	0	0	0	0	0	0	456
6	7815	19585	15052	32732	130162	0	67918	19810	42014	57188	15724	5544	34457
7	0	101426	98569	0	93654	2935	1620864	101151	56609	60040	0	7088	178525
8	8929	3304	0	95378	24297	65132	194572	90780	37114	24965	0	0	45369

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	702937	34734	11077	85924	0	4443	636227	19.3	225000	275000	34046	0	79481	102181	3.9
2	636227	47311	10399	52734	0	7616	612789	18.6	225000	275000	0	59538	48930	112789	4.3
3	612789	39793	12296	95857	0	9749	534680	16.2	225000	275000	11021	0	89130	23659	.9
4	534680	221066	13983	167863	144204	9550	708554	21.4	225000	275000	0	206807	21912	208554	7.9
5	708554	211640	13858	155272	0	15385	735679	22.3	225000	275000	0	170823	143698	235679	8.9
6	735679	237073	14517	149670	0	18165	790400	23.9	225000	275000	0	193473	138752	290400	11.0
7	790400	2715700	16242	129653	0	60970	3306850	99.6	225000	378318	55893	2477724	120485	2647639	100.0
8	3306850	179155	16742	121591	0	88584	3259088	98.1	225000	372862	13587	113251	113251	2647639	100.0
9	3259088	150565	13617	71803	0	76773	3247460	97.8	225000	371533	3288	66878	66878	2647639	100.0
10	3247460	148146	12930	74199	0	49470	3259007	98.1	225000	372852	13516	69085	69085	2647639	100.0
11	3259007	77615	11762	51794	0	39927	3233139	97.3	225000	369897	38930	0	48327	2599312	98.2
12	3233139	57705	11574	48640	0	38257	3192373	96.1	225000	365240	48089	0	45268	2554044	96.5

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10   CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	2582	.00000	0	0	66857	299	299	.00000	0	0	4009
2	353	0	4565	3063	3063	.03327	2311	2311	66857	177	177	.01957	78	78	4009
3	412	0	4153	5418	3107	.00000	0	0	64546	313	235	.00000	0	0	3931
4	474	0	3679	9982	9982	.11556	8028	8028	64546	576	576	.06798	273	273	3931
5	459	0	3220	9322	1294	.09546	6631	6631	56518	538	265	.05615	225	225	3658
6	477	0	2743	8794	2163	.10811	7510	7510	49887	507	282	.06360	255	255	3433
7	532	0	2211	7384	0	1.38456	96177	96303	42503	426	171	.81445	3265	3265	3178
8	550	0	1661	6717	0	.06328	4396	93982	35786	388	0	.03723	149	3026	2790
9	450	0	1211	3967	0	.03737	2596	92611	31819	229	0	.02198	88	2885	2561
10	426	0	785	4119	0	.03860	2682	91174	27700	238	0	.02271	91	2738	2323
11	394	0	391	2793	0	.00000	0	88381	24907	161	0	.00000	0	2577	2162
12	391	0	0	2716	0	.00000	0	85665	22191	157	0	.00000	0	2420	2005
ANNUAL	5300	0		69464	22191		130331			4009	2005		4424		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	180	.00000	0	0	4674	361	361	.00000	0	0	4828
2	264	0	3417	214	214	.03327	162	162	4674	213	213	.01957	94	94	4828
3	308	0	3109	379	217	.00000	0	0	4512	376	282	.00000	0	0	4734
4	355	0	2754	698	698	.11556	561	561	4512	694	694	.06798	328	328	4734
5	343	0	2411	652	91	.09546	464	464	3951	648	320	.05615	271	271	4406
6	357	0	2054	615	151	.10811	525	525	3487	611	340	.06360	307	307	4135
7	398	0	1656	516	0	1.38456	6725	6734	2971	513	206	.81445	3932	3932	3828
8	412	0	1244	470	0	.06328	307	6571	2501	467	0	.03723	180	3645	3361
9	337	0	907	277	0	.03737	182	6476	2224	276	0	.02198	106	3475	3085
10	319	0	588	288	0	.03860	188	6376	1936	286	0	.02271	110	3299	2799
11	295	0	293	195	0	.00000	0	6181	1741	194	0	.00000	0	3105	2605
12	293	0	0	190	0	.00000	0	5991	1551	189	0	.00000	0	2916	2416
ANNUAL	3967	0		4857	1551		9114			4828	2416		5328		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	5494	.00000	0	0	142230	35	35	.00000	0	0	470
2	409	0	5289	6517	6517	.03327	4916	4916	142230	21	21	.01957	9	9	470
3	477	0	4812	11526	6610	.00000	0	0	137314	37	28	.00000	0	0	461
4	549	0	4263	21235	21235	.11556	17077	17077	137314	68	68	.06798	32	32	461
5	532	0	3731	19831	2754	.09546	14106	14106	120237	63	31	.05615	26	26	429
6	553	0	3178	18708	4602	.10811	15976	15976	106131	59	33	.06360	30	30	403
7	616	0	2562	15709	0	1.38456	204603	204870	90422	50	20	.81445	383	383	373
8	637	0	1925	14290	0	.06328	9352	199932	76132	45	0	.03723	17	355	328
9	522	0	1403	8438	0	.03737	5523	197017	67694	27	0	.02198	10	338	301
10	493	0	910	8763	0	.03860	5705	193959	58931	28	0	.02271	11	321	273
11	457	0	453	5941	0	.00000	0	188018	52990	19	0	.00000	0	302	254
12	453	0	0	5778	0	.00000	0	182240	47212	18	0	.00000	0	284	236
ANNUAL	6140	0		147775	47212		277258			470	236		518		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 11 CALENDAR YEAR 1955

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	53265	53265	0	0	65532	.27	10018	2077	0	5397	0	43213	1827241	1827241
2	46070	46070	0	0	65627	.34	12584	2074	0	5194	0	33486	1827241	1827241
3	46460	46460	0	0	65699	.55	20336	2584	0	11773	0	26124	1827241	1827241
4	38188	38188	0	0	65066	.62	22683	2808	0	12954	0	71705	1771041	1771041
5	91475	91475	0	65298	62905	.75	27508	3033	0	10604	0	0	1769710	1771041
6	77149	77149	0	43930	61450	.87	32574	3267	0	13195	0	0	1770355	1771041
7	112166	112166	0	67518	61038	1.19	44313	3692	0	15062	0	0	1770690	1771041
8	137761	137761	0	103259	62000	.93	34363	3767	0	17348	0	0	1770829	1771041
9	262213	262213	0	236565	63498	.71	25917	2992	0	10249	0	0	1770560	1771041
10	121255	121255	0	88205	64313	.93	33700	2893	0	10274	0	0	1769910	1771041
11	63095	63095	0	0	65071	.53	19415	2462	0	8458	0	0	1813590	1827241
12	54706	54706	0	0	65505	.40	14767	2349	0	6490	0	26288	1827241	1827241
ANNUAL	1103803	1103803	0	604775			298178	33998	0	126998	0	200816		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	27719	63458	0	89527	66522	.31	15659	9000	0	80527	0	0	1328038	1613729
2	36136	62354	0	55865	62290	.28	14184	8325	0	47540	0	0	1320343	1613729
3	41745	53512	0	93796	59935	.56	27751	9712	0	84084	0	0	1252308	1613729
4	42016	97959	0	166084	54103	.63	30379	11175	0	154909	0	0	1153804	1555129
5	44340	96001	0	155493	47827	.80	37741	10825	0	144668	0	0	1056571	1166347
6	38884	66352	0	147725	44284	.89	39361	11250	0	136475	0	0	935837	1166347
7	35364	84128	0	127141	41210	.96	39513	12550	0	114591	0	0	853311	1166347
8	71120	153264	0	117218	39913	.84	33484	12975	0	104243	0	0	855873	1166347
9	76243	299567	0	72179	44709	.51	21597	10625	0	61554	0	0	1061664	1166347
10	30353	105391	0	73962	49882	.55	24476	10037	0	63925	0	0	1068617	1166347
11	30308	19388	0	52636	49987	.38	16552	9300	0	43336	0	0	1018817	1210297
12	18476	35925	0	51375	48804	.25	10631	9225	0	42150	0	0	992736	1210297
ANNUAL	492704	1137299	0	1203001			311328	124999	0	1078002	0	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	22309	22309	0	0	65532	.27	7676	5181	0	0	0	0	1407232	1424078
2	20812	20812	0	0	65627	.34	9729	4798	0	0	0	0	1418315	1424078
3	18282	18282	0	0	65699	.55	15798	4917	0	0	0	0	1420799	1424078
4	13271	13271	0	36146	65066	.62	17658	5603	0	0	0	0	1380266	1380278
5	55394	55394	0	264268	62905	.75	19671	5273	0	0	0	0	1151721	1035209
6	44002	44002	0	56557	61450	.87	20888	5478	0	0	0	0	1118278	1035209
7	67429	67429	0	12474	61038	1.19	28322	6039	0	0	0	0	1144911	1035209
8	137336	137336	0	2796	62000	.93	23297	6006	0	0	0	0	1256154	1035209
9	126021	126021	0	0	63498	.71	19167	5914	0	0	0	0	1363008	1035209
10	112111	112111	0	68823	64313	.93	26111	5676	0	0	0	0	1380185	1035209
11	36852	36852	0	0	65071	.53	15073	5445	0	0	0	0	1401964	1424078
12	26675	26675	0	0	65505	.40	11435	5669	0	0	0	0	1417204	1424078
ANNUAL	680494	680494	0	441064			214825	65999	0	0	0	0		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 11 CALENDAR YEAR 1955

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	20735	15554	0	198288	66522	.31	4963	198288	0	0	0	0	333700	855056
2	28170	23372	0	79438	62290	.28	3257	79438	0	0	0	0	274377	855056
3	30598	25681	0	29743	59935	.56	5813	29743	0	0	0	0	264502	855056
4	32995	63538	0	295351	54103	.63	3706	295351	0	0	0	0	28983	824006
5	38570	297565	0	324482	47827	.80	521	324482	0	0	0	0	1545	1099
6	28463	79542	0	79927	44284	.89	52	79927	0	0	0	0	1108	1099
7	29715	36150	0	36108	41210	.96	49	36108	0	0	0	0	1101	1099
8	75716	72506	0	72461	39913	.84	43	72461	0	0	0	0	1103	1099
9	139724	133810	0	27785	44709	.51	1205	27785	0	0	0	0	105923	1099
10	27584	90731	0	42106	49882	.55	2959	42106	0	0	0	0	151589	1099
11	27606	22161	0	14810	49987	.38	2443	14810	0	0	0	0	156497	855056
12	14898	9229	0	23501	48804	.25	1570	23501	0	0	0	0	140655	855056
ANNUAL	494774	869839	0	1224000			26581	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH / LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	25642	34062	39161	39208	41307	35617	31672	67353	73251	27460	27846	16127	38220
3	20245	28868	27388	26254	30703	22422	16610	50005	63002	17186	19388	9637	27638
4	80527	47540	84084	154909	144668	136475	114591	104243	61554	63925	43336	42150	89828
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	15554	23372	25681	27392	33297	22985	23676	69710	133810	21908	22161	9229	35726
7	43213	33486	26124	71705	65298	43930	67518	103259	236565	88205	0	26288	67127
8	0	0	0	36146	264268	56557	12474	2796	0	68823	0	0	36754

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	3192373	80984	11077	85924	0	25677	3150679	94.9	225000	360476	0	90640	79481	2565203	96.9
2	3150679	82206	10399	52734	0	26768	3142984	94.6	225000	359597	42114	0	48930	2516273	95.0
3	3142984	88205	12296	95857	0	48087	3074949	92.6	225000	351825	0	70981	89130	2498124	94.4
4	3074949	80204	13983	167863	0	53062	2920245	87.9	225000	334150	18441	0	155470	2342654	88.5
5	2920245	135815	13858	155272	0	65249	2821681	85.0	225000	322890	0	74835	143698	2273791	85.9
6	2821681	116033	14517	149670	0	71935	2701592	81.4	225000	309170	32383	0	138752	2135039	80.6
7	2701592	147530	16242	129653	0	83826	2619401	78.9	225000	299780	0	80067	120485	2094621	79.1
8	2619401	208881	16742	121591	0	67847	2622102	79.0	225000	300089	0	115643	113251	2097013	79.2
9	2622102	338456	13617	71803	0	47514	2827624	85.1	225000	323569	0	248920	66878	2279055	86.1
10	2827624	151608	12930	74199	0	58176	2833927	85.3	225000	324289	0	74668	69085	2284638	86.3
11	2833927	93403	11762	51794	0	35967	2827807	85.2	225000	323590	42906	0	48327	2236311	84.5
12	2827807	73182	11574	48640	0	25398	2815377	84.8	225000	322170	0	77164	45268	2268207	85.7

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 11 CALENDAR YEAR 1955

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	0	.05065	3518	83994	64275	299	0	.02979	119	2240	3710
2	353	0	4565	3063	0	.00000	0	80931	61212	177	0	.00000	0	2063	3533
3	412	0	4153	5418	0	.03966	2755	78268	55794	313	0	.02333	94	1844	3220
4	474	0	3679	9982	0	.00000	0	68286	45812	576	0	.00000	0	1268	2644
5	459	0	3220	9322	0	.04182	2905	61869	36490	538	0	.02460	99	829	2106
6	477	0	2743	8794	0	.00000	0	53075	27696	507	0	.00000	0	322	1599
7	532	0	2211	7384	0	.04474	3108	48799	20312	426	104	.02632	106	106	1277
8	550	0	1661	6717	0	.06462	4489	46571	13595	388	282	.03801	152	152	1171
9	450	0	1211	3967	0	.13910	9662	52266	9628	229	77	.08182	328	328	1019
10	426	0	785	4119	0	.04172	2898	51045	5509	238	0	.02454	98	188	781
11	394	0	391	2793	0	.00000	0	48252	2716	161	0	.00000	0	27	620
12	391	0	0	2716	0	.04312	2995	48531	0	157	130	.02536	102	102	593
ANNUAL	5300	0		69464	0		32330			4009	593		1098		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	0	.05065	246	5874	4494	361	0	.02979	144	2699	4467
2	264	0	3417	214	0	.00000	0	5660	4280	213	0	.00000	0	2486	4254
3	308	0	3109	379	0	.03966	193	5474	3901	376	0	.02333	113	2223	3878
4	355	0	2754	698	0	.00000	0	4776	3203	694	0	.00000	0	1529	3184
5	343	0	2411	652	0	.04182	203	4327	2551	648	0	.02460	119	1000	2536
6	357	0	2054	615	0	.00000	0	3712	1936	611	0	.00000	0	389	1925
7	398	0	1656	516	0	.04474	217	3413	1420	513	124	.02632	127	127	1536
8	412	0	1244	470	0	.06462	314	3257	950	467	340	.03801	184	184	1409
9	337	0	907	277	0	.13910	676	3656	673	276	92	.08182	395	395	1225
10	319	0	588	288	0	.04172	203	3571	385	286	0	.02454	118	227	939
11	295	0	293	195	0	.00000	0	3376	190	194	0	.00000	0	33	745
12	293	0	0	190	0	.04312	209	3395	0	189	156	.02536	122	122	712
ANNUAL	3967	0		4857	0		2261			4828	712		1322		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION YEAR 11   CALENDAR YEAR 1955

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	0	.05065	7485	178686	136736	35	0	.02979	14	263	435
2	409	0	5289	6517	0	.00000	0	172169	130219	21	0	.00000	0	242	414
3	477	0	4812	11526	0	.03966	5861	166504	118693	37	0	.02333	11	216	377
4	549	0	4263	21235	0	.00000	0	145269	97458	68	0	.00000	0	148	309
5	532	0	3731	19831	0	.04182	6180	131618	77627	63	0	.02460	12	97	246
6	553	0	3178	18708	0	.00000	0	112910	58919	59	0	.00000	0	38	187
7	616	0	2562	15709	0	.04474	6612	103813	43210	50	12	.02632	12	12	149
8	637	0	1925	14290	0	.06462	9549	99072	28920	45	33	.03801	18	18	137
9	522	0	1403	8438	0	.13910	20555	111189	20482	27	9	.08182	38	38	119
10	493	0	910	8763	0	.04172	6166	108592	11719	28	0	.02454	12	22	91
11	457	0	453	5941	0	.00000	0	102651	5778	19	0	.00000	0	3	72
12	453	0	0	5778	0	.04312	6372	103245	0	18	15	.02536	12	12	69
ANNUAL	6140	0		147775	0		68780			470	69		129		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 1 U.S. AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1771041	1100000	1100000	43	189389	276426	33998	0	126998	0	578028	1827241	1758253
1946	1827241	1117000	1117000	0	13099	249172	33998	0	126998	0	854729	1827241	1771041
1947	1827241	875000	875000	0	54879	273503	33998	0	126998	0	546640	1827219	1771041
1948	1827219	1384000	1384000	0	68861	275508	33998	0	126998	0	1039623	1827227	1771041
1949	1827227	1589000	1589000	1	14754	234041	33998	0	126998	0	1340192	1827241	1771041
1950	1827241	1035000	1035000	0	76372	257611	33998	0	126998	0	701065	1827193	1771041
1951	1827193	691000	691000	0	82400	279294	33998	0	126998	0	331960	1824539	1760873
1952	1824539	598000	598000	0	1289892	216731	33998	0	126998	0	0	915916	891681
1953	915916	457000	457000	0	763479	95646	33998	0	126998	44767	0	513791	340704
1954	513791	3704101	3704101	7615	1960290	220210	33998	0	126998	11128	217800	1827207	383292
1955	1827207	1103803	1103803	0	604775	298178	33998	0	126998	0	200816	1827241	1769710
1956	1827241	515774	515774	0	438761	337121	33998	0	126998	0	0	1567133	1567133
1957	1567133	1610739	1610739	-305589	244487	269173	33998	0	126998	0	531382	1827241	1411132
1958	1827241	1881826	1881826	-244378	0	242471	33998	0	126998	0	1394977	1827241	1771041
1959	1827241	1279514	1279514	0	14093	229115	33998	0	126998	0	1036306	1827241	1771040
1960	1827241	1096226	1096226	-10	31144	246732	33998	0	126998	0	818340	1827241	1771025
1961	1827241	1090303	1090303	-1	0	233837	33998	0	126998	0	856465	1827241	1771041
1962	1827241	841972	841972	0	340131	309410	33998	0	126998	0	192670	1827002	1770287
1963	1827002	713470	713470	0	231469	285244	33998	0	126998	0	245934	1777825	1770642
1964	1777825	1602311	1602311	-128939	864215	265878	33998	0	126998	0	293863	1827241	1187045
1965	1827241	973545	973545	-92708	0	255532	33998	0	126998	0	625305	1827241	1771041
1966	1827241	1249166	1249166	-208051	55946	234188	33998	0	126998	0	750987	1827235	1771041
1967	1827235	894820	894820	0	258346	280126	33998	0	126998	0	356342	1827241	1657582
1968	1827241	933727	933727	-23762	97292	219107	33998	0	126998	0	593889	1826918	1770865
1969	1826918	843864	843864	0	913310	226854	33998	0	126998	0	0	1530618	1409437
1970	1530618	844695	844695	0	1122683	169914	33998	0	126998	0	0	1082716	947258
1971	1082716	1783089	1783089	-48059	597985	167320	33998	0	126998	0	225200	1827241	706804
1972	1827241	1307088	1307088	-258287	0	234240	33998	0	126998	0	814561	1827241	1771041
1973	1827241	918028	918028	732	406858	213047	33998	0	126998	0	301167	1824929	1770358
1974	1824929	3029423	3029423	-599	284434	239730	33998	0	126998	0	2502348	1827241	1769907
1975	1827241	1284972	1284972	0	9019	211382	33998	0	126998	0	1064571	1827241	1771041
1976	1827241	1607050	1607050	0	31586	201156	33998	0	126998	0	1374308	1827241	1771041
1977	1827241	1163283	1163283	0	461	238493	33998	0	126998	0	924329	1827241	1771040
1978	1827241	1743638	1743638	2	444896	225378	33998	0	126998	0	1073366	1827241	1769800
1979	1827241	1275063	1275063	0	7690	224821	33998	0	126998	0	1042552	1827241	1771041
1980	1827241	1329313	1329313	-15	60122	253781	33998	0	126998	0	1015395	1827241	1771023
1981	1827241	1888274	1888274	0	3482	214053	33998	0	126998	0	1670739	1827241	1771041
1982	1827241	1118780	1118780	0	21115	243427	33998	0	126998	0	854238	1827241	1771041
1983	1827241	910765	910765	0	411265	249920	33998	0	126998	0	249663	1827158	1770282
1984	1827158	1086407	1086407	0	526594	291574	33998	0	126998	0	299999	1795398	1719121
1985	1795398	1043484	1043484	0	959452	228833	33998	0	126998	0	37798	1612799	1437879
1986	1612799	1887478	1887478	-203148	914666	232988	33998	0	126998	0	322234	1827241	1330007
1987	1827241	1797750	1797750	-123360	938738	212431	33998	0	126998	0	523221	1827241	1770290
1988	1827241	1469121	1469121	953	739349	241106	33998	0	126998	0	489619	1827241	1769885
1989	1827241	1055062	1055062	0	345584	292563	33998	0	126998	0	417112	1827044	1769345
1990	1827044	2076817	2076817	-130759	733406	265495	33998	0	126998	0	946960	1827241	1770434
1991	1827241	2027658	2027658	0	62602	285132	33998	0	126998	0	1679924	1827241	1771041
1992	1827241	1702861	1702861	0	4242	250028	33998	0	126998	0	1448591	1827241	1771041
1993	1827241	1181767	1181767	0	30221	290243	33998	0	126998	0	861303	1827241	1771041
1994	1827241	924654	924654	0	343797	289940	33998	0	126998	0	290981	1827177	1769978
1995	1827177	895126	895126	0	774520	317488	33998	0	126998	0	222759	1407536	1389956
1996	1407536	956466	956466	0	1192572	242373	33998	0	126998	0	0	929057	753135

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 2 U.S. FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1555129	285000	891421	117316	1203001	322630	124999	0	1078002	0	0	1038235	700736
1946	1038235	506000	1212832	427547	1203001	231693	124999	0	1078002	0	0	1243920	719155
1947	1243920	426000	866523	182693	1203001	261489	124999	0	1078002	0	0	828646	758001
1948	828646	595000	1542488	286634	1203001	250787	124999	0	1078002	0	0	1203980	409464
1949	1203980	783000	1976950	66697	1203001	324158	124999	0	1078002	0	106739	1613729	1164225
1950	1613729	248000	864441	16876	1203001	406307	124999	0	1078002	0	0	885738	885738
1951	885738	371000	624364	0	1203001	164223	124999	0	1078002	0	0	142878	142878
1952	142878	92000	1220896	0	1203001	58001	124999	0	1078002	0	0	102772	1822
1953	102772	380000	1027250	0	855205	81071	124999	0	1078002	347796	0	193746	59877
1954	193746	416402	2444624	0	1069925	198679	124999	0	1078002	133076	0	1369766	1876
1955	1369766	492704	1137299	0	1203001	311328	124999	0	1078002	0	0	992736	853311
1956	992736	268064	545829	0	1203001	179840	124999	0	1078002	0	0	155724	137063
1957	155724	914601	1529474	0	1203001	124230	124999	0	1078002	0	0	357967	110877
1958	357967	1591997	2825978	111366	1203001	149832	124999	0	1078002	0	328749	1613729	343218
1959	1613729	707063	1596466	-120792	1203001	286953	124999	0	1078002	0	58427	1541022	1424175
1960	1541022	595785	1284273	0	1203001	292981	124999	0	1078002	0	0	1329313	1180926
1961	1329313	771455	1466924	0	1203001	306538	124999	0	1078002	0	0	1286698	1110382
1962	1286698	527290	899095	0	1203001	294034	124999	0	1078002	0	0	688758	651808
1963	688758	502426	818833	0	1203001	149013	124999	0	1078002	0	0	155577	149179
1964	155577	709744	1706826	0	1203001	85752	124999	0	1078002	0	0	573650	1582
1965	573650	656638	1120947	0	1203001	170498	124999	0	1078002	0	0	321098	321098
1966	321098	689286	1335223	0	1203001	102038	124999	0	1078002	0	0	351282	200475
1967	351282	1036461	1490153	0	1203001	93278	124999	0	1078002	0	0	545156	66528
1968	545156	570101	1100286	0	1203001	112449	124999	0	1078002	0	0	329992	266011
1969	329992	346676	1098990	0	1203001	70484	124999	0	1078002	0	0	155497	118336
1970	155497	297120	1258807	0	1203001	55978	124999	0	1078002	0	0	155325	1581
1971	155325	2201017	2863206	560957	1203001	116430	124999	0	1078002	0	649017	1613729	1587
1972	1613729	569612	1223177	-37070	1203001	279847	124999	0	1078002	0	0	1319355	1275630
1973	1319355	707828	1254857	0	1203001	235265	124999	0	1078002	0	0	1135946	995495
1974	1135946	287805	2913591	-701628	1203001	248184	124999	0	1078002	0	283593	1613729	605787
1975	1613729	689676	1602270	-96903	1203001	290297	124999	0	1078002	0	121492	1504306	1480576
1976	1504306	1062184	2307082	979	1203001	254359	124999	0	1078002	0	741297	1613729	1196374
1977	1613729	464282	1228076	-157036	1203001	280675	124999	0	1078002	0	0	1201093	1201093
1978	1201093	556024	1913290	25964	1203001	245977	124999	0	1078002	0	77640	1613729	867419
1979	1613729	564636	1453882	-69223	1203001	292374	124999	0	1078002	0	121055	1381958	1381958
1980	1381958	409238	1323759	0	1203001	266010	124999	0	1078002	0	0	1236706	844367
1981	1236706	994629	2507854	-102283	1203001	243536	124999	0	1078002	0	598689	1597051	1233410
1982	1597051	340150	1054507	-46493	1203001	275797	124999	0	1078002	0	0	1126267	1126267
1983	1126267	342907	842839	0	1203001	200372	124999	0	1078002	0	0	565733	502215
1984	565733	234142	899739	0	1203001	106853	124999	0	1078002	0	0	155618	101028
1985	155618	424262	1260516	0	1203001	57679	124999	0	1078002	0	0	155454	47314
1986	155454	377249	1453153	0	1203001	53983	124999	0	1078002	0	0	351623	1576
1987	351623	630894	1931857	0	1203001	175605	124999	0	1078002	0	0	904874	391522
1988	904874	539973	1607945	0	1203001	210891	124999	0	1078002	0	0	1098927	669896
1989	1098927	278254	879954	0	1203001	235058	124999	0	1078002	0	0	540822	540822
1990	540822	418569	1937939	0	1203001	176264	124999	0	1078002	0	0	1099496	290009
1991	1099496	308733	1890263	87814	1203001	236593	124999	0	1078002	0	26137	1611842	903211
1992	1611842	517404	1809241	-124952	1203001	281695	124999	0	1078002	0	299670	1511765	1481160
1993	1511765	250123	980651	0	1203001	270951	124999	0	1078002	0	0	1018464	1017726
1994	1018464	295200	768982	0	1203001	210118	124999	0	1078002	0	0	374327	373565
1995	374327	218838	1055121	0	1203001	70954	124999	0	1078002	0	0	155493	76945
1996	155493	227673	1259249	0	1203001	56214	124999	0	1078002	0	0	155527	1583

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 3 MEX AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLOWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1380278	1703000	1703000	-43	81692	215620	65999	0	0	0	1361845	1424078	1380217
1946	1424078	1635000	1635000	0	5273	194195	65999	0	0	0	1435532	1424078	1380278
1947	1424078	1571000	1571000	0	86845	213261	65999	0	0	0	1270894	1424078	1380278
1948	1424078	1349000	1349000	0	69994	214780	65999	0	0	0	1064226	1424078	1380278
1949	1424078	1612000	1612000	-1	11081	182399	65999	0	0	0	1418519	1424078	1380278
1950	1424078	1626000	1626000	0	86410	200980	65999	0	0	0	1338610	1424078	1380278
1951	1424078	1214000	1214000	0	213392	218057	65999	0	0	0	782551	1424078	1380243
1952	1424078	1276000	1276000	0	553711	236183	65999	0	0	0	486106	1424078	1379568
1953	1424078	1188000	1188000	0	248672	274734	65999	0	0	0	664594	1424078	1294847
1954	1424078	779350	779350	-7615	5478	253265	65999	0	0	0	544471	1392599	1380278
1955	1392599	680494	680494	0	441064	214825	65999	0	0	0	0	1417204	1118278
1956	1417204	303177	303177	0	905517	154397	65999	0	0	0	0	660467	598286
1957	660467	566668	566668	305589	492370	109890	65999	0	0	0	0	930464	327206
1958	930464	1559946	1559946	244378	1104752	84607	65999	0	0	0	121351	1424078	391532
1959	1424078	653034	653034	0	12019	178463	65999	0	0	0	462579	1424051	1380278
1960	1424051	845465	845465	10	108320	192237	65999	0	0	0	544891	1424078	1377648
1961	1424078	620768	620768	1	8447	182145	65999	0	0	0	430201	1424054	1380278
1962	1424054	515482	515482	0	297341	217012	65999	0	0	0	100503	1324680	1126767
1963	1324680	487817	487817	0	868090	126696	65999	0	0	0	0	817711	614775
1964	817711	675919	675919	128939	953585	55718	65999	0	0	0	0	613266	98520
1965	613266	490504	490504	92708	449726	80922	65999	0	0	0	0	665830	410412
1966	665830	1002479	1002479	208051	705067	54061	65999	0	0	0	0	1117232	205851
1967	1117232	605373	605373	0	845401	99180	65999	0	0	0	0	778024	407729
1968	778024	876137	876137	23762	146754	113520	65999	0	0	0	0	1417649	747923
1969	1417649	705083	705083	0	887796	149574	65999	0	0	0	0	1085362	933347
1970	1085362	620385	620385	0	1020706	69292	65999	0	0	0	0	615749	286538
1971	615749	692998	692998	48059	750788	39986	65999	0	0	0	0	566032	1422
1972	566032	802803	802803	258287	21899	118786	65999	0	0	0	64672	1421765	626024
1973	1421765	679907	679907	-732	255611	160236	65999	0	0	0	275134	1409959	1202507
1974	1409959	1211470	1211470	599	526311	174928	65999	0	0	0	496711	1424078	1186006
1975	1424078	748604	748604	0	978	164596	65999	0	0	0	583066	1424042	1380278
1976	1424042	773967	773967	0	15525	156703	65999	0	0	0	601722	1424059	1380278
1977	1424059	550896	550896	0	0	185664	65999	0	0	0	379373	1409918	1380278
1978	1409918	1517216	1517216	-2	56907	175656	65999	0	0	0	1270491	1424078	1380276
1979	1424078	878202	878202	0	2269	175100	65999	0	0	0	712516	1412395	1380278
1980	1412395	817103	817103	15	249236	197639	65999	0	0	0	358573	1424065	1377308
1981	1424065	1238430	1238430	0	0	166824	65999	0	0	0	1071593	1424078	1380278
1982	1424078	664349	664349	0	6006	189622	65999	0	0	0	474720	1418079	1380278
1983	1418079	497472	497472	0	362680	176613	65999	0	0	0	85595	1290663	1141885
1984	1290663	775321	775321	0	1047630	129122	65999	0	0	0	0	889232	592246
1985	889232	682379	682379	0	866727	67443	65999	0	0	0	0	637441	316616
1986	637441	1208462	1208462	203148	832401	52089	65999	0	0	0	0	1164561	1523
1987	1164561	1203973	1203973	123360	672094	157454	65999	0	0	0	238286	1424060	1064640
1988	1424060	929864	929864	-953	357760	182260	65999	0	0	0	388875	1424076	1223371
1989	1424076	589071	589071	0	22193	228019	65999	0	0	0	338871	1424064	1380275
1990	1424064	1728668	1728668	130759	848855	162324	65999	0	0	0	848234	1424078	739778
1991	1424078	1892590	1892590	0	45082	222129	65999	0	0	0	1625395	1424062	1380278
1992	1424062	1283085	1283085	0	14354	194769	65999	0	0	0	1073965	1424059	1380278
1993	1424059	788586	788586	0	24534	226103	65999	0	0	0	537957	1424051	1380278
1994	1424051	488813	488813	0	425149	200662	65999	0	0	0	162314	1124739	1112634
1995	1124739	387891	387891	0	1075201	83687	65999	0	0	0	0	353742	238653
1996	353742	441577	441577	0	527977	18019	65999	0	0	0	0	249323	1357

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-96 HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 4 MEX FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1098674	278000	1655538	-117316	1224000	272822	1224000	0	0	0	0	1140074	640146
1946	1140074	521000	1895806	-427547	1224000	244259	1224000	0	0	0	0	1140074	677509
1947	1140074	371000	1662740	-182693	1224000	256069	1224000	0	0	0	0	1140074	652171
1948	1140074	702000	1770221	-286634	1224000	259601	1224000	0	0	0	0	1140074	612578
1949	1140074	442000	1805601	-66697	1224000	221568	1224000	0	0	0	293336	1140074	833013
1950	1140074	128000	1487021	-16876	1224000	299603	1224000	0	0	0	0	1086616	661947
1951	1086616	326000	1255944	0	1224000	282022	1224000	0	0	0	0	836538	617263
1952	836538	64000	1037818	0	1224000	198283	1224000	0	0	0	0	452073	217368
1953	452073	1003000	1850267	0	1224000	139084	1224000	0	0	0	0	939256	1115
1954	939256	474065	958015	0	1224000	151874	1224000	0	0	0	0	521397	246217
1955	521397	494774	869839	0	1224000	26581	1224000	0	0	0	0	140655	1101
1956	140655	247474	1086992	0	1224000	2507	1224000	0	0	0	0	1140	1103
1957	1140	839072	1265443	0	1224000	9037	1224000	0	0	0	0	33546	1114
1958	33546	3046578	4206682	-111366	1224000	26833	1224000	0	0	0	1737955	1140074	1119
1959	1140074	684289	1092888	120792	1224000	160620	1224000	0	0	0	19132	950002	662590
1960	950002	473986	1061198	0	1224000	103860	1224000	0	0	0	0	683340	225648
1961	683340	786956	1159605	0	1224000	93243	1224000	0	0	0	0	525702	65962
1962	525702	396565	728410	0	1224000	27415	1224000	0	0	0	0	2697	1103
1963	2697	430318	1232409	0	1224000	3251	1224000	0	0	0	0	7855	1113
1964	7855	692882	1580468	0	1224000	20339	1224000	0	0	0	0	343984	1098
1965	343984	507366	891093	0	1224000	9837	1224000	0	0	0	0	1240	1120
1966	1240	593653	1232721	0	1224000	3405	1224000	0	0	0	0	6556	1129
1967	6556	1128259	1907661	0	1224000	27746	1224000	0	0	0	0	662471	1157
1968	662471	574792	655547	0	1224000	30726	1224000	0	0	0	0	63292	1136
1969	63292	382759	1204556	0	1224000	3476	1224000	0	0	0	0	40372	1098
1970	40372	283218	1237925	0	1224000	6034	1224000	0	0	0	0	48263	1098
1971	48263	3101272	3786061	-560957	1099188	94153	1224000	124812	0	0	939952	1140074	1135
1972	1140074	670492	691064	37070	1224000	116530	1224000	0	0	0	0	527678	408818
1973	527678	740920	1205666	0	1224000	39548	1224000	0	0	0	0	469796	1422
1974	469796	305682	1262705	701628	1224000	46280	1224000	0	0	0	23775	1140074	1105
1975	1140074	913544	1431589	96903	1224000	183744	1224000	0	0	0	163659	1097163	745677
1976	1097163	1693211	2244459	-979	1224000	144983	1224000	0	0	0	831586	1140074	371754
1977	1140074	554875	868249	157036	1224000	171579	1224000	0	0	0	28647	741133	741133
1978	741133	801281	2062680	-25964	1224000	65989	1224000	0	0	0	347786	1140074	8722
1979	1140074	688648	1337434	69223	1224000	201343	1224000	0	0	0	122808	998580	846078
1980	998580	544535	1086345	0	1224000	110220	1224000	0	0	0	0	750705	173492
1981	750705	1430420	2436014	102283	1224000	160538	1224000	0	0	0	764390	1140074	623678
1982	1140074	338840	753567	46493	1224000	142251	1224000	0	0	0	0	573883	573883
1983	573883	291291	673567	0	1224000	22103	1224000	0	0	0	0	1347	1103
1984	1347	243487	1225118	0	1224000	1219	1224000	0	0	0	0	1246	1110
1985	1246	463802	1264530	0	1224000	3501	1224000	0	0	0	0	38275	1100
1986	38275	540129	1306531	0	1168593	15099	1224000	55407	0	0	0	161114	1121
1987	161114	748490	1592871	0	1224000	41495	1224000	0	0	0	0	488490	1109
1988	488490	831771	1512407	0	1224000	48727	1224000	0	0	0	0	728170	1110
1989	728170	285024	580089	0	1224000	48935	1224000	0	0	0	0	35324	3433
1990	35324	498141	2129231	0	1224000	38473	1224000	0	0	0	0	902082	1111
1991	902082	322749	1927227	-87814	1224000	130366	1224000	0	0	0	247055	1140074	305613
1992	1140074	623610	1645930	124952	1224000	196508	1224000	0	0	0	406941	1083507	1013955
1993	1083507	230123	726615	0	1224000	120248	1224000	0	0	0	0	465874	330457
1994	465874	255581	777045	0	1224000	17768	1224000	0	0	0	0	1151	1108
1995	1151	240841	1250043	0	1224000	4368	1224000	0	0	0	0	22826	1098
1996	22826	259854	721832	0	734651	4132	1224000	489349	0	0	0	5875	943

April 7, 1998

Mr. Glenn Jarvis
Valley Water Policy and Management Council
P. O. Box 1499
Weslaco, Texas 78599-1499

Re: Review Comments for Draft Report Submitted by the Lower Rio Grande Water Committee, Inc., TWDB Contract Number 95-483-143

Dear Mr. Jarvis:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 95-483-143. The following comment should be considered before the report is finalized.

The CPA portion of the report does not address a portion of Task II, which calls for establishment of appropriate definitions for "Partial Hydrologic Drought: and "Full Hydrologic Drought" with respect to inflows to the system. The terms appear on Figure 6-8 but are not defined in the report. Please include the definitions.

The report is extremely well written. The graphics are plentiful, proceed in a logical and helpful order, and are well incorporated into the text.

The Board looks forward to receiving one (1) unbound camera-ready original and nine (9) bound double-sided copies of the Final Report and the Model Documentation Report on this planning project. Please contact Mr. Jorge Arroyo, the Board's Contract Manager, at (512) 475-3003, if you have any questions about the Board's comments.

Sincerely,

Tommy Knowles
Deputy Executive Administrator
for Planning

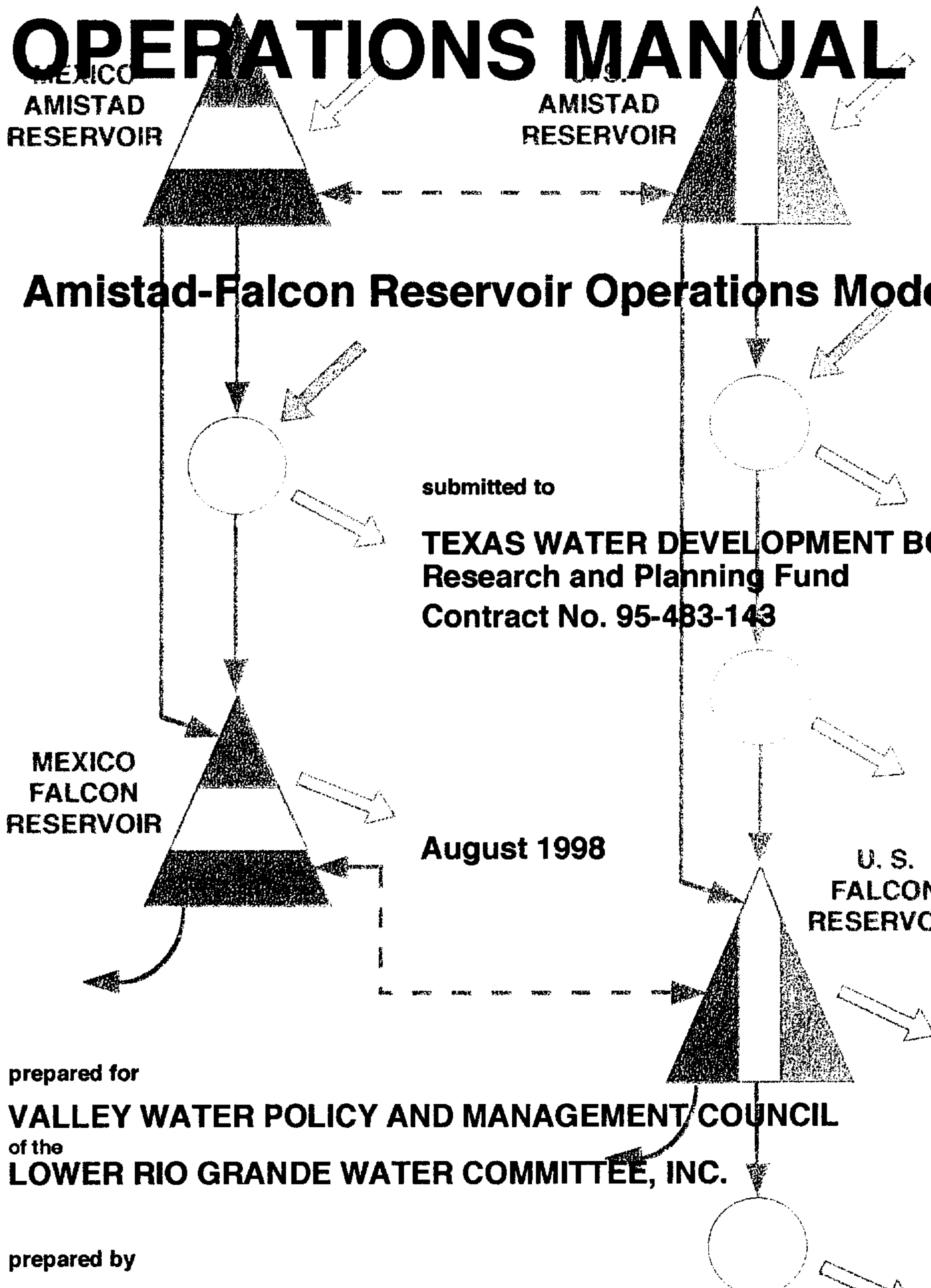
cc: Jorge Arroyo, TWDB

V:\RPP\DRAFT\95483143.ltr.doc

APPENDIX 4

LETTER DATED APRIL 7, 1998 FROM TEXAS WATER DEVELOPMENT BOARD TRANSMITTING REVIEW COMMENTS FOR REPORT

OPERATIONS MANUAL



Amistad-Falcon Reservoir Operations Model

submitted to

TEXAS WATER DEVELOPMENT BOARD
Research and Planning Fund
Contract No. 95-483-143

August 1998

prepared for

VALLEY WATER POLICY AND MANAGEMENT COUNCIL
of the
LOWER RIO GRANDE WATER COMMITTEE, INC.

prepared by

R. J. BRANDES COMPANY
Austin, Texas

OPERATIONS MANUAL

AMISTAD-FALCON RESERVOIR OPERATIONS MODEL

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Austin, Texas

OPERATIONS MANUAL

AMISTAD-FALCON RESERVOIR OPERATIONS MODEL

This document describes the data input requirements for the Amistad-Falcon Reservoir Operations Model (ROM) as developed by R. J. Brandes Company for the Valley Water Policy and Management Council (VWPMC) of the Lower Rio Grande Water Committee, Inc. This work was funded through a research grant from the Texas Water Development Board (TWDB), with financial assistance from the Texas Natural Resource Conservation Commission and the Texas Governor's Office. A description of the technical aspects of the Amistad-Falcon ROM, including data development and sample output, is presented in the Final Report as submitted to the VWPMC and the TWDB[1].

The version of the ROM program to which this Operations Manual applies is essentially the same version of the program described in the 1998 Final Report. This version of the program is dated February 15, 1998. Only a few minor modifications to this version of the program are reflected in the data input files described herein. These modifications have been made to improve the ability of the ROM to calculate the firm annual yield of the Amistad-Falcon reservoir system for both the United States and Mexico. A complete listing of the ROM Fortran program is contained in Attachment A.

The Amistad-Falcon ROM computer code was developed by modifying and enhancing the TWDB's existing SIMYLD-II program, and, therefore, much of the data input structure and formatting is very similar to that for SIMYLD-II. The SIMYLD-II Program Description report[2] provides detailed discussions of the various mathematical formulae and assumptions incorporated into the SIMYLD-II program, its basic solution procedure, and its data requirements and input formats, and this document can be consulted for a general understanding of the program structure, subroutines, solution methodology, and basic data input needs of the ROM.

A complete listing of the basic data input file for the ROM is presented in Attachment B. This file includes all of the data required for operating the ROM to perform a long-term simulation of the Amistad-Falcon reservoir system for the period January, 1945, through

[1] R. J. Brandes Company; "The International Reservoirs Operations and Drought Contingency Planning Study for the Middle and Lower Rio Grande, Phase I - Development, Testing and Application of ROM/CPM Modeling System and Phase II - Extension of ROM/CPM Modeling System to Include Individual Municipal and Irrigation Water Rights Accounts"; Valley Water Policy and Management Council of the Lower Rio Grande Water Committee, Inc.; August, 1998; Austin, Texas.

[2] Texas Water Development Board; "Economic Optimization & Simulation Techniques for Management of Regional Water Resource Systems, River Basin Simulation Model SIMYLD-II Program Description; July, 1972; Austin, Texas.

December, 1998, with demands set equal to current average values as described in the 1998 Final Report. Historical monthly inflows to the system and corresponding monthly reservoir evaporation rates for this 54-year simulation period are included in the file, with one exception. Inflow data from the International Boundary and Water Commission (IBWC) are available only through March, 1998; consequently, in order to provide a complete 1998 data set, the monthly inflows in the data input file for April through December of 1998 are specified based on 1995 flow conditions. The data input file in Attachment B represents the most up-to-date long-term data set that has been compiled for the Amistad-Falcon ROM, and it actually has evolved through work performed as part of Phase II of the Integrated Water Resource Planning Study for the Lower Rio Grande Valley[3,4]. It should be noted that the monthly inflows to the system that are contained in this data input file do reflect the revisions and corrections that were made by Perez-Freese and Nichols in Phase II of the Integrated Water Resource Planning Study for the Lower Rio Grande Valley.

The different types of data included in the ROM data input file are grouped and identified by alphabetic letter (A through Q) for purposes of describing the required data input structure and formatting. Descriptions of each of these different data groups and their format specifications as required by the ROM program are presented in Attachment C. Options for specifying several of the groups and individual parameters in different ways are described in this document. As currently coded, the ROM program requires all fixed-format data entry.

A set of output generated by operating the ROM using the data input file in Attachment B with current average demands for both countries is contained in Attachment D. To minimize the size of the output, only one year (1954) of simulated reservoir operations and water accounting output is included; however, the complete set of output from the ROM contains similar information for all years in the simulation period. Descriptions of the various types and forms of results included in the output from the ROM are described in the 1998 Final Report as presented to the VWPMC and the TWDB.

The output file for the final firm annual yield determination corresponding to the most recent and revised set of inflows to the reservoir system also is included in Attachment E. Again, to minimize the size of the output, only one year (1954) of simulated reservoir

[3] Perez/Freese and Nichols, L.L.C.; "Integrated Water Resource Plan, Phase II, Second Draft, Interim Technical Report"; Lower Rio Grande Valley Development Council and Valley Water Policy and Management Council of the Lower Rio Grande Water Committee, Inc.; October, 1998; McAllen, Texas.

[4] R. J. Brandes Company; "Evaluation of Amistad-Falcon Water Supply Under Current and Extended Drought Conditions, Lower Rio Grande Valley Regional Integrated Water Resources Planning Study"; Lower Rio Grande Valley Development Council and Valley Water Policy and Management Council of the Lower Rio Grande Water Committee, Inc.; February, 1999; Austin, Texas.

operations and water accounting output is included. This output file can be generated with the ROM by changing the IFLYLD parameter on Card 16 of Group B in the data input file in Attachment B from a "zero" to a "2". This triggers the firm annual yield analysis for the Mexico demands, with the U. S. demands held constant. By alternating this parameter between a value of "1" for the United States and "2" for Mexico in successive simulations with corresponding changes and updating of the demands for each country using the adjustment factors on Cards 17 and 18 of Group B (DRUSFC and DRMXFC), the firm annual yield for both countries has been determined.

Electronic copies of the ROM Fortran code (ROM.FOR), the ROM executable file (ROM.EXE), the current average demands data input file (UM4598AV.INP), the corresponding current average demands output file (UM4598AV.OUT), and the firm annual yield output file (UM4598FY.OUT) as contained in Attachments A, B, D and E, respectively, are included on the accompanying floppy disk in Attachment F. On the disk, these files are compressed into a single ZIP file (ROMFILE.ZIP). The WinZip program was used to compress the ROM files to create the ZIP file. WinZip or some other Zip program will need to be run to decompress the ROM files.

ATTACHMENTS

A. Listing of the February 15, 1998, Version of the Fortran Code for the Amistad-Falcon Reservoir Operations Model

B. Listing of the Long-Term (1945-1998) Data Input File for the Amistad-Falcon Reservoir Operations Model Including Current Average Demands for the United States and Mexico and Revised Inflows as Developed in the 1998 Integrated Water Resources Planning Study of the Lower Rio Grande, With Data Group Delineations

C. Amistad-Falcon Reservoir Operations Model Data Input File Description and Formatting

D. Abbreviated Output Listing from the Amistad-Falcon Reservoir Operations Model for the 1945-1998 Data Input File with Current Average Demands for the United States and Mexico

E. Abbreviated Output Listing from the Amistad-Falcon Reservoir Operations Model for the Firm Annual Yield Analysis for the United States and Mexico

F. Floppy Disk Containing Electronic Copies of the ROM Fortran Code (Attachment A) and Executable Code, the Current Average Demands Data Input File (Attachment B), the Current Average Demands Output File (Complete Version of Attachment D), and the Firm Annual Yield Output File (Complete Version of Attachment E)

Attachment A.

Listing of the February 15, 1998, Version of the Fortran Code for the Amistad-Falcon Reservoir Operations Model

```
C
C  *****************************************************************
C  *                                                               *
C  *  PROGRAM SIMYLD - RIVER BASIN SIMULATION PROGRAM              *
C  *  AUTHOR - CARLOS PUENTES                                      *
C  *  SYSTEMS ENGINEERING DIVISION, TEXAS WATER DEVELOPMENT BOARD  *
C  *  MARCH 1972                                                   *
C  *                                                               *
C  *  ADAPTED AND MODIFIED FOR MIDDLE AND LOWER RIO GRANDE         *
C  *  R. J. BRANDES COMPANY - AUSTIN, TEXAS                        *
C  *                                                               *
C  *                    FEBRUARY 15, 1998                          *
C  *                                                               *
C  *****************************************************************
C                                                                       00000900
$DEBUG
C
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00001000
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00001100
      COMMON/FILENM/PROJNM                                              RJB091997
      DIMENSION EXTNDR(3)                                               RJB091797
      DIMENSION ICARD(30)                                               RJB021198
      CHARACTER FF                                                      RJB030896
      CHARACTER*8 PROJNM                                                RJB091797
      CHARACTER*12 INPNAM, OUTNAM, PLTNAM                               RJB091997
      DATA EXTNDR/'.INP','.OUT','.PLT'/                                 RJB091797
C                                                                       00001200
C                        STEP 01                                        00001300
C                        READ I/0 LOGICAL UNITS ASSIGNMENTS             00001400
      FF = CHAR(12)                                                     RJB030896
      KIN = 5                                                           RJB091797
      KOUT = 6                                                          RJB091797
      KAPE1 = 7                                                         RJB091797
      KAPE2 = 8                                                         RJB091797
      KAPE3 = 9                                                         RJB091797
      WRITE (*,4)                                                       RJB091797
    4 FORMAT (/, ' PROJECT NAME (8 CHARACTERS MAXIMUM PLEASE) ?')       RJB091797
      READ (*,5) PROJNM                                                 RJB091797
    5 FORMAT (A8)                                                       RJB091797
      INPNAM = PROJNM//EXTNDR(1)                                        RJB091797
      OUTNAM = PROJNM//EXTNDR(2)                                        RJB091797
      PLTNAM = PROJNM//EXTNDR(3)                                        RJB091797
      OPEN(KIN,FILE=INPNAM,STATUS='OLD')                                RJB091797
      OPEN(KOUT,FILE=OUTNAM,STATUS='UNKNOWN')                           RJB091797
      OPEN(KAPE2,FILE=PLTNAM,STATUS='UNKNOWN')                          RJB091797
C
C                        STEP 1.5
C                        ECHO PRINT INPUT FILE DATA CARDS
      CALL GETDAT (IYREND,IMOEND,IDAEND)                                RJB030496
      WRITE(KOUT,1111) IMOEND,IDAEND,IYREND,PROJNM                      RJB021198
 1111 FORMAT(//, 25X, 30HRIVER BASIN SIMULATION PROGRAM,7X,'-',         RJB030796
     1             7X,30HTEXAS WATER DEVELOPMENT BOARD ,10X,'DATE: ',   RJB030496
     1            I2,'-',I2,'-',I4,/,                                   RJB030496
     2 23X,'ADAPTED AND MODIFIED FOR AMISTAD AND FALCON',               RJB030496
     2 ' RESERVOIRS IN THE RIO GRANDE BASIN', /,                        RJB021198
     4 29X, 'INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERAT',RJB030896
     5 'ING RULES',15X, 'FILE:    ', A8, /,                             RJB091997
     6 42X, 'R. J. BRANDES COMPANY     FEBRUARY 1998', //, 10X,         RJB021198
     7 'ECHO PRINT OF INPUT DATA FILE PARAMETERS WITHOUT FLOW, DEMAND,',RJB021298
     8 ' OR EVAPORATION DATA',//)                                       RJB021298
 1110 READ(KIN,1112) (ICARD(I),I=1,30)                                  RJB021298
 1112 FORMAT(30A4)                                                      RJB021198
      IF (ICARD(1) .EQ. 'FLOW') GOTO 1114                               RJB021298
      WRITE(KOUT,1115) (ICARD(I),I=1,30)                                RJB021198
 1115 FORMAT(10X,30A4)                                                  RJB021198
      GOTO 1110                                                         RJB021298
 1114 WRITE (KOUT,1113) FF                                              RJB021198
 1113 FORMAT (A1)                                                       RJB021198
      REWIND KIN                                                        RJB021198
C                        STEP 02                                        00001700
C                        CALL INPUT AND OUTPUT SUBROUTINES              00001800
C                        TO READ AND PRINT INPUT VARIABLES              00001900
      CALL CARDS                                                        00002000
      CALL OUT1                                                         00002100
C                        STEP 03                                        00002200
C                        SET SWITCH TO BUILD DATA TAPE                  00002300
```

```
      IF(KCRD.EQ.1) GOTO 12
      OPEN(KAPE1,FILE='SYM.TP',STATUS='OLD',FORM='UNFORMATTED')
      GOTO 13
12    OPEN(KAPE1,FILE='SYM.TP',STATUS='UNKNOWN',FORM='UNFORMATTED')
      CALL DATA1
13    CONTINUE
C                             STEP 04                                   00002500
C                             BUILD NETWORK AND OPERATE SYSTEM          00002600
      CALL SETNET                                                       00002700
      CALL OPRATE                                                       00002800
C                             STEP 05                                   00002900
C                             CALL SUMMARIES PRINT ROUTINES             00003000
      CALL OUT3                                                         00003100
C                             STEP 06
C                             CLOSE I/O UNITS
      CLOSE(KIN)
      CLOSE(KOUT)
      CLOSE(KAPE1)
      CLOSE(KAPE2)
      STOP 'PROGRAM TERMINATED NORMALLY'
      END                                                               00003300
C
      SUBROUTINE CARDS                                                  00000100
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                  RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                     00000300
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000400
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000500
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,   RJB092697
     1       LIMSHT,NSRS,LRULE(10)                                      RJB092697
      COMMON/OPER/IPLT,IYRST,IYEND,IFLYLD,NUMWR,IRLFLG,IWRFLG,DRUSFC,   RJB021198
     1    DRMXFC                                                        RJB021198
      COMMON/WATRIT/MAXMWR,MXMIWR,MMIAWR,MMIBWR,MXLIWR,MLIAWR,MLIBWR,   RJB100897
     1    MAXMPL,MAXIPL,IRSTRT,MAXUSC,WPALLC,                           RJB092497
     2    WRNAME(3,3),MUNWR(3),IRAWR(3),IRBWR(3),MUNMND(3,55,12),       RJB100897
     3    IRAMND(3,55,12),IRBMND(3,55,12),IRAWRB(3),IRBWRB(3),          RJB100897
     4    MUNSHT(3,55,12),IRASHT(3,55,12),IRBSHT(3,55,12),              RJB100897
     5    MUNANB(3),IRAANB(3),IRBANB(3),IRAALC(3,55,12),IRBALC(3,55,12),RJB100897
     6    RATEA(12),RATEB(12),MNANBP(3,12),IAANBP(3,12),IBANBP(3,12),   RJB092597
     7    IAWRBP(3,12),IBWRBP(3,12),MNADNO(3,3),IAADNO(3,3),IBADNO(3,3) RJB092597
      DATA TAPE/'TAPE'/                                                 00001400
      CONFLO = 1.0
      CONDEM = 1.0
      CONINF = 1.0
      DO 4 J=1,NJ                                                       00001500
      DO 4 K=1,3                                                        00001600
      DEMR(J,K)=99                                                      00001700
      OPRP(K,J)=99                                                      00001800
    4 CONTINUE                                                          00001900
C                             STEP 01                                   00002000
C                             READ FILE A CARDS                         00002100
      READ(KIN,11,END=22) (TITLE(I),I=1,25)                             RJB091997
      READ(KIN,11,END=22) (TITLE2(I),I=1,25)                            RJB091997
   11 FORMAT(25A4)                                                      RJB030896
C                             STEP 02                                   00002000
C                             READ FILE B CARDS                         00002100
      READ(KIN,12) NJ,NRES,NL,NR,NYEAR,ND,NS,IYEAR,IFRM,ITOY            RJB091997
   12 FORMAT(80X,I5)                                                    RJB021198
      READ(KIN,122) TAPE1,LIMSHT                                        RJB091997
  122 FORMAT(81X,A4,/,80X,I5)                                           RJB021198
C
C     NEW PARAMETERS FOR SIMYLD ROM MODEL
C
      READ(KIN,123) IPLT,IYRST,IYEND,IFLYLD                             RJB091997
  123 FORMAT(80X,I5)                                                    RJB021198
      READ(KIN,1233) DRUSFC,DRMXFC                                      RJB091997
 1233 FORMAT(75X,F10.0)                                                 RJB021198
      READ(KIN,124) MAXMWR,MXLIWR,MLIAWR,MLIBWR,MXMIWR,MMIAWR,MMIBWR,   RJB092397
     1              MAXMPL,IRSTRT,NUMWR,IRLFLG,IWRFLG                   RJB021198
```

```
  124 FORMAT(75X,I10)                                                        RJB021198
      IFROM=IFRM                                                            00003000
      NC=NL-NR                                                              00003100
      KCRD=0                                                                00003200
      IF(TAPE1.NE.TAPE) KCRD = 1
C                                                                           00003600
C                             STEP 03                                       00003700
C                             READ FILE C CARDS                             00003800
      DO 105 I=1,NJ                                                         00003900
  105 READ(KIN,13) J,(RNAME(J,K),K=1,3), RFLOOD(J), RCON(J), RMIN(J),        RJB031296
     * FSTART(J)                                                            RJB031396
   13 FORMAT(T13,I5,T1,3A4,T18,4I10)                                         RJB091997
C                                                                           00004300
C                             STEP 04                                       00004400
C                             READ FILE D CARDS                             00004500
      READ(KIN,18) (SP(I),I=1,NS)                                           00004600
   18 FORMAT(10X,12I5)                                                      00004700
C                                                                           00004800
C                             STEP 05                                       00004900
C                             READ FILES E & F CARDS                        00005000
      DO 107 I=1, 2                                                         RJB030896
      DO 107 K=1, 30                                                        RJB030896
      READ (KIN,15) J, N, ELEV(J,K), (ACTAB(J,K,L),L=1,2)                   RJB030896
   15 FORMAT(10X, I5, I5, F10.1, 2I10)                                      RJB030896
C  SET MEXICAN AREA-CAPACITIES THE SAME AS U.S.
      DO 107 L=1, 2                                                         RJB030896
      ACTAB(J+2,K,L) = ACTAB(J,K,L)                                         RJB030896
  107 CONTINUE                                                              RJB030896
C                                                                           00005400
C                             STEP 06                                       00005500
C                             READ FILE G CARDS                             00005600
      DO 108 I=1,ND                                                         00005700
  108 READ(KIN,16) J,DEM(J),(DEMR(J,K),K=1,3),(DEMD(J,K),K=1,12)            00005800
   16 FORMAT(10X,I3,I8,3I3,12F5.0)                                          RJB031996
C                                                                           00006000
C                             STEP 07                                       00006500
C                             READ FILE H CARDS                             00006600
      READ(KIN,23) AVLOUS,AVHIUS,AVLOMX,AVHIMX                              RJB092697
   23 FORMAT(10X,2F10.2)                                                    00007000
C                             STEP 08                                       00007900
C                             READ FILE I CARDS                             00008000
      DO 19 K=1,NRES                                                        00008100
      READ(KIN,109) (J,OPRP(L,J),(OPRR(L,J,I),I=1,12),L=1,3)                00008200
  109 FORMAT(10X,I5,10X,I5,12F6.0)                                          RJB020798
      DO 19 LL=1, 3                                                         RJB030496
      DO 19 II=1, 12                                                        RJB030496
      OPRR(LL,J,II) = OPRR(LL,J,II)/100.0                                   RJB030496
   19 CONTINUE
C                                                                           00008400
C                             STEP 09                                       00008500
C                             READ FILE J CARDS                             00008600
      READ(KIN,20) (L,(LNODE(L,I),I=1,2),CMAX(L),CMIN(L),K=1,NL)            00008700
   20 FORMAT(10X,3I5,2I10)                                                  00008800
C                                                                           00008400
C                             STEP 010                                      00008500
C                             READ FILE K CARDS                             00008600
C
C     CHECK FLAG FOR READING AMISTAD RESERVOIR RELEASES
C
      IF (IRLFLG .EQ. 1) GOTO 139                                           RJB021198
C
C     READ MONTHLY MINIMUM U.S. RELEASES FROM AMISTAD RESERVOIR BY YEAR
C
      DO 30 IY = 1,NYEAR
      READ(KIN,21) IYR,(USMNRL(IY,MON), MON=1,12)                           RJB092397
   30 CONTINUE                                                              RJB092397
   21 FORMAT(15X,I4,1X,12I7)                                                RJB092397
C
C     READ MONTHLY MINIMUM MEXICO RELEASES FROM AMISTAD RESERVOIR BY YEAR
C
      DO 32 IY = 1,NYEAR
      READ(KIN,21) IYR,(MXMNRL(IY,MON), MON=1,12)                           RJB092397
   32 CONTINUE                                                              RJB021198
      GOTO 138                                                              RJB021198
C
  139 CONTINUE                                                              RJB021198
```

```
C
C     READ AVERAGE MONTHLY MINIMUM U.S. RELEASES FROM AMISTAD RESERVOIR
C
      READ(KIN,21) IYR,(USMNRL(1,MON), MON=1,12)                         RJB100997
C
C     READ AVERAGE MONTHLY MINIMUM MEXICO RELEASES FROM AMISTAD RESERVOIR
C
      READ(KIN,21) IYR,(MXMNRL(1,MON), MON=1,12)                         RJB100997
C
C     COPY AVERAGE MONTHLY MINIMUM AMISTAD RELEASES TO ALL YEARS OF SIMULATION
C
      DO 33 IY=2, NYEAR                                                  RJB100697
      DO 33 IW=1, NUMWR                                                  RJB100697
      DO 33 MON=1, 12                                                    RJB100697
      USMNRL(IY,MON) = USMNRL(1,MON)                                     RJB100997
      MXMNRL(IY,MON) = MXMNRL(1,MON)                                     RJB100997
   33 CONTINUE                                                           RJB100697
C
  138 CONTINUE                                                           RJB021198
C                                                                        00008400
C                         STEP 011                                       00008500
C                         READ FILE L, M, & N CARDS                      00008600
C
C     CHECK FLAG FOR READING INDIVIDUAL WATER RIGHTS DIVERSIONS
C
      IF (IWRFLG .EQ. 1) GOTO 150                                        RJB021198
C
C     READ INDIVIDUAL WATER RIGHTS INFORMATION AND MONTHLY DIVERSIONS BY YEAR
C
      DO 40 IW = 1,NUMWR                                                 RJB092497
      READ (KIN,140) JW,(WRNAME(JW,K),K=1,3)                             RJB092397
  140 FORMAT(T15,I1,3X,T1,3A4)                                           RJB092597
      READ (KIN,142) (MNADNO(IW,K),K=1,3),(IAADNO(IW,K),K=1,3),          RJB092597
     1 (IBADNO(IW,K),K=1,3)                                              RJB092597
  142 FORMAT(10X,3A4,20X,3A4,20X,3A4)                                    RJB092597
      READ (KIN,143) MUNWR(IW),IRAWR(IW),IRBWR(IW)                       RJB092597
  143 FORMAT(12X, I10, 22X, I10, 22X, I10)                               RJB092597
      READ (KIN,144) IRAWRB(JW), IRBWRB(JW)                              RJB092597
  144 FORMAT(44X, I10, 22X, I10)                                         RJB092597
      DO 41 IY = 1,NYEAR                                                 RJB092397
      READ (KIN,141) JW,IYR,(MUNMND(JW,IY,MON), MON=1,12)                RJB092397
   41 CONTINUE                                                           RJB092397
      DO 42 IY = 1,NYEAR                                                 RJB092397
      READ (KIN,141) JW,IYR,(IRAMND(JW,IY,MON), MON=1,12)                RJB092397
   42 CONTINUE                                                           RJB092397
      DO 43 IY = 1,NYEAR                                                 RJB092397
      READ (KIN,141) JW,IYR,(IRBMND(JW,IY,MON), MON=1,12)                RJB092397
   43 CONTINUE                                                           RJB092397
  141 FORMAT(11X,I2,2X,I4,1X,12I7)                                       RJB092497
   40 CONTINUE                                                           RJB092397
      GOTO 52                                                            RJB100697
C
  150 CONTINUE                                                           RJB100997
C
C     READ INDIVIDUAL WATER RIGHTS INFORMATION AND AVERAGE MONTHLY DIVERSIONS
C
      DO 50 IW=1, NUMWR                                                  RJB100697
      READ (KIN,140) JW,(WRNAME(JW,K),K=1,3)                             RJB092397
      READ (KIN,142) (MNADNO(IW,K),K=1,3),(IAADNO(IW,K),K=1,3),          RJB092597
     1 (IBADNO(IW,K),K=1,3)                                              RJB092597
      READ (KIN,143) MUNWR(IW),IRAWR(IW),IRBWR(IW)                       RJB092597
      READ (KIN,144) IRAWRB(JW), IRBWRB(JW)                              RJB092597
      READ (KIN,141) JW,IYR,(MUNMND(JW,1,MON), MON=1,12)                 RJB092397
      READ (KIN,141) JW,IYR,(IRAMND(JW,1,MON), MON=1,12)                 RJB092397
      READ (KIN,141) JW,IYR,(IRBMND(JW,1,MON), MON=1,12)                 RJB092397
   50 CONTINUE                                                           RJB100697
C
C     COPY AVERAGE MONTHLY WATER RIGHTS DIVERSIONS TO ALL YEARS OF SIMULATION
C
      DO 51 IY=2, NYEAR                                                  RJB100697
      DO 51 IW=1, NUMWR                                                  RJB100697
      DO 51 MON=1, 12                                                    RJB100697
      MUNMND(IW,IY,MON) = MUNMND(IW,1,MON)                               RJB100697
      IRAMND(IW,IY,MON) = IRAMND(IW,1,MON)                               RJB100697
      IRBMND(IW,IY,MON) = IRBMND(IW,1,MON)                               RJB100697
   51 CONTINUE                                                           RJB100697
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   52 CONTINUE                                                         RJB100697
C
      WRITE(*,31)                                                      RJB092397
   31 FORMAT(5X,' FILE A THRU N CARDS READ')
C
      RETURN                                                           00008900
   22 STOP 'PROGRAM STOPPED IN SUBROUTINE CARDS'
      END                                                              00009200
C
      SUBROUTINE OUT1                                                  00000100
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                 RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                    00000300
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                  00000400
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                          00000500
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25), RJB091997
     1    TITLE2(25),NR,ICARD(30)                                      RJB021198
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),            RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),         00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),         RJB100897
     1 MXMNRL(55,12)                                                   RJB100897
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,  RJB092697
     1        LIMSHT,NSRS,LRULE(10)                                    RJB092697
      COMMON/WATRIT/MAXMWR,MXMIWR,MMIAWR,MMIBWR,MXLIWR,MLIAWR,MLIBWR,  RJB100897
     1    MAXMPL,MAXIPL,IRSTRT,MAXUSC,WPALLC,                          RJB092497
     2    WRNAME(3,3),MUNWR(3),IRAWR(3),IRBWR(3),MUNMND(3,55,12), .    RJB100897
     3    IRAMND(3,55,12),IRBMND(3,55,12),IRAWRB(3),IRBWRB(3),         RJB100897
     4    MUNSHT(3,55,12),IRASHT(3,55,12),IRBSHT(3,55,12),             RJB100897
     5    MUNANB(3),IRAANB(3),IRBANB(3),IRAALC(3,55,12),IRBALC(3,55,12),RJB100897
     6    RATEA(12),RATEB(12),MNANBP(3,12),IAANBP(3,12),IBANBP(3,12),  RJB092597
     7    IAWRBP(3,12),IBWRBP(3,12),MNADNO(3,3),IAADNO(3,3),IBADNO(3,3) RJB092597
      COMMON/OPER/IPLT,IYRST,IYEND,IFLYLD,NUMWR,IRLFLG,IWRFLG,DRUSFC,  RJB021198
     1    DRMXFC                                                       RJB021198
      COMMON/FILENM/PROJNM                                             RJB091997
      DIMENSION COND(3)                                                00001400
      CHARACTER FF                                                     RJB030896
      CHARACTER*8 PROJNM                                               RJB091997
      DATA COND/'MOD ',' LO ',' HI '/                                  RJB031596
      CALL GETDAT (IYREND,IMOEND,IDAEND)                               RJB030496
      CALL GETTIM (IHREND,IMIEND,ISEEND,IDUM)                          RJB030496
      FF = CHAR(12)                                                    RJB030896
      ROFF = 0.499                                                     RJB032396
C                                                                      00001600
C                              STEP 01                                 00001700
C                              PRINT OUT ALL INPUT INFORMATION         00001800
      WRITE(KOUT,111) IMOEND,IDAEND,IYREND,IHREND,IMIEND,ISEEND,PROJNM, RJB091997
     1 TITLE,TITLE2                                                    RJB091997
  111 FORMAT(//, 25X, 30HRIVER BASIN SIMULATION PROGRAM,7X,'-',        RJB030796
     1             7X,30HTEXAS WATER DEVELOPMENT BOARD ,10X,'DATE: ',  RJB030496
     1             I2,'-',I2,'-',I4,/,                                 RJB030496
     2 23X,'ADAPTED AND MODIFIED FOR AMISTAD AND FALCON',              RJB030496
     2 ' RESERVOIRS IN THE RIO GRANDE BASIN', 9X, 'TIME:    ',I2,':',  RJB030896
     3 I2,':',I2,/,                                                    RJB030496
     4 29X, 'INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERAT',RJB030896
     5 'ING RULES',15X, 'FILE:    ', A8, /,                            RJB091997
     6 42X, 'R. J. BRANDES COMPANY     FEBRUARY 1998', ///, 22X,25A4,/, RJB091997
     7 22X, 25A4)                                                      RJB091997
   11 FORMAT (A1, //, 25X, 25A4)                                       RJB030896
      WRITE(KOUT,13) NJ,NRES,NL,NR,IYEAR,NYEAR,ND,NS,NUMWR             RJB093097
   13 FORMAT(////,10X,15X,17HNUMBER OF NODES =,I5,   7X,               00002400
     1            7X,22HNUMBER OF RESERVOIRS =,I3 //                   00002500
     2         10X,15X,17HNUMBER OF LINKS =,I5,    7X,                 00002600
     3              4X,25HNUMBER OF RIVER REACHES =,I3//               00002700
     4        10X,32HCALENDAR YEAR OPERATION STARTS =,I5, 7X,          00002800
     5              29HNUMBER OF YEARS TO SIMULATE =,I3//              00002900
     6         10X, 8X,24HNUMBER OF DEMAND NODES =,I5, 7X,             00003000
     7   6X,23HNUMBER OF SPILL NODES =,I3,//,                          RJB120595
     8     7X, 'NUMBER OF INDIVIDUAL WATER RIGHTS =', I5)              RJB093097
      WRITE(KOUT,15)                                                   00003300
   15 FORMAT(///, 10X,'SYSTEM NODE CHARACTERISTICS',//,                RJB031896
     1 10X,8HNODE NO.,   3X,   9HNODE NAME, 5X,13(1H-),                RJB031396
     1 12H CAPACITIES ,14(1H-),5X,6HYEARLY, /,                         RJB031396
     2 10X,26X,'FLOOD      CONSERV    MINIMUM    STARTING',5X,6HDEMAND, /, RJB031396
     3 10X,25X,'(AC-FT)     (AC-FT)     (AC-FT)     (AC-FT)',4X,7H(AC-FT),/)RJB031396
      DO 5 J=1,NJ                                                      00003700
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      IF(J.NE.20) GO TO 5                                               00003800
      WRITE(KOUT,11) FF, TITLE                                          RJB030896
      WRITE(KOUT,15)                                                    00004000
    5 WRITE(KOUT,17) J,(RNAME(J,I),I=1,3), RFLOOD(J), RCON(J), RMIN(J), RJB091997
     1 FSTART(J),DEM(J)                                                 00004200
   17 FORMAT(10X,I4,5X,3A4,1X,I10,1X,2I10,1X,I10,3X,I8)                 RJB091997
      WRITE(KOUT,177)                                                   RJB031596
  177 FORMAT (/,10X, 'NOTE:  FLOOD POOL IS AVAILABLE FOR CONSERVATION ' RJB031596
     1 'STORAGE DURING NOVEMBER-APRIL NON-HURRICANE SEASON')            RJB031596
      WRITE(KOUT,19)                                                    00004500
   19 FORMAT(///10X, 'SYSTEM LINK CONFIGURATION', //,                   RJB031896
     1          10X, 8HLINK NO.,  4X, 9HFROM NODE, 5X,                  00004700
     2        7HTO NODE, 5X,13HMAX. CAPACITY, 4X, 13HMIN. CAPACITY, /,  00004800
     2                    48X,  ' (AC-FT/MON) ',4X,   ' (AC-FT/MON) ',/) RJB030896
      DO 10 L=1,NL                                                      00004900
      IF(MOD(L,20).NE.0) GO TO 10                                       00005000
      WRITE(KOUT,11) FF, TITLE                                          00005100
      WRITE(KOUT,19)                                                    00005200
   10 WRITE(KOUT,21)  L,(LNODE(L,I),I=1,2), CMAX(L), CMIN(L)            00005300
   21 FORMAT(10X, 2X,I2, 12X,I2, 11X,I2, 7X,I10, 7X,I10)                RJB031896
      WRITE(KOUT,11) FF, TITLE                                          RJB030896
C
C     CHECK FOR AVERAGE MONTHLY AMISTAD RELEASES OR INDIVIDUAL MONTHLY
C       AMISTAD RELEASES BY YEAR
C
      IF (IRLFLG .EQ. 0) GOTO 238                                       RJB021198
      WRITE(KOUT,242)                                                   RJB020898
  242 FORMAT(///10X,'MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM ', RJB092697
     1 'AMISTAD RESERVOIR    (AC-FT)', //,                              RJB100997
     2 10X,8X, 4HJAN ,4X,4HFEB ,4X,4HMAR ,4X,4HAPR ,4X,4HMAY ,          RJB020898
     3 4X, 4HJUN , 4X, 4HJUL , 4X, 4HAUG , 4X, 4HSEP , 4X, 4HOCT ,      RJB031396
     4 4X, 4HNOV , 4X, 4HDEC ,/)                                        RJB092697
      WRITE(KOUT,243) (USMNRL(1,L),L=1,12)                              RJB020898
  243 FORMAT(10X, 4X, 12I8)                                             RJB020898
      WRITE(KOUT,244)                                                   RJB092697
  244 FORMAT(///10X,'MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM ',RJB092697
     1 'AMISTAD RESERVOIR    (AC-FT)', //,                              RJB100997
     2 10X,8X, 4HJAN ,4X,4HFEB ,4X,4HMAR ,4X,4HAPR ,4X,4HMAY ,          RJB020898
     3 4X, 4HJUN , 4X, 4HJUL , 4X, 4HAUG , 4X, 4HSEP , 4X, 4HOCT ,      RJB031396
     4 4X, 4HNOV , 4X, 4HDEC ,/)                                        RJB092697
      WRITE(KOUT,243) (MXMNRL(1,L),L=1,12)                              RJB020898
      GOTO 241                                                          RJB100997
  238 CONTINUE                                                          RJB020898
      WRITE(KOUT,23)                                                    RJB092697
   23 FORMAT(///10X,'MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM ', RJB092697
     1 'AMISTAD RESERVOIR    (AC-FT)', //,                              RJB100997
     2 10X,'YEAR',8X, 4HJAN ,4X,4HFEB ,4X,4HMAR ,4X,4HAPR ,4X,4HMAY ,   RJB092697
     3 4X, 4HJUN , 4X, 4HJUL , 4X, 4HAUG , 4X, 4HSEP , 4X, 4HOCT ,      RJB031396
     4 4X, 4HNOV , 4X, 4HDEC ,/)                                        RJB092697
      DO 233 IY = 1, NYEAR                                              RJB092697
      IYR = IYEAR + IY - 1                                              RJB092697
      WRITE(KOUT,237) IYR, (USMNRL(IY,L),L=1,12)                        RJB092697
  237 FORMAT(10X, I4, 4X, 12I8)                                         RJB092697
  233 CONTINUE                                                          RJB092697
      WRITE(KOUT,236)                                                   RJB092697
  236 FORMAT(///10X,'MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM ',RJB092697
     1 'AMISTAD RESERVOIR    (AC-FT)', //,                              RJB100997
     2 10X,'YEAR',8X, 4HJAN ,4X,4HFEB ,4X,4HMAR ,4X,4HAPR ,4X,4HMAY ,   RJB092697
     3 4X, 4HJUN , 4X, 4HJUL , 4X, 4HAUG , 4X, 4HSEP , 4X, 4HOCT ,      RJB031396
     4 4X, 4HNOV , 4X, 4HDEC ,/)                                        RJB092697
      DO 234 IY = 1, NYEAR                                              RJB092697
      IYR = IYEAR + IY - 1                                              RJB092697
      WRITE(KOUT,235) IYR, (MXMNRL(IY,L),L=1,12)                        RJB092697
  235 FORMAT(10X, I4, 4X, 12I8)                                         RJB092697
  234 CONTINUE                                                          RJB092697
  241 WRITE(KOUT,11) FF, TITLE                                          RJB030896
      WRITE(KOUT,24) (SP(I),I=1,NS)                                     00005500
   24 FORMAT(///10X, 'U.S. SPILL RESERVOIR NODE:', 1I5, //, 10X,        RJB092697
     1 'MEXICO SPILL RESERVOIR NODE:', 1I5)                             RJB092697
      WRITE(KOUT,26) AVLOUS,AVHIUS                                      RJB092697
   26 FORMAT(///10X,15HU.S. 'AVERAGE', ' STORAGE CONDITION DEFINED AS', RJB031596
     1 F6.2, ' TO', F6.2, ' PERCENT OF FALCON U.S. MAXIMUM STORAGE',    RJB031596
     2 ' CAPACITY')                                                     RJB031596
      WRITE(KOUT,25) AVLOMX,AVHIMX                                      RJB092697
   25 FORMAT(/,10X, 17HMEXICO 'AVERAGE', ' STORAGE CONDITION DEFINED',  RJB031596
     1 ' AS', F6.2, ' TO', F6.2, ' PERCENT OF FALCON MEXICAN ',         RJB031596
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     2 'MAXIMUM STORAGE CAPACITY')                                      RJB031596
      WRITE(KOUT,27)                                                    00007100
   27 FORMAT(///,10X,'NODE MONTHLY DEMAND DISTRIBUTIONS AND DEMAND',    RJB031896
     1 ' PRIORITIES', //,                                               RJB030896
     2 10X, 'NODE NO.', 32X, 'MONTHLY FRACTIONS OF ANNUAL DEMAND',      RJB031396
     * 29X, 'PRIORITIES', /,                                            RJB031396
     3 10X, 17X, 4HJAN ,3X,4HFEB , 3X, 4HMAR , 3X, 4HAPR , 3X, 4HMAY ,  RJB030896
     4 3X, 4HJUN , 3X, 4HJUL , 3X, 4HAUG , 3X, 4HSEP , 3X, 4HOCT ,      RJB030896
     5 3X, 4HNOV , 3X, 4HDEC , 4X, 'MOD  LO  HI',/)                     RJB031896
      WRITE(KOUT,29) (J,(DEMD(J,K),K=1,12),(DEMR(J,I),I=1,3),J=1,NJ)    00007800
   29 FORMAT(10X,2X,I2,10X,12F7.4,3X,3I4)                               00007900
      WRITE(KOUT,31)                                                    00008100
   31 FORMAT(///10X,'RESERVOIR MONTHLY STORAGE TARGETS AND STORAGE',    RJB031896
     1 ' PRIORITIES', //, 10X,
     2 'RESERVOIR',15X,'DESIRED MONTHLY STORAGE LEVEL (PERCENT OF MAXI',RJB031396
     * ' MUM STORAGE CAPACITY)', /,
     3  10X, 3X, 'NO.',                                                 RJB031196
     3      11X, 4HJAN ,3X,4HFEB , 3X, 4HMAR , 3X, 4HAPR , 3X, 4HMAY ,  RJB031196
     4 3X, 4HJUN , 3X, 4HJUL , 3X, 4HAUG , 3X, 4HSEP , 3X, 4HOCT ,      RJB031196
     5 3X, 4HNOV , 3X, 4HDEC , 4X, 10HPRIORITIES)                       RJB031196
      DO 32 J=1,NRES                                                    00008400
   32 WRITE(KOUT,33) J, (COND(L), (OPRR(L,J,I)*100.0, I=1, 12),         RJB030496
     1 OPRP(L,J),L=1,3)                                                 00008600
   33 FORMAT(/10X,3X,I2,3X,A4,2X,12F7.3,5X,I5/(17X,A4,3X,12F7.3,5X,I5)) RJB031196
C
C     WRITE OUT STAGE - AREA - CAPACITY RELATIONSHIPS
C        FOR AMISTAD & FALCON RESERVOIRS
C
      WRITE(KOUT,11) FF, TITLE                                          00010000
      WRITE(KOUT,41)                                                    RJB030896
   41 FORMAT(//,10X,'STAGE-AREA-CAPACITY RELATIONSHIPS FOR TOTAL',      RJB031196
     1 ' STORAGE IN AMISTAD AND FALCON RESERVOIRS',                     RJB031196
     2 //, 22X,      'AMISTAD RESERVOIR', 24X, 'FALCON RESERVOIR')      RJB031196
      WRITE(KOUT,42)                                                    RJB030896
   42 FORMAT( /,10X,'POINT     STAGE    AREA  CAPACITY', 15X,           RJB031196
     1 '  STAGE    AREA  CAPACITY', /, 11X, 'NO.    (FT MSL)    (AC)',  RJB030896
     2 '    (AC-FT)      ',10X, '(FT MSL)    (AC)    (AC-FT)', /)       RJB031196
      DO 45 K=1, 30                                                     RJB030896
      WRITE(KOUT,43) K, ELEV(1,K),(ACTAB(1,K,L), L=1,2), ELEV(2,K),     RJB030896
     1 (ACTAB(2,K,M), M=1,2)                                            RJB030896
   43 FORMAT(11X,I2,6X,F6.1,2X,I6,3X,I7, 16X,F6.1,2X,I6,3X,I7)          RJB031196
   45 CONTINUE                                                          00010800
C
C     SET CURRENT AMOUNT OF AUTHORIZED ANNUAL IRRIGATION WATER RIGHTS
C       IN THE MIDDLE AND LOWER RIO GRANDES SYSTEM, MAXIMUM STORAGE IN
C       MUNICIPAL AND IRRIGATION POOLS, AND INITIAL IRRIGATION POOL
C       STORAGE AT BEGINNING OF SIMULATION
C
C     MAXIMUM TOTAL D-M-I WATER RIGHTS BASED ON 2/5/98 FAX FROM
C       C. MARTINEZ OF WATERMASTER'S OFFICE
C      MAXMWR = 271579                                                   RJB020798
C     MAXIMUM TOTAL IRRIGATION & MINING WATER RIGHTS IN LOWER RIO GRANDE BASED
C       ON 2/5/98 WATERMASTER FAX
C      MXLIWR = 1696228                                                  RJB020798
C     MAXIMUM TOTAL IRRIGATION WATER RIGHTS IN MIDDLE RIO GRANDE
C       BASED ON 2/5/98 FAX
C      MXMIWR = 181530                                                   RJB020798
      IRWATR = MXMIWR + MXLIWR                                          RJB22996
C     MAXIMUM U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE IN ACORDANCE
C       WITH TNRCC RULES
C      MAXMPL = 225000                                                   RJB22996
C     MAXIMUM U.S. USABLE STORAGE IN ACCORDANCE WITH TNRCC RULES
      MAXUSC = RCON(1) + RCON(2) - 4600                                 RJB071096
      DUMMY = 1.41 * IRWATR + 0.499                                     RJB22996
      IDUMMY = DUMMY                                                    RJB050296
C     LIMIT IRRIGATION POOL TO REMAINING BALANCE OF USABLE STORAGE AFTER
C       SUBTRACTING MAXMPL AND MINIMUM OPERATING RESERVE
      MAXIPL = MIN(IDUMMY,MAXUSC-MAXMPL-150000)                         RJB050296
C     STARTING 1995 TOTAL IRRIGATION ACCOUNT BALANCE (IRPOL) FOR LOWER AND
C       MIDDLE RIO GRANDE BASED ON 7/29/96 MEMO FROM C. MARTINEZ OF
C       WATERMASTER'S OFFICE
C      IRPOL = 1747743                                                   RJB020798
C     SET IRPOL = 0 FOR SIMULATIONS WITHOUT KNOWN STARTING IRRIGATION
C       ACCOUNT BALANCE AND DETERMINE IRSTRT BASED ON TNRCC RULES
C
C     IF STARTING IRRIGATION ACCOUNT BALANCE IS NOT KNOWN, DETERMINE
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C        MAXIMUM IRRIGATION ACCOUNT BALANCE AT BEGINNING OF SIMULATION
C        BASED ON TNRCC RULES
C
      IF (IRSTRT .GT. 0) GO TO 260                                      RJB032596
      CALL STRTIR (FSTART(1),FSTART(2),IRPOL)                           RJB042996
      IRSTRT = IRPOL                                                    RJB22996
  260 CONTINUE                                                          RJB22996
C
C     CALCULATE FACTOR FOR USE IN POSITIVE IRRIGATION ALLOCATIONS
      WPALLC = (1.7 * (MLIAWR+MMIAWR)) + (MLIBWR+MMIBWR)                RJB092397
C
C     WRITE OUT MAXIMUM MUNICIPAL AND IRRIGATION WATER RIGHTS IN MIDDLE
C        AND LOWER RIO GRANDE AND BEGINNING ACCOUNT BALANCES
C
      WRITE(KOUT,51) MAXMWR,MXMIWR,MMIAWR,MMIBWR                        RJB092397
   51 FORMAT (/10X, 'SUMMARY OF TEXAS WATER RIGHTS IN MIDDLE AND ',     RJB092397
     1 'LOWER RIO GRANDE AND',/,13X, 'MAXIMUM STORAGE ALLOCATIONS IN ', RJB092397
     2 'AMISTAD AND FALCON RESERVOIRS',//,10X,                          RJB092397
     3 'TOTAL DOMESTIC, MUNICIPAL AND INDUSTRIAL WATER RIGHTS          ',RJB092397
     4 '      (AC-FT/YR): ',I10,/,10X,                                  RJB092397
     5 'TOTAL IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE   ',RJB020798
     6 '      (AC-FT/YR): ',I10,/,10X,                                  RJB020798
     7 'CLASS A IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE ',RJB020798
     8 '      (AC-FT/YR): ',I10,/,10X,                                  RJB020798
     9 'CLASS B IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE ',RJB020798
     * '      (AC-FT/YR): ',I10)                                        RJB020798
      WRITE(KOUT,52) MXLIWR,MLIAWR,MLIBWR,MAXMPL,MAXIPL,MAXUSC,IRSTRT   RJB092397
   52 FORMAT (10X,                                                      RJB092397
     7 'TOTAL IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE    ',RJB020798
     8 '      (AC-FT/YR): ',I10,/,10X,                                  RJB020798
     7 'CLASS A IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE  ',RJB020798
     8 '      (AC-FT/YR): ',I10,/,10X,                                  RJB020798
     7 'CLASS B IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE  ',RJB020798
     8 '      (AC-FT/YR): ',I10,/,10X,                                  RJB020798
     9 'MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON D-M-I POOL         ',RJB092397
     * '         (AC-FT): ',I10,/,10X,                                  RJB092397
     1 'MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON IRRIGATION POOL    ',RJB092397
     2 '         (AC-FT): ',I10,/,10X,                                  RJB092397
     3 'TOTAL RESERVOIR DEAD STORAGE USED IN WATER RIGHTS ACCOUNTING  ',RJB092397
     4 '         (AC-FT):       4600',/,10X,                            RJB092397
     3 'MAXIMUM STORAGE CAPACITY ALLOTTED TO OPERATING RESERVE        ',RJB092397
     4 '         (AC-FT):     380000',/,10X,                            RJB092397
     5 'MAXIMUM USABLE STORAGE AVAILABLE FOR WATER RIGHTS ACCOUNTING  ',RJB092397
     6 '         (AC-FT): ',I10,/,10X,                                  RJB092397
     7 'TOTAL IRRIGATION & MINING ACCOUNT BALANCE AT BEGINNING OF SIMU',RJB020798
     8 'LATION  (AC-FT): ',I10)                                         RJB020798
      RETURN                                                            00010900
C
C     WRITE OUT FIRM ANNUAL YIELD DEMANDS
C
      ENTRY OUT1A(ITER)                                                 RJB042996
      WRITE(KOUT,11) FF, TITLE                                          00010000
      WRITE(KOUT,60) ITER                                               RJB042996
   60 FORMAT(///, 10X,'RESULTS FROM FIRM ANNUAL YIELD ANALYSIS AFTER ', RJB042996
     * I2,' CRITICAL DROUGHT ITERATIONS',//,                            RJB042996
     1 20X,8HNODE NO.,  6X,  9HNODE NAME, 10X,6H FIRM , /,              RJB042996
     2 53X,6HYIELD ,  /, 52X,7H(AC-FT),/)                               RJB042996
      DO 65 J=1,NJ                                                      RJB042996
   65 WRITE(KOUT,67) J,(RNAME(J,I),I=1,3),DEM(J)                        RJB091997
   67 FORMAT(20X,I4,3X,5X,3A4,7X,I8,/)                                  RJB091997
      IUSSUM = DEM(2)+DEM(5)+DEM(6)+DEM(7)                              RJB042996
      IMXSUM = DEM(4)+DEM(8)                                            RJB042996
      WRITE(KOUT,68) IUSSUM,IMXSUM                                      RJB042996
   68 FORMAT (/,20X,'TOTAL UNITED STATES DEMANDS    ',I9,//,            RJB042996
     *          20X,'TOTAL MEXICO DEMANDS           ',I9)               RJB042996
      END                                                               00011000
C
      SUBROUTINE OUT2(IY)                                               00000100
      INTEGER TOTLS                                                     00000200
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,RCON,RFLOOD       RJB031396
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000400
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000500
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)          RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
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     1     RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10),  RJB031896
     2     DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),           00001700
     3     DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                  RJB031296
      COMMON/LNKFLW/LNKFLO(15,13)                                         RJB30196
      COMMON/WATRIT/MAXMWR,MXMIWR,MMIAWR,MMIBWR,MXLIWR,MLIAWR,MLIBWR,     RJB100897
     1     MAXMPL,MAXIPL,IRSTRT,MAXUSC,WPALLC,                            RJB092497
     2     WRNAME(3,3),MUNWR(3),IRAWR(3),IRBWR(3),MUNMND(3,55,12),        RJB100897
     3     IRAMND(3,55,12),IRBMND(3,55,12),IRAWRB(3),IRBWRB(3),           RJB100897
     4     MUNSHT(3,55,12),IRASHT(3,55,12),IRBSHT(3,55,12),               RJB100897
     5     MUNANB(3),IRAANB(3),IRBANB(3),IRAALC(3,55,12),IRBALC(3,55,12),RJB100897
     6     RATEA(12),RATEB(12),MNANBP(3,12),IAANBP(3,12),IBANBP(3,12),    RJB092597
     7     IAWRBP(3,12),IBWRBP(3,12),MNADNO(3,3),IAADNO(3,3),IBADNO(3,3)  RJB092597
      COMMON/OPER/IPLT,IYRST,IYEND,IFLYLD,NUMWR,IRLFLG,IWRFLG,DRUSFC,     RJB021198
     1     DRMXFC                                                         RJB021198
      CHARACTER FF                                                        RJB030896
      DIMENSION PCTUSC(12), PCTUSI(12)                                    RJB042996
      FF = CHAR(12)                                                       RJB030896
C                                                                         00001300
C                             STEP 01                                     00001400
C                             PRINT OUT MONTHLY DATA FOR YEAR             00001500
      ICALYR=IYEAR-1+IY                                                   00001600
C
C     WRITE OUT MONTHLY RESULTS FOR U.S. AMISTAD AND FALCON RESERVOIRS
C
      DO 30 J=1, 2                                                        RJB30896
      IF(J.EQ.1) WRITE(KOUT,11) FF,TITLE,IY,ICALYR                        RJB30896
   11 FORMAT(A1,/25X,25A4//3X,15HSIMULATION YEAR,I3,5X,13HCALENDAR YEAR,00002000
     * I5)                                                                00002100
C
      WRITE(KOUT,14) J,(RNAME(J,I),I=1,3),RFLOOD(J),RCON(J),RMIN(J)       RJB091997
   14 FORMAT(/,3X,13HRESERVOIR NO.,I2,4X,3A4,8X,'MAX FLOOD POOL:', I8,    RJB091997
     1 8X, 'MAX CONSERVATION POOL:',I8, 8X, 'DEAD POOL:', I6, /)          RJB031396
C                                                                         00002700
      WRITE(KOUT,16)                                                      00002800
   16 FORMAT(   10X, 7HWTRSHED, 1X, 8H RESERVR, 2X, 7HFLDWATR, 1X,        RJB31896
     1 8H DWNSTRM,2X, 7HSURFACE, 3X, 4HEVAP, 4X, 4HEVAP, 2X, 7H D-M-I ,   RJB30196
     2 2X,8HSHORTAGE, 1X, 7H IRRIG , 2X, 8HSHORTAGE, 2X, 6H FLOOD, 2X,    RJB31496
     3 7HEND-MON, 3X, 'TARGET', /,                                        RJB31596
     4 1X,55H  MONTH  INFLOWS  INFLOWS  TRANSFR  RELEASE    AREA    ,     RJB31896
     5 21HRATE     LOSS  DEMANDS, 11X, 27HDEMANDS           SPILLS  ,     RJB31496
     6 7HSTORAGE, 2X, 'STORAGE')                                          RJB31596
C                                                                         00003500
      DO 17 MON=1,12                                                      00003600
   17 WRITE(KOUT,18) MON,(ICAP(J,MON,I),I=1,5),EVAP(J,MON),               RJB30196
     1 (ICAP(J,MON,I),I=6,13)                                             RJB31596
   18 FORMAT(4X,I2,2X,5I9,2X,F5.2,2X,I6,2I9,4I9,1X,I8)                    RJB31596
C                                                                         00004000
      WRITE(KOUT,20) (TOTLS(J,IY,I),I=1,4),(TOTLS(J,IY,I),I=6,11)         00004100
   20 FORMAT(1X,2X, 6HANNUAL,I8,3I9,15X, 6I9)                             RJB031996
C                                                                         00004300
   30 CONTINUE                                                            RJB30196
C
C     WRITE OUT MONTHLY RESULTS FOR MEXICO AMISTAD AND FALCON RESERVOIRS
C
      DO 40 J=3,4                                                         RJB30196
      IF(J.EQ.4) WRITE(KOUT,11) FF,TITLE,IY,ICALYR                        RJB30896
C
      WRITE(KOUT,14) J,(RNAME(J,I),I=1,3),RFLOOD(J),RCON(J),RMIN(J)       RJB091997
C                                                                         00002700
      WRITE(KOUT,41)                                                      00002800
   41 FORMAT(   10X, 7HWTRSHED, 1X, 8H RESERVR, 2X, 7HFLDWATR, 1X,        RJB31896
     1 8H DWNSTRM,2X, 7HSURFACE, 3X, 4HEVAP, 4X, 4HEVAP, 2X, 7HMUN&IRR,   RJB30196
     2 2X,8HSHORTAGE, 1X, 7H OTHER , 2X, 8HSHORTAGE, 2X, 6H FLOOD, 2X,    RJB31496
     3 7HEND-MON, 3X, 'TARGET', /,                                        RJB31596
     4 1X,55H  MONTH  INFLOWS  INFLOWS  TRANSFR  RELEASE    AREA    ,     RJB31896
     5 21HRATE     LOSS  DEMANDS, 11X, 27HDEMANDS           SPILLS  ,     RJB31496
     6 7HSTORAGE, 2X, 'STORAGE')                                          RJB31596
C                                                                         00003500
      DO 42 MON=1,12                                                      00003600
   42 WRITE(KOUT,18) MON,(ICAP(J,MON,I),I=1,5),EVAP(J,MON),               RJB30196
     1 (ICAP(J,MON,I),I=6,13)                                             RJB31596
C                                                                         00004000
      WRITE(KOUT,20) (TOTLS(J,IY,I),I=1,4),(TOTLS(J,IY,I),I=6,11)         00004100
C                                                                         00004300
   40 CONTINUE                                                            RJB30196
C
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C     WRITE OUT MONTHLY LINK FLOWS FOR ONE YEAR
C
      DO 35 L=1,NL                                                      00005700
      IF(L.NE.1) GO TO 31                                               00005800
      WRITE(KOUT,32)                                                    RJB031396
   32 FORMAT(//, 3X, 'MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)', //,   RJB031396
     * 4X,6HMONTH ,
     2        5X, 4HJAN ,4X,4HFEB , 4X, 4HMAR , 4X, 4HAPR , 4X, 4HMAY ,  RJB031396
     3 4X, 4HJUN , 4X, 4HJUL , 4X, 4HAUG , 4X, 4HSEP , 4X, 4HOCT ,      RJB031396
     4 4X, 4HNOV , 4X, 4HDEC , 5X, 3HAVG, /, 3X, 8HLINK NO.)            RJB031396
   31 LNKFLO(L,13)=0                                                    00006200
      DO 33 I=1,12                                                      00006300
      LNKFLO(L,13)=LNKFLO(L,13)+LNKFLO(L,I)/12                          00006400
   33 CONTINUE                                                          00006500
      WRITE(KOUT,34) L, (LNKFLO(L,I),I=1,13)                            00006600
   34 FORMAT(1X,5X,I2,3X,13I8)                                          RJB031396
   35 CONTINUE                                                          00006800
      RETURN
C                                                                       00004600
C     WRITE OUT U.S. STORAGE ALLOCATIONS FOR AMISTAD AND FALCON RESERVOIRS
C
      ENTRY OUT2A(IY,PCTUSC,PCTUSI)                                     RJB032396
C
      WRITE(KOUT,60)                                                    RJB30196
   60 FORMAT(///,3X, 'ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON',  RJB30196
     1 ' RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES',//,             RJB30196
     2 3X, 'MONTH  INITIAL   TOTAL    TOTAL    TOTAL    TOTAL   TOTAL'  RJB32396
     3 '  END-MON   o/o  D-M-I   OPRATNG  EXCESS   IRRIG   IRRIG ',     RJB021198
     4 '   IRRIG    o/o',/,                                             RJB32396
     5 3X, '         USABLE  WTRSHED   D-M-I    IRRIG   SYSTEM  RESERVR' RJB32396
     6 '  USABLE  CONS RESERVE  RESERVE  USABLE ACCOUNT  RIVER',        RJB021198
     7 '   ACCOUNT IRRIG',/,                                            RJB32396
     8 3X, '        STORAGE  INFLOWS  DEMANDS  DEMANDS SHORTAGE    EVAP ' RJB32396
     9 ' STORAGE  POOL STORAGE  STORAGE STORAGE ALLOCAT DIVERSN',       RJB021198
     * '  BALANCE  POOL',/)                                             RJB32396
C                                                                       00003500
      DO 61 MON=1,12                                                    RJB30196
61    WRITE(KOUT,62) MON,(ICAP(10,MON,I),I=1,7),PCTUSC(MON),            RJB31196
     1 ICAP(10,MON,8),(ICAP(10,MON,I),I=10,13),ICAP(10,MON,9),          RJB32396
     2 PCTUSI(MON)                                                      RJB032396
62    FORMAT (4X,I2,4X,3(I7,2X),I7,1X,I7,2X,I6,2X,I7,1X,F5.1,1X,I7,1X,  RJB032396
     1 3(1X,I7),I8,2X,I7,1X,F5.1)                                       RJB32396
      RETURN                                                            00006900
C
C     WRITE OUT MONTHLY RESULTS FROM INDIVIDUAL WATER RIGHTS ACCOUNTING
C
      ENTRY OUT2B(IY)                                                   RJB092597
      ICALYR = IYEAR-1 + IY                                             RJB092597
      DO 89 IW=1, NUMWR                                                 RJB092597
      IF (IW.EQ.1 .OR. IW.EQ.3) GOTO 188                                RJB093097
      GOTO 191                                                          RJB093097
C
  188 WRITE(KOUT,11) FF,TITLE,IY,ICALYR                                 RJB093097
      WRITE(KOUT,189)                                                   RJB092597
  189 FORMAT(/,3X,'WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS',     RJB092597
     1 ' WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES')              RJB092597
  191 WRITE(KOUT,190) (WRNAME(IW,K),K=1,3), (MNADNO(IW,K),K=1,3),       RJB092597
     1 (IAADNO(IW,K),K=1,3),(IBADNO(IW,K),K=1,3),MUNWR(IW),IRAWR(IW),   RJB092597
     2 IRBWR(IW)                                                        RJB092597
  190 FORMAT(///,3X,'NAME OF WATER RIGHTS OWNER:',5X,3A4,//,            RJB092597
     3 13X,'D-M-I WATER RIGHTS',13X,'CLASS A IRRIGATION WATER RIGHTS',  RJB092597
     4 17X,'CLASS B IRRIGATION WATER RIGHTS',/,12X,'ADJ. NO.',3A4,16X,  RJB092597
     5 'ADJ. NO.',1X,3A4,27X,'ADJ. NO.',1X,3A4,/,                       RJB092697
     6 11X,'ANNUAL AUTH: ',I6,' AF',2X,12X,'ANNUAL AUTH: ',I7,' AF',    RJB092597
     7 25X,'ANNUAL AUTH: ',I7,' AF')                                    RJB092597
      WRITE(KOUT,92)                                                    RJB092597
   92 FORMAT(11X,'----------------------',4X,                           RJB092597
     1 '-------------------------------------------',4X,                RJB092597
     2 '-------------------------------------------',/,                 RJB092597
     3 3X,'MONTH',3X,' DEMAND  SHORT  USABLE   DEMAND  SHORT  RATE A',  RJB092597
     4 '  ALLOC STORAGE  USABLE   DEMAND  SHORT  RATE B  ALLOC ',       RJB092697
     5 'STORAGE  USABLE',/,                                             RJB092697
     6 11X,' AMOUNT AMOUNT BALANCE    AMOUNT AMOUNT          AMOUNT',   RJB092597
     7 ' BALANCE BALANCE    AMOUNT AMOUNT          AMOUNT BALANCE ',    RJB092797
     8 'BALANCE',/)                                                     RJB092697
      DO 89 MON=1, 12                                                   RJB092597
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      WRITE(KOUT,91) MON,MUNMND(IW,IY,MON),MUNSHT(IW,IY,MON),            RJB092597
     1 MNANBP(IW,MON),IRAMND(IW,IY,MON),IRASHT(IW,IY,MON),RATEA(MON),    RJB092597
     2 IRAALC(IW,IY,MON),IAWRBP(IW,MON),IAANBP(IW,MON),                  RJB092597
     3 IRBMND(IW,IY,MON),IRBSHT(IW,IY,MON),RATEB(MON),IRBALC(IW,IY,MON),RJB092597
     4 IBWRBP(IW,MON),IBANBP(IW,MON)                                     RJB092597
   91 FORMAT(5X,I2,4X,I7,I7,I8,2X,I8,I7,F8.5,I7,I8,I8,2X,I8,I7,F8.5,     RJB092697
     1        I7,I8,I8)                                                  RJB092697
C
C     SUM MONTHLY VALUES FOR ANNUAL TOTALS PRINTOUT
C
      MNDTOT = MNDTOT + MUNMND(IW,IY,MON)                                RJB021298
      MSHTOT = MSHTOT + MUNSHT(IW,IY,MON)                                RJB021298
      MIAMTO = MIAMTO + IRAMND(IW,IY,MON)                                RJB021298
      MIASTO = MIASTO + IRASHT(IW,IY,MON)                                RJB021298
      MIALTO = MIALTO + IRAALC(IW,IY,MON)                                RJB021298
      MIBMTO = MIBMTO + IRBMND(IW,IY,MON)                                RJB021298
      MIBSTO = MIBSTO + IRBSHT(IW,IY,MON)                                RJB021298
      MIBLTO = MIBLTO + IRBALC(IW,IY,MON)                                RJB021298
      IF(MON .LT. 12) GOTO 89                                            RJB021298
C
C     WRITE ANNUAL TOTALS
C
      WRITE(KOUT,93) MNDTOT,MSHTOT,MIAMTO,MIASTO,MIALTO,MIBMTO,MIBSTO,   RJB021298
     1 MIBLTO                                                            RJB021298
   93 FORMAT(/,5X,'ANNUAL',I7,I7,8X,2X,I8,I7,8X,I7,8X,8X,2X,I8,I7,8X,I7)RJB021298
C
C     ZERO OUT TOTALS AFTER PRINTING EACH WATER RIGHTS HOLDER
C
      MNDTOT = 0                                                         RJB021298
      MSHTOT = 0                                                         RJB021298
      MIAMTO = 0                                                         RJB021298
      MIASTO = 0                                                         RJB021298
      MIALTO = 0                                                         RJB021298
      MIBMTO = 0                                                         RJB021298
      MIBSTO = 0                                                         RJB021298
      MIBLTO = 0                                                         RJB021298
   89 CONTINUE                                                           RJB092597
      RETURN                                                             RJB092597
C
C     WRITE OUT MONTHLY RESULTS FOR U.S. AMISTAD AND FALCON RESERVOIRS
C       FOR PLOTTING PURPOSES
C
C     IF IPLT = 0, DO NOT STORE ANY RESULTS IN PLT FILE
C     IF IPLT = 1, STORE U.S. AMISTAD RESERVOIR RESULTS
C     IF IPLT = 2, STORE U.S. FALCON RESERVOIR RESULTS
C     IF IPLT = 3, STORE MEXICAN AMISTAD RESERVOIR RESULTS
C     IF IPLT = 4, STORE MEXICAN FALCON RESERVOIR RESULTS
C     IF IPLT = 5, STORE U.S. WATER ACCOUNTING RESULTS
C
      ENTRY OUT2C(IY)                                                    RJB093097
      ICALYR=IYEAR-1+IY                                                  00001600
      IF (IPLT .EQ. 0) GO TO 90
      IF (IPLT .EQ. 5) GO TO 80                                           RJB060496
C
      J = IPLT
      IF(IY.NE.IFROM) GO TO 70
      WRITE(KAPE2,71) FF,TITLE                                            RJB42996
   71 FORMAT(A1,/25X,25A4//)
      WRITE(KAPE2,74) J,(RNAME(J,I),I=1,3),RFLOOD(J),RCON(J),RMIN(J)     RJB091997
C     *   K,(RNAME(K,I),I=1,3),RFLOOD(K),RCON(K),RMIN(K)                  RJB091997
   74 FORMAT(/,3X,13HRESERVOIR NO.,I2,4X,3A4,6X,'MAX FLOOD POOL:', I8,   RJB091997
     1 8X, 'MAX CONSERVATION POOL:',I8, 8X, 'DEAD POOL:', I6,/)            RJB031396
C     * 30X,13HRESERVOIR NO.,I2,4X,3A4,6X,'MAX FLOOD POOL:', I8,          RJB091997
C     1 8X, 'MAX CONSERVATION POOL:',I8, 8X, 'DEAD POOL:', I6, /)
C                                                                        00002700
      WRITE(KAPE2,76)                                                     00002800
   76 FORMAT(20X,7HWTRSHED,8H RESERVR,1X, 7HFLDWATR,                     RJB31896
     1 8H DWNSTRM,1X, 7HSURFACE, 1X, 4HEVAP, 2X, 4HEVAP, 1X, 7H D-M-I , RJB30196
     2 1X,8HSHORTAGE, 7H IRRIG , 1X, 8HSHORTAGE, 1X, 6H FLOOD, 1X,       RJB31496
     3 7HEND-MON, 2X, 'TARGET',/,
C     * 10X,7HWTRSHED,8H RESERVR,1X, 7HFLDWATR,                           RJB31896
C     1 8H DWNSTRM,1X, 7HSURFACE, 2X, 4HEVAP, 3X, 4HEVAP, 1X, 7H D-M-I , RJB30196
C     2 1X,8HSHORTAGE, 7H IRRIG , 1X, 8HSHORTAGE, 1X, 6H FLOOD, 1X,       RJB31496
C     3 7HEND-MON, 2X, 'TARGET', /,                                       RJB31596
     4 2X,'YEAR'4X,
     4 1X,49H  MONTH  INFLOWS INFLOWS TRANSFR RELEASE   AREA            ,RJB31896
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     5 20HRATE  LOSS DEMANDS  , 7X, 24HDEMANDS            SPILLS     ,    RJB31496
     6 7HSTORAGE, 1X, 'STORAGE',/)                                         RJB31596
C      * 1X, 55H        INFLOWS INFLOWS TRANSFR RELEASE   AREA            ,RJB31896
C      5 21HRATE   LOSS DEMANDS  , 11X, 27HDEMANDS           SPILLS       ,RJB31496
C      6 7HSTORAGE, 1X, 'STORAGE',/)                                      RJB31596
C                                                                         00003500
       WRITE (KAPE2,79) (I, I = 1,16)
   79 FORMAT(2X,I4,3X,5X,I2,1X,5I8,1X,I5,I6,2I8,4I8,I8,
     * 7X,5I8,1X,I5,1X,I6,2I8,4I8,I8)
   70 CONTINUE
      DO 77 MON=1,12                                                      00003600
   77 WRITE(KAPE2,78) ICALYR,MON,(ICAP(J,MON,I),I=1,5),EVAP(J,MON),       RJB30196
     1 (ICAP(J,MON,I),I=6,13)
   78 FORMAT(2X,I4,4X,4X,I2,2X,5I8,1X,F5.2,1X,I5,6I8,I8)
      GO TO 90
   80 CONTINUE
      IF(IY.NE.IFROM) GO TO 85
      WRITE(KAPE2,71) FF,TITLE                                            RJB060496
      WRITE(KAPE2,82)                                                     RJB30196
   85 CONTINUE                                                            RJB060496
   82 FORMAT(/,3X, 'ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON',      RJB30196
     1 ' RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES',/,3X,'YEAR  '     RJB060496
     2     'MONTH  INITIAL   TOTAL    TOTAL    TOTAL    TOTAL   TOTAL'    RJB32396
     3 '  END-MON    o/o  D-M-I   OPRATNG  EXCESS  IRRIG  NEGATIV',       RJB032396
     4 '   IRRIG     o/o',/,                                              RJB32396
     5 9X, '           USABLE  WTRSHED   D-M-I    IRRIG   SYSTEM  RESERVR' RJB32396
     6 '  USABLE  CONS    POOL   RESERVE  USABLE ACCOUNT  IRRIG',        .RJB032396
     7 '      POOL  IRRIG',/,                                             RJB32396
     8 9X, '         STORAGE  INFLOWS  DEMANDS  DEMANDS SHORTAGE   EVAP ' RJB32396
     9 ' STORAGE  POOL STORAGE  STORAGE STORAGE ALLOCAT ALLOCAT',         RJB032396
     * '  STORAGE  POOL')                                                 RJB32396
      DO 83 MON=1,12                                                      RJB30196
83    WRITE(KAPE2,84) ICALYR,MON,(ICAP(10,MON,I),I=1,7),PCTUSC(MON),      RJB060496
     1 ICAP(10,MON,8),(ICAP(10,MON,I),I=10,13),ICAP(10,MON,9),            RJB32396
     2 PCTUSI(MON)                                                        RJB032396
84    FORMAT (3X,I4,3X,I2,4X,3(I7,2X),I7,1X,I7,2X,I6,2X,I7,1X,F5.1,1X,    RJB060496
     1 I7,1X,4(1X,I7),2X,I7,1X,F5.1)                                      RJB060496
   90 CONTINUE
      END                                                                 00007000
C
      SUBROUTINE STRTIR (ISTOR1,ISTOR2,IRPOL)                             RJB041596
      COMMON/WATRIT/MAXMWR,MXMIWR,MMIAWR,MMIBWR,MXLIWR,MLIAWR,MLIBWR,     RJB100897
     1    MAXMPL,MAXIPL,IRSTRT,MAXUSC,WPALLC,                             RJB092497
     2    WRNAME(3,3),MUNWR(3),IRAWR(3),IRBWR(3),MUNMND(3,55,12),         RJB100897
     3    IRAMND(3,55,12),IRBMND(3,55,12),IRAWRB(3),IRBWRB(3),            RJB100897
     4    MUNSHT(3,55,12),IRASHT(3,55,12),IRBSHT(3,55,12),                RJB100897
     5    MUNANB(3),IRAANB(3),IRBANB(3),IRAALC(3,55,12),IRBALC(3,55,12),RJB100897
     6    RATEA(12),RATEB(12),MNANBP(3,12),IAANBP(3,12),IBANBP(3,12),     RJB092597
     7    IAWRBP(3,12),IBWRBP(3,12),MNADNO(3,3),IAADNO(3,3),IBADNO(3,3)   RJB092597
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),               RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10),   RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),            00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                   RJB031296
      ROFF = 0.499                                                        RJB032396
C     DETERMINE AVAILABLE U.S. USABLE STORAGE BASED ON TNRCC RULES
      STODUM = MAX(0,(ISTOR1 + ISTOR2 - 4600))                            RJB071096
      ISTDUM = STODUM                                                     RJB30196
      DUMMY = STODUM                                                      RJB22996
      DUMMI = MAXUSC                                                      RJB031896
      PCTCON = 100 * DUMMY / DUMMI                                        RJB31896
      IF (PCTCON .GT. 100.) PCTCON = 100.                                 RJB031896
      MNPOL = MAXMPL                                                      RJB22996
      IRPOS = 0                                                           RJB22996
      IRNEG = 0                                                           RJB22996
      EXCES = 0                                                           RJB22996
      IRPOL = MAXIPL                                                      RJB41596
      STOTMP = STODUM - MAXMPL                                            RJB22996
      IF (STOTMP .GT. 0) GO TO 205                                        RJB22996
      MNPOL = STODUM                                                      RJB22996
      IRPOL = 0                                                           RJB22996
      OPRES = 0                                                           RJB22996
      GO TO 260                                                           RJB22996
205   CONTINUE                                                            RJB22996
      IF (STOTMP .GT. 150000) GO TO 206                                   RJB22996
      IRPOL = 0                                                           RJB22996
      OPRES = STOTMP                                                      RJB22996
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```
      GO TO 260                                                          RJB22996
206   CONTINUE                                                           RJB22996
      STOTMP = STOTMP - IRPOL                                            RJB22996
      DUMMY = (380000 * PCTCON / 100) + ROFF                             RJB22996
      OPRES = MAX(DUMMY,275000)                                          RJB22996
      IF (OPRES .LT. STOTMP) GO TO 210                                   RJB22996
      IF (STOTMP .LT. 150000) GO TO 220                                  RJB22996
      OPRESV = STOTMP                                                    RJB22996
      GO TO 250                                                          RJB22996
220   CONTINUE                                                           RJB22996
      OPRES = 150000                                                     RJB22996
      IRNEG = 150000 - STOTMP                                            RJB22996
      GO TO 250                                                          RJB22996
210   CONTINUE                                                           RJB22996
      AVAILA = STOTMP - OPRES                                            RJB22996
      IRPOS = AVAILA                                                     RJB22996
      IF (AVAILA .LT. 50000) IRPOS = 0                                   RJB22996
250   CONTINUE                                                           RJB22996
      IRPOL = IRPOL + IRPOS - IRNEG                                      RJB31196
      IRDUM = IRPOL                                                      RJB31196
      IF (IRDUM .LT. 0) GOTO 261                                         RJB31196
      IF (IRDUM .LT. MAXIPL) GOTO 262                                    RJB31196
      IRPOL = MAXIPL                                                     RJB31196
      IRPOS = IRPOS - (IRDUM - MAXIPL)                                   RJB31196
      GOTO 262                                                           RJB31196
  261 CONTINUE                                                           RJB31196
      IRPOL = 0                                                          RJB31196
      IRNEG = IRNEG + IRDUM                                              RJB31196
  262 CONTINUE                                                           RJB31196
      EXCES = STODUM - MNPOL - IRPOL - OPRES                             RJB22996
  260 CONTINUE                                                           RJB041596
      RETURN                                                             RJB041596
      END                                                                RJB041596
C
      SUBROUTINE OUT3                                                    00000100
      INTEGER TOTLS                                                      00000200
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                    00000300
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                            00000400
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),   RJB091997
     1    TITLE2(25),NR,ICARD(30)                                        RJB021198
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)           RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),              RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10),  RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),           00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                  RJB031296
      COMMON/LNKFLW/LNKFLO(15,13)                                        RJB30196
      DIMENSION DNA(2)                                                   00000900
      CHARACTER FF                                                       RJB030896
      DATA DNA/'NODE','YEAR'/                                            00001100
C                                                                        00001200
      FF = CHAR(12)                                                      RJB030896
C                                                                        00002800
C                             STEP 01                                    00002900
C                             PRINT OUT NODE DATA FOR ALL YEARS          00003000
C                             FOR U.S. AMISTAD AND FALCON RESERVOIRS
      DO 7  J=1,2                                                        RJB031996
      WRITE(KOUT,21) FF,TITLE,DNA(1),J,(RNAME(J,I), I=1,3),DNA(2)        RJB091997
   21 FORMAT(A1,/25X,25A4//31X,36HSIMULATION PERIOD TOTAL SUMMARY FOR ,  RJB031996
     * A4, I3, 5X, 3A4,//5X,A4,4X,7HINITIAL,2X,7HWTRSHED,1X,8H RESERVR,  RJB091997
     * 2X, 7HFLDWATR, 1X, 8H DWNSTRM,3X, 4HEVAP, 3X, 7H D-M-I ,          RJB32596
     2 2X,8HSHORTAGE, 1X, 7H IRRIG , 2X, 8HSHORTAGE, 2X, 6H FLOOD, 2X,   RJB31496
     3 7HYEAREND, 2X, 7HMINIMUM, /,                                      RJB31996
     4 13X,53HSTORAGE  INFLOWS  INFLOWS  TRANSFR  RELEASE   LOSS   ,     RJB032596
     5 'DEMANDS',                                                        RJB032596
     6 11X, 27HDEMANDS            SPILLS   , 7HSTORAGE, 2X, 7HSTORAGE)   RJB31996
      DO 6  KY=1,NYEAR                                                   00003300
      KYEAR = IYEAR - 1 + KY                                             RJB031996
      WRITE(KOUT,22) KYEAR, INISTO(J,KY), (TOTLS(J,KY,N),N=1,4),         RJB032596
     1 (TOTLS(J,KY,N),N=6,12), TOTLS(J,KY,5)                             RJB032596
   22 FORMAT(5X,I4,2X,5I9,2X,I6,2I9,5I9)                                 RJB31996
    6 CONTINUE                                                           00004500
    7 CONTINUE                                                           00006500
C                                                                        00002800
C                             STEP 02                                    00002900
C                             PRINT OUT NODE DATA FOR ALL YEARS          00003000
C                             FOR MEXICO AMISTAD AND FALCON RESERVOIRS
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```
C
      DO 9  J=3,4                                                       RJB031996
      WRITE(KOUT,24) FF,TITLE,DNA(1),J,(RNAME(J,I), I=1,3),DNA(2)       RJB091997
   24 FORMAT(A1,/25X,25A4//31X,36HSIMULATION PERIOD TOTAL SUMMARY FOR , RJB031996
     * A4, I3, 5X, 3A4,//5X,A4,4X,7HINITIAL,2X,7HWTRSHED,1X,8H RESERVR, RJB091997
     * 2X, 7HFLDWATR, 1X, 8H DWNSTRM,3X, 4HEVAP, 3X, 7HMUN&IRR,         RJB32596
     2 2X,8HSHORTAGE, 1X, 7H OTHER , 2X, 8HSHORTAGE, 2X, 6H FLOOD, 2X,  RJB31496
     3 7HYEAREND, 2X, 7HMINIMUM, /,                                     RJB31996
     4 13X,53HSTORAGE  INFLOWS  INFLOWS  TRANSFR  RELEASE   LOSS    ,   RJB032596
     5 'DEMANDS',                                                       RJB032596
     6 11X, 27HDEMANDS            SPILLS   , 7HSTORAGE, 2X, 7HSTORAGE)   RJB31996
      DO 11  KY=1,NYEAR                                                 RJB032396
      KYEAR = IYEAR - 1 + KY                                            RJB031996
      WRITE(KOUT,22) KYEAR, INISTO(J,KY), (TOTLS(J,KY,N),N=1,4),        RJB032596
     1 (TOTLS(J,KY,N),N=6,12), TOTLS(J,KY,5)                            RJB032596
   11 CONTINUE
    9 CONTINUE
      RETURN                                                            00012000
      END                                                               00012100
C
      SUBROUTINE SETNET                                                 00000100
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000200
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/ADATA/NARC,NMAX,FESIBL,NTIME                               00000500
     * ,NT(500),NF(500),HI(500),LO(500),FLOW(500),COST(500)             00000600
C                             STEP 01                                   00000700
C                             SET UP ALL FROM AND TO NODES BY LINK NO.  00000800
      DO 5 L=1,NL                                                       00000900
      NF(L)=LNODE(L,1)                                                  00001000
      NT(L)=LNODE(L,2)                                                  00001100
    5 CONTINUE                                                          00001200
C                                                                       00001300
C                             STEP 02                                   00001400
C                             SET UP ALL INITIAL ARCS                   00001500
      NARC=NL                                                           00001600
      N=NJ+1                                                            00001700
      DO 7 K=1,NJ                                                       00001800
      NARC=NARC+1                                                       00001900
      NF(NARC)=N                                                        00002000
      NT(NARC)=K                                                        00002100
    7 CONTINUE                                                          00002200
C                                                                       00002300
C                             STEP 03                                   00002400
C                             SET UP ALL DESIRED STORAGE ARCS           00002500
      N=NJ+2                                                            00002600
      DO 9 K=1,NJ                                                       00002700
      NARC=NARC+1                                                       00002800
      NF(NARC)=K                                                        00002900
      NT(NARC)=N                                                        00003000
    9 CONTINUE                                                          00003100
C                                                                       00003200
C                             STEP 04                                   00003300
C                             SET UP ALL FINAL STORAGE ARCS             00003400
      DO 11 K=1,NJ                                                      00003500
      NARC=NARC+1                                                       00003600
      NF(NARC)=K                                                        00003700
      NT(NARC)=N                                                        00003800
   11 CONTINUE                                                          00003900
C                                                                       00004000
C                             STEP 05                                   00004100
C                             SET UP ALL DEMAND ARCS                    00004200
      N=NJ+3                                                            00004300
      DO 13 K=1,NJ                                                      00004400
      NARC=NARC+1                                                       00004500
      NT(NARC)=N                                                        00004600
      NF(NARC)=K                                                        00004700
   13 CONTINUE                                                          00004800
C                                                                       00004900
C                             STEP 06                                   00005000
C                             SET UP ALL SPILL ARCS                     00005100
      N=NJ+4                                                            00005200
      DO 15 K=1,NRES                                                    00005300
      NARC=NARC+1                                                       00005400
```

```
      NT(NARC)=N
      NF(NARC)=K
   15 CONTINUE
C
C                                    STEP 07
C                                    SET UP MASS BALANCE ARCS
      NMAX=NJ+5
      NF(NARC+1)=NJ+2
      NT(NARC+1)=NMAX
      NF(NARC+2)=NJ+4
      NT(NARC+2)=NMAX
      NF(NARC+3)=NJ+3
      NT(NARC+3)=NMAX
      NF(NARC+4)=NMAX
      NT(NARC+4)=NJ+1
C
      NARC=NARC+4
      RETURN
      END
C
      SUBROUTINE RIGHT(I,INDEX)
      COMMON/ADATA/NR,NN,FESIBL,NTIME
     1  ,NA(500),NF(500),JSAVE(500),ILO(500),NC(500),ISAVE(500)
      COMMON IWV(42),LABL(42),NODE(42),MIDL(42),KOS(500),MIR(500)
      COMMON JWV(500)
      MID=MIDL(I)
      IA=NODE(I)
      DO 1 II=IA,MID
      IF(MIR(II)-INDEX) 1,3,1
 1    CONTINUE
      KWAY=1
 2    WRITE(6 ,900) I,INDEX,KWAY
 900  FORMAT(5H NODE,I5,5H  ARC, I5, 16H  LOST ON SHIFT  ,I4,4H LOC ,I4)
      IFROM=NODE(I)
      ITO=NODE(I+1)-1
      WRITE( 6,910) IFROM,MIDL(I),ITO,(K,MIR(K),K=IFROM,ITO)
 910  FORMAT(3I6/(20I6))
      RETURN
 3    ITEMP=MIR(MID)
      MIR(MID)=INDEX
      MIR(II)=ITEMP
      MIDL(I)=MID-1
      RETURN
      END
C
      SUBROUTINE LEFT(I,INDEX)
      COMMON/ADATA/NR,NN,FESIBL,NTIME
     1  ,NA(500),NF(500),JSAVE(500),ILO(500),NC(500),ISAVE(500)
      COMMON IWV(42),LABL(42),NODE(42),MIDL(42),KOS(500),MIR(500)
      COMMON JWV(500)
      MID=MIDL(I)+1
      IB=NODE(I+1)-1
      DO 10 II=MID,IB
      IF(MIR(II)-INDEX) 10,12,10
 10   CONTINUE
      KWAY=2
      GO TO 2
 12   ITEMP=MIR(MID)
      MIR(MID)=INDEX
      MIR(II)=ITEMP
      MIDL(I)=MID
      RETURN
 2    WRITE(6 ,900) I,INDEX,KWAY
 900  FORMAT(5H NODE,I5,5H  ARC, I5, 16H  LOST ON SHIFT  ,I4,4H LOC ,I4)
      IFROM=NODE(I)
      ITO=NODE(I+1)-1
      WRITE( 6,910) IFROM,MIDL(I),ITO,(K,MIR(K),K=IFROM,ITO)
 910  FORMAT(3I6/(20I6))
      RETURN
      END
C
      SUBROUTINE DUMPO(NLINES,ID)
      COMMON/ADATA/NR,NN,FESIBL,NTIME
     1  ,NA(500),NF(500),JSAVE(500),ILO(500),NC(500),ISAVE(500)
      COMMON IWV(42),LABL(42),NODE(42),MIDL(42),KOS(500),MIR(500)
      COMMON JWV(500)
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```
      WRITE(6,1120)ID                                                   00003800
      DO 1070 M=1,NLINES                                                00003900
      N=M+NR                                                            00004000
      I=NA(N)                                                           00004100
      J=NA(M)                                                           00004200
      L=ILO(M)                                                          00004300
      K=JSAVE(M)                                                        00004400
      KOST=ISAVE(M)                                                     00004500
      KBAR=KOS(M)                                                       00004600
      IFLOW=K-NC(M)                                                     00004700
      IF(IFLOW.LT.L .OR. IFLOW.GT.K) WRITE(6,1121)                      00004800
      IF(KBAR) 1065,1070,1067                                           00004900
 1065 IF(IFLOW.LT.K) WRITE(6,1122)                                      00005000
      GO TO 1070                                                        00005100
 1067 IF(IFLOW.GT.L) WRITE(6,1122)                                      00005200
 1070 WRITE(6,1125)M,I,J,L,K,IFLOW,KOST,KBAR                            00005300
 1125 FORMAT(3I5,3I10,5X,2I10)                                          00005400
 1120 FORMAT('1 ARC     I    J          L          K       IFLOW       K00005500
     *OST       KBAR' ,I15        /)                                    00005600
 1121 FORMAT(' THE FOLLOWING ARC IS PRIMAL INFEASIBLE')                 00005700
 1122 FORMAT(' THE FOLLOWING ARC IS DUAL INFEASIBLE')                   00005800
      RETURN                                                            00005900
      END                                                               00006000
C
      SUBROUTINE AREA(X,Y,J)                                            00000100
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP                   RJB031396
      INTEGER START,STEND,USE,UREG,ISHTM,ISPIL,AREAX,EVPT,AMAX,AMIN
      INTEGER X,Y,RCON,RFLOOD
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000300
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000400
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/WRKD/START(10),STEND(10),USE(10),UREG(10),ISHTM(10,12),    00001100
     *            ISPIL(10,12),AREAX(10),EVPT(10),AMAX(10),AMIN(10),    00001200
     *            IAREA(10)                                             00001360
      ROFF = .499
C                             STEP 01                                   00001400
C                             BASED ON RES VOL DETERMINE AREA           00001500
      DO 5 I=1,30                                                       RJB030896
      IF(X   -ACTAB(J,I,2)) 2,3,5                                       00001800
    5 CONTINUE                                                          00001900
C                                                                       00002200
    3 Y   =ACTAB(J,I,1)                                                 00002300
      GO TO 10                                                          00002400
C                                                                       00002500
C                             STEP 02                                   00002600
C                             IF VOL BETWEEN POINTS INTERPOLATE         00002700
C                             FOR AREA                                  00002800
    2 X1=ACTAB(J,I,2)-ACTAB(J,I-1,2)                                    00002900
      Y1=ACTAB(J,I,1)-ACTAB(J,I-1,1)                                    00003000
      X2=X   -ACTAB(J,I-1,2)                                            00003100
      X3=(X2/X1)*Y1                                                     00003200
      Y   =ACTAB(J,I-1,1)+IFIX(X3 + ROFF)                               00003300
   10 CONTINUE                                                          00003400
      RETURN                                                            00003500
      END                                                               00003600
      SUBROUTINE SUPERK                                                 00000100
      COMMON/ADATA/NR,NN,FESIBL,NTIME                                   00000200
     1  ,NA(500),NF(500),JSAVE(500),ILO(500),NC(500),ISAVE(500)         00000300
      COMMON IWV(42),LABL(42),NODE(42),MIDL(42),KOS(500),MIR(500)       00000500
      COMMON JWV(500),NSAVE(42)                                         00000500
      LOGICAL FESIBL                                                    00000600
      MAXA=200                                                          00000700
      FESIBL=.TRUE.                                                     00000800
      INFIN= 100 000 000                                                00000900
      IFLOW=0                                                           00001000
      KLAB=0                                                            00001100
      KPOT=0                                                            00001200
      KBRK=0                                                            00001300
      IP=0                                                              00001400
      NUMS=0                                                            00001500
      IPL=0                                                             00001600
```

```
      NR2=NR*2
      NN1=NN+1
      IF(NTIME.GT.1) GO TO 12
      DO 5 I=1,NN1
      NODE(I)=0
 5    LABL(I)=0
      DO 10 M=1,NR
      N=M+NR
      I=NF(M)
      J=NA(M)
      IFLOW=NC(M)
      KOST=ISAVE(M)
      NODE(I)=NODE(I)+1
      NODE(J)=NODE(J)+1
      NA(N)=I
      KOS(M)=KOST
      KOS(N)=-KOST
      NC(M)=JSAVE(M)-IFLOW
      NC(N)=IFLOW-ILO(M)
 10   CONTINUE
      DO 11 I=1,NN1
 11   NSAVE(I)=NODE(I)
      GO TO 1401
 12   DO 13 I=1,NN1
      NODE(I)=NSAVE(I)
 13   LABL(I)=0
      DO 14 M=1,NR
      N=M+NR
      IFLOW=NC(M)
      KOST=ISAVE(M)+KOS(M)
      KOS(M)=KOST
      KOS(N)=-KOST
      NC(M)=JSAVE(M)-IFLOW
      NC(N)=IFLOW-ILO(M)
 14   CONTINUE
 1401 CONTINUE
C     ******************************************************************
C
C     SETUP SECTION
C
C     ******************************************************************
      KL=1
      DO 15 K=1,NN1
      JK=NODE(K)
      NODE(K)=KL
      JWV(K)=KL
      KL=JK+KL
 15   MIDL(K)=KL-1
      DO 20 L=1,NR
      LL=L+NR
      J=NA(L)
      I=NA(LL)
      KOST=KOS(L)
      K=NC(L)
      LO=-NC(LL)
C     RIGHT=2   LEFT=1
      MAIN=2
      MIRROR=2
      IF(KOST) 29,29,30
 29   IF(K)32,32,31
 30   IF(LO)35,36,31
 31   MAIN=1
 32   IF(KOST) 33,34,34
 33   IF(K) 35,36,36
 34   IF(LO) 35,36,36
 35   MIRROR=1
 36   GO TO(43,44),MAIN
 43   II=JWV(I)
      MIR(II)=L
      JWV(I)=II+1
      GO TO 45
 44   II=MIDL(I)
      MIR(II)=L
      MIDL(I)=II-1
 45   GO TO(46,47),MIRROR
 46   II=JWV(J)
```

```
      MIR(II)=LL
      JWV(J)=II+1
      GO TO 20
 47   II=MIDL(J)
      MIR(II)=LL
      MIDL(J)=II-1
 20   CONTINUE
C     *****************************************************************
C
C     GO - SUPERKILTER
C
C     *****************************************************************
      ND=INFIN
C
C     MAIN LOOP (1000)
C
      NR2=NR*2
      DO 1000 MAIN=1,NR
      MAINM=MAIN+NR
      DO 1000 MODE=1,2
      GO TO(52,53),MODE
 52   II=MAIN
      JZ=MAINM
      GO TO 54
 53   II=MAINM
      JZ=MAIN
 54   IF(NC(II)) 65,55,56
 55   IF(NC(JZ)) 63,990,990
 56   IF(KOS(II)) 63,55,55
C          IS,IT = START,END NODE NOS, JS,JT = ARC,MIRROR ARC NOS
C               FOR ARC NEEDING FLOW INCREASE
C          WANT TO INCREASE FLOW, START LABLEING AT JJ
 63   IS=NA(JZ)
      JS=II
      IT=NA(II)
      JT=JZ
      GO TO 70
C          WANT TO DECREASE FLOW, START LABELING AT II
 65   IT=NA(JZ)
      IS=NA(II)
      JS=JZ
      JT=II
C
C     LABELING PROCEDURE
C
 70   IPL=1
      IPLL=1
      IPS=0
      NUMS=0
      LABL(IT)=JS
      IWV(IPL)=IT
 84   KLAB=KLAB+1
      GO TO 86
 85   IF(IPS-IPL)86,200,86
 86   IPS=IPS+1
      IA=IWV(IPS)
      IB=NODE(IA)
      IE=MIDL(IA)
      IF(IB-IE) 87,87,85
 87   DO 90JJ=IB,IE
      J=MIR(JJ)
      NUNODE=NA(J)
      IF(LABL(NUNODE)) 90,88,90
 88   LABL(NUNODE)=J
      IPL=IPL+1
      IWV(IPL)=NUNODE
      IF(NUNODE-IS) 90,96,90
 90   CONTINUE
      GO TO 85
C
C     BREAKTHROUGH     BREAKTHROUGH     BREAKTHROUGH
C
 96   KBRK=KBRK+1
 97   IALPHA=INFIN
C
C     FIRST RETRACE
```

```
C
C          IJ = PREDECESSOR ARC INDEX
C          JI = MIRROR ARC INDEX
C          K = JWV POINTER
C          NEXT = PREDECESSOR NODE
C
      K=0
      NOW=IS
 100  IJ=LABL(NOW)
      JI=IJ-NR
      IF(JI) 101,101,102
 101  JI=JI+NR2
 102  NEXT=NA(JI)
      K=K+1
      IF(KOS(IJ)) 105,105,104
 104  NET=-NC(JI)
      JWV(K)=NET
      GO TO 110
 105  NET=NC(IJ)
      JWV(K)=NET
 110  IALPHA=MIN0(IALPHA,NET)
      IF(NEXT-IS) 111,120,111
 111  NOW=NEXT
      GO TO 100
C
C     SECOND RETRACE
C
 120  K=0
      NOW=IS
 125  IJ=LABL(NOW)
      JI=IJ-NR
      IF(JI) 126,126,127
 126  JI=JI+NR2
 127  NEXT=NA(JI)
      K=K+1
      NC(IJ)=NC(IJ)-IALPHA
      NET=NC(JI)
      NETNU=NET+IALPHA
      NC(JI)=NETNU
      IF(KOS(JI)) 128,1271,128
 1271 IF(NET) 1272,1272,128
 1272 IF(NETNU) 128,128,1273
 1273 CALL LEFT(NOW,JI)
 128  IF(JWV(K)-IALPHA) 129,1281,129
 1281 CALL RIGHT(NEXT,IJ)
 129  IF(NEXT-IS) 130,150,130
 130  NOW=NEXT
      GO TO 125
C
C     ERASE LABELS AND GO FOR O-K CHECK
C
 150  DO 155 I=1,IPL
      J=IWV(I)
 155  LABL(J)=0
      GO TO 54
C
C     POTENTIAL CHANGE
C
200   KPOT=KPOT+1
 201  KSET=NUMS
      NEWLAB=0
      NUMS=0
      IMTHRU=0
      MIN=INFIN
      NEW=NONS
      NONS=MAXA+1
      IF(KSET) 204,204,202
 202  IF(NEW-MAXA) 295,295,312
C        NON-S (L,L-) SET RECYCLING FILTER
 295  MAXNEW=MAXA+NEW
      DO 310 L=NEW,MAXA
      K=MAXNEW-L
      KK=JWV(K)
      KKK=NA(KK)
      IF(LABL(KKK)) 310,300,310
 300  NONS=NONS-1
```

```
      JWV(NONS)=KK
 310  CONTINUE
C       S-SET RECYCLING FILTER
 312  DO 203 K=1,KSET
      KK=JWV(K)
      KKK=NA(KK)
      IF(LABL(KKK)) 203,2021,203
 2021 IF(KOS(KK)) 2023,2023,2022
 2022 NUMS=NUMS+1
      JWV(NUMS)=KK
      MIN=MIN0(MIN,KOS(KK))
      GO TO 203
 2023 NONS=NONS-1
      JWV(NONS)=KK
 203  CONTINUE
 204  CONTINUE
      IF(IPLL-IPL) 2039,2039,2111
C       FIND MIN(C-BAR) OVER SET S
 2039 DO 211 LL=IPLL,IPL
      L=IWV(LL)
      JMID=MIDL(L)+1
      JRT=NODE(L+1)-1
      IF(JMID-JRT) 2045,2045,211
 2045 DO 210KK=JMID,JRT
      K=MIR(KK)
      I=NA(K)
      IF(LABL(I)) 210,2040,210
 2040 IF(NC(K)) 206,2041,2041
 2041 IF(KOS(K)) 206,206,205
 205  NUMS=NUMS+1
      JWV(NUMS)=K
      MIN=MIN0(MIN,KOS(K) )
      GO TO 210
 206  NONS=NONS-1
      JWV(NONS)=K
 210  CONTINUE
 211  CONTINUE
 2111 IPLL=IPL+1
      IF(NUMS) 212,212,215
 212  FESIBL=.FALSE.
      CALL DUMPO(NR,II)
      WRITE(6,2125)IS,IT,II
      WRITE(6,2121) (I,LABL(I),I=1,NN)
      WRITE(6,2122) (I,IWV(I),I=1,IPL)
      WRITE(6,2123) (JWV(I),I=NEW,MAXA)
 2121 FORMAT(' LABELS, BY NODE'/(5(I9,'=',I10)) )
 2122 FORMAT(' LABELED NODES (IWV)'/      (10I10))
 2123 FORMAT(' THE SET (L,L-), NON-S'/(10I10))
 2125 FORMAT('0IS=',I5,'   IT='I5,10X,'INFEASIBLE ARC =',I5)
      RETURN
C
C     UPDATE RELATIVE COSTS
C
C       UPDATE COST FOR SET S
 215  DO 230 I=1,NUMS
      IJ=JWV(I)
      JI=IJ-NR
      IF(JI) 216,216,217
 216  JI=IJ+NR
 217  KOST=KOS(IJ)-MIN
      KOS(IJ)=KOST
      KOS(JI)=-KOST
      IF(KOST) 230,218,230
 218  IF(NC(IJ)) 230,230,220
 220  NODEB=NA(IJ)
      CALL LEFT(NA(JI),IJ)
      IF(LABL(NODEB)) 230,223,230
 223  LABL(NODEB) =IJ
      IPL=IPL+1
      IWV(IPL)=NODEB
      IF(NODEB-IS) 230,225,230
 225  IMTHRU=1
 230  CONTINUE
C       UPDATE COST FOR NON-S
      IF(NONS-MAXA) 240,240,345
 240  DO 270 I=NONS,MAXA
```

```
      IJ=JWV(I)                                                         00032100
      JI=IJ-NR                                                          00032200
      IF(JI) 242,242,244                                                00032300
  242 JI=IJ+NR                                                          00032400
  244 KOSTA=KOS(IJ)                                                     00032500
      KOSTB=KOSTA-MIN                                                   00032600
      KOS(IJ)=KOSTB                                                     00032700
      KOS(JI)=-KOSTB                                                    00032800
C        CHECK FOR MIRROR LEAVING MU STATE                              00032900
C        CHECK LATER FOR COMBINING IF-CHECKS HERE                       00033000
  260 IF(KOSTA) 270,262,262                                             00033100
  262 IF(KOSTB) 264,270,270                                             00033200
  264 IF(NC(IJ)) 270,269,269                                            00033300
  269 IF(NC(JI)) 270,270,2691                                           00033400
 2691 CALL RIGHT(NA(IJ),JI)                                             00033500
  270 CONTINUE                                                          00033600
C        OUT-OF-KILTER CHECK                                            00033700
  345 IF(NC(II))360,350,351                                             00033800
  350 IF(NC(JZ)) 360,980,980                                            00033900
  351 IF(KOS(II)) 360,350,350                                           00034000
C        BREAKTHROUGH CHECK                                             00034100
  360 IF(IMTHRU) 361,361,96                                             00034200
  361 IF(IPS-IPL) 84,200,84                                             00034300
  980 DO 981 I=1,IPL                                                    00034400
      J=IWV(I)                                                          00034500
  981 LABL(J)=0                                                         00034600
  990 CONTINUE                                                          00034700
 1000 CONTINUE                                                          00034800
      TOTAL=0.                                                          00034900
      DO 1010 I=1,NR                                                    00035000
      KOS(I)=KOS(I)-ISAVE(I)                                            00035100
      NC(I)=JSAVE(I)-NC(I)                                              00035200
      TOTAL=TOTAL+NC(I)*FLOAT(ISAVE(I))                                 00035300
 1010 CONTINUE                                                          00035400
      RETURN                                                            00035500
      END                                                               00035600
C                        SUBROUTINE OPRATE WITH FAY ROUTINE
C
      SUBROUTINE OPRATE
      LOGICAL FESIBL                                                    00000200
      INTEGER TOTLS,STVG,STEMP
      INTEGER STVGA13,STVGB13,STVGC13,STVGA24,STVGB24,STVGC24           RJB011596
      INTEGER HI,COST,FLOW                                              00000400
      INTEGER START,STEND,USE,UREG,ISHTM,ISPIL,AREAX,EVPT,AMAX,AMIN      00000500
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                  RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                     00000700
      INTEGER STORUS,OPRESV,EXCESS
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000800
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000900
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/WRKD/START(10),STEND(10),USE(10),UREG(10),ISHTM(10,12),    00001100
     *            ISPIL(10,12),AREAX(10),EVPT(10),AMAX(10),AMIN(10),    00001200
     *            IAREA(10)                                             00001360
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)          RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/LNKFLW/LNKFLO(15,13)                                       RJB30196
      COMMON/ADATA/NARC,NMAX,FESIBL,NTIME                               00002100
     * ,NT(500),NF(500),HI(500),LO(500),FLOW(500),COST(500)             00002500
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,   RJB092697
     1       LIMSHT,NSRS,LRULE(10)                                      RJB092697
      COMMON/WATRIT/MAXMWR,MXMIWR,MMIAWR,MMIBWR,MXLIWR,MLIAWR,MLIBWR,   RJB100897
     1    MAXMPL,MAXIPL,IRSTRT,MAXUSC,WPALLC,                           RJB092497
     2    WRNAME(3,3),MUNWR(3),IRAWR(3),IRBWR(3),MUNMND(3,55,12),       RJB100897
     3    IRAMND(3,55,12),IRBMND(3,55,12),IRAWRB(3),IRBWRB(3),          RJB100897
     4    MUNSHT(3,55,12),IRASHT(3,55,12),IRBSHT(3,55,12),              RJB100897
     5    MUNANB(3),IRAANB(3),IRBANB(3),IRAALC(3,55,12),IRBALC(3,55,12),RJB100897
     6    RATEA(12),RATEB(12),MNANBP(3,12),IAANBP(3,12),IBANBP(3,12),   RJB092597
     7    IAWRBP(3,12),IBWRBP(3,12),MNADNO(3,3),IAADNO(3,3),IBADNO(3,3) RJB092597
      COMMON/DEMON/DEMON(10,12)                                         00002600
      COMMON/OPER/IPLT,IYRST,IYEND,IFLYLD,NUMWR,IRLFLG,IWRFLG,DRUSFC,   RJB021198
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     1    DRMXFC                                                        RJB021198
      DIMENSION IA(10),IB(10),IC(10)
      DIMENSION STORUS(55,12),IRPOOL(55,12),OPRESV(55,12),IRAPOS(55,12),RJB100897
     * IRANEG(55,12),IRRDIV(12),ITOTID(12),EXCESS(12),MNPOOL(12),       RJB100897
     * PCTUSC(12),ISTRUS(12),ITOTQS(12),ITOTMD(12),ITOTSH(12),          RJB32396
     * ITOTEV(12),PCTUSI(12)                                            RJB32396
      CHARACTER FF                                                      RJB030896
      FF = CHAR(12)                                                     RJB030896
C
C     ESTABLISH AND/OR INITIALIZE VARIABLES
C
      IRWATR = MXMIWR + MXLIWR                                          RJB092397
C
C     DETERMINE DEMAND RATIOS FOR USE IN FIRM YIELD ANALYSIS
C
      IF (IFLYLD .EQ. 0) GO TO 563                                      RJB071096
      DEMMUN = DEM(2) + DEM(5)                                          RJB041796
      RATIO2 = DEM(2) / DEMMUN                                          RJB041796
      RATIO5 = DEM(5) / DEMMUN                                          RJB041796
      DEMIRR = DEM(6) + DEM(7) + 1                                      RJB041796
      RATIO6 = DEM(6) / DEMIRR                                          RJB041796
      RATIO7 = DEM(7) / DEMIRR                                          RJB041796
      DEMNEW = DEMIRR - 1 + DEMMUN                                      RJB042996
      RATIOM = DEMMUN / DEMNEW                                          RJB042996
      DMXNEW = DEM(4) + DEM(8)                                          RJB042996
      RATMX8 = DEM(8) / DMXNEW                                          RJB042996
C
C     APPLY ADJUSTMENT FACTORS TO ESTABLISH INITIAL TOTAL DEMAND FOR
C       COUNTRY FOR WHICH THE FIRM ANNUAL YIELD IS BEING DETERMINED
C       AND TO ESTABLISH FIXED TOTAL DEMAND FOR OTHER COUNTRY FOR
C       THE FIRM ANNUAL YIELD SIMULATIONS
C
      DEMNEW = DEMNEW * DRUSFC + ROFF
      DEMOLD = 1.005 * DEMNEW
      DMXNEW = DMXNEW * DRMXFC + ROFF
      DMXOLD = 1.005 * DMXNEW
  563 CONTINUE                                                          RJB071096
C                               STEP 01                                 00002700
C                               ZERO OUT ARRAYS AND INITIALIZE          00002800
C                               VARIABLES                               00002900
      NR=NL - NC
      ROFF=0.499                                                        00003000
      DO 2 L=1,NL                                                       00003300
      DO 2 I=1,13                                                       00003400
      LNKFLO(L,I)=0                                                     00003500
    2 CONTINUE                                                          00003800
      DO 4 J=1,NJ                                                       00003900
      STEND(J)=0                                                        00004100
      DO 4 N=1,12                                                       00004400
      ISHTM(J,N)=0                                                      00004500
      ISPIL(J,N)=0                                                      00004600
    4 CONTINUE                                                          00004700
C                               STEP 02                                 00004800
C                               SETS BOUND ON ARCS # AND UPPER AND      00004900
C                               LOWER CONSTRAINTS ON PHYSICAL LINKS     00005000
C  SET LIMITS ON ARCS                                                   00005100
      L1=NL+1                                                           00005200
      L2=NL+NJ                                                          00005300
      L3=L2+1                                                           00005400
      L4=L2+NJ                                                          00005500
      L5=L4+1                                                           00005600
      L6=L4+NJ                                                          00005700
      L7=L6+1                                                           00005800
      L8=L6+NJ                                                          00005900
      L9=L8+1                                                           00006000
      LA=L8+NRES                                                        00006100
      LB=NR+1                                                           00006200
C                                                                       00006300
      DO 5 L=1,NARC                                                     00006400
      HI(L)=0                                                           00006500
      LO(L)=0                                                           00006600
      FLOW(L)=0                                                         00006700
      COST(L)=0                                                         00006800
    5 CONTINUE                                                          00006900
C                                                                       00007000
C  SET HI + LO ON LINKS                                                 00007100
```

```
      DO 7 L=1,NL                                                       00007200
      HI(L)=CMAX(L)*CONFLO                                              00007300
      LO(L)=CMIN(L)*CONFLO                                              00007400
    7 CONTINUE                                                          00007600
C                                                                       00007800
C                           STEP 03                                     00007900
C                           PRICE RIVER REACHES TO 1 AND CANALS TO 2    00008000
      DO 8 L=1,NL                                                       00008100
      COST(L)=1                                                         00008200
      IF(L.GT.NR) COST(L)=2                                             00008300
    8 CONTINUE                                                          00008400
C
C     REPEAT ENTIRE SIMULATION USING FAY DEMANDS
C
  399 CONTINUE                                                          RJB041896
C                                                                       00008600
      REWIND KAPE1
C
C     SET BEGINNING AND ENDING YEARS FOR FULL SIMULATION
C
      ISTRT = 1                                                         RJB042996
      NYR = NYEAR                                                       RJB042996
      IF (IFLYLD .NE. 1 .AND. IFLYLD .NE. 2) GO TO 402                  RJB042996
C
C     SET INITIAL FIRM YIELD U.S. AND MEXICO DEMANDS
C
      DEMMUN = RATIOM * DEMNEW                                          RJB042996
      DEM2 = RATIO2 * DEMMUN                                            RJB042996
      DEM5 = DEMMUN - DEM2                                              RJB042996
      DEMIRR = DEMNEW - DEMMUN                                          RJB042996
      DEM6 = RATIO6 * DEMIRR                                            RJB042996
      DEM7 = DEMIRR - DEM6                                              RJB042996
      DEM8 = RATMX8 * DMXNEW                                            RJB042996
      DEM4 = DMXNEW - DEM8                                              RJB042996
C                                                                       00009900
C     SET BEGINNING AND ENDING YEARS OF DESIRED SIMULATION PERIOD FOR
C       FIRM YIELD ANALYSIS
C
      ISTRT = IYRST - IYEAR + 1                                          RJB042296
      NYR = IYEND - IYEAR + 1                                            RJB042296
C
C     ESTABLISH STARTING POINT FOR REPEAT CYCLE IN FIRM YIELD ANALYSIS
C       AND SET NEW DEMANDS
C
      ITER = 0                                                          RJB041796
  299 CONTINUE                                                          RJB041796
      ITER = ITER + 1                                                   RJB041796
      MAXSHT = 0                                                        RJB041796
      MEXSHT = 0                                                        RJB042996
      MINSUS = 9999999
      MINSMX = 9999999
      DEM(2) = DEM2 + ROFF                                              RJB041796
      DEM(5) = DEM5 + ROFF                                              RJB041796
      DEM(6) = DEM6 + ROFF                                              RJB041796
      DEM(7) = DEM7 + ROFF                                              RJB041796
      DEM(4) = DEM4 + ROFF                                              RJB041796
      DEM(8) = DEM8 + ROFF                                              RJB041796
C
C     REWIND INFLOW AND EVAPORATION TAPE TO FIRST YEAR
C
      REWIND KAPE1
C
C     SKIP ANNUAL RECORDS TO FIRST YEAR BEFORE SPECIFIED DROUGHT PERIOD
C
      IENDUM = ISTRT - 1                                                RJB042996
      IF (IENDUM .LE. 0) GO TO 4055                                     RJB071196
      DO 405 IY = 1, IENDUM                                             RJB042396
      CALL DATA2                                                        RJB041796
  405 CONTINUE                                                          RJB041796
 4055 CONTINUE                                                          RJB071196
C
C     ESTABLISH IRRIGATION POOL AT BEGINNING OF SIMULATION
C
      CALL STRTIR (FSTART(1),FSTART(2),IRPOL)                           RJB042996
      IRSTRT = IRPOL                                                    RJB042996
  402 CONTINUE                                                          RJB041796
```

```
C                                                                       00011000
C                             STEP 06                                   00011100
C                             NTIME=1 FOR FIRST SOLUTION                00011200
C                             BEGIN YEARLY LOOP                         00011300
      NTIME=1                                                           00011400
C                                                                       00011500
C     START YEARLY LOOP                                                 00011600
C
      DO 300 IY=ISTRT,NYR                                               00011700
      IPRTYR = IYEAR - 1 + IY                                           RJB032396
C
C     INITIALIZE VARIABLES
C
      NSHORT = 0                                                        RJB042996
      MSHORT = 0                                                        RJB042996
      DO 12 J=1,NJ                                                      00011800
      DO 112 I=1,12                                                     RJB040396
      TOTLS(J,IY,I)=0                                                   00012000
  112 CONTINUE                                                          RJB040396
      TOTLS(J,IY,5) = 9999999                                           RJB040396
   12 CONTINUE                                                          00012100
C
C     RESET INDIVIDUAL WATER RIGHTS ACCOUNTS TO ANNUAL AUTHORIZED DIVERSIONS
C
      DO 113 IW = 1,NUMWR                                               RJB092497
      MUNANB(IW) = MUNWR(IW)                                            RJB092397
      IRAANB(IW) = IRAWR(IW)                                            RJB020898
      IRBANB(IW) = IRBWR(IW)                                            RJB020898
  113 CONTINUE                                                          RJB092397
C                             STEP 07                                   00012200
C                             READ MONTHLY DATA FOR ONE YEAR            00012300
      CALL DATA2                                                        00012400
C                                                                       00012500
C                             STEP 08                                   00012600
C                             SET BEGINNING STORAGES TO STARTING AND
C                             SAVE INITIAL STORAGES EACH YEAR
      DO 14 J=1,NRES                                                    00012900
      IF (IY .EQ. ISTRT ) STEND(J)=FSTART(J)                            RJB042996
      INISTO(J,IY) = STEND(J)                                           RJB032596
   14 CONTINUE                                                          00013100
      ISTDUM = MAX(0,(STEND(1) + STEND(2) - 4600))                      RJB071196
C
C                             STEP 09                                   00013200
C                             BEGIN MONTHLY LOOP                        00013300
C     ENTER SEASONAL LOOP                                               00013400
C                                                                       00013500
      DO 200 MON=1,12                                                   00013600
C                                                                       00013700
      ITOT=0                                                            00003100
      DO 16 J=1,NJ                                                      00013800
      USE(J)=0                                                          00013900
      EVPT(J)=0                                                         00014000
      UREG(J)=0                                                         00014100
      START(J)=0                                                        00014200
C
C     CHECK FOR TEMPORARY FLOOD STORAGE DURING NON-HURRICANE SEASON (NOV-APR)
C
      IF (MON .LT. 4) GOTO 11                                           RJB031296
      IF (MON .GE. 11) GOTO 11                                          RJB031296
      RCAP(J) = RCON(J)                                                 RJB031296
      GOTO 122                                                          RJB031296
   11 RCAP(J) = RFLOOD(J)                                               RJB031296
  122 CONTINUE                                                          RJB031296
      RCAPSV(J,MON) = RCAP(J)                                           RJB031896
      ITOT=ITOT+RCAP(J)                                                 RJB031396
      DO 16 I=1,13                                                      00014300
      ICAP(J, MON,I)=0                                                  00014400
   16 CONTINUE                                                          00014500
      DO 17 L=1,NARC                                                    00014600
      FLOW(L)=0                                                         00014700
   17 CONTINUE                                                          00014800
C                                                                       00014900
C                             STEP 10                                   00015000
C                             SET INFLOWS AND DEMANDS - IF A TOTAL      00015100
C                             YEARLY DEMAND IS GIVEN USE IT X DISTRIB.  00015200
      DO 19 J=1,NJ                                                      00015300
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```
      USE(J)=IFIX(DEMON(J,MON)+ ROFF)                                   0001540
      IF(DEM(J).GT.0) USE(J)=CONDEM*DEM(J)*DEMD(J,MON)+ROFF             RJB032396
      UREG(J)=IFIX(U(J,MON)+ ROFF)                                      00015600
      START(J)=STEND(J)                                                 00015700
   19 CONTINUE                                                          00015800
C
C                            STEP 11
C                            CHECK U.S. IRRIGATION DEMAND AGAINST
C                            AVAILABLE STORAGE IN U.S. IRRIGATION POOL
C                            AND SET TEMPORARY IRRIGATION DEMANDS TO
C                            REFLECT SHORTAGE IN U.S. IRRIGATION POOL
      ISHTI6 = 0                                                        RJB30596
      ISHTI7 = 0                                                        RJB30596
      IF(IRSTRT .GE. (USE(6)+USE(7))) GO TO 18                          RJB31396
      ISHTIR = USE(6) + USE(7) - IRSTRT                                 RJB30596
      DUMMY = USE(6)                                                    RJB30596
      USERAT = DUMMY/(USE(6)+USE(7))                                    RJB30506
      DUMMY = USERAT * ISHTIR                                           RJB31196
      ISHTI6 = DUMMY + ROFF                                             RJB31196
      USE(6) = USE(6) - ISHTI6                                          RJB30596
      ISHTI7 = ISHTIR - ISHTI6                                          RJB30596
      USE(7) = USE(7) - ISHTI7                                          RJB30596
   18 CONTINUE                                                          RJB31396
C                            STEP 12                                    00016300
C                            DETERMINE RESERVOIR OPERATING RULE FOR
C                            U.S. STORAGE
      JRULUS = 2                                                        RJB091997
      JNUSMX = JRULUS                                                   RJB091997
      CALL RULE(JNUSMX)                                                 RJB30596
C
C                            STEP 12B
C                            DETERMINE RESERVOIR OPERATING RULE FOR
C                            MEXICO STORAGE
      JRULMX = 4                                                        RJB091997
      JNUSMX = JRULMX                                                   RJB091997
      CALL RULE(JNUSMX)                                                 RJB30596
C
C     SET MINIMUM U.S. AND MEXICAN FLOWS IN LINKS BELOW AMISTAD RESERVOIR
C         TO OPERATIONAL RELEASES FROM AMISTAD RESERVOIR
C
      CMIN(1) = USMNRL(IY,MON)                                          RJB071196
      CMIN(5) = MXMNRL(IY,MON)                                          RJB071196
      IF (CMIN(1) .GT. 0.9*START(1)) CMIN(1) = 0.75*START(1)            RJB071196
      IF (CMIN(5) .GT. 0.9*START(3)) CMIN(5) = 0.75*START(3)            RJB071196
      LO(1) = CMIN(1)                                                   RJB031396
      LO(5) = CMIN(5)                                                   RJB031396
C
C     SET MAXIMUM U.S. AND MEXICAN FLOWS IN LINKS BELOW AMISTAD RESERVOIR
C         TO REFLECT REQUIRED RELEASES TO SATISFY MIDDLE RIO GRANDE DEMANDS
C
      CMAX(1) = MAX(0,(USE(5)+USE(6)-UREG(5)),CMIN(1))                  RJB021098
      CMAX(5) = MAX(0,(USE(8)-UREG(8)),CMIN(5))                         RJB021098
C
C                            STEP 13                                    00016800
C                            SET BOUNDS ON INITIAL STORAGE ARCS         00016900
C                            SET BOUNDS + FLOWS ON STORAGE ARCS         00017000
C
      IAT=0
      ISUM=0                                                            00017100
      LO(NARC-3)=0                                                      00017110
      DO 28 L=L1,L2                                                     00017200
      JN=NT(L)                                                          00017300
      LO(L)=START(JN)+UREG(JN)                                          00017400
      HI(L)=LO(L)                                                       00017500
      FLOW(L)=LO(L)                                                     00017600
      ISUM=ISUM+FLOW(L)                                                 00017700
C                                                                       00017800
      NP=L+NJ                                                           00017900
      NN=L+2*NJ                                                         00018000
      IF (JN .LT. 5) GO TO 22                                           RJB031896
      IA(JN) = 0
      IB(JN) = 0
      IC(JN) = 0
      GO TO 26                                                          RJB031896
   22 CONTINUE                                                          RJB031896
C                            STEP 14                                    00018500
```

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C                             ESTIMATE EVAP FOR MONTH                      00018600
      IF (JN .NE. 1) GO TO 20                                              RJB031896
      STVG = 0.5*(START(1) + RCAP(1) + START(3) + RCAP(3))                 RJB011096
      CALL AREA(STVG,ISURA,JN)
      FRCDEN = START(1) + START(3)                                         RJB011596
      FRCSTR = START(1) / FRCDEN                                           RJB031896
      IEVP = ISURA * EVAP(1,MON) + ROFF                                    RJB031896
      IA(1) = IEVP * FRCSTR + ROFF                                         RJB031896
      IA(3) = IEVP - IA(1)                                                 RJB031896
      STVGA13 = STVG                                                       RJB011596
      ISURA13 = ISURA                                                      RJB011596
      IA1 = IA(1)                                                          RJB011596
      IA3 = IA(3)
      STVG = 0.5*(START(1) + RMIN(1) + START(3) + RMIN(3))                 RJB011096
      CALL AREA(STVG,ISURA,JN)
      IEVP = ISURA * EVAP(1,MON) + ROFF                                    RJB031896
      IB(1) = IEVP * FRCSTR + ROFF                                         RJB031896
      IB(3) = IEVP - IB(1)                                                 RJB031896
      STVGB13 = STVG                                                       RJB011596
      ISURB13 = ISURA                                                      RJB011596
      IB1 = IB(1)                                                          RJB011596
      IB3 = IB(3)
      LRUL1 = LRULE(1)                                                     RJB31896
      LRUL3 = LRULE(3)                                                     RJB031896
      STVG = 0.5*(START(1) + OPRR(LRUL1,1,MON)*RCAP(1) + START(3) +        RJB031896
     * OPRR(LRUL3,3,MON)*RCAP(3))                                          RJB31896
      CALL AREA(STVG,ISURA,JN)
      IEVP = ISURA * EVAP(1,MON) + ROFF                                    RJB031896
      IC(1) = IEVP * FRCSTR + ROFF                                         RJB031896
      IC(3) = IEVP - IC(1)                                                 RJB031896
      STVGC13 = STVG                                                       RJB011596
      ISURC13 = ISURA                                                      RJB011596
      IC1 = IC(1)                                                          RJB011596
      IC3 = IC(3)
      GOTO 21                                                              RJB010996
20    CONTINUE                                                             RJB010996
      IF (JN .NE. 2) GO TO 21                                              RJB031896
      STVG = 0.5*(START(2) + RCAP(2) + START(4) + RCAP(4))                 RJB011096
      CALL AREA(STVG,ISURA,JN)
      FRCDEN = START(2) + START(4)                                         RJB011596
      FRCSTR = START(2) / FRCDEN                                           RJB031896
      IEVP = ISURA * EVAP(2,MON) + ROFF                                    RJB031896
      IA(2) = IEVP * FRCSTR + ROFF                                         RJB031896
      IA(4) = IEVP - IA(2)                                                 RJB031896
      STVGA24 = STVG                                                       RJB011596
      ISURA24 = ISURA                                                      RJB011596
      IA2 = IA(2)                                                          RJB011596
      IA4 = IA(4)
      STVG = 0.5*(START(2) + RMIN(2) + START(4) + RMIN(4))                 RJB011096
      CALL AREA(STVG,ISURA,JN)
      IEVP = ISURA * EVAP(2,MON) + ROFF                                    RJB031896
      IB(2) = IEVP * FRCSTR + ROFF                                         RJB031896
      IB(4) = IEVP - IB(2)                                                 RJB031896
      STVGB24 = STVG                                                       RJB011596
      ISURB24 = ISURA                                                      RJB011596
      IB2 = IB(2)                                                          RJB011596
      IB4 = IB(4)
      LRUL2 = LRULE(2)                                                     RJB31896
      LRUL4 = LRULE(4)                                                     RJB31896
      STVG = 0.5*(START(2) + OPRR(LRUL2,2,MON)*RCAP(2) + START(4) +        RJB31896
     * OPRR(LRUL4,4,MON)*RCAP(4))                                          RJB31896
      CALL AREA(STVG,ISURA,JN)
      IEVP = ISURA * EVAP(2,MON) + ROFF                                    RJB031896
      IC(2) = IEVP * FRCSTR + ROFF                                         RJB031896
      IC(4) = IEVP - IC(2)                                                 RJB031896
      STVGC24 = STVG                                                       RJB011596
      ISURC24 = ISURA                                                      RJB011596
      IC2 = IC(2)                                                          RJB011596
      IC4 = IC(4)
21    CONTINUE
C                                                                          00037700
C                                                                          00037700
C     WRITE OUT TEMPORARY VALUES TO AID IN EVAP TROUBLE-SHOOTING
C
      IF (IY .GT. 0) GO TO 725
      JRES = JN
```

```
      WRITE(KOUT,721) MON, JRES,START(JRES),UREG(JRES),EVAP(JN,MON)
      WRITE(KOUT,723) STVGA13,ISURA13,IA1,IA3,STVGB13,ISURB13,IB1,IB3,  RJB011596
     3 STVGC13,ISURC13,IC1,IC3,STVGA24,ISURA24,IA2,IA4,STVGB24,ISURB24, RJB011596
     4 IB2,IB4,STVGC24,ISURC24,IC2,IC4
721   FORMAT (5X, 'MON= ', I2, 5X, 'RES NO. ', I2, 5X, 'STRT STOR= ',I9,RJB011096
     1 5X, 'UREG= ', I8, 5X, 'EVAP(JN,MON)= ', F7.3)
723   FORMAT (5X, 'STVGA13=',I7,5X,'ISURA13=',I5,5X,'IA1=',I5,
     1        5X, 'IA3=',I5,/,                                          RJB011596
     2        5X, 'STVGB13=',I7,5X,'ISURB13=',I5,5X,'IB1=',I5,          RJB011596
     3        5X, 'IB3=',I5,/,                                          RJB011596
     4        5X, 'STVGC13=',I7,5X,'ISURC13=',I5,5X,'IC1=',I5,          RJB011596
     5        5X, 'IC3=',I5,/,                                          RJB011596
     6        5X, 'STVGA24=',I7,5X,'ISURA24=',I5,5X,'IA2=',I5,          RJB011596
     7        5X, 'IA4=',I5,/,                                          RJB011596
     8        5X, 'STVGB24=',I7,5X,'ISURB24=',I5,5X,'IB2=',I5,          RJB011596
     9        5X, 'IB4=',I5,/,                                          RJB011596
     *        5X, 'STVGC24=',I7,5X,'ISURC24=',I5,5X,'IC2=',I5,          RJB011596
     *        5X, 'IC4=',I5,/)                                          RJB011596
725   CONTINUE
C                                                                       00037700
C                                                                       00018900
C                               STEP 15                                 00019000
C                               SET UP BOUNDS FOR DESIRED STORAGE ARCS  00019100
C                               BASED ON RULES - PRICE ARCS FROM RANK   00019200
C                               INPUT - CALCULATE BOUNDS FOR FINAL STORAGE00019300
C                               ARCS                                    00019400
      IAT=IAT+IA(JN)
      MINPOL=RMIN(JN)                                                   00019500
      LO(NP)=IB(JN)+MINPOL                                                  0001
      IF(LO(L).LT.LO(NP)) LO(NP)=LO(L)                                  00019700
      IF(LO(NP).LT.0) LO(NP)=0                                          00019800
      LO(NN)=0                                                          00019900
      LRUL = LRULE(JN)                                                  RJB031896
      HI(NP)=OPRR(LRUL,JN,MON)*RCAP(JN)+IC(JN)                          RJB31896
      COST(NP)=-(1000-OPRP(LRUL,JN)*10)                                 RJB30596
      HI(NN)=(1.0-OPRR(LRUL,JN,MON))*RCAP(JN)+IA(JN)-IC(JN)             RJB31896
      IF(HI(NN).LT.0) HI(NN)=0                                          00020300
      IF(HI(NP).GT.LO(NP)) GO TO 26                                     00020400
      HI(NP)=LO(NP)                                                     00020500
      HI(NN)=RCAP(JN)-HI(NP)                                            00020600
      IF(HI(NN).LT.0) HI(NN)=0                                          00020700
   26 CONTINUE                                                          00020800
      FLOW(NN)=FLOW(L)                                                  00020900
      LO(NARC-3)=LO(NARC-3)+LO(NP)                                      00020910
   28 CONTINUE                                                          00021000
C                                                                       00021100
C                               STEP 16                                 00021200
C                               SET UP BOUNDS IN MASS BALANCE ARCS      00021300
      FLOW(NARC-3)=ISUM                                                 00021400
      HI(NARC-3)=ITOT+IAT                                               00021500
      FLOW(NARC)=ISUM                                                   00021600
      HI(NARC)=FLOW(NARC)                                               00021700
      LO(NARC)=FLOW(NARC)                                               00021800
C                                                                       00021900
C                               STEP 17                                 00022000
C                               SET UP DEMAND ARCS AND PRICE            00022100
C                               ACCORDING TO RANK                       00022200
C   SET LIMITS ON DEMAND ARCS                                           00022300
      MAXD=0                                                            00022400
      DO 32 L=L7,L8                                                     00022500
      JN=NF(L)                                                          00022600
      HI(L)=USE(JN)                                                     00022700
      LRUL = LRULE(JN)                                                  RJB30596
      COST(L)=-(1000-DEMR(JN,LRUL)*10)                                  RJB30596
      MAXD=MAXD+HI(L)                                                   00022900
   32 CONTINUE                                                          00023000
      HI(NARC-1)=MAXD                                                   00023100
C                                                                       00023200
C                               STEP 18                                 00023300
C                               SET UP SPILL ARCS AND PRICE             00023400
C                               ACCORDING TO ORDER                      00023500
C   SET LIMITS ON SPILL ARCS                                            00023600
C                                                                       00023700
      MAXS=0                                                            00023800
      DO 34 L=L9,LA                                                     00023900
      JN=NF(L)                                                          00024000
```

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      NTX=0                                                             00024100
C                                                                       00024200
      DO 36 K=1,NS                                                      00024300
      IF(JN.EQ.SP(K).AND.NS.NE.0) NTX=1                                 00024400
      IF(NTX.EQ.1) GO TO 33                                             00024500
   36 CONTINUE                                                          00024600
      K=0                                                               00024700
   33 KS=K                                                              00024800
      HI(L)=ITOT*10*NTX                                                 00024900
      COST(L)=NTX*10000*(1+KS)                                          00025000
      MAXS=MAXS+HI(L)                                                   00025100
   34 CONTINUE                                                          00025200
      HI(NARC-2)=MAXS                                                   00025300
C                                                                       00025400
C                                                                       00025500
C                                                                       00025600
C                                                                       00025700
C                              STEP 19                                  00025800
C                              CALL NETWORK FLOW ALGORITHM              00025900
      CALL SUPERK                                                       00026000
      NTIME=1                                                           00026100
C                                                                       00026200
      IF(.NOT.FESIBL) GO TO 450                                         00026300
C                                                                       00026400
C                              STEP 20                                  00026500
C                              BUILD SHORTAGE ARRAY                     00026600
      DO 42 L=L7,L8                                                     00026700
      JN=NF(L)                                                          00026800
      ISHTM(JN,MON)=HI(L)-FLOW(L)                                       00026900
   42 CONTINUE                                                          00027000
C                                                                       00027100
C                                                                       00027200
C                              STEP 21                                  00027300
C                              BUILD SPILL ARRAY                        00027400
      DO 44 L=L9,LA                                                     00027500
      JN=NF(L)                                                          00027600
      ISPIL(JN,MON)=FLOW(L)                                             00027700
   44 CONTINUE                                                          00027800
C                                                                       00027900
C                                                                       00028000
C                              STEP 22                                  00028100
C                              CALCULATE FINAL RESERVOIR STORAGE
C                              AND SET MONTHLY EVAPORATION ESTIMATE
      DO 58 L=L3,L4                                                     00028300
      JN=NF(L)                                                          00028400
      LN=L+NJ                                                           00028500
      STEND(JN)=FLOW(L)+FLOW(LN)                                        00028700
      EVPT(JN)=IA(JN)
      IF(FLOW(L).EQ.0) EVPT(JN)=IB(JN)
      IF(FLOW(LN).EQ.0) EVPT(JN)=IC(JN)
      IF(STEND(JN) .LT. 0) STEND(JN) = 0
   58 CONTINUE                                                          00028800
C                                                                       00029300
C                              STEP 23                                  00029400
C                              CALCULATE TOTAL MONTHLY EVAPORATION AND
C                              DETERMINE TOTAL RESERVOIR ENDING STORAGE
C                              FOR AMISTAD AND FALCON RESERVOIRS
      DO 60 L=1, 2                                                      RJB011196
      IF (IY.LT.0 .AND. L.EQ.1) WRITE(KOUT,698)
698   FORMAT(5X,'IY,MON,JN,START(JN),START(JN+2),STEND(JN),STEND(JN+2)',
     * 'EVPT(JN),EVPT(JN+2),EVP,STEMP,STVG,ISURA,ETEMP')
      ICHK=0
      JN = L                                                            RJB011196
      EVP = EVPT(JN) + EVPT(JN+2)                                       RJB011196
      STEMP = STEND(JN) + STEND(JN+2)                                   RJB011196
   63 IF (STEMP .GT. (RCAP(JN)+RCAP(JN+2))) STEMP = RCAP(JN)+RCAP(JN+2) RJB011196
      STVG = (STEMP+ START(JN) + START(JN+2))*0.5                       RJB011196
      CALL AREA(STVG,ISURA,JN)
      ETEMP=0.0
      IAREA(JN)=ISURA
      IAREA(JN+2)=ISURA
      IF(EVAP(JN,MON))69,1117,69                                        RJB031896
  69  ETEMP=ISURA*EVAP(JN,MON)+ROFF
      IF (IY.LT.0) WRITE(KOUT,699) IY,MON,JN,START(JN),START(JN+2),
     *   STEND(JN),STEND(JN+2),EVPT(JN),EVPT(JN+2),EVP,STEMP,STVG,
     *                ISURA,ETEMP
```

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 699 FORMAT (5X,3I5,6I10,F10.0,3I10,F10.0)
 61  IF(ABS(ETEMP - EVP).LT.5.0)GO TO 1111
     ICHK=ICHK + 1
     IF(ICHK.LE.100)GO TO 64
     WRITE(KOUT,1013) JN,ETEMP,EVP,ISURA,START(JN),STEND(JN)
     WRITE(*,1013) JN,ETEMP,EVP,ISURA,START(JN),STEND(JN)
1013 FORMAT(5X,'JN=',I3,5X,'ETEMP=',F12.4,5X,'EVP=',
    *F10.4,5X,'ISURA=',I10, 'START =',I10,'STEND = ',I10)
     WRITE(KOUT,1017) IY,MON,STEMP
     WRITE(*,1017) IY,MON,STEMP
1017 FORMAT(//3I10)
     CLOSE(KOUT)
     STOP 'PROGRAM TERMINATED IN OPRATE AT STATEMENT 64'
 64  CONTINUE
     EVP=ETEMP
     STEMP = STEND(JN) + STEND(JN+2) - EVP                         RJB011196
     IF(STEMP.LT.0) STEMP=0
     GO TO 63
1111 CONTINUE                                                      RJB031796
C
C    ALLOCATE FINAL EVAPORATION TO U.S. AND MEXICO STORAGE IN AMISTAD
C      AND FALCON RESERVOIRS
C
     LASTEV = ETEMP                                                RJB031796
     ICHK = 0                                                      RJB031696
     FRACT1 = 0.5*(START(JN) + STEND(JN))                          RJB031396
     FRACT2 = 0.5*(START(JN)+STEND(JN)) + 0.5*(START(JN+2)+STEND(JN+2))RJB031396
     FRACT1 = FRACT1/FRACT2                                        RJB011596
     EVPJN = FRACT1 * LASTEV + ROFF                                RJB031796
     EVPJN2 = LASTEV - EVPJN                                       RJB031796
     STMJN = STEND(JN) - EVPJN                                     RJB031796
     IF (STMJN .LT. 0) STMJN = 0                                   RJB011196
     IF (STMJN .GT. RCAP(JN)) STMJN = RCAP(JN)                     RJB011196
     STMJN2 = STEND(JN+2) - EVPJN2                                 RJB031796
     IF (STMJN2 .LT. 0) STMJN2 = 0                                 RJB011196
     IF (STMJN2 .GT. RCAP(JN+2)) STMJN2 = RCAP(JN+2)               RJB011196
1113 CONTINUE                                                      RJB031696
     ICHK = ICHK + 1                                               RJB031696
     FRACT1 = 0.5*(START(JN) + STMJN)                              RJB031396
     FRACT2 = 0.5*(START(JN)+STMJN) + 0.5*(START(JN+2)+STMJN2)     RJB031396
     FRACT1 = FRACT1/FRACT2                                        RJB011596
     EVPT(JN) = LASTEV * FRACT1 + ROFF                             RJB031796
     EVPT(JN+2) = LASTEV - EVPT(JN)                                RJB031796
     STMJN = STEND(JN) - EVPT(JN)                                  RJB031796
     IF (STMJN .LT. 0) STMJN = 0                                   RJB031796
     IF (STMJN .GT. RCAP(JN)) STMJN = RCAP(JN)                     RJB031796
     STMJN2 = STEND(JN+2) - EVPT(JN+2)                             RJB031796
     IF (STMJN2 .LT. 0) STMJN2 = 0                                 RJB031796
     IF (STMJN2 .GT. RCAP(JN+2)) STMJN2 = RCAP(JN+2)               RJB031796
     IF(ICHK.LE.100) GO TO 1114                                    RJB031696
     WRITE(KOUT,1213) JN,EVPJN,EVPJN2,EVPT(JN),EVPT(JN+2),STMJN,
    * STMJN2
1213 FORMAT(5X,'JN=',I3,5X,2F12.1,4I12)
     WRITE(KOUT,1217) IY,MON
1217 FORMAT(//3I10)
     CLOSE(KOUT)
     STOP 'PROGRAM TERMINATED IN OPRATE AT STATEMENT 1114'
1114 IF ((EVPT(JN) - EVPJN) .GT. 5) GO TO 1115                     RJB031796
     IF ((EVPT(JN+2) - EVPJN2) .GT. 5) GO TO 1115                  RJB031796
     STEND(JN) = STEND(JN) - EVPT(JN)                              RJB031796
     STEND(JN+2) = STEND(JN+2) - EVPT(JN+2)                        RJB031796
C
C    LIMIT FINAL STORAGE VALUES FOR U.S. AND MEXICO WATER IN AMISTAD
C      RESERVOIR TO SPECIFIED MAXIMUM CAPACITIES AND ADJUST FLOWS
C      ACCORDINGLY
C
     IF (JN .EQ. 2) GO TO 1117                                     RJB031896
     IF (STEND(1) .LE. RCAP(1)) GO TO 1116                         RJB040396
     ISTCOR = STEND(1) - RCAP(1)                                   RJB040396
     STEND(1) = RCAP(1)                                            RJB040396
     FLOW(7) = FLOW(7) + ISTCOR                                    RJB021098
     STEND(2) = STEND(2) + ISTCOR                                  RJB040396
     IF (ISPIL(2,MON) .GT. 0) ISPIL(2,MON) = ISPIL(2,MON) + ISTCOR RJB040396
1116 CONTINUE                                                      RJB031796
     IF (STEND(3) .LE. RCAP(3)) GO TO 60                           RJB040396
     ISTCOR = STEND(3) - RCAP(3)                                   RJB040396
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      STEND(3) = RCAP(3)                                                RJB040396
      FLOW(8) = FLOW(8) + ISTCOR                                        RJB021098
      STEND(4) = STEND(4) + ISTCOR                                      RJB040396
      IF (ISPIL(4,MON) .GT. 0) ISPIL(4,MON) = ISPIL(4,MON) + ISTCOR     RJB040396
      GO TO 60                                                          RJB031796
C
C     BALANCE FINAL STORAGE AND SPILL VALUES FOR U.S. AND MEXICO WATER
C       IN FALCON RESERVOIR
C
 1117 CONTINUE                                                          RJB031896
      IF (STEND(2) .LE. RCAP(2)) GO TO 1118                             RJB040396
      ISPCOR = STEND(2) - RCAP(2)                                       RJB040396
      ISPIL(2,MON) = ISPIL(2,MON) + ISPCOR                              RJB040396
      STEND(2) = STEND(2) - ISPCOR                                      RJB040396
      GO TO 1119                                                        RJB040396
 1118 CONTINUE                                                          RJB031896
      IF (ISPIL(2,MON) .LE. 0) GO TO 1119                               RJB040396
      ISPCOR = MIN(ISPIL(2,MON),(RCAP(2) - STEND(2)))                   RJB040396
      STEND(2) = STEND(2) + ISPCOR                                      RJB040396
      ISPIL(2,MON) = ISPIL(2,MON) - ISPCOR                              RJB040396
 1119 CONTINUE                                                          RJB031896
      IF (STEND(4) .LT. RCAP(4)) GO TO 1120                             RJB040396
      ISPCOR = STEND(4) - RCAP(4)                                       RJB040396
      ISPIL(4,MON) = ISPIL(4,MON) + ISPCOR                              RJB040396
      STEND(4) = STEND(4) - ISPCOR                                      RJB040396
      GO TO 60                                                          RJB040396
 1120 CONTINUE                                                          RJB031896
      IF (ISPIL(4,MON) .LE. 0) GO TO 60                                 RJB040396
      ISPCOR = MIN(ISPIL(4,MON),(RCAP(4) - STEND(4)))                   RJB040396
      STEND(4) = STEND(4) + ISPCOR                                      RJB040396
      ISPIL(4,MON) = ISPIL(4,MON) - ISPCOR                              RJB040396
      GO TO 60                                                          RJB031896
C
C     RESET ESTIMATED EVAPORATION LOSSES AND RETURN FOR ANOTHER CYCLE
C       OF EVAPORATION ALLOCATION CALCULATIONS
C
 1115 CONTINUE                                                          RJB031796
      EVPJN = EVPT(JN)                                                  RJB031796
      EVPJN2 = EVPT(JN+2)                                               RJB031796
      GO TO 1113                                                        RJB031796
   60 CONTINUE                                                          00030300
C
C     RESTORE FULL IRRIGATION DEMANDS FOLLOWING TEMPORARY REDUCTIONS
C       FOR SHORTAGES DUE TO INSUFFICIENT U.S. IRRIGATION POOL STORAGE
C
      USE(6) = USE(6) + ISHTI6                                          RJB30596
      USE(7) = USE(7) + ISHTI7                                          RJB30596
C
C     ADJUST U.S. IRRIGATION DEMAND SHORTAGES TO REFLECT INSUFFICIENT
C          U.S. IRRIGATION POOL STORAGE
C
      ISHTM(6,MON) = ISHTM(6,MON) + ISHTI6                              RJB031196
      ISHTM(7,MON) = ISHTM(7,MON) + ISHTI7                              RJB031196
C
C     DETERMINE U.S. FLOOD SPILL PORTION AND RELEASE PORTION OF TOTAL
C       U.S. OUTFLOW FROM AMISTAD RESERVOIR
C
      RLUSAM = 0                                                        RJB021098
      ISPUSA = 0                                                        RJB021098
      IF (STEND(1) .GE. (RCAP(1)-1)) ISPUSA = FLOW(7)                   RJB021098
      ISPIL(1,MON) = ISPUSA                                             RJB021098
      IF (ISPUSA .EQ. 0) RLUSAM = FLOW(7)                               RJB021098
      RLUSAM = RLUSAM + FLOW(1)                                         RJB021098
C
C     DETERMINE MEXICO FLOOD SPILL PORTION AND RELEASE PORTION OF TOTAL
C       MEXICO OUTFLOW FROM AMISTAD RESERVOIR
C
      RLMXAM = 0                                                        RJB021098
      ISPMXA = 0                                                        RJB021098
      IF (STEND(3) .GE. (RCAP(3)-1)) ISPMXA = FLOW(8)                   RJB021098
      ISPIL(3,MON) = ISPMXA                                             RJB021098
      IF (ISPMXA .EQ. 0) RLMXAM = FLOW(8)                               RJB021098
      RLMXAM = RLMXAM + FLOW(5)                                         RJB021098
C
C     DETERMINE U.S. RELEASE PORTION OF TOTAL U.S. OUTFLOW FROM
C       FALCON RESERVOIR
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C
      RLUSFL = USE(2) - ISHTM(2,MON) + FLOW(4)                          RJB031596
C
C     DETERMINE MEXICO RELEASE PORTION OF TOTAL MEXICO OUTFLOW FROM
C       FALCON RESERVOIR
C
      RLMXFL = USE(4) - ISHTM(4,MON)                                    RJB031596
C
C     TRANSFER EXCESS INFLOWS FROM COUNTRY WITH FULL CONSERVATION POOL
C       TO COUNTRY WITH AVAILABLE CONSERVATION STORAGE CAPACITY
C
      TRAUTM = 0                                                        RJB031496
      TRAMTU = 0                                                        RJB031496
      TRFUTM = 0                                                        RJB031496
      TRFMTU = 0                                                        RJB031496
C
C     SHIFT U.S. SPILLS FROM AMISTAD RESERVOIR TO MEXICO STORAGE, IF POSSIBLE
C     NOTE:  UP TO 120,000 ACRE-FEET/MONTH CAN BE PASSED DOWNSTREAM TO FALCON
C            RESERVOIR PROVIDED ADITIONAL SPILLS DO NOT OCCUR.  THE 120,000
C            ACRE-FEET/MONTH AMOUNT IS ABOUT EQUAL TO 2,000 CFS, WHICH IS
C            ASSUMED TO BE THE MAXIMUM AMOUNT THAT CAN BE RELEASED BY EITHER
C            COUNTRY THROUGH ITS PENSTOCKS AT AMISTAD DAM.
C
C
      IF (ISPUSA .LE. 0) GO TO 120                                      RJB021098
      IF (STEND(3) .GE. RCAP(3)) GOTO 120                               RJB031396
      MAXSPL = MAX(0,(120000-FLOW(1)))                                  RJB021098
      TRAMAX = MAX(0,(ISPUSA-MAXSPL))                                   RJB021098
      TRAUTM = MIN(TRAMAX,(RCAP(3)-STEND(3)))                           RJB031396
      ISPIL(1,MON) = ISPUSA - TRAUTM                                    RJB031496
      FLOW(7) = FLOW(7) - TRAUTM                                        RJB021098
      STEND(3) = STEND(3) + TRAUTM                                      RJB021098
      ISTRED = MAX(0,(TRAUTM-ISPIL(2,MON)))                             RJB021098
      STEND(2) = STEND(2) - ISTRED                                      RJB021098
      ISPIL(2,MON) = ISPIL(2,MON) - (TRAUTM-ISTRED)                     RJB021098
      GOTO 130                                                          RJB031396
  120 CONTINUE
C
C     SHIFT MEXICO SPILLS FROM AMISTAD RESERVOIR TO U.S. STORAGE, IF POSSIBLE
C
      IF (ISPMXA .LE. 0) GOTO 130                                       RJB021098
      IF (STEND(1) .GE. RCAP(1)) GOTO 130                               RJB031396
      MAXSPL = MAX(0,(120000-FLOW(5)))                                  RJB021098
      TRAMAX = MAX(0,(ISPMXA-MAXSPL))                                   RJB021098
      TRAMTU = MIN(TRAMAX,(RCAP(1)-STEND(1)))                           RJB031396
      ISPIL(3,MON) = ISPMXA - TRAMTU                                    RJB031496
      FLOW(8) = FLOW(8) - TRAMTU                                        RJB021098
      STEND(1) = STEND(1) + TRAMTU                                      RJB021098
      ISTRED = MAX(0,(TRAMTU-ISPIL(4,MON)))                             RJB021098
      STEND(4) = STEND(4) - ISTRED                                      RJB021098
      ISPIL(4,MON) = ISPIL(4,MON) - (TRAMTU-ISTRED)                     RJB021098
C
C     SHIFT U.S. SPILLS FROM FALCON TO MEXICO STORAGE, IF POSSIBLE
C
  130 CONTINUE                                                          RJB031396
      IF (ISPIL(2,MON) .EQ. 0) GOTO 140                                 RJB031396
      IF (ISPIL(4,MON) .GT. 0) GOTO 140                                 RJB031396
      TRFUTM = MIN(ISPIL(2,MON), (RCAP(4)-STEND(4)))                    RJB031396
      ISPIL(2,MON) = ISPIL(2,MON) - TRFUTM                              RJB031396
      STEND(4) = STEND(4) + TRFUTM                                      RJB031396
      GOTO 150                                                          RJB031396
C
C     SHIFT MEXICO SPILLS FROM FALCON RESERVOIR TO U.S. STORAGE, IF POSSIBLE
C
  140 CONTINUE                                                          RJB031396
      IF (ISPIL(4,MON) .EQ. 0) GOTO 150                                 RJB031396
      IF (ISPIL(2,MON) .GT. 0) GOTO 150                                 RJB031396
      TRFMTU = MIN(ISPIL(4,MON), (RCAP(2)-STEND(2)))                    RJB031396
      ISPIL(4,MON) = ISPIL(4,MON) - TRFMTU                              RJB031396
      STEND(2) = STEND(2) + TRFMTU                                      RJB031396
  150 CONTINUE                                                          RJB031396
C
C     PERFORM U.S. WATER ACCOUNTING FOR RESERVOIR STORAGE ACCORDING TO
C       8/26/87 TNRCC RIO GRANDE RULES
C
      ISTRUS(MON) = ISTDUM                                              RJB30196
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      ITOTQS(MON) = UREG(1) + UREG(5)                                   RJB30196
      ITOTMD(MON) = USE(5) + USE(2)                                     RJB31196
      ITOTID(MON) = USE(6) + USE(7)                                     RJB31196
      ITOTSH(MON) = ISHTM(5,MON) + ISHTM(6,MON) + ISHTM(2,MON)          RJB30196
     * + ISHTM(7,MON)                                                   RJB31196
      ITOTEV(MON) = EVPT(1) + EVPT(2)                                   RJB30196
      STORUS(IY,MON) = MAX(0,(STEND(1) + STEND(2) - 4600))              RJB071196
      ISTDUM = STORUS(IY,MON)                                           RJB30196
      DUMMY = STEND(1) + STEND(2)                                       RJB020898
      DUMMI = RCON(1) + RCON(2)                                         RJB020898
      PCTUSC(MON) = 100 * DUMMY / DUMMI                                 RJB31896
      IF (PCTUSC(MON) .GT. 100.) PCTUSC(MON) = 100.                     RJB031896
C
C     NOTE:  AS SPECIFIED IN THE ROM DATA INPUT FILE, USE(7) IS THE RELEASE
C            MADE FROM FALCON RESERVOIR TO SATISFY IRRIGATION DEMANDS IN
C            THE LOWER RIO GRANDE VALLEY, BUT FOR ACCOUNTING PURPOSES, DEBITS
C            AGAINST THE IRRIGATION POOL MUST REFLECT THE RIVER DIVERSION AMOUNTS
C            CHARGED AGAINST INDIVIDUAL WATER RIGHTS.  THEREFORE, FOR ACCOUNTING
C            PURPOSES IN THE ROM, THE AMOUNT OF IRRIGATION DIVERSIONS FOR THE
C            LOWER RIO GRANDE IS TAKEN AS 92% OF THE U. S. FALCON RELEASES
C            IN ORDER TO REFLECT THE EFFECTS OF AVERAGE CHANNEL LOSSES FROM
C            FALCON DAM TO THE INDIVIDUAL DIVERTERS DOWNSTREAM.  THIS
C            ADJUSTMENT IS NOT NECESSARY FOR USE(6) SINCE IT REPRESENTS THE
C            ACTUAL DIVERSIONS FROM THE RIVER BY MIDDLE RIO GRANDE IRRIGATORS.
C
      IRRDIV(MON) = (USE(6)-ISHTM(6,MON)) + 0.92*(USE(7)-ISHTM(7,MON))  RJB020998
      MNPOOL(MON) = MAXMPL                                              RJB22996
      IRAPOS(IY,MON) = 0                                                RJB22996
      IRANEG(IY,MON) = 0                                                RJB22996
      EXCESS(MON) = 0                                                   RJB22996
      IRPOOL(IY,MON) = IRSTRT - IRRDIV(MON)                             RJB22996
C     TNRCC STEP 1
      STOTMP = STORUS(IY,MON) - MAXMPL                                  RJB22996
      IF (STOTMP .GT. 0) GO TO 205                                      RJB22996
      MNPOOL(MON) = STORUS(IY,MON)                                      RJB22996
      IRANEG(IY,MON) = IRPOOL(IY,MON)                                   RJB020898
      OPRESV(IY,MON) = 0                                                RJB22996
      GO TO 250                                                         RJB020898
C     TNRCC STEP 2
205   CONTINUE                                                          RJB22996
      STOTMP = STOTMP - IRPOOL(IY,MON)                                  RJB22996
      IDUMMY = (380000. * PCTUSC(MON) / 100.) + ROFF                    RJB020898
      OPRESV(IY,MON) = MAX(IDUMMY,275000)                               RJB020898
      OPRESV(IY,MON) = MIN(OPRESV(IY,MON),STOTMP)                       RJB020898
      IF (STOTMP .GE. 275000) GO TO 210                                 RJB020898
      IF (STOTMP .GE. 150000) GO TO 206                                 RJB020898
      GO TO 220                                                         RJB020898
  206 CONTINUE                                                          RJB020898
      OPRESV(IY,MON) = STOTMP                                           RJB22996
      GO TO 260                                                         RJB020898
220   CONTINUE                                                          RJB22996
      OPRESV(IY,MON) = 150000                                           RJB22996
      IRANEG(IY,MON) = 150000 - STOTMP                                  RJB22996
      GO TO 250                                                         RJB22996
210   CONTINUE                                                          RJB22996
      AVAILA = STOTMP - OPRESV(IY,MON)                                  RJB22996
      IRAPOS(IY,MON) = AVAILA                                           RJB22996
      IF (AVAILA .LT. 50000) IRAPOS(IY,MON) = 0                         RJB22996
250   CONTINUE                                                          RJB22996
      IRPOOL(IY,MON) = IRPOOL(IY,MON) + IRAPOS(IY,MON) - IRANEG(IY,MON) RJB31196
      IRDUM = IRPOOL(IY,MON)                                            RJB31196
      IF (IRDUM .LT. 0) GOTO 261                                        RJB31196
      IF (IRDUM .LE. MAXIPL) GOTO 262                                   RJB31196
      IRPOOL(IY,MON) = MAXIPL                                           RJB31196
      IRAPOS(IY,MON) = IRAPOS(IY,MON) - (IRDUM - MAXIPL)                RJB31196
      GOTO 262                                                          RJB31196
  261 CONTINUE                                                          RJB31196
      IRPOOL(IY,MON) = 0                                                RJB31196
      IRANEG(IY,MON) = IRANEG(IY,MON) + IRDUM                           RJB31196
  262 CONTINUE                                                          RJB31196
      EXCESS(MON) = STORUS(IY,MON) - MNPOOL(MON) - IRPOOL(IY,MON)       RJB30596
     & - OPRESV(IY,MON)                                                 RJB22996
  260 CONTINUE                                                          RJB22996
      DUMIR = IRPOOL(IY,MON)                                            RJB032396
      DUMMXI = MAXIPL                                                   RJB032396
      PCTUSI(MON) = 100 * DUMIR / DUMMXI                                RJB032396
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      IRSTRT = IRPOOL(IY,MON)                                           RJB22996
C
C     IF FIRM ANNUAL YIELD ANALYSIS, DO NOT PERFORM INDIVIDUAL WATER
C       RIGHTS ACCOUNTING
      IF (IFLYLD.EQ.1 .OR. IFLYLD.EQ.2) GO TO 268
C
C     PERFORM INDIVIDUAL WATER RIGHTS ACCOUNTING FOR THREE DIVERTERS
C       ACCORDING TO 8/26/87 TNRCC RIO GRANDE RULES
C
      RATEA(MON) = 0                                                    RJB092597
      RATEB(MON) = 0                                                    RJB092597
      IF (IRAPOS(IY,MON).EQ.0 .AND. IRANEG(IY,MON).EQ.0) GO TO 269      RJB092597
C     ESTABLISH ALLOCATION RATE FOR POSITIVE IRRIGATION ALLOCATIONS
      RATEPB = IRAPOS(IY,MON)/WPALLC                                    RJB092397
      RATEPA = 1.7 * RATEPB                                             RJB092397
C     ESTABLISH ALLOCATION RATE FOR NEGATIVE IRRIGATION ALLOCATIONS
      DUM1 = IRANEG(IY,MON)                                             RJB092397
      DUM2 = IRPOOL(IY,MON)                                             RJB092397
      RATENI = 0                                                        RJB092597
      IF (DUM2 .GT. 0) RATENI = DUM1/DUM2                               RJB092597
  269 CONTINUE                                                          RJB092597
C     ENTER WATER RIGHTS ACCOUNTING LOOP FOR THREE INDIVIDUAL DIVERTERS
      DO 270 IW = 1, NUMWR                                              RJB092497
C     DEDUCT MONTHLY DIVERSIONS FROM WATER RIGHTS BALANCES AND CALCULATE SHORTAGES
      IRAWRB(IW) = IRAWRB(IW) - IRAMND(IW,IY,MON)                       RJB092397
      IRBWRB(IW) = IRBWRB(IW) - IRBMND(IW,IY,MON)                       RJB092397
      IRASHT(IW,IY,MON) = MAX(0,-IRAWRB(IW))                            RJB092397
      IRBSHT(IW,IY,MON) = MAX(0,-IRBWRB(IW))                            RJB092397
      MUNANB(IW) = MUNANB(IW) - MUNMND(IW,IY,MON)                       RJB092397
      IRAANB(IW) = IRAANB(IW) - (IRAMND(IW,IY,MON)-IRASHT(IW,IY,MON))   RJB092397
      IRBANB(IW) = IRBANB(IW) - (IRBMND(IW,IY,MON)-IRBSHT(IW,IY,MON))   RJB092397
      MUNSHT(IW,IY,MON) = MAX(0,-MUNANB(IW))                            RJB092397
      IRASTD = MAX(0,-IRAANB(IW))                                       RJB092397
      IRBSTD = MAX(0,-IRBANB(IW))                                       RJB092397
      MUNANB(IW) = MUNANB(IW) + MUNSHT(IW,IY,MON)                       RJB092397
      IRAANB(IW) = IRAANB(IW) + IRASTD                                  RJB092397
      IRBANB(IW) = IRBANB(IW) + IRBSTD                                  RJB092397
      IRASHT(IW,IY,MON) = IRASHT(IW,IY,MON) + IRASTD                    RJB092397
      IRBSHT(IW,IY,MON) = IRBSHT(IW,IY,MON) + IRBSTD                    RJB092397
      IRAWRB(IW) = IRAWRB(IW) + IRASHT(IW,IY,MON)                       RJB092397
      IRBWRB(IW) = IRBWRB(IW) + IRBSHT(IW,IY,MON)                       RJB092397
C
C     MAKE POSITIVE IRRIGATION ALLOCATIONS, IF REQUIRED
C
      IF (IRAPOS(IY,MON) .EQ. 0) GO TO 271                              RJB092397
      RATEA(MON) = RATEPA                                               RJB092597
      RATEB(MON) = RATEPB                                               RJB092597
      AIRDUM = RATEPA * IRAWR(IW)                                       RJB092397
      BIRDUM = RATEPB * IRBWR(IW)                                       RJB092397
      AIRWR = 1.41 * IRAWR(IW)                                          RJB092597
      BIRWR = 1.41 * IRBWR(IW)                                          RJB092597
      AIRDUM = MIN((AIRDUM+IRAWRB(IW)),AIRWR)                           RJB092597
      BIRDUM = MIN((BIRDUM+IRBWRB(IW)),BIRWR)                           RJB092597
      IRAALC(IW,IY,MON) = AIRDUM + 0.499 - IRAWRB(IW)                   RJB092597
      IRBALC(IW,IY,MON) = BIRDUM + 0.499 - IRBWRB(IW)                   RJB092597
      IRAWRB(IW) = AIRDUM + 0.499                                       RJB092597
      IRBWRB(IW) = BIRDUM + 0.499                                       RJB092597
      GO TO 272                                                         RJB092597
C
C     MAKE NEGATIVE IRRIGATION ALLOCATIONS, IF REQUIRED
C
  271 CONTINUE                                                          RJB092597
      IF (IRANEG(IY,MON) .EQ. 0) GO TO 272                              RJB092397
      RATEA(MON) = RATENI                                               RJB092597
      RATEB(MON) = RATENI                                               RJB092597
      IRAALC(IW,IY,MON) = RATENI * IRAWRB(IW) + 0.499                   RJB092397
      IRBALC(IW,IY,MON) = RATENI * IRBWRB(IW) + 0.499                   RJB092397
      IRAWRB(IW) = IRAWRB(IW) - IRAALC(IW,IY,MON)                       RJB092397
      IRBWRB(IW) = IRBWRB(IW) - IRBALC(IW,IY,MON)                       RJB092397
      IRAALC(IW,IY,MON) = -1 * IRAALC(IW,IY,MON)                        RJB092397
      IRBALC(IW,IY,MON) = -1 * IRBALC(IW,IY,MON)                        RJB092397
  272 CONTINUE                                                          RJB092597
      MNANBP(IW,MON) = MUNANB(IW)                                       RJB092597
      IAANBP(IW,MON) = IRAANB(IW)                                       RJB092597
      IBANBP(IW,MON) = IRBANB(IW)                                       RJB092597
      IAWRBP(IW,MON) = IRAWRB(IW)                                       RJB092597
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      IBWRBP(IW,MON) = IRBWRB(IW)                                       RJB092597
  270 CONTINUE                                                          RJB09239
  268 CONTINUE
C
C                            STEP 25                                    00031000
C                            BUILD PRINT-ARRAY WITH MONTHY DATA         00031100
      DO 72 J=1,NRES                                                    00031200
      ICAP(J,MON,1)=UREG(J)                                             RJB021496
      ICAP(J,MON,7)=USE(J)                                              00031500
      ICAP(J,MON,5)=IAREA(J) + ROFF                                     00031600
      ICAP(J,MON,6)=EVPT(J)                                             00031700
      ICAP(J,MON,8)=ISHTM(J,MON)                                        00031800
      ICAP(J,MON,11)=ISPIL(J,MON)                                       00031900
      ICAP(J,MON,12)=STEND(J)                                           00032000
      ICAP(J,MON,9)=0                                                   RJB30196
      ICAP(J,MON,10)=0                                                  RJB30196
      LRUL = LRULE(J)                                                   RJB201098
      TARGST = OPRR(LRUL,J,MON)*RCAP(J) + 0.499                         RJB021098
      ICAP(J,MON,13) = TARGST                                           RJB021098
      IDN=0                                                             00032200
      IUP=0                                                             00032300
      IPI=0                                                             00032400
      IPO=0                                                             00032500
C                                                                       00032600
C                            STEP 26                                    00032700
C                            SET UP UPSTREAM AND DOWNSTREAM FLOWS       00032800
      IF(NR.EQ.0) GO TO 65                                              00032900
      DO 66 L=1,NR                                                      00033000
      LNKFLO(L,MON)=FLOW(L)                                             00033100
   66 CONTINUE                                                          00033400
C                                                                       00033800
   65 IF(NC.EQ.0) GO TO 67                                              00033900
      DO 68 L=LB,NL                                                     00034000
      LNKFLO(L,MON)=FLOW(L)                                             00034100
   68 CONTINUE                                                          00034400
   67 CONTINUE                                                          00034500
   72 CONTINUE
C                                                                       00034800
C                            STEP 27                                    00034900
C                            SET RIO GRANDE OUTPUT VARIABLES
C                                                                       00036700
      ICAP(1,MON,4)  = RLUSAM                                           RJB03196
      ICAP(2,MON,4)  = RLUSFL                                           RJB031596
      ICAP(3,MON,4)  = RLMXAM                                           RJB03196
      ICAP(4,MON,4)  = RLMXFL                                           RJB031596
      ICAP(1,MON,3)  = TRAMTU - TRAUTM                                  RJB031496
      ICAP(2,MON,3)  = TRFMTU - TRFUTM                                  RJB031496
      ICAP(3,MON,3)  = TRAUTM - TRAMTU                                  RJB031496
      ICAP(4,MON,3)  = TRFUTM - TRFMTU                                  RJB031496
      ICAP(2,MON,1)  = UREG(5)                                          RJB31496
      ICAP(4,MON,1)  = UREG(8)                                          RJB31496
      ICAP(1,MON,2)  = UREG(1)                                          RJB031896
      ICAP(2,MON,2)  = FLOW(3) + FLOW(7)                                RJB021198
      ICAP(3,MON,2)  = UREG(3)                                          RJB031896
      ICAP(4,MON,2)  = FLOW(6) + FLOW(8)                                RJB021198
      ICAP(1,MON,7)  = USE(5)                                           RJB30196
      ICAP(3,MON,7)  = USE(8)                                           RJB30196
      ICAP(1,MON,8)  = ISHTM(5,MON)                                     RJB30196
      ICAP(3,MON,8)  = ISHTM(8,MON)                                     RJB30196
      ICAP(1,MON,9)  = USE(6)                                           RJB30196
      ICAP(2,MON,9)  = USE(7)                                           RJB30196
      ICAP(1,MON,10)  = ISHTM(6,MON)                                    RJB30196
      ICAP(2,MON,10)  = ISHTM(7,MON)                                    RJB30196
C                                                                       00036800
C                            STEP 28                                    00036900
C                            ADD MONTHLY AMOUNTS FOR YEAR TOTALS        00037000
      NSHORT = NSHORT + ISHTM(5,MON) + ISHTM(2,MON) + ISHTM(6,MON)      RJB02996
     *                + ISHTM(7,MON)                                    RJB042996
      MSHORT = MSHORT + ISHTM(4,MON) + ISHTM(8,MON)                     RJB042996
      IF ((STEND(1)+STEND(2)) .LT. MINSUS) MINSUS = STEND(1) + STEND(2)
      IF ((STEND(3)+STEND(4)) .LT. MINSMX) MINSMX = STEND(3) + STEND(4)
      DO 82 JN=1,NJ                                                     00037100
      IF(MON.EQ.12) TOTLS(JN,IY,12)=STEND(JN)                           00037300
      IF (STEND(JN).LT.TOTLS(JN,IY,5)) TOTLS(JN,IY,5) = STEND(JN)       RJB031996
      DO 84 I=1,4                                                       RJB032396
      TOTLS(JN,IY,I)=TOTLS(JN,IY,I)+ICAP(JN,MON,I)                      00037500
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   84 CONTINUE                                                          00037600
      DO 83 I=6,11                                                      RJB032396
      TOTLS(JN,IY,I)=TOTLS(JN,IY,I)+ICAP(JN,MON,I)                      00037500
   83 CONTINUE                                                          00037600
   82 CONTINUE                                                          RJB032396
      GO TO 823
C                                                                       00037700
C     WRITE OUT TEMPORARY VALUES TO AID IN TROUBLE-SHOOTING
C
      DO 888 J=1,NRES
      WRITE(KOUT,818) MON,(ICAP(J,MON,I),I=1,5),EVAP(J,MON),             RJB30196
     1 (ICAP(J,MON,I),I=6,12)                                           RJB30196
  818 FORMAT(4X,I2,2X,5I9,2X,F5.2,2X,I6,2I9,4I9,I10)                    RJB30196
  888 CONTINUE
      DO 820 JRES=1, NRES                                               RJB011096
      WRITE(KOUT,821) MON, JRES,START(JRES),UREG(JRES),ICAP(JRES,MON,3),RJB011096
     1 USE(JRES), IAREA(JRES)
      WRITE(KOUT,822) EVPT(JRES), ISHTM(JRES,MON), ISPIL(JRES,MON),     RJB011096
     2 STEND(JRES)
821   FORMAT (5X, 'MON= ', I2, 5X, 'RES NO. ', I2, 5X, 'STRT STOR= ',I9,RJB011096
     1 5X, 'UREG= ', I8, 5X, 'UPSPIL= ', I8, 5X, 'DEMD= ', I8, 'AREA= ',RJB011096
     2 I6, 5X,)
822   FORMAT (5X, 'EVAP= ', I6, 5X, 'SHORT= ', I8, 5X, 'SPILL= ', I9,
     1 5X, 'END STOR= ', I9)
820   CONTINUE
823   CONTINUE
C
C     END ONE MONTH OF SIMULATION
C
  200 CONTINUE                                                          00037800
      IF (NSHORT .GT. MAXSHT) MAXSHT = NSHORT                           RJB042996
      IF (MSHORT .GT. MEXSHT) MEXSHT = MSHORT                           RJBO42996
C
C                             STEP 29                                   00037900
C                             IF SIMULATION YEAR WITHIN ANNUAL PRINT    RJB30196
C                             WINDOW, CALL ANNUAL PRINT ROUTINE FOR     RJB30196
C                             AMISTAD AND FALCON RESERVOIR RESULTS      RJB30196
C                                                                       00038200
      IF (IFLYLD .EQ. 1 .OR. IFLYLD .EQ. 2) GO TO 201                   RJB042996
      IF(IY.LT.IFROM .OR. IY.GT.ITOY) GO TO 201                         RJB042996
      CALL OUT2(IY)                                                     RJB42996
C                                                                       00038500
C                             STEP 30                                   00037900
C                             IF SIMULATION YEAR WITHIN ANNUAL PRINT    RJB30196
C                             WINDOW, SET PRINT VARIABLES AND CALL      RJB30196
C                             ANNUAL PRINT ROUTINE FOR U.S. WATER       RJB30196
C                             ALLOCATIONS BY TNRCC RULES                RJB30196
C                                                                       00038200
      DO 75 MON=1,12                                                    RJB30196
      ICAP(10,MON,1) = ISTRUS(MON)                                      RJB30196
      ICAP(10,MON,2) = ITOTQS(MON)                                      RJB30196
      ICAP(10,MON,3) = ITOTMD(MON)                                      RJB31196
      ICAP(10,MON,4) = ITOTID(MON)                                      RJB31196
      ICAP(10,MON,5) = ITOTSH(MON)                                      RJB31196
      ICAP(10,MON,6) = ITOTEV(MON)                                      RJB31196
      ICAP(10,MON,7) = STORUS(IY,MON)                                   RJB31196
      ICAP(10,MON,8) = MNPOOL(MON)                                      RJB31196
      ICAP(10,MON,9) = IRPOOL(IY,MON)                                   RJB31196
      ICAP(10,MON,10) = OPRESV(IY,MON)                                  RJB31196
      ICAP(10,MON,11) = EXCESS(MON)                                     RJB31196
      ICAP(10,MON,12) = IRAPOS(IY,MON)                                  RJB31196
      IF (IRAPOS(IY,MON).EQ.0) ICAP(10,MON,12) = IRANEG(IY,MON)         RJB021198
      ICAP(10,MON,13) = IRRDIV(MON)                                     RJB021198
75    CONTINUE
C
      CALL OUT2A(IY,PCTUSC,PCTUSI)                                      RJB42996
      CALL OUT2B(IY)                                                    RJB092597
      IF (IPLT .NE. 0) CALL OUT2C(IY)                                   RJB093097
  201 CONTINUE                                                          RJB042996
C                                                                       00038500
C     END ONE YEAR OF SIMULATION
C
  300 CONTINUE                                                          00038600
      IF (IFLYLD .NE. 1 .AND. IFLYLD .NE. 2) GO TO 409                  RJB041796
      IF (ITER. LT. 500) GO TO 414
      WRITE (KOUT,413) ITER
```

```
  413 FORMAT (5X,'FAY ANALYSIS STOPPED AT ',I2,' ITERATIONS')
      GO TO 448
  414 CONTINUE
C
C     WRITE OUT INTERIM FIRM ANNUAL YIELD RESULTS
C
      IDEMUS = DEMNEW                                                   RJB042996
      IDEMMX = DMXNEW                                                   RJB042996
      IF (ITER .EQ. 1) WRITE (KOUT,3333) FF
 3333 FORMAT (A1,//,5X,'FIRM ANNUAL YIELD ITERATION RESULTS',/)
      WRITE (KOUT,333) IFLYLD,ITER,MAXSHT,IDEMUS,MEXSHT,IDEMMX          RJB042996
  333 FORMAT (5X,'IFLYLD = ',I1,2X,'ITERATION = ',I3,2X,'USSHORTAGE = ',RJB042996
     * I6,2X,'USDEMAND = ',I7,2X,'MXSHORTAGE = ',I6,2X,'MXDEMAND = ',I7)RJB042996
C
C     CHECK FOR U.S. SHORTAGE, REVISE DEMANDS AS REQUIRED, AND THEN
C       CHECK MEXICO SHORTAGES AND RETURN TO BEGINNING TO REPEAT YEARLY
C       COMPUTATION CYCLE FOR FIRM YIELD, IF NECESSARY
C
      IF (IFLYLD .NE. 1) GO TO 444
      IF (MAXSHT .LT. LIMSHT) GO TO 430                                 RJB042996
      DEMOLD = DEMNEW                                                   RJB041796
      DEMNEW = DEMOLD - 0.05*MAXSHT                                     RJB042996
      GO TO 440
  430 CONTINUE                                                          RJB041796
      IF (MAXSHT .GT. 0) GO TO 448
      IF (ABS(DEMNEW - DEMOLD) .LE. 5) GO TO 448
      IF (DEMNEW .LT. DEMOLD) GO TO 421                                 RJB041796
      DEMTMP = DEMOLD                                                   RJB041796
      DEMOLD = DEMNEW                                                   RJB041796
      DEMNEW = DEMOLD + 0.5*(DEMOLD - DEMTMP)                           RJB041796
      GO TO 440                                                         RJB041796
  421 CONTINUE                                                          RJB041796
      DEMTMP = DEMOLD                                                   RJBO41796
      DEMOLD = DEMNEW                                                   RJB041796
      DEMNEW = 0.5 * (DEMOLD + DEMTMP)                                  RJB041796
  440 CONTINUE                                                          RJB041796
C
C     SET NEW U.S. DEMANDS BASED ON RATIOS OF INITIALLY-SPECIFIED DEMANDS
      DEMMUN = RATIOM * DEMNEW                                          RJB042996
      DEM2 = RATIO2 * DEMMUN                                            RJB042996
      DEM5 = DEMMUN - DEM2                                              RJB042996
      DEMIRR = DEMNEW - DEMMUN                                          RJB042996
      DEM6 = RATIO6 * DEMIRR                                            RJB042996
      DEM7 = DEMIRR - DEM6                                              RJB042996
  445 CONTINUE                                                          RJB042996
      GO TO 447
C
C     CHECK FOR MEXICO SHORTAGE, REVISE DEMANDS AS REQUIRED, AND THEN
C       RETURN TO BEGINNING TO REPEAT YEARLY COMPUTATION CYCLE FOR
C       FIRM YIELD, IF NECESSARY
C
  444 CONTINUE
      IF (IFLYLD .NE. 2) GO TO 409
      IF (MEXSHT .LT. LIMSHT) GO TO 420                                 RJB042996
      DMXOLD = DMXNEW                                                   RJB041796
      DMXNEW = DMXOLD - 0.05*MEXSHT                                     RJB042996
      GO TO 425                                                         RJB041796
  420 CONTINUE                                                          RJB041796
      IF (MEXSHT .GT. 0) GO TO 448
      IF (ABS(DMXNEW - DMXOLD) .LE. 5) GO TO 448
      IF (DMXNEW .LT. DMXOLD) GO TO 422                                 RJB041796
      DMXTMP = DMXOLD                                                   RJB041796
      DMXOLD = DMXNEW                                                   RJB041796
      DMXNEW = DMXOLD + 0.5*(DMXOLD - DMXTMP)                           RJB041796
      GO TO 425
  422 CONTINUE
      DMXTMP = DMXOLD                                                   RJBO41796
      DMXOLD = DMXNEW                                                   RJB041796
      DMXNEW = 0.5 * (DMXOLD + DMXTMP)                                  RJB041796
  425 CONTINUE                                                          RJB041796
C
C     SET NEW MEXICO DEMANDS BASED ON RATIOS OF INITIALLY-SPECIFIED DEMANDS
      DEM8 = RATMX8 * DMXNEW                                            RJB042996
      DEM4 = DMXNEW - DEM8                                              RJB042996
C
```

```
C     RETURN FOR NEW SIMULATION USING REVISED FIRM YIELD DEMANDS
C
  447 CONTINUE                                                          RJB042996
      GO TO 299                                                         RJB041796
C
C     SAVE FINAL FIRM YIELD DEMAND VALUES FOR PRINTING
C
  448 CONTINUE                                                          RJB041796
      CALL OUT1A(ITER)                                                  RJB042996
  409 CONTINUE                                                          RJB041796
C
C     AFTER FIRM YIELD ANALYSIS, REPEAT ENTIRE SIMULATION USING FIRM
C       YIELD DEMANDS
C
      IF (IFLYLD .NE. 1 .AND. IFLYLD .NE. 2) GO TO 411                  RJB041896
      IFLYLD = 3                                                        RJB041896
      GO TO 399                                                         RJB041896
  411 CONTINUE                                                          RJB041896
C                                                                       00038700
C                            STEP 31                                    00039800
C                            PRINT ARC DUMP IS SOLUTION INFEASIBLE      00039900
C                                                                       00040000
      RETURN                                                            00040100
  450 WRITE(KOUT,452)      IY,MON,(L,NF(L),NT(L),LO(L),HI(L),FLOW(L),   00040200
     * COST(L),L=1,NARC)                                                00040300
  452 FORMAT(1H1/20X,20HSOLUTION INFEASIBLE ,5H YEAR,I3,7H  MONTH,I3//  00040400
     * 60H     LINK  FROM   TO     LO       HI        FLOW      COST  //00040500
     * (3I5,4I10))                                                      00040600
      RETURN                                                            00040700
      END                                                               00040800
C
      SUBROUTINE DATA1                                                  00000100
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                  RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                     00000300
      INTEGER START,UREG                                                00000400
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000500
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000600
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/WRKD/START(10),STEND(10),USE(10),UREG(10),ISHTM(10,12),    00001100
     *            ISPIL(10,12),AREAX(10),EVPT(10),AMAX(10),AMIN(10),    00001200
     *            IAREA(10)                                             00001360
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)          RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,   RJB092697
     1       LIMSHT,NSRS,LRULE(10)                                      RJB092697
      COMMON/DEMON/DEMON(10,12)                                         00001900
      DIMENSION W(55,10,12),D(55,10,12),E(55,10,12)                     RJB100897
      EQUIVALENCE (W(1,1,1),ICAP(1,1,1))                                00002200
C                            STEP 01                                    00002300
C                            READ INFLOWS,DEMANDS AND EVAP DATA FOR     00002400
C                            SYSTEM NODES                               00002500
      REWIND KAPE1                                                      00002600
      READ(KIN,11) (((W(I,J,K),K=1,12),I=1,NYEAR),J=1,NJ)               00002700
     A           , (((D(I,J,K),K=1,12),I=1,NYEAR),J=1,NJ)               00002800
     B           , (((E(I,J,K),K=1,12),I=1,NYEAR),J=1,NRES)             00002900
C                                                                       00003000
C                                                                       00003100
   11 FORMAT(20X,12F7.0)                                                RJB120595
C                                                                       00003300
C                            STEP 02                                    00003400
C                            WRITE OUT A SCRATCH FILE OF ALL DATA       00003500
      DO 5 IY=1,NYEAR
      WRITE(KAPE1) ((W(IY,J,K),K=1,12),J=1,NJ),((D(IY,J,K),K=1,12),     00003700
     * J=1,NJ),((E(IY,J,K),K=1,12),J=1,NRES)                            00003800
    5 CONTINUE                                                          00003900
      REWIND KAPE1                                                      00004000
      RETURN                                                            00004100
      END
C                                                                       00004200
      SUBROUTINE DATA2
```

```
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                  RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                     00000300
      INTEGER START,UREG                                                00000400
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000500
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000600
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/WRKD/START(10),STEND(10),USE(10),UREG(10),ISHTM(10,12),    00001100
     *            ISPIL(10,12),AREAX(10),EVPT(10),AMAX(10),AMIN(10),    00001200
     *            IAREA(10)                                             00001360
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)          RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,   RJB092697
     1       LIMSHT,NSRS,LRULE(10)                                      RJB092697
      COMMON/DEMON/DEMON(10,12)                                         00001900
C                                                                       00004200
C                           STEP 03                                     00004300
C                           READ ONE YEAR OF DATA (INFLOW,DEMAND,EVAP)00004400
C                           FOR NODES IN SYSTEM                         00004500
      READ(KAPE1) ((U(J,K),K=1,12),J=1,NJ),((DEMON(J,K),K=1,12),J=1,NJ),00004700
     * ((EVAP(J,K),K=1,12),J=1,NRES)                                    00004800
      DO 6 J=1,NJ                                                       00004900
      DO 6 K=1,12                                                       00005000
C                           STEP 04                                     00005100
C                           MODIFY INFLOWS AND DEMANDS BY MULTIPLIER    00005200
C                           IF REQUIRED                                 00005300
      U(J,K)=U(J,K)*CONINF                                              00005400
      DEMON(J,K)=DEMON(J,K)*CONDEM                                      00005500
    6 CONTINUE                                                          00005600
      RETURN                                                            00005700
      END                                                               00008800
C
      SUBROUTINE RULE(JNUSMX)                                           RJB30596
      INTEGER RCAP,RMIN,FSTART,ACTAB,DEM,DEMR,OPRP,SP,                  RJB031396
     * CMAX,CMIN,RCON,RFLOOD,USMNRL                                     00000300
      INTEGER START,UREG                                                00000400
      COMMON/CONTRL/ KIN,KOUT,KAPE1,KAPE2,KAPE3,KPNCH                   00000500
      COMMON/IPRNT/IPRNT,IYLD,ITOY,IFROM,KCRD                           00000600
      COMMON/PARM/NJ,NRES,NJUNC,NL,NC,NYEAR,ND,NS,IYEAR,IMP,TITLE(25),  RJB091997
     1    TITLE2(25),NR,ICARD(30)                                       RJB021198
      COMMON/WRKD/START(10),STEND(10),USE(10),UREG(10),ISHTM(10,12),    00001100
     *            ISPIL(10,12),AREAX(10),EVPT(10),AMAX(10),AMIN(10),    00001200
     *            IAREA(10)                                             00001360
      COMMON/PRNT/ICAP(10,12,13),TOTLS(10,55,12),INISTO(10,55)          RJB100897
      COMMON/RESV/RNAME(10,3),RCAP(10),RMIN(10),FSTART(10),             RJB091997
     1    RCAPSV(10,12),ACTAB(10,30,2),OPRR(3,10,12),OPRP(3,10),SP(10), RJB031896
     2    DEM(10),DEMR(10,3),DEMD(10,12),EVAP(10,12),U(10,12),          00001700
     3    DIMP(12),IMPRT,ELEV(2,30),RCON(10),RFLOOD(10)                 RJB031296
      COMMON/LINK/LNODE(15,2),CMAX(15),CMIN(15),USMNRL(55,12),          RJB100897
     1 MXMNRL(55,12)                                                    RJB100897
      COMMON/CONFAC/AVLOUS,AVHIUS,AVLOMX,AVHIMX,CONFLO,CONDEM,CONINF,   RJB092697
     1       LIMSHT,NSRS,LRULE(10)                                      RJB092697
      COMMON/DEMON/DEMON(10,12)                                         00001900
C                                                                       00005900
      TSUBMX=0.0                                                        00006100
      WTRSYS=0.0                                                        00006200
      AVRGLO = AVLOUS                                                   RJB092697
      AVRGHI = AVHIUS                                                   RJB092697
      IF (JNUSMX .EQ. 2) GO TO 5                                        RJB092697
      AVRGLO = AVLOMX                                                   RJB092697
      AVRGHI = AVHIMX                                                   RJB092697
5     CONTINUE                                                          RJB092697
C                           STEP 05                                     00006400
C                           DETERMINE TOTAL AMOUNT OF STORAGE
C                           IN SUBSYSTEM                                00006600
C
       TSUBMX = RCAP(JNUSMX)                                            RJB091997
       WTRSYS = START(JNUSMX)                                           RJB091997
C                                                                       00007600
C                           STEP 06                                     00007700
C                           DETERMINE RULE ACCORDING TO SUB-SYSTEM
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```
C                                   STORAGE  (AVERAGE=1, DRY=2, WET=3)
      LRULE(JNUSMX) = 1                                                 RJB30596
      XMAX=TSUBMX*AVRGHI / 100.                                         00008100
      XMIN=TSUBMX*AVRGLO / 100.                                         00008200
      IF(WTRSYS.LT.XMIN) LRULE(JNUSMX) = 2                              RJB30596
      IF(WTRSYS.GT.XMAX) LRULE(JNUSMX) = 3                              RJB30596
      IF(AVRGLO.LE.0.0) LRULE(JNUSMX) = 1                               RJB30596
      IF(AVRGHI.LE.0.0) LRULE(JNUSMX) = 1                               RJB30596
      IF(JNUSMX .EQ. 4) GO TO 10                                        RJB30596
      LRULE(1) = LRULE(JNUSMX)                                          RJB01396
      LRULE(5) = LRULE(JNUSMX)                                          RJB30596
      LRULE(6) = LRULE(JNUSMX)                                          RJB30596
      LRULE(7) = LRULE(JNUSMX)                                          RJB30596
      GO TO 20                                                          RJB30596
10    CONTINUE                                                          RJB30596
      LRULE(3) = LRULE(JNUSMX)                                          RJB01396
      LRULE(8) = LRULE(JNUSMX)                                          RJB30596
20    CONTINUE                                                          RJB30596
      RETURN                                                            00008700
      END                                                               00008800
```

Attachment B.

Listing of the Long-Term (1945-1998) Data Input File for the Amistad-Falcon Reservoir Operations Model Including Current Average Demands for the United States and Mexico and Revised Inflows as Developed in the 1998 Integrated Water Resources Planning Study of the Lower Rio Grande, With Data Group Delineations

ROM DATA INPUT FILE WITH GROUP DELINEATIONS

GROUP A	HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 HYDROLOGY AVERAGE CURRENT HISTORICAL DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION	
GROUP B	CARD 01 NJ - NUMBER OF NODES IN THE MODEL NETWORK	8
	CARD 02 NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK	4
	CARD 03 NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK	8
	CARD 04 NR - NUMBER OF LINKS THAT ARE RIVER REACHES	8
	CARD 05 NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD	54
	CARD 06 ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK	8
	CARD 07 NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK	2
	CARD 08 IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD	1945
	CARD 09 IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT	1
	CARD 10 ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT	54
	CARD 11 INPUT DATA SOURCE (ALWAYS SET EQUAL TO "CARD")	CARD
	CARD 12 DEMAND SHORTAGE LIMIT USED AS CRITERION IN FIRM ANNUAL YIELD ANALYSIS	10
	CARD 13 IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT	1
	CARD 14 IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1945
	CARD 15 IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1972
	CARD 16 IFLYLD=0, NO FIRM ANNUAL YIELD ANALYSIS; =1, U.S. FAY; =2, MEXICO FAY	0
	CARD 17 DRUSFC - INITIAL FAY ADJUSTMENT FACTOR FOR U.S. DEMANDS	0.8761716
	CARD 18 DRMXFC - INITIAL FAY ADJUSTMENT FACTOR FOR MEXICO DEMANDS	0.7691899
	CARD 19 MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS	271579
	CARD 20 MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE	1696228
	CARD 21 MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE	1500719
	CARD 22 MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE	195509
	CARD 23 MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE	181530
	CARD 24 MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	162803
	CARD 25 MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	18727
	CARD 26 MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL	225000
	CARD 27 IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE	0000000
	CARD 28 NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING	3
	CARD 29 IRLFLG=0, READ ALL MONTHLY RELEASES; =1, READ AVG. MON RELEASES	1
	CARD 30 IWRFLG=0, READ ALL MONTHLY DEMANDS; =1, READ AVG. MON DEMANDS	1

GROUP C	U.S. AMISTAD	1	1827241	1771041	1771	1771041
	U.S. FALCON	2	1613729	1555129	1555	1555129
	MEX AMISTAD	3	1424078	1380278	1380	1380278
	MEX FALCON	4	1140074	1098674	1099	1098674
	U.S.MRG MUNI	5	0	0	0	
	U.S.MRG IRRI	6	0	0	0	
	U.S.LRG IRRI	7	0	0	0	
	MEX MRG M&IR	8	0	0	0	

GROUP D	SPILL RESR	2	4			
GROUP E	AMISTAD	1	1	930.0	0	0
	AMISTAD	1	2	945.0	5	1
	AMISTAD	1	3	946.5	87	294
	AMISTAD	1	4	948.2	180	823

ATTACHMENT B

	AMISTAD	1	5	949.1	237	1180
	AMISTAD	1	6	950.1	297	1684
	AMISTAD	1	7	951.4	376	2782
	AMISTAD	1	8	961.3	1045	13873
	AMISTAD	1	9	971.1	1843	33110
	AMISTAD	1	10	981.0	2770	59404
	AMISTAD	1	11	990.8	3823	93556
	AMISTAD	1	12	1000.7	5004	138573
	AMISTAD	1	13	1010.5	6314	195568
	AMISTAD	1	14	1020.3	7722	264663
	AMISTAD	1	15	1030.2	9758	350120
	AMISTAD	1	16	1040.0	12751	458690
GROUP E	AMISTAD	1	17	1049.9	16734	605456
	AMISTAD	1	18	1059.7	21627	790919
	AMISTAD	1	19	1069.6	27399	1029250
	AMISTAD	1	20	1079.4	34051	1328996
	AMISTAD	1	21	1089.2	41702	1699411
	AMISTAD	1	22	1094.2	45665	1911714
	AMISTAD	1	23	1099.1	49658	2142942
	AMISTAD	1	24	1104.0	53679	2393700
	AMISTAD	1	25	1108.9	57729	2664077
	AMISTAD	1	26	1115.5	63173	3055670
	AMISTAD	1	27	1117.0	64438	3151319
	AMISTAD	1	28	1118.8	65915	3265037
	AMISTAD	1	29	1122.0	68671	3483939
	AMISTAD	1	30	1131.9	77013	4199954
	FALCON	2	1	203.3	0	0
	FALCON	2	2	203.4	35	57
	FALCON	2	3	205.1	195	235
	FALCON	2	4	206.7	425	735
	FALCON	2	5	207.3	539	1050
	FALCON	2	6	208.3	727	1670
	FALCON	2	7	210.0	1100	3158
	FALCON	2	8	214.9	1559	9631
	FALCON	2	9	219.8	2202	18806
	FALCON	2	10	224.7	3526	32732
	FALCON	2	11	229.7	5169	54000
	FALCON	2	12	234.6	6531	82799
GROUP F	FALCON	2	13	239.5	8061	118624
	FALCON	2	14	242.8	10341	148482
	FALCON	2	15	244.4	11654	166516
	FALCON	2	16	249.3	15894	234115
	FALCON	2	17	254.3	20562	323644
	FALCON	2	18	259.2	25677	437240
	FALCON	2	19	264.1	30775	576159
	FALCON	2	20	269.0	36184	740751
	FALCON	2	21	274.0	42448	933844
	FALCON	2	22	278.9	48929	1158684
	FALCON	2	23	282.2	53474	1326587
	FALCON	2	24	285.4	58443	1509829

GROUP F

FALCON	2	25	288.7	65021	1712296
FALCON	2	26	292.0	70235	1935151
FALCON	2	27	295.3	74804	2172702
FALCON	2	28	298.6	82000	2429861
FALCON	2	29	301.2	87181	2653803
FALCON	2	30	305.1	93809	3008297

GROUP G

US AMISTAD	1	000	20	20	20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON	2	125000	2	2	2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD	3	000	20	20	20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON	4	1224000	6	6	6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI	5	34000	1	1	1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI	6	127000	3	3	3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI	7	1078000	4	4	4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR	8	66000	5	5	5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859

GROUP H

US AVERAGE	9.65	75.00
MX AVERAGE	10.00	75.00

GROUP I

RESERVOIR	1	1	AVERAGE	10	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
OPERATING	1	2	DRY	11	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.
RULES	1	3	WET	10	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
RESERVOIR	2	1	AVERAGE	11	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.
OPERATING	2	2	DRY	10	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65
RULES	2	3	WET	11	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
RESERVOIR	3	1	AVERAGE	12	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
OPERATING	3	2	DRY	13	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.
RULES	3	3	WET	12	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
RESERVOIR	4	1	AVERAGE	13	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.	75.
OPERATING	4	2	DRY	12	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
RULES	4	3	WET	13	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.

GROUP J

LINK1	1	1	5	9000000	0
LINK2	2	5	6	9000000	0
LINK3	3	6	2	9000000	0
LINK4	4	2	7	9000000	0
LINK5	5	3	8	9000000	0
LINK6	6	8	4	9000000	0
LINK7	7	1	2	9000000	0
LINK8	8	3	4	9000000	0

GROUP K

US AMS REL	0	0	0	0	0	0	0	0	0	0	0	0
MEX AMS REL	0	0	0	0	0	0	0	0	0	0	0	0

GROUP L

UNITED I.D. 1

MUN ADJ NO	0849-000	CL A ADJ NO	A847-001	CL B ADJ NO	B769-000
MUN ANN AUTH	5300	CL A ANN AUTH	69464	CL B ANN AUTH	4009
IRRIG ACCT START BALANCES		CL A BALANCE	97944	CL B BALANCE	5653

MUNICIPAL	1	1945	382	353	412	474	459	477	532	550	450	426	394	391
CLASS A IRR	1	1945	5189	3063	5418	9982	9322	8794	7384	6717	3967	4119	2793	2716
CLASS B IRR	1	1945	299	177	313	576	538	507	426	388	229	238	161	157

GROUP M

SANTACRUZ 15 2

MUN ADJ NO	0240-000	CL A ADJ NO	0810-000	CL B ADJ NO	B804-000
MUN ANN AUTH	3967	CL A ANN AUTH	4857	CL B ANN AUTH	4828
IRRIG ACCT START BALANCES		CL A BALANCE	6848	CL B BALANCE	6807

MUNICIPAL	2	1945	286	264	308	355	343	357	398	412	337	319	295	293

GROUP M

CLASS A IRR	2	1945	363	214	379	698	652	615	516	470	277	288	195	190
CLASS B IRR	2	1945	361	213	376	694	648	611	513	467	276	286	194	189

GROUP N

HCID2 S.JUAN 3
MUN ADJ NO 0808-001 CL A ADJ NO 0808-005 CL B ADJ NO 0573-001
MUN ANN AUTH 6140 CL A ANN AUTH 147775 CL B ANN AUTH 470
IRRIG ACCT START BALANCES CL A BALANCE 208363 CL B BALANCE 663

MUNICIPAL	3	1945	442	409	477	549	532	553	616	637	522	493	457	453
CLASS A IRR	3	1945	11039	6517	11526	21235	19831	18708	15709	14290	8438	8763	5941	5778
CLASS B IRR	3	1945	35	21	37	68	63	59	50	45	27	28	19	18

GROUP O

FLOW	1	1945	71782	62390	59897	76812	54490	44090	193317	62795	66480	301055	83055	87040
FLOW	1	1946	86204	62275	63004	75697	96524	185289	83280	64977	86133	240206	82594	86671
FLOW	1	1947	99747	76519	78133	64519	104672	82212	65212	51982	137675	77675	59053	75731
FLOW	1	1948	63386	58726	51894	49733	60541	416395	386055	74940	71426	76255	71009	73664
FLOW	1	1949	70288	141828	105100	168176	171982	133015	184670	231462	138409	144432	86925	89810
FLOW	1	1950	90510	71874	70089	63713	70920	86720	140004	102004	136766	120958	66398	73613
FLOW	1	1951	68421	59006	67321	50191	83436	89303	60181	49644	61113	57275	55952	41669
FLOW	1	1952	41469	37515	33860	40822	68960	56860	174252	38221	30929	38952	39646	42807
FLOW	1	1953	40669	36316	47313	35168	33738	27431	35454	54390	62958	52828	39183	40021
FLOW	1	1954	38416	33736	34617	202326	122060	242949	2629279	147042	101092	90484	62309	60114
FLOW	1	1955	57873	49938	50752	42407	96296	82112	116804	142889	268036	126811	67824	59341
FLOW	1	1956	55820	50371	46657	39337	43702	37859	32284	40613	41487	90540	42518	40946
FLOW	1	1957	41011	50275	45132	141294	668097	184680	79476	80278	80906	145435	82586	71480
FLOW	1	1958	67093	70865	66351	53583	92334	170177	83666	74336	383328	644243	157338	106035
FLOW	1	1959	97614	79277	80235	71789	101503	107390	170352	104497	136855	273227	92221	86006
FLOW	1	1960	85664	90230	85760	67668	56650	61036	160608	152035	126641	127506	82245	87041
FLOW	1	1961	82500	70743	67638	49211	68009	258803	154218	114646	85600	81259	71194	69389
FLOW	1	1962	65073	57012	55710	52270	49692	71524	87601	51910	117405	155195	75927	67362
FLOW	1	1963	59705	49909	48918	49344	77710	83304	74396	81880	86448	60089	46949	51490
FLOW	1	1964	60724	47551	50428	82067	61187	90685	50721	68377	865414	130670	85916	79886
FLOW	1	1965	74558	67419	66043	57564	99842	248150	64812	78703	88306	76177	60538	57857
FLOW	1	1966	55528	47027	49387	119622	105342	107379	79121	143267	314169	154838	74390	68215
FLOW	1	1967	70034	58893	63557	56724	49880	83552	114986	87643	146874	89904	67473	64687
FLOW	1	1968	62953	50809	52307	75723	85076	82368	131994	93447	164133	94458	59908	38154
FLOW	1	1969	59631	54983	56636	95899	81456	69074	65326	48985	63267	122658	64670	61279
FLOW	1	1970	54181	56541	59979	46572	56565	82176	74870	65609	133861	103064	59300	51977
FLOW	1	1971	47456	74064	51354	59800	57118	122660	122555	769277	169876	178262	61741	68926
FLOW	1	1972	74371	62622	73565	67437	89356	91731	80713	401460	166768	95550	53831	49684
FLOW	1	1973	48704	57063	65390	54551	74438	65044	122131	121412	146629	87150	39735	35781
FLOW	1	1974	49979	40836	87326	90485	103805	78188	58187	155061	1690713	395996	162287	116560
FLOW	1	1975	96081	104061	147536	131421	107960	85401	154811	126916	97082	83108	75802	74793
FLOW	1	1976	67703	74070	80445	82235	102453	81918	455057	164994	184622	120053	95102	98398
FLOW	1	1977	89008	85013	101136	147229	148707	106444	101933	95317	89932	74485	61999	62080
FLOW	1	1978	60420	61575	75543	91355	134599	168315	107300	154627	118017	445622	240779	85486
FLOW	1	1979	71806	78664	121406	103579	128394	235341	142118	136697	80578	60607	53330	62543
FLOW	1	1980	67160	62311	75471	75331	102078	77657	68958	281384	245093	127441	73919	72510
FLOW	1	1981	83096	74848	96882	220281	174608	150108	110515	147960	179909	443195	112126	94746
FLOW	1	1982	93576	91846	98486	102927	152460	135910	108229	83599	73987	60019	55632	62109
FLOW	1	1983	64240	63752	62000	65647	90020	71170	60444	80636	54696	162207	84295	51658
FLOW	1	1984	71795	65832	70138	73716	85155	127691	112178	122723	103037	114561	65828	73753

GROUP O

FLOW	1	1985	80817	59997	73653	69616	83746	99230	88313	80917	155521	128097	70269	53308
FLOW	1	1986	63429	59928	76810	70322	128185	170631	151349	149990	215841	499780	146111	155102
FLOW	1	1987	156284	140452	143562	143294	179545	236029	186572	185032	132521	121320	91033	82106
FLOW	1	1988	79165	76343	87264	99944	114589	94284	212892	167090	278705	101198	80012	77635
FLOW	1	1989	84613	84150	88669	90840	97514	89478	75820	113492	111571	90729	76017	52169
FLOW	1	1990	70810	71819	84714	87094	125922	82381	237328	409204	350926	338661	129731	88227
FLOW	1	1991	98305	92208	108985	113656	117755	109018	145834	230821	497082	318888	94443	100663
FLOW	1	1992	145135	182132	144066	135629	217972	213410	194327	119361	102339	91789	72315	84386
FLOW	1	1993	67435	72192	87821	80034	97834	111852	187126	118431	127818	80203	73798	77223
FLOW	1	1994	83071	67994	80523	72772	104279	87619	88168	71032	74270	63971	62796	68159
FLOW	1	1995	67892	56680	61812	75819	101801	79903	80026	89329	95852	66988	62195	56829
FLOW	1	1996	55280	55444	54797	60455	77853	82278	69082	101372	194441	83591	61439	60434
FLOW	1	1997	59322	118427	90033	67334	91328	140637	84279	79060	60896	60700	48598	50678
FLOW	1	1998	58433	51428	66714	75819	101801	79903	80026	89329	95852	66988	62195	56829
FLOW	2	1945	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1946	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1947	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1948	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1949	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1950	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1951	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1952	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1953	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1954	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1955	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1956	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1957	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1958	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1959	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1960	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1961	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1962	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1963	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1964	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1965	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1966	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1967	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1968	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1969	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1970	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1971	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1972	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1973	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1974	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1975	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1976	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1977	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1978	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1979	0	0	0	0	0	0	0	0	0	0	0	0

GROUP O

FLOW	2	1980	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1981	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1982	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1983	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1984	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1985	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1986	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1987	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1988	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1989	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1990	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1991	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1992	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1993	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1994	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	2	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	3	1945	57218	48609	43103	37187	13710	17609	261682	38205	18220	235943	74944	36959
FLOW	3	1946	43796	48724	47996	41303	47476	94710	56719	9722	227866	194794	54406	42329
FLOW	3	1947	50253	53480	41866	12380	31327	12688	17187	115018	200324	33325	53946	47269
FLOW	3	1948	34814	42274	45306	20467	20658	76603	51943	37060	42573	55744	49990	30336
FLOW	3	1949	33712	119171	69900	53823	44018	59985	74330	193537	145590	109568	82074	57190
FLOW	3	1950	56490	50126	55911	26987	25180	52280	129995	89995	130233	82042	47601	39387
FLOW	3	1951	32579	46994	43678	22009	51563	57697	42819	31656	26186	9725	16548	23032
FLOW	3	1952	23331	22485	23039	18577	42039	21539	185747	30479	15870	17248	13454	15093
FLOW	3	1953	18331	14884	17987	8333	6362	9769	28946	27510	44042	15472	14417	16178
FLOW	3	1954	17883	16263	14282	72673	46940	1050	342713	119957	66908	44516	23591	22185
FLOW	3	1955	23126	21062	18348	12993	54703	42887	66195	136110	124963	112188	37175	27459
FLOW	3	1956	26579	23929	20143	14763	16998	18941	13716	26886	30413	54460	25682	24254
FLOW	3	1957	25088	27725	23568	66706	143900	63320	21524	38721	30094	62564	31414	29520
FLOW	3	1958	24607	23235	20848	12516	19666	22822	14434	27664	375670	842753	123661	59965
FLOW	3	1959	48386	31722	29765	26911	44497	44610	85647	83502	118145	77773	38779	37993
FLOW	3	1960	50335	64769	54239	31631	22350	30464	128391	137964	125359	81493	55754	65958
FLOW	3	1961	59499	47256	40362	19589	34991	94196	81781	74353	52400	47741	36806	35610
FLOW	3	1962	34835	29250	27082	22074	22254	35329	53663	28688	82620	93952	41437	39886
FLOW	3	1963	34174	26039	23518	19530	30609	50681	43165	64165	77548	44718	32688	34455
FLOW	3	1964	31984	27505	31134	40803	30116	65278	32427	53775	230018	54787	38706	36367
FLOW	3	1965	35982	36358	31704	22014	40668	90313	21827	38421	61111	42059	36435	32828
FLOW	3	1966	30278	24696	24383	27579	27968	56378	53476	131605	432656	111763	44997	37307
FLOW	3	1967	30330	23145	23816	16606	15952	36946	81816	59988	101102	61992	39259	32484
FLOW	3	1968	28208	14964	13768	18176	22231	21142	83759	90739	292200	139723	83816	32506
FLOW	3	1969	85209	80154	84419	82467	46984	50851	58830	35350	52029	61180	35225	32385
FLOW	3	1970	29729	29280	27597	18748	28634	47680	47475	44817	111656	120358	67719	46692
FLOW	3	1971	33484	38445	30716	28061	29026	52730	52470	181580	85533	98933	21006	41014
FLOW	3	1972	63187	35598	42476	40524	47942	68874	63929	112324	194565	75961	30647	26776
FLOW	3	1973	25789	27363	25781	18269	29477	38917	92508	152806	166534	56001	25263	21199
FLOW	3	1974	28270	22809	51064	65280	93690	72342	36392	70322	345406	297838	80137	47920

GROUP O

FLOW	3	1975	39053	67640	152322	95620	50347	38996	82148	70278	54822	34986	30274	32118
FLOW	3	1976	31054	26043	26135	33893	43999	58258	209414	126796	93956	54289	30968	39162
FLOW	3	1977	33941	29435	56352	81031	83134	49961	45395	54238	39298	28899	25077	24135
FLOW	3	1978	22719	24852	27504	50868	93956	79482	59410	135160	196318	549428	227771	49748
FLOW	3	1979	45558	47475	83573	82227	92494	182466	96608	124367	44682	27348	25017	26387
FLOW	3	1980	31670	27459	38983	42772	72049	34680	28340	234986	127781	99558	39131	39694
FLOW	3	1981	52936	61796	85932	139227	76729	82394	58659	111812	212626	214082	79190	63047
FLOW	3	1982	46492	52387	55228	73876	108660	91900	59594	45538	44351	32322	28943	25058
FLOW	3	1983	26633	28357	29212	26353	63540	38608	27203	58365	37393	80429	54508	26871
FLOW	3	1984	38405	39992	34140	30578	44382	105591	91301	132843	79074	92897	39830	46288
FLOW	3	1985	44361	38288	42656	39042	57737	51125	47111	53823	115025	109010	50043	34158
FLOW	3	1986	37309	35791	46058	38600	51933	115227	118409	110897	246970	200219	96427	110622
FLOW	3	1987	104036	84667	112280	100241	131421	169964	122162	129300	84640	82205	43218	39839
FLOW	3	1988	39143	35653	38000	47346	66499	68397	121618	146122	201853	66692	53970	44571
FLOW	3	1989	45068	42725	43500	35329	50394	41753	36386	72419	82548	68873	41090	28986
FLOW	3	1990	31532	41127	48500	45920	49205	31075	106713	434169	280507	499003	119755	41162
FLOW	3	1991	55727	54954	65690	74159	70030	64513	115050	286483	681512	322515	43267	58690
FLOW	3	1992	158556	165946	91560	82462	164866	239963	122761	81921	53835	44256	41577	35382
FLOW	3	1993	47753	31236	36274	33152	46992	93704	215840	69832	78181	47182	43768	44672
FLOW	3	1994	50832	36937	44798	40202	86549	41047	40014	29349	31169	28947	28074	30895
FLOW	3	1995	28687	21287	23319	26625	38768	29252	37006	49855	43976	35154	30206	23756
FLOW	3	1996	23037	22888	20943	19311	17171	26255	34280	60233	88867	79094	25897	23601
FLOW	3	1997	22128	31542	31264	24422	60387	59218	40161	37395	21742	25799	21632	22878
FLOW	3	1998	24980	20862	24405	26625	38768	29252	37006	49855	43976	35154	30206	23756
FLOW	4	1945	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1946	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1947	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1948	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1949	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1950	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1951	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1952	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1953	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1954	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1955	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1956	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1957	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1958	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1959	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1960	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1961	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1962	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1963	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1964	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1965	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1966	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1967	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1968	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1969	0	0	0	0	0	0	0	0	0	0	0	0

GROUP O

FLOW	4	1970	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1971	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1972	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1973	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1974	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1975	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1976	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1977	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1978	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1979	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1980	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1981	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1982	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1983	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1984	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1985	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1986	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1987	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1988	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1989	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1990	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1991	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1992	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1993	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1994	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	4	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	5	1945	20000	15000	19000	65000	14000	2000	0	10000	0	124000	9000	7000
FLOW	5	1946	7000	7000	2000	32000	177000	69000	37000	41000	33000	72000	18000	11000
FLOW	5	1947	14000	13000	10000	7000	57000	133000	19000	108000	33000	17000	9000	6000
FLOW	5	1948	6000	6000	9000	1000	18000	164000	101000	22000	177000	61000	16000	14000
FLOW	5	1949	10000	76000	37000	283000	70000	83000	4000	73000	52000	47000	26000	22000
FLOW	5	1950	17000	12000	11000	17000	91000	61000	0	10000	8000	20000	1000	0
FLOW	5	1951	2000	0	4000	5000	87000	59000	0	10000	163000	27000	9000	5000
FLOW	5	1952	6000	0	0	1000	41000	17000	1000	1000	24000	1000	0	0
FLOW	5	1953	0	0	0	0	1000	0	0	97000	223000	59000	0	0
FLOW	5	1954	0	7080	0	13474	83610	0	46245	0	17585	37191	1183	0
FLOW	5	1955	14086	20453	14322	15218	19240	12228	11514	51327	64343	12946	17770	9281
FLOW	5	1956	13856	11816	8016	9067	18434	0	16457	0	38501	19323	2368	8293
FLOW	5	1957	0	1843	21537	130393	242914	99741	796	10225	66748	25520	17120	16713
FLOW	5	1958	71864	31339	24526	24127	131365	94040	34240	18347	122155	400924	230115	104748
FLOW	5	1959	57139	66045	41393	32719	24043	76196	35094	10869	24863	15476	17107	12319
FLOW	5	1960	10531	18341	20822	23800	21739	8839	13940	16742	40491	91225	24697	13053
FLOW	5	1961	16402	20159	23094	31884	25397	126653	50341	32710	54611	27713	21770	7909
FLOW	5	1962	10348	21189	14263	58223	5503	18316	0	17472	47077	12758	14768	2671
FLOW	5	1963	3610	7482	8966	22845	63689	67238	10233	0	30314	38567	4159	2892
FLOW	5	1964	0	11098	11565	0	20584	3432	5100	39515	240698	117095	19515	9863

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FLOW	5	1965	17191	17653	21574	23827	127914	17012	14113	16905	20332	16824	21145	19940
FLOW	5	1966	7604	12909	11746	50644	189694	18050	7434	9237	67958	7636	5513	2997
FLOW	5	1967	14819	8728	23652	41032	6943	7090	13755	89004	408935	58667	30941	9654
FLOW	5	1968	16806	20130	21264	29467	38273	23643	28749	6156	73144	30227	0	6778
FLOW	5	1969	5789	10559	5162	49017	48003	12375	0	52548	39826	78384	22435	22578
FLOW	5	1970	18045	0	34368	16673	18877	20269	28017	15646	69273	48326	13009	14617
FLOW	5	1971	0	576	21342	16018	0	271318	312041	248103	573395	575018	113862	69344
FLOW	5	1972	61254	44969	36899	41065	94037	52021	24181	62881	72089	36880	16987	26349
FLOW	5	1973	30905	47598	37312	21719	24901	148819	67508	33623	109434	124198	40856	20955
FLOW	5	1974	26575	11647	48845	22314	21661	21798	11801	24445	0	51818	15978	30923
FLOW	5	1975	24878	17755	14770	13543	115397	68352	201670	76265	82873	22632	29707	21834
FLOW	5	1976	16454	11975	30678	34540	55709	25411	359476	115155	134023	95134	96819	86810
FLOW	5	1977	53404	54556	41583	22609	86065	44932	31825	20654	17762	55146	16643	19103
FLOW	5	1978	19140	19949	8399	28187	19673	57260	6580	52531	126670	47404	98407	71824
FLOW	5	1979	49334	42905	21934	90334	22395	167177	75880	23690	43476	11487	4910	11114
FLOW	5	1980	11983	14518	0	26503	71293	6934	12155	159815	27787	33057	24209	20984
FLOW	5	1981	26295	25960	30930	166158	289492	199381	121898	34733	9759	47777	22080	20166
FLOW	5	1982	9489	32572	26535	34189	93272	28362	19944	0	38836	18059	15529	23363
FLOW	5	1983	20840	31006	24576	32158	32078	29165	19884	14393	37266	57406	33260	10875
FLOW	5	1984	35650	18978	8161	31527	32981	6317	0	0	16755	65476	12632	5665
FLOW	5	1985	19161	21194	18312	39286	71939	63669	41702	5797	17189	91810	26710	7493
FLOW	5	1986	15834	2132	0	0	30473	120162	26243	12285	67776	54315	22767	25262
FLOW	5	1987	21540	34500	21548	39399	68855	182132	55017	54281	65639	34741	29598	23644
FLOW	5	1988	20628	28825	23820	25371	27614	36659	29221	31023	126924	112110	55598	22180
FLOW	5	1989	29811	25920	23516	34875	45249	34662	8975	18321	23890	19335	3198	10502
FLOW	5	1990	5050	40402	21258	49495	42125	21899	94819	50854	37435	12530	31079	11623
FLOW	5	1991	29965	27328	15154	29803	54953	41735	11485	0	24682	0	27828	45800
FLOW	5	1992	35804	35357	11232	46393	72989	80871	69496	53437	41465	21961	22773	25626
FLOW	5	1993	27011	20357	29487	21487	17471	61463	9805	12271	27953	3339	9876	9603
FLOW	5	1994	23445	15648	16847	27793	48520	53964	28394	11543	32073	10878	8365	17730
FLOW	5	1995	7832	7386	2433	0	57403	8711	1299	3501	73473	17386	33696	5718
FLOW	5	1996	7807	10255	4586	0	5213	10551	18724	30928	82151	36792	12953	7713
FLOW	5	1997	7272	12931	32382	19377	37055	38075	3660	6298	10209	26869	18221	13812
FLOW	5	1998	15363	12548	10153	0	57403	8711	1299	3501	73473	17386	33696	5718
FLOW	6	1945	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1946	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1947	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1948	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1949	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1950	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1951	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1952	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1953	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1954	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1955	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1956	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1957	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1958	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1959	0	0	0	0	0	0	0	0	0	0	0	0

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FLOW	6	1960	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1961	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1962	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1963	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1964	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1965	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1966	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1967	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1968	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1969	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1970	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1971	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1972	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1973	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1974	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1975	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1976	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1977	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1978	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1979	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1980	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1981	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1982	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1983	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1984	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1985	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1986	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1987	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1988	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1989	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1990	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1991	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1992	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1993	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1994	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	6	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1945	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1946	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1947	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1948	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1949	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1950	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1951	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1952	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1953	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1954	0	0	0	0	0	0	0	0	0	0	0	0

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FLOW	7	1955	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1956	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1957	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1958	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1959	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1960	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1961	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1962	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1963	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1964	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1965	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1966	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1967	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1968	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1969	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1970	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1971	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1972	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1973	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1974	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1975	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1976	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1977	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1978	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1979	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1980	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1981	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1982	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1983	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1984	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1985	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1986	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1987	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1988	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1989	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1990	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1991	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1992	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1993	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1994	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1995	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1996	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1997	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	7	1998	0	0	0	0	0	0	0	0	0	0	0	0
FLOW	8	1945	24000	18000	17000	0	21000	11000	17000	1000	24000	106000	19000	20000
FLOW	8	1946	17000	8000	11000	26000	0	175000	51000	43000	81000	55000	28000	26000
FLOW	8	1947	20000	11000	12000	8000	34000	0	7000	177000	62000	10000	15000	15000
FLOW	8	1948	11000	8000	20000	13000	9000	0	47000	12000	501000	34000	29000	18000
FLOW	8	1949	15000	26000	41000	0	104000	0	45000	114000	43000	23000	16000	15000

GROUP O

FLOW	8	1950	16000	10000	8000	0	0	0	24000	7000	42000	0	11000	10000
FLOW	8	1951	14000	8000	11000	27000	55000	77000	25000	11000	8000	75000	8000	7000
FLOW	8	1952	6000	10000	7000	9000	16000	0	6000	1000	0	2000	3000	4000
FLOW	8	1953	6000	5000	11000	22000	7000	1000	9000	566000	215000	118000	26000	17000
FLOW	8	1954	4587	15854	11664	30500	123844	0	53312	0	27300	48060	10438	0
FLOW	8	1955	11612	19626	14105	16477	23282	14084	15249	61350	130829	14143	16572	7082
FLOW	8	1956	11581	10952	9222	11059	21586	0	17395	0	50007	11911	1726	7951
FLOW	8	1957	0	3655	23908	131968	307573	116197	5523	9801	68085	29643	16890	14643
FLOW	8	1958	70067	28550	21112	23152	134787	81101	41335	17223	326607	629268	378822	181858
FLOW	8	1959	87085	94850	54853	36929	26729	63911	37843	13229	25032	21091	18127	9876
FLOW	8	1960	6111	15069	16996	22755	20800	9095	12398	19098	43107	103744	26483	11940
FLOW	8	1961	16089	20564	20447	32710	29860	213109	69198	41002	70595	37775	24647	7964
FLOW	8	1962	7568	19277	12519	60151	6566	20089	0	17519	61238	17086	15846	2236
FLOW	8	1963	2337	6924	8833	25586	70263	74648	13007	0	50064	48157	4588	2754
FLOW	8	1964	0	11189	11450	479	25315	6165	3578	48742	258279	149262	24577	9152
FLOW	8	1965	15187	14326	19188	20721	148016	26325	13809	17565	22806	15048	19926	17142
FLOW	8	1966	4049	11135	11211	54538	224804	17940	4492	10090	70055	6109	2796	0
FLOW	8	1967	10811	6205	20941	42047	5484	9400	11964	104231	585047	90677	42028	14990
FLOW	8	1968	21062	22641	24089	33128	42526	25089	49239	18226	91391	43918	1448	9334
FLOW	8	1969	7463	12749	6707	48940	58291	14705	0	61047	44360	83431	22934	22132
FLOW	8	1970	15122	0	31513	10956	8590	4552	15650	13371	86786	63622	16034	17022
FLOW	8	1971	0	926	19747	10471	0	326517	464146	313217	861701	788216	202357	113974
FLOW	8	1972	52444	58559	44777	47119	105531	63846	31101	78548	87772	50583	22877	27335
FLOW	8	1973	29847	48711	36021	21673	25964	166431	10192	32730	118885	172487	51931	26048
FLOW	8	1974	28295	13213	49656	19315	18767	23691	4848	23330	0	65290	24321	34956
FLOW	8	1975	25382	16856	13035	14549	119189	70655	325522	100315	117641	40012	41754	28634
FLOW	8	1976	21040	17091	31731	37731	66432	26177	613827	232922	204504	146887	153781	141088
FLOW	8	1977	82341	78369	49815	29152	98027	49766	36403	21094	17272	61562	14856	16218
FLOW	8	1978	15038	16421	5549	22041	11956	64016	15852	68719	192724	109521	167112	112332
FLOW	8	1979	78260	54649	27705	97091	24548	221257	89746	26591	46059	8989	3176	10577
FLOW	8	1980	11215	14203	0	24294	76365	3405	7968	234132	44963	54945	39663	33382
FLOW	8	1981	34142	34949	37041	253568	438750	297231	170120	43826	15091	56896	26872	21934
FLOW	8	1982	6954	29023	27603	36133	105173	27068	16728	0	38369	17207	13939	20643
FLOW	8	1983	17595	31829	28355	30870	26985	19462	6041	4528	27747	51699	38010	8170
FLOW	8	1984	29926	12813	3946	24218	55034	12610	0	0	22287	71668	8118	2867
FLOW	8	1985	19931	20762	18517	49636	76989	71436	47557	6934	17243	104559	26962	3276
FLOW	8	1986	14080	0	0	0	23904	155485	34114	16766	124050	89078	43226	39426
FLOW	8	1987	32161	44593	30263	41181	31687	190066	97968	72925	90496	48307	38803	30040
FLOW	8	1988	24985	30643	21676	23952	27909	46658	30118	43196	277506	182655	90303	32170
FLOW	8	1989	35881	30167	25595	31318	50654	25956	9952	18517	26016	19763	2131	9074
FLOW	8	1990	0	32965	16719	53902	37287	15060	114041	57849	65956	45551	42909	15902
FLOW	8	1991	31390	23863	9409	25304	53173	39924	7660	0	40150	7379	34116	50381
FLOW	8	1992	39062	39748	13890	49775	85743	94973	104991	67637	52173	25106	23703	26809
FLOW	8	1993	23361	15343	25194	17303	12163	72790	6816	10590	29366	2384	7627	7186
FLOW	8	1994	21670	13312	14748	21721	43575	47246	27416	8770	32969	6979	4198	12977
FLOW	8	1995	3906	3825	0	0	58914	10260	3913	5330	98882	18370	33717	3724
FLOW	8	1996	6958	9093	4786	0	12781	20695	27018	40713	88400	33031	11824	4555
FLOW	8	1997	2713	7665	36555	17408	39881	42399	8118	7910	12731	33052	21197	13204

GROUP O	FLOW	8	1998	13771	11090	9301	0	58914	10260	3913	5330	98882	18370	33717	3724
	DEMAND	1	1945	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1946	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1947	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1948	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1949	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1950	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1951	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1952	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1953	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1954	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1955	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1956	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1957	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1958	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1959	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1960	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1961	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1962	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1963	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1964	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1965	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1966	0	0	0	0	0	0	0	0	0	0	0	0
GROUP P	DEMAND	1	1967	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1968	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1969	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1970	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1971	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1972	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1973	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1974	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1975	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1976	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1977	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1978	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1979	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1980	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1981	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1982	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1983	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1984	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1985	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1986	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1987	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1988	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1989	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1990	0	0	0	0	0	0	0	0	0	0	0	0
	DEMAND	1	1991	0	0	0	0	0	0	0	0	0	0	0	0

GROUP P

DEMAND	1	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	1	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1989	0	0	0	0	0	0	0	0	0	0	0	0

GROUP P

DEMAND	2	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	2	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1987	0	0	0	0	0	0	0	0	0	0	0	0

GROUP P

DEMAND	3	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	3	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1985	0	0	0	0	0	0	0	0	0	0	0	0

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DEMAND	4	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	4	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1983	0	0	0	0	0	0	0	0	0	0	0	0

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DEMAND	5	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	5	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1981	0	0	0	0	0	0	0	0	0	0	0	0

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DEMAND	6	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	6	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1977	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1979	0	0	0	0	0	0	0	0	0	0	0	0

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DEMAND	7	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	7	1996	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1945	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1946	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1947	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1948	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1949	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1950	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1951	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1952	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1953	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1954	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1955	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1956	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1957	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1958	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1959	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1960	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1961	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1962	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1963	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1964	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1965	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1966	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1967	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1968	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1969	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1970	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1971	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1972	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1973	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1974	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1975	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1976	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1977	0	0	0	0	0	0	0	0	0	0	0	0

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DEMAND	8	1978	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1979	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1980	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1981	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1982	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1983	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1984	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1985	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1986	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1987	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1988	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1989	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1990	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1991	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1992	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1993	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1994	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1995	0	0	0	0	0	0	0	0	0	0	0	0
DEMAND	8	1996	0	0	0	0	0	0	0	0	0	0	0	0

GROUP Q

EVAP	1	1945	0.26	0.28	0.54	0.64	0.87	1.06	0.76	1.17	0.88	0.38	0.39	0.37
EVAP	1	1946	0.26	0.34	0.58	0.66	0.54	0.71	1.07	0.82	0.72	0.44	0.40	0.30
EVAP	1	1947	0.23	0.33	0.42	0.58	0.76	0.91	1.15	0.92	0.86	0.73	0.38	0.25
EVAP	1	1948	0.22	0.25	0.52	0.69	0.83	1.03	0.95	1.03	0.76	0.45	0.48	0.36
EVAP	1	1949	0.13	0.26	0.47	0.51	0.62	0.85	0.93	0.76	0.75	0.43	0.43	0.29
EVAP	1	1950	0.16	0.23	0.55	0.45	0.63	0.85	0.93	0.88	0.73	0.66	0.59	0.42
EVAP	1	1951	0.37	0.29	0.45	0.58	0.61	0.65	1.09	1.13	0.94	0.73	0.46	0.38
EVAP	1	1952	0.33	0.40	0.49	0.54	0.64	0.77	1.03	1.19	0.93	0.78	0.45	0.29
EVAP	1	1953	0.43	0.38	0.37	0.70	0.83	1.05	1.24	1.08	0.80	0.66	0.46	0.35
EVAP	1	1954	0.25	0.39	0.56	0.43	0.65	0.88	1.14	1.11	1.09	0.68	0.58	0.58
EVAP	1	1955	0.27	0.34	0.55	0.62	0.75	0.87	1.19	0.93	0.71	0.93	0.53	0.40
EVAP	1	1956	0.28	0.34	0.45	0.61	0.82	1.16	1.26	1.10	1.21	0.78	0.49	0.35
EVAP	1	1957	0.28	0.28	0.53	0.55	0.52	0.77	1.23	1.21	0.71	0.48	0.23	0.30
EVAP	1	1958	0.22	0.27	0.34	0.61	0.75	0.81	0.84	1.07	0.43	0.26	0.22	0.25
EVAP	1	1959	0.27	0.24	0.54	0.54	0.66	0.79	0.78	0.66	0.75	0.45	0.33	0.28
EVAP	1	1960	0.21	0.34	0.43	0.59	0.80	1.22	0.65	0.79	0.75	0.54	0.25	0.21
EVAP	1	1961	0.21	0.24	0.53	0.72	0.78	0.77	0.76	0.69	0.69	0.40	0.35	0.28
EVAP	1	1962	0.27	0.47	0.64	0.57	0.95	0.86	1.11	1.15	0.99	0.71	0.36	0.29
EVAP	1	1963	0.31	0.37	0.61	0.61	0.64	0.77	1.03	1.01	0.75	0.60	0.40	0.20
EVAP	1	1964	0.34	0.33	0.63	0.74	0.75	0.93	1.11	0.94	0.63	0.42	0.30	0.22
EVAP	1	1965	0.29	0.24	0.42	0.61	0.50	0.71	0.99	0.91	0.68	0.49	0.29	0.22
EVAP	1	1966	0.21	0.25	0.49	0.59	0.49	0.71	1.02	0.73	0.50	0.23	0.19	0.29
EVAP	1	1967	0.30	0.33	0.53	0.58	0.88	1.01	1.12	0.85	0.49	0.51	0.25	0.24
EVAP	1	1968	0.14	0.22	0.33	0.46	0.52	0.74	0.76	0.92	0.54	0.46	0.34	0.27
EVAP	1	1969	0.23	0.28	0.56	0.58	0.66	0.83	1.07	0.97	0.55	0.37	0.22	0.16
EVAP	1	1970	0.16	0.25	0.38	0.49	0.72	0.70	0.83	0.81	0.63	0.33	0.35	0.23
EVAP	1	1971	0.30	0.38	0.66	0.70	0.71	0.65	0.70	0.62	0.52	0.25	0.26	0.19
EVAP	1	1972	0.24	0.27	0.54	0.70	0.57	0.76	0.83	0.62	0.58	0.40	0.32	0.24
EVAP	1	1973	0.25	0.17	0.52	0.57	0.76	0.58	0.71	0.77	0.56	0.34	0.27	0.32
EVAP	1	1974	0.25	0.42	0.40	0.73	0.70	0.96	0.99	0.73	0.50	0.39	0.23	0.22
EVAP	1	1975	0.21	0.30	0.52	0.56	0.57	0.74	0.63	0.69	0.49	0.47	0.35	0.27

GROUP Q

EVAP	1	1976	0.27	0.39	0.52	0.48	0.49	0.79	0.59	0.71	0.53	0.37	0.20	0.18
EVAP	1	1977	0.20	0.30	0.46	0.54	0.41	0.77	0.88	1.03	0.75	0.52	0.37	0.32
EVAP	1	1978	0.24	0.25	0.55	0.68	0.69	0.86	0.95	0.76	0.45	0.33	0.20	0.23
EVAP	1	1979	0.20	0.24	0.35	0.51	0.64	0.69	0.78	0.76	0.72	0.69	0.36	0.24
EVAP	1	1980	0.24	0.31	0.55	0.76	0.65	0.92	1.11	0.88	0.62	0.47	0.28	0.18
EVAP	1	1981	0.23	0.21	0.43	0.43	0.56	0.60	0.81	0.76	0.72	0.52	0.34	0.27
EVAP	1	1982	0.28	0.28	0.37	0.57	0.58	0.79	0.94	0.94	0.81	0.56	0.34	0.23
EVAP	1	1983	0.22	0.28	0.47	0.72	0.77	0.71	0.96	0.85	0.71	0.61	0.36	0.11
EVAP	1	1984	0.20	0.39	0.54	0.90	0.85	0.85	0.97	1.00	0.85	0.38	0.33	0.21
EVAP	1	1985	0.23	0.19	0.38	0.52	0.70	0.71	0.82	0.97	0.66	0.43	0.26	0.23
EVAP	1	1986	0.25	0.38	0.69	0.67	0.72	0.60	1.05	0.88	0.53	0.27	0.20	0.19
EVAP	1	1987	0.23	0.23	0.38	0.47	0.44	0.53	0.77	0.82	0.54	0.68	0.47	0.23
EVAP	1	1988	0.21	0.28	0.58	0.71	0.71	0.77	0.79	0.79	0.73	0.38	0.40	0.24
EVAP	1	1989	0.23	0.22	0.43	0.59	0.85	0.95	1.07	1.30	0.91	0.83	0.51	0.16
EVAP	1	1990	0.35	0.45	0.49	0.52	0.75	1.24	0.80	0.76	0.53	0.50	0.30	0.35
EVAP	1	1991	0.23	0.37	0.70	0.73	0.86	0.86	1.00	0.98	0.73	0.70	0.47	0.20
EVAP	1	1992	0.19	0.30	0.43	0.53	0.73	0.78	0.92	0.83	0.81	0.69	0.41	0.25
EVAP	1	1993	0.29	0.30	0.57	0.77	0.89	0.81	1.10	1.14	0.60	0.68	0.41	0.41
EVAP	1	1994	0.34	0.33	0.55	0.67	0.65	1.15	1.11	1.16	0.70	0.55	0.34	0.28
EVAP	1	1995	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	1	1996	0.41	0.46	0.62	0.89	1.01	1.29	1.30	1.01	0.57	0.70	0.39	0.27
EVAP	2	1945	0.34	0.41	0.52	0.58	0.83	0.92	1.03	0.94	1.02	0.77	0.65	0.51
EVAP	2	1946	0.30	0.30	0.50	0.50	0.58	0.71	1.02	0.93	0.63	0.61	0.54	0.38
EVAP	2	1947	0.31	0.36	0.48	0.52	0.67	0.91	1.03	0.78	0.95	0.78	0.58	0.24
EVAP	2	1948	0.35	0.23	0.52	0.71	0.61	0.87	0.93	1.05	0.73	0.68	0.74	0.43
EVAP	2	1949	0.32	0.20	0.34	0.37	0.56	0.73	0.88	0.88	0.68	0.65	0.55	0.35
EVAP	2	1950	0.49	0.45	0.58	0.64	0.97	0.83	1.19	1.33	0.95	0.80	0.76	0.52
EVAP	2	1951	0.53	0.51	0.60	0.62	0.69	0.84	1.14	0.95	0.93	0.86	0.58	0.51
EVAP	2	1952	0.46	0.53	0.53	0.69	0.75	0.83	0.91	1.23	1.03	0.93	0.51	0.38
EVAP	2	1953	0.44	0.37	0.49	0.61	0.67	0.97	1.04	0.99	0.92	0.66	0.54	0.39
EVAP	2	1954	0.20	0.49	0.55	0.63	0.80	0.82	0.90	0.89	0.70	0.47	0.36	0.33
EVAP	2	1955	0.31	0.28	0.56	0.63	0.80	0.89	0.96	0.84	0.51	0.55	0.38	0.25
EVAP	2	1956	0.28	0.32	0.49	0.66	0.88	0.81	1.06	0.91	0.77	0.64	0.43	0.32
EVAP	2	1957	0.28	0.37	0.61	0.57	0.68	0.75	1.01	0.94	0.68	0.49	0.39	0.33
EVAP	2	1958	0.23	0.24	0.35	0.54	0.70	0.71	0.86	0.90	0.44	0.25	0.23	0.18
EVAP	2	1959	0.18	0.16	0.40	0.47	0.75	0.76	0.86	0.36	0.67	0.44	0.31	0.27
EVAP	2	1960	0.18	0.35	0.37	0.53	0.71	0.83	0.98	0.76	0.49	0.43	0.23	0.15
EVAP	2	1961	0.17	0.32	0.57	0.72	0.77	0.78	0.87	0.69	0.57	0.43	0.24	0.19
EVAP	2	1962	0.28	0.43	0.55	0.63	0.86	0.79	1.04	0.91	0.65	0.56	0.34	0.21
EVAP	2	1963	0.24	0.36	0.58	0.71	0.66	0.81	0.90	0.96	0.61	0.47	0.38	0.17
EVAP	2	1964	0.28	0.30	0.51	0.62	0.67	0.72	0.89	1.00	0.64	0.46	0.34	0.22
EVAP	2	1965	0.30	0.30	0.43	0.57	0.65	0.89	1.01	0.84	0.72	0.39	0.28	0.18
EVAP	2	1966	0.15	0.20	0.38	0.54	0.50	0.58	0.78	0.80	0.58	0.44	0.40	0.31
EVAP	2	1967	0.26	0.32	0.53	0.74	0.77	0.88	1.04	0.72	0.43	0.35	0.17	0.18
EVAP	2	1968	0.16	0.21	0.39	0.41	0.55	0.69	0.66	0.77	0.42	0.37	0.31	0.27
EVAP	2	1969	0.22	0.23	0.47	0.55	0.66	0.73	0.98	0.75	0.51	0.45	0.29	0.20
EVAP	2	1970	0.15	0.26	0.45	0.59	0.62	0.72	0.77	0.76	0.55	0.39	0.37	0.29
EVAP	2	1971	0.33	0.40	0.63	0.72	0.74	0.84	0.87	0.61	0.54	0.32	0.29	0.20
EVAP	2	1972	0.24	0.28	0.43	0.64	0.49	0.57	0.63	0.75	0.59	0.39	0.23	0.20
EVAP	2	1973	0.21	0.19	0.43	0.45	0.62	0.64	0.70	0.55	0.48	0.33	0.26	0.27

GROUP Q

EVAP	2	1974	0.18	0.39	0.43	0.55	0.64	0.76	0.84	0.86	0.54	0.41	0.27	0.17
EVAP	2	1975	0.26	0.30	0.51	0.58	0.60	0.72	0.67	0.55	0.39	0.41	0.37	0.25
EVAP	2	1976	0.25	0.41	0.41	0.48	0.53	0.72	0.55	0.66	0.50	0.33	0.14	0.15
EVAP	2	1977	0.13	0.28	0.41	0.50	0.55	0.71	0.84	0.81	0.56	0.39	0.31	0.25
EVAP	2	1978	0.18	0.23	0.53	0.61	0.67	0.77	0.91	0.77	0.41	0.29	0.21	0.21
EVAP	2	1979	0.20	0.22	0.42	0.47	0.67	0.72	0.79	0.78	0.46	0.52	0.33	0.17
EVAP	2	1980	0.19	0.20	0.45	0.60	0.59	0.94	0.98	0.71	0.64	0.43	0.27	0.17
EVAP	2	1981	0.16	0.20	0.37	0.40	0.50	0.53	0.69	0.63	0.49	0.41	0.28	0.22
EVAP	2	1982	0.28	0.22	0.39	0.45	0.39	0.69	0.89	0.79	0.61	0.38	0.26	0.22
EVAP	2	1983	0.17	0.25	0.44	0.63	0.58	0.68	0.64	0.69	0.53	0.42	0.34	0.19
EVAP	2	1984	0.14	0.34	0.51	0.57	0.68	0.76	0.80	0.84	0.50	0.35	0.33	0.23
EVAP	2	1985	0.17	0.21	0.44	0.50	0.57	0.68	0.80	0.85	0.64	0.46	0.30	0.19
EVAP	2	1986	0.24	0.33	0.59	0.51	0.59	0.59	0.86	0.80	0.62	0.39	0.20	0.14
EVAP	2	1987	0.21	0.27	0.33	0.45	0.51	0.57	0.75	0.81	0.53	0.48	0.29	0.20
EVAP	2	1988	0.21	0.23	0.47	0.55	0.61	0.74	0.78	0.62	0.51	0.42	0.33	0.25
EVAP	2	1989	0.22	0.25	0.54	0.55	0.76	0.80	0.83	0.71	0.63	0.48	0.31	0.21
EVAP	2	1990	0.31	0.33	0.41	0.48	0.71	0.93	0.87	0.76	0.48	0.48	0.32	0.27
EVAP	2	1991	0.19	0.28	0.60	0.55	0.61	0.71	0.68	0.81	0.41	0.42	0.26	0.20
EVAP	2	1992	0.15	0.24	0.34	0.43	0.47	0.67	0.92	0.74	0.63	0.43	0.28	0.20
EVAP	2	1993	0.20	0.24	0.37	0.58	0.65	0.57	0.87	0.88	0.54	0.46	0.27	0.27
EVAP	2	1994	0.26	0.28	0.49	0.50	0.62	0.74	1.00	0.72	0.57	0.45	0.35	0.23
EVAP	2	1995	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	2	1996	0.28	0.34	0.51	0.67	0.81	0.87	0.99	0.69	0.56	0.39	0.34	0.24
EVAP	3	1945	0.26	0.28	0.54	0.64	0.87	1.06	0.76	1.17	0.88	0.38	0.39	0.37
EVAP	3	1946	0.26	0.34	0.58	0.66	0.54	0.71	1.07	0.82	0.72	0.44	0.40	0.30
EVAP	3	1947	0.23	0.33	0.42	0.58	0.76	0.91	1.15	0.92	0.86	0.73	0.38	0.25
EVAP	3	1948	0.22	0.25	0.52	0.69	0.83	1.03	0.95	1.03	0.76	0.45	0.48	0.36
EVAP	3	1949	0.13	0.26	0.47	0.51	0.62	0.85	0.93	0.76	0.75	0.43	0.43	0.29
EVAP	3	1950	0.16	0.23	0.55	0.45	0.63	0.85	0.93	0.88	0.73	0.66	0.59	0.42
EVAP	3	1951	0.37	0.29	0.45	0.58	0.61	0.65	1.09	1.13	0.94	0.73	0.46	0.38
EVAP	3	1952	0.33	0.40	0.49	0.54	0.64	0.77	1.03	1.19	0.93	0.78	0.45	0.29
EVAP	3	1953	0.43	0.38	0.37	0.70	0.83	1.05	1.24	1.08	0.80	0.66	0.46	0.35
EVAP	3	1954	0.25	0.39	0.56	0.43	0.65	0.88	1.14	1.11	1.09	0.68	0.58	0.58
EVAP	3	1955	0.27	0.34	0.55	0.62	0.75	0.87	1.19	0.93	0.71	0.93	0.53	0.40
EVAP	3	1956	0.28	0.34	0.45	0.61	0.82	1.16	1.26	1.10	1.21	0.78	0.49	0.35
EVAP	3	1957	0.28	0.28	0.53	0.55	0.52	0.77	1.23	1.21	0.71	0.48	0.23	0.30
EVAP	3	1958	0.22	0.27	0.34	0.61	0.75	0.81	0.84	1.07	0.43	0.26	0.22	0.25
EVAP	3	1959	0.27	0.24	0.54	0.54	0.66	0.79	0.78	0.66	0.75	0.45	0.33	0.28
EVAP	3	1960	0.21	0.34	0.43	0.59	0.80	1.22	0.65	0.79	0.75	0.54	0.25	0.21
EVAP	3	1961	0.21	0.24	0.53	0.72	0.78	0.77	0.76	0.69	0.69	0.40	0.35	0.28
EVAP	3	1962	0.27	0.47	0.64	0.57	0.95	0.86	1.11	1.15	0.99	0.71	0.36	0.29
EVAP	3	1963	0.31	0.37	0.61	0.61	0.64	0.77	1.03	1.01	0.75	0.60	0.40	0.20
EVAP	3	1964	0.34	0.33	0.63	0.74	0.75	0.93	1.11	0.94	0.63	0.42	0.30	0.22
EVAP	3	1965	0.29	0.24	0.42	0.61	0.50	0.71	0.99	0.91	0.68	0.49	0.29	0.22
EVAP	3	1966	0.21	0.25	0.49	0.59	0.49	0.71	1.02	0.73	0.50	0.23	0.19	0.29
EVAP	3	1967	0.30	0.33	0.53	0.58	0.88	1.01	1.12	0.85	0.49	0.51	0.25	0.24
EVAP	3	1968	0.14	0.22	0.33	0.46	0.52	0.74	0.76	0.92	0.54	0.46	0.34	0.27
EVAP	3	1969	0.23	0.28	0.56	0.58	0.66	0.83	1.07	0.97	0.55	0.37	0.22	0.16
EVAP	3	1970	0.16	0.25	0.38	0.49	0.72	0.70	0.83	0.81	0.63	0.33	0.35	0.23
EVAP	3	1971	0.30	0.38	0.66	0.70	0.71	0.65	0.70	0.62	0.52	0.25	0.26	0.19

GROUP Q

EVAP	3	1972	0.24	0.27	0.54	0.70	0.57	0.76	0.83	0.62	0.58	0.40	0.32	0.24
EVAP	3	1973	0.25	0.17	0.52	0.57	0.76	0.58	0.71	0.77	0.56	0.34	0.27	0.32
EVAP	3	1974	0.25	0.42	0.40	0.73	0.70	0.96	0.99	0.73	0.50	0.39	0.23	0.22
EVAP	3	1975	0.21	0.30	0.52	0.56	0.57	0.74	0.63	0.69	0.49	0.47	0.35	0.27
EVAP	3	1976	0.27	0.39	0.52	0.48	0.49	0.79	0.59	0.71	0.53	0.37	0.20	0.18
EVAP	3	1977	0.20	0.30	0.46	0.54	0.41	0.77	0.88	1.03	0.75	0.52	0.37	0.32
EVAP	3	1978	0.24	0.25	0.55	0.68	0.69	0.86	0.95	0.76	0.45	0.33	0.20	0.23
EVAP	3	1979	0.20	0.24	0.35	0.51	0.64	0.69	0.78	0.76	0.72	0.69	0.36	0.24
EVAP	3	1980	0.24	0.31	0.55	0.76	0.65	0.92	1.11	0.88	0.62	0.47	0.28	0.18
EVAP	3	1981	0.23	0.21	0.43	0.43	0.56	0.60	0.81	0.76	0.72	0.52	0.34	0.27
EVAP	3	1982	0.28	0.28	0.37	0.57	0.58	0.79	0.94	0.94	0.81	0.56	0.34	0.23
EVAP	3	1983	0.22	0.28	0.47	0.72	0.77	0.71	0.96	0.85	0.71	0.61	0.36	0.11
EVAP	3	1984	0.20	0.39	0.54	0.90	0.85	0.85	0.97	1.00	0.85	0.38	0.33	0.21
EVAP	3	1985	0.23	0.19	0.38	0.52	0.70	0.71	0.82	0.97	0.66	0.43	0.26	0.23
EVAP	3	1986	0.25	0.38	0.69	0.67	0.72	0.60	1.05	0.88	0.53	0.27	0.20	0.19
EVAP	3	1987	0.23	0.23	0.38	0.47	0.44	0.53	0.77	0.82	0.54	0.68	0.47	0.23
EVAP	3	1988	0.21	0.28	0.58	0.71	0.71	0.77	0.79	0.79	0.73	0.38	0.40	0.24
EVAP	3	1989	0.23	0.22	0.43	0.59	0.85	0.95	1.07	1.30	0.91	0.83	0.51	0.16
EVAP	3	1990	0.35	0.45	0.49	0.52	0.75	1.24	0.80	0.76	0.53	0.50	0.30	0.35
EVAP	3	1991	0.23	0.37	0.70	0.73	0.86	0.86	1.00	0.98	0.73	0.70	0.47	0.20
EVAP	3	1992	0.19	0.30	0.43	0.53	0.73	0.78	0.92	0.83	0.81	0.69	0.41	0.25
EVAP	3	1993	0.29	0.30	0.57	0.77	0.89	0.81	1.10	1.14	0.60	0.68	0.41	0.41
EVAP	3	1994	0.34	0.33	0.55	0.67	0.65	1.15	1.11	1.16	0.70	0.55	0.34	0.28
EVAP	3	1995	0.31	0.44	0.47	0.77	0.87	0.99	1.17	1.18	0.86	0.74	0.34	0.32
EVAP	3	1996	0.41	0.46	0.62	0.89	1.01	1.29	1.30	1.01	0.57	0.70	0.39	0.27
EVAP	4	1945	0.34	0.41	0.52	0.58	0.83	0.92	1.03	0.94	1.02	0.77	0.65	0.51
EVAP	4	1946	0.30	0.30	0.50	0.50	0.58	0.71	1.02	0.93	0.63	0.61	0.54	0.38
EVAP	4	1947	0.31	0.36	0.48	0.52	0.67	0.91	1.03	0.78	0.95	0.78	0.58	0.24
EVAP	4	1948	0.35	0.23	0.52	0.71	0.61	0.87	0.93	1.05	0.73	0.68	0.74	0.43
EVAP	4	1949	0.32	0.20	0.34	0.37	0.56	0.73	0.88	0.88	0.68	0.65	0.55	0.35
EVAP	4	1950	0.49	0.45	0.58	0.64	0.97	0.83	1.19	1.33	0.95	0.80	0.76	0.52
EVAP	4	1951	0.53	0.51	0.60	0.62	0.69	0.84	1.14	0.95	0.93	0.86	0.58	0.51
EVAP	4	1952	0.46	0.53	0.53	0.69	0.75	0.83	0.91	1.23	1.03	0.93	0.51	0.38
EVAP	4	1953	0.44	0.37	0.49	0.61	0.67	0.97	1.04	0.99	0.92	0.66	0.54	0.39
EVAP	4	1954	0.20	0.49	0.55	0.63	0.80	0.82	0.90	0.89	0.70	0.47	0.36	0.33
EVAP	4	1955	0.31	0.28	0.56	0.63	0.80	0.89	0.96	0.84	0.51	0.55	0.38	0.25
EVAP	4	1956	0.28	0.32	0.49	0.66	0.88	0.81	1.06	0.91	0.77	0.64	0.43	0.32
EVAP	4	1957	0.28	0.37	0.61	0.57	0.68	0.75	1.01	0.94	0.68	0.49	0.39	0.33
EVAP	4	1958	0.23	0.24	0.35	0.54	0.70	0.71	0.86	0.90	0.44	0.25	0.23	0.18
EVAP	4	1959	0.18	0.16	0.40	0.47	0.75	0.76	0.86	0.36	0.67	0.44	0.31	0.27
EVAP	4	1960	0.18	0.35	0.37	0.53	0.71	0.83	0.98	0.76	0.49	0.43	0.23	0.15
EVAP	4	1961	0.17	0.32	0.57	0.72	0.77	0.78	0.87	0.69	0.57	0.43	0.24	0.19
EVAP	4	1962	0.28	0.43	0.55	0.63	0.86	0.79	1.04	0.91	0.65	0.56	0.34	0.21
EVAP	4	1963	0.24	0.36	0.58	0.71	0.66	0.81	0.90	0.96	0.61	0.47	0.38	0.17
EVAP	4	1964	0.28	0.30	0.51	0.62	0.67	0.72	0.89	1.00	0.64	0.46	0.34	0.22
EVAP	4	1965	0.30	0.30	0.43	0.57	0.65	0.89	1.01	0.84	0.72	0.39	0.28	0.18
EVAP	4	1966	0.15	0.20	0.38	0.54	0.50	0.58	0.78	0.80	0.58	0.44	0.40	0.31
EVAP	4	1967	0.26	0.32	0.53	0.74	0.77	0.88	1.04	0.72	0.43	0.35	0.17	0.18
EVAP	4	1968	0.16	0.21	0.39	0.41	0.55	0.69	0.66	0.77	0.42	0.37	0.31	0.27

GROUP Q

EVAP	4	1969	0.22	0.23	0.47	0.55	0.66	0.73	0.98	0.75	0.51	0.45	0.29	0.20
EVAP	4	1970	0.15	0.26	0.45	0.59	0.62	0.72	0.77	0.76	0.55	0.39	0.37	0.29
EVAP	4	1971	0.33	0.40	0.63	0.72	0.74	0.84	0.87	0.61	0.54	0.32	0.29	0.20
EVAP	4	1972	0.24	0.28	0.43	0.64	0.49	0.57	0.63	0.75	0.59	0.39	0.23	0.20
EVAP	4	1973	0.21	0.19	0.43	0.45	0.62	0.64	0.70	0.55	0.48	0.33	0.26	0.27
EVAP	4	1974	0.18	0.39	0.43	0.55	0.64	0.76	0.84	0.86	0.54	0.41	0.27	0.17
EVAP	4	1975	0.26	0.30	0.51	0.58	0.60	0.72	0.67	0.55	0.39	0.41	0.37	0.25
EVAP	4	1976	0.25	0.41	0.41	0.48	0.53	0.72	0.55	0.66	0.50	0.33	0.14	0.15
EVAP	4	1977	0.13	0.28	0.41	0.50	0.55	0.71	0.84	0.81	0.56	0.39	0.31	0.25
EVAP	4	1978	0.18	0.23	0.53	0.61	0.67	0.77	0.91	0.77	0.41	0.29	0.21	0.21
EVAP	4	1979	0.20	0.22	0.42	0.47	0.67	0.72	0.79	0.78	0.46	0.52	0.33	0.17
EVAP	4	1980	0.19	0.20	0.45	0.60	0.59	0.94	0.98	0.71	0.64	0.43	0.27	0.17
EVAP	4	1981	0.16	0.20	0.37	0.40	0.50	0.53	0.69	0.63	0.49	0.41	0.28	0.22
EVAP	4	1982	0.28	0.22	0.39	0.45	0.39	0.69	0.89	0.79	0.61	0.38	0.26	0.22
EVAP	4	1983	0.17	0.25	0.44	0.63	0.58	0.68	0.64	0.69	0.53	0.42	0.34	0.19
EVAP	4	1984	0.14	0.34	0.51	0.57	0.68	0.76	0.80	0.84	0.50	0.35	0.33	0.23
EVAP	4	1985	0.17	0.21	0.44	0.50	0.57	0.68	0.80	0.85	0.64	0.46	0.30	0.19
EVAP	4	1986	0.24	0.33	0.59	0.51	0.59	0.59	0.86	0.80	0.62	0.39	0.20	0.14
EVAP	4	1987	0.21	0.27	0.33	0.45	0.51	0.57	0.75	0.81	0.53	0.48	0.29	0.20
EVAP	4	1988	0.21	0.23	0.47	0.55	0.61	0.74	0.78	0.62	0.51	0.42	0.33	0.25
EVAP	4	1989	0.22	0.25	0.54	0.55	0.76	0.80	0.83	0.71	0.63	0.48	0.31	0.21
EVAP	4	1990	0.31	0.33	0.41	0.48	0.71	0.93	0.87	0.76	0.48	0.48	0.32	0.27
EVAP	4	1991	0.19	0.28	0.60	0.55	0.61	0.71	0.68	0.81	0.41	0.42	0.26	0.20
EVAP	4	1992	0.15	0.24	0.34	0.43	0.47	0.67	0.92	0.74	0.63	0.43	0.28	0.20
EVAP	4	1993	0.20	0.24	0.37	0.58	0.65	0.57	0.87	0.88	0.54	0.46	0.27	0.27
EVAP	4	1994	0.26	0.28	0.49	0.50	0.62	0.74	1.00	0.72	0.57	0.45	0.35	0.23
EVAP	4	1995	0.26	0.29	0.42	0.68	0.73	0.80	0.87	0.61	0.58	0.43	0.25	0.20
EVAP	4	1996	0.28	0.34	0.51	0.67	0.81	0.87	0.99	0.69	0.56	0.39	0.34	0.24

Attachment C.

Amistad-Falcon Reservoir Operations Model Data Input File Description and Formatting

ATTACHMENT C

ROM DATA INPUT FILE DESCRIPTION AND FORMATTING

GROUP A

Name: Simulation Titles

Description: These two lines, each containing 100 alphanumeric characters, are used to describe simulation conditions.

Lines: 2

Format:

Line	Field	Format	Columns	Parameter Description
1	1	25A4	1-100	Alphanumeric characters
2	1	25A4	1-100	Alphanumeric characters

GROUP B

Name: Simulation Control Parameters

Description: This file contains 30 lines, with one parameter per line. These parameters specify various controls for the simulation, including the amounts of authorized diversions and storage for different types of water rights for the Middle and Lower Rio Grande that are recognized for purposes of the simulation.

Lines: 30

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I5	81-85	Number of nodes in network
2	1	I5	81-85	Number of reservoir nodes
3	1	I5	81-85	Number of links in model network
4	1	I5	81-85	Number of river links
5	1	I5	81-85	Number of years simulated
6	1	I5	81-85	Number of demand nodes
7	1	I5	81-85	Number of spill reservoirs
8	1	I5	81-85	First calendar year of simulation
9	1	I5	81-85	First ordinal year for detailed printout
10	1	I5	81-85	Last ordinal year for detailed printout
11	1	A4	82-85	Always set equal to "CARD"
12	1	I5	81-85	Demand shortage limit used as criterion in firm annual yield analysis
13	1	I5	81-85	Flag for saving plot variables = 0, Save no output for plotting = Node Number, save Reservoir Operations output for this node = 5, Save Water Accounting output
14	1	I5	81-85	First calendar year of critical drought period for firm annual yield analysis
15	1	I5	81-85	Last calendar year of critical drought period for firm annual yield analysis
16	1	I5	81-85	Flag for firm annual yield analysis = 0, No firm annual yield analysis

				= 1, Perform FAY analysis for U. S. holding Mexico demands constant = 2, Perform FAY analysis for Mexico holding U. S. demands constant
17	1	F10.0	76-85	Demand adjustment factor that is applied to annual demands in Group G data file to establish initial U. S. FAY demands
18	1	F10.0	76-85	Demand adjustment factor that is applied to annual demands in Group G data file to establish initial Mexico FAY demands
19	1	I10	76-85	Total Lower & Middle Rio Grande Domestic-Municipal-Industrial water rights
20	1	I10	76-85	Total Lower Rio Grande irrigation water rights
21	1	I10	76-85	Total Lower Rio Grande Class A irrigation water rights
22	1	I10	76-85	Total Lower Rio Grande Class B irrigation water rights
23	1	I10	76-85	Total Middle Rio Grande irrigation water rights
24	1	I10	76-85	Total Middle Rio Grande Class A irrigation water rights
25	1	I10	76-85	Total Middle Rio Grande Class B irrigation water rights
26	1	I10	76-85	Maximum U. S. Domestic-Municipal-Industrial reserve pool
27	1	I10	76-85	Starting Irrigation & Mining Account balance
28	1	I10	76-85	Number of water rights owners for individual accounting (Max. of 3)
29	1	I10	76-85	Flag for specifying Amistad releases = 0, specify all monthly release values = 1, specify average monthly releases
30	1	I10	76-85	Flag for specifying water demands for individual water rights = 0, specify all monthly demand values = 1, specify average monthly demands

GROUP C

Name: Reservoir Node Parameters

Description: This file contains eight lines (one line per node), with six parameters per line. These parameters specify the name and storage capacities for each reservoir included in the network.

Lines: 8

Format:

Line	Field	Format	Columns	Parameter Description
1-8	1	3A4	1-12	Abbreviated name of reservoir
	2	I5	13-17	Node identification number
	3	I10	18-27	Maximum flood storage capacity, ac-ft
	4	I5	28-37	Conservation storage capacity, ac-ft
	5	I5	38-47	Minimum storage capacity, ac-ft
	6	I5	48-57	Starting storage capacity, ac-ft

GROUP D

Name: Spill Reservoir Nodes

Description: This file contains one line, identifying up to 12 node numbers for reservoirs where spills from the network system can occur.

Lines: 1

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I5	11-15	Node number of spill reservoir
	2	I5	13-17	Node number of spill reservoir
------	------	------	------	------
	12	I5	66-70	Node number of spill reservoir

GROUP E

Name: Amistad Reservoir Stage-Area-Capacity Data

Description: This file contains 30 lines, with stage-area-capacity data for Amistad Reservoir.

Lines: 8

Format:

Line	Field	Format	Columns	Parameter Description
1-30	1	I5	11-15	Value of “1” for U. S. Amistad node
	2	I5	16-20	Stage-area-capacity data set number
	3	F10.1	21-30	Reservoir stage value, feet msl
	4	I10	31-40	Reservoir surface area value, acres
	5	I10	41-50	Reservoir storage capacity value, ac-ft

GROUP F

Name: Falcon Reservoir Stage-Area-Capacity Data

Description: This file contains 30 lines, with stage-area-capacity data for Falcon Reservoir.

Lines: 8

Format:

Line	Field	Format	Columns	Parameter Description
1-30	1	I5	11-15	Value of "2" for U. S. Falcon node
	2	I5	16-20	Stage-area-capacity data set number
	3	F10.1	21-30	Reservoir stage value, feet msl
	4	I10	31-40	Reservoir surface area value, acres
	5	I10	41-50	Reservoir storage capacity value, ac-ft

GROUP G

Name: Node Annual Demand Data

Description: This file contains eight lines (one line per node), with 17 parameters per line. These parameters specify the annual demand amount, demand priorities (ranking), and monthly demand distributions for each demand node included in the network. If the annual demand amount is greater than zero, then this demand amount will be used instead of monthly-varying demands as may be specified in the Group P data file. The priority for a particular demand indicates the order of preference in which this demand should be met in reference to other demand and storage priorities in the system.

Lines: 8

Format:

Line	Field	Format	Columns	Parameter Description
1-8	1	I3	11-13	Node identification number
	2	I8	14-21	Annual demand, ac-ft
	3	I3	22-24	Priority number for average hydrologic state based on Falcon storage
	4	I3	25-27	Priority number for dry hydrologic state based on Falcon storage
	5	I3	28-30	Priority number for wet hydrologic state based on Falcon storage
	6-17	12F5.0	31-90	Monthly demand distribution factors

GROUP H

Name: Hydrologic State Definitions

Description: This file contains two lines (one line for the United States and one for Mexico), with two parameters per line that define the lower and upper limits of Falcon storage that bracket the average hydrologic state of the system for each country.

Lines: 2

Format:

Line	Field	Format	Columns	Parameter Description
1	1	F10.2	11-20	Percent of Falcon maximum capacity that sets the lower bound of the average hydrologic state for the United States
	2	F10.2	21-30	Percent of Falcon maximum capacity that sets the upper bound of the average hydrologic state for the United States
2	1	F10.2	11-20	Percent of Falcon maximum capacity that sets the lower bound of the average hydrologic state for Mexico
	2	F10.2	21-30	Percent of Falcon maximum capacity that sets the upper bound of the average hydrologic state for Mexico

GROUP I

Name: Reservoir Operating Rules

Description: This file contains four sets of input data (one set each for Amistad and Falcon Reservoirs for both the United States and for Mexico), with each set containing three lines corresponding to the three system hydrologic states (1-average, 2-dry and 3-wet). Parameters on each line specify the reservoir storage priority and monthly storage targets for the associated hydrologic state.

Lines: 12

Format:

Line	Field	Format	Columns	Parameter Description
1,4	1	I5	11-15	United States reservoir node number, "1" for Amistad and "2" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the average hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for average hydrologic state
2,5	1	I5	11-15	United States reservoir node number, "1" for Amistad and "2" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the dry hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for dry hydrologic state
3,6	1	I5	11-15	United States reservoir node number, "1" for Amistad and "2" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the wet hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for wet hydrologic state
7,10	1	I5	11-15	Mexico reservoir node number, "3" for Amistad and "4" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the average hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for average hydrologic state
8,11	1	I5	11-15	Mexico reservoir node number, "3" for Amistad and "4" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the dry hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for dry hydrologic state
9,12	1	I5	11-15	Mexico reservoir node number, "3" for Amistad and "4" for Falcon
	2	I5	26-30	Reservoir storage priority corresponding to the wet hydrologic state
	3-14	12F10.6	31-102	Target percentage of reservoir's maximum capacity for wet hydrologic state

GROUP J

Name: Network Link Specifications

Description: This file contains eight lines (one line per link), with five parameters per line. These parameters specify the link identification number, the beginning and ending nodes, and the maximum and minimum flow capacities of each link included in the model network.

Lines: 8

Format:

Line	Field	Format	Columns	Parameter Description
1-8	1	I5	11-15	Link identification number
	2	I5	16-20	Identification number for node at beginning (upstream end) of link
	3	I5	21-25	Identification number for node at end (downstream end) of link
	4	I10	26-35	Maximum flow capacity of link which can never be exceeded, ac-ft/mon
	5	I10	36-45	Minimum flow capacity of link which always must be satisfied, ac-ft/mon

GROUP K

Name: Minimum Monthly Amistad Releases

Description: This file can be provided in two different formats, depending on the desired Amistad release specification. The variable "IRLFLG" as specified on Line No. 27 of the Group B data file defines the type of release information to be provided. If IRLFLG = 1, then 12 average minimum monthly release values are specified on two lines (one line each for the United States and Mexico), and these are repeated for each year of the simulation period. If IRLFLG = 0, then individual monthly release values are specified for each month of the simulation period, with two different sets of monthly releases specified for the United States and for Mexico.

For IRLFLG = 1,

Lines: 2

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I4	16-19	Calendar Year 1 of the simulation period
	2-13	12I7	20-103	Average minimum monthly Amistad releases for the United States
2	1	I4	16-19	Calendar Year 1 of the simulation period
	2-13	12I7	20-103	Average minimum monthly Amistad releases for the Mexico

For IRLFLG = 0,

Lines: 2 times the number of years simulated (N)

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I4	16-19	Calendar Year 1 of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for the United States for Calendar Year 1
2	1	I4	16-19	Calendar Year 2 of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for the United States for Calendar Year 2

N	1	I4	16-19	Last calendar year of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for the United States for last simulation year
N+1	1	I4	16-19	Calendar Year 1 of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for Mexico for Calendar Year 1
N+2	1	I4	16-19	Calendar Year 2 of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for Mexico for Calendar Year 2

2N	1	I4	16-19	Last calendar year of the simulation period
	2-13	12I7	20-103	Minimum monthly Amistad releases for Mexico for last simulation year

GROUP L

Name: Individual Water Rights Data for Owner No. 1

Description: This file contains four initial lines of data describing the name, adjudication numbers, authorized annual diversion amounts, and initial starting account balances for the individual water rights of Owner No. 1 (Note: Individual water rights accounting can be simulated for a maximum of three water rights owners, each of which can have a municipal water right, a Class A irrigation water right, and a Class B irrigation water right). In addition, the monthly diversions for each of the individual water rights of Owner No. 1 are specified at the end of this file. These monthly diversions can be provided in two different formats, depending on the desired diversion specification. The variable "IWRFLG" as specified on Line No. 28 of the Group B data file defines the type of monthly diversion information to be provided. If IWRFLG = 1, then 12 average monthly diversion values are specified on each of three lines (one line each for the municipal water right, the Class A irrigation water right, and the Class B irrigation water right), and these are repeated for each year of the simulation period. If IWRFLG = 0, then individual monthly diversion values are specified for each month of the simulation period, with three different sets of monthly diversions specified for the municipal water right, the Class A irrigation water right, and the Class B irrigation water right.

Lines: 7 or 4 plus 3 times the number of years simulated (N)

Format:

	Line	Field	Format	Columns	Parameter Description
	1	1	3A4	1-12	Name of water rights Owner No. 1
		2	I1	15	Value of "1" for Owner No. 1
	2	1	3A4	11-22	Municipal adjudication number
		2	3A4	43-54	Class A irrigation adjudication number
		3	3A4	73-86	Class B irrigation adjudication number
	3	1	I10	13-22	Municipal authorized diversion, ac-ft\yr
		2	I10	45-54	Class A irrig. authorized diversion, ac-ft/yr
		3	I10	77-86	Class B irrig. authorized diversion, ac-ft/yr
	4	1	I10	45-54	Class A irrig. initial account balance, ac-ft
		2	I10	77-86	Class B irrig. initial account balance, ac-ft
For IRLFLG = 1,					
	5	1	I2	12-13	Value of "1" for Owner No. 1
		2	I4	16-19	Dummy calendar year specification
		3-14	12I7	21-104	Ave. monthly municipal diversion, ac-ft
	6	1	I2	12-13	Value of "1" for Owner No. 1
		2	I4	16-19	Dummy calendar year specification
		3-14	12I7	21-104	Ave. mon. Class A irrig. diversion, ac-ft
	7	1	I2	12-13	Value of "1" for Owner No. 1
		2	I4	16-19	Dummy calendar year specification
		3-14	12I7	21-104	Ave. mon. Class B irrig. diversion, ac-ft
For IRLFLG = 0,					
	5	1	I2	12-13	Value of "1" for Owner No. 1
		2	I4	16-19	Calendar Year 1 of the simulation period
		3-14	12I7	21-104	Ave. monthly municipal diversion for Calendar Year 1, ac-ft
	6	1	I2	12-13	Value of "1" for Owner No. 1

	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12I7	21-104	Ave. monthly municipal diversion for Calendar Year 2, ac-ft
N	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Last calendar year of the simulation period
	3-14	12I7	21-104	Ave. monthly municipal diversion for last calendar year of simulation period, ac-ft
N+1	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Calendar Year 1 of the simulation period
	3-14	12I7	21-104	Ave. mon. Class A irrigation diversion for Calendar Year 1, ac-ft
N+2	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12I7	21-104	Ave. mon. Class A irrigation diversion for Calendar Year 2, ac-ft
2N	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Last calendar year of the simulation period
	3-14	12I7	21-104	Ave. mon. Class A irrigation diversion for last year of simulation period, ac-ft
2N+1	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Calendar Year 1 of the simulation period
	3-14	12I7	21-104	Ave. mon. Class B irrigation diversion for Calendar Year 1, ac-ft
2N+2	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12I7	21-104	Ave. mon. Class B irrigation diversion for Calendar Year 2, ac-ft
3N	1	I2	12-13	Value of "1" for Owner No. 1
	2	I4	16-19	Last calendar year of the simulation period
	3-14	12I7	21-104	Ave. mon. Class B irrigation diversion for last year of simulation period, ac-ft

GROUP M

Name: Individual Water Rights Data for Owner No. 2

Description: This file contains the same data in the same format as the Group L file, except it is for water rights Owner No. 2.

GROUP N

Name: Individual Water Rights Data for Owner No. 3

Description: This file contains the same data in the same format as the Group L file, except it is for water rights Owner No. 3.

GROUP O

Name: Monthly Inflow Data

Description: This file contains eight sets of monthly inflow data (one set per node), with each set containing a line of 12 monthly inflow values for each year of the simulation period. These inflows represent external flows into the system at each node.

Lines: 8 times the number of years simulated (N)

The following data structure and formats are repeated for each node.

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 1 of the simulation period
	3-14	12F7.0	21-104	Monthly inflows for Calendar Year 1, ac-ft
2	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12F7.0	21-104	Monthly inflows for Calendar Year 2, ac-ft
----	----	----	----	----
N	1	I2	12-13	Node identification number
	2	I4	16-19	Last year of the simulation period
	3-14	12F7.0	21-104	Monthly inflows for last year, ac-ft

GROUP P

Name: Node Monthly Demand Data

Description: This file contains eight sets of monthly demand data (one set per node), with each set containing a line of 12 monthly demand values for each year of the simulation period. If these monthly demands are to be used for a particular node, then the annual demand for this node must be set equal to zero in the Group G data file.

Lines: 8 times the number of years simulated (N)
The following data structure and formats are repeated for each node.

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 1 of the simulation period
	3-14	12F7.0	21-104	Monthly demands for Calndr. Year 1, ac-ft
2	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12F7.0	21-104	Monthly demands for Calndr. Year 2, ac-ft
----	----	----	----	----
N	1	I2	12-13	Node identification number
	2	I4	16-19	Last year of the simulation period
	3-14	12F7.0	21-104	Monthly demands for last year, ac-ft

GROUP Q

Name: Reservoir Monthly Evaporation Data

Description: This file contains four sets of monthly reservoir evaporation data (one set per reservoir), with each set containing a line of 12 monthly evaporation values for each year of the simulation period. The evaporation data sets for Node No. 1 (United States portion of Amistad Reservoir) and Node No. 3 (Mexico portion of Amistad Reservoir) are the same. Similarly, the evaporation data sets for Node No. 2 (United States portion of Falcon Reservoir) and Node No. 4 (Mexico portion of Falcon Reservoir) are the same. Gross reservoir evaporation rates are specified in the current data files since rainfall on the reservoirs is accounted for in the specified monthly inflows to the system.

Lines: 4 times the number of years simulated (N)
The following data structure and formats are repeated for each reservoir node.

Format:

Line	Field	Format	Columns	Parameter Description
1	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 1 of the simulation period
	3-14	12F7.0	21-104	Monthly evap. rates for Calendar Year 1, ft
2	1	I2	12-13	Node identification number
	2	I4	16-19	Calendar Year 2 of the simulation period
	3-14	12F7.0	21-104	Monthly evap. rates for Calendar Year 2, ft
----	----	----	----	----
N	1	I2	12-13	Node identification number
	2	I4	16-19	Last year of the simulation period
	3-14	12F7.0	21-104	Monthly evap. rates for last year, ac-ft

Attachment D.

Abbreviated Output Listing from the Amistad-Falcon Reservoir Operations Model for the 1945-1998 Data Input File with Current Average Demands for the United States and Mexico

RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD

ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN

INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES

R. J. BRANDES COMPANY FEBRUARY 1998

DATE: 3-22-1999

FILE: um4598av

ECHO PRINT OF INPUT DATA FILE PARAMETERS WITHOUT FLOW, DEMAND, OR EVAPORATION DATA

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

AVERAGE CURRENT HISTORICAL DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

CARD 01	NJ - NUMBER OF NODES IN THE MODEL NETWORK	8
CARD 02	NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK	4
CARD 03	NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK	8
CARD 04	NR - NUMBER OF LINKS THAT ARE RIVER REACHES	8
CARD 05	NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD	54
CARD 06	ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK	8
CARD 07	NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK	2
CARD 08	IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD	1945
CARD 09	IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT	1
CARD 10	ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT	54
CARD 11	INPUT DATA SOURCE ("CARD" OR "TAPE")	CARD
CARD 12	FIRM ANNUAL YIELD ITERATION SHORTAGE LIMIT (AC-FT/YR)	10
CARD 13	IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT	1
CARD 14	IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1945
CARD 15	IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1972
CARD 16	IFLYLD=0, NO FAY; =1, DETERMINE U.S. FAY; =2, DETERMINE MEXICO FAY	0
CARD 17	DRUSFC - INITIAL FAY ADJUSTMENT FACTOR FOR U.S. DEMANDS	0.8761716
CARD 18	DRMXFC - INITIAL FAY ADJUSTMENT FACTOR FOR MEXICO DEMANDS	0.7691899
CARD 17	MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS	271579
CARD 18	MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE	1696228
CARD 19	MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE	1500719
CARD 20	MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE	195509
CARD 21	MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE	181530
CARD 22	MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	162803
CARD 23	MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	18727
CARD 24	MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL	225000
CARD 25	IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE	0000000
CARD 26	NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING	3
CARD 27	IRLFLG=0, READ ALL MON AMISTAD RELEASES; =1, READ AVG MON RELEASES	1
CARD 28	IWRFLG=0, READ ALL WATER RIGHTS DEMANDS; =1, READ AVG MON DEMANDS	1

U.S. AMISTAD	1	1827241	1771041	1771	1771041
U.S. FALCON	2	1613729	1555129	1555	1555129
MEX AMISTAD	3	1424078	1380278	1380	1380278
MEX FALCON	4	1140074	1098674	1099	1098674
U.S.MRG MUNI	5	0	0	0	
U.S.MRG IRRI	6	0	0	0	
U.S.LRG IRRI	7	0	0	0	
MEX MRG M&IR	8	0	0	0	

SPILL RESR	2	4			
AMISTAD	1	1	930.0	0	0
AMISTAD	1	2	945.0	5	1
AMISTAD	1	3	946.5	87	294
AMISTAD	1	4	948.2	180	823
AMISTAD	1	5	949.1	237	1180
AMISTAD	1	6	950.1	297	1684
AMISTAD	1	7	951.4	376	2782
AMISTAD	1	8	961.3	1045	13873
AMISTAD	1	9	971.1	1843	33110

ATTACHMENT D

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AMISTAD        1   10     981.0        2770      59404
AMISTAD        1   11     990.8        3823      93556
AMISTAD        1   12    1000.7        5004     138573
AMISTAD        1   13    1010.5        6314     195568
AMISTAD        1   14    1020.3        7722     264663
AMISTAD        1   15    1030.2        9758     350120
AMISTAD        1   16    1040.0       12751     458690
AMISTAD        1   17    1049.9       16734     605456
AMISTAD        1   18    1059.7       21627     790919
AMISTAD        1   19    1069.6       27399    1029250
AMISTAD        1   20    1079.4       34051    1328996
AMISTAD        1   21    1089.2       41702    1699411
AMISTAD        1   22    1094.2       45665    1911714
AMISTAD        1   23    1099.1       49658    2142942
AMISTAD        1   24    1104.0       53679    2393700
AMISTAD        1   25    1108.9       57729    2664077
AMISTAD        1   26    1115.5       63173    3055670
AMISTAD        1   27    1117.0       64438    3151319
AMISTAD        1   28    1118.8       65915    3265037
AMISTAD        1   29    1122.0       68671    3483939
AMISTAD        1   30    1131.9       77013    4199954
FALCON         2    1     203.3           0          0
FALCON         2    2     203.4          35         57
FALCON         2    3     205.1         195        235
FALCON         2    4     206.7         425        735
FALCON         2    5     207.3         539       1050
FALCON         2    6     208.3         727       1670
FALCON         2    7     210.0        1100       3158
FALCON         2    8     214.9        1559       9631
FALCON         2    9     219.8        2202      18806
FALCON         2   10     224.7        3526      32732
FALCON         2   11     229.7        5169      54000
FALCON         2   12     234.6        6531      82799
FALCON         2   13     239.5        8061     118624
FALCON         2   14     242.8       10341     148482
FALCON         2   15     244.4       11654     166516
FALCON         2   16     249.3       15894     234115
FALCON         2   17     254.3       20562     323644
FALCON         2   18     259.2       25677     437240
FALCON         2   19     264.1       30775     576159
FALCON         2   20     269.0       36184     740751
FALCON         2   21     274.0       42448     933844
FALCON         2   22     278.9       48929    1158684
FALCON         2   23     282.2       53474    1326587
FALCON         2   24     285.4       58443    1509829
FALCON         2   25     288.7       65021    1712296
FALCON         2   26     292.0       70235    1935151
FALCON         2   27     295.3       74804    2172702
FALCON         2   28     298.6       82000    2429861
FALCON         2   29     301.2       87181    2653803
FALCON         2   30     305.1       93809    3008297
US AMISTAD  1      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON   2   125000  2  2  2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD  3      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON   4 1224000  6  6  6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI  5    34000  1  1  1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI  6   127000  3  3  3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI  7 1078000  4  4  4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR  8    66000  5  5  5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859
US AVERAGE       9.65       75.00
```

```
MX AVERAGE      10.00     75.00
RESERVOIR     1 1 AVERAGE   10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    1 2 DRY       11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       1 3 WET       10 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     2 1 AVERAGE   11  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    2 2 DRY       10 9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65  9.65
  RULES       2 3 WET       11 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     3 1 AVERAGE   12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
 OPERATING    3 2 DRY       13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
  RULES       3 3 WET       12 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
RESERVOIR     4 1 AVERAGE   13  75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.   75.
 OPERATING    4 2 DRY       12  0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
  RULES       4 3 WET       13 100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
LINK1         1    1    5   9000000          0
LINK2         2    5    6   9000000          0
LINK3         3    6    2   9000000          0
LINK4         4    2    7   9000000          0
LINK5         5    3    8   9000000          0
LINK6         6    8    4   9000000          0
LINK7         7    1    2   9000000          0
LINK8         8    3    4   9000000          0
US AMS REL                 0      0      0      0      0      0      0      0      0      0      0      0
MEX AMS REL                0      0      0      0      0      0      0      0      0      0      0      0
UNITED I.D.   1
MUN ADJ NO    0849-000          CL A ADJ NO    A847-001          CL B ADJ NO    B769-000
MUN ANN AUTH      5300          CL A ANN AUTH     69464          CL B ANN AUTH      4009
IRRIG ACCT START BALANCES       CL A BALANCE      97944          CL B BALANCE       5653
MUNICIPAL    1  1945      382    353    412    474    459    477    532    550    450    426    394    391
CLASS A IRR 1  1945     5189   3063   5418   9982   9322   8794   7384   6717   3967   4119   2793   2716
CLASS B IRR 1  1945      299    177    313    576    538    507    426    388    229    238    161    157
SANTACRUZ 15  2
MUN ADJ NO    0240-000          CL A ADJ NO    0810-000          CL B ADJ NO    B804-000
MUN ANN AUTH      3967          CL A ANN AUTH      4857          CL B ANN AUTH      4828
IRRIG ACCT START BALANCES       CL A BALANCE       6848          CL B BALANCE       6807
MUNICIPAL    2  1945      286    264    308    355    343    357    398    412    337    319    295    293
CLASS A IRR 2  1945      363    214    379    698    652    615    516    470    277    288    195    190
CLASS B IRR 2  1945      361    213    376    694    648    611    513    467    276    286    194    189
HCID2 S.JUAN  3
MUN ADJ NO    0808-001          CL A ADJ NO    0808-005          CL B ADJ NO    0573-001
MUN ANN AUTH      6140          CL A ANN AUTH    147775          CL B ANN AUTH       470
IRRIG ACCT START BALANCES       CL A BALANCE     208363          CL B BALANCE        663
MUNICIPAL    3  1945      442    409    477    549    532    553    616    637    522    493    457    453
CLASS A IRR 3  1945    11039   6517  11526  21235  19831  18708  15709  14290   8438   8763   5941   5778
CLASS B IRR 3  1945       35     21     37     68     63     59     50     45     27     28     19     18
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RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES
R. J. BRANDES COMPANY FEBRUARY 1998

DATE: 3-22-1999
TIME: 13:34:13
FILE: um4598av

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY
AVERAGE CURRENT HISTORICAL DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

NUMBER OF NODES = 8
NUMBER OF RESERVOIRS = 4
NUMBER OF LINKS = 8
NUMBER OF RIVER REACHES = 8
CALENDAR YEAR OPERATION STARTS = 1945
NUMBER OF YEARS TO SIMULATE = 54
NUMBER OF DEMAND NODES = 8
NUMBER OF SPILL NODES = 2
NUMBER OF INDIVIDUAL WATER RIGHTS = 3

SYSTEM NODE CHARACTERISTICS

NODE NO.	NODE NAME	CAPACITIES FLOOD (AC-FT)	CONSERV (AC-FT)	MINIMUM (AC-FT)	STARTING (AC-FT)	YEARLY DEMAND (AC-FT)
1	U.S. AMISTAD	1827241	1771041	1771	1771041	0
2	U.S. FALCON	1613729	1555129	1555	1555129	125000
3	MEX AMISTAD	1424078	1380278	1380	1380278	0
4	MEX FALCON	1140074	1098674	1099	1098674	1224000
5	U.S.MRG MUNI	0	0	0	0	34000
6	U.S.MRG IRRI	0	0	0	0	127000
7	U.S.LRG IRRI	0	0	0	0	1078000
8	MEX MRG M&IR	0	0	0	0	66000

NOTE: FLOOD POOL IS AVAILABLE FOR CONSERVATION STORAGE DURING NOVEMBER-APRIL NON-HURRICANE SEASON

SYSTEM LINK CONFIGURATION

LINK NO.	FROM NODE	TO NODE	MAX. CAPACITY (AC-FT/MON)	MIN. CAPACITY (AC-FT/MON)
1	1	5	9000000	0
2	5	6	9000000	0
3	6	2	9000000	0
4	2	7	9000000	0
5	3	8	9000000	0
6	8	4	9000000	0
7	1	2	9000000	0
8	3	4	9000000	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

U.S. SPILL RESERVOIR NODE: 2

MEXICO SPILL RESERVOIR NODE: 4

U.S. 'AVERAGE', STORAGE CONDITION DEFINED AS 9.65 TO 75.00 PERCENT OF FALCON U.S. MAXIMUM STORAGE CAPACITY

MEXICO 'AVERAGE', STORAGE CONDITION DEFINED AS 10.00 TO 75.00 PERCENT OF FALCON MEXICAN MAXIMUM STORAGE CAPACITY

NODE MONTHLY DEMAND DISTRIBUTIONS AND DEMAND PRIORITIES

NODE NO.	MONTHLY FRACTIONS OF ANNUAL DEMAND												PRIORITIES		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MOD	LO	HI
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
2	.0720	.0666	.0777	.0894	.0866	.0900	.1004	.1038	.0850	.0803	.0744	.0738	2	2	2
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
4	.1620	.0649	.0243	.2413	.2651	.0653	.0295	.0592	.0227	.0344	.0121	.0192	6	6	6
5	.0611	.0610	.0760	.0826	.0892	.0961	.1086	.1108	.0880	.0851	.0724	.0691	1	1	1
6	.0425	.0409	.0927	.1020	.0835	.1039	.1186	.1366	.0807	.0809	.0666	.0511	3	3	3
7	.0747	.0441	.0780	.1437	.1342	.1266	.1063	.0967	.0571	.0593	.0402	.0391	4	4	4
8	.0785	.0727	.0745	.0849	.0799	.0830	.0915	.0910	.0896	.0860	.0825	.0859	5	5	5

RESERVOIR MONTHLY STORAGE TARGETS AND STORAGE PRIORITIES

RESERVOIR NO.		DESIRED MONTHLY STORAGE LEVEL (PERCENT OF MAXI MUM STORAGE CAPACITY)												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	PRIORITIES
1	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
2	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	LO	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	10
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	11
3	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
4	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	LO	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	12
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	13

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

STAGE-AREA-CAPACITY RELATIONSHIPS FOR TOTAL STORAGE IN AMISTAD AND FALCON RESERVOIRS

	AMISTAD RESERVOIR			FALCON RESERVOIR		
POINT NO.	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)
1	930.0	0	0	203.3	0	0
2	945.0	5	1	203.4	35	57
3	946.5	87	294	205.1	195	235
4	948.2	180	823	206.7	425	735
5	949.1	237	1180	207.3	539	1050
6	950.1	297	1684	208.3	727	1670
7	951.4	376	2782	210.0	1100	3158
8	961.3	1045	13873	214.9	1559	9631
9	971.1	1843	33110	219.8	2202	18806
10	981.0	2770	59404	224.7	3526	32732
11	990.8	3823	93556	229.7	5169	54000
12	1000.7	5004	138573	234.6	6531	82799
13	1010.5	6314	195568	239.5	8061	118624
14	1020.3	7722	264663	242.8	10341	148482
15	1030.2	9758	350120	244.4	11654	166516
16	1040.0	12751	458690	249.3	15894	234115
17	1049.9	16734	605456	254.3	20562	323644
18	1059.7	21627	790919	259.2	25677	437240
19	1069.6	27399	1029250	264.1	30775	576159
20	1079.4	34051	1328996	269.0	36184	740751
21	1089.2	41702	1699411	274.0	42448	933844
22	1094.2	45665	1911714	278.9	48929	1158684
23	1099.1	49658	2142942	282.2	53474	1326587
24	1104.0	53679	2393700	285.4	58443	1509829
25	1108.9	57729	2664077	288.7	65021	1712296
26	1115.5	63173	3055670	292.0	70235	1935151
27	1117.0	64438	3151319	295.3	74804	2172702
28	1118.8	65915	3265037	298.6	82000	2429861
29	1122.0	68671	3483939	301.2	87181	2653803
30	1131.9	77013	4199954	305.1	93809	3008297

SUMMARY OF TEXAS WATER RIGHTS IN MIDDLE AND LOWER RIO GRANDE AND
MAXIMUM STORAGE ALLOCATIONS IN AMISTAD AND FALCON RESERVOIRS

TOTAL DOMESTIC, MUNICIPAL AND INDUSTRIAL WATER RIGHTS	(AC-FT/YR):	271579
TOTAL IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	181530
CLASS A IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	162803
CLASS B IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	18727
TOTAL IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1696228
CLASS A IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1500719
CLASS B IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	195509
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON D-M-I POOL	(AC-FT):	225000
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON IRRIGATION POOL	(AC-FT):	2647639
TOTAL RESERVOIR DEAD STORAGE USED IN WATER RIGHTS ACCOUNTING	(AC-FT):	4600
MAXIMUM STORAGE CAPACITY ALLOTTED TO OPERATING RESERVE	(AC-FT):	380000
MAXIMUM USABLE STORAGE AVAILABLE FOR WATER RIGHTS ACCOUNTING	(AC-FT):	3321570
TOTAL IRRIGATION & MINING ACCOUNT BALANCE AT BEGINNING OF SIMULATION	(AC-FT):	2647639

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	38416	38416	0	7474	19209	.25	3964	2077	0	5397	0	0	590721	1827241
2	33736	33736	0	113766	18843	.39	5873	2074	0	5194	0	0	504818	1370431
3	34617	34617	0	114281	16918	.56	7138	2584	0	11773	0	0	418016	1370431
4	202326	202326	0	0	19448	.43	6094	2808	0	12954	7801	0	614248	1771041
5	122060	122060	0	155669	20890	.65	10539	3033	0	10604	0	0	570100	1328281
6	242949	242949	0	174217	18413	.88	14463	3267	0	13195	0	0	624369	1328281
7	2629279	2629279	-1013826	0	35580	1.14	34808	3692	0	15062	0	433973	1771041	1328281
8	147042	147042	0	108301	64428	1.11	40184	3767	0	17348	0	0	1769598	1771041
9	101092	101092	0	61625	64419	1.09	39448	2992	0	10249	0	0	1769617	1771041
10	90484	90484	0	65338	64423	.68	24613	2893	0	10274	0	0	1770150	1771041
11	62309	62309	0	9737	64677	.58	21135	2462	0	8458	0	0	1801587	1827241
12	60114	60114	0	13822	65091	.58	21391	2349	0	6490	0	0	1826488	1827241
ANNUAL	3764424	3764424	-1013826	824230			229650	33998	0	126998	7801	433973		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	0	0	0	89527	34611	.20	1468	9000	0	80527	0	0	101418	1210297
2	7080	113578	0	55865	29193	.49	3450	8325	0	47540	0	0	155681	155725
3	0	99924	0	93796	28141	.55	4798	9712	0	84084	0	0	157011	155725
4	13474	5513	0	72791	20009	.63	4870	11175	0	154909	93293	0	84863	1166347
5	83610	225642	0	155493	10038	.80	6484	10825	0	144668	0	0	148528	150070
6	0	157755	0	147725	10536	.82	8532	11250	0	136475	0	0	150026	150070
7	46245	461464	0	127141	38543	.90	34408	12550	0	114591	0	0	449941	150070
8	0	87186	0	117218	25798	.89	22091	12975	0	104243	0	0	397818	1166347
9	17585	65969	0	72179	24998	.70	16029	10625	0	61554	0	0	375579	1166347
10	37191	89362	0	73962	25764	.47	10414	10037	0	63925	0	0	380565	1166347
11	1183	0	0	52636	24827	.36	7488	9300	0	43336	0	0	320441	1210297
12	0	4983	0	51375	21486	.33	6061	9225	0	42150	0	0	267988	1210297
ANNUAL	206368	1311376	0	1109708			126093	124999	0	1078002	93293	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	17883	17883	0	594	19209	.25	838	5181	0	0	0	0	130250	1424078
2	16263	16263	0	0	18843	.39	1476	4798	0	0	0	0	145037	1424078
3	14282	14282	0	0	16918	.56	2336	4917	0	0	0	0	156983	1424078
4	72673	72673	0	0	19448	.43	2269	5603	0	0	0	0	227387	1380278
5	46940	46940	0	157091	20890	.65	3039	5273	0	0	0	0	114197	1035209
6	1050	1050	0	84015	18413	.88	1740	5478	0	0	0	0	29492	1035209
7	342713	342713	1013826	0	35580	1.14	5753	6039	0	0	0	0	1380278	1035209
8	119957	119957	0	88630	64428	1.11	31331	6006	0	0	0	0	1380274	1035209
9	66908	66908	0	0	64419	1.09	30769	5914	0	0	0	36135	1380278	1035209
10	44516	44516	0	0	64423	.68	19195	5676	0	0	0	25321	1380278	1035209
11	23591	23591	0	0	64677	.58	16378	5445	0	0	0	0	1387491	1068059
12	22185	22185	0	5669	65091	.58	16362	5669	0	0	0	0	1387645	1068059
ANNUAL	788961	788961	1013826	335999			131486	65999	0	0	0	61456		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

RESERVOIR NO. 4 MEX FALCON MAX FLOOD POOL: 1140074 MAX CONSERVATION POOL: 1098674 DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	4587	0	0	198288	34611	.20	5454	198288	0	0	0	0	444108	855056
2	15854	11056	0	79438	29193	.49	10855	79438	0	0	0	0	364871	855056
3	11664	6747	0	29743	28141	.55	10680	29743	0	0	0	0	331195	855056
4	30500	24897	0	295351	20009	.63	7736	295351	0	0	0	0	53005	824006
5	123844	275662	0	324482	10038	.80	1546	324482	0	0	0	0	2639	1099
6	0	78537	0	79927	10536	.82	108	79927	0	0	0	0	1141	1099
7	53312	47273	0	36108	38543	.90	281	36108	0	0	0	0	12025	1099
8	0	82624	0	72461	25798	.89	869	72461	0	0	0	0	21319	1099
9	27300	57521	0	27785	24998	.70	1470	27785	0	0	0	0	49585	1099
10	48060	67705	0	42106	25764	.47	1695	42106	0	0	0	0	73489	1099
11	10438	4993	0	14810	24827	.36	1450	14810	0	0	0	0	62222	1140
12	0	0	0	23501	21486	.33	1029	23501	0	0	0	0	37692	1140
ANNUAL	325559	657015	0	1224000			43173	1224000	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	7474	188	14357	0	0	16462	0	21115	0	0	9737	8839	6510
2	5397	5194	11773	10666	80577	13195	42553	17348	14593	34298	8458	6490	20872
3	0	0	0	5513	69973	0	27491	0	4344	24024	0	0	10944
4	80527	47540	84084	61616	144668	136475	114591	104243	61554	63925	43336	42150	82053
5	594	0	0	0	0	5478	0	6006	0	0	0	5669	1477
6	0	11056	6747	24897	118571	0	47273	0	21386	42384	4993	0	23106
7	0	113578	99924	0	155669	157755	433973	87186	61625	65338	0	4983	98332
8	0	0	0	0	157091	78537	0	82624	36135	25321	0	0	31640

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WRTSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	751556	38416	11077	85924	0	5432	687539	20.8	225000	275000	41764	0	79481	145775	5.5
2	687539	40816	10399	52734	0	9323	655899	19.9	225000	275000	0	59054	48930	155899	5.9
3	655899	34617	12296	95857	0	11936	570427	17.3	225000	275000	3658	0	89130	66769	2.5
4	570427	215800	13983	167863	101094	10964	694511	21.0	225000	275000	0	189581	61839	194511	7.3
5	694511	205670	13858	155272	0	17023	714028	21.6	225000	275000	0	163215	143698	214028	8.1
6	714028	242949	14517	149670	0	22995	769795	23.3	225000	275000	0	194519	138752	269795	10.2
7	769795	2675524	16242	129653	0	69216	2216382	66.8	225000	275000	0	1567072	120485	1716382	64.8
8	2216382	147042	16742	121591	0	62275	2162816	65.2	225000	275000	0	59685	113251	1662816	62.8
9	2162816	118677	13617	71803	0	55477	2140596	64.5	225000	275000	44658	0	66878	1595938	60.3
10	2140596	127675	12930	74199	0	35027	2146115	64.7	225000	275000	0	119262	69085	1646115	62.2
11	2146115	63492	11762	51794	0	28623	2117428	63.8	225000	275000	19640	0	48327	1597788	60.3
12	2117428	60114	11574	48640	0	27452	2089876	63.0	225000	275000	37356	0	45268	1552520	58.6

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	1130	.00000	0	0	65405	299	299	.00000	0	0	4009
2	353	0	4565	3063	3063	.03300	2292	2292	65405	177	177	.01941	78	78	4009
3	412	0	4153	5418	3126	.00000	0	0	63113	313	235	.00000	0	0	3931
4	474	0	3679	9982	9982	.10594	7359	7359	63113	576	576	.06232	250	250	3931
5	459	0	3220	9322	1963	.09120	6335	6335	55754	538	288	.05365	215	215	3681
6	477	0	2743	8794	2459	.10870	7551	7551	49419	507	292	.06394	256	256	3466
7	532	0	2211	7384	0	.87568	60828	60995	42035	426	170	.51511	2065	2065	3210
8	550	0	1661	6717	0	.03335	2317	56595	35318	388	0	.01962	79	1756	2822
9	450	0	1211	3967	0	.00000	0	52628	31351	229	0	.00000	0	1527	2593
10	426	0	785	4119	0	.06664	4629	53138	27232	238	0	.03920	157	1446	2355
11	394	0	391	2793	0	.00000	0	50345	24439	161	0	.00000	0	1285	2194
12	391	0	0	2716	0	.00000	0	47629	21723	157	0	.00000	0	1128	2037
ANNUAL	5300	0		69464	21723		91311			4009	2037		3100		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	78	.00000	0	0	4572	361	361	.00000	0	0	4828
2	264	0	3417	214	214	.03300	160	160	4572	213	213	.01941	94	94	4828
3	308	0	3109	379	219	.00000	0	0	4412	376	282	.00000	0	0	4734
4	355	0	2754	698	698	.10594	515	515	4412	694	694	.06232	301	301	4734
5	343	0	2411	652	137	.09120	443	443	3897	648	347	.05365	259	259	4433
6	357	0	2054	615	172	.10870	528	528	3454	611	352	.06394	309	309	4174
7	398	0	1656	516	0	.87568	4253	4265	2938	513	204	.51511	2487	2487	3865
8	412	0	1244	470	0	.03335	162	3957	2468	467	0	.01962	95	2115	3398
9	337	0	907	277	0	.00000	0	3680	2191	276	0	.00000	0	1839	3122
10	319	0	588	288	0	.06664	324	3716	1903	286	0	.03920	189	1742	2836
11	295	0	293	195	0	.00000	0	3521	1708	194	0	.00000	0	1548	2642
12	293	0	0	190	0	.00000	0	3331	1518	189	0	.00000	0	1359	2453
ANNUAL	3967	0		4857	1518		6385			4828	2453		3734		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	2402	.00000	0	0	139138	35	35	.00000	0	0	470
2	409	0	5289	6517	6517	.03300	4876	4876	139138	21	21	.01941	9	9	470
3	477	0	4812	11526	6650	.00000	0	0	134262	37	28	.00000	0	0	461
4	549	0	4263	21235	21235	.10594	15655	15655	134262	68	68	.06232	29	29	461
5	532	0	3731	19831	4176	.09120	13478	13478	118607	63	34	.05365	25	25	432
6	553	0	3178	18708	5230	.10870	16063	16063	105129	59	34	.06394	30	30	407
7	616	0	2562	15709	0	.87568	129404	129758	89420	50	20	.51511	242	242	377
8	637	0	1925	14290	0	.03335	4929	120397	75130	45	0	.01962	9	206	332
9	522	0	1403	8438	0	.00000	0	111959	66692	27	0	.00000	0	179	305
10	493	0	910	8763	0	.06664	9848	113044	57929	28	0	.03920	18	169	277
11	457	0	453	5941	0	.00000	0	107103	51988	19	0	.00000	0	150	258
12	453	0	0	5778	0	.00000	0	101325	46210	18	0	.00000	0	132	240
ANNUAL	6140	0		147775	46210		194253			470	240		362		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 1 U.S. AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1771041	1163203	1163203	-85	105686	276760	33998	0	126998	0	724472	1827241	1762107
1946	1827241	1212854	1212854	1	389153	250234	33998	0	126998	0	573468	1827241	1769979
1947	1827241	973130	973130	0	214969	279993	33998	0	126998	0	478391	1827018	1769623
1948	1827018	1454024	1454024	-318786	412293	289519	33998	0	126998	0	433203	1827241	1604237
1949	1827241	1666097	1666097	-209876	376558	239631	33998	0	126998	0	840032	1827241	1770262
1950	1827241	1093569	1093569	0	441505	267712	33998	0	126998	0	384442	1827151	1770156
1951	1827151	743512	743512	0	988849	266760	33998	0	126998	0	40186	1274868	1270543
1952	1274868	644293	644293	0	1350288	163945	33998	0	126998	0	0	404928	404928
1953	404928	505469	505469	0	248206	98448	33998	0	126998	81332	0	563743	377020
1954	563743	3764424	3764424	-1013826	824230	229650	33998	0	126998	7801	433973	1826488	418016
1955	1826488	1161083	1161083	0	1063229	288585	33998	0	126998	0	0	1635757	1402511
1956	1635757	562134	562134	0	1291370	233788	33998	0	126998	0	0	672733	672733
1957	672733	1670650	1670650	0	787496	204008	33998	0	126998	1294	0	1351879	589097
1958	1351879	1969349	1969349	-167064	668194	209477	33998	0	126998	0	449252	1827241	1194271
1959	1827241	1400966	1400966	0	34196	229110	33998	0	126998	0	1137660	1827241	1771040
1960	1827241	1183084	1183084	0	511963	247204	33998	0	126998	0	423917	1827241	1769329
1961	1827241	1173210	1173210	-114894	183853	236345	33998	0	126998	0	638118	1827241	1769727
1962	1827241	906681	906681	0	674789	315386	33998	0	126998	0	62441	1681306	1595069
1963	1681306	770142	770142	0	1170423	234231	33998	0	126998	0	0	1046794	1046794
1964	1046794	1673626	1673626	0	1009421	164124	33998	0	126998	107	0	1546875	431816
1965	1546875	1039969	1039969	0	1032633	227939	33998	0	126998	0	0	1326272	1317940
1966	1326272	1318285	1318285	0	1022152	183184	33998	0	126998	0	0	1439221	1103383
1967	1439221	954207	954207	0	849505	210612	33998	0	126998	0	0	1333311	943094
1968	1333311	991330	991330	0	986163	172604	33998	0	126998	0	0	1165874	1060369
1969	1165874	843864	843864	0	1076307	144261	33998	0	126998	0	0	789170	655200
1970	789170	844695	844695	0	920951	90562	33998	0	126998	25734	0	622352	423318
1971	622352	1783089	1783089	0	488320	120315	33998	0	126998	20671	0	1796806	383637
1972	1796806	1307088	1307088	-279992	0	235361	33998	0	126998	0	761300	1827241	1771041
1973	1827241	918028	918028	0	406486	213416	33998	0	126998	0	300439	1824928	1769701
1974	1824928	3029423	3029423	-719	283862	240232	33998	0	126998	0	2502297	1827241	1769852
1975	1827241	1284972	1284972	0	9019	211382	33998	0	126998	0	1064571	1827241	1771041
1976	1827241	1607050	1607050	0	31586	201156	33998	0	126998	0	1374308	1827241	1771041
1977	1827241	1163283	1163283	0	461	238493	33998	0	126998	0	924329	1827241	1771040
1978	1827241	1743638	1743638	2	444896	225378	33998	0	126998	0	1073366	1827241	1769800
1979	1827241	1275063	1275063	0	7690	224821	33998	0	126998	0	1042552	1827241	1771041
1980	1827241	1329313	1329313	-15	60122	253781	33998	0	126998	0	1015395	1827241	1771023
1981	1827241	1888274	1888274	0	3482	214053	33998	0	126998	0	1670739	1827241	1771041
1982	1827241	1118780	1118780	0	21115	243427	33998	0	126998	0	854238	1827241	1771041
1983	1827241	910765	910765	0	411265	249920	33998	0	126998	0	249663	1827158	1770282
1984	1827158	1086407	1086407	0	526594	291574	33998	0	126998	0	299999	1795398	1719121
1985	1795398	1043484	1043484	0	959452	228833	33998	0	126998	0	37798	1612799	1437879
1986	1612799	1887478	1887478	-203148	914666	232988	33998	0	126998	0	322234	1827241	1330007
1987	1827241	1797750	1797750	-123360	938738	212431	33998	0	126998	0	523221	1827241	1770290
1988	1827241	1469121	1469121	953	739349	241106	33998	0	126998	0	489619	1827241	1769885
1989	1827241	1055062	1055062	0	345584	292563	33998	0	126998	0	417112	1827044	1769345
1990	1827044	2076817	2076817	-130759	733406	265495	33998	0	126998	0	946960	1827241	1770434
1991	1827241	2027658	2027658	0	62602	285132	33998	0	126998	0	1679924	1827241	1771041
1992	1827241	1702861	1702861	0	4242	250028	33998	0	126998	0	1448591	1827241	1771041
1993	1827241	1181767	1181767	0	30221	290243	33998	0	126998	0	861303	1827241	1771041
1994	1827241	924654	924654	0	343797	289940	33998	0	126998	0	290981	1827177	1769978
1995	1827177	895126	895126	0	774520	317488	33998	0	126998	0	222759	1407536	1389956
1996	1407536	956466	956466	0	1192572	242373	33998	0	126998	0	0	929057	753135
1997	929057	951292	951292	0	1187938	149372	33998	0	126998	0	0	543039	543039
1998	543039	885317	885317	0	771425	118203	33998	0	126998	42436	0	538728	410223

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 2 U.S. FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1555129	285000	954162	0	1203001	349701	124999	0	1078002	0	0	956589	725362
1946	956589	506000	1307625	0	1203001	248476	124999	0	1078002	0	0	812737	662569
1947	812737	426000	958364	0	1203001	216867	124999	0	1078002	0	0	351233	351233
1948	351233	595000	1279500	0	1203001	128987	124999	0	1078002	0	0	298745	111223
1949	298745	783000	1838594	0	1203001	199854	124999	0	1078002	0	0	734484	272197
1950	734484	248000	912951	0	1203001	233648	124999	0	1078002	0	0	210786	210786
1951	210786	371000	1239039	0	1203001	91313	124999	0	1078002	0	0	155511	1582
1952	155511	92000	1281292	0	1203001	78078	124999	0	1078002	0	0	155724	1584
1953	155724	380000	548542	0	424317	87536	124999	0	1078002	778684	0	192413	85487
1954	192413	206368	1311376	0	1109708	126093	124999	0	1078002	93293	0	267988	84863
1955	267988	262728	1164961	0	1203001	74546	124999	0	1078002	0	0	155402	71953
1956	155402	146131	1276505	0	1203001	73182	124999	0	1078002	0	0	155724	1584
1957	155724	633550	1261344	0	1187524	73934	124999	0	1078002	15477	0	155610	64434
1958	155610	1287790	2244240	347351	1203001	61394	124999	0	1078002	0	0	1482806	1578
1959	1482806	413263	1424123	0	1203001	276592	124999	0	1078002	0	0	1427336	1268882
1960	1427336	304220	1079104	0	1203001	273251	124999	0	1078002	0	0	1030188	907766
1961	1030188	438643	1099618	0	1203001	235865	124999	0	1078002	0	0	690940	690386
1962	690940	222588	798822	0	1203001	131037	124999	0	1078002	0	0	155724	94006
1963	155724	259995	1269422	0	1203001	66425	124999	0	1078002	0	0	155720	1587
1964	155720	478465	1326997	0	1202357	64340	124999	0	1078002	644	0	216020	1581
1965	216020	334430	1206067	0	1203001	63362	124999	0	1078002	0	0	155724	1584
1966	155724	391422	1252578	0	1203001	49577	124999	0	1078002	0	0	155724	17827
1967	155724	713220	1401729	0	1203001	65315	124999	0	1078002	0	0	289137	10104
1968	289137	294637	1119804	0	1203001	50474	124999	0	1078002	0	0	155466	72408
1969	155466	346676	1261987	0	1203001	58955	124999	0	1078002	0	0	155497	19215
1970	155497	297120	1082809	0	1029487	53494	124999	0	1078002	173514	0	155325	1581
1971	155325	2201017	2549012	478903	967992	129978	124999	0	1078002	235009	471541	1613729	25529
1972	1613729	569612	1169916	-5552	1203001	280713	124999	0	1078002	0	0	1295665	1274189
1973	1295665	707828	1253757	0	1203001	232925	124999	0	1078002	0	0	1113496	973079
1974	1113496	287805	2912968	-735713	1203001	245946	124999	0	1078002	0	228793	1613729	585050
1975	1613729	689676	1602270	-96903	1203001	290297	124999	0	1078002	0	121492	1504306	1480576
1976	1504306	1062184	2307082	979	1203001	254359	124999	0	1078002	0	741297	1613729	1196374
1977	1613729	464282	1228076	-157036	1203001	280675	124999	0	1078002	0	0	1201093	1201093
1978	1201093	556024	1913290	25964	1203001	245977	124999	0	1078002	0	77640	1613729	867419
1979	1613729	564636	1453882	-69223	1203001	292374	124999	0	1078002	0	121055	1381958	1381958
1980	1381958	409238	1323759	0	1203001	266010	124999	0	1078002	0	0	1236706	844367
1981	1236706	994629	2507854	-102283	1203001	243536	124999	0	1078002	0	598689	1597051	1233410
1982	1597051	340150	1054507	-46493	1203001	275797	124999	0	1078002	0	0	1126267	1126267
1983	1126267	342907	842839	0	1203001	200372	124999	0	1078002	0	0	565733	502215
1984	565733	234142	899739	0	1203001	106853	124999	0	1078002	0	0	155618	101028
1985	155618	424262	1260516	0	1203001	57679	124999	0	1078002	0	0	155454	47314
1986	155454	377249	1453153	0	1203001	53983	124999	0	1078002	0	0	351623	1576
1987	351623	630894	1931857	0	1203001	175605	124999	0	1078002	0	0	904874	391522
1988	904874	539973	1607945	0	1203001	210891	124999	0	1078002	0	0	1098927	669896
1989	1098927	278254	879954	0	1203001	235058	124999	0	1078002	0	0	540822	540822
1990	540822	418569	1937939	0	1203001	176264	124999	0	1078002	0	0	1099496	290009
1991	1099496	308733	1890263	87814	1203001	236593	124999	0	1078002	0	26137	1611842	903211
1992	1611842	517404	1809241	-124952	1203001	281695	124999	0	1078002	0	299670	1511765	1481160
1993	1511765	250123	980651	0	1203001	270951	124999	0	1078002	0	0	1018464	1017726
1994	1018464	295200	768982	0	1203001	210118	124999	0	1078002	0	0	374327	373565
1995	374327	218838	1055121	0	1203001	70954	124999	0	1078002	0	0	155493	76945
1996	155493	227673	1259249	0	1203001	56214	124999	0	1078002	0	0	155527	1583
1997	155527	226161	1253103	0	1203001	49913	124999	0	1078002	0	0	155716	1570
1998	155716	239251	892116	0	835634	56704	124999	0	1078002	367367	0	155494	18204

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 3 MEX AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1380278	883389	883389	85	446819	215099	65999	0	0	0	177756	1424078	1357376
1946	1424078	909841	909841	-1	332447	189562	65999	0	0	0	387832	1424077	1224724
1947	1424077	669063	669063	0	407068	185761	65999	0	0	0	157025	1343286	969964
1948	1343286	507768	507768	318786	986540	146432	65999	0	0	0	0	1036868	613365
1949	1036868	1042898	1042898	209876	534714	158786	65999	0	0	0	172064	1424078	987427
1950	1424078	786227	786227	0	802346	158752	65999	0	0	0	135462	1113745	842418
1951	1113745	404486	404486	0	966794	99239	65999	0	0	0	0	452198	429023
1952	452198	428901	428901	0	828227	20279	65999	0	0	0	0	32593	1366
1953	32593	222231	222231	0	135467	5558	65999	0	0	0	0	113799	1360
1954	113799	788961	788961	1013826	335999	131486	65999	0	0	0	61456	1387645	29492
1955	1387645	677209	677209	0	947517	148975	65999	0	0	0	0	968362	589118
1956	968362	296764	296764	0	1107735	50143	65999	0	0	0	0	107248	38653
1957	107248	564144	564144	0	351184	24564	65999	0	0	0	0	295644	1372
1958	295644	1567841	1567841	167064	453801	26314	65999	0	0	0	126356	1424078	1368
1959	1424078	667730	667730	0	15586	178472	65999	0	0	0	473695	1424055	1380278
1960	1424055	848707	848707	0	223634	190232	65999	0	0	0	434818	1424078	1283410
1961	1424078	624584	624584	114894	448667	171938	65999	0	0	0	118900	1424051	1033135
1962	1424051	511070	511070	0	904025	164066	65999	0	0	0	0	867030	685720
1963	867030	481290	481290	0	984578	54654	65999	0	0	0	0	309088	129053
1964	309088	672900	672900	0	591689	15335	65999	0	0	0	0	374964	1360
1965	374964	489720	489720	0	656082	27341	65999	0	0	0	0	181261	70107
1966	181261	1003086	1003086	0	530225	15573	65999	0	0	0	0	638549	1368
1967	638549	523436	523436	0	795268	30433	65999	0	0	0	0	336284	1363
1968	336284	841232	841232	0	348911	49736	65999	0	0	0	0	778869	146058
1969	778869	705083	705083	0	934108	70615	65999	0	0	0	0	479229	293374
1970	479229	620385	620385	0	741244	17544	65999	0	0	0	0	340826	1367
1971	340826	692998	692998	0	489994	25851	65999	0	0	0	0	517979	1367
1972	517979	802803	802803	279992	0	114337	65999	0	0	0	64672	1421765	578204
1973	1421765	679907	679907	0	407628	158590	65999	0	0	0	125495	1409959	1157129
1974	1409959	1211470	1211470	719	528575	172784	65999	0	0	0	496711	1424078	1150528
1975	1424078	748604	748604	0	978	164596	65999	0	0	0	583066	1424042	1380278
1976	1424042	773967	773967	0	15525	156703	65999	0	0	0	601722	1424059	1380278
1977	1424059	550896	550896	0	0	185664	65999	0	0	0	379373	1409918	1380278
1978	1409918	1517216	1517216	-2	56907	175656	65999	0	0	0	1270491	1424078	1380276
1979	1424078	878202	878202	0	2269	175100	65999	0	0	0	712516	1412395	1380278
1980	1412395	817103	817103	15	249236	197639	65999	0	0	0	358573	1424065	1377308
1981	1424065	1238430	1238430	0	0	166824	65999	0	0	0	1071593	1424078	1380278
1982	1424078	664349	664349	0	6006	189622	65999	0	0	0	474720	1418079	1380278
1983	1418079	497472	497472	0	362680	176613	65999	0	0	0	85595	1290663	1141885
1984	1290663	775321	775321	0	1047630	129122	65999	0	0	0	0	889232	592246
1985	889232	682379	682379	0	866727	67443	65999	0	0	0	0	637441	316616
1986	637441	1208462	1208462	203148	832401	52089	65999	0	0	0	0	1164561	1523
1987	1164561	1203973	1203973	123360	672094	157454	65999	0	0	0	238286	1424060	1064640
1988	1424060	929864	929864	-953	357760	182260	65999	0	0	0	388875	1424076	1223371
1989	1424076	589071	589071	0	22193	228019	65999	0	0	0	338871	1424064	1380275
1990	1424064	1728668	1728668	130759	848855	162324	65999	0	0	0	848234	1424078	739778
1991	1424078	1892590	1892590	0	45082	222129	65999	0	0	0	1625395	1424062	1380278
1992	1424062	1283085	1283085	0	14354	194769	65999	0	0	0	1073965	1424059	1380278
1993	1424059	788586	788586	0	24534	226103	65999	0	0	0	537957	1424051	1380278
1994	1424051	488813	488813	0	425149	200662	65999	0	0	0	162314	1124739	1112634
1995	1124739	387891	387891	0	1075201	83687	65999	0	0	0	0	353742	238653
1996	353742	441577	441577	0	527977	18019	65999	0	0	0	0	249323	1357
1997	249323	398568	398568	0	601678	4394	65999	0	0	0	0	41819	1365
1998	41819	384845	384845	0	293741	4148	65999	0	0	0	0	128775	1359

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 4 MEX FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1098674	278000	836576	0	1224000	154821	1224000	0	0	0	0	556429	209947
1946	556429	521000	1175280	0	1224000	63574	1224000	0	0	0	0	444135	1561
1947	444135	371000	869094	0	1224000	33828	1224000	0	0	0	0	55401	1114
1948	55401	702000	1622541	0	1224000	49410	1224000	0	0	0	0	404532	1101
1949	404532	442000	1082779	0	1224000	28248	1224000	0	0	0	0	235063	1109
1950	235063	128000	999809	0	1224000	9682	1224000	0	0	0	0	1190	1119
1951	1190	326000	1226795	0	1224000	2632	1224000	0	0	0	0	1353	1098
1952	1353	64000	826228	0	825691	750	1224000	398309	0	0	0	1140	949
1953	1140	1003000	1072468	0	339862	85896	1224000	884138	0	0	0	647850	813
1954	647850	325559	657015	0	1224000	43173	1224000	0	0	0	0	37692	1141
1955	37692	344411	1225929	0	1224000	7754	1224000	0	0	0	0	31867	1098
1956	31867	153390	1195126	0	1224000	1853	1224000	0	0	0	0	1140	1098
1957	1140	727886	1013071	0	1008421	4536	1224000	215579	0	0	0	1254	1062
1958	1254	1933882	2448040	-347351	935818	26051	1224000	288182	0	0	0	1140074	1016
1959	1140074	489555	912837	0	1224000	143980	1224000	0	0	0	0	684931	571993
1960	684931	307596	900049	0	1224000	40888	1224000	0	0	0	0	320092	1101
1961	320092	583960	1085528	0	1224000	31910	1224000	0	0	0	0	149710	1113
1962	149710	240095	1078121	0	1224000	2691	1224000	0	0	0	0	1140	1111
1963	1140	307161	1225740	0	1224000	1736	1224000	0	0	0	0	1144	1098
1964	1144	548188	1073878	0	762916	20732	1224000	461084	0	0	0	291374	901
1965	291374	350059	940142	0	1224000	6376	1224000	0	0	0	0	1140	1098
1966	1140	417219	881445	0	879683	1762	1224000	344317	0	0	0	1140	996
1967	1140	943825	1673094	0	1045162	26860	1224000	178838	0	0	0	602212	1071
1968	602212	382091	665003	0	1224000	26535	1224000	0	0	0	0	16680	1116
1969	16680	382759	1250868	0	1224000	3176	1224000	0	0	0	0	40372	1098
1970	40372	283218	958463	0	944619	5923	1224000	279381	0	0	0	48293	1073
1971	48293	3101272	3525267	-478903	838566	91785	1224000	385434	0	0	1024232	1140074	1013
1972	1140074	670492	669165	5552	1224000	110991	1224000	0	0	0	0	479800	380811
1973	479800	740920	1208044	0	1224000	34309	1224000	0	0	0	0	429535	1969
1974	429535	305682	1264969	735713	1224000	42368	1224000	0	0	0	23775	1140074	1105
1975	1140074	913544	1431589	96903	1224000	183744	1224000	0	0	0	163659	1097163	745677
1976	1097163	1693211	2244459	-979	1224000	144983	1224000	0	0	0	831586	1140074	371754
1977	1140074	554875	868249	157036	1224000	171579	1224000	0	0	0	28647	741133	741133
1978	741133	801281	2062680	-25964	1224000	65989	1224000	0	0	0	347786	1140074	8722
1979	1140074	688648	1337434	69223	1224000	201343	1224000	0	0	0	122808	998580	846078
1980	998580	544535	1086345	0	1224000	110220	1224000	0	0	0	0	750705	173492
1981	750705	1430420	2436014	102283	1224000	160538	1224000	0	0	0	764390	1140074	623678
1982	1140074	338840	753567	46493	1224000	142251	1224000	0	0	0	0	573883	573883
1983	573883	291291	673567	0	1224000	22103	1224000	0	0	0	0	1347	1103
1984	1347	243487	1225118	0	1224000	1219	1224000	0	0	0	0	1246	1110
1985	1246	463802	1264530	0	1224000	3501	1224000	0	0	0	0	38275	1100
1986	38275	540129	1306531	0	1168593	15099	1224000	55407	0	0	0	161114	1121
1987	161114	748490	1592871	0	1224000	41495	1224000	0	0	0	0	488490	1109
1988	488490	831771	1512407	0	1224000	48727	1224000	0	0	0	0	728170	1110
1989	728170	285024	580089	0	1224000	48935	1224000	0	0	0	0	35324	3433
1990	35324	498141	2129231	0	1224000	38473	1224000	0	0	0	0	902082	1111
1991	902082	322749	1927227	-87814	1224000	130366	1224000	0	0	0	247055	1140074	305613
1992	1140074	623610	1645930	124952	1224000	196508	1224000	0	0	0	406941	1083507	1013955
1993	1083507	230123	726615	0	1224000	120248	1224000	0	0	0	0	465874	330457
1994	465874	255581	777045	0	1224000	17768	1224000	0	0	0	0	1151	1108
1995	1151	240841	1250043	0	1224000	4368	1224000	0	0	0	0	22826	1098
1996	22826	259854	721832	0	734651	4132	1224000	489349	0	0	0	5875	943
1997	5875	242833	778512	0	782654	585	1224000	441346	0	0	0	1148	1038
1998	1148	267272	495014	0	469317	4257	1224000	754683	0	0	0	22588	784

Attachment E.

Abbreviated Output Listing from the Amistad-Falcon Reservoir Operations Model for the Firm Annual Yield Analysis for the United States and Mexico

RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES
R. J. BRANDES COMPANY FEBRUARY 1998

DATE: 3-23-1999
FILE: UM4598FY

ECHO PRINT OF INPUT DATA FILE PARAMETERS WITHOUT FLOW, DEMAND, OR EVAPORATION DATA

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY
FIRM ANNUAL YIELD DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

CARD 01	NJ - NUMBER OF NODES IN THE MODEL NETWORK	8
CARD 02	NRES - NUMBER OF RESERVOIRS IN THE MODEL NETWORK	4
CARD 03	NL - NUMBER OF LINKS BETWEEN NODES IN THE MODEL NETWORK	8
CARD 04	NR - NUMBER OF LINKS THAT ARE RIVER REACHES	8
CARD 05	NYEAR - TOTAL NUMBER OF YEARS IN SIMULATION PERIOD	54
CARD 06	ND - NUMBER OF DEMAND NODES IN THE MODEL NETWORK	8
CARD 07	NS - NUMBER OF SPILL RESERVOIRS IN THE MODEL NETWORK	2
CARD 08	IYEAR - BEGINNING CALENDAR YEAR OF SIMULATION PERIOD	1945
CARD 09	IFRM - BEGINNING ORDINAL YEAR OF DETAILED PRINTOUT	1
CARD 10	ITOY - ENDING ORDINAL YEAR OF DETAILED PRINTOUT	54
CARD 11	INPUT DATA SOURCE ("CARD" OR "TAPE")	CARD
CARD 12	FIRM ANNUAL YIELD ITERATION SHORTAGE LIMIT (AC-FT/YR)	10
CARD 13	IPLT=0, DO NOT SAVE; =NODE, SAVE RES. OPER; =5, SAVE ACCOUNT	1
CARD 14	IYSTR - BEGINNING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1945
CARD 15	IYEND - ENDING YEAR FOR FIRM ANNUAL YIELD ANALYSIS	1972
CARD 16	IFLYLD=0, NO FAY; =1, DETERMINE U.S. FAY; =2, DETERMINE MEXICO FAY	2
CARD 17	DRUSFC - INITIAL FAY ADJUSTMENT FACTOR FOR U.S. DEMANDS	0.8761716
CARD 18	DRMXFC - INITIAL FAY ADJUSTMENT FACTOR FOR MEXICO DEMANDS	0.7691899
CARD 19	MAXMWR - TOTAL DOMESTIC-MUNICIPAL-INDUSTRIAL WATER RIGHTS	271579
CARD 20	MXLIWR - TOTAL IRRIGATION WATER RIGHTS ON LOWER RIO GRANDE	1696228
CARD 21	MLIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON LOWER RIO GRANDE	1500719
CARD 22	MLIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON LOWER RIO GRANDE	195509
CARD 23	MXMIWR - TOTAL IRRIGATION WATER RIGHTS ON MIDDLE RIO GRANDE	181530
CARD 24	MMIAWR - TOTAL CLASS A IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	162803
CARD 25	MMIBWR - TOTAL CLASS B IRRI WATER RIGHTS ON MIDDLE RIO GRANDE	18727
CARD 26	MAXMPL - MAX. U.S. DOMESTIC-MUNICIPAL-INDUSTRIAL RESERVE POOL	225000
CARD 27	IRSTRT - STARTING TOTAL IRRIGATION & MINING ACCOUNT BALANCE	0000000
CARD 28	NUMWR - NUMBER OF WATER RIGHTS OWNERS INCLUDED IN ACCOUNTING	3
CARD 29	IRLFLG=0, READ ALL MON AMISTAD RELEASES; =1, READ AVG MON RELEASES	1
CARD 30	IWRFLG=0, READ ALL WATER RIGHTS DEMANDS; =1, READ AVG MON DEMANDS	1

U.S. AMISTAD	1	1827241	1771041	1771	1771041
U.S. FALCON	2	1613729	1555129	1555	1555129
MEX AMISTAD	3	1424078	1380278	1380	1380278
MEX FALCON	4	1140074	1098674	1099	1098674
U.S.MRG MUNI	5	0	0	0	
U.S.MRG IRRI	6	0	0	0	
U.S.LRG IRRI	7	0	0	0	
MEX MRG M&IR	8	0	0	0	

SPILL RESR	2	4			
AMISTAD	1	1	930.0	0	0
AMISTAD	1	2	945.0	5	1
AMISTAD	1	3	946.5	87	294
AMISTAD	1	4	948.2	180	823
AMISTAD	1	5	949.1	237	1180
AMISTAD	1	6	950.1	297	1684
AMISTAD	1	7	951.4	376	2782
AMISTAD	1	8	961.3	1045	13873
AMISTAD	1	9	971.1	1843	33110

ATTACHMENT E

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AMISTAD        1   10     981.0       2770      59404
AMISTAD        1   11     990.8       3823      93556
AMISTAD        1   12    1000.7       5004     138573
AMISTAD        1   13    1010.5       6314     195568
AMISTAD        1   14    1020.3       7722     264663
AMISTAD        1   15    1030.2       9758     350120
AMISTAD        1   16    1040.0      12751     458690
AMISTAD        1   17    1049.9      16734     605456
AMISTAD        1   18    1059.7      21627     790919
AMISTAD        1   19    1069.6      27399    1029250
AMISTAD        1   20    1079.4      34051    1328996
AMISTAD        1   21    1089.2      41702    1699411
AMISTAD        1   22    1094.2      45665    1911714
AMISTAD        1   23    1099.1      49658    2142942
AMISTAD        1   24    1104.0      53679    2393700
AMISTAD        1   25    1108.9      57729    2664077
AMISTAD        1   26    1115.5      63173    3055670
AMISTAD        1   27    1117.0      64438    3151319
AMISTAD        1   28    1118.8      65915    3265037
AMISTAD        1   29    1122.0      68671    3483939
AMISTAD        1   30    1131.9      77013    4199954
FALCON         2    1     203.3          0          0
FALCON         2    2     203.4         35         57
FALCON         2    3     205.1        195        235
FALCON         2    4     206.7        425        735
FALCON         2    5     207.3        539       1050
FALCON         2    6     208.3        727       1670
FALCON         2    7     210.0       1100       3158
FALCON         2    8     214.9       1559       9631
FALCON         2    9     219.8       2202      18806
FALCON         2   10     224.7       3526      32732
FALCON         2   11     229.7       5169      54000
FALCON         2   12     234.6       6531      82799
FALCON         2   13     239.5       8061     118624
FALCON         2   14     242.8      10341     148482
FALCON         2   15     244.4      11654     166516
FALCON         2   16     249.3      15894     234115
FALCON         2   17     254.3      20562     323644
FALCON         2   18     259.2      25677     437240
FALCON         2   19     264.1      30775     576159
FALCON         2   20     269.0      36184     740751
FALCON         2   21     274.0      42448     933844
FALCON         2   22     278.9      48929    1158684
FALCON         2   23     282.2      53474    1326587
FALCON         2   24     285.4      58443    1509829
FALCON         2   25     288.7      65021    1712296
FALCON         2   26     292.0      70235    1935151
FALCON         2   27     295.3      74804    2172702
FALCON         2   28     298.6      82000    2429861
FALCON         2   29     301.2      87181    2653803
FALCON         2   30     305.1      93809    3008297
US AMISTAD  1      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
US FALCON   2   125000  2  2  2.0720.0666.0777.0894.0866.0900.1004.1038.0850.0803.0744.0738
MX AMISTAD  3      000 20 20 20.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000
MX FALCON   4 1224000  6  6  6.1620.0649.0243.2413.2651.0653.0295.0592.0227.0344.0121.0192
USMRG MUNI  5    34000  1  1  1.0611.0610.0760.0826.0892.0961.1086.1108.0880.0851.0724.0691
USMRG IRRI  6   127000  3  3  3.0425.0409.0927.1020.0835.1039.1186.1366.0807.0809.0666.0511
USLRG IRRI  7 1078000  4  4  4.0747.0441.0780.1437.1342.1266.1063.0967.0571.0593.0402.0391
MXMRG M&IR  8    66000  5  5  5.0785.0727.0745.0849.0799.0830.0915.0910.0896.0860.0825.0859
US AVERAGE      9.65      75.00
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MX AVERAGE     10.00     75.00
RESERVOIR     1 1 AVERAGE   10 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
 OPERATING    1 2 DRY       11  75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.
  RULES       1 3 WET       10 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
RESERVOIR     2 1 AVERAGE   11  75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.
 OPERATING    2 2 DRY       10 9.65   9.65   9.65   9.65   9.65   9.65   9.65   9.65   9.65   9.65   9.65   9.65
  RULES       2 3 WET       11 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
RESERVOIR     3 1 AVERAGE   12 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
 OPERATING    3 2 DRY       13  75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.
  RULES       3 3 WET       12 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
RESERVOIR     4 1 AVERAGE   13  75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.    75.
 OPERATING    4 2 DRY       12  0.1    0.1    0.1    0.1    0.1    0.1    0.1    0.1    0.1    0.1    0.1    0.1
  RULES       4 3 WET       13 100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
LINK1         1    1    5   9000000         0
LINK2         2    5    6   9000000         0
LINK3         3    6    2   9000000         0
LINK4         4    2    7   9000000         0
LINK5         5    3    8   9000000         0
LINK6         6    8    4   9000000         0
LINK7         7    1    2   9000000         0
LINK8         8    3    4   9000000         0
US AMS REL                0      0      0      0      0      0      0      0      0      0      0      0
MEX AMS REL               0      0      0      0      0      0      0      0      0      0      0      0
UNITED I.D.   1
MUN ADJ NO    0849-000          CL A ADJ NO    A847-001          CL B ADJ NO    B769-000
MUN ANN AUTH      5300          CL A ANN AUTH     69464          CL B ANN AUTH      4009
IRRIG ACCT START BALANCES       CL A BALANCE      97944          CL B BALANCE       5653
MUNICIPAL   1  1945      382    353    412    474    459    477    532    550    450    426    394    391
CLASS A IRR 1  1945     5189   3063   5418   9982   9322   8794   7384   6717   3967   4119   2793   2716
CLASS B IRR 1  1945      299    177    313    576    538    507    426    388    229    238    161    157
SANTACRUZ 15   2
MUN ADJ NO    0240-000          CL A ADJ NO    0810-000          CL B ADJ NO    B804-000
MUN ANN AUTH      3967          CL A ANN AUTH      4857          CL B ANN AUTH      4828
IRRIG ACCT START BALANCES       CL A BALANCE       6848          CL B BALANCE       6807
MUNICIPAL   2  1945      286    264    308    355    343    357    398    412    337    319    295    293
CLASS A IRR 2  1945      363    214    379    698    652    615    516    470    277    288    195    190
CLASS B IRR 2  1945      361    213    376    694    648    611    513    467    276    286    194    189
HCID2 S.JUAN   3
MUN ADJ NO    0808-001          CL A ADJ NO    0808-005          CL B ADJ NO    0573-001
MUN ANN AUTH      6140          CL A ANN AUTH    147775          CL B ANN AUTH       470
IRRIG ACCT START BALANCES       CL A BALANCE     208363          CL B BALANCE        663
MUNICIPAL   3  1945      442    409    477    549    532    553    616    637    522    493    457    453
CLASS A IRR 3  1945    11039   6517  11526  21235  19831  18708  15709  14290   8438   8763   5941   5778
CLASS B IRR 3  1945       35     21     37     68     63     59     50     45     27     28     19     18
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RIVER BASIN SIMULATION PROGRAM - TEXAS WATER DEVELOPMENT BOARD
ADAPTED AND MODIFIED FOR AMISTAD AND FALCON RESERVOIRS IN THE RIO GRANDE BASIN
INCLUDING U.S. / MEXICO WATER ACCOUNTING AND TNRCC OPERATING RULES
R. J. BRANDES COMPANY FEBRUARY 1998

DATE: 3-23-1999
TIME: 12:33: 9
FILE: UM4598FY

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY
FIRM ANNUAL YIELD DEMANDS, ACTUAL HISTORICAL GROSS EVAPORATION

NUMBER OF NODES = 8
NUMBER OF RESERVOIRS = 4
NUMBER OF LINKS = 8
NUMBER OF RIVER REACHES = 8
CALENDAR YEAR OPERATION STARTS = 1945
NUMBER OF YEARS TO SIMULATE = 54
NUMBER OF DEMAND NODES = 8
NUMBER OF SPILL NODES = 2
NUMBER OF INDIVIDUAL WATER RIGHTS = 3

SYSTEM NODE CHARACTERISTICS

NODE NO.	NODE NAME	CAPACITIES FLOOD (AC-FT)	CONSERV (AC-FT)	MINIMUM (AC-FT)	STARTING (AC-FT)	YEARLY DEMAND (AC-FT)
1	U.S. AMISTAD	1827241	1771041	1771	1771041	0
2	U.S. FALCON	1613729	1555129	1555	1555129	125000
3	MEX AMISTAD	1424078	1380278	1380	1380278	0
4	MEX FALCON	1140074	1098674	1099	1098674	1224000
5	U.S.MRG MUNI	0	0	0	0	34000
6	U.S.MRG IRRI	0	0	0	0	127000
7	U.S.LRG IRRI	0	0	0	0	1078000
8	MEX MRG M&IR	0	0	0	0	66000

NOTE: FLOOD POOL IS AVAILABLE FOR CONSERVATION STORAGE DURING NOVEMBER-APRIL NON-HURRICANE SEASON

SYSTEM LINK CONFIGURATION

LINK NO.	FROM NODE	TO NODE	MAX. CAPACITY (AC-FT/MON)	MIN. CAPACITY (AC-FT/MON)
1	1	5	9000000	0
2	5	6	9000000	0
3	6	2	9000000	0
4	2	7	9000000	0
5	3	8	9000000	0
6	8	4	9000000	0
7	1	2	9000000	0
8	3	4	9000000	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

MINIMUM MONTHLY U. S. OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

MINIMUM MONTHLY MEXICO OPERATIONAL RELEASES FROM AMISTAD RESERVOIR (AC-FT)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	0	0	0	0	0	0	0	0	0	0

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

U.S. SPILL RESERVOIR NODE: 2

MEXICO SPILL RESERVOIR NODE: 4

U.S. 'AVERAGE', STORAGE CONDITION DEFINED AS 9.65 TO 75.00 PERCENT OF FALCON U.S. MAXIMUM STORAGE CAPACITY

MEXICO 'AVERAGE', STORAGE CONDITION DEFINED AS 10.00 TO 75.00 PERCENT OF FALCON MEXICAN MAXIMUM STORAGE CAPACITY

NODE MONTHLY DEMAND DISTRIBUTIONS AND DEMAND PRIORITIES

NODE NO.	MONTHLY FRACTIONS OF ANNUAL DEMAND												PRIORITIES		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MOD	LO	HI
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
2	.0720	.0666	.0777	.0894	.0866	.0900	.1004	.1038	.0850	.0803	.0744	.0738	2	2	2
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	20	20	20
4	.1620	.0649	.0243	.2413	.2651	.0653	.0295	.0592	.0227	.0344	.0121	.0192	6	6	6
5	.0611	.0610	.0760	.0826	.0892	.0961	.1086	.1108	.0880	.0851	.0724	.0691	1	1	1
6	.0425	.0409	.0927	.1020	.0835	.1039	.1186	.1366	.0807	.0809	.0666	.0511	3	3	3
7	.0747	.0441	.0780	.1437	.1342	.1266	.1063	.0967	.0571	.0593	.0402	.0391	4	4	4
8	.0785	.0727	.0745	.0849	.0799	.0830	.0915	.0910	.0896	.0860	.0825	.0859	5	5	5

RESERVOIR MONTHLY STORAGE TARGETS AND STORAGE PRIORITIES

RESERVOIR NO.		DESIRED MONTHLY STORAGE LEVEL (PERCENT OF MAXI MUM STORAGE CAPACITY)												PRIORITIES
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	10
2	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	11
	LO	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.650	10
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	11
3	MOD	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
	LO	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	12
4	MOD	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	75.000	13
	LO	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	12
	HI	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	13

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

STAGE-AREA-CAPACITY RELATIONSHIPS FOR TOTAL STORAGE IN AMISTAD AND FALCON RESERVOIRS

	AMISTAD RESERVOIR			FALCON RESERVOIR		
POINT NO.	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)	STAGE (FT MSL)	AREA (AC)	CAPACITY (AC-FT)
1	930.0	0	0	203.3	0	0
2	945.0	5	1	203.4	35	57
3	946.5	87	294	205.1	195	235
4	948.2	180	823	206.7	425	735
5	949.1	237	1180	207.3	539	1050
6	950.1	297	1684	208.3	727	1670
7	951.4	376	2782	210.0	1100	3158
8	961.3	1045	13873	214.9	1559	9631
9	971.1	1843	33110	219.8	2202	18806
10	981.0	2770	59404	224.7	3526	32732
11	990.8	3823	93556	229.7	5169	54000
12	1000.7	5004	138573	234.6	6531	82799
13	1010.5	6314	195568	239.5	8061	118624
14	1020.3	7722	264663	242.8	10341	148482
15	1030.2	9758	350120	244.4	11654	166516
16	1040.0	12751	458690	249.3	15894	234115
17	1049.9	16734	605456	254.3	20562	323644
18	1059.7	21627	790919	259.2	25677	437240
19	1069.6	27399	1029250	264.1	30775	576159
20	1079.4	34051	1328996	269.0	36184	740751
21	1089.2	41702	1699411	274.0	42448	933844
22	1094.2	45665	1911714	278.9	48929	1158684
23	1099.1	49658	2142942	282.2	53474	1326587
24	1104.0	53679	2393700	285.4	58443	1509829
25	1108.9	57729	2664077	288.7	65021	1712296
26	1115.5	63173	3055670	292.0	70235	1935151
27	1117.0	64438	3151319	295.3	74804	2172702
28	1118.8	65915	3265037	298.6	82000	2429861
29	1122.0	68671	3483939	301.2	87181	2653803
30	1131.9	77013	4199954	305.1	93809	3008297

SUMMARY OF TEXAS WATER RIGHTS IN MIDDLE AND LOWER RIO GRANDE AND
MAXIMUM STORAGE ALLOCATIONS IN AMISTAD AND FALCON RESERVOIRS

TOTAL DOMESTIC, MUNICIPAL AND INDUSTRIAL WATER RIGHTS	(AC-FT/YR):	271579
TOTAL IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	181530
CLASS A IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	162803
CLASS B IRRIGATION & MINING WATER RIGHTS ON MIDDLE RIO GRANDE	(AC-FT/YR):	18727
TOTAL IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1696228
CLASS A IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	1500719
CLASS B IRRIGATION & MINING WATER RIGHTS ON LOWER RIO GRANDE	(AC-FT/YR):	195509
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON D-M-I POOL	(AC-FT):	225000
MAXIMUM STORAGE CAPACITY IN AMISTAD-FALCON IRRIGATION POOL	(AC-FT):	2647639
TOTAL RESERVOIR DEAD STORAGE USED IN WATER RIGHTS ACCOUNTING	(AC-FT):	4600
MAXIMUM STORAGE CAPACITY ALLOTTED TO OPERATING RESERVE	(AC-FT):	380000
MAXIMUM USABLE STORAGE AVAILABLE FOR WATER RIGHTS ACCOUNTING	(AC-FT):	3321570
TOTAL IRRIGATION & MINING ACCOUNT BALANCE AT BEGINNING OF SIMULATION	(AC-FT):	2647639

FIRM ANNUAL YIELD ITERATION RESULTS

IFLYLD = 2	ITERATION = 1	USSHORTAGE = 5	USDEMAND = 1195098	MXSHORTAGE = 22	MXDEMAND = 992254
IFLYLD = 2	ITERATION = 2	USSHORTAGE = 5	USDEMAND = 1195098	MXSHORTAGE = 22	MXDEMAND = 992253
IFLYLD = 2	ITERATION = 3	USSHORTAGE = 3	USDEMAND = 1195098	MXSHORTAGE = 19	MXDEMAND = 992252
IFLYLD = 2	ITERATION = 4	USSHORTAGE = 2	USDEMAND = 1195098	MXSHORTAGE = 15	MXDEMAND = 992251
IFLYLD = 2	ITERATION = 5	USSHORTAGE = 2	USDEMAND = 1195098	MXSHORTAGE = 15	MXDEMAND = 992251
IFLYLD = 2	ITERATION = 6	USSHORTAGE = 3	USDEMAND = 1195098	MXSHORTAGE = 0	MXDEMAND = 992250

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

RESULTS FROM FIRM ANNUAL YIELD ANALYSIS AFTER 6 CRITICAL DROUGHT ITERATIONS

NODE NO.	NODE NAME	FIRM YIELD (AC-FT)
1	U.S. AMISTAD	0
2	U.S. FALCON	109521
3	MEX AMISTAD	0
4	MEX FALCON	941484
5	U.S.MRG MUNI	29790
6	U.S.MRG IRRI	111274
7	U.S.LRG IRRI	944513
8	MEX MRG M&IR	50766
TOTAL UNITED STATES DEMANDS		1195098
TOTAL MEXICO DEMANDS		992250

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

RESERVOIR NO. 1 U.S. AMISTAD MAX FLOOD POOL: 1827241 MAX CONSERVATION POOL: 1771041 DEAD POOL: 1771

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	38416	38416	0	108281	20891	.25	4353	1820	0	4729	0	0	598740	1370431
2	33736	33736	0	52678	19998	.39	6269	1817	0	4551	0	0	573529	1370431
3	34617	34617	0	12579	20190	.56	8906	2264	0	10315	0	0	586661	1827241
4	202326	202326	0	228356	21016	.43	6713	2461	0	11350	0	0	553918	1328281
5	122060	122060	0	76200	22468	.65	10114	2657	0	9291	0	0	589664	1328281
6	242949	242949	0	14424	25868	.88	16394	2863	0	11561	0	0	801795	1771041
7	2629279	2629279	-784049	0	42093	1.14	35946	3235	0	13197	0	840038	1771041	1328281
8	147042	147042	0	108301	64428	1.11	40184	3301	0	15200	0	0	1769598	1771041
9	101092	101092	0	61625	64419	1.09	39448	2622	0	8980	0	0	1769617	1771041
10	90484	90484	0	65338	64423	.68	24613	2535	0	9002	0	0	1770150	1771041
11	62309	62309	0	8385	64686	.58	21141	2157	0	7411	0	0	1802933	1827241
12	60114	60114	0	14390	65341	.58	21474	2058	0	5686	0	0	1827183	1827241
ANNUAL	3764424	3764424	-784049	750557			235555	29790	0	111273	0	840038		

RESERVOIR NO. 2 U.S. FALCON MAX FLOOD POOL: 1613729 MAX CONSERVATION POOL: 1555129 DEAD POOL: 1555

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	0	101732	0	78441	36698	.20	1404	7886	0	70555	0	0	155681	155725
2	7080	53390	0	48947	33470	.49	3886	7294	0	41653	0	0	156238	155725
3	0	0	0	82182	30576	.55	3344	8510	0	73672	0	0	70712	1210297
4	13474	228019	0	145515	26009	.63	4037	9791	0	135727	3	0	149179	150070
5	83610	147862	0	136239	19944	.80	7733	9485	0	126754	0	0	153069	150070
6	0	0	0	129432	10085	.82	4895	9857	0	119575	0	0	18742	1166347
7	46245	869851	0	111398	38429	.90	33029	10996	0	100402	0	0	744166	150070
8	0	89800	0	102702	37500	.89	30854	11368	0	91334	0	0	700410	1166347
9	17585	67608	0	63241	37462	.70	23226	9309	0	53932	0	0	681551	1166347
10	37191	90992	0	64805	38441	.47	15317	8795	0	56010	0	0	692421	1166347
11	1183	0	0	46117	38113	.36	11380	8148	0	37969	0	0	634924	1210297
12	0	6646	0	45013	35948	.33	9878	8083	0	36930	0	0	586679	1210297
ANNUAL	206368	1655900	0	1054032			148983	109522	0	944513	3	0		

RESERVOIR NO. 3 MEX AMISTAD MAX FLOOD POOL: 1424078 MAX CONSERVATION POOL: 1380278 DEAD POOL: 1380

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	17883	17883	0	0	20891	.25	870	3985	0	0	0	0	135676	1424078
2	16263	16263	0	0	19998	.39	1530	3691	0	0	0	0	150409	1424078
3	14282	14282	0	0	20190	.56	2400	3782	0	0	0	0	162291	1424078
4	72673	72673	0	0	21016	.43	2324	4310	0	0	0	0	232640	1380278
5	46940	46940	0	0	22468	.65	4490	4056	0	0	0	0	275090	1380278
6	1050	1050	0	4214	25868	.88	6370	4214	0	0	0	0	265556	1035209
7	342713	342713	784049	0	42093	1.14	12040	4645	0	0	0	0	1380278	1035209
8	119957	119957	0	88630	64428	1.11	31331	4620	0	0	0	0	1380274	1035209
9	66908	66908	0	0	64419	1.09	30769	4549	0	0	0	36135	1380278	1035209
10	44516	44516	0	0	64423	.68	19195	4366	0	0	0	25321	1380278	1035209
11	23591	23591	0	0	64686	.58	16377	4188	0	0	0	0	1387492	1424078
12	22185	22185	0	4361	65341	.58	16424	4361	0	0	0	0	1388892	1424078
ANNUAL	788961	788961	784049	97205			144120	50767	0	0	0	61456		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10   CALENDAR YEAR 1954

RESERVOIR NO. 4   MEX FALCON   MAX FLOOD POOL: 1140074   MAX CONSERVATION POOL: 1098674   DEAD POOL: 1099

MONTH	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	SURFACE AREA	EVAP RATE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	END-MON STORAGE	TARGET STORAGE
1	4587	602	0	152520	36698	.20	5936	152520	0	0	0	0	532939	855056
2	15854	12163	0	61102	33470	.49	12514	61102	0	0	0	0	471486	855056
3	11664	7882	0	22878	30576	.55	13473	22878	0	0	0	0	443017	855056
4	30500	26190	0	227180	26009	.63	12349	227180	0	0	0	0	229678	824006
5	123844	119788	0	249587	19944	.80	8222	249587	0	0	0	0	91657	824006
6	0	0	0	61479	10085	.82	3375	61479	0	0	0	0	26803	1099
7	53312	48667	0	27774	38429	.90	1557	27774	0	0	0	0	46139	1099
8	0	84010	0	55736	37500	.89	2521	55736	0	0	0	0	71892	1099
9	27300	58886	0	21372	37462	.70	2997	21372	0	0	0	0	106409	1099
10	48060	69015	0	32387	38441	.47	2750	32387	0	0	0	0	140287	1099
11	10438	6250	0	11392	38113	.36	2341	11392	0	0	0	0	132804	855056
12	0	0	0	18076	35948	.33	1985	18076	0	0	0	0	112743	855056
ANNUAL	325559	433453	0	941483			70020	941483	0	0	0	0		

MONTHLY FLOWS IN SYSTEM LINKS (ACRE-FEET)

MONTH LINK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
1	6549	0	12579	337	0	14424	0	18501	0	0	8385	7744	5707
2	4729	5263	10315	11350	80953	11561	43010	15200	14963	34656	7411	5686	20419
3	0	712	0	0	71662	0	29813	0	5983	25654	0	0	11149
4	70555	41653	73672	135724	126754	119575	100402	91334	53932	56010	37969	36930	78704
5	0	0	0	0	0	4214	0	4620	0	0	0	4361	1099
6	602	12163	7882	26190	119788	0	48667	0	22751	43694	6250	0	23994
7	101732	52678	0	228019	76200	0	840038	89800	61625	65338	0	6646	126835
8	0	0	0	0	0	0	0	84010	36135	25321	0	0	12121

ALLOCATION OF U.S. WATER IN AMISTAD AND FALCON RESERVOIRS PURSUANT TO TNRCC RIO GRANDE RULES

MONTH	INITIAL USABLE STORAGE	TOTAL WTRSHED INFLOWS	TOTAL D-M-I DEMANDS	TOTAL IRRIG DEMANDS	TOTAL SYSTEM SHORTAGE	TOTAL RESERVR EVAP	END-MON USABLE STORAGE	o/o CONS POOL	D-M-I RESERVE STORAGE	OPRATNG RESERVE STORAGE	EXCESS USABLE STORAGE	IRRIG ACCOUNT ALLOCAT	IRRIG RIVER DIVERSN	IRRIG ACCOUNT BALANCE	o/o IRRIG POOL
1	802152	38416	9706	75284	0	5757	749821	22.7	225000	275000	47750	0	69639	202071	7.6
2	749821	40816	9111	46204	0	10155	725167	21.9	225000	275000	0	65967	42871	225167	8.5
3	725167	34617	10774	83987	0	12250	652773	19.8	225000	275000	5699	0	78093	147074	5.6
4	652773	215800	12252	147077	3	10750	698497	21.1	225000	275000	0	187639	136216	198497	7.5
5	698497	205670	12142	136045	0	17847	738133	22.3	225000	275000	0	165540	125904	238133	9.0
6	738133	242949	12720	131136	0	21289	815937	24.7	225000	275000	0	199374	121570	315937	11.9
7	815937	2675524	14231	113599	0	68975	2510607	75.6	225000	287351	0	1787885	105566	1998256	75.5
8	2510607	147042	14669	106534	0	71038	2465408	74.3	225000	282187	0	59192	99227	1958221	74.0
9	2465408	118677	11931	62912	0	62674	2446568	73.7	225000	280035	41909	0	58597	1899624	71.7
10	2446568	127675	11330	65012	0	39930	2457971	74.0	225000	281338	0	112540	60531	1951633	73.7
11	2457971	63492	10305	45380	0	32521	2433257	73.3	225000	278514	20452	0	42342	1909291	72.1
12	2433257	60114	10141	42616	0	31352	2409262	72.6	225000	275773	38859	0	39661	1869630	70.6

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10   CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: UNITED I.D.

	D-M-I WATER RIGHTS ADJ. NO. 0849-000 ANNUAL AUTH: 5300 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. A847-001 ANNUAL AUTH: 69464 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B769-000 ANNUAL AUTH: 4009 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	382	0	4918	5189	2135	.00000	0	0	66410	299	299	.00000	0	0	4009
2	353	0	4565	3063	3063	.03686	2561	2561	66410	177	177	.02168	87	87	4009
3	412	0	4153	5418	2857	.00000	0	0	63849	313	226	.00000	0	0	3922
4	474	0	3679	9982	9982	.10485	7284	7284	63849	576	576	.06168	247	247	3922
5	459	0	3220	9322	2038	.09250	6426	6426	56565	538	291	.05441	218	218	3675
6	477	0	2743	8794	2368	.11141	7739	7739	50139	507	289	.06554	263	263	3457
7	532	0	2211	7384	0	.99907	69400	69755	42755	426	163	.58769	2356	2356	3194
8	550	0	1661	6717	0	.03308	2298	65336	36038	388	0	.01946	78	2046	2806
9	450	0	1211	3967	0	.00000	0	61369	32071	229	0	.00000	0	1817	2577
10	426	0	785	4119	0	.06289	4368	61618	27952	238	0	.03699	148	1727	2339
11	394	0	391	2793	0	.00000	0	58825	25159	161	0	.00000	0	1566	2178
12	391	0	0	2716	0	.00000	0	56109	22443	157	0	.00000	0	1409	2021
ANNUAL	5300	0		69464	22443		100076			4009	2021		3397		

NAME OF WATER RIGHTS OWNER: SANTACRUZ 15

	D-M-I WATER RIGHTS ADJ. NO. 0240-000 ANNUAL AUTH: 3967 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0810-000 ANNUAL AUTH: 4857 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. B804-000 ANNUAL AUTH: 4828 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	286	0	3681	363	149	.00000	0	0	4643	361	361	.00000	0	0	4828
2	264	0	3417	214	214	.03686	179	179	4643	213	213	.02168	105	105	4828
3	308	0	3109	379	200	.00000	0	0	4464	376	271	.00000	0	0	4723
4	355	0	2754	698	698	.10485	509	509	4464	694	694	.06168	298	298	4723
5	343	0	2411	652	143	.09250	449	449	3955	648	350	.05441	263	263	4425
6	357	0	2054	615	166	.11141	541	541	3506	611	348	.06554	316	316	4162
7	398	0	1656	516	0	.99907	4852	4877	2990	513	197	.58769	2837	2837	3846
8	412	0	1244	470	0	.03308	161	4568	2520	467	0	.01946	94	2464	3379
9	337	0	907	277	0	.00000	0	4291	2243	276	0	.00000	0	2188	3103
10	319	0	588	288	0	.06289	305	4308	1955	286	0	.03699	179	2081	2817
11	295	0	293	195	0	.00000	0	4113	1760	194	0	.00000	0	1887	2623
12	293	0	0	190	0	.00000	0	3923	1570	189	0	.00000	0	1698	2434
ANNUAL	3967	0		4857	1570		6996			4828	2434		4092		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION YEAR 10 CALENDAR YEAR 1954

WATER ACCOUNTING FOR SELECTED INDIVIDUAL TEXAS WATER RIGHTS PURSUANT TO TNRCC RIO GRANDE RULES

NAME OF WATER RIGHTS OWNER: HCID2 S.JUAN

	D-M-I WATER RIGHTS ADJ. NO. 0808-001 ANNUAL AUTH: 6140 AF			CLASS A IRRIGATION WATER RIGHTS ADJ. NO. 0808-005 ANNUAL AUTH: 147775 AF						CLASS B IRRIGATION WATER RIGHTS ADJ. NO. 0573-001 ANNUAL AUTH: 470 AF					
MONTH	DEMAND AMOUNT	SHORT AMOUNT	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE A	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE	DEMAND AMOUNT	SHORT AMOUNT	RATE B	ALLOC AMOUNT	STORAGE BALANCE	USABLE BALANCE
1	442	0	5698	11039	4543	.00000	0	0	141279	35	35	.00000	0	0	470
2	409	0	5289	6517	6517	.03686	5447	5447	141279	21	21	.02168	10	10	470
3	477	0	4812	11526	6079	.00000	0	0	135832	37	27	.00000	0	0	460
4	549	0	4263	21235	21235	.10485	15495	15495	135832	68	68	.06168	29	29	460
5	532	0	3731	19831	4336	.09250	13670	13670	120337	63	34	.05441	26	26	431
6	553	0	3178	18708	5038	.11141	16464	16464	106667	59	33	.06554	31	31	405
7	616	0	2562	15709	0	.99907	147638	148393	90958	50	19	.58769	276	276	374
8	637	0	1925	14290	0	.03308	4888	138991	76668	45	0	.01946	9	240	329
9	522	0	1403	8438	0	.00000	0	130553	68230	27	0	.00000	0	213	302
10	493	0	910	8763	0	.06289	9293	131083	59467	28	0	.03699	17	202	274
11	457	0	453	5941	0	.00000	0	125142	53526	19	0	.00000	0	183	255
12	453	0	0	5778	0	.00000	0	119364	47748	18	0	.00000	0	165	237
ANNUAL	6140	0		147775	47748		212895			470	237		398		

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 1 U.S. AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1771041	1163203	1163203	-92	96265	276781	29790	0	111273	0	733865	1827241	1764136
1946	1827241	1212854	1212854	0	45860	249256	29790	0	111273	0	917738	1827241	1770979
1947	1827241	973130	973130	0	137471	273939	29790	0	111273	0	561732	1827229	1770942
1948	1827229	1454024	1454024	0	919966	275639	29790	0	111273	0	258407	1827241	1769661
1949	1827241	1666097	1666097	1	12432	234041	29790	0	111273	0	1419625	1827241	1771041
1950	1827241	1093569	1093569	0	76898	257701	29790	0	111273	0	758976	1827235	1771041
1951	1827235	743512	743512	0	253048	280254	29790	0	111273	0	210602	1826843	1769491
1952	1826843	644293	644293	0	1004496	268367	29790	0	111273	0	0	1198273	1198273
1953	1198273	505469	505469	0	868159	162625	29790	0	111273	0	0	672958	493901
1954	672958	3764424	3764424	-784049	750557	235555	29790	0	111273	0	840038	1827183	553918
1955	1827183	1161083	1161083	-121455	396432	303717	29790	0	111273	0	339881	1826781	1770198
1956	1826781	562134	562134	0	1029464	280478	29790	0	111273	0	0	1078973	1078973
1957	1078973	1670650	1670650	-4341	335331	251040	29790	0	111273	0	331670	1827241	962722
1958	1827241	1969349	1969349	-264455	154	239775	29790	0	111273	0	1464965	1827241	1771041
1959	1827241	1400966	1400966	0	31582	229110	29790	0	111273	0	1140274	1827241	1771040
1960	1827241	1183084	1183084	-16	21103	246742	29790	0	111273	0	915223	1827241	1771013
1961	1827241	1173210	1173210	0	2192	233850	29790	0	111273	0	937168	1827241	1771041
1962	1827241	906681	906681	0	295679	304681	29790	0	111273	0	306321	1827241	1769531
1963	1827241	770142	770142	0	537204	271067	29790	0	111273	0	98990	1690122	1690122
1964	1690122	1673626	1673626	-82589	885927	243732	29790	0	111273	0	324259	1827241	1129262
1965	1827241	1039969	1039969	-101108	254184	239977	29790	0	111273	0	444750	1827191	1770760
1966	1827191	1318285	1318285	-69316	415829	217580	29790	0	111273	0	615880	1826871	1743625
1967	1826871	954207	954207	0	572031	261861	29790	0	111273	0	119945	1827241	1616229
1968	1827241	991330	991330	1	383480	210083	29790	0	111273	0	397790	1827219	1770234
1969	1827219	843864	843864	0	401816	225695	29790	0	111273	0	348927	1694645	1511700
1970	1694645	844695	844695	0	982313	181111	29790	0	111273	0	0	1375916	1208209
1971	1375916	1783089	1783089	-161931	522937	181541	29790	0	111273	0	465355	1827241	1064132
1972	1827241	1307088	1307088	0	0	221100	29790	0	111273	0	1085988	1827241	1771041
1973	1827241	918028	918028	0	0	211923	29790	0	111273	0	708417	1824929	1771041
1974	1824929	3029423	3029423	0	16233	237411	29790	0	111273	0	2773467	1827241	1771041
1975	1827241	1284972	1284972	0	7068	211382	29790	0	111273	0	1066522	1827241	1771041
1976	1827241	1607050	1607050	0	31586	201156	29790	0	111273	0	1374308	1827241	1771041
1977	1827241	1163283	1163283	0	0	238493	29790	0	111273	0	924790	1827241	1771040
1978	1827241	1743638	1743638	0	14032	225421	29790	0	111273	0	1504185	1827241	1771041
1979	1827241	1275063	1275063	0	4708	224825	29790	0	111273	0	1045530	1827241	1771041
1980	1827241	1329313	1329313	-15	56306	253780	29790	0	111273	0	1019212	1827241	1771023
1981	1827241	1888274	1888274	0	1843	214053	29790	0	111273	0	1672378	1827241	1771041
1982	1827241	1118780	1118780	0	18501	243427	29790	0	111273	0	856852	1827241	1771041
1983	1827241	910765	910765	0	4108	246355	29790	0	111273	0	660302	1827241	1771041
1984	1827241	1086407	1086407	0	494607	272252	29790	0	111273	0	319548	1827241	1769744
1985	1827241	1043484	1043484	0	703263	223344	29790	0	111273	0	116877	1827241	1769943
1986	1827241	1887478	1887478	-27298	728894	237000	29790	0	111273	0	894286	1827241	1769971
1987	1827241	1797750	1797750	0	17641	210849	29790	0	111273	0	1569260	1827241	1771041
1988	1827241	1469121	1469121	0	9180	240013	29790	0	111273	0	1219928	1827241	1771041
1989	1827241	1055062	1055062	0	14007	292726	29790	0	111273	0	748329	1827241	1771041
1990	1827241	2076817	2076817	-17	38974	256479	29790	0	111273	0	1781347	1827241	1771013
1991	1827241	2027658	2027658	0	56036	285132	29790	0	111273	0	1686490	1827241	1771041
1992	1827241	1702861	1702861	0	2464	250028	29790	0	111273	0	1450369	1827241	1771041
1993	1827241	1181767	1181767	0	23655	290243	29790	0	111273	0	867869	1827241	1771041
1994	1827241	924654	924654	0	30886	285048	29790	0	111273	0	608720	1827241	1771018
1995	1827241	895126	895126	0	296378	319795	29790	0	111273	0	278953	1827241	1769798
1996	1827241	956466	956466	0	984869	312669	29790	0	111273	0	39297	1446872	1252564
1997	1446872	951292	951292	0	1026589	236416	29790	0	111273	0	0	1135159	1135099
1998	1135159	885317	885317	0	1008875	212135	29790	0	111273	0	0	799466	714427

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 2 U.S. FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	D-M-I DEMANDS	SHORTAGE	IRRIG DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1555129	285000	974067	0	1054035	363031	109522	0	944513	0	0	1112130	860956
1946	1112130	506000	1328535	0	1054035	278291	109522	0	944513	0	0	1108339	940631
1947	1108339	426000	984140	0	1054035	279728	109522	0	944513	0	0	758716	757884
1948	758716	595000	1632310	0	1054035	291087	109522	0	944513	0	0	1045904	437001
1949	1045904	783000	2073994	-177289	1054035	346453	109522	0	944513	0	0	1542121	1023496
1950	1542121	248000	942811	0	1054035	442977	109522	0	944513	0	0	987920	987920
1951	987920	371000	693587	0	1054035	274037	109522	0	944513	0	0	353435	353435
1952	353435	92000	955433	0	1054035	99109	109522	0	944513	0	0	155724	77074
1953	155724	380000	1107096	0	1054035	74991	109522	0	944513	0	0	133794	6296
1954	133794	206368	1655900	0	1054032	148983	109522	0	944513	3	0	586679	18742
1955	586679	262728	857978	0	1054035	136397	109522	0	944513	0	0	254225	162301
1956	254225	146131	1034532	0	1054035	78998	109522	0	944513	0	0	155724	67906
1957	155724	633550	1159488	0	1054035	79991	109522	0	944513	0	0	181186	76841
1958	181186	1287790	2611846	314103	1054035	102929	109522	0	944513	0	336442	1613729	130551
1959	1613729	413263	1444056	-86181	1054035	283831	109522	0	944513	0	87801	1545937	1402910
1960	1545937	304220	1099483	0	1054035	285878	109522	0	944513	0	0	1305507	1150264
1961	1305507	438643	1236940	0	1054035	285465	109522	0	944513	0	0	1202947	1068520
1962	1202947	222588	683525	0	1054035	258098	109522	0	944513	0	0	574339	534484
1963	574339	259995	755126	0	1054035	119819	109522	0	944513	0	0	155611	101048
1964	155611	478465	1547588	0	1054035	84833	109522	0	944513	0	0	564331	6233
1965	564331	334430	892301	0	1054035	158768	109522	0	944513	0	0	243829	236738
1966	243829	391422	1282068	0	1054035	85874	109522	0	944513	0	0	385988	126866
1967	385988	713220	1264133	0	1054035	99240	109522	0	944513	0	0	496846	146767
1968	496846	294637	934844	0	1054035	97910	109522	0	944513	0	0	279745	210949
1969	279745	346676	956356	0	1054035	57002	109522	0	944513	0	0	125064	54168
1970	125064	297120	1138370	0	1054035	54162	109522	0	944513	0	0	155237	8712
1971	155237	2201017	3048246	303232	1054035	125118	109522	0	944513	0	714000	1613729	7774
1972	1613729	569612	1514537	-114249	1054035	277456	109522	0	944513	0	187239	1495287	1403515
1973	1495287	707828	1275182	12269	1054035	246755	109522	0	944513	0	0	1481948	1295424
1974	1481948	287805	2936442	-201515	1054035	277804	109522	0	944513	0	1271307	1613729	1055450
1975	1613729	689676	1622203	-118931	1054035	288323	109522	0	944513	0	236126	1538517	1501454
1976	1538517	1062184	2327015	0	1054035	258143	109522	0	944513	0	939644	1613729	1324405
1977	1613729	464282	1248009	-155973	1054035	280697	109522	0	944513	0	78441	1292592	1292592
1978	1292592	556024	1933178	0	1054035	255710	109522	0	944513	0	302296	1613729	1068009
1979	1613729	564636	1473811	5106	1054035	293025	109522	0	944513	0	325001	1420585	1420585
1980	1420585	409238	1343693	0	1054035	278674	109522	0	944513	0	0	1431569	991863
1981	1431569	994629	2527787	22082	1054035	247409	109522	0	944513	0	1066265	1613729	1439718
1982	1613729	340150	1074440	-140773	1054035	271298	109522	0	944513	0	0	1222063	1220124
1983	1222063	342907	866254	0	1054035	211452	109522	0	944513	0	0	822830	735637
1984	822830	234142	907234	0	1054035	182837	109522	0	944513	0	0	493192	452285
1985	493192	424262	1103339	0	1054035	133756	109522	0	944513	0	0	408740	266183
1986	408740	377249	1859366	0	1054035	123089	109522	0	944513	0	0	1090982	225838
1987	1090982	630894	2076732	-80047	1054035	265691	109522	0	944513	0	201672	1566269	1166600
1988	1566269	539973	1628018	40965	1054035	289736	109522	0	944513	0	277752	1613729	1387491
1989	1613729	278254	899527	-47114	1054035	302148	109522	0	944513	0	0	1109959	1109959
1990	1109959	418569	2097827	-7748	1054035	280051	109522	0	944513	0	252223	1613729	912336
1991	1613729	308733	1910196	-73881	1054035	290051	109522	0	944513	0	492229	1613729	1416759
1992	1613729	517404	1829174	-68821	1054035	281741	109522	0	944513	0	500603	1537703	1499741
1993	1537703	250123	1000584	0	1054035	280746	109522	0	944513	0	0	1203506	1196344
1994	1203506	295200	793743	0	1054035	243838	109522	0	944513	0	0	699376	691000
1995	699376	218838	653106	0	1054035	137193	109522	0	944513	0	0	161254	161254
1996	161254	227673	1110776	0	1054035	62566	109522	0	944513	0	0	155429	5917
1997	155429	226161	1111687	0	1054035	57408	109522	0	944513	0	0	155673	13526
1998	155673	239251	1107063	0	1054035	53280	109522	0	944513	0	0	155421	5854

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 3 MEX AMISTAD

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1380278	883389	883389	92	444158	215088	50767	0	0	0	180435	1424078	1357385
1946	1424078	909841	909841	0	198380	194046	50767	0	0	0	517416	1424077	1366919
1947	1424077	669063	669063	0	61683	212510	50767	0	0	0	394869	1424078	1348270
1948	1424078	507768	507768	0	112156	214166	50767	0	0	0	181457	1424067	1363207
1949	1424067	1042898	1042898	-1	8524	182399	50767	0	0	0	851963	1424078	1380278
1950	1424078	786227	786227	0	16946	200871	50767	0	0	0	568410	1424078	1380278
1951	1424078	404486	404486	0	124235	214682	50767	0	0	0	152479	1337168	1320427
1952	1337168	428901	428901	0	916612	148485	50767	0	0	0	0	700972	682653
1953	700972	222231	222231	0	770570	33970	50767	0	0	0	0	118663	1375
1954	118663	788961	788961	784049	97205	144120	50767	0	0	0	61456	1388892	135676
1955	1388892	677209	677209	121455	606445	191015	50767	0	0	0	0	1390096	892010
1956	1390096	296764	296764	0	780058	169817	50767	0	0	0	0	736985	680881
1957	736985	564144	564144	4341	320114	112717	50767	0	0	0	0	872639	536215
1958	872639	1567841	1567841	264455	1059132	95369	50767	0	0	0	126356	1424078	519769
1959	1424078	667730	667730	0	15586	178472	50767	0	0	0	473695	1424055	1380278
1960	1424055	848707	848707	16	105920	192219	50767	0	0	0	550561	1424078	1376113
1961	1424078	624584	624584	0	10677	182143	50767	0	0	0	431791	1424051	1380278
1962	1424051	511070	511070	0	98862	237278	50767	0	0	0	174924	1424057	1375744
1963	1424057	481290	481290	0	508671	177807	50767	0	0	0	23580	1195289	1030743
1964	1195289	672900	672900	82589	780914	131530	50767	0	0	0	0	1038334	598145
1965	1038334	489720	489720	101108	331566	142791	50767	0	0	0	0	1154805	954394
1966	1154805	1003086	1003086	69316	578242	119625	50767	0	0	0	105272	1424068	849445
1967	1424068	523436	523436	0	624273	160558	50767	0	0	0	0	1162673	880153
1968	1162673	841232	841232	-1	278542	150059	50767	0	0	0	151225	1424078	1187460
1969	1424078	705083	705083	0	79295	185731	50767	0	0	0	440057	1424078	1379934
1970	1424078	620385	620385	0	512297	151702	50767	0	0	0	34518	1345946	1039874
1971	1345946	692998	692998	161931	633206	143621	50767	0	0	0	0	1424048	807402
1972	1424048	802803	802803	0	0	172246	50767	0	0	0	632840	1421765	1380278
1973	1421765	679907	679907	0	16286	165083	50767	0	0	0	510344	1409959	1380278
1974	1409959	1211470	1211470	0	11549	184998	50767	0	0	0	1000804	1424078	1380278
1975	1424078	748604	748604	0	978	164596	50767	0	0	0	583066	1424042	1380278
1976	1424042	773967	773967	0	15525	156703	50767	0	0	0	601722	1424059	1380278
1977	1424059	550896	550896	0	0	185664	50767	0	0	0	379373	1409918	1380278
1978	1409918	1517216	1517216	0	1697	175649	50767	0	0	0	1325710	1424078	1380278
1979	1424078	878202	878202	0	1012	175106	50767	0	0	0	712516	1413646	1380278
1980	1413646	817103	817103	15	248084	197642	50767	0	0	0	360973	1424065	1377308
1981	1424065	1238430	1238430	0	0	166824	50767	0	0	0	1071593	1424078	1380278
1982	1424078	664349	664349	0	4620	189622	50767	0	0	0	476106	1418079	1380278
1983	1418079	497472	497472	0	14410	191984	50767	0	0	0	285079	1424078	1380278
1984	1424078	775321	775321	0	298935	210433	50767	0	0	0	265966	1424065	1317365
1985	1424065	682379	682379	0	387896	166939	50767	0	0	0	127532	1424077	1235896
1986	1424077	1208462	1208462	27298	667901	170783	50767	0	0	0	397075	1424078	1034514
1987	1424078	1203973	1203973	0	19319	164228	50767	0	0	0	1020444	1424060	1380278
1988	1424060	929864	929864	0	36434	187053	50767	0	0	0	706361	1424076	1380278
1989	1424076	589071	589071	0	7213	228039	50767	0	0	0	353831	1424064	1380278
1990	1424064	1728668	1728668	17	84268	199807	50767	0	0	0	1444596	1424078	1376383
1991	1424078	1892590	1892590	0	43696	222129	50767	0	0	0	1626781	1424062	1380278
1992	1424062	1283085	1283085	0	14354	194769	50767	0	0	0	1073965	1424059	1380278
1993	1424059	788586	788586	0	23224	226103	50767	0	0	0	539267	1424051	1380278
1994	1424051	488813	488813	0	8078	221959	50767	0	0	0	261203	1421624	1376910
1995	1421624	387891	387891	0	618746	190219	50767	0	0	0	0	1000550	914255
1996	1000550	441577	441577	0	720888	113729	50767	0	0	0	0	607510	366728
1997	607510	398568	398568	0	718303	46105	50767	0	0	0	0	241670	158758
1998	241670	384845	384845	0	484429	9500	50767	0	0	0	0	132586	1363

HISTORICAL LONG-TERM AMISTAD & FALCON RESERVOIR SIMULATION WITH FAY - 1945-98 F&N HYDROLOGY

SIMULATION PERIOD TOTAL SUMMARY FOR NODE 4 MEX FALCON

YEAR	INITIAL STORAGE	WTRSHED INFLOWS	RESERVR INFLOWS	FLDWATR TRANSFR	DWNSTRM RELEASE	EVAP LOSS	MUN&IRR DEMANDS	SHORTAGE	OTHER DEMANDS	SHORTAGE	FLOOD SPILLS	YEAREND STORAGE	MINIMUM STORAGE
1945	1098674	278000	851826	0	941483	209134	941483	0	0	0	0	799883	434042
1946	799883	521000	1186029	0	941483	155139	941483	0	0	0	0	889290	284911
1947	889290	371000	776785	0	941483	147265	941483	0	0	0	0	577327	239908
1948	577327	702000	944846	0	941483	80364	941483	0	0	0	0	500326	1437
1949	500326	442000	1251720	177289	941483	108469	941483	0	0	0	0	879383	197881
1950	879383	128000	662589	0	941483	163079	941483	0	0	0	0	437410	263238
1951	437410	326000	551947	0	941483	34220	941483	0	0	0	0	13654	1172
1952	13654	64000	929845	0	941483	876	941483	0	0	0	0	1140	1098
1953	1140	1003000	1722803	0	941483	91667	941483	0	0	0	0	690793	1073
1954	690793	325559	433453	0	941483	70020	941483	0	0	0	0	112743	26803
1955	112743	344411	900089	0	941483	9046	941483	0	0	0	0	62303	1114
1956	62303	153390	882681	0	941483	2361	941483	0	0	0	0	1140	1098
1957	1140	727886	997233	0	941483	18920	941483	0	0	0	0	37970	1140
1958	37970	1933882	3068603	-314103	941483	28518	941483	0	0	0	682395	1140074	1149
1959	1140074	489555	928069	86181	941483	172718	941483	0	0	0	62677	977446	776583
1960	977446	307596	913310	0	941483	132707	941483	0	0	0	0	816566	399345
1961	816566	583960	975661	0	941483	139529	941483	0	0	0	0	711215	320990
1962	711215	240095	463114	0	941483	69799	941483	0	0	0	0	163047	34396
1963	163047	307161	788645	0	941483	4904	941483	0	0	0	0	5305	1121
1964	5305	548188	1278335	0	941483	19670	941483	0	0	0	0	322487	1098
1965	322487	350059	630858	0	941483	10618	941483	0	0	0	0	1244	1121
1966	1244	417219	1049966	0	941483	7409	941483	0	0	0	0	102318	1100
1967	102318	943825	1517331	0	941483	28299	941483	0	0	0	0	649867	1098
1968	649867	382091	761091	0	941483	50999	941483	0	0	0	0	418476	2307
1969	418476	382759	851344	0	941483	72757	941483	0	0	0	0	255580	98535
1970	255580	283218	779266	0	941483	16355	941483	0	0	0	0	77008	1093
1971	77008	3101272	3683711	-303232	941483	94874	941483	0	0	0	1281056	1140074	1140
1972	1140074	670492	1252565	114249	941483	184425	941483	0	0	0	285683	1095297	871015
1973	1095297	740920	1216783	-12269	941483	149264	941483	0	0	0	89913	1119151	571339
1974	1119151	305682	1267268	201515	941483	170641	941483	0	0	0	335736	1140074	606109
1975	1140074	913544	1446821	118931	941483	196738	941483	0	0	0	458167	1109438	978525
1976	1109438	1693211	2259691	0	941483	158800	941483	0	0	0	1128772	1140074	611851
1977	1140074	554875	883481	155973	941483	198073	941483	0	0	0	67742	972230	972038
1978	972230	801281	2077921	0	941483	137702	941483	0	0	0	830892	1140074	435368
1979	1140074	688648	1351409	-5106	941483	204026	941483	0	0	0	321305	1019563	921478
1980	1019563	544535	1102825	0	941483	151854	941483	0	0	0	0	1029051	420712
1981	1029051	1430420	2451246	-22082	941483	174081	941483	0	0	0	1202577	1140074	947649
1982	1140074	338840	768799	140773	941483	186553	941483	0	0	0	0	921610	921610
1983	921610	291291	540013	0	941483	103985	941483	0	0	0	0	416155	308979
1984	416155	243487	757621	0	941483	31247	941483	0	0	0	0	201046	1112
1985	201046	463802	928463	0	941483	14226	941483	0	0	0	0	173800	1122
1986	173800	540129	1554338	0	941483	34424	941483	0	0	0	0	752231	1184
1987	752231	748490	1737486	80047	941483	173839	941483	0	0	0	323503	1130939	677145
1988	1130939	831771	1523799	-40965	941483	170613	941483	0	0	0	361603	1140074	662342
1989	1140074	285024	595301	47114	941483	174039	941483	0	0	0	0	666967	641891
1990	666967	498141	1976238	7748	941483	123445	941483	0	0	0	445951	1140074	163814
1991	1140074	322749	1942459	73881	941483	188829	941483	0	0	0	886028	1140074	826403
1992	1140074	623610	1661162	68821	941483	198947	941483	0	0	0	623878	1105749	1094279
1993	1105749	230123	741847	0	941483	158930	941483	0	0	0	0	747183	564845
1994	747183	255581	474095	0	941483	89151	941483	0	0	0	0	190644	190644
1995	190644	240841	808820	0	941483	7257	941483	0	0	0	0	50724	1110
1996	50724	259854	929975	0	941483	5826	941483	0	0	0	0	33390	1098
1997	33390	242833	910369	0	941483	1085	941483	0	0	0	0	1191	1098
1998	1191	267272	700934	0	645901	5617	941483	295582	0	0	0	50607	955

Attachment F.

Floppy Disk Containing

1. **Electronic Copies of the ROM Fortran Code (Attachment A) and Executable Code**

2. **Current Average Demands Data Input File (Attachment B)**

3. **Current Average Demands Output File (Complete Version of Attachment D)**

4. **Firm Annual Yield Output File (Complete Version of Attachment E)**