It should be emphasized that the attached information is only preliminary in nature, however, it does give an indication of the anticipated results. More definative estimates will require development at a later date.

If you do not agree with our figures or have any questions about our model, please do not hesitate to call me at (918) 496-5709.

Yours very truly

WILLIAMS BROTHERS ENGINEERING COMPANY

Terry L. Bentley

Terry L. Bentley
Projects Coordinator

TLB:dgk/2742

Enclosures

cc: L.R. Fisher, Jr.
E. Evans

...MS
...THERS
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April 2, 1980

Mr. Warren Webber
New Mexico Representative
Water and Power Resources Service
P.E. Box 252
Albuquerque, New Mexico 87103

Dear Mr. Webber,

Enclosed is a simplified flow diagram which represents the basic function of the "return flows" computer model developed here at Williams Brothers Engineering Company. The program is essentially a mass balance equation which incorporates all major inputs and outputs that are easily quantified. The only major parameter not considered in the program is deep percolation (recharge of groundwater aquifers). The hypothesis that this process is negligible in this area is substantiated by the fact that all quantifiable extractions such as crop consumptive use, evaporation, soil moisture recharge requirements, surface water runoff, and losses from irrigation efficiency result in little if any water left over for either groundwater recharge or return flow.

As is indicated in the selected runs (Table 1) which are representative of full implementation of the completed NIIP operations, the return flows are essentially nonexistant at a diversion of 357,000 ac/feet until 85% irrigation efficiency is assumed. Since the actual overall irrigation efficiency will be closer to 60% it leads us to believe that actual long-range return flows from the NIIP will not be a major factor in reducing tha overall quality of flows in the San Juan River

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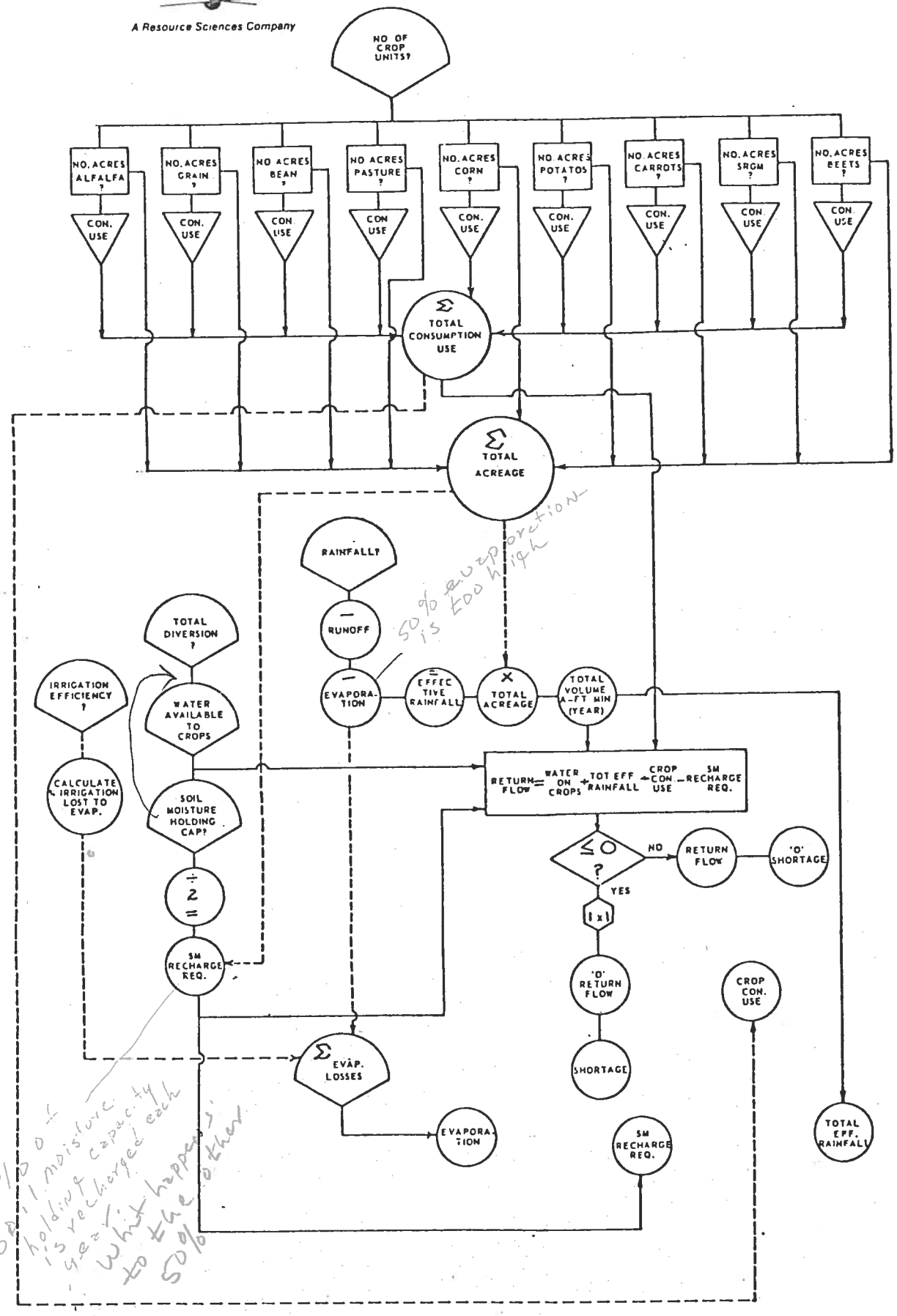
FIGURE 1



Flow Diagram for Crop Consumptive use
Return Flow Program for Navajo/Four Corners Water Project

WBEC-691

WBEC-691

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TABLE I

RESERVOIR OPERATION RESULTS

(Chinde Reservoir)

1	2	3	4	5	6	7	8	9	10
Actual Rainfall (in)	Irrigation Efficiency %	Diversion (ac/ft-yr)	Soil Moisture SMS*(in)	Effective Precipitation (ac/ft-yr)	Total Evaporation (ac/ft-yr)	Crop * Consum. Use(ac/ft) yr	Effective Irrigation (Ac/ft-yr)	Soil Recharge (Ac/ft-yr)	Return Flow (Ac/ft-yr)	Shortage for Crop Use(ac/ft) yr
8	0.60	357,000	6	36,900	179,700	299,700	214,200	27,700	0.	(76,200) 76,300
8	0.70	"	"	"	144,000	"	249,900	27,700	0.	(40,500) 40,600
8	0.80	"	"	"	108,300	"	285,600	"	0.	(4,800) 4,900
8	0.85	"	"	"	(90,900) 90,400	"	303,500	"	13,000	0
6	0.60	375,000	6	27,700	170,500	299,700	214,200	27,700	0.	85,500
6	0.85	"	6	"	81,200	"	303,500	"	3,800	0
6	0.80	"	5	27,700	99,100	"	285,600	23,000	0	(9,500) 9400
6	0.85	"	5	"	81,200	"	303,500	"	(8,400) 8500	0
6	0.85	"	4	"	"	"	"	18,400	(13,000) 13100	0
6	0.80	"	6	"	99,100	"	285,600	27,700	0	14,100

* Soil Moisture Holding Capacity (in)
* See attached sheet for crop acreage used to compute consumptive use.

What happens to Soil recharge each year?
It is 50% of Soil Moisture Holding Capacity