INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

El Paso, Texas
March 22, 1990

REPORT OF THE PRINCIPAL ENGINEERS REGARDING THE NEED TO REHABILITATE THE SALINE WATERS DISPOSAL SYSTEM FOR CONTROL OF THE SALINITY PROBLEM IN THE WATERS OF THE LOWER RIO GRANDE

To The Honorable Commissioners
International Boundary and Water Commission
United States and Mexico
El Paso, Texas and Ciudad Juarez, Chihuahua

In accordance to your instructions, we present for your consideration this joint report regarding the present need to rehabilitate the saline waters disposal system for control of the salinity problem in the waters of the Lower Rio Grande.

Description of Systems

The works consist of a diversion structure near the mouth of the Morillo agricultural drain in the Lower Rio Grande, a pumping plant, and a 24-mile (38.98 kilometers) long bypass canal, all located in Mexico. These works were constructed by Mexico in 1968 and 1969 at a construction cost equally divided by the United States and Mexico. The cost of their operation and maintenance is also divided equally by the two governments, pursuant to the stipulations in Minutes No. 223, entitled "Measures for the Solution of the Lower Rio Grande Salinity Problem", dated November 30, 1965, and No. 224, entitled "Recommendations Concerning the Lower Rio Grande Salinity Problem", dated January 16, 1967. Minutes Nos. 223 and 224 stipulate that these works shall have capacity to divert to the Gulf of Mexico 105.9 cfs (3 cms) of highly saline waters from the Morillo drain, to resolve the problem of salinity of the waters in the Lower Rio Grande, such that the waters can be satisfactorily used for domestic and irrigation purposes in both countries.

The canal and pumping plant originally were placed into operation in 1969 to comply with Minute 224. The plant originally was made up of two Fairbanks Morse model XLL 6720 pumps with a capacity of 35.3 cfs (1 cms) and two Fairbanks Morse model XLL 6717 pumps with a capacity of 17.6 cfs (0.5 cms). In November 1984, the Commission, pursuant to Minute No. 269, entitled "Replacement of Pumps at the Morillo Drain Pumping Plant", dated November 9, 1984, replaced the two 17.6 cfs (0.5 cms) pumps with two 35.3 cfs (1 cms) pumps, which increased the installed capacity from 105.9 cfs (3 cms) to 141.2 cfs (4 cms). A location map showing the diversion structure, pumping plant, and the bypass canal is enclosed as Exhibit 1.

For the purposes of this report, IBWC refers to the International Boundary and Water Commission and NWC refers to the National Water Commission of the Secretariat of Agriculture and Hydraulic Resources of Mexico and United States Section and Mexican Section refer to the organizations that form the IBWC.

Need For Rehabilitation

Pumping Plant

The two remaining 35.3 cfs (1 cms) capacity pumps originally installed have been in continuous use for 21 years and because of this use, breakdowns have been frequent in recent years. At those times when these two older pumps are out service, the conveyance capacity of 105.9 cfs (3 cms) is reduced by 33 percent and the standby capacity is lost. This condition causes an adverse impact on the quality of the waters of the Rio Grande. We conclude that to improve the efficiency and reliability of the pumping plant, the 21-year old pumps should be replaced.

Manufacturers of pumps normally extend, with the purchase of equipment, a warranty for its parts and operation of no greater than one year. We investigated the possibility of repairing the pumps, essentially replacing all the components that are subject to wear and tear, and found this to be possible. A one-year warranty, the same as for new pumps, could be provided. Also, we found that the cost could be about 50 percent of the cost of acquiring new equipment, and it would not be necessary to modify the pump bases.

In addition to the pump repairs, we considered it necessary to rehabilitate and replace the pump control panels, sliding gate control panel, sliding gates elevating mechanisms, internal and external lighting of the plant, the radial gate, and the existing steel screens. Anticorrosive treatment will have to be applied to the gates and replace the missing steel screens in the intake structure.

Conveyance Canal

Because of the time that the drain has been in operation, the unlined reaches are highly deteriorated and silted. The concrete-lined reach, the covered portion through Reynosa, Tamaulipas, and the bypass canal structures are similarly deteriorated and silted. We have concluded that the following rehabilitation work is necessary to maintain the capacity to convey saline waters to the Gulf of Mexico:

1. Desilting of the unlined and concrete-lined reaches.

2. Grading of the embankment crowns and interior slopes of the canal in unlined sections.

3. Reconstruction of the embankment reaches as required.

4. Demolition and replacement of highly broken concrete slabs.

5. Sealing of concrete slab cracks.

6. Cleaning of storm drains and siphons.

7. Rehabilitation of manholes.

8. Cleaning of the covered section.

9. Hauling of material as necessary for the actions above.

Considerations Before Carrying Out Rehabilitation of the System

Resolution 6 of IBWC Minute 223 indicates that the operation and maintenance of the canal with its structures, the pumping plant and the diversion structure in the drain will be performed by Mexico, and their costs will be divided at 50 percent, which was the proportion established to divide the construction costs.

The IBWC considers it appropriate that the two originally installed 35.3 cfs (1 cms) capacity Fairbanks Morse pumps be rehabilitated by the Government of the United States with costs divided at 50 percent to each Government.

Point 7 of the Resolution in Minute No. 223 stipulates that the design, construction, and operation and maintenance of the diversion structure, pumping plant and bypass canal shall be under supervision of the IBWC. We reviewed the above-referenced rehabilitation needs and concluded that to carry out the work, pumping of the saline Morillo Drain waters into the bypass canal would have to be temporarily suspended resulting in discharge of these waters into the Rio Grande.

Precautionary Measures During Rehabilitation

The United States and Mexico, in Minute 223, expressed their intent to preserve the beneficial value of the waters of the Rio Grande by avoiding or

correcting their high salt concentrations. We conclude that the United States and Mexico, through the IBWC, should take certain measures during that rehabilitation to avoid high salt concentrations in the waters of the Rio Grande in temporary storage in the pool formed behind Anzalduas Dam. These measures include:

a) The rehabilitation must take place during any of the following periods: (1) When demands for Rio Grande waters downstream of the Morillo Drain discharge are low and Morillo Drain discharges are also low, (2) When demands for Rio Grande waters downstream of the Morillo Drain discharge are sufficiently high to provide dilution. In this manner, a first work period could be from October 1989 through January 1990, a second period would be between April and July 1990, and a third period between October 1990 and the end of January 1991.

b) The salinity in the waters of the Rio Grande discharged from Anzalduas Dam should be determined by electrical conductivity readings. The readings will be converted to dissolved solids concentrations equivalent to parts per million (ppm) based on samples taken by IBWC personnel downstream at the gaging station located below Anzalduas Dam utilizing the factor normally used at this dam.

c) The water samples should be taken daily at the same time by personnel of each Section in the morning and afternoon and the electric conductivity determination will be made immediately by personnel designated by each Section of the IBWC. These personnel will compare the results one hour later. If differences in the readings taken by both Sections are greater than 5 percent, the instruments shall be calibrated and the sampling procedure repeated.

d) The measuring instruments should be inspected each day and calibrated each week.

e) The volume of water necessary to arrive at any operating level between the minimum storage elevation and elevation 100 feet (30.48 m), will be supplied equally by both countries. If the operating level is greater than elevation 100 feet (30.48 m), in addition to complying with the above storage obligation, the two countries will attempt to maintain the ownership of stored waters above elevation 100 feet (30.48 m) as close as practicable to 50 percent to each country.

f) If salinity of the waters downstream of the dam equals or exceeds an average of 1,100 ppm for three consecutive days, the waters in the pool behind Anzalduas Dam should be evacuated in a volume determined by the Resident Engineers and approved by the Principal Engineers to be sufficient to reduce their salinity at least to 1,100 ppm replacing the water in the pool with waters released from Falcon Dam or any other source.

g) If water in the pool requires evacuation to reduce its salinity, once the volume to be evacuated is determined and approved, the Resident Engineers shall determine the elevation to which the storage will be lowered. The volume of water to be evacuated and charged to each country will be determined on the basis of the daily water accounting. The volume of water evacuated will be replaced immediately.

Construction Schedule

Principal Engineer Luis Guzman of the Mexican Section informs that:

The NWC has developed plans for the rehabilitation of the diversion structure, the pumping plant, and the bypass canal and proposes three stages of construction in accordance with the following schedule:

First Stage - Which began last October 15, 1989 and which was completed on February 7, 1990, consisted of the rehabilitation of the intake structure, pumping plant and bypass drain from Km 0+130 to Km 9+000.

Second Stage - This will take place in April, May and June 1990 and will consist of rehabilitation of the bypass drain from Km 9+000 to Km 17+600.

Third Stage - The third stage will take place in October, November and December, 1990 and January 1991 and will consist of rehabilitation of the bypass drain from Km 17+600 to Km 39+062.

The Mexican Section will provide to the United States Section a copy of the bid announcement containing specifications and volumes of the rehabilitation works before awarding the construction contracts. Later it will provide the construction contract with the company that will be assigned the work, including specifications and unit prices.

The NWC will apply the standards it has established for unit price increases in periodic revisions due to inflation that could take place in Mexico during the rehabilitation periods proposed.

Construction Costs Considerations

The Mexican Section, in accordance with the recommendations in Minute No. 223, manages the transfer of United States funds to Mexico for the annual costs of operation and maintenance. Similarly, it would be appropriate for the Mexican Section to manage the transfer of United States funds for the proposed rehabilitation in a manner similar to the case of the replacement pumps in Minute No. 269. The following financing procedures should be used to facilitate the division of costs between the United States and Mexico and the transfer of United States funds to Mexico:

1) The costs of the works shall be managed in United States dollars with payment in this currency. The expenditures made in Mexican pesos will be converted into dollars, converting to such currency those total amounts of the work estimates, based on the free exchange rate established by the Banco de Mexico on the date the contracts have been awarded.

2) The first stage of the rehabilitation shall be financed by both the United States and Mexico. In this manner, the Government of Mexico shall finance the rehabilitation of the drain gate, the drains intake structure, the pumping plant (exclusive of the older pumps replacement), and the bypass canal from its start at Km 0+130 to Km 9+000, at a cost estimated at $200,900.00 U.S. dollars for the work to be performed by Mexico, and the United States Government would finance the rehabilitation of the two 35.3 cfs (1 cms), estimated at $50,000.00 U.S. dollars.

3) The second stage consists of rehabilitation of the canal from Km 9+000 to Km 13+800 and the covered reach from Km 13+800 to Km 17+600, estimated at a cost of $97,000.00, U.S. currency, shall be completely financed by the United States Government and performed by the Government of Mexico.

4) The third stage, consisting of rehabilitation of the bypass canal between Km 17+600 and Km 39+062 and estimated to cost $300,000.00 U.S. currency, shall be financed by both governments such that at the end of construction, each country will have paid 50 percent of the total cost of the project.

5) To cover the financing corresponding to the United States for the second and third stages of construction:

   a) The United States Section upon being notified by the Mexican Section of the bid announcement will immediately obligate funds sufficient to cover the estimated construction costs for the stage under consideration.

   b) The Mexican Section will inform the United States Section when the contracts have been awarded providing the specifications and catalog unit costs and work schedule. The United States Section will set aside an amount corresponding to the monthly expenditures in the work schedule.

   c) The personnel designated by the respective Sections shall make joint weekly inspections of the work sites and shall report to the respective Principal Engineers on the progress of the work.

   d) The NWC shall formulate the monthly work estimates which will be provided to the Mexican Section for its review. Based on paragraphs a), b), and c), and after the estimates described in this paragraph have been reviewed by the Principal Engineers, and approved by the Commissioners, the United States Section, no later than 10 working days after approval, shall deliver to the Mexican Section a check in an amount corresponding to the work performed.

6) Exhibit 2 shows an analysis of the approximate total financing, taking into account the costs of operation and maintenance by Mexico during 1987, 1988, and 1989, as well as the value of the construction or repair contracts underway, and that of future contracts required to complete the rehabilitation. The future costs have been estimated based on unit prices presently in force by the NWC for present contracts, applying an adjustment factor since these would be carried out in 1990 and early 1991.

RECOMMENDATIONS

Based on the above considerations, we recommend the following:

A. The United States and Mexico will participate in equal parts in the financing of the rehabilitation of the three components of the international project named Morillo Bypass Canal to avoid the problem of salinity of the waters of the Lower Rio Grande constructed in Mexico, equally financed by the United States and Mexico under Minute No. 223 "Measures for Solution of the Lower Rio Grande Salinity Problem", and No. 224 "Recommendations Concerning the Lower Rio Grande Salinity Problem", dated November 30, 1965 and January 16, 1967, respectively.

B. The United States and Mexico, through the IBWC, during the period of rehabilitation will take the following measures to avoid high salt concentrations in the waters of the Rio Grande in temporary storage in the pool formed behind Anzalduas Dam:

1) The salinity in the waters of the Rio Grande downstream of Anzalduas Dam shall be determined based on the electrical conductivity which will be converted into dissolved solids equivalent to parts per million utilizing the factor normally used at Anzalduas Dam.

2) The water samples will be taken daily at the same time by personnel of the two Sections in the morning and afternoon and the electrical conductivity shall be determined immediately by personnel designated by each Section. The results will be compared one hour later and if the difference in readings taken by both Sections is greater than five percent, the instruments shall be calibrated and the sampling procedures repeated.

3) The measuring instruments should be inspected each day and calibrated once a week.

4) The volume of water necessary to arrive at any operating level between the minimum storage elevation and elevation 100 feet (30.48 m), will be supplied equally by both countries. If the operating level is greater than elevation 100 feet (30.48 m), in addition to complying with the above storage obligation, the two countries will attempt to maintain the ownership of stored waters above elevation 100 feet (30.48 m) as close as practicable to 50 percent to each country.

5) If the salinity of the waters downstream of the dam equals or exceeds an average quantity of 1,100 ppm in salt concentrations during three consecutive days, the waters from the Anzalduas Dam pool should be evacuated in a volume determined by the Resident Engineers and approved by the Principal Engineers to reduce the salinity of the waters to less than 1,100 ppm replacing the water in the pool with waters discharged from Falcon Dam or any other source.

6) If water in the pool requires evacuation to reduce its salinity, once the volume to be evacuated is determined and approved, the Resident Engineers shall determine the elevation to which the storage will be lowered. The volume of water to be evacuated and charged to each country will be determined on the basis of the daily water accounting. The volume of water evacuated will be replaced immediately.

C. The rehabilitation of the three components of the system that avoid the problem of the salinity in the waters of the Lower Rio Grande, consisting of a diversion structure near the mouth of the Morillo Drain into the Rio Grande, a pumping plant, and a 24-mile (38.93 kilometer) long open and closed bypass canal, exclusive of repairs of the two Fairbanks Morse model XLL 6720 pumps, shall be carried out by the responsible authorities of the Government of Mexico. The rehabilitation of the referenced pumps will be carried out by the Government of the United States. All the work will be carried out under the supervision of the IBWC following the procedures outlined in this report. Such rehabilitation would be carried out in three stages as follows:

1) First Stage - Beginning October 15, 1989, and completed at the latest on January 31, 1990.

2) Second Stage - The period from April through the end of June 1990.

3) Third Stage - From October through January 1991.

D. The division of costs, managed in United States dollars, between the two countries shall be carried out under the following financial arrangement:

1) For the first stage, the Government of Mexico would finance the rehabilitation of the drain gate, the pumping plant (exclusive of the two older pumps), and the bypass canal from its start at Km 0+130 to Km 9+000, at a cost estimated at $200,900.00 U.S. dollars, and the United States Government would finance the rehabilitation of the two 35.3 cfs (1 cms), estimated at $50,000.00 U.S. dollars. Mexico's participation in the operation and maintenance costs for 1987, 1988, and 1989 will be considered as part of Mexico's share for this stage.

2) For the second stage, the United States would finance the rehabilitation performed by Mexico of the bypass canal from Km 9+000 to Km 13+800 and the covered reach from Km 13+800 to Km 17+600 estimated at a cost of $97,000.00, U.S. currency.

3) For the third stage both Governments would finance the rehabilitation of the bypass canal between Km 17+600 and Km 39+062 estimated to cost $300,000.00 U.S. currency, dividing the costs so that at the end of the construction each country will have paid 50 percent of the total cost.

4) Expenditures made in Mexican pesos shall be converted into United States dollars based on the free rate of exchange established by the Banco de Mexico for purchase on the date that a contract is awarded.

5) To cover the financing corresponding to the United States for the second and third stages of construction:

   a) The United States Section, upon being notified by the Mexican Section of the bid announcement, will immediately obligate funds sufficient to cover the estimated construction costs for the stage under consideration.

   b) The Mexican Section will inform the United States Section when the contracts have been awarded providing the specifications and unit catalog costs and work schedule. The United States Section will set aside an amount corresponding to the monthly expenditures in the work schedule.

c) The personnel designated by the respective Sections shall make joint weekly inspections of the work sites and shall report to the respective Principal Engineers on the progress of the work.

d) The NWC shall formulate the monthly work estimates which will be provided to the Mexican Section for its review. Based on paragraphs a), b), and c) above, and after the estimates described in this paragraph have been reviewed by the Principal Engineers and approved by the Commissioners, the United States Section, no later than 10 working days after approval, shall deliver to the Mexican Section a check in an amount corresponding to the work performed.

Respectfully Submitted,

Jose S. Valdez
Principal Engineer
U.S. Section

Luis Guzman del Castillo
Principal Engineer
Mexican Section

ESTIMATED FINANCIAL ANALYSIS

EXHIBIT 2

MEXICO	DOLLARS	UNITED STATES	DOLLARS
Expenditures		**Expenditures**	
Operation and Maintenance 1987	30,000.00	Repairs 1 cms pumps (approx)	50,000.00
Operation and Maintenance 1988	35,000.00	Rehabilitation Contract km 9+000-18+800	166,000.00
Operation and Maintenance 1989	40,000.00	Rehabilitation Covered Reach	28,000.00
Rehabilitation Pumping Plant	53,900.00		
Rehabilitation km 0+130-9+000	147,000.00		
	305,900.00		244,000.00
Obligations		**Obligations**	
50% Operation and Maintenance 1987	15,000.00	50% Operation and Maintenance 1987	15,000.00
50% Operation and Maintenance 1988	17,500.00	50% Operation and Maintenance 1988	17,500.00
50% Operation and Maintenance 1989	20,000.00	50% Operation and Maintenance 1989	20,000.00
50% Rehabilitation Pumping Plant	26,950.00	50% Rehabilitation Pumping Plant	26,950.00
50% Rehabilitation km 0+130-9+000	73,500.00	50% Rehabilitation km 0+130-9+000	73,500.00
50% Rehab. Contract km 9+000-18+800	83,000.00	50% Rehab. Contract km 9+000-18+800	83,000.00
50% Rehabilitation Covered Reach	14,000.00	50% Rehabilitation Covered Reach	14,000.00
50% Repairs 1 cms pumps	25,000.00	50% Repairs 1cms pumps	25,000.00
	274,950.00		274,950.00
Balance (Credit)	30,950.00	(charge)	30,950.00
Final Obligation			
50% Rehab. Contract km 17+600-39+062	150,000.00	50% Rehab. Contract km 17+600-39+062	150,000.00
Final Expenditure	119,050.00	Final Expenditure	180,950.00
EXPENDITURE TOTAL	424,950.00	EXPENDITURE TOTAL	424,950.00