MINUTE NO. 168

WORKS WHICH EACH GOVERNMENT SHOULD UNDER
TAKE ON ACCOUNT OF EXISTING CONDITIONS IN
THE CHANNEL OF THE RIO GRANDE AT EL PASO,
TEXAS, AND CIUDAD JUÁREZ, CHIHUAHUA.

The Commission met at the offices of
the Mexican Section in Ciudad Juárez, Chi-
huahua, at 10:00 A.M., December 20, 1939,
for the purpose of taking formal action
with regard to the works which each gov-
ernment should undertake on account of the
conditions existing in the channel of the
Río Grande in the vicinity of El Paso,
Texas, and Ciudad Juárez, Chihuahua.

The Commission reviewed the maps, re-
ports and other data with regard to the
work performed in the rectification of the
Río Grande in the El Paso-Juárez Valley in
accordance with the provisions of the Con-
vention of February 1, 1933, and studied
especially the effects which the construc-
tion of the rectified channel immediately
below the cities of El Paso and Ciudad
Juárez has had upon the regimen of the
river in that reach between the point a-
bove El Paso and Ciudad Juárez where the
river becomes the international boundary
line and the point of beginning of the
rectified channel near Córdova Island.
The Commission also received and studied
the joint report of the Consulting Engi-
neers dated December 14, 1939, regarding
the existing conditions along the Río
Grande in the vicinity of El Paso and
Ciudad Juárez, which report is attached
hereeto and made a part hereof.

The Commission considers that the con-
ditions existing in the channel of the
Río Grande within the reach in reference
and as described in the attached report
of the Consulting Engineers constitute an

(Continued on sheet No. 2)
increasingly serious menace to the cities of El Paso and Juárez and to the headworks of the irrigation systems for the El Paso-Juárez Valley, and in view of the large expenditures which the two governments have made in an endeavor to remove the flood hazard from the El Paso-Juárez Valley and especially from the cities of El Paso and Juárez, and since by taking advantage of the works already constructed there now exists the opportunity to further protect the two cities and the irrigation systems which are so vital to the existence of the region, the Commission recommends that the alteration of the International Dam, the removal of the tubes located in the channel of the river just above the mouth of the Colorado Arroyo, the removal of the old piling under the four bridges between El Paso and Ciudad Juárez and the removal of the sand bar in the river channel at the Stanton Street Bridge, all as outlined in the Consulting Engineers' report and the map and plan thereto attached, be undertaken by the two governments as supplementary to those works already performed under the provisions of the Convention of February 1, 1933, for the rectification of the Río Grande in the El Paso-Juárez Valley, and that these supplementary works be performed under the same provisions as those for the works heretofore carried out under that convention.

For the accomplishment of the works proposed herein, it is recommended that Mexico undertake the work involved in the alteration of the International Dam from the westerly or Mexican end of the dam to the pier that supports the most westerly radial gate, the work of removal of the tubes located in the river channel above the mouth of the Colorado Arroyo, the work of removing the old piling under the four bridges between the cities of El Paso and Juárez and the work of removal of the sand bar at the Stanton Street Bridge; that the United States undertake that part of the work involved in the alteration of the International Dam not herein allocated to Mexico, and

(Continued on sheet No. 3)
that the works herein outlined be performed before next summer's floods.-------

The meeting then adjourned.-----------

P.M. Larnum
Commissioner of the United States.

J. Richard Cardova
Commissioner of Mexico.

W. B. Moore
Secretary of the United States Section.

Acting Secretary of the Mexican Section.

The Spanish agrees with the English text.

Acting Translator.
INTERNATIONAL BOUNDARY COMMISSION
UNITED STATES AND MEXICO

El Paso, Texas,
December 14, 1939.

JOINT REPORT OF THE CONSULTING ENGINEERS REGARDING THE EXISTING CONDITIONS ALONG THE RIO GRANDE IN THE VICINITY OF EL PASO, TEXAS, AND CIUDAD JUÁREZ, CHIHUAHUA.

The Honorable Commissioners,
International Boundary Commission,
United States and Mexico,
El Paso, Texas, and Ciudad Juárez, Chih.

Sirs:

In accordance with your instructions, we have made an examination and study of the conditions existing along the channel of the Rio Grande near El Paso, Texas, and Ciudad Juárez, Chihuahua, in the reach of river from the recently constructed American diversion dam to the International diversion dam and on downstream to the point of beginning of the Rio Grande Rectification Project.

Within the reach of river under consideration are located the American diversion dam, the International diversion dam, the abandoned wells of the old International Water Company, and the four bridges connecting the cities of El Paso and Juárez.

The International dam, the location of which is shown on the attached map, has been in existence for many years and is used for the diversion of water from the river for irrigation purposes. The international boundary line intersects the axis line of the International dam in its central part, so that one-half of the dam lies in Mexico and one-half lies in the United States. The dam is of rubble-masonry construction and of the overpour gravity type, and is not provided with gates of any kind. Consequently,

(Continued on sheet No. 2)
(Continued from sheet No. 1)

river bed above the dam has become filled with deposited materials practically to the top of the dam.

The material deposited in the reach of river channel between the International dam and the American dam located about two miles upstream is partly from the sand brought down by the river and partly from the sand and gravel carried into the channel by the three arroyos which discharge into the river from the right or westerly side. At the mouths of these arroyos, gravel bars have been projected into and almost across the channel of the river, the gravel being too heavy for the river to move under the prevailing conditions of flow. One of the arroyos discharges into the Rio Grande immediately above the International dam. This circumstance results in a particularly hazardous situation, since in the event a large arroyo flow should reach the river at the time a major flood was passing, the debris carried by the arroyo could so fill the river channel as to cause unprecedented floodwater heights. The filling up of the river channel in this reach, together with the absence of gates in the International dam, produces a dangerous condition in that at time of flood the headworks of the Acequia Madre on the Mexican side and those of the Franklin Canal on the American side are likely to be overtopped, in which event the heading structures and the canals below them would be destroyed and great damage from flooding might occur in the cities of Juárez and El Paso.

Since 1935, the river bed below the International dam on downstream to the point of beginning of the Rio Grande Rectification Project has lowered approximately 1.5 meters (5 feet) due to the effects of the river rectification project built in the valley below El Paso and Ciudad Juárez in accordance with the Convention of 1933. This degradation of river bed, which has reached the downstream toe of the International dam, would make possible the securing

(Continued on sheet No. 3)
out of the material in the river bed above if the dam were provided with gates so that at times of flood flow advantage could be taken of the difference in head above and below the dam.

Our studies show that by installing a series of four 20-foot (6-meter) radial gates in the central part of the International dam and with the gate sills at elevation 1130.22 meters (3708.28 feet), there can be obtained for that part of the river between the International dam and the American dam a gradient of .0008 as compared with the present gradient of .00015, and that with the gates fully opened the elevation of the water surface of the anticipated flood of 12,000 cubic feet (340 cubic meters) per second would be lowered about 0.86 meter (2.82 feet). This marked lowering of the floodwater surface would in large measure eliminate the danger to the heading structures and canals and so tend to prevent any overflow within the two cities. Also, the steeper river gradient would, due to the increased velocities so induced, scour out the material now deposited in the reach of river between the two dams and it is probable that this beneficial degradation would extend upstream above the American dam. This scouring of the river channel would greatly reduce the cost of the operation of the irrigation canal systems heading at the International dam, in that the settling basin thus provided would prevent in large measure the sanding up of the canals.

The abandoned wells of the old International Water Company are located in the channel of the river immediately above the mouth of the Colorado Arroyo. These wells were constructed many years ago and consist of eleven steel tubes about 1 meter (3 feet) in diameter, set vertically and standing from 1 to 2 meters (3 to 7 feet) above the bed of the river and thus interfere with the flow of water in the river.

(Continued from sheet No. 2)

(De la Hoja No. 2)

cho del río arriba si la presa estuviera -- provista de compuertas para que en época de crecientes se pudiera aprovechar la diferencia de carga entre la parte de abajo y la parte de arriba de la presa.

Nuestros estudios muestran que mediante la instalación de una serie de cuatro compuertas radiales de 6 metros (20 pies) cada una, en la parte central de la presa Internacional, y con sus umbrales a una elevación de 1 130.22 metros (3 708.28 pies) se podría obtener para el tramo del río comprendido entre la presa Internacional y la presa Americana, una pendiente de .0008 en lugar de la pendiente actual de .00015 y que, con las compuertas completamente abier tas, la elevación de la superficie del agua de una creciente dada de 340 metros cúbicos por segundo (12 000 pies cúbicos por segundo), se bajaría como 0.86 metros (2.82 pies). Este importante abatimiento de la superficie del agua, en gran parte eliminaría el peligro para las estructuras de bocatoma y para los canales y por lo mismo tendería a evitar que se inundaran las dos ciudades. Igualmente, la pendiente más pronunciada del río, debida al aumento de velocidades provocado, excavaría el azolve depositado en el tramo del río comprendido entre las dos presas y es probable que esta erosión benéfica se extendiera hasta aguas-arriba de la presa Americana. Esta excavación del cauce del río reduciría en gran parte el costo de operación de los sistemas de los canales de irrigación que parten de la presa Internacional, porque quedarían provisionadas de un vaso de reposo que evitaría en gran parte el azolve de los canales.

Los pozos abandonados por la antigua Compañía Internacional de Aguas están situados en el cauce del río inmediatamente arriba de la desembocadura del Arroyo Colorado. Estos pozos fueron construidos hace muchos años y consisten de once tubos de acero de 1 metro (3 pies) de diámetro colocados verticalmente y que sobresalen de 1 a 2 metros (de 3 a 7 pies) del lecho del río y, por lo tanto, estorban la corriente del agua del río.

(Continuación en la Hoja No. 4)
Beneath the four bridges connecting the cities of El Paso and Juárez, the lowering of the river bed has exposed many old piling installations left from former structures which interfere with the flow of water in the river. Also, at the Stanton Street Bridge there exists a sand bar which will interfere with the proper flow of floodwater in the river.

There are attached hereto four exhibits, as follows:

A. Map showing the general conditions along the Río Grande in the vicinity of El Paso and Ciudad Juárez.

B. Profile of the Río Grande between the American Dam and International Dam, showing the present river bottom and normal and floodwater surfaces and those that will result if the proposed gates are installed in the International Dam.

C. Plan showing the proposed installation of four radial gates in the central part of the International Dam.

D. Estimate of cost.

It is concluded (a) that a serious situation exists as a result of the obstruction to flood flows, due to the International dam and the silted river bed above, in that at time of flood great damage could occur to the canal headings at both ends of the dam, to the canals below, and to the cities of Juárez and El Paso, (b) that the installation of the four radial gates in the central part of the dam would ameliorate these conditions through an effective lowering of flood heights and a securing out of the river bed above the International dam, and also would be of great benefit in the operation of the canal systems which head at the dam, and (c) that the walls of the old International Water Company, the sand bar near the middle of the Stanton Street bridge, and the old piling now exposed under the four inter-city

(Continued on sheet No. 5)
(Continued from sheet No. 4)

It is therefore recommended:

1. That the changes in the International dam, as shown on the plan hereto attached and including the installation of four radial gates, be made.

2. That the sand bar near the middle of the Stanton Street bridge, the wells of the old International Water Company and the old piling under the four bridges between the cities of Juárez and El Paso be removed from the river channel.

Respectfully submitted,

[Signature]
Consulting Engineer, United States Section.

[Signature]
Consulting Engineer, Mexican Section.

(De la Hoja No. 4)

hallan ahora al descubierto debajo de los cuatro puentes que unen a las ciudades y que constituyen un estorbo al escurrimiento apropiado del agua del río.

Por lo tanto se recomienda:

1. Que se hagan las modificaciones en la Presa Internacional, señaladas en el plano anexo a este informe, que incluyen la instalación de cuatro compuertas radiales.

2. Que se remueven del cauce del río la playa de arena que está cerca de la mitad del puente de la calle de Stanton, los pozos de la antigua Compañía Internacional de Aguas y los restos de pilotes existentes debajo de los cuatro puentes que unen a las poblaciones de Ciudad Juárez y El Paso.

Respetuosamente,

[Signature]
Ingeniero Consultor de la Sección Mexicana.

[Signature]
Ingeniero Consultor de la Sección de los Estados Unidos.
# COST ESTIMATE

Accompanying Report of Consulting Engineers dated December 14, 1939.

Alterations to International Dam -

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Pits and Borings</td>
<td>$1,500</td>
</tr>
<tr>
<td>Diversion and care of river, and unwatering</td>
<td>5,500</td>
</tr>
<tr>
<td>Demolition</td>
<td>398 cu.M. at $3.92 (520 cu.yds. at $3.00)</td>
</tr>
<tr>
<td>Excavation and Backfill</td>
<td>1,835 cu.M. at $1.21 (2,400 cu.yds. at $0.925)</td>
</tr>
<tr>
<td>Gravel Drains</td>
<td>18 cu.M. at $3.33 (24 cu.yds. at $2.50)</td>
</tr>
<tr>
<td>Concrete</td>
<td>615 cu.M. at $34.43 (805 cu.yds. at $26.30)</td>
</tr>
<tr>
<td>Structural Steel</td>
<td>23,860 kg. at $0.232 (52,600 lbs. at $0.105)</td>
</tr>
<tr>
<td>Gates and Lifts</td>
<td>4 at $2,613.50</td>
</tr>
<tr>
<td>Protective Work at Ends</td>
<td></td>
</tr>
<tr>
<td><strong>Total for Dam</strong></td>
<td></td>
</tr>
<tr>
<td>Removal of Well Casings from River</td>
<td>400</td>
</tr>
<tr>
<td>Removal of Piling under Intercity Bridges</td>
<td>400</td>
</tr>
<tr>
<td>Removal of Sand Bar</td>
<td>200</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td></td>
</tr>
<tr>
<td>Engineering and Contingencies - 20%</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL COST ESTIMATE**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>$61,200</strong></td>
</tr>
</tbody>
</table>