APPENDIX B

FORMULATION OF DETAILED PLANS

APPENDIX B

TABLES

TABLES (CONT'D)

LIST OF PLATES

This appendix displays the results of the Stage 3 study efforts which consist of evaluating the detailed plans which remained as viable alternatives after completion of the Stage 2 formulation process. After considering all possible solutions for flood protection of the Middle Rio Grande valley from main stem flooding, only two basic alternatives emerged as feasible. The first alternative would consist of a combination of structural and nonstructural measures; rehabilitating the existing levee systems to provide SPF protection for those independent units where economically justified, employing flood plain management techniques on econonomically unjustified units where protection was less than 100-year, and doing nothing on those unjustified units where protection exceeds 100-year and greater protection cannot be justified. The second alternative would be to do nothing to the Albuquerque Units which were constructed in 1958 and to raise and rehabilitate the levees upstream and downstream to provide a uniform level of protection, 42,000 c.f.s., where economically justified to do so. "No action" or flood plain management would be implemented where levee rehabilitation would be economically infeasible. Hence, four plans are evaluated in this appendix; the SPF plan (Plan A), a modified version of the SPF plan (Plan B) which emphasizes the environmental objectives identified in the preceding appendix, a plan which provides 42,000 c.f.s. protection and emphasizes environmental objectives (Plan C), and the "no-action" alternative.

SECTION A

DESCRIPTION OF DETAILED PLANS

Detailed descriptions of the Plans A, B, and C are presented in this section. The principal features are given by individual unit to support the detailed costs given in Section B. Design details and technical aspects of the plans are also presented in Section B.

PLAN A

Bernalillo Unit. Stage 2 formulation produced no feasible alternatives for protecting the entire unit. Alternatives to protect only the town of Bernalillo, which contains 75 percent of the damageable property within the unit, also proved to be infeasible. The existing levee is in very good condition and provides protection from flows up to 30,000 c.f.s., which is the 133-year flood. No action other than development of a warning system and emergency evacuation plan is recommended for the Bernalillo Unit.

Corrales Unit. The plan for this unit would consist of reconstructing the existing levee and increasing its height an average of 4.3 feet over its entire length to provide the required Standard Project Flood protection. Toe drains would be provided to control seepage, and Kellner jetties would be placed at vulnerable locations to protect the levees from high flow velocities. The existing overlap levee along the riverside drain which empties into the river at the Highway 46 bridge would be raised and extended to increase its length to about 16,700 feet. Another short overlap levee would be

constructed from the high ground just upstream from the "oxbow nature preserve." These overlap levees would permit the existing valley drainage system to function without modification, while preventing intrusion of floodwaters into the protected areas. None of the measures would adversely impact upon the plans of other organizations to preserve the "oxbow." The plan and profile of improvements for the Corrales Unit are shown on Plates B-1 and B-2.

Albuquerque Unit - East. The levee in this unit would be raised an average of 2.3 feet to increase the system's capacity from 42,000 c.f.s. to 72,000 c.f.s., the Standard Project Flood. The existing system has toe drains and sufficient Kellner jetty fields, and no additional work would be required in these areas. The overlap levee for the riverside drain emptying into the river between the Interstate 40 bridge and the Highway 66 bridge at Section 502 would be raised and extended about 6,000 feet to protect against SPF backwater. Existing sewage treatment outfalls near Sections 534 and 568 would be improved by adding new gates to insure against inflow. These gate modifications are shown on Plate B-5. Plates B-3, B-4, B-6, and B-7 show the plan and profile for the improvements in this unit.

Albuquerque Unit - West. The levee would be raised an average of 2.7 feet over the entire length of this unit to protect against the Standard Project Flood peak flow of 71,000 c.f.s. All but the lower 2 miles of this unit are equipped with toe drains which perform adequately. New toe drains would have to be added to this lower portion. Kellner jetty protection is sufficient in this unit and no new fields are proposed. A new excessive inflow structure would be built at the Atrisco intake near Section 502. The outlet structures near Sections 516 and 563 would be modified to insure against inflow. These new and modified structures are shown on Plate B-8. Both the U.S. Highway 66 and U.S. Highway 85 bridges would have to be raised as indicated on Plate B-9 in order to pass

the Standard Project Flood. The costs of raising these bridges, a non-Federal cost, are divided equally between the east and west units of the Albuquerque Unit. The New Mexico State Highway Department has already initiated planning efforts for rehabilitation of these bridges. The plan and profiles for this unit are shown on Plates B-4, B-6, and B-7.

Mountainview Unit. In addition to raising the levees an average of 4.7 feet over the entire length of the unit, toe drains and Kellner jetty fields would be added to the existing system. Because no improvements were justified for the Isleta Unit - East immediately downstream, the Mountainview levee would be extended approximately 5,000 feet below the Interstate 25 bridge to prevent the Standard Project Flood backflow from entering the Mountainview Unit through the railroad opening in the Interstate 25 embankment. A backflow prevention structure would be placed on the riverside drain to prevent entry of backwater into the unit by this means. To protect the end of the levee from the scouring action of flows spilling into the overbank, sheet piling would be driven into the last 100 feet of levee as indicated on Plate B-8. The plan and profile for this unit are shown on Plates B-6 and B-7.

Isleta Unit - East. No structural measures for flood prevention would be economically justified for this unit, because there are practically no improvements or other damageable property within the entire flood plain. Therefore, only flood plain management would be a viable recommendation to be implemented by the Isleta Indians. The limits of the Standard Project Flood plain for the unprotected unit are shown on Plate B-10.

Isleta Unit - West. The existing levee would be reconstructed and raised an average of 5.2 feet over its entire length. Toe drains would be installed as a part of the levee rehabilitation, but no new Kellner jetty fields would be required. Approximately 16,000

feet of new overlap levee would be constructed to prevent backflows from entering the protected area though the riverside drain which empties into the Rio Grande just upstream from the Santa Fe Railroad bridge. Two backflow prevention structures would be placed in the overlap levee where irrigation wasteways empty into the riverside drain. Rather than modify the existing intake structure on the west end of the Isleta Diversion Dam to prevent excessive inflow and still maintain its original function, a new large capacity excessive inflow prevention structure would be constructed about 100 feet downstream on the intake canal. Although the new Mexico Highway 47 bridge at Isleta will pass the Standard Project Flood, about 300 feet of the west approach roadway would have to be raised to match the rehabilitated levee height. Plans and profiles for this unit are shown on Plates B-10 and B-11.

Belen Unit- East. The average height of the levee would be increased 4.6 feet over its entire length to protect against a Standard Project Flood of 69,000 c.f.s. Toe drains for seepage control would be included in the rehabilitation, and Kellner jetty fields for scour protection would be place at vulnerable locations. Overlap levees would be constructed at the riverside drain wasteways near the New Mexico Highway 49 bridge and at the railroad bridge south of Belen. While both the New Mexico Highways 47 and 49 bridges at Isleta and Los Lunas, respectively, will pass the Standard Project Flood, their east approaches would be raised to match the new levee height. Because no new levee is provided for the Isleta Unit - East upstream, a tieback would be built to high ground upstream from the Highway 47 bridge at Isleta. Also an excessive inflow prevention structure would be placed on the riverside drain where it would penetrate the tieback to prevent water from entering the Belen Unit - East through this channel. A backflow prevention structure would be constructed at the outlet of the Peralta Main Canal near Section 830. Rather than modify the existing intake

structure at the east end of the Isleta Diversion Dam to prevent excessive inflow, a new excessive inflow preventer would be constructed about 50 feet downstream on the intake canal. Details of these control structures are shown on Plate B-16. The levee rehabilitation would terminate about 3,700 feet downstream from the railroad bridge at Belen. To protect the end of the levee from flows spilling into the overbank area, piling would be driven into the last 100 feet of levee as shown on Plate B-8. Plans and profiles for the Belen Unit - East are shown on Plates B-10, B-11, B-12, B-13, B-14, and B-15.

Belen Unit - West. Rehabilitation of the existing levee would include installing toe drains and increasing the height an average of 5.1 feet over the entire length of the unit to protect against the Standard Project Flood of 69,000 c.f.s. Two small backflow prevention structures would be constructed near Sections 682 and 783 where small discharge channels from the irrigation system empty into the Rio Grande. Two large backflow prevention structures would be constructed near Sections 699 and 879 for wasteways which presently pass over the riverside drain and discharge to the Rio Grande. Earthwork on the riverside channel which conducts the discharges to the river at each location would be improved. The Middle Rio Grande Conservancy District has connected the riverside drain which formerly discharged to the Rio Grande near the railroad bridge, R2, near Belen with the drain south of the railroad by carrying it around the west bridge abutment. Therefore, no structure would be constructed at this location.

The Los Lunas sewage treatment plant outfall, near Section 748 would be modified to prevent backflow. A new flap valve would be installed on the riverside of the conduit and a new sluice gate on the landside of the conduit.

Approximately 8,400 feet of new riverside drain would be constructed between the new levee and the railroad embankment between Sections 683 and 697 through the Isleta Marsh. The new drain would connect to the existing riverside drain which starts near Section 697. The cost of excavation required to prepare this new drain was included in the cost of levee fill because the drain was assumed to be a source of borrow.

The west approaches to both the Highways 49 and 6 bridges at Los Lunas and Belen, respectively, would be humped to match the rehabilitated levee height and raised above the Standard Project Flood water surface elevation between the levee and bridge. Structures under the roadways carrying the riverside drain would be extended to accommodate the increased road fill.

The levee rehabilitation would be extended about 12,000 feet downstream from the railroad bridge near Belen. One backflow prevention structure would be constructed near Section 879 for the wasteway discharge to the river. To protect the end of the levee (near Section 900) from the attack of flow spilling into the overbank area, piling would be driven the last 100 feet of levee as indicated in Plate 8. The plan and profiles for the Belen Unit - West are shown on Plates B-10, B-11, B-12, B-13, B-14, and B-15.

Mitigation. Mitigation measures would be required to offset the adverse impacts to recreation and fish and wildlife created by construction activities, the temporary loss of 478 acres of habitat due to borrow pits and haul roads, and the permanent loss of 286 acres due to levee enlargement, as well as the partial loss of Isleta Marsh. The basic features of a mitigation plan would be intensive management of the riparian woodland within the project area and acquisition in fee or easement and management of 500 acres of additional deciduous woodland.

PLAN B

This plan, a modification of the preceding plan, incorporates measures which address most of the environmental objectives identified in Section G of Appendix A. The levee rehabilitation for each individual unit is the same for this plan as it is for Plan A, except for the Belen Unit - West. Under this plan approximately 11,500 feet of levee and toe drain at the upstream end of the Belen Unit - West between Sections 672 and 696 would be eliminated from the plan of improvement to avoid drainage of the existing wetland, Isleta Marsh, at this location. A backflow prevention structure at Section 683 would also be eliminated. In order to prevent backwater from entering the Isleta Unit - West, a tieback levee approximately 1,000 feet long would be constructed to intersect the railroad embankment at about Section 673. An overlap levee approximately 4,000 feet long would be constructed along the Isleta Drain to prevent flood flows from entering the lower end of the Isleta Unit - West.

In order to prevent flood flows from entering the upstream end of the Belen Unit - West, a tieback would be constructed to a raised railroad embankment at Section 696. The railroad would have to be raised a total distance of 3,200 feet to match the required new levee height at this location. The maximum increase in grade would be 6 feet at the point of the tieback. The raise can be performed under traffic, or traffic can be diverted over an existing line which swings to the west immediately upstream from the raised portion and then back into Belen downstream. The plan and profiles for this modification of the Belen Unit - West are shown on Plates B-17 and B-18. The only improvements located in the unprotected area are the railroad, U.S. Highway 85, and the Isleta Drain, which would have negligible effect on average annual benefits for this unit.

Another feature of this plan would be the creation of wetlands from some of the borrow areas created by the levee construction.

As described in more detail in Section B of this appendix, a portion of the material to be used in the levee construction would be borrowed from the bosque area between the levee and the cleared channel. Because of the continual changes in the bosque as a result of natural and man-caused acts; i.e., floods, fires, steam-meandering, woodland succession, and tree-cutting, the borrow areas would not be selected until preparation of final design. At that time, sites for borrow would be selected which had the least impact on the riparian environment. Haul road locations would also be specified to minimize destruction to the large trees. From these borrow areas, those suitable for development into wetlands would be so designated and designed to create a marsh-type environment.

Specific design features of these these manmade wetlands would be held in abeyance until development of final plans, pending the outcome of additional studies as recommended in the Fish and Wildlife Service's Wildlife Coordination Report. General characteristics of the borrow areas identified for wetland development would include sufficient depth to permit ground water to serve as the sole source of water supply in compliance with desires expressed by the New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service. Depths within each of the selected borrow pits would be varied to accommodate the different species of wildlife.

Borrow areas within the bosque would normally be excavated by using a scraper-dozer operation. On those borrow pits to be converted into wetlands, a dragline operation would be required to excavate below the water line. Material obtained and placed by this method would cost approximately $0.50 per cubic yard more than the scraper operation. Not all borrow areas would be suitable for wetlands and excavated in this fashion. Site specific characteristics at the time of final design would determine the number and size of these manmade marshes.

The remaining borrow pits and haul roads would be scarified and/or shaped to more readily accept natural or, if necessary, mechanical seeding with restoration of vegetation expected to take place in two years. Destroying the haul roads would prevent the use of such roads as entry into the bosque after project completion. The U.S. Fish and Wildlife Service, the New Mexico Department of Game and Fish, and the city of Albuquerque have expressed that additional access or improvement of existing access would only induce more human activity which would negate the natural environment that this plan addresses.

As stated previously, the sole source of water for the manmade wetlands would be ground water. Because all water within the basin has been appropriated, water rights would have to be acquired for these marsh areas. The amount of water rights required would be equal to the difference between the water lost through evaporation resulting from this open water and the water lost through evapotranspiration over the same area. This water loss is estimated to be 4 acre-feet per acre of wetland created. A preliminary examination of the area at this time would indicate that approximately 125 acres of wetland could be developed, requiring that 500 acre-feet of water rights be acquired.

The creation of the wetlands and preservation of Isleta Marsh would offset some of the adverse environmental impacts which would be created by construction of Plan B. Other mitigation measures based upon known conditions as they currently exist include the following:

a. Construction contractual controls to minimize adverse impacts.

b. Grassing and selected planting if required.

c. Management of riparian woodland and river channel in the project area.

d. Acquisition in fee or easement and management of 250 acres of deciduous woodland prior to construction.

e. Preconstruction wildlife study.

Detailed analysis of mitigation and compensation measures for Plan B are presented in Appendix H.

PLAN C

This plan provides the same environmental features as described for Plan B while providing protection for flood flows up to 42,000 c.f.s. to the units where economically justified. Details of Plan C for each of the individual units are given in the following paragraphs.

Bernalillo Unit. As stated at the beginning of this section, stage 2 formulation produced no feasible alternatives for protecting the entire unit, therefore, no action other than development of a warning system and emergency evacuation plan is recommended for the Bernalillo Unit.

Corrales Unit. The plan for this unit would consist of reconstructing the existing levee and increasing its height an average of 2.2 feet over its entire length to provide protection up to 42,000 c.f.s. Toe drains would be provided to control seepage, and Kellner jetties would be placed at vulnerable locations to protect the levees from high flow velocities. The existing overlap levee along the

riverside drain which empties into the river at the Highway 46 bridge would be raised and extended to increase its length to about 9,000 feet. Another short overlap levee would be constructed from the high ground just upstream from the "oxbow nature preserve." These overlap levees would permit the existing valley drainage system to function without modification, while preventing intrusion of floodwaters into the protected areas. None of the measures would adversely impact upon the plans of other organizations to preserve the "oxbow." The plan and profile of improvements for the Corrales Unit are shown on Plates B-19 and B-20.

Albuquerque Unit - East. No work would be performed in this unit. Existing levee plan and profile are shown on Plates B-21, B-22, B-23, and B-24.

Albuquerque Unit - West. No work would be performed in this unit. Existing levee plan and profile are shown on Plates B-22, B-23, and B-24.

Mountainview Unit. In addition to raising the levees an average of 2.3 feet over the entire length of the unit, toe drains and Kellner jetty fields would be added to the existing system. Because no improvements were justified for the Isleta Unit - East immediately downstream, the Mountainview levee would be extended approximately 3,000 feet below the Interstate 25 bridge to prevent the backflow from entering the Mountainview Unit through the railroad opening in the Interstate 25 embankment. A backflow prevention structure would be placed on the riverside drain to prevent entry of backwater into the unit by this means. To protect the end of the levee from the scouring action of flows spilling into the overbank, sheet piling would be driven into the last 100 feet of levee as indicated on Plate B-8. The plan and profile for this unit are shown on Plates B-23 and B-24.

Isleta Unit - East. No structural measures for flood prevention would be economically justified for this unit, because there are practically no improvements or other damageable property within the entire flood plain. Therefore, only flood plain management would be a viable recommendation to be implemented by the Isleta Indians. The limits of the Standard Project Flood plain for the unprotected unit are shown on Plate B-10.

Isleta Unit - West. The existing levee would be reconstructed and raised an average of 2.5 feet over its entire length from the Albuquerque levee to State road 47. Toe drains would be installed as a part of the levee rehabilitation, but no new Kellner jetty fields would be required. Approximately 8,000 feet of new overlap levee would be constructed to prevent backflows from entering the protected area through the riverside drain which empties into the Rio Grande just upstream from the Santa Fe Railroad bridge. Also, 7,000 feet of new overlap levee would be constructed to prevent backflows from entering the protected area through the riverside drain which flows under State road 47. One backflow prevention structure would be placed in the overlap levee where irrigation wasteways empty into the riverside drain and two backflow prevention structures would be placed in the second overlap levee for the same purpose as before. Although the New Mexico Highway 47 bridge at Isleta will pass 42,000 c.f.s., the west approach roadway would have to be raised to match the rehabilitated levee height. Plans and profiles for this unit are shown on Plates B-25 and B-26.

Belen Unit- East. The average height of the levee would be increased an average of 2.4 feet over its entire length to protect against a flood of 42,000 c.f.s. Toe drains for seepage control would be included in the rehabilitation, and Kellner jetty fields

for scour protection would be placed at vulnerable locations. Overlap levees would be constructed at the riverside drain wasteways near the New Mexico Highway 49 bridge and at the railroad bridge south of Belen. While both the New Mexico Highways 47 and 49 bridges at Isleta and Los Lunas, respectively, will pass 42,000 c.f.s. their east approaches would be raised to match the new levee height. Because no new levee is provided for the Isleta Unit - East upstream, a tieback would be built to high ground upstream from the Highway 47 bridge at Isleta. Also an excessive inflow prevention structure would be placed on the riverside drain where it would penetrate the tieback to prevent water from entering the Belen Unit - East through this channel. A backflow prevention structure would be constructed at the outlet of the Peralta Main Canal near Section 830. Rather than modify the existing intake structure at the east end of the Isleta Diversion Dam to prevent excessive inflow, a new excessive inflow preventer would be constructed about 50 feet downstream on the intake canal. Details of these control structures are shown on Plate B-16. The levee rehabilitation would terminate about 3,700 feet downstream from the railroad bridge at Belen. To protect the end of the levee from flows spilling into the overbank area, piling would be driven into the last 100 feet of levee as shown on Plate B-8. Plans and profiles for the Belen Unit - East are shown on Plates B-25, B-26, B-27, B-28, B-29, and B-30.

Belen Unit - West. Rehabilitation of the existing levee would include installing toe drains and increasing the height an average of 2.7 feet over the entire length of the unit to protect against a flood of 42,000 c.f.s. The levee and toe drain would not be extended through the existing Isleta Marsh to prevent drainage of the marsh. In order to prevent flood flows from entering the upstream end of the Belen Unit- West, a tieback would be constructed to a

raised railroad embankment at Section 696. The railroad would have to be raised to match the required new levee height at this location. The maximum increase in grade would be 4 feet at the point of the tie-back. The raise can be performed under traffic, or traffic can be diverted over an existing line which swings to the west immediately upstream from the raised portion and then back into Belen downstream. The only improvements located in the unprotected area are the railraod, U.S. Highway 85, and the Isleta Drain, which would have negligible effect on average annual benefits for this unit.

A new large capacity excessive inflow prevention structure would be constructed on the Belen Highline Canal in the vicinity of where the upstream end of the levee would tie into the railroad embankment. A small backflow prevention structure would be constructed near Section 783 where small discharge channels from the irrigation system empty into the Rio Grande. Two large backflow prevention structures would be constructed near Sections 699 and 879 for wasteways which presently pass over the riverside drain and discharge to the Rio Grande. Earthwork on the riverside channel which conducts the discharges to the river at each location would be improved. The Middle Rio Grande Conservancy District has connected the riverside drain which formerly discharged to the Rio Grande near the railroad bridge, R2, near Belen with the drain south of the railroad by carrying it around the west bridge abutment. Therefore, no structure would be constructed at this location.

The Los Lunas sewage treatment plant outfall, near Section 748 would be modified to prevent backflow. A new flap valve would be installed on the riverside of the conduit and a new sluice gate on the landside of the conduit.

The west approaches to both the Highways 49 and 6 bridges at Los Lunas and Belen, respectively, would be humped to match the rehabilitated levee height and raised above the 42,000 c.f.s. water surface elevation between the levee and bridge. Structures under the roadways carrying the riverside drain would be extended to accommodate the increased road fill.

The levee rehabilitation would be extended about 7,000 feet downstream from the railroad bridge near Belen. One backflow prevention structure would be constructed near Section 879 for the wasteway discharge to the river. To protect the end of the levee (near Section 900) from the attack of flow spilling into the overbank area, piling would be driven the last 100 feet of levee as indicated in Plate 8. The plan and profiles for the Belen Unit - West are shown on Plates B-25, B-26, B-27, B-28, B-29, and B-30.

Mitigation. Mitigation measures would be required to offset the adverse impacts to recreation and fish and wildlife created by construction activities, the temporary loss of 150 acres of habitat due to borrow pits and haul roads, and the permanent loss of 105 acres due to levee enlargement. The basic features of the mitigation plan would be intensive management of the riparian woodland within the project area and acquisition in fee or easement and management of 200 acres of additional deciduous woodland. Also this plan would create 75 acres of wetlands from borrow areas required for levee construction as previously described for Plan B and discussed in detail there and in Section B of this Appendix.

SECTION B

DESIGN & COSTS

This section discusses the design parameters used in the design of Plans A, B, and C and developes the cost estimates necessary for economic evaluation.

DESIGN PARAMETERS

Levees. The levees would be rehabilitated by reworking the existing levee and placing borrow onto the reworked levee as shown in the typical levee sections on Plate B-5. The levee alignment would not be changed. The crown width would be 12 feet and the side slopes 1 on 2.5. Three feet of freeboard would be provided. A positive drainage system (toe drains) would be located (where not existing now) along the landside toe of the levee to intercept seepage and relieve hydrostatic pressure to prevent sloughing at the levee toe. The fill would have two zones of materials as shown in Plate B-5. The major portion of the levee would be a zone of random or more impervious materials obtained largely from the existing levee and from borrow areas on the riverside of the levee. The landside of the levee would be a zone of pervious material obtained from the river channel to aid in proper operation of the toe drain. Levee fill volumes were estimated from levee profiles and cross sections ascertained in the levee evaluation portion of problem identification.

Toe Drains. Toe drains would consist of perforated pipe embedded in graded filter in a trench along the toe of the levee as the typical section of toe drain shows on Plate B-5. The trench would be excavated to a sufficient depth to penetrate the underlying pervious stratum which varies in depth from 0 to 12 feet below the ground surface throughout most of the valley. Outfall drains spaced at intervals of 200 feet and extending from the collector pipe along the toe of the levee to existing riverside drains would conduct intercepted drainage into the drains.

Levee Protection Works. Levee protection works in the form of flexible type (Kellner) jetties, as shown in Plate B-5, would be installed where required to deflect the channel current away from the levees. Jetty fields already exist in many locations throughout the study reach. New jetty fields would be located as shown on the plates depicting Plans A, B, and C, where the sinuosity of the stream would normally direct channel current during flood stage into levees now having either no jetty fields or widely spaced fields.

Overlap Levees. Existing overlap levees would be improved and new ones constructed at several riverside drain outlets in order to prevent creation of internal drainage problems. Overlap levees would provide very reliable protection because they do not rely on mechanical devices. Typical overlap levee sections are shown on Plate B-4.

Backflow Prevention Structures. Backflow prevention structures would be used mainly on irrigation wasteways and on some riverside drains. Each new structure would be reinforced concrete rectangular conduits with flap valves on the riverside and geared sluice gates on the landside. The head loss through the flap valves would not be greater than 0.5 foot. The dimensions and general features of the

backflow prevention structures would be patterned after the structures designed for wasteways in the Albuquerque Unit. Plates B-5, B-8, and B-16 provide details of these structures.

Excessive Inflow Prevention Structures. These structures would be constructed wherever flow must normally pass through the levee from the river to the landside, such as irrigation intakes. Several alternative methods for controlling excessive inflow exist. One would be to design the structure so as to limit its capacity. This approach would be difficult to design without affecting its normal operating capacities. The alternative approach recommended in this report is that of structures using electrically operated and automatically controlled sluice gates. The control would be a device which senses the level of water on the riverside and would signal the sluice gates to close. The sensing mechanism could be overridden by manual operation.

These structures would be reinforced concrete rectangular conduits. The reliability of these structures would depend heavily on regular maintenance and operation checks. These devices are vulnerable from two aspects. They depend upon electric power which could fail under severe weather conditions causing floods and water level sensing device which could malfunction. In spite of these drawbacks, the recommended approach can work and provides more reliable and effective protection than exists now. Plates B-8 and B-16 show the structures proposed for Plans A and B.

Borrow Areas for Levee Fill. Availability of borrow sites along the levees was based on a cursory review of 1972 aerial photos. General areas where sites could possibly be located are shown on Plates B-1, B-3, B-6, B-10, B-12, and B-24. These areas lie mainly on sparsely vegetated land between the edge of the river channel and the levee. Borrow pits would go no deeper than the

water table, which was assumed to be 3 to 4 feet below ground surface, except those to be proposed for wetland development. No borrow areas will be located within 100 feet of the reconstructed levee. Approximately 25 percent of the levee fill would come from the river channel except in the Albuquerque Unit. The remainder of the fill would come from the existing levee and borrow pits. The additional material for the Albuquerque Unit to provide SPF protection would all be random fill from borrow pits. Based on the above assumptions, sufficient borrow appears available along the levees which would result in an average haul distance of 3,000 feet or less. The suitability of these sites will be carefully examined in final design.

COST ESTIMATES

Unit Costs. Unit costs for major items were based on unit costs from recent bids on similar type projects in the Southwest United States as recorded by Engineering News Records, manufacturer price quotations, and Dodge Guide for Estimating Public Works Construction Costs. Costs from Dodge Guide were adjusted to reflect the difference in labor and material costs in the Albuquerque area from the national average. Unit costs for minor items for which no bid costs or Dodge Guide Data were available were estimated from Means Building Construction Cost Data.

Built-Up Unit Costs. Unit costs of toe drains and levee embankment fill are built-up. Rather than show all the quantities of the numerous cost items of the toe drain and levee fill, a single unit cost was developed for each to account for the various items and their quantities. The unit cost for embankment fill except in the Albuquerque Unit assumes that approximately 25 percent of the

new levee cross section would be pervious material obtained by dragline from the river channel. The remaining 75 percent would be random material obtained from the existing levee and riverbank borrow areas. Material from the existing levee was assumed to provide about 50 percent of the random fill. The existing levee would be removed (except in the Albuquerque Unit) and the material reworked on the riverside of the new cross section, allowing the pervious material to be placed over the toe drain along the landside of the levee. Under Plans A and B the levees in the Albuquerque Unit would be left in place and new random fill placed on the riverside to increase the levee height. The unit cost for embankment fill in all units except the Albuquerque Unit includes the costs of excavation by dragline, excavation by scraper, hauling by scrapers, placing and shaping by scrapers, and compaction. The embankment fill unit cost for the Albuquerque Unit includes all items mentioned above except for the dragline excavation costs.

Levee fill obtained from borrow pits to be made into wetlands would require excavation by dragline below the water table, and this material would cost $0.50 per cubic yard more than that obtained in a scraper operation.

The unit cost of toe drains was built-up by estimating the cost of an 800-foot length of toe drain in place and dividing by the length. The built-up cost of toe drain includes the cost and placement of the pipe and graded filter, the excavation, and the backfill.

Lump Sum Costs. Some items such as hydraulic control structures are listed as lump sum costs to simplify the cost estimate. Estimates of quantities of various materials applied with unit costs

were made for most such lump sum items. In light of the degree of accuracy possible and necessary at this stage of planning, these lump sum prices were considered appropriate.

Contingencies. The contingency factor for all features of this study was 15 percent.

Federal Costs Other Than Direct Construction. Percentages used for engineering and design, supervision and inspection of construction, and District overhead were based upon actual percentages for the same items incurred by the Corps of Engineers in past levee construction.

Non-Federal Costs. Non-Federal costs include the costs of lands, easements, rights-of-way, and relocations other than railroad bridges and approaches thereto, which would be required for flood control. However, the cost of these items necessary for the wetland preservation included in Plans B and C would be shared with the Federal Government.

Operation and Maintenance. Operation and maintenance of the project would be the responsibility of local interests. Operation would be limited to flood occurrences where sluice gates on backflow preventers would need to be closed and later opened. The Middle Rio Grande Conservancy District operates the present levee system along the Rio Grande.

Maintenance would consist mainly of periodic inspection of levees, periodic lubrication, test operation, and repair of sluice gates, restoration and replacement of levee earth slopes and protection stone after floods, freeing up flap valves after floods, periodic replacement of jack fields, and periodic cleanout and repair of toe drains. These activities are performed by the Middle Rio Grande

Conservancy District for the existing levees in the area along the Rio Grande. In addition, Plan B and Plan C include costs for managing and maintaining the manmade marshes.

Mitigation Costs. Mitigation costs for either Plan A or Plan B would include the acquisition in fee or easement of 500 and 250 acres, respectively, of riparian woodland, as well as management of the project area for fish and wildlife. Because of its lesser impact, mitigation costs for Plan C would include acquisition of 200 acres of additional lands and management of project lands for fish and wildlife, estimated at $24,000 annually. Mitigation costs would be shared by Federal and non-Federal interests in the same proportion as the remainder of the project.

Real Estate Requirements. Additional land requirements for increasing the levee widths would not exceed the existing right-of-way currently dedicated for flood control purposes and, therefore, are not shown as a project economic cost. The real estate shown in the following cost estimate; 104 acres for Plan A, 114 acres for Plan B, and 50 acres for Plan C, are required to extend overlap levees and to construct tieback levees where required. Plan A and B require the acquisition of 3 residences in order to extend the overlap levee in the Albuquerque Unit - East. Relocations assistance payments are included in the cost estimate. Estimates of costs for right-of-way are based upon a gross real estate appraisal.

Period of Construction. Each levee unit was considered as a project in itself. Based on the construction times for the Albuquerque Unit phases, it was assumed that individual units discussed in this report would be constructed and provide benefits in less than two years.

Annual Costs. Annual charges on the investment cost were computed by applying the 6-7/8 percent interest rate and amortizing the

cost over 100 years. To the interest and amortization, estimated annual operation and maintenance charges were added to obtain the total estimated annual cost.

Plan A. Tables B-1 through B-7 give the detailed cost estimates for each unit within the study for which a structural solution is proposed under Plan A. Fish and wildlife mitigation costs for Plan A are detailed in Table B-8 and included in Table B-9. Table B-8 then summarizes the first cost and annual charges for each of the units and gives a total estimate for Plan A.

Plan B. Quantities for all units are the same for this plan as for Plan A, except the Belen Unit - West, which has been modified to preserve the existing wetland at the upstream end of the unit. The costs of these modifications, as described in Section A, are charged to the Belen Unit - West, since they are required by deletion of the upper portion of this unit. Authority for this change is Executive Order 11990, Preservation of Wetlands. The elimination of the levee and appurtenances through the wetland and the addition of the required tiebacks and railroad raise result in a net decrease of $22,000 for the Belen Unit - West and a net increase of $685,000 for Isleta Unit-West. The revised cost estimates for the Belen Unit-West and Isleta Unit-West are given in Tables B-10 and B-10A.

Another feature of Plan B would be the creation of wetlands from some of the borrow pits located within the bosque. Under this proviso, approximately 125 acres of marsh-type environment could be established within the study reach. Table B-11 gives the total cost of converting borrow areas into wetlands, which includes the additional cost of levee fill obtained from these wetlands due to underwater excavation and to shaping and grading requirements, and the purchase of water rights to replace that lost by evaporation.

Creation of the wetlands and preservation of Isleta Marsh would reduce the amount of mitigation lands required from 500 acres to

TABLE B-1

Detailed Cost Estimate of Plan A
Corrales Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 191,000
	Embankment fill	737,000	CY	1.50	1,087,000
	Gravel-levee crown	14,800	CY	5.65	84,000
	Toe drains (pipe)	57,430	LF	14.10	809,000
	Bank protection (jacks)	1,540	Each	225.00	346,000
	Overlap Levee (near Section 419R) I-1	1	Job	LS	332,000
	Overlap levee (near Section 452R) I-2	1	Job	LS	38,000
	Contingencies 15%				433,000
	Total Levees				$3,320,000
30	ENGINEERING AND DESIGN				$ 432,000
31	SUPERVISION AND INSPECTION				$ 299,000
	TOTAL FEDERAL COST				$4,051,000

TABLE B-1

Detailed Cost Estimate of Plan A
Corrales Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST				
01	LANDS AND DAMAGES				
	Fee purchase, crop land (R/N)	26	Acre	20,000	$ 520,000
	Contingencies 25%				130,000
	Total Lands and Damages				$ 650,000
	TOTAL NONFEDERAL COST				$ 650,000
	TOTAL PROJECT COST				$4,701,000

TABLE B-1

Detailed Cost Estimate of Plan A
Corrales Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$4,051,000
	Interest during construction (less than 2 years)				None
					$4,051,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 650,000
	Interest during construction (less than 2 years)				0
					$ 650,000
	TOTAL INVESTMENT				4,701,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 278,500
	Amortization (6-7/8% for 100 years)				500
	Total Federal Annual Cost				$ 279,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 44,680
	Amortization (6-7/8% for 100 years)				20
	Operation and maintenance				9,300
	Total Nonfederal Annual Cost				$ 54,000
	TOTAL ANNUAL CHARGES				$ 333,000

TABLE B-2

Detailed Cost Estimate of Plan A
Albuquerque Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 53,000
	Embankment fill	298,000	CY	1.40	418,000
	Gravel - levee crown	19,800	CY	5.65	112,000
	Modification to existing outlet structure (near Section 431L) I-3	1	Job	LS	76,000
	Raising existing over-lap levee (near Section 502L) I-4	1	Job	LS	197,000
	Modification to existing sewage treatment plant outfall (near Section 534L) U1	1	Job	LS	41,000
	Modification to existing sewage treatment plant outfall (near Section 534L) U2	1	Job	LS	41,000
	Modification to existing sewage treatment plant outfall (near Section 568L) U3	1	Job	LS	41,000
	Contingencies 15%				153,000
	Total Levees				$1,173,000

TABLE B-2

Detailed Cost Estimate of Plan A
Albuquerque Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	FEDERAL COST (Cont'd)				
30	ENGINEERING AND DESIGN				$ 165,000
31	SUPERVISION AND INSPECTION				$ 106,000
	TOTAL FEDERAL COST				$ 1,444,000
	NONFEDERAL COST				
01	LANDS AND DAMAGES				
	Fee purchase, crop-land (R/W)	13	Acre	20,000	$ 260,000
	Residences	3	Each	20,000	60,000
	Relocations assistance	3	Each	15,500	46,500
	Contingencies 25%				91,500
	TOTAL LANDS AND DAMAGES				$ 458,000
02	RELOCATIONS				
.1	Roads				
	U.S. 66 Bridge H4				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - east end	12,000	CY	1.40	17,000

TABLE B-2

Detailed Cost Estimate of Plan A
Albuquerque Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost		Total Cost
	NONFEDERAL COST (Cont'd)					
	Pavement - east end	8,000	SY	$19.20	$	154,000
	Modification to drainage structure under roadway east end	1	Job	LS		17,000
	Subtotal U.S. 66 Bridge				$	216,000
	U.S. 85 Bridge H5					
	Care of traffic	1	Job	LS	$	28,000
	Embankment fill - east end	8,000	CY	1.40		11,000
	Pavement - east end	3,590	SY	19.20		69,000
	Modification to drainage structure under roadway east end	1	Job	LS		86,000
	Subtotal U.S. 85 Bridge				$	194,000
	Contingencies 15%					62,000
	Subtotal Roads				$	472,000
.2	Bridges					
	Raising bridges					
	U.S. 66 (East 1/2) H4	39,000	SF	22.50	$	878,000
	U.S. 85 (East 1/2) H5	48,850	SF	22.50		1,099,000
	Contingencies 15%					297,000
	Subtotal - Bridges				$	2,274,000
	TOTAL - RELOCATIONS				$	2,746,000

TABLE B-2

Detailed Cost Estimate of Plan A
Albuquerque Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COSTS (Cont'd)				
30	ENGINEERING AND DESIGN				$ 344,000
31	SUPERVISION AND INSPECTION				$ 247,000
	TOTAL NONFEDERAL COST				$ 3,795,000
	TOTAL PROJECT COST				$ 5,239,000
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$ 1,444,000
	Interest during construction (less than 2 years)				None
					$ 1,444,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 3,795,000
	Interest during construction (less than 2 years)				None
					$ 3,795,000
	TOTAL INVESTMENT				$ 5,239,000

TABLE B-2

Detailed Cost Estimate of Plan A
Albuquerque Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 98,900
	Amortization (6-7/8% for 100 years)				100
	Total Federal Annual Cost				$ 99,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 260,900
	Amortization (6-7/8% for 100 years)				100
	Operation and maintenance (in addition to existing)				None
	Total nonfederal annual cost				261,000
	TOTAL ANNUAL CHARGES				$ 360,000

TABLE B-3

Detailed Cost Estimate of Plan A
Albuquerque Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 37,000
	Embankment fill	347,000	CY	$ 1.40	486,000
	Gravel - levee crown	14,800	CY	5.65	84,000
	Toe drains (pipe)	15,980	LF	14.10	225,000
	Bank protection - jacks	1,270	Each	225.00	286,000
	Excessive inflow prevention structure - Type D (Near Section 502R) I5	1	Job	LS	158,000
	Modification to existing outlet structure (Near Section 516R) I6	1	Job	LS	28,000
	Modification to existing outlet structure (Near Section 563R) I7	1	Job	LS	36,000
	Contingencies 15%				201,000
	Total - Levee				$1,541,000
30	ENGINEERING AND DESIGN				$ 216,000
31	SUPERVISION AND INSPECTION				$ 146,000
	TOTAL FEDERAL COST				$1,903,000

TABLE B-3

Detailed Cost Estimate of Plan A
Albuquerque Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST				
01	LANDS AND DAMAGES				
	Fee purchase, cropland (Hwy Borrow)	6	Acre	$20,000	$ 120,000
	Contingencies 25%				30,000
	TOTAL LANDS AND DAMAGES				$ 150,000
02	RELOCATIONS				
1	ROADS				
	U. S. 66 Bridge H4				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill-west end	7,000	CY	$ 1.40	10,000
	Pavement-west end	3,530	SY	19.20	68,000
	Modification to drainage structure under roadway-west end	1	Job	LS	22,000
	Subtotal - U. S. 66 Bridge				128,000

TABLE B-3

Detailed Cost Estimate of Plan A
Albuquerque Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST (cont'd)				
	U. S. 85 Bridge H5				
	Care of Traffic	1	Job	LS	$ 28,000
	Embankment fill-west end	7,000	CY	$ 1.40	10,000
	Pavement-west end	3,120	SY	19.20	60,000
	Modification to drainage structure under roadway-west end	1	Job	LS	3,000
	Subtotal - U. S. 85 Bridge				$ 101,000
	Contingencies 15%				34,000
	Subtotal - Roads				$ 263,000
.2	BRIDGES				
	Raising Bridges				
	U. S. 66 (West 1/2) H4	39,000	SF	22.50	$ 878,000
	U. S. 85 (West 1/2) H5	48,850	SF	22.50	1,099,000
	Contingencies 15%				297,000
	Subtotal - Bridges				$2,274,000
	TOTAL - RELOCATIONS				$2,537,000

TABLE B-3

Detailed Cost Estimate of Plan A
Albuquerque Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST (cont'd)				
30	ENGINEERING AND DESIGN				$ 330,000
31	SUPERVISION AND INSPECTION				$ 228,000
	TOTAL NONFEDERAL COST				$3,245,000
	TOTAL PROJECT COST				$5,148,000
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$1,903,000
	Interest during construction (less than 2 years)				None
					$1,903,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$3,245,000
	Interest during construction (less than 2 years)				None
					$3,245,000
	TOTAL INVESTMENT				$5,148,000

TABLE B-3

Detailed Cost Estimate of Plan A
Albuquerque Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 130,830
	Amortization (6-7/8% for 100 years)				170
	Total Federal Annual Cost				$ 131,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 222,700
	Amortization (6-7/8% for 100 years)				300
	Operation and Maintenance (in addition to existing)				None
	Total Nonfederal Annual Cost				$ 223,000
	TOTAL ANNUAL CHARGES				$ 354,000

TABLE B-4

Detailed Cost Estimate of Plan A
Mountainview Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEE				
	Clearing and grubbing	1	Job	LS	$ 64,000
	Embankment fill	356,000	CY	1.50	534,000
	Gravel - levee crown	5,600	CY	5.65	32,000
	Toe drains (pipe)	23,056	LF	14.10	325,000
	Slope protection - piling	1	Job	LS	85,000
	Bank protection - jacks	1,615	Each	225.00	363,000
	Backflow prevention structure, Type A (near Section 623L) I9	1	Job	LS	170,000
	Contingencies 15%				236,000
	Total Levees				$ 1,809,000
30	ENGINEERING AND DESIGN				253,000
31	SUPERVISION AND INSPECTION				162,000
	TOTAL FEDERAL COST				$ 2,224,000
	TOTAL PROJECT COST				$ 2,224,000

TABLE B-4

Detailed Cost Estimate of Plan A
Mountainview Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL				
	Federal first cost				$ 2,224,000
	Interest during construction (less than 2 years)				None
					$ 2,224,000
	NONFEDERAL				
	Nonfederal first cost				$ 0
	Interest during construction				None
	TOTAL INVESTMENT				$ 2,224,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 152,900
	Amortization (6-7/8% for 100 years)				100
	Total Federal Annual Cost				$ 153,000
	NONFEDERAL ANNUAL CHARGES				
	Operation and Maintenance				4,000
	Total Nonfederal Annual Cost				$ 4,000
	TOTAL ANNUAL CHARGES				$ 157,000

TABLE B-5

Detailed Cost Estimate of Plan A
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEE				
	Clearing and grubbing	1	Job	LS	$ 41,000
	Embankment fill	403,000	CY	1.50	706,000
	Gravel - levee crown	4,000	CY	5.65	32,000
	Toe drain (pipe)	25,500	LF	14.10	359,000
	Bank protection - jacks	1,075	Each	225.00	242,000
	Backflow prevention structure, Type C (near Section 620R on overlap) I8	1	Job	LS	85,000
	Backflow prevention structure, Type C (near Section 632R on overlap) I10	1	Job	LS	85,000
	Overlap levee (near Section 637R) I11	1	Job	LS	278,000
	Excessive Inflow Prevention Structure, Type E (Section 670R) I13	1	Job	LS	268,000
	Contingencies 15%				314,000
	Total Levees				$ 2,410,000
30	ENGINEERING AND DESIGN				329,000
31	SUPERVISION AND INSPECTION				213,000
	TOTAL FEDERAL COST				$ 2,952,000

TABLE B-5

Detailed Cost Estimate of Plan A
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost		Total Cost
	NONFEDERAL COST					
01	LANDS AND DAMAGES					
	Fee land, cropland (R/W)	35	Acre	5,000	$	165,000
	Contingencies 15%					25,000
	Acquisition cost					40,000
	TOTAL LANDS AND DAMAGES				$	230,000
02	RELOCATIONS					
.1	Roads					
	S.R. 47 bridge - west approach H8					
	Care of traffic	1	Job	LS	$	28,000
	Embankment fill - west end	2,400	CY	1.40		3,000
	Pavement - west end	824	SY	19.20		16,000
	Contingencies 15% ±					7,000
	TOTAL - RELOCATIONS				$	54,000
30	ENGINEERING AND DESIGN				$	10,000
31	SUPERVISION AND INSPECTION				$	7,000
	TOTAL NONFEDERAL COST				$	301,000
	TOTAL PROJECT COST				$	3,253,000

TABLE B-5

Detailed Cost Estimate of Plan A
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$ 2,952,000
	Interest during construction (less than 2 years)				None
					$ 2,952,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 301,000
	Interest during construction (less than 2 years)				None
					$ 301,000
	TOTAL INVESTMENT				$ 3,253,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 203,730
	Amortization (6-7/8% for 100 years)				270
	Total Federal Annual Cost				$ 204,000

TABLE B-5

Detailed Cost Estimate of Plan A
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES (Cont'd)				
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 20,700
	Amortization (6-7/8% for 100 years)				50
	Operation and Maintenance				2,250
	Total Nonfederal Annual Cost				$ 23,000
	TOTAL ANNUAL CHARGES				$ 227,000

TABLE B-6

Detailed Cost Estimate of Plan A
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 181,000
	Embankment fill	2,147,000	CY$	1.50	3,220,000
	Gravel - levee crown	25,600	CY	5.65	145,000
	Toe drains (pipe)	116,740	LF	14.10	1,645,000
	Slope protection - piling	1	Job	LS	85,000
	Bank protection - jacks	15,630	Each	225.00	3,517,000
	Excessive inflow prevention structure - Type D (near Section 651L) I 12	1	Job	LS	158,000
	Excessive inflow prevention structure - Type E (near Section 656L) I 14	1	Job	LS	268,000
	Overlap levee (near Section 739L) I 18				332,000
	Backflow prevention structure, Type B (near Section 829L) I 20				113,000
	Overlap levee (near Section 877L) I 21				52,000
	Contingencies 15%				1,457,000
	Total Levees				11,173,000
30	ENGINEERING AND DESIGN				1,229,000
31	SUPERVISION AND INSPECTION				894 000
	TOTAL FEDERAL COST				$13,296,000

TABLE B-6

Detailed Cost Estimate of Plan A
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST				
01	LANDS AND DAMAGES				
	Fee purchase, cropland (R/W)	24	Acre	$15,000	$ 360,000
	Contingencies 25% ±				90,000
	TOTAL - LANDS AND DAMAGES				$ 450,000
02	RELOCATIONS				
	Roads				
	SR 47 bridge - east approach H10				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - east end	12,000	CY	$ 1.40	17,000
	Pavement - east end	2,118	SY	19.20	41,000
	Modification to drainage structure under roadway east end	1	Job	LS	21,000
	Subtotal SR 47				$ 107,000

TABLE B-6

Detailed Cost Estimate of Plan A
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST (Cont'd)				
	SR 49 bridge - east approach				
	H12				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - east end	9,000	CY	$1.40	13,000
	Pavement - east end	2,235	SY	19.20	43,000
	Modification to drainage structure under roadway east end	1	Job	LS	18,000
	Subtotal SR 49				$ 102,000
	Contingencies 15%				31,000
	TOTAL - RELOCATIONS				$ 240,000
30	ENGINEERING AND DESIGN				$ 41,000
31	SUPERVISION AND INSPECTION				$ 26,000
	TOTAL NONFEDERAL COST				$ 757,000
	TOTAL PROJECT COST				$ 14,053,000
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$ 13, 296,000
	Interest during construction (less than 2 years)				None
					$ 13, 296,000

TABLE B-6

Detailed Cost Estimate of Plan A
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT (Cont'd)				
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 757,000
	Interest during construction (less than 2 years)				None
					$ 757,000
	TOTAL INVESTMENT				$14,053,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 914,100
	Amortization (6-7/8% for 100 years)				$ 1,900
	Total Federal Annual Cost				$ 916,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 52,030
	Amortization (6-7/8% for 100 years)				70
	Operation and Maintenance				43,900
	Total Nonfederal Annual Cost				$ 96,000
	TOTAL ANNUAL CHARGES				$ 1,012,000

TABLE B-7

Detailed Cost Estimate of Plan A
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 165,000
	Embankment fill	2,244,000	CY	1.50	3,366,000
	Gravel - levee crown	25,600	CY	5.65	145,000
	Toe drains (pipe)	115,760	LF	14.10	1,632,000
	Slope protection - piling	1	Job	LS	85,000
	Bank protection - jacks	12,630	Each	$200.00	2,842,000
	Backflow prevention structure, Type C (near Section 682R) I16	1	Job	LS	85,000
	Backflow prevention structure, Type B (near Section 699R) I17	1	Job	LS	113,000
	Modification to existing sewage treatment plant outfall (near Section 748R) U4	1	Job	LS	41,000
	Backflow prevention structure, Type C (near Section 783R) I19	1	Job	LS	85,000
	Backflow prevention structure, Type B (near Section 879R) I22	1	Job	LS	113,000
	Contingencies 15%				1,301,000
	Total Levees				9,973,000

TABLE B-7

Detailed Cost Estimate of Plan A
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost		Total Cost
	FEDERAL COST (CON'T)					
30	ENGINEERING AND DESIGN					$ 1,097,000
31	SUPERVISION AND INSPECTION					798,000
	TOTAL FEDERAL COST					11,868,000
	NONFEDERAL COST					
02	RELOCATION					
	ROADS					
	SR 49 bridge - west approach H13					
	Care of traffic	1	Job	LS	$	28,000
	Embankment fill - west end	4,000	CY	1.40		6,000
	Pavement - west end	1,235	SY	19.20		24,000
	Modification to drainage structure under roadway - west end	1	Job	LS		12,000
	Subtotal SR 49				$	70,000

TABLE B-7

Detailed Cost Estimate of Plan A
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST (CON'T)				
	SR 6 bridge - west approach H15				
	Care of traffic	1	Job	LS	$ 34,000
	Embankment fill - west end	11,000	CY	1.40	15,000
	Pavement - west end	2,118	SY	19.20	41,000
	Modification to drainage structure under roadway - west end	1	Job	LS	19,000
	Subtotal SR 6				$ 109,000
	Contingencies 15%				27,000
	TOTAL - RELOCATIONS				$ 206,000
30	ENGINEERING AND DESIGN				$ 25,000
31	SUPERVISION AND INSPECTION				$ 23,000
	TOTAL NONFEDERAL COST				$ 254,000
	TOTAL PROJECT COST				$12,122,000
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$11,868,000
	Interest during construction (less than 2 years)				None
					$11,868,000

TABLE B-7

Detailed Cost Estimate of Plan A
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT (CON'T)				
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 254,000
	Interest during construction (less than 2 years)				None
					$ 254,000
	TOTAL INVESTMENT				$12,122,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 815,030
	Amortization (6-7/8% for 100 years)				970
	Total Federal Annual Cost				$ 816,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 17,460
	Amortization (6-7/8% for 100 years)				50
	Operation and Maintenance				45,490
	Total Nonfederal Annual Cost				$ 63,000
	TOTAL ANNUAL CHARGES				$ 879,000

TABLE B-8

Detailed Cost Estimate of Plan A
Mitigation Costs

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
INVESTMENT				
LANDS AND DAMAGES				
Fee **Purchase**	500	ACRE	$ 5,500	$2,750,000
Contingencies 25%				688,000
TOTAL - LANDS AND DAMAGES				$ 3,438,000
ANNUAL CHARGES				
Interest (6-7/8%)				236,360
Amortization (6-7/8 % for 100 years)				310
Management of project lands for fish and wildlife				24,330
TOTAL - ANNUAL CHARGES				$ 261,000

Table B-9
Plan A
Summary of First Costs and Annual Costs by Levee Unit

(Based on 10-78 Price Levels)

Units	First Costs			Annual Costs		
	Federal	Nonfederal	Total	Federal	Nonfederal	Total
Bernalillo	0	0	0	0	0	0
Corrales	4,051,000	650,000	4,701,000	279,000	54,000	333,000
Albuquerque-East	1,444,000	3,795,000	5,239,000	99,000	261,000	360,000
Albuquerque-West	1,903,000	3,245,000	5,148,000	131,000	223,000	354,000
Mountainview	2,224,000	0	2,224,000	153,000	4,000	157,000
Isleta-East	0	0	0	0	0	0
Isleta-West	2,952,000	301,000	3,253,000	204,000	23,000	227,000
Belen-East	13,296,000	757,000	14,053,000	916,000	96,000	1,012,000
Belen-West	11,868,000	254,000	12,122,000	816,000	63,000	879,000
Total Levee Rehabilitation	37,738,000	9,002,000	46,740,000	2,598,000	724,000	3,322,000
Mitigation	2,776,000	662,000	3,438,000	204,000	57,000	261,000
TOTAL - PLAN A	40,514,000	9,664,000	50,178,000	2,802,000	781,000	3,583,000

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TABLE B-10

Detailed Cost Estimate of Plan B
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	FEDERAL COST				
11	LEVEE				
	Clearing and grubbing	1	Job	LS	$ 44,000
	Embankment fill	412,100	CY	1.50	720,000
	Gravel - levee crown	4,500	CY	5.65	35,000
	Toe drain (pipe)	27,500	LF	14.10	387,000
	Bank Protection - jacks	1,075	Each	225.00	242,000
	Backflow prevention structure, Type C (near Section 620R on overlap) I8	1	Job	LS	85,000
	Backflow prevention structure, Type C (near Section 632R on overlap) I10	1	Job	LS	85,000
	Overlap levee (near Section 637R)I11	1	Job	LS	278,000
	Backflow prevention structure Type B (near Section 670R) on tieback levee	1	Job	LS	113,000
	Backflow prevention structure Type B (near Section 670R) on tieback levee	1	Job	LS	113,000
	Overlap levee (near Section 672R)	1	Job	LS	130,000
	Excessive inflow prevention structure Type E (near Section 656R) I13	1	Job	LS	268,000
	Contingencies 15%				375,000
	Total Levees				$2,875,000
30	ENGINEERING AND DESIGN				403,000
31	SUPERVISION AND INSPECTION				259,000
	TOTAL FEDERAL COST				$3,537,000

TABLE B-10

Detailed Cost Estimate of Plan B
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		NONFEDERAL COST			
01	LANDS AND DAMAGES				
	Fee land, cropland (R/W)	47	Acre	5,000	$ 225,000
	Contingencies 15%				34,000
	Acquisition cost				71,000
	TOTAL LANDS AND DAMAGES				$ 330,000
02	RELOCATIONS				
.1	Roads				
	S.R. 47 bridge - west approach H8				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - west end	2,400	CY	1.40	3,000
	Pavement - west end	824	SY	19.20	16,000
	Contingencies 15% ±				7,000
	TOTAL - RELOCATIONS				$ 54,000
30	ENGINEERING AND DESIGN				10,000
31	SUPERVISION AND INSPECTION				7,000
	TOTAL NONDEDERAL COST				$ 401,000
	TOTAL PROJECT COST				$3,938,000

TABLE B-10

Detailed Cost Estimate of Plan B
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$ 3,537,000
	Interest during construction (less than 2 years)				None
					$ 3,537,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 401,000
	Interest during construction (less than 2 years)				None
					$ 401,000
	TOTAL INVESTMENT				$ 3,938,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 242,670
	Amortization (6-7/8% for 100 years)				$ 330
	Total Federal Annual Cost				$ 243,000

TABLE B-10

Detailed Cost Estimate of Plan B
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES (Cont'd)				
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 27,570
	Amortization (6-7/8% for 100 years)				30
	Operation and Maintenance				3,400
	Total Nonfederal Annual Cost				$ 31,000
	TOTAL ANNUAL CHARGES				$ 274,000

TABLE B-10 A
Detailed Cost Estimate of Plan B
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	FEDERAL COST				
11	Levees				
	Clearing and grubbing	1	Job	LS	$ 165,000
	Embankment fill	2,087,000	CY	1.50	3,130,000
	Gravel - levee crown	23,100	CY	5.65	131,000
	Toe drains (pipe)	104,260	LF	14.10	1,470,000
	Slope protection - piling	1	Job	LS	85,000
	Blank protection - jacks	12,630	Each	225.00	2,842,000
	Backflow prevention structure, Type B (near Section 699R) I17	1	Job	LS	113,000
	Modification to existing sewage treatment plant outfall (near Section 748R) U4	1	Job	LS	41,000
	Backflow prevention structure, Type B (near Section 879R) I22	1	Job	LS	113,000
	Subtotal				$8,090,000
	Contingencies 15%				1,214,000
	Total Levees				9,304,000

TABLE B-10A Cont.
Belen Unit - West

Cost Account Number	Item -	Estimated Quantity	Unit	Unit Cost	Total Cost
30	ENGINEERING AND DESIGN				$ 1,023,000
31	SUPERVISION AND INSPECTION				752,000
	TOTAL FEDERAL COST				$11,079,000

NONFEDERAL COST

02	RAILROADS				
	Railroad Raise	1	Job	LS	98,000
	Contingencies ±15%				15,000
	Total Railroads				$ 113,000
	ROADS				
	SR 49 bridge - west approach H13				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - west end	4,000	CY	1.40	6,000
	Pavement - west end	1,235	SY	19.20	24,000
	Modification to drainage structure under roadway - west end	1	Job	LS	12,000
	Subtotal				$ 70,000

TABLE B-10A Cont.
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	SR 6 bridge - west approach H15				
	Care of traffic	1	Job	LS	34,000
	Embankment fill - west end	11,000	CY	1.40	15,000
	Pavement - west end	2,118	SY	19.20	41,000
	Modification to drainage structure under roadway - west end	1	Job	LS	19,000
	Subtotal SR 6				$ 109,000
	Contingencies 15%				27,000
	Total Roads				206,000
	TOTAL - RELOCATIONS				$ 319,000
30	ENGINEERING AND DESIGN				$ 38,000
31	SUPERVISION AND INSPECTION				$ 35,000
	TOTAL NONFEDERAL COST				$ 392,000
	TOTAL PROJECT COST				$11,471,000

INVESTMENT

FEDERAL INVESTMENT	
Federal first cost	$11,079,000
Interest during construction (less than 2 years)	None
	$11,079,000
NONFEDERAL INVESTMENT	
Nonfederal first cost	$ 392,000
Interest during construction (less than 2 years)	None
	$ 392,000
TOTAL INVESTMENT	$11,471,000

TABLE B-10A Cont.
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 762,000
	Amortization (6-7/8% for 100 years)				1,000
	Total Federal Annual Cost				$ 763,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 26,950
	Amortization (6-7/8% for 100 years)				40
	Operation and Maintenance				$ 44,010
	Total Nonfederal Annual Cost				$ 71,000
	TOTAL ANNUAL CHARGES				$ 834,000

TABLE B-11
Detailed Cost Estimate for Creation
of Wetlands - Plan B

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		INVESTMENT		
Additional cost of levee fill from wetlands excavation	875,000	CY	0.50	438,000
Contingencies 15%				66,000
Subtotal				$ 504,000
ENGINEERING AND DESIGN				$ 66,000
SUPERVISION AND ADMINISTRATION				$ 45,000
Subtotal				$ 615,000
Water rights	500	Acre-feet	300.00	150,000
Contingencies 15%				22,000
Acquisition				38,000
Subtotal				$ 210,000
TOTAL INVESTMENT				$ 825,000

TABLE B-11 (Cont.)

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
ANNUAL CHARGES				
Interest (6-7/8%)				56,720
Amortization (6-7/8% for 100 years)				70
Operation and Maintenance				20,210
TOTAL ANNUAL CHARGES				$77,000

250 acres. Table B-12 displays the first cost and annual charges for providing the mitigation of acquiring additional riparian woodland and managing the project area for fish and wildlife.

Table B-13 summarizes first cost, annual charges, fish and wildlife mitigation costs and gives a total estimate for Plan B.

Plan C. Tables B-14 through B-18 detail the first costs and annual charges for each of the units to provide a floodway capacity of 42,000 c.f.s. Table B-19 presents the cost of providing 75 acres of wetlands in under this plan, while Table B-20 summarizes the total cost of Plan C.

TABLE B-12
Detailed Cost Estimate of Plan B
Mitigation Costs

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
INVESTMENT				
LANDS AND DAMAGES				
Fee purchase	250	Acre	5,500	1,375,000
Contigencies 25%				344,000
TOTAL - LANDS AND DAMAGES				$1,719,000
ANNUAL CHARGES				
Interest (6-7/8%)				118,180
Amortization (6-7/8% for 100 years)				150
Management of project lands for fish and wildlife				24,670
TOTAL ANNUAL CHARGES				$ 143,000

TABLE B-13
PLAN B
Summary of First Costs and Annual Costs by Levee Unit

(Based on 10-78 Price Levels)

Units	First Costs			Annual Costs		
	Federal	Non-Federal	Total	Federal	Non-Federal	Total
LEVEE REHABILITATION:						
Bernalillo	0	0	0	0	0	0
Corrales	4,051,000	650,000	4,701,000	279,000	54,000	333,000
Albuquerque-East	1,444,000	3,795,000	5,239,000	99,000	261,000	360,000
Albuquerque-West	1,903,000	3,245,000	5,148,000	131,000	223,000	354,000
Mountainview	2,224,000	0	2,224,000	153,000	4,000	157,000
Isleta-East	0	0	0	0	0	0
Isleta-West	3,537,000	401,000	3,938,000	243,000	31,000	274,000
Belen-East	13,296,000	757,000	14,053,000	916,000	96,000	1,012,000
Belen-West	11,079,000	392,000	11,471,000	763,000	71,000	834,000
TOTAL LEVEE REHABILITATION	37,534,000	9,240,000	46,774,000	2,584,000	740,000	3,324,000
WETLAND CREATION:	662,000	163,000	825,000	60,000	17,000	77,000
SUBTOTAL	38,196,000	9,403,000	47,599,000	2,644,000	757,000	3,401,000
MITIGATION	1,379,000	340,000	1,719,000	111,000	32,000	143,000
TOTAL - PLAN B	39,575,000	9,743,000	49,318,000	2,755,000	789,000	3,544,000

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TABLE B-14

Detailed Cost Estimate of Plan C
Corrales Units

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 100,000
	Embankment fill	383,200	CY	1.50	575,000
	Gravel-levee crown	14,800	CY	5.65	84,000
	Toe drains (pipe)	57,430	LF	14.10	809,000
	Bank protection (jacks)	1,540	Each	225.00	346,000
	Overlap Levee (near Section 419R) I-1	1	Job	LS	250,000
	Overlap levee (near Section 452R) I-2	1	Job	LS	29,000
	Contingencies 15%				329,000
	Total Levees				$2,522,000
30	ENGINEERING AND DESIGN				$ 328,000
31	SUPERVISION AND INSPECTION				227,000
	TOTAL FEDERAL COST				$3,077,000

TABLE B-14 (Cont'd)

Detailed Cost Estimate of Plan C
Corrales Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NON-FEDERAL COST				
01	LANDS AND DAMAGES				
	Fee purchase, cropland (R/N)	14	Acre	20,000	$ 280,000
	Contingencies 25%				70,000
	Total Lands and Damages				$ 350,000
	TOTAL NON-FEDERAL COST				$ 350,000
	TOTAL PROJECT COST				$3,427,000

TABLE B-14 (Cont'd)
Detailed Cost Estimate of Plan C
Corrales Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$3,077,000
	Interest during construction (less than 2 years)				none
					$3,077,000
	NON-FEDERAL INVESTMENT				
	Non-federal first cost				$ 350,000
	Interest during construction (less than 2 years)				0
					$ 350,000
	TOTAL INVESTMENT				$3,427,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 211,500
	Amortization (6-7/8% for 100 years)				500
	Total Federal Annual Cost				$ 212,000
	NON-FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 23,980
	Amortization (6-7/8% for 100 years)				20
	Operation and maintenance				10,000
	Total Non-federal Annual Cost				$ 34,000
	TOTAL ANNUAL CHARGES				$ 246,000

TABLE B-15

Detailed Cost Estimate of Plan C
Mountainview Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEE				
	Clearing and grubbing	1	Job	LS	$ 31,000
	Embankment fill	171,000	CY	1.50	256,000
	Gravel - levee crown	5,600	CY	5.65	32,000
	Toe drains (pipe)	23,056	LF	14.10	325,000
	Slope protection - piling	1	Job	LS	85,000
	Bank protection - jacks	1,615	Each	225.00	363,000
	Backflow prevention structure, Type A (near Section 623L) I9	1	Job	LS	170,000
	Contingencies 15%				189,000
	Total Levees				$1,451,000
30	ENGINEERING AND DESIGN				203,000
31	SUPERVISION AND INSPECTION				130,000
	TOTAL FEDERAL COST				$1,784,000
	TOTAL PROJECT COST				$1,784,000

TABLE B-15 (Cont'd)

Detailed Cost Estimate of Plan C
Mountaiview Unit

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL				
	Federal first cost				$1,784,000
	Interest during construction (less than 2 years)				none
					$1,784,000
	NONFEDERAL				
	Nonfederal first cost				$ 0
	Interest during construction				none
	TOTAL INVESTMENT				$1,784,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 122,650
	Amortization (6-7/8% for 100 years)				350
	Total Federal Annual Cost				$ 123,000
	NONFEDERAL ANNUAL CHARGES				
	Operation and Maintenance				$ 4,000
	Total Nonfederal Annual Cost				$ 4,000
	TOTAL ANNUAL CHARGES				$ 127,000

TABLE B-16

Detailed Cost Estimate of Plan C
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEE				
	Clearing and grubbing	1	Job	LS	$ 18,000
	Embankment fill	158,800	CY	1.50	238,000
	Gravel - levee crown	3,400	CY	5.65	19,000
	Toe drain (pipe)	16,000	LF	14.10	226,000
	Bank protection - jacks	675	Each	225.00	152,000
	Backflow prevention structure, Type C (near Section 653R) on tieback	1	Job	LS	85,000
	Backflow prevention structure, Type C (near Section 649R) on tieback	1	Job	LS	85,000
	Overlap levee (near Section 655R)	1	Job	LS	64,000
	Backflow prevention structure, Type C (near Section 632R on overlap I10	1	Job	LS	85,000
	Overlap levee (near Section 637R) I11	1	Job	LS	134,000
	Contingencies 15%				166,000
	Total Levees				$1,272,000
30	ENGINEERING AND DESIGN				178,000
31	SUPERVISION AND INSPECTION				114,000
	TOTAL FEDERAL COST				$1,564,000

TABLE B-16 (Cont'd)
Detailed Cost Estimated of Plan C
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONFEDERAL COST				
01	LANDS AND DAMAGES				
	Fee land, cropland (R/W)	24	Acre	5,000	$ 120,000
	Contingencies 15%				18,000
	Acquisition cost				37,000
	TOTAL LANDS AND DAMAGES				$ 175,000
02	RELOCATIONS				
.1	Roads				
	S.R. 47 bridge - west approach H8				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - west end	1,600	CY	1.40	2,200
	Pavement - west end	650	SY	19.20	12,500
	Contingencies 15% ±				6,300
	TOTAL - RELOCATIONS				$ 49,000
30	ENGINEERING AND DESIGN				$ 9,000
31	SUPERVISION AND INSPECTION				$ 6,000
	TOTAL NONFEDERAL COST				$ 239,000
	TOTAL PROJECT COST				$1,803,000

TABLE B-16 (Cont'd)

Detailed Cost Estimate of Plan C
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$1,564,000
	Interest during construction (less than 2 years)				none
					$1,564,000
	NONFEDERAL INVESTMENT				
	Nonfederal first cost				$ 239,000
	Interest during construction (less than 2 years)				none
					$ 239,000
	TOTAL INVESTMENT				$1,803,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 107,840
	Amortization (6-7/8% for 100 years)				160
	Total Federal Annual Cost				$ 108,000

TABLE B-16 (Cont'd)

Detailed Cost Estimate of Plan C
Isleta Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES (Cont'd)				
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 16,430
	Amortization (6-7/8% for 100 years)				30
	Operation and Maintenance				2,540
	Total Nonfederal Annual Cost				$ 19,000
	TOTAL ANNUAL CHARGES				$ 127,000

TABLE B-17

Detailed Cost Estimate of Plan C
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 94,000
	Embankment Fill	1,116,400	CY	1.50	1,675,000
	Gravel - levee crown	25,600	CY	5.65	145,000
	Toe drains (pipe)	116,740	LF	14.10	1,645,000
	Slope protection -piling	1	Job	LS	85,000
	Bank protection - jacks	15,630	Each	225.00	3,517,000
	Excessive inflow prevention structure - Type D (near Section 651L) I 12	1	Job	LS	158,000
	Excessive inflow prevention structure - Type E (near Section 656L) I 14	1	Job	LS	268,000
	Overlap levee (near Section 739L) I 18				245,000
	Backflow prevention structure, Type B (near Section 829L) I 20				113,000
	Overlap levee (near Section 877L) I 21				27,000
	Contingencies 15%				1,196,000
	Total Levees				$9,168,000
30	ENGINEERING AND DESIGN				1,008,000
31	SUPERVISION AND INSPECTION				734,000
	TOTAL FEDERAL COST				$10,910,000

TABLE B-17 (Cont'd)

Detailed Cost Estimate of Plan C
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		NONFEDERAL COST			
01	LANDS AND DAMAGES				
	Fee purchase, cropland (R/W)	12	Acre	15,000	$ 180,000
	Contingencies 25%				45,000
	TOTAL - LANDS AND DAMAGES				$ 225,000
02	RELOCATIONS				
	Roads				
	SR 47 bridge - east approach H10				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - east end	6,400	CY	1.40	9,000
	Pavement - east end	2,118	SY	19.20	30,000
	Modification to drainage structure under roadway east end	1	Job	LS	21,000
	Subtotal SR 47				$ 88,000

TABLE B-17 (Cont'd)

Detailed Cost Estimated of Plan C
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	NONDFEDERAL COST (Cont'd)				
	SR 49 bridge - east approach H12				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - east end	4,000	CY	1.40	6,000
	Pavement - east end	2,235	SY	19.20	32,000
	Modification to drainage structure under roadway east end	1	Job	LS	18,000
	Subtotal SR 49				$ 84,000
	Contingencies 15%				26,000
	TOTAL - RELOCATIONS				$ 198,000
30	ENGINEERING AND DESIGN				$ 34,000
31	SUPERVISION AND INSPECTION				$ 21,000
	TOTAL NONFEDERAL COST				$ 478,000
	TOTAL PROJECT COST				$11,388,000
	INVESTMENT				
	FEDERAL INVESTMENT				
	Federal first cost				$10,910,000
	Interest during construction (less than 2 years)				none
					$10,910,000

TABLE B-17 (Cont'd)

Detailed Cost Estimate of Plan C
Belen Unit - East

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	INVESTMENT (Cont'd)				
	NONDFEDERAL INVESTMENT				
	Nonfederal first cost				$ 478,000
	Interest during construction (less than 2 years)				none
					$ 478,000
	TOTAL INVESTMENT				$11,388,000
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 750,000
	Amortization (6-7/8% for 100 years)				1,000
	Total Federal Annual Cost				$ 751,000
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 32,860
	Amortization (6-7/8% for 100 years)				40
	Operation and Maintenance				44,100
	Total Nonfederal Annual Cost				$ 77,000
	TOTAL ANNUAL CHARGES				$ 828,000

TABLE B-18

Detailed Cost Estimate of Plan C
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
		FEDERAL COST			
11	LEVEES				
	Clearing and grubbing	1	Job	LS	$ 78,000
	Embankment fill	1,084,000	CY	1.50	1,626,000
	Gravel - levee crown	23,100	CY	5.65	131,000
	Toe drains (pipe)	104,260	LF	14.10	1,470,000
	Slope protection - piling	1	Job	LS	85,000
	Bank protection - jacks	12,630	Each	225.00	2,842,000
	Excessive inflow prevention structure, Type E (near Section 697R) I13	1	Job	LS	268,000
	Backflow prevention structure, Type B (near Section 699R) I17	1	Job	LS	113,000
	Modification to existing sewage treatment plant outfall (near Section 748R) U4	1	Job	LS	41,000
	Backflow Prevention structure, Type B (near Section 879R) I22	1	Job	LS	113,000
	Subtotal				$6,767,000
	Contingencies 15%				1,015,000
	Total Levees				$7,782,000

TABLE B-18 (Cont'd)

Detailed Cost Estimate of Plan C
Belen Unit - West

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
30	ENGINEERING AND DESIGN				$ 856,000
31	SUPERVISION AND INSPECTION				623,000
	TOTAL FEDERAL COST				$9,261,000

NONFEDERAL COST

02	RAILROADS				
	Railroad Raise	1	Job	LS	$ 98,000
	Contingencies ±15%				15,000
	Total Railroads				$ 113,000
	ROADS				
	SR 49 bridge - west approach H13				
	Care of traffic	1	Job	LS	$ 28,000
	Embankment fill - west end	2,400	CY	1.40	3,000
	Pavement - west end	925	SY	19.20	18,000
	Modification to drainage structure under roadway - west end	1	Job	LS	12,000
	Subtotal				$ 61,000

TABLE B-18 (Cont'd)

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	SR 6 bridge - west apprcach H15				
	Care of traffic	1	Job	LS	34,000
	Embankment fill - west end	5,500	CY	1.40	8,000
	Pavement -west end	1,590	SY	19.20	30,000
	Modification to drainage structure under roadway - west end	1	Job	LS	19,000
	Subtotal SR 6				$ 91,000
	Contingencies 15%				23,000
	Total Roads				175,000
	TOTAL - RELOCATIONS				$ 288,000
30	ENGINEERING AND DESIGN				$ 34,000
31	SUPERVISION AND INSPECTION				$ 32,000
	TOTAL NONFEDERAL COST				$ 354,000
	TOTAL PROJECT COST				$ 9,615,000

INVESTMENT

FEDERAL INVESTMENT	
Federal first cost	$ 9,261,000
Interest during construction (less than 2 years)	none
	$ 9,261,000
NONFEDERAL INVESTMENT	
Nonfederal first cost	$ 354,000
Interest during construction (less than 2 years)	none
	$ 354,000
TOTAL INVESTMENT	$ 9,615,000

TABLE B-18 (Cont'd)

Cost Account Number	Item	Estimated Quantity	Unit	Unit Cost	Total Cost
	ANNUAL CHARGES				
	FEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 636,700
	Amortization (6-7/8% for 100 years)				800
	Total Federal Annual Cost				$ 637,500
	NONFEDERAL ANNUAL CHARGES				
	Interest (6-7/8%)				$ 24,340
	Amortization (6-7/8% for 100 years)				30
	Operation and Maintenance				44,130
	Total Nonfederal Annual Cost				$ 68,500
	TOTAL ANNUAL CHARGES				$ 706,000

TABLE B-19

Detailed Cost Estimate for Creation of Wetlands - Plan C

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
INVESTMENT				
Additional cost of levee fill from wetland excavation	525,000	CY	0.50	$ 263,000
Contingencies 15%				40,000
Subtotal				$ 303,000
ENGINEERING AND DESIGN				$ 40,000
SUPERVISION AND ADMINISTRATION				$ 27,000
Subtotal				$ 370,000
Water rights	300	Acre-feet	300.00	$ 90,000
Contingencies 15%				15,000
Acquisition				25,000
Subtotal				$ 130,000
TOTAL INVESTMENT				$ 500,000

TABLE B-19 (Cont'd)

Item	Estimated Quantity	Unit	Unit Cost	Total Cost
ANNUAL CHARGES				
Interest (6-7/8%)				$ 34,375
Amortization (6-7/8% for 100 years)				45
Operation and Maintenance				19,580
TOTAL ANNUAL CHARGES				$ 54,000

TABLE B-20
Detailed Cost Estimate of Plan C
Mitigation Costs

INVESTMENT				
LANDS AND DAMAGES				
Fee purchase	200	Acre	5,500	$1,100,000
Contigencies 25%				275,000
TOTAL - LANDS AND DAMAGES				$1,375,000
ANNUAL CHARGES				
Interest (6-7/8%)				$ 94,530
Amortization (6-7/8% for 100 years)				120
Management of project lands for fish and wildlife				24,350
TOTAL ANNUAL CHARGES				$ 119,000

TABLE B-21
PLAN C
Summary of First Costs and Annual Costs by Levee Unit

(Based on 10-78 Price Levels)

Units	First Costs			Annual Costs		
	Federal	Non-Federal	Total	Federal	Non-Federal	Total
LEVEE REHABILITATION:						
Bernalillo	0	0	0	0	0	0
Corrales	3,077,000	350,000	3,427,000	212,000	34,000	246,000
Albuquerque - East	0	0	0	0	0	0
Albuquerque - West	0	0	0	0	0	0
Mountainview	1,784,000	0	1,784,000	123,000	4,000	127,000
Isleta - East	0	0	0	0	0	0
Isleta - West	1,564,000	239,000	1,803,000	108,000	19,000	127,000
Belen - East	10,910,000	478,000	11,388,000	751,000	77,000	828,000
Belen - West	9,261,000	354,000	9,615,000	637,500	68,500	706,000
TOTAL LEVEE REHABILITATION	26,596,000	1,421,000	28,017,000	1,831,500	202,500	2,034,000
WETLAND CREATION:	475,000	25,000	500,000	49,000	5,000	54,000
SUBTOTAL	27,071,000	1,446,000	28,517,000	1,880,500	207,500	2,088,000
MITIGATION:	1,305,000	70,000	1,375,000	107,000	12,000	119,000
TOTAL - PLAN C	28,376,000	1,516,000	29,892,000	1,987,500	219,500	2,207,000

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SECTION C

IMPACT ASSESSMENT

Plans A, B, and C each provide a partial solution to the Rio Grande flood problems within the study reach; however, plan selection must be based upon an analysis of the significant economic, social, and environmental impacts which each plan will have. These impacts are determined by comparing the existing and future effects of implementing each plan with those of doing nothing, the "without condition." In addition, the future conditions of doing nothing must be compared with the base conditions to determine the impacts of a "no-action" plan. This section identifies and describes the impacts which are pertinent to plan selection.

ECONOMIC DEVELOPMENT

Quantification of costs and benefits for the plans under consideration are the measure of economic impacts. Comparison of the two SPF plans reveals that the first cost of Plan A is slightly higher than Plan B, $50,178,000 to $49,318,000, which results in corresponding higher average annual charges for Plan A. The operation and maintenance costs for Plan B are higher because of the management requirements for the manmade wetlands. Average annual charges for Plan A and Plan B are $3,583,000 and $3,544,000, respectively. The first cost for Plan C, with its lesser level of protection, is $29,892,000 with average annual costs of $2,207,000. There would be no first costs or average annual charges for the

"no-action" plan. Another cost associated with Plans A, B, or C, would be the expropriation of 104, 114, and 50 acres of cropland, respectively, resulting in loss of tax revenues. Five hundred acres of riparian woodland would also be taken from the tax rolls to satisfy mitigation requirements for Plan A. Plan B would require only 250 acres for mitigation, because creation of the wetlands would offset some of the adverse impacts. Plan C would require acquisition of 200 acres of mitigation lands because the permanent adverse impacts would be less.

Flood damage reduction is the primary objective addressed by this investigation, and primary benefits are those derived from providing flood protection. Both Plans A and B would increase the existing flood protection up to Standard Project Flood for approximately 63,000 acres. Plan B would protect about 50 acres less because of the preservation of Isleta marsh. Because of this, flood control benefits would be slightly less for Plan B. Plan C would provide protection from flows up to 42,000 c.f.s. to nearly the same areas as Plan B; however, benefits would be less due to the lesser degree of protection. Determination of flood control benefits are given in Section D of this appendix. Flood damages would actually increase for the "no-action" plan, because, in the absence of flood zoning regulations, flood plain development will continue. This adoption of the "no-action" plan would cost at least $5,159,000 in foregone flood control benefits.

Certain benefits would be derived from construction of the project through salaries paid to unemployed and underemployed residents in the area. These were computed to be $867,800 (Plan A), $855,300 (Plan B), and $521,000 (Plan C) for the Regional Development (RD) account; and $222,100 (Plan A), $225,300 (Plan B), and

157,200
$~~265,800~~ (Plan C) for the NED account. Detailed explanation of these benefits is contained in Section D of this appendix.

Quantifiable wetland benefits are considered in the mitigation plan as a partial compensation for lands impacted by the respective flood control plans. No similar benefits are attained by Plan A. Qualitative fish and wildlife impacts are discussed under Environmental Impacts.

Other economic benefits to be derived from Plans A, B, or C would be increased property values because of increased flood protection with a resultant increase in the tax revenue base. These benefits were not estimated or considered in the economic justification, which would result in a more conservative analysis.

SOCIAL WELL-BEING

Assessment of the impacts on the social well-being of the valley residents is qualitative, rather than quantitative. Plans A, B, or C would relieve the flood hazard, reduce the possibility of loss of life and the anxiety associated with a constant flood threat. Health problems caused by flooded wells and septic tanks would be alleviated. Also, those in areas of high flood frequency may take more pride in property ownership and clean up and better maintain their property. These problems would still exist under the "no-action" alternative. There would be a real income distribution under Plans A, B, or C with the lower-income families as beneficiaries. Both Plans A and B would displace only three households within the project area. Plan C would displace no families.

The following temporary adverse impacts would result during construction of Plan A, Plan B, or Plan C. There would be an abnormal amount and level of construction associated noise within the project area. Traffic flow could be disrupted where roads and streets cross project limits. There would be some impairment of the normal aesthetic nature of the bosque and the leisure and recreational opportunities associated with the riverine environment.

The creation of wetlands would provide a source of vector problems, and management procedures would be implemented to reduce the effects.

ENVIRONMENTAL EFFECTS

Plan A. The primary impacts associated with Plan A would be those associated with the riparian woodland. Valued because of its relative scarcity in the arid southwest, its value to wildlife, and aesthetic qualities, disturbances to the woodland would be kept as minimal as possible. Rehabilitation of the levee system would affect a maximum of about 762 acres of riparian woodland, or about 9 percent of the total woodland in the study area. Of this number about 286 acres, or less than 4 percent, would be permanently lost because of levee enlargement or construction. About 436 acres of woodland would be temporarily lost due to borrow areas and haul roads. Depending on condition and successional stage of vegetation in borrow areas, the period of time required for regrowth to a similar developmental stage would vary from about 15 to 40 years. Coincident with the removal of vegetation would be same reduction and disturbance of wildlife. Wildlife dependent on removed woodland would be directly impacted. Wildlife in adjacent areas would be temporarily disturbed as a result of construction noises and activity, and many would emigrate. A less severe impact could occur since many species would reestablish after the disturbance had

stopped. Reductions in those species of wildlife dependent upon the areas where vegetation will be permanently removed will be permanently lost. Wildlife reduction in areas that have the potential for regrowth would be temporary with reutilization being commensurate with vegetation development.

Even more scarce than woodland in the region are wetlands. Rehabilitation of the upper portion of the Belen Unit - West would severely damage the Isleta Marsh, the largest (about 116 acres) of only three wetlands in the entire study area, the others being about 42 and 5 acres. This marsh provides habitat for a great variety of wildlife and its loss would be very significant.

The removal of granular material from the channel of the river would have little effect on aquatic organisms. Construction noise and activity would disturb resting waterfowl that seasonally utilize the river to a small extent, causing them to utilize another part of the river. Any shorebirds that could be utilizing the sandy channel for nesting purposes during the construction period would be scared from the area and temporarily prevented from utilizing it.

The whooping crane and the peregrine falcon are two wildlife species in the project area that are nationally classified endangered species. Project impacts would be secondary in nature, resulting from project-associated noise and disturbance. Generally they should not be significantly affected. There are several state-classified endangered species that may utilize the riparian woodland. These species could be directly or indirectly impacted, by nesting disturbance.

Recreational activities associated with the riverine environment and the fishery in the riverside drain would be diminished in

those reaches where construction is occurring and for at least as long as construction lasts because of the decreased accessibility and woodland disturbance. This impact would be more pronounced and of longer duration in the more aesthetically appealing areas. The potential destruction or reduction in size of the Isleta Marsh would reduce abundant nature study opportunities.

Some permanent and temporary aesthetic degradation would be associated with vegetation removal, and increased levee height.

Mitigation of the adverse impacts described herein would be provided by the acquisition and management of 500 acres of riparian woodland.

Plan B. Impacts resulting from implementation of Plan B would be similar to Plan A in that there would still be the removal of riparian woodland for levee enlargement and borrow material, wildlife disturbance with some losses; some impairment of recreational opportunities; and some aesthetic degradation. However, associated with this plan is the avoidance and protection of all existing marshes; the adaptation of a number of the borrow pits into marshes and management thereof; and mitigation measures such as plantings of grass, shrubs, and trees. Implementation of the plan for marsh development would significantly compensate for impairment of the wildlife resource as a result of habitat destruction, would benefit recreational and nature study opportunities, and would restore a small portion of the once-abundant marshes that existed in the project area. The avoidance of the Isleta Marsh would perpetuate the existence of a limited and important resource. Restoration methods would aid in improving aesthetic quality, restoring wildlife habitat and retarding erosion.

Acquisition and management of 250 acres of riparian woodland would offset the remainder of adverse impacts created by Plan B.

Plan C. Environmental impacts for Plan C would be similar to Plan B, except that less riparian woodland would be permanently lost because the levee rehabilitation for 42,000 c.f.s. protection would require a lesser levee base width. Also there would be no permanent or temporary construction impacts in the vicinity of Albuquerque.

Creation of 75 acres of wetlands, acquisition of 200 acres of riparian woodland, and management of the area plus contiguous areas for fish and wildlife should compensate for the adverse impacts caused by Plan C.

No-Action Plan. The "No-Action Plan" would allow the environmental entities associated with the riverine environment to remain unaltered by construction and to follow a course determined by biological and physical processes, current uses of the riverine area, increased recreational use of the river's resources, and the ramifications of continued urbanization within the flood plain. However, a "no-action" plan would offer no guarantee that the environmental and recreational potential of the bosque would not be destroyed.

SECTION D

EVALUATION

The purpose of this section is to evaluate Plan A, Plan B, Plan C and the "no-action" alternative so that they may be compared with one another. Specific items of comparison include the accomplishment of the planning objectives identified in Appendix A, net economic benefits, beneficial and adverse social and environmental impacts, implementability of the plans, and acceptability of the plans by the public. This comparison may lead to trade-offs between plans or other modifications to achieve the most objectives at the least cost and still maintain the support of the people. Contributions to the national economic development, environmental quality, social well-being, and regional development by each of the plans is displayed in the system of accounts at the end of this section.

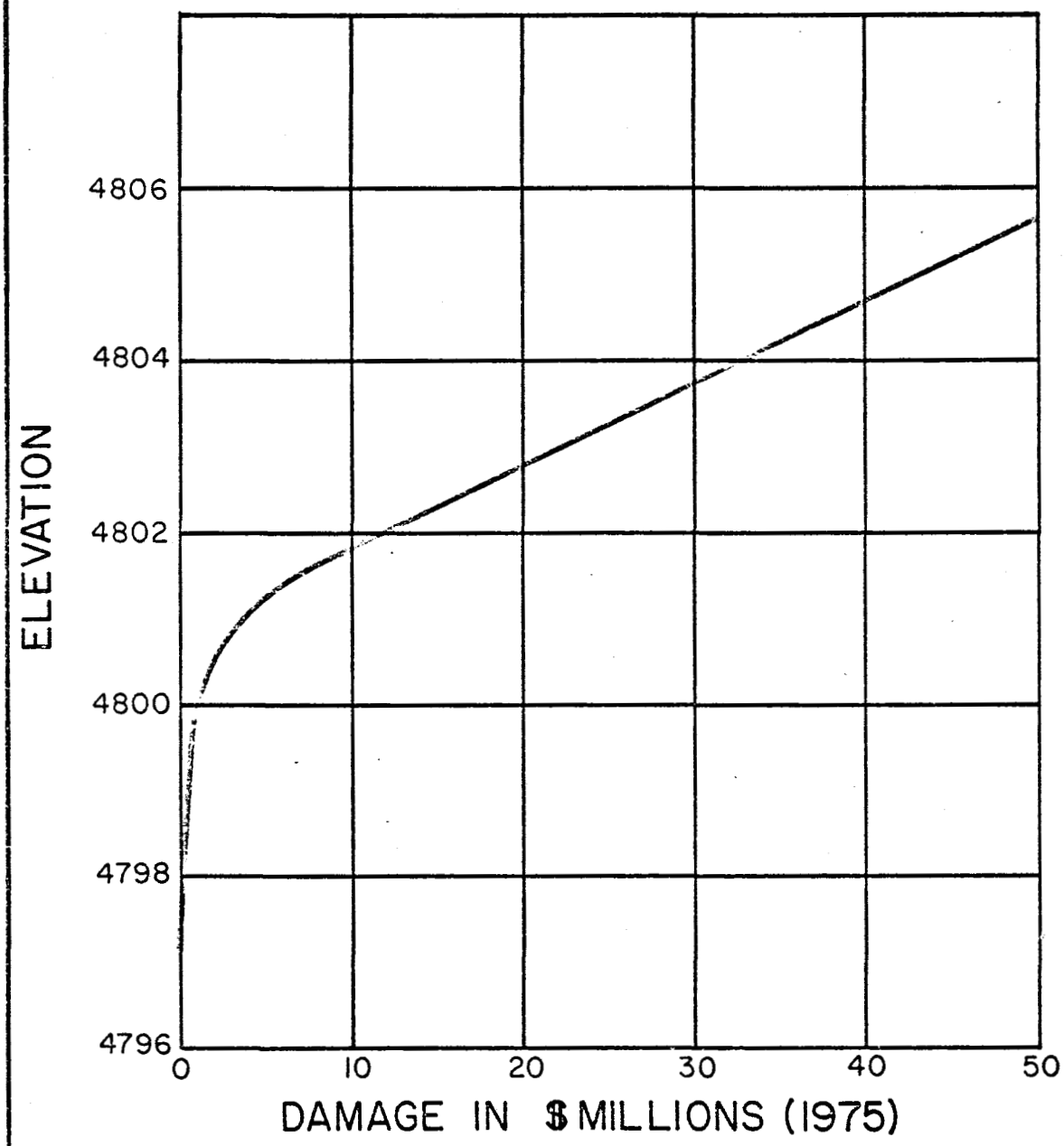
ECONOMIC EVALUATION

Benefits from Existing Damages Prevented. The existing average annual benefits creditable to Plans A, B, and C for prevention of flood damages are the difference between the average annual damages under existing development (Base Year 1980) in the Standard Project Flood plain and the average annual residual damages which can be expected with the plan in operation. Average annual damages, both with and without the project, are derived by integrating the stage-damage and stage-frequency curves into a damage-frequency curve for each economic unit. Separate stage-damage curves were developed for

flood damages and business losses. Examples of the stage-damage, stage-frequency, and the damage-frequency curves are shown on Figures 1, 2, and 3. In addition, Figure 3 presents an example of the computation of average annual benefits. Total damages prevented by either Plan A or B at 1980 are determined to be $4,433,800, and are estimated to be $2,871,200 for Plan C, excluding affluence, and are presented in Table B-22.

Benefits from Future Damages Prevented. For most economic units, urban development is expected to continue beyond 1980. Plans A, B, and C would prevent damages to this future growth as well as existing development. Future increases in damages were reduced to annual equivalent future benefits by the method described in the next paragraph. Figure 4 shows an example computation of average annual equivalent future benefits. The increases in average annual damages prevented come from projected future growth in various property classes. It was assumed, given the restraints of the flood insurance act and current regulations, that future growth was limited to the area between the 100-year and Standard Project Flood plains. No future growth was projected for Units 6 and 7 on the Isleta Pueblo. Following current land use patterns and zoning restrictions, vacant and agriculture land was examined for future growth, and property was placed accordingly.

The computations shown in Figure 4 do basically two operations. First, they determine the present worth of future damages prevented brought back to 1980. Secondly, they amortize the present worth of future damages prevented over the 100-year project life at an interest rate of 6-7/8 percent. Table B-23 presents and summarizes the average annual equivalent future benefits for flood damages and business losses prevented.



ALBUQUERQUE, NEW MEXICO
RIO GRANDE

STAGE – DAMAGE CURVE

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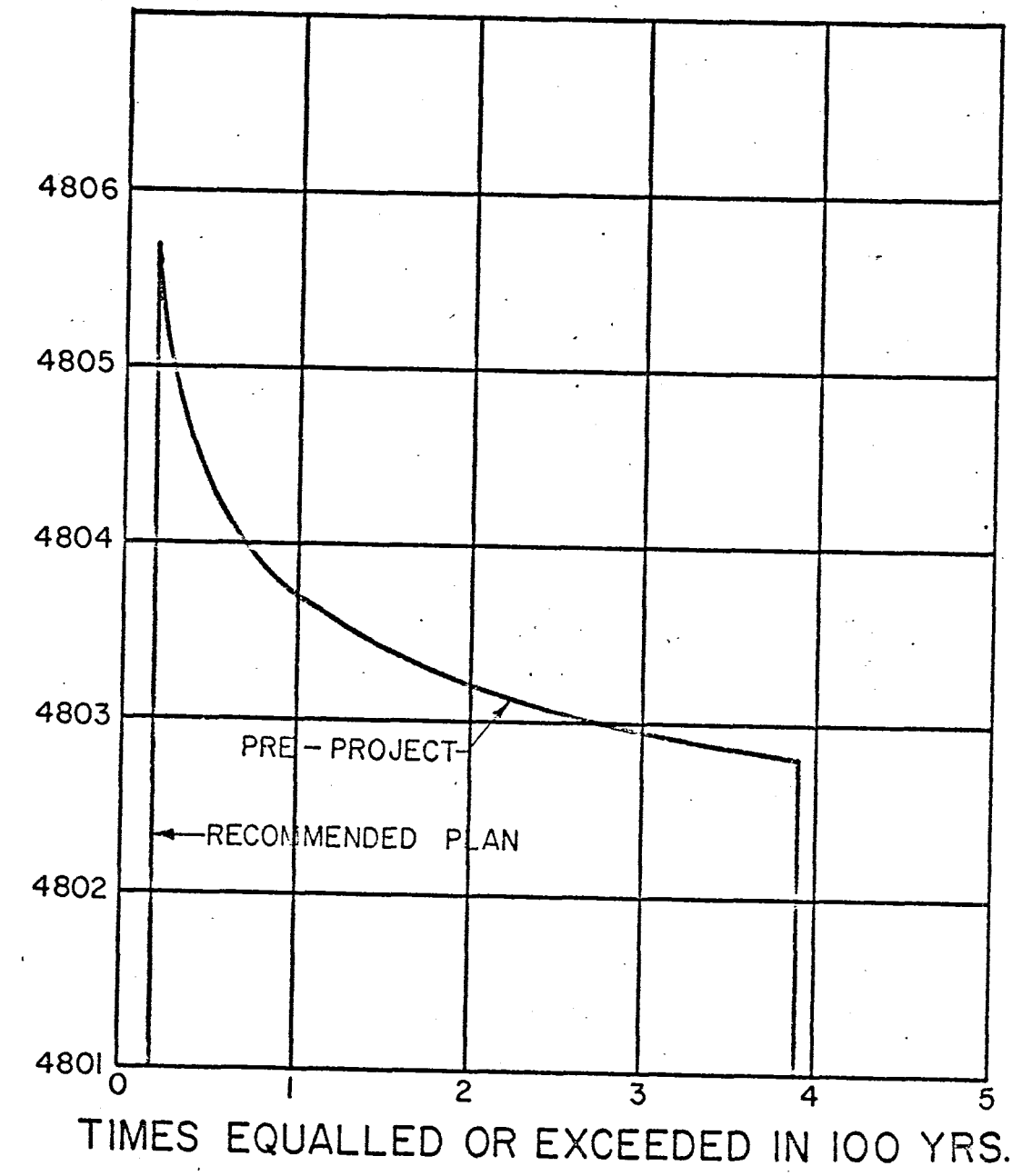
LEFT BANK

FIG. I



ALBUQUERQUE, NEW MEXICO
RIO GRANDE

STAGE – FREQUENCY CURVE

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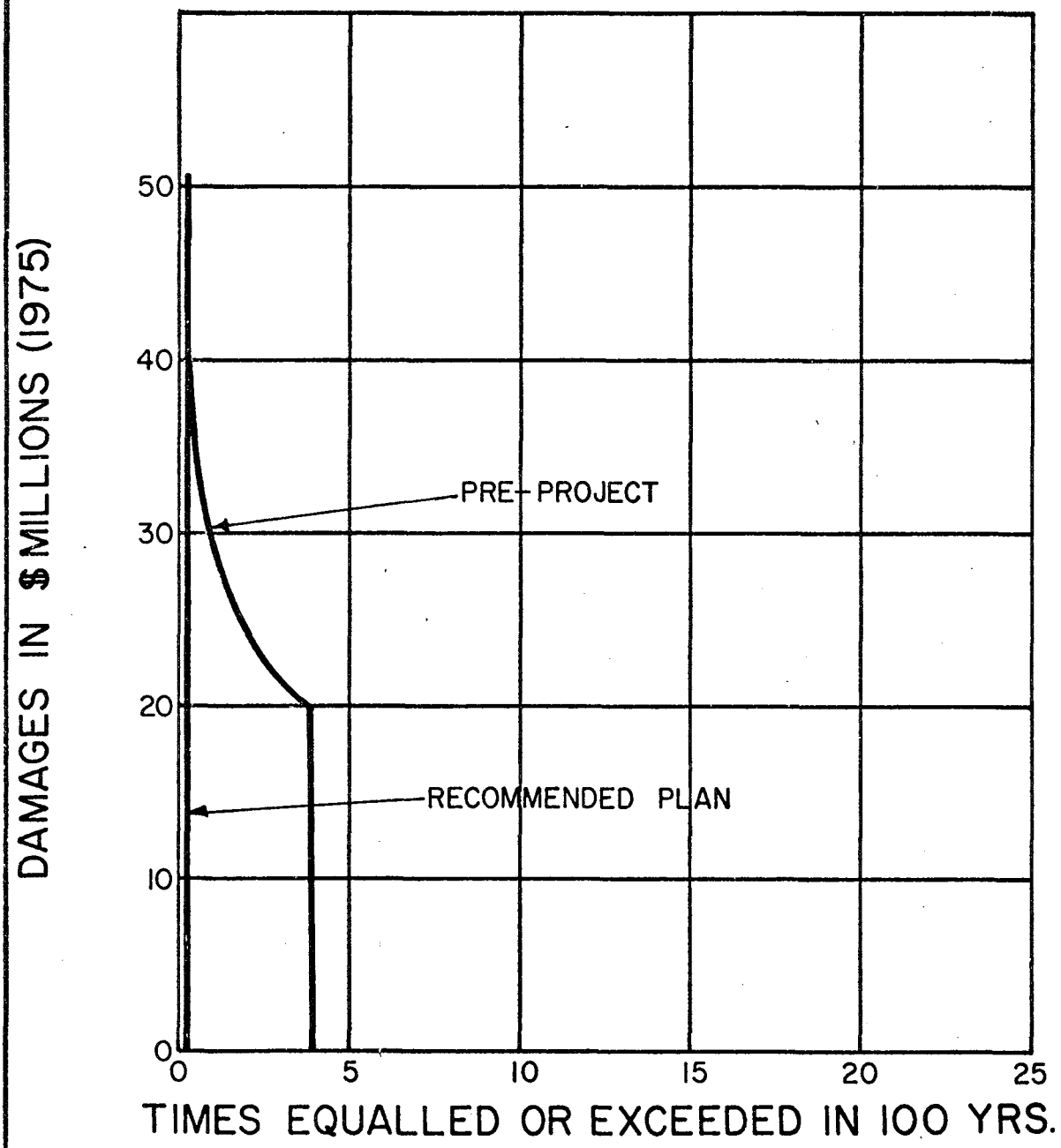
FIG. 2

AVERAGE ANNUAL DAMAGES	$1,027.0
RESIDUAL DAMAGES	0
AVG. ANNUAL DAMAGES PREVENTED	$1,027.0



ALBUQUERQUE, NEW MEXICO
RIO GRANDE

DAMAGE—FREQUENCY CURVE

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FIG. 3

TABLE B-22

EXISTING AVERAGE ANNUAL DAMAGES
October 78 Prices ($1,000)

Base Year 1980	Without Plans A, B, or C			With Plan A or B			With Plan C			Prevented by Plan A or B			Prevented by Plan C		
Economic Unit	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total
Bernalillo	72.4	0.3	72.7	73.2	0.3	73.5	72.9	0.3	73.2	- 0.8[1]	0.0	- 0.8[1]	- 0.5[1]	0.0	- 0.5[1]
Corrales	656.0	6.6	662.6	0.0	0.0	0.0	32.8	0.3	33.1	656.0	6.6	662.6	623.2	6.3	629.5
Albuquerque-East	901.1	30.6	931.7	0.0	0.0	0.0	901.1	30.6	931.7	901.1	30.6	931.7	0.0	0.0	0.0
Albuquerque-West	336.3	3.4	339.7	0.0	0.0	0.0	336.3	3.4	339.7	336.3	3.4	339.7	0.0	0.0	0.0
Mountainview	124.1	30.3	154.4	0.0	0.0	0.0	0.0	0.0	0.0	124.1	30.3	154.4	124.1	30.3	154.4
Isleta-East	7.4	0.0	7.4	10.7	0.0	10.7	10.2	0.0	10.2	- 3.3[2]	0.0	- 3.3[2]	- 2.8[2]	0.0	- 2.8[2]
Isleta-West	128.2	0.2	128.4	0.0	0.0	0.0	40.1	0.0	40.1	128.2	0.2	128.4	88.1	0.2	88.3
Belen-East	1151.2	16.9	1168.1	0.0	0.0	0.0	103.6	1.5	105.1	1151.2	16.9	1168.1	1047.6	15.4	1063.0
Belen-West	1018.7	34.3	1053.0	0.0	0.0	0.0	109.9	3.8	113.7	1018.7	34.3	1053.0	908.8	30.5	939.3
TOTALS	4395.4	122.6	4518.0	83.9	0.3	84.2	1606.9	39.9	1646.8	4311.5	122.3	4433.5	2788.5	82.7	2871.2

[1] Damages prevented are negative because they represent damages induced by the recommended levee for the Corrales Unit.

[2] Damages prevented are negative because they represent damages induced by the recommended levee for the Isleta-West Unit.

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TABLE B-23

FUTURE AVERAGE ANNUAL DAMAGES
October 78 Prices ($1,000)

Base Year 1980	Without Plans A, B, or C			With Plan A or B			With Plan C			Prevented by Plan A or B			Prevented by Plan C		
Economic Unit	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total	Flood Damages	Business Losses	Total
Bernalillo	26.7	0.2	26.9	26.7	0.2	26.9	26.7	0.2	26.9	0.0	0.0	0.0	0.0	0.0	0.0
Corrales	1.1	0.0	1.1	0.0	0.0	0.0	0.1	0.0	0.1	1.1	0.0	1.1	1.0	0.0	1.0
Albuquerque-East	124.8	3.3	128.1	0.0	0.0	0.0	124.8	3.3	128.1	124.8	3.3	128.1	0.0	0.0	0.0
Albuquerque-West	78.2	0.5	78.7	0.0	0.0	0.0	78.2	0.5	78.7	78.2	0.5	78.7	0.0	0.0	0.0
Mountainview	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Isleta-East	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Isleta-West	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Belen-East	1.8	0.0	1.8	0.0	0.0	0.0	0.2	0.0	0.2	1.8	0.0	1.8	1.6	0.0	1.6
Belen-West	10.9	0.0	10.9	0.0	0.0	0.0	1.2	0.0	1.2	10.9	0.0	10.9	9.7	0.0	9.7
TOTAL	243.6	4.0	247.6	26.7	0.2	26.9	231.2	4.0	235.2	216.9	3.8	220.7	12.4	0.0	12.4

Residential Affluence Factor. According to ER 1105-2-351, the OBERS regional growth rate for per capita income will be used as a basis for increasing the real value of residential contents in the future to account for the effects of the affluence factor. The affluence factor assumes that as real income rises, people acquire more goods and the value of household contents rises in relation to the residential structure value. The value of residential contents is projected at the per capita income growth rate to a maximum level of 75 percent of the value of the residential structure and is limited to the first 50 years of project life. Residential contents were determined to be 50 percent of the structure value at the time of the survey year (1975). By the base year (1980) the percentage increases to 59.15 percent and reaches the maximum percent (75) by 1989. The following OBERS projected Per Capita Income figures were utilized.

PER CAPITA INCOME, 1973-2030
1967 DOLLARS
SERIES E

BEA ECONOMIC AREA 146			
YEAR	PER CAPITA INCOME	AVERAGE ANNUAL % CHANGE	FACTORS OF CHANGE FROM 1973
1973	$ 3,040		1.000
		3.55	
1980	$ 3,880		1.276
		2.69	
1990	$ 5,058		1.664
		3.02	
2000	$ 6,813		2.241
		2.67	
2010	$ 8,868		2.917
		2.67	
2020	$11,544		3.797
		1.41	
2030	$13,285		4.370
	- - -	2.67	

An example of the method of computation for affluence benefits is shown on Figure 5. These computations deal with two groups of data - existing and future growth. The affluence related to existing contents accounts for the increase in contents percentage to 59.15 by 1980 (an 18.3 percent increase over the 1975 value) and to 75 percent by 1989 (a 31.7 percent increase over the 1980 content value). The affluence related to future growth accounts for the increase to 75 percent by 1990 for new residences in the economic unit subsequent to 1980. The future growth computations, as discussed in paragraph 2, above, are relative for a content value of 50 percent only. Accordingly, the second portion of Figure 5 takes the affluence factor of future residences into account.

The total average annual affluence benefits for all economic units are shown on Table B-24.

Economic Development Benefits. Economic development benefits are measured as those salaries paid to individuals who would otherwise be unemployed or underemployed. The recommended plan is located in Sandoval, Bernalillo, and Valencia counties, identified as EDA area 146, and designated as having substantial and persistent unemployment in accordance with Public Law 87-27. Of the total first cost of construction 13.78 percent of this money will be paid as salaries to unemployed individuals based upon the following mathematical assumptions:

First Cost of Construction	$X
26 Percent Labor	.26X

Breakdown of Labor	Percentage Hired Labor	X	Percentage Unemployed	X	Weighted Percentage	=	Factor
Supervisory	10%		0%		26%		0x
Skilled	20%		30%		26%		.0156x
Unskilled	20%		47%		26%		.0244x
Other	50%		35%		26%		.0455x
							.0855x

FLOOD DAMAGES PREVENTED - BELEN UNIT-WEST

(6-7/8 PERCENT INTEREST, 100-YEAR PROJECT LIFE, OCT 1978 PRICES)

AVERAGE ANNUAL FLOOD DAMAGES PREVENTED (IN $1000)

SURVEY YEAR	1980	1990	2000	2010	2011
1,026.7	1,030.0	1,043.0	1,044.4	1,045.9	1,046.1
INCREASE EQUALS		13.0	1.4	1.5	0.2

1980-1990

PVIA(10) X INCREASE 1980-1990 X AM(100) /10
(35.00736) (13.0) (0.06884)/10 = 3.1

PVA1(90) X PV1(10) X INCREASE 1980-1990 X AM(100)
(14.50882) (0.51433) (13.0) (0.06884) = 6.7

1990-2000

PVIA(10) X PV1(10) X INCREASE 1990-2000 X AM(100) /10
(35.007367) (0.51433) (1.4) (0.06884)/10 = 0.2

PVA1(80) X PV1(20) X INCREASE 1990-2000 X AM(100)
(14.47423) (0.26453) (1.4) (0.06884) = 0.4

2000-2010

PVIA(10) X PV1(20) X INCREASE 2000-2010 X AM(100) /10
(35.007367) (0.26453) (1.5) (0.06884)/10 = 0.1

PVA1(70) X PV1(30) X INCREASE 2000-2010 X AM(100)
(14.40697) (0.13606) (1.5) (0.06884) = 0.2

2010-2011

PVIA(1) X PV1(30) X INCREASE 2010-2011 X AM(100) /1
(0.93567) (0.13606) (0.2) (0.06884)/1 = 0.0

PVA1(69) X PV1(31) X INCREASE 2010-2011 X AM(100)
(14.39745) (0.12730) (0.2) (0.06884) = 0.0

TOTAL = 10.7

LEGEND

PV1A = Present Value of Increasing Annuity
PVA1 = Present Value of 1 Annuity Per Year
PV1 = Present Value 1
AM = Amortization

ALBUQUERQUE, NEW MEXICO
RIO GRANDE

EXAMPLE COMPUTATION OF AVERAGE ANNUAL EQUIVALENT FUTURE BENEFITS

FIG. 4

RESIDENTIAL AFFLUENCE BENEFITS - BELEN UNIT-WEST

(6-7/8 Percent Interest, October 78 Price Levels. 100-Year Project Life)

AVERAGE ANNUAL CONTENT DAMAGES PREVENTED (IN $1000)

	EXISTING(1980)	1990	2000	2010	2011
	235.1	242.4	243.1	244.0	244.1
INCREASE		7.3	0.7	0.9	0.1

EXISTING AFFLUENCE BENEFITS

INCREASED AFFLUENCE BENEFITS OF EXISTING CONTENTS, 1975 TO 1980

EXISTING CONTENT DAMAGES PREVENTED X AFFLUENCE FACTOR

(235.1) (0.183) = 43.00

FUTURE AFFLUENCE BENEFITS

FUTURE AFFLUENCE BENEFITS OF EXISTING CONTENTS, 1980 TO 1989

PVIA(9) X EXIST. CONT. DMGS. PREVENT. X AFFLUENCE FACTOR X AM(100) /9

(29.8641) (235.1) (0.317) (0.06884)/9 = 17.00

PVA1(91) X PV1(9) X EXIST. CONT. DMGS. PREVENT. X AFFLUENCE FACTOR X AM(100)

(14.51118) (0.54969) (235.1) (0.317) (0.06884) = 40.90

AFFLUENCE OF FUTURE GROWTH BETWEEN 1980 AND 2011

1980-1990

PVIA(10) X INCREASE 1980-1990 X AFFLUENCE FACTOR X AM(100) /10

(35.00736) (7.3) (0.5) (0.06884)/10 = 0.90

PVA1(90) X PV1(10) X INCREASE 1980-1990 X AFFLUENCE FACTOR X AM(100)

(14.50882) (0.51433) (7.3) (0.5) (0.06884) = 1.90

LEGEND

PV1A = Present Value of Increasing Annuity
PVA1 = Present Value of 1 Annuity Per Year
PV1 = Present Value 1
PM = Amortization

ALBUQUERQUE, NEW MEXICO
RIO GRANDE

EXAMPLE COMPUTATION OF AFFLUENCE BENEFITS

FIG.5

1990-2000

PVIA(10)	X PV1(10)	X	INCREASE 1990-2000	X AFFLUENCE FACTOR	X AM(100)	/10
(35.00736)	(0.51433)		(0.7)	(0.5)	(0.06884)	/10 = 0.00
PVA1(80)	X PV1(20)	X	INCREASE 1990-2000	X AFFLUENCE FACTOR	X AM(100)	
(14.47423)	(0.26453)]		(0.7)	(0.5)	(0.06884)	= 0.10

2000-2010

PVIA(10)	X PV1(20)	X	INCREASE 2000-2010	X AFFLUENCE FACTOR	X AM(100)	/10
(35.00736)	(0.26453)		(0.9)	(0.5)	(0.06884)	/10 = 0.00
PVA1(70)	X PV1(30)	X	INCREASE 2000-2010	X AFFLUENCE FACTOR	X AM(100)	
(14.40967)	(0.13606)		(0.9)	(0.5)	(0.06884)	= 0.10

2010-2011

PVIA(1)	X PV1(30)	X	INCREASE 2010-2011	X AFFLUENCE FACTOR	X AM(100)	/1
(0.93567)	(0.13606)		(0.1)	(0.5)	(0.06884)	/1 = 0.00
PVA1(69)	X PV1(31)	X	INCREASE 2010-2011	X AFFLUENCE FACTOR	X AM(100)	
(14.39745)	(0.12730)		(0.1)	(0.5)	(0.06884)	= 0.00

TOTAL FUTURE AFFLUENCE BENEFITS = 60.90

TOTAL AVERAGE ANNUAL AFFLUENCE BENEFITS = 103.9

ALBUQUERQUE, NEW MEXICO
RIO GRANDE

EXAMPLE COMPUTATION OF AFFLUENCE BENEFITS

FIG.5 (CONT'D)

Table B-24
Average Annual Affluence Damages
Oct 1978 Prices ($1,000) Base Year 1980

	Without Plans A or B	With Plan A or Plan B	With Plan C	Prevented By Plans A or B	Prevented By Plan C
Bernalillo					
Existing - 1980	$ 4.8	$ 4.8	$ 4.8	$ 0	$ 0
Future	11.7	11.7	11.7	0	0
TOTAL	$ 16.5	$ 16.5	$ 16.5	$ 0	$ 0
Corrales					
Existing - 1980	$ 37.0	$ 0	$ 1.8	$ 37.0	$ 35.2
Future	50.1	0	2.5	50.1	47.6
TOTAL	$ 87.1	$ 0	$ 4.3	$ 87.1	$ 82.8
Albuquerque-East					
Existing - 1980	$ 44.6	$ 0	$ 44.6	$ 44.6	$ 0
Future	79.5	0	79.5	79.5	0
TOTAL	$124.1	$ 0	$124.1	$124.1	$ 0
Albuquerque-West					
Existing - 1980	$ 21.1	$ 0	$ 21.1	$ 21.1	$ 0
Future	44.2	0	44.2	44.2	0
TOTAL	$ 65.3	$ 0	$ 65.3	$ 65.3	$ 0
Mountain View					
Existing - 1980	$ 0.8	$ 0	$ 0	$ 0.8	$ 0.8
Future	1.1	0	0	1.1	1.1
TOTAL	$ 1.9	$ 0	$ 0	$ 1.9	$ 1.9

Table B-24 (Cont'd)
Average Annual Affluence Damages
Oct 1978 Prices ($1,000) Base Year 1980

	Without Plans A or B	With Plan A or Plan B	With Plan C	Prevented By Plans A or B	Prevented By Plan C
Isleta-East					
Existing - 1980	$ 0	$ 0	$ 0	$ 0	$ 0
Future	0	0	0	0	0
TOTAL	$ 0	$ 0	$ 0	$ 0	$ 0
Isleta-West					
Existing	$ 8.4	$ 0	$ 2.1	$ 8.4	$ 6.3
Future	11.3	0	2.7	11.3	8.6
TOTAL	$ 19.7	$ 0	$ 4.8	$ 19.7	$ 14.9
Belen-East					
Existing	$ 65.4	$ 0	$ 5.9	$ 65.4	$ 59.5
Future	88.4	0	8.0	88.4	80.4
TOTAL	$153.8	$ 0	$ 13.9	$153.8	$139.9
Belen-West					
Existing	$ 43.0	$ 0	$ 4.7	$ 43.0	$ 38.3
Future	60.9	0	6.7	60.9	54.2
TOTAL	$103.9	$ 0	$ 11.4	$103.9	$ 92.5
TOTAL					
Existing	$225.1	$ 4.8	$ 85.0	$220.3	$140.1
Future	347.2	11.7	155.3	335.5	191.9
TOTAL	$572.3	$ 16.5	$240.3	$555.8	$332.0

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The resultant amount is then amortized over a 100-year period of analysis at 6-7/8 percent to derive the average annual benefit. The benefits were computed for each economic unit as presented in Table B-25 and the study area total average annual benefit is $222,100 for Plan A, $225,500 for Plan B, and $157,200 for Plan C.

TABLE B-25

ECONOMIC DEVELOPMENT BENEFITS
Oct 1978 Prices - 6-7/8%

ECONOMIC UNIT	BENEFITS ($1000) Plan A	Plan B	Plan C
Bernalillo	-0-	-0-	-0-
Corrales	23.8	23.8	18.1
Albuquerque - East	8.5	8.5	-0-
Albuquerque - West	11.2	11.2	-0-
Mountainview	13.1	13.1	10.5
Isleta - East	-0-	-0-	-0-
Isleta - West	17.4	20.8	9.2
Belen - East	78.3	78.3	64.2
Belen - West	69.8	65.2	52.3
Subtotal	222.1	220.9	154.3
Wetland Creation	-	4.6	2.9
TOTAL	222.1	225.5	157.2

Induced Damages. Induced damages are sometimes called negative benefits because they result when flood protective works are constructed in one area and damages in an adjacent area become greater than damages prior to the improvements. This condition occurs in this study mainly where levees are rehabilitated and improved on one side of the Rio Grande but not on the other. The new levees

reduce damages on the one side of the river. However, by preventing flood waters from going into the overbank areas on one side, the area of flow is reduced and the water surface levels become higher than prior to the improvements. For example, the Isleta Unit - East, which under existing conditions, experiences an average damage rate of $7,400 per year. By improving all units upstream and the Isleta Unit - West levees to provide SPF protection, the water surface of the Standard Project Flood would be raised about 6 feet in the Isleta Unit - East. Smaller raises would occur for more frequent floods. This raise would increase damages to the Isleta Unit - East to an average damage rate of $10,700 per year. Computing the benefits by subtracting postproject damages from preproject damages yields a negative $3,300 per year. This is the amount recorded in Tables B-26 and B-27. Similarly, raising the levees at Isleta Unit - West to provide 42,000 c.f.s. flood protection would elevate the water surafce for 42,000 c.f.s. at Isleta Unit - East slightly more than 2 feet higher than the 42,000 c.f.s. elevation under existing conditions. This increased flooding depth for a 42,000 c.f.s. at Isleta Unit - East would induce damages to the concessionaire building and the fishing lakes amounting to $2,800 per year. Because of the type of property being damaged and the depth of flooding being greater than 3 feet, floodproofing or flood plain evacuation do not seem to be methods whereby this induced damage can be mitigated. However, for damages induced by more frequent flooding, floodproofing may be adequate to mitigate the damages.

The damages induced on the Bernalillo Unit by raising the levees on the Corrales Unit are indicated by a slight change in the upper end of the stage-frequency curve. If Corrales were provided SPF protection, induce damages in the Bernalillo Unit would amount to $800 per year. In the case of providing Corrales with only 42,000 c.f.s. flood protection, this damage induced on the Bernilillo Unit would be $500 per year. These induced damages are the sum of those occurring to numerous structures. It would not be practical to mitigate these

TABLE B-26

SUMMARY OF BENEFITS FOR PLAN A

($1,000 PER YEAR) OCT 78 PRICES

Economic Unit	Total Average Annual Flood Damages Prevented		Total Average Annual Business Losses Prevented		Total Average Annual Affluence		Total Average Annual Flood Control Benefits	Average Annual Economic Development Benefits	Other Benefits	TOTAI BENEFITS
	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980				
Bernalillo	**-0.8***	0	0	0	0	0	**-0.8***	0	- -	**-0.8***
Corrales	**656.0**	**1.1**	**6.6**	0	**37.0**	**50.1**	**750.8**	23.8	- -	774.6
Albuquerque - East	**901.1**	**124.8**	**30.6**	**3.3**	**44.6**	**79.5**	**1,183.9**	8.5	- -	1,192.4
Albuquerque - West	**336.3**	**78.2**	**3.4**	**0.5**	**21.1**	**44.2**	**483.7**	11.2	- -	494.9
Mountainview	**124.0**	0.1	**30.3**	0	**0.8**	**1.1**	**156.3**	13.1	- -	169.4
Isleta - East	**-3.3***	0	0	0	0	0	**-3.3***	0	- -	**-3.3***
Isleta - West	128.2	0	0.2	0	8.4	11.3	148.1	17.4	- -	168.9
Belen - East	**1,151.2**	**1.8**	**16.9**	0	**65.4**	**88.4**	**1,323.7**	78.3	- -	1,402.0
Belen - West	1,018.7	**10.9**	**34.3**	0	**43.0**	**60.9**	1,167.8	69.8	- -	1,233.0
TOTAL	4,311.4	**216.9**	122.3	**3.8**	220.3	335.5	5,210.2	222.1	**- -**	5,432.3

*Induced Damages.

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TABLE B-27

SUMMARY OF BENEFITS FOR PLAN B

($1,000 PER YEAR) OCT 78 PRICES

Economic Unit	Total Average Annual Flood Damages Prevented		Total Average Annual Business Losses Prevented		Total Average Annual Affluence		Total Average Annual Flood Control Benefits	Average Annual Economic Development Benefits	Other Benefits	Total Benefits
	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980				
Bernalillo	**-0.8***	0	0	0	0	**0**	**-0.8***	0	- -	**-0.8***
Corrales	**656.0**	**1.1**	**6.6**	0	**37.0**	**50.1**	**750.8**	23.8	- -	774.6
Albuquerque - East	**901.1**	**124.8**	**30.6**	**3.3**	**44.6**	**79.5**	**1,183.9**	8.5	- -	1,192.4
Albuquerque - West	**336.3**	**78.2**	**3.4**	**0.5**	**21.1**	**44.2**	**483.7**	11.2	- -	494.9
Mountainview	**124.0**	**0.1**	**30.3**	0	**0.8**	**1.1**	**156.3**	13.1	- -	169.4
Isleta - East	**-3.3***	0	0	0	0	0	**-3.3***	0	- -	**-3.3***
Isleta - West	128.2	0	0.2	0	8.4	11.3	148.1	20.8	- -	168.9
Belen - East	**1,151.2**	**1.8**	**16.9**	0	**65.4**	**88.4**	**1,323.7**	78.3	- -	1,402.0
Belen - West	1,018.7	**10.9**	**34.3**	0	**43.0**	**60.9**	1,167.8	65.2	- -	1,233.0
Wetland Creation								4.6	- -	4.6
TOTAL	4,311.4	**216.9**	122.3	**3.8**	220.3	335.5	5,210.2	225.5	- -	5,435.7

*Induced Damages.

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TABLE B-28

SUMMARY OF BENEFITS FOR PLAN C

OCT 78 PRICES, ($1,000), 6-7/8%

Economic Unit	Total Average Annual Flood Damages Prevented		Total Average Annual Business Losses Prevented		Total Average Annual Affluence		Total Average Annual Flood Control Benefits	Average Annual Economic Developments Benefits	Other Benefits	Total Benefits
	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980	Existing 1980	Future Discounted to 1980				
Bernalillo	- 0.5*	0.0	0.0	0.0	0.0	0.0	- 0.5*	0.0	- -	- 0.5*
Corrales	623.2	1.0	6.3	0.0	35.2	47.6	713.3	18.1	- -	731.4
Albuquerque-East	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -	0.0
Albuquerque-West	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -	0.0
Mountainveiw	124.1	0.1	30.3	0.0	0.8	1.1	156.4	10.5	- -	166.9
Isleta-East	- 2.8*	0.0	0.0	0.0	0.0	0.0	- 2.8*	0.0	- -	- 2.8*
Isleta-West	88.1	0.0	0.2	0.0	6.3	8.6	103.2	9.2	- -	112.4
Belen-East	1047.6	1.6	15.4	0.0	59.5	80.4	1204.5	64.2	- -	1,268.4
Belen-West	908.8	9.7	30.5	0.0	38.3	54.2	1041.5	52.3	- -	1,093.8
Wetlands Creation	- -	- -	- -	- -	- -	- -	- -	2.9	- -	2.9
TOTAL	2,788.5	12.4	82.7	0.0	140.1	191.9	3,215.6	157.2	- -	3,372.8

*Induced Damages.

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damages by any known structural or non-structural measure or to accurately compensate for them. The induced damages for Plan C at Bernalillo and Isleta East are presented in Table B-28.

The condition for induced damages also occurs in this study in the area immediately adjacent to the end of the Belen - West downstream closure. The closure levee confines the Rio Grande flood flows to a narrow cross section and consequently keeps the flood water surface high until it reaches the end of the closure. A short distance upstream of the end of the closure, the water surface profile of flood flows greater than the existing levee capacity will begin to drop rapidly but will be higher at the end of the closure than had no closure been built. The area of influence of this higher water level would be very small because the water surface would slope steeply down to the water level that would result had no closure been built. The end of the closure was located near a sparsely populated area for the purpose of eliminating induced damages.

Benefit Summary. The estimated average annual benefits at 6-7/8 and October 1978 prices for Plans A, B, and C are presented and summarized in Tables B-26, B-27, and B-28.

PLANNING OBJECTIVE FULFILLMENT

The next step in the evaluation process is to determine how well Plans A, B, and C, and the "no-action" alternative address the planning objectives identified in Section I of Appendix A. Table B-29 illustrates which planning objectives are accomplished by the three alternatives.

Table B-29

PLANNING OBJECTIVE FULFILLMENT

PLANNING OBJECTIVES	PLAN A	PLAN B	PLAN C	NO ACTION
a. Eliminate threat to life posed by Rio Grande Flooding	Yes	Yes	Yes	No
b. Reduce inundation, scour, and sediment damages caused by Rio Grande floodflows	Yes	Yes	Yes	No
c. Preserve existing riparian woodland along the Rio Grande	90%	95%	97%	Yes[1/]
d. Restore existing riparian woodland which has been destroyed in the past	No	No	No	No
e. Increase wildlife habitat in the flood plain	No	For Some species	For Some species	No
f. Preserve existing wetlands	Partially	Yes	Yes	Yes[1/]
g. Create new wetlands	No	Yes	Yes	No
h. Provide increased recreational opportunities associated with a riparian environment	No	Yes	Yes	No
i. Provide increased water-based recreational opportunities along the Rio Grande	No	No	No	No
j. Reduce aggradation of the Rio Grande	No	No	No	No

1/ Except for destruction due to future encroachment and development.

TABLE B-30

APPLICATION OF SPECIFIED CRITERIA

CRITERIA	PLAN A	PLAN B	PLAN C	"NO-ACTION" ALTERNATIVE
1. Acceptability	Acceptable to all but the environmentally conscious *	Acceptable to all but preservationists. *	Acceptable to all but preservationists.	Unacceptable to all but preservationists.
2. Completeness	Depends upon local assurances.	Same as for Plan A	Same as for Plan A	N/A
3. Effectiveness	Achieves most NED objectives but not streambed aggradation.	Achieves most NED objectives and some EQ objectives.	Achieves most NED objectives and some EQ objectives.	Could achieve one EQ objective, preservation of existing riparian woodland.
4. Efficiency	Only feasible plan to achieve NED objectives.	Only feasible plan to achieve both NED and some EQ objectives.	Only feasible plan to achieve both NED and some EQ objectives.	N/A
5. Certainty	All NED objectives except aggradation would certainly be attained.	Both NED and some EQ objectives addressed by this plan would be attained.	Both NED and some EQ objectives addressed by this plan would be attained.	No certainty that riparian woodland or existing wetlands would be preserved.
6. Geographic scope	Encompasses the total area of the study area where development exists or can reasonably be expected to exist in the future.	Same as Plan A.	Same as Plan A.	Same as Plan A.

Table B-30 (Cont'd)

APPLICATION OF SPECIFIED CRITERIA

CRITERIA	PLAN A	PLAN B	PLAN C	"NO-ACTION" ALTERNATIVE
7. NED benefit-cost ratio	1.52	1.53	1.53	N/A
8. Reversibility	Levees could be remobed, but highly improbable.	Same as Plan A	Same as Plan A	Essentially the "without" condition. Could be reversed easily.
9. Stability	Can accommodate a full range of alternative futures	Same as Plan A	Same as Plan A	Remaining flood hazard would reduce the range of alternative futures and create pressure that would make conditions unstable.

* Plans A and B are acceptable on principal only. Due to local economic priorities, the expenditures required for SPF protection by local sponsors did not have the priority required to make Plans A and B acceptable. The reader is referred to the Comments of Appendix D.

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APPLICATION OF SPECIFIED EVALUATION CRITERIA

Another evaluation activity is to apply criteria specified in ER 1105-2-250 to determine the responsiveness of each alternative. Table B-30 illustrates the responsiveness of each plan to acceptability, completeness, effectiveness, efficiency, certainty, geographic scope, NED benefit-cost ratio, reversability, and stability.

SECTION E

INSTITUTIONAL ANALYSIS & DIVISION OF PLAN RESPONSIBILITIES

In order to determine the implementability of any alternative for flood control within the Middle Rio Grande valley, the existing institutions affected by such a plan and their functional responsibilities must be identified. The interaction between these various institutions and New Mexico water-rights law with regard to water resources and related land uses must then be determined.

EXISTING INSTITUTIONS

The following Federal, State, regional, and local institutions would be directly affected by any alternative for flood control within the Middle Rio Grande valley.

Federal Agencies:

The Soil Conservation Service generally administers its programs at field locations through the locally organized Natural Resource Conservation Districts. Programs carried out are Watershed Protection and Flood Prevention, Great Plains Conservation Program and Resource Conservation and Development, including surveys, investigations, technical assistance, and cost sharing. Other programs for which the Soil Conservation Service provides technical assistance are River Basin Studies and Agricultural Conservation Programs.

Albuquerque District, Corps of Engineers' primary mission is the execution of the Corps water resources program. It conducts survey investigations to determine the need and feasibility of improvements for flood control and related purposes, and the planning, construction, and operation of those projects which gain congressional approval and authorization. In addition, it is the responsible agency for the Urban Studies Program within its area of responsibility.

The Flood Insurance Administration is responsible for carrying out a national flood insurance program which will enable persons to purchase insurance against loss resulting from floods occurring in the United States and its territories.

Bureau of Indian Affairs has responsibility for planning, coordinating, and directing administrative, social, governmental, education and economic development programs for the several reservations within their jurisdiction; and for integrating Bureau of Indian Affairs' plans and programs with State, local, and other Federal agencies. The Bureau is responsible for water resources projects; e.g., irrigation on the reservations and for water and wastewater facilities for Federal installations located therein.

Bureau of Land Management (State of New Mexico Office). As manager of the public domain, the Bureau of Land Management in New Mexico administers over 13,000,000 acres of land, carrying out the functions concerned with identification, classification, use, and disposal of those lands, and the development, conservation, management and utilization of the natural resources of those lands.

Bureau of Reclamation (Albuquerque Planning Office) conducts investigations and evolves plans for optimum development, use, conservation, and control of interbasin, basin and project water resources for all purposes, and of related natural resources, including overall river regulation for optimum conservation and use, in cooperation with other Federal agencies, the states, and local agencies.

The Bureau of Reclamation was responsible for construction of water collection, diversion, and distribution features comprising the multipurpose San Juan-Chama project located in south-central Colorado and north-central New Mexico.

The Upper Rio Grande Basin Projects Office is responsible for the operation and maintenance of the San Juan-Chama Project, Rio Grande Channel rectification works from Espanola to the headwaters of Elephant Butte Reservoir, operation and maintenance of a low-flow conveyance channel extending from San Acacia Dam to the narrows of Elephant Butte Reservoir, and water of the San Juan-Chama Project water in New Mexico.

At the request of the Middle Rio Grande Conservancy District, the Secretary of Interior returned all operation and maintenance functions for the irrigation district to the District on 1 February 1975.

Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife Regional Office, is the primary agency through which the Federal Government carries out its responsibilities for preserving, conserving, developing, utilizing and protecting the sport fish and wildlife resources of the United States. The programs which the Bureau administers that are applicable to the Urban Studies Program are: (1) acquisition, development, protection, and management of wildlife refuges; (2) enforcement of Federal laws and regulations;

(3) development and application of management methods and techniques; (4) analysis, review and recommendations of proposed water resources development projects; and (5) technical assistance to Federal, State, Indian tribal groups, and to private organizations.

Geological Survey (Water Resources Division) investigates and determines the source, quality, quantity, distribution, movement, and availability of surface and ground water within New Mexico. The water resources investigation program consists of the collection of basic information through hydrologic monitoring, interpretive studies and research. The data collected, studies, and research findings are published by the Geological Survey, State agencies, and nongovernmental scientific organizations.

The appraisal of water resources in New Mexico is a cooperative effort in which planning and financial support are shared by the Geological Survey, State agencies, local governments, and other Federal agencies.

State Agencies:

The New Mexico Water Quality Control Commission has no staff of its own. Instead, its administrative duties are assigned to its constituent agencies, which are already established State agencies. Activities of the Commission include adoption of a comprehensive water quality program; adoption of water quality standards and regulations to prevent and abate water pollution; and assignment of responsibility for administering regulations to its constituent agencies. The Commission may also enter into agreements with the National government or other State governments; may grant variances of regulations; may require notice of introduction of contaminants into state waters; and may accept and supervise administration of loans and grants. The following agencies are the members of the Commission:

1. Environmental Improvement Agency
2. State Engineer and Interstate Stream Commission
3. Department of Game and Fish
4. Oil Conservation Commission
5. Department of Agriculture
6. State Parks and Recreation
7. Natural Resource Conservation Commission
8. Bureau of Mines and Mineral Resources.

State Engineer Office has general supervision of the measurement, appropriation, and distribution of surface and ground waters of the state. He is directed to make hydrographic surveys and investigation of each stream system and source of water to obtain all available data for the development of the water supply and for determination and adjudication of water rights. The State Engineer is by statute the New Mexico Commissioner on the Rio Grande Compact Commission.

Interstate Stream Commission institutes negotiations or causes to be instituted in the name of the State necessary negotiations and legal proceedings to protect, conserve and develop the waters and stream systems of the State. The State Engineer is the Secretary of the Commission and directs the work of the staff.

Park and Recreation Commission acquires, develops, maintains, manages and supervises State parks and recreation areas. The Commission prescribes standards, policies and uses of State park and recreation areas; acquires land or interests in land; enters into agreements and contracts with Federal government agencies in obtaining funds or assistance for acquisition, erection, maintenance and operation of State parks and recreation areas. It contracts for surveys and studies; conducts feasibility studies of potential sites for future parks, recreation areas, monuments, museums, and scientific and historical exhibits; grants concessions; exercises general

police power in enforcing State laws and the Commission's rules and regulations within State parks and recreation areas; and determines fees and charges.

Department of Game and Fish was created to provide an adequate and flexible system for the protection of game and fish and for their use and development for public recreation and food. The Department is to provide for the propagation, planting, protection, regulation and conservation of game and fish to the extent necessary to provide and maintain an adequate supply.

Regional Agencies:

The Middle Rio Grande Council of Governments of New Mexico is designated by the U.S. Department of Housing and Urban Development as a metropolitan regional planning agency, operating in accordance with HUD requirements and guidelines and designated by the Economic Development Administration as an Economic Development District. It is also designated as a multimodal, multijurisdictional metropolitan planning organization, under the Federal-Aid Highway Act of 1973, the Urban Mass Transit Act of 1974, as amended, and the Airport and Airway Development Act of 1970. The COG member agencies provide the basic financial support for their local inter-governmental areawide programs. Financial assistance with these programs is received from the State of New Mexico and the Federal Government, through the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the U.S. Department of Commerce. It is the A-95 review agency for State Planning and Development District No. 3. It also serves as the planning agency for all communities within the area except Albuquerque.

Middle Rio Grande Conservancy District is a political subdivision of the State of New Mexico with the powers of a public corporation and with legal authority under the 1923 New Mexico statute on

Conservancy Subdivision is concerned with irrigation water, silting, and related problems, as well as flood control and drainage. The District includes Sandoval, Bernalillo, Valencia, and Socorro counties.

The Central Rio Grande Natural Resource Conservation District, created in 1943 under the New Mexico State Law of 1937 on Soil and Water Conservation Districts, this District includes parts of Bernalillo, Valencia, McKinley, Sandoval and Santa Fe counties. The organization is governed by a Board of Supervisors elected by landowners in the District and is primarily interested in promoting sound soil and water conservation practices.

The Albuquerque Metropolitan Arroyo Flood Control Authority, created under the New Mexico Arroyo Flood Control Act of 1963, is responsible for planning, construction and maintenance of flood control systems in the Greater Albuquerque area.

The Rio Grande Compact Commission was established by the Rio Grande Compact of 1939 for the purpose of administering the Compact. The Compact made an equitable apportionment of Rio Grande waters among the states of Colorado, New Mexico, and Texas. Projects under consideration within the basin cannot have the effect of reducing water deliveries as established by the Compact.

Local Agency:

City of Albuquerque. As the major city in the study area, Albuquerque also has the major local staff capabilities in the water resources field. The Planning Department serves as the city's water resources coordinating agency. It also serves as the Bernalillo County planning department through contractual agreement.

WATER RIGHTS LAW OF NEW MEXICO

New Mexico water rights are based on the doctrine of prior appropriation. All of New Mexico's ground and surface waters belong to the public and are subject to appropriation in accordance with law. The surface water code provides that an appropriation of surface water may be initiated after 1907 only by application to and approval of the State Engineer. When the State Engineer finds that an underground water source has reasonably ascertainable boundaries and so proclaims, he assumes jurisdiction over the appropriation of ground water within the basin and supervises its appropriation and use. The Rio Grande Compact also imposes certain constraints on the use of waters in the Rio Grande stream system.

Surface waters within the Rio Grande drainage are fully appropriated. Changes in points of diversion, places and purposes of use may be made provided no detrimental effects to existing rights will result. Such changes or new appropriation require a permit from the State Engineer.

Most of the area is within the boundaries of underground water basins as declared by the State Engineer. Permits from the State Engineer are necessary prior to drilling wells within the declared basin boundaries. No permit is required to drill in those portions of the area outside the declared basins.

Most of the area is within the boundaries of the declared Rio Grande Underground Water Basin. New appropriations of ground water, except for domestic and stock watering purposes generally are not permitted within the basin unless the effects of the withdrawal on the flow of the Rio Grande are offset by the retirement of existing rights.

Several Indian pueblos in New Mexico are contesting the present water appropriations. This issue is presently in Federal Court for adjudication. The outcome of this decision could affect the appropriations of water to the pueblos in the study area.

INSTITUTIONAL ARRANGEMENTS FOR PLAN IMPLEMENTATION

Neither Plan A, its environmentally oriented modification, Plan B, nor Plan C would require a change in institutional arrangements or their respective functions in order to be effectively implemented. Following construction of the project, the Middle Rio Grande Conservancy District would retain the responsibility for operation and maintenance of the project. Should Plan B or Plan C be selected for implementation, a question of water rights immediately arises in conjunction with utilizing ground water as the source of water for the borrow areas selected for creation into wetlands. Prior water rights must be secured equal to the difference between the water loss due to evaporation which would take place under this plan minus that lost due to evapotranspiration, if excavation did not penetrate the water table.

Also under Plan B or C, management of the created wetlands must by assured before this portion of the plan can be recommended for implementation.

DIVISION OF PLAN RESPONSIBILITIES

The purpose of this section is to present pertinent information concerning the Federal and non-Federal responsibilities regarding cost apportionment and the division of responsibilities for construction and subsequent operation and maintenance of the proposed project. Such cost apportionment is based on Federal legislation and administrative policies governing flood control channel projects and associated recreational development at nonreservoir projects.

Cost Apportionment. Sharing of costs between Federal and non-Federal interests for the project would be based on standard requirements established as Federal policy for flood control and recreation projects. Section 3 of the Flood Control Act of June 1936, Public Law 74-738, and subsequent amendments, have established Federal policies of local cooperation for flood control projects. Under the flood control policy, non-Federal interests would be required to furnish all lands, rights-of-way and easements, and all relocations and alterations required by the plan. Non-Federal interests would also bear the costs of operating and maintaining all project features after construction in accordance with Federal requirements. The Federal Government would be responsible for all flood control construction costs. Table B-31 shows the apportionment of the first costs (including wetland creation and mitigation) and annual operation, maintenance, and major replacement costs between Federal and non-Federal interests, in accordance with the policies outlined above for both Plans A, B, and C.

Cost Apportionment Based on Executive Water Policy Initiatives. The President, in his June 1978 water policy message to Congress, proposed several changes in cost sharing for water resources projects to allow States to participate more actively in project implementation decisions and to equalize cost sharing between structural and nonstructural flood control projects. These changes include a cash contribution from benefiting states of 5 percent of construction costs associated with non-vendible outputs and 10 percent of costs associated with vendible outputs. Flood control is not classified as a vendible product. Application of this policy to the levee rehabilitation project would require the State of New Mexico to contribute an estimated $2,509,000 for Plan A, $2,466,000 for Plan B, or $1,494,000 for Plan C at October 1978 price levels. The President also proposed that the present cost-sharing requirements

TABLE B-31

COST APPORTIONMENT
October 1978 Prices

PLAN	FEDERAL	NON-FEDERAL	TOTAL
Plan A:			
First Cost	$40,514,000	$ 9,664,000	$50,178,000
Annual Costs			
Interest & Amortization	$ 2,783,000	$ 671,000	$ 3,454,000
Annual Maintenance, Operation, & Major Replacement Costs	$ 19,000	$ 110,000	$ 129,000
Subtotal Annual Costs	$ 2,802,000	$ 781,000	$ 3,583,000
Plan B:			
First Cost	$39,575,000	$ 9,743,000	$49,318,000
Annual Cost			
Interest & Amortization	$ 2,720,000	$ 674,000	$ 3,394,000
Annual Maintenance, Operation, & Major Replacement Costs	$ 35,000	$ 115,000	$ 150,000
Subtotal Annual Costs	$ 2,755,000	$ 789,000	$ 3,544,000
Plan C:			
First Cost	$28,376,000	$ 1,516,000	$29,892,000
Annual Cost			
Interest & Amortization	$ 1,947,500	$ 110,500	$ 2,058,000
Annual Maintenance, Operation & Major Replacement Costs	$ 40,000	$ 109,000	$ 149,000
Subtotal Annual Costs	$ 1,987,500	$ 219,500	$ 2,207,000

for flood control projects be modified to require a cash or in-kind contribution equal to 20 percent of the project first costs associated with flood control benefits. Application of this policy would require that non-Federal interests make, in addition to the State contribution, a cash or in-kind contribution of an estimated $10,036,000 for Plan A, $9,864,000 for Plan B, or $5,980,000 for Plan C at October 1978 price levels. Apportionment of costs under this policy is shown in Table B-32.

Federal Responsibilities. The Federal Government would design, prepare detailed plans and specifications, and construct the project. This would be accomplished after Congressional authorization and funding, and after the non-Federal items required prior to construction have been provided. The Federal Government would also be responsible for the relocation and modification of railroad bridges. The Federal Government would assume responsibility for its contractors during construction. The Federal Government would also bear a portion of the costs for management of the project area for fish and wildlife.

Non-Federal Responsibilities. The local sponsoring agency would be required to provide all lands, rights-of-way, and disposal areas and to perform all relocations and alterations of structures such as bridges (except railroad bridges), pipelines, utilities, and similar obstructions prior to construction of the proposed improvements. Local interests would be required to maintain, operate, and provide necessary replacements for the features of the project after completion. They would also share a portion of the annual cost for management of the project area for fish and wildlife purposes. The detailed items of local cooperation are listed in the Recommendations chapter (pages 209-211) in the Main Report.

TABLE B-32

COST APPORTIONMENT
UNDER PRESIDENT'S POLICY

October 1978 Prices

ITEM	PLAN A	PLAN B	PLAN C
Federal First Cost	$37,633,000	$36,988,000	$22,418,000
State of New Mexico's Cash Contribution (5%)	2,509,000	2,466,000	1,494,000
Non-Federal in-kind (Lands, easements, relocations)	9,690,000	9,749,000	1,796,000
Non-Federal Cash	346,000	115,000	4,184,000
Total non-federal other than State (20%)	10,036,000	9,864,000	5,980,000
Total non-federal (25%)	12,545,000	12,330,000	7,474,000
Total First Cost	$50,178,000	$49,318,000	$29,892,000
Interest & Amortization:			
Federal	$ 2,590,000	$ 2,546,000	$ 1,544,000
Non-Federal	864,000	848,000	514,000
TOTAL	$ 3,454,000	$ 3,394,000	$ 2,058,000
Annual Maintenance, Operation, & Management:			
Federal	$ 19,000	$ 36,000	$ 35,000
Non-Federal	110,000	114,000	114,000
TOTAL	$ 129,000	$ 150,000	$ 149,000
Total Federal Annual Costs:	$ 2,609,000	$ 2,582,000	$ 1,579,000
Total Non-Federal Annual Costs:	974,000	962,000	628,000
TOTAL ANNUAL COSTS:	$ 3,583,000	$ 3,544,000	$ 2,207,000

SECTION F

SYSTEM OF ACCOUNTS

Consistent with the requirements of the Water Resources Council Principles and Standards, the National Environmental Policy Act of 1969, and other related policies, Tables B-33, B-34, B-35, and B-36 are presented herein containing project details and project impacts under the various headings of the system of accounts for each of the plans considered at this point: Plans A, B, C, and the "no-action" Plan. These tables display the breadth and detail of the assessment and evaluation of final alternative plans. All significant impacts of and trade-offs between plans are covered. The conclusions section of the main report presents crucial factors that are relevent to plan selection.

TABLE B-33
SYSTEM OF ACCOUNTS
PLAN A

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
I. NATIONAL ECONOMIC DEVELOPMENT				
A. Beneficial effects				
1. Inundation Reduction				
a. Present	$4,311,400	$4,311,400	0	
b. Future	216,900	216,900	0	
2. Business Losses Prevented				
a. Present	122,300	122,300	0	
b. Future	3,800	3,800	0	
3. Affluence				
a. Present	220,300	220,300	0	
b. Future	335,500	335,500	0	
4. Value of output resulting from external economies	0	0	0	
5. EDA Benefits	222,100	222,100	0	
6. Fish & Wildlife Benefits	0	0	0	
7. Employment	30	30	0	
8. Total Beneficial effects	$5,432,300	$5,432,300	0	
B. Adverse effects				
1. Project Annual Cost				
a. Interest	3,449,000	3,449,000	0	
b. Amortization	5,000	5,000	0	
c. Operation & Maintenance	129,000	129,000	0	
2. Total Adverse Effects	$3,583,000	$3,583,000	0	
3. Net NED Benefits	$1,849,300	$1,849,300	0	
II. ENVIRONMENTAL QUALITY				
A. Environmental Quality Enhanced or Preserved				
B. Environmental Quality Degraded				
Vegetation	a. Loss of about 436 acres of riparian woodland from borrow areas (4,6,17). b. Loss of about 276 acres of riparian woodland as a consequence of levee enlargement (5,17).			
Animal Life	a. Losses associated with woodland removal from borrow areas (4,6,17). b. Losses associated with woodland removal as a consequence of levee displacement (5,17). c. Disturbance associated with construction activity and noise (7).			

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation).
4. Impact expected to be temporary.
5. Impact expected to be permanent.
6. Condition to gradually improve with regrowth, estimated to be between 5 and 75 years to attain similar stage of development
7. Impact expected for duration of construction or shortly thereafter.

Uncertainty

8. The uncertainty associated with the impact is 50% or more.
9. The uncertainty is between 10% and 50%.
10. The uncertainty is less than 10%.

Exclusivity

11. Overlapping entry; fully monetized in NED account.
12. Overlapping entry; not fully monetized in NED account.

Actuality

13. Impact will occur with implementation.
14. Impact will occur only when specific additional actions are carried out during implementation.
15. Impact will not occur because necessary additional actions are lacking.

Potential

16. Certain.
17. Certain but extent unknown.

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TABLE B-33 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN A

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
Aesthetics	a. Degraded aesthetic quality associated with removal of woodland from borrow areas (4,6,17) b. Degraded aesthetic quality associated with levee displacement (5,17).			Potential 18. 7.30% or more certainty. Section 122 *Items specifically required in Section 122 and ER 1105-2-240.
Air & Noise Pollution	a. Increase (4,7).			
Recreation	a. Impaired (4,6,7).			
C. Environmental Quality Destroyed				
Wetlands	Drainage of about 116 acres of marshland and coincident loss or reduction of wildlife (5).			
II. SOCIAL WELL-BEING (SWB) ACCOUNT				
A. Beneficial Effects				
1. Community Well-Being: Health & Safety				
a. Safety	Reduced hazard of flooding - (10,11,13)	No Effect	No Effect	
b. Health	Reduced health hazard from contaminated water & food supplies (10,13).	No Effect	No Effect	
*2. Public Facilities & Services	Reduced flood damage to public property-(10,11,13).	Decreased expenditure of revenues for flood damage to public property-(10,13).	No Effect	
B. Adverse Effects				
*1. Displacement of People	Three households must relocate-$35,500 per residence allocated-(10,11,13).	No effect	No effect	
*2. Noise	Increased during construction-(9,13).	No effect	No effect	
*3. Public Facilities & Services	Disruption of traffic flow during construction-(10,12,13)	Same as flood plain.	No effect	
4. Leisure, Cultural, & Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction-(9,13)	Same as flood plain.	No effect	
5. Aesthetic Effects	Some impairment of aesthetic attraction-particularly during construction-(9,13).	Same as flood plain.	No effect	

TABLE B-33 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN A

ACCOUNTS	LOCATION OF IMPACTS			INDEX OF FOOTNOTES
	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	
C. Net effects				
1. Community Well-Being: Health & Safety	Reduced flood & health hazards	No effect	No effect	
2. Public Facilities & Services				
a. Beneficial	Reduced flood damage to public property	Decreased expenditure of revenues for flood damage to public property	No effect	
b. Adverse	Disruption of traffic flow during construction	Same as flood plain	No effect	
3. Displacement of People	Relocation of three households with $35,500 per residence allocated	No effect	No effect	
4. Noise	Increased during construction	No effect	No effect	
5. Leisure, Cultural, Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction	Same as flood plain	No effect	

TABLE B-33 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN A

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
6. Aesthetic Effects	Some impairment of aesthetic attraction	Same as flood plain	No effect	
7. Community Cohesion	No definitive effect-(10)	No effect	No effect	
8. Community Growth	No appreciable effect-(9)	No effect	No effect	
9. Real Income Distribution of Benefits	Primary beneficiaries are lower-income families; however, benefits will accrue to all landowners (10, 13)	Lower-income workers will benefit from the recommended.	No effect	
IV. REGIONAL DEVELOPMENT (RD) ACCOUNT				
A. Beneficial Effects				
1. Income				
a. Inundation Reduction				
(1) Present	$4,311,400(2)	0	0	
(2) Future	216,900(3)	0	0	
b. Business Losses Prevented				
(1) Present	122,300(2)	0	0	
(2) Future	3,800(3)	0	0	
c. Affluence				
(1) Present	220,300(2)	0	0	
(2) Future	335,500(3)	0	0	
d. Value of Output from External Economies	0	0	0	
e. EDA Benefits: Value of Output from Use of Unemployed or Underemployed Resources	Benefits shared with region-(10,13,12)	$867,800 (10,12,13)	0	
f. Total Beneficial Effects	$5,432,300(1,3)	$867,800	0	
2. Employment	Benefits shared with region-(10,13,12)	53(10,12,13)	0	
3. Local Government Finance				
a. Property Values	Increase due to reduced flood hazard-(10,14)	No effect	No effect	
b. Tax Revenues				
(1) Property Tax	Increase concomitant with increased property values (10,14)	Benefits from higher property tax revenues to accrue to region (10,14)	No effect	

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TABLE B-33 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN A

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
b. Tax Revenues (cont)				
(2) Personal income tax	No effect	No effect	Some increase, benefits accrued in accordance with Federal tax distribution (10,13)	
(3) Sales tax	No effect	Some increase (10,13)	No effect	
(4) Expenditure for repair of flood damage to public property	No effect	Decrease - (10,13)	No effect	
B. Adverse Effects				
1. Income				
a. Construction				
(1) Interest	$ 660,000	0	$2,760,000	
(2) Amortization	1,000	0	2,000	
b. Operation & Maintenance	110,000	0	19,000	
c. Total	$ 771,000	0	$2.781,000	
2. Employment Displaced	No effect	No effect	No effect	
3. Loss of Cropland	$520,000/104 acres (10,11, 13)	Loss of property tax taxes from cropland - (10,13)	No effect	
4. Local Government Finance	No effect	Loss of revenue, i.e., property taxes, from the expropriated land-(10,13)	No effect	
C. Net effects				
1. Income	$3,868,000	$ 867,000	<$2,781,000>	
2. Employment	Benefits shared with region	53	0	
3. Local Government Finance				
a. Beneficial Effects	Increased property values and taxes	Increased revenues from higher property taxes in flood plain; sales tax (during construction); & decreased expenditure for flood-damaged public property	Some increase in personal income tax revenues (during construction)	
b. Adverse Effects	No effect	Some loss of property taxes from expropriated land	No effect	
4. Regional Growth	No appreciable effect (10)	No effect	No effect	
5. Population Distribution	May induce a less densely-developed area-(9,14)	No effect	No effect	

TABLE B-34
SYSTEM OF ACCOUNTS
PLAN B

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation
I. NATIONAL ECONOMIC DEVELOPMENT			
A. Beneficial Effects			
1. Inundation Reduction			
a. Present	$4,311,400	$4,311,400	0
b. Future	216,900	216,900	0
2. Business Losses Prevented			
a. Present	122,300	122,300	0
b. Future	3,800	3,800	0
3. Affluence			
a. Present	220,300	222,300	0
b. Future	335,500	335,500	0
4. Value of Output Resulting from External Economies	0	0	0
5. EDA Benefits	225,300	225,300	0
6. Fish & Wildlife Benefits	0	0	0
7. Employment	30	30	0
8. Total Beneficial Effects	$5,435,700	$5,435,700	0
B. Adverse Effects			
1. Project Annaul Costs			
a. Interest	3,389,000	3,389,000	0
b. Amortization	5,000	5,000	0
c. Operation & Maintenance	150,000	150.000	0
2. Total Adverse Effects	$3,544,000	$3,544,000	0
3. Net NED Benefits	$1,892,700	$1,892,700	0
II. ENVIRONMENTAL QUALITY			
A. Environmental Quality Enhanced or Preserved			
1. Wetlands	a. Development of marsh areas (18) b. Preservation of existing marshes (7)		
B. Environmental Quality Degraded			
1. Vegetation	a. Loss of about 436 acres of riparian woodland from borrow areas (4,6,17) b. Loss of about 276 acres of riparian woodland as a consequence of levee displacement (5,17)		
2. Animal life	a. Losses associated with woodland removal from borrow areas (4,6,17) b. Losses associated with woodland removal as a consequence of levee displacement (5,17) c. Disturbance associated with construction activities & noise (7)		
3. Aesthetics	a. Degraded aesthetic quality associated with removal of woodland from borrow areas (4,6,17) b. Degraded aesthetic quality associated with levee displacement (5,17)		

INDEX OF FOOTNOTES

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation).
4. Impact expected to be temporary.
5. Impact expected to be permanent.
6. Condition to gradually improve with regrowth, estimated to be between 5 and 75 years to attain similar stage of development.
7. Impact expected for duration of construction or shortly thereafter.

Uncertainty

8. The uncertainty associated with the impact is 50% or more.
9. The uncertainty is between 10% and 50%.
10. The uncertainty is less than 10%.

Exclusivity

11. Overlapping entry; fully monetized in NED account.
12. Overlapping entry; not fully monetized in NED account.

Actuality

13. Impact will occur with implementation.
14. Impact will occur only when specific additional actions are carried out during implementation.
15. Impact will not occur because necessary additional actions are lacking.

Potential

16. Certain.
17. Certain but extent unknown.
18. 7.50% or more certainty.

Section 122

*Items specifically required in Section 122 and ER 1105-2-240.

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TABLE B-34 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN B

ACCOUNTS	LOCATION OF IMPACTS			INDEX OF FOOTNOTES
	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	
4. Air & Water Pollution	a. Increases (4,7)			
5. Recreation Opportunities	a. Impaired (4,6,7)			
C. Environmental Quality Destroyed				
III. SOCIAL WELL-BEING (SWB) ACCOUNT				
A. Beneficial Effects				
1. Community Well-Being: Health & Safety				
a. Safety	Reduced hazard of flooding (10,11,13)	No effect	No effect	
b. Health	Reduced health hazard from contaminated water & food supplies (10,13)	No effect	No effect	
*2. Public Facilities & Services	Reduced flood damage to public property (10,11,13)	Decreased expenditure of revenues for flood damage to public property (10,13)	No effect	
B. Adverse Effects				
*1. Displacement of People	Three households must relocate - $35,500 per residence allocated - (10,11,13)	No effect	No effect	
*2. Noise	Increased during construction (9,13)	No effect	No effect	
*3. Public Facilities & Services	Disruption of traffic flow during construction (10,12,13)	Same as flood plain	No effect	
4. Leisure, Cultural, & Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction long-range enhancement (9,13)	Same as flood plain	No effect	
5. Aesthetic Effects	Some impairment of aesthetic attraction during construction long range enhancement (9,13)	Same as flood plain	No effect	

TABLE B-34 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN B

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
C. Net effects				
1. Community Well-Being: Health & Safety	Reduced flood & health hazards	No effect	No effect	
2. Public Facilities & Services				
a. Beneficial	Reduced flood damage to public property	Decreased expenditure of revenues for flood damage to public property.	No effect	
b. Adverse	Disruption of traffic flow during construction	Same as flood plain	No effect	
3. Displacement of People	Relocation of three households with $35,500 per residence allocated	No effect	No effect	
4. Noise	Increased during construction	No effect	No effect	
5. Leisure, Cultural, Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction	Same as flood plain	No effect	
6. Aesthetic Effects	Some impairment of aesthetic attraction during construction, long-range enhancement	Same as flood plain	No effect	
7. Community Cohesion	No definitive effect (10)	No effect	No effect	
8. Community Growth	No appreciable effect (9)	No effect	No effect	
9. Real Income Distribution of Benefits	Primary beneficiaries are lower-income facilies; however, benefits will accrue to all landowners (10,13)	Lower-income workers will benefit from the recommended plan	No effect	

TABLE B-34(Cont'd)
SYSTEM OF ACCOUNT
PLAN B

ACCOUNT	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
IV. REGIONAL DEVELOPMENT (RD) ACCOUNT				
A. Beneficial Effects				
1. Income				
a. Inundation Reduction		0	0	
(1) Present	$4,311,400	0	0	
(2) Future	216,900	0	0	
b. Business Losses Prevented		0	0	
(1) Present	122,300	0	0	
(2) Future	3,800	0	0	
c. Affluence		0	0	
(1) Present	220,300	0	0	
(2) Future	335,500	0	0	
d. Value of Output from External Economies	0	0	0	
e. EDA Benefits: Value of Output from Use of Unemployed or Under employed Resources	Benefits shared with region - (10,13,12)	$855,300 (10,12,13)	0	
f. Wetland Creation benefits	$ 0	0	0	
g. Total Beneficial Effects	$5,435,700	$855,300	0	
2. Employment	Benefits shared with region (10,13,12)	53 (10,12,13)	0	
3. Local Government Finance				
a. Property Values	Increase due to reduced flood hazard (10,14)	No effect	No effect	
b. Tax Revenues				
(1) Property tax	Increase concomitant with increased property values (10, 14)	Benefits from higher property tx revenues to accrue to region (10,14)	No effect	
(2) Personal income tax	No effect	No effect	Some increase, benefits accrued in accordance with Federal tax distribution (10,13)	
(3) Sales tax	No effect	Some Increase (10,13)	No effect	
(4) Expenditure for repair of flood damage to public property	No effect	Decrease (10,13)	No effect	

TABLE B-34 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN B

ACCOUNTS	LOCATION OF IMPACTS			INDEX OF FOOTNOTES
	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	
B. Adverse Effects				
1. Income				
a. Construction		0		
(1) Interest	672,000	0	2,717,000	
(2) Ammortization	1,000	0	4,000	
b. Operation & Maintenance	115,000	0	35,000	
c. Total	$ 788,000	0	$2,756,000	
2. Employment Displaced	No effect	No effect	No effect	
3. Loss of Cropland	$517,000/114 acres (10, 11,13)	Loss of property tax taxes from cropland (10, 13)	No effect	
4. Local Government Finance	No effect	Loss of revenue, i.e., property taxes, from the expropriated land (10,13)	No effect	
C. Net Effects				
1. Income	$3,916,000	$ 855,300	$2,756,000	
2. Employment	Benefits shared with region	53	0	
3. Local Government Finance				
a. Beneficial Effects	Increased property values & taxes	Increased revenues from higher property taxes in flood plain; sales tax (during construction); & decreased expenditure for flood-damaged public property	Some increase in personal income tax revenues (during construction)	
b. Adverse Effects	No effect	Some loss of property taxes from expropriated land	No effect	
4. Regional Growth	No appreciable effect (1)	No effect	No effect	
5. Population Distribution	May induce a less densely developed area (9,14)	No effect	No effect	

Revised April 1980

TABLE B-35
SYSTEM OF ACCOUNTS
PLAN C

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
I. NATIONAL ECONOMIC DEVELOPMENT				
A. Beneficial Effects				
1. Inundation Reduction				
a. Present	$2,788,500	$2,788,500	0	
b. Future	12,400	12,400	0	
2. Business Losses Prevented				
a. Present	82,700	82,700	0	
b. Future	0	0	0	
3. Affluence				
a. Present	140,100	140,100	0	
b. Future	191,900	191,900	0	
4. Value of Output Resulting from External Economies	0	0	0	
5. EDA Benefits	157,200	157,200	0	
6. Fish & Wildlife Benefits	0	0	0	
7. Employment	30	30	0	
8. Total Beneficial Effects	$3,372,800	$3,372,800	0	
B. Adverse Effects				
1. Project Annual Costs				
a. Interest	2,055,000	2,055,000	0	
b. Amortization	3,000	3,000	0	
c. Operation & Maintenance	149,000	149,000	0	
2. Total Adverse Effects	$2,207,000	$2,207,000	0	
3. Net NED Benefits	1,165,800	1,165,800	0	
II. ENVIRONMENTAL QUALITY				
A. Environmental Quality Enhanced or Preserved				
1. Wetlands	a. Development of marsh areas (18) b. Preservation of existing marshes (7)			
B. Environmental Quality Degraded				
1. Vegetation	a. Loss of about 150 acres of riparian woodland from borrow areas (4,6,17) b. Loss of about 105 acres of riparian woodland as a consequence of levee displacement (5,17)			
2. Animal life	a. Losses associated with woodland removal from borrow areas (4,6,17) b. Losses associated with woodland removal as a consequence of levee displacement (5,17) c. Disturbance associated with construction activities & noise (7)			
3. Aesthetics	a. Degraded aesthetic quality associated with removal of woodland from borrow areas (4,6,17) b. Degraded aesthetic quality associated with levee displacement (5,17)			

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation).
4. Impact expected to be temporary.
5. Impact expected to be permanent.
6. Condition to gradually improve with regrowth, extimated to be between 5 and 75 years to attain similar stage of development.
7. Impact expected for duration of construction or shortly thereafter.

Uncertainty

8. The uncertainty associated with the impact is 50% or more.
9. The uncertainty is between 10% and 50%.
10. The uncertainty is less than 10%.

Exclusivity

11. Overlapping entry; fully monetized in NED account.
12. Overlapping entry; not fully monetized in NED account.

Actuality

13. Impact will occur with implementation.
14. Impact will occur only when specific additional actions are carried out during implementation.
15. Impact will not occur because necessary additional actions are lacking.

Potential

16. Certain.
17. Certain but extent unknown.
18. 7.50% or more certainty.

Section 122

*Items specifically required in Section 122 and ER 1105-2-240/

Revised April 1980

TABLE B-35 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN C

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
4. Air & Water Pollution	a. Increases (4,7)			
5. Recreation Opportunities	a. Impaired (4,6,7)			
C. Environmental Quality Destroyed				
III. SOCIAL WELL-BEING (SWB) ACCOUNT				
A. Beneficial Effects				
1. Community Well-Being: Health & Safety				
a. Safety	Reduced hazard of flooding (10,11,13)	No effect	No effect	
b. Health	Reduced health hazard from contaiminated water & food supplies (10,13)	No effect	No effect	
*2. Public Facilities & Services	Reduced flood damage to public property (10,11,13)	Decreased expenditure of revenues for flood damage to public property (10,13)	No effect	
B. Adverse Effects				
*1. Displacement of People	No effect	No effect	No effect	
*2. Noise	Increased during construction (9,13)	No effect	No effect	
*3. Public Facilities & Services	Disruption of traffic flow during construction (10,12,13)	Same as flood plain	No effect	
4. Leisure, Cultural, & Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction long-range enhancement (9,13)	Same as flood plain	No effect	
5. Aesthetic Effects	Some impairment of aesthetic attraction during construction (9,13)	Same as flood plain	No effect	

TABLE B-35 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN C

ACCOUNTS	LOCATION OF IMPACTS			INDEX OF FOOTNOTES
	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	
C. Net effects				
1. Community Well-Being: Health & Safety	Reduced flood & health hazards	No effect	No effect	
2. Public Facilities & Services				
a. Beneficial	Reduced flood damage to public property	Decreased expenditure of revenues for flood damage to public property.	No effect	
b. Adverse	Disruption of traffic flow during construction	Same as flood plain	No effect	
3. Displacement of People	No effect	No effect	No effect	
4. Noise	Increased during construction	No effect	No effect	
5. Leisure, Cultural, Recreation Opportunities	Some impairment of leisure/recreation opportunities during construction	Same as flood plain	No effect	
6. Aesthetic Effects	Some impairment of aesthetic attraction during construction	Same as flood plain	No effect	
7. Community Cohesion	No definitive effect (10)	No effect	No effect	
8. Community Growth	No appreciable effect (9)	No effect	No effect	
9. Real Income Distribution	Primary beneficiaries are lower-income families; however, benefits will accrue to all landowners (10,13)	Lower-income workers will benefit from the recommended plan	No effect	

TABLE B-35 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN C

ACCOUNT	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
IV. REGIONAL DEVELOPMENT (RD) ACCOUNT				
A. Beneficial Effects				
1. Income				
a. Inundation Reduction				
(1) Present	$2,788,500	0	0	
(2) Future	12,400	0	0	
b. Business Losses Prevented				
(1) Present	82,700	0	0	
(2) Future	0	0	0	
c. Affluence				
(1) Present	140,100	0	0	
(2) Future	191,900	0	0	
d. Value of Output from External Economies	0	0	0	
e. EDA Benefits: Value of Output from Use of Unemployed or Under-employed Resources	Benefits shared with region - (10,13,12)	$521,000 (10,12,13)	0	
f. Wetland Creation Benefits	$ 0	0	0	
g. Total Beneficial Effects	$3,215,600	$521,000	0	
2. Employment	Benefits shared with region (10,13,12)	53 (10,12,13)	0	
3. Local Government Finance				
a. Property Values	Increase due to reduced flood hazard (10,14)	No effect	No effect	
b. Tax Revenues				
(1) Property tax	Increase concomitant with increased property values (10, 14)	Benefits from higher property tax revenues to accrue to region (10,14)	No effect	
(2) Personal income tax	No effect	No effect	Some increase, benefits accrued in accordance with Federal tax distribution (10,13)	
(3) Sales Tax	No effect	Some Increase (10,13)	No effect	
(4) Expenditure for repair of flood damage to public property	No effect	Decrease (10,13)	No effect	

Revised April 1980

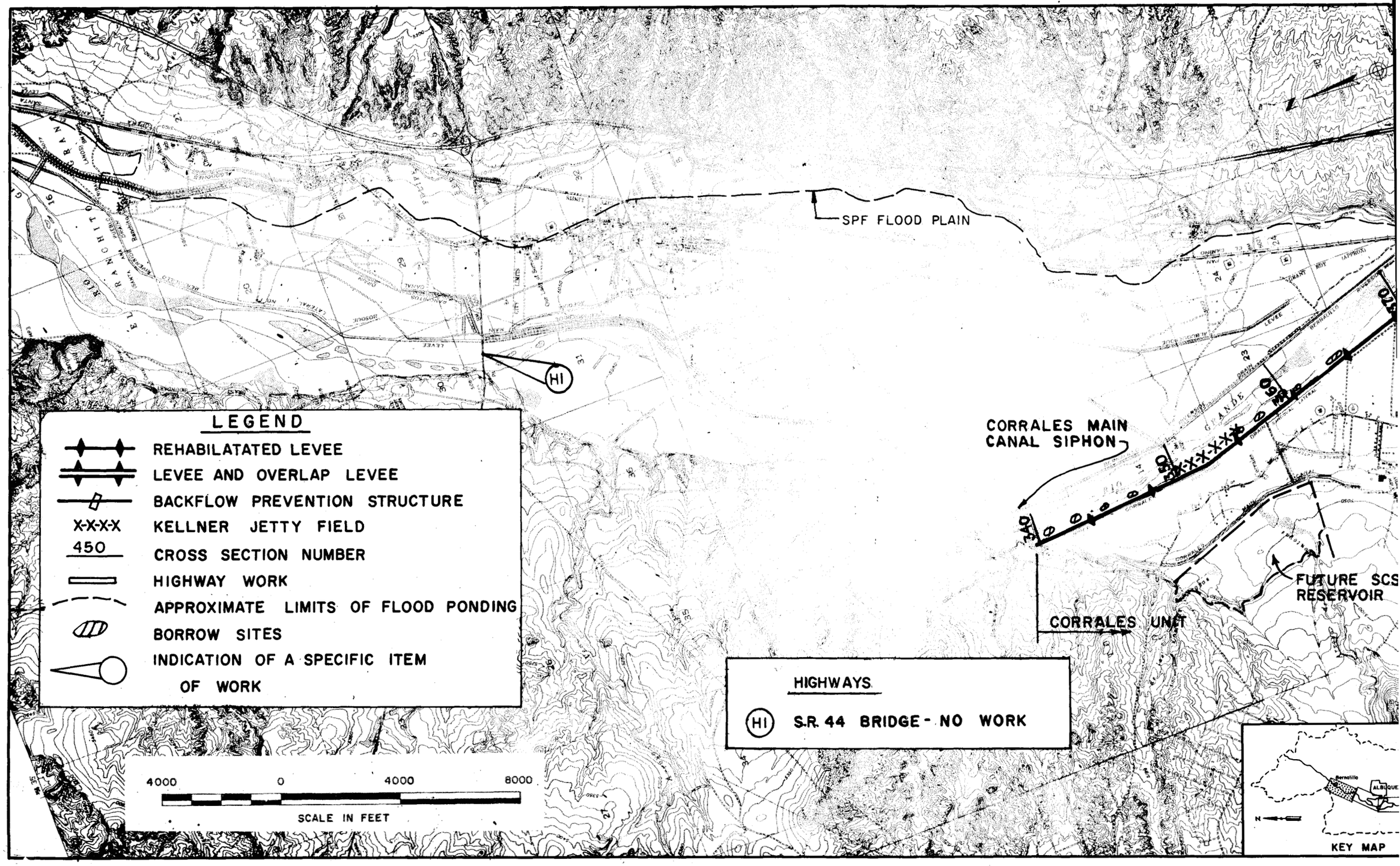
TABLE B-35 (Cont'd)
SYSTEM OF ACCOUNTS
PLAN C

ACCOUNTS	Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
B. Adverse Effects				
1. Income				
a. Construction		0		
(1) Interest	$111,000	0	$1,944,000	
(2) Amortization	0	0	3,000	
b. Operation & Maintenance	109,000	0	40,000	
c. Total	$220,000	0	$1,987,000	
2. Employment Displaced	No effect	No effect	No effect	
3. Loss of Cropland	$750,000/50 acres (10, 11,13)	Loss of property taxes from cropland (10,13)	No effect	
4. Local Government Finance	No effect	Loss of revenue, i.e., property taxes, from the expropriated land (10,13)	No effect	
C. Net Effects				
1. Income	$3,283,000	$521,000	$1,987,000	
2. Employment	Benefits shared with region	53	0	
3. Local Government Finance				
a. Beneficial Effects	Increased property values & taxes	Increased revenues from higher property taxes in flood plain; sales tax (during construction); & decreased expenditure for flood-damaged public property	Some increase in personal income tax revenues (during construction)	
b. Adverse Effects	No effect	Some loss of property taxes from expropriated land	No effect	
4. Regional Growth	No appreciable effect (1)	No effect	No effect	
5. Population Distribution	May induce a less densely developed area (9,14)	No effect	No effect	

Revised April 1980

TABLE B-36
SYSTEM OF ACCOUNTS
NO ACTION PLAN

ACCOUNTS	LOCATION OF IMPACTS: Within the Flood Plain	Within the AGUA Region	Within the Rest of the Nation	INDEX OF FOOTNOTES
I. NATIONAL ECONOMIC DEVELOPMENT				
A. Beneficial Effects				
1. Inundation Reduction	--	--	--	
2. Business Losses Prevented	--	--	--	
3. Affluence	--	--	--	
4. Value of output resulting from external economies	--	--	--	
5. EDA Benefits	--	--	--	
6. Levee tieback eliminated	--	--	--	
7. Fish & Wildlife Benefits	--	--	--	
8. Employment	--	--	--	
9. Total Beneficial Effects	--	--	--	
B. Adverse Effect				
1. Project Annual Cost	--	--	--	
2. Total Adverse Effects	--	--	--	
3. Net NED Benefits	--	--	--	
II. ENVIRONMENTAL QUALITY				
A. Environmental Quality Enhanced or Preserved				
1. Riparian woodland	a. Preserved to continue "natural" succession.			
2. Ecological relationships	b. Preserved to continue "natural" evaluation.			
3. Willife and Habitat	c. Preserved.			
B. Environmental Quality Degraded				
C. Environmental Quality Destroyed				
1. Wetlands	Lack of opportunity to increase wetland areas.			
III. SOCIAL WELL-BEING				
A. Beneficial Effects	None	None	None	
B. Adverse Effects	Continued threat of flooding to 150,000 residents & 70,000 acres of land	Same as flood plain	Same as flood plain	
IV. REGIONAL DEVELOPMENT				
A. Beneficial Effects	None	None	None	
B. Adverse Impacts				
1. Employment	No employment construction	None	None	
2. Construction Expenditures	None	None	None	
3. Real Estate & Taxes	Decreased property values and decreased taxes	None	None	


SPF FLOOD PLAIN
CORRALES MAIN CANAL SIPHON
FUTURE SCS RESERVOIR
CORRALES UNIT
H1
LEGEND
REHABILATATED LEVEE
LEVEE AND OVERLAP LEVEE
BACKFLOW PREVENTION STRUCTURE
X-X-X-X KELLNER JETTY FIELD
450 CROSS SECTION NUMBER
HIGHWAY WORK
APPROXIMATE LIMITS OF FLOOD PONDING
BORROW SITES
INDICATION OF A SPECIFIC ITEM OF WORK
HIGHWAYS
H1 S.R. 44 BRIDGE - NO WORK
4000 0 4000 8000
SCALE IN FEET
KEY MAP

SPF FLOOD PLAIN

CORRALES MAIN CANAL SIPHON

CORRALES UNIT

FUTURE SCS RESERVOIR

MATCH LINE

LEGEND

- BILATATED LEVEE
- E AND OVERLAP LEVEE
- FLOW PREVENTION STRUCTURE
- NER JETTY FIELD
- S SECTION NUMBER
- WAY WORK
- OXIMATE LIMITS OF FLOOD PONDING
- OW SITES
- ATION OF A SPECIFIC ITEM
- WORK

0 4000 8000

SCALE IN FEET

HIGHWAYS

(HI) S.R. 44 BRIDGE - NO WORK

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

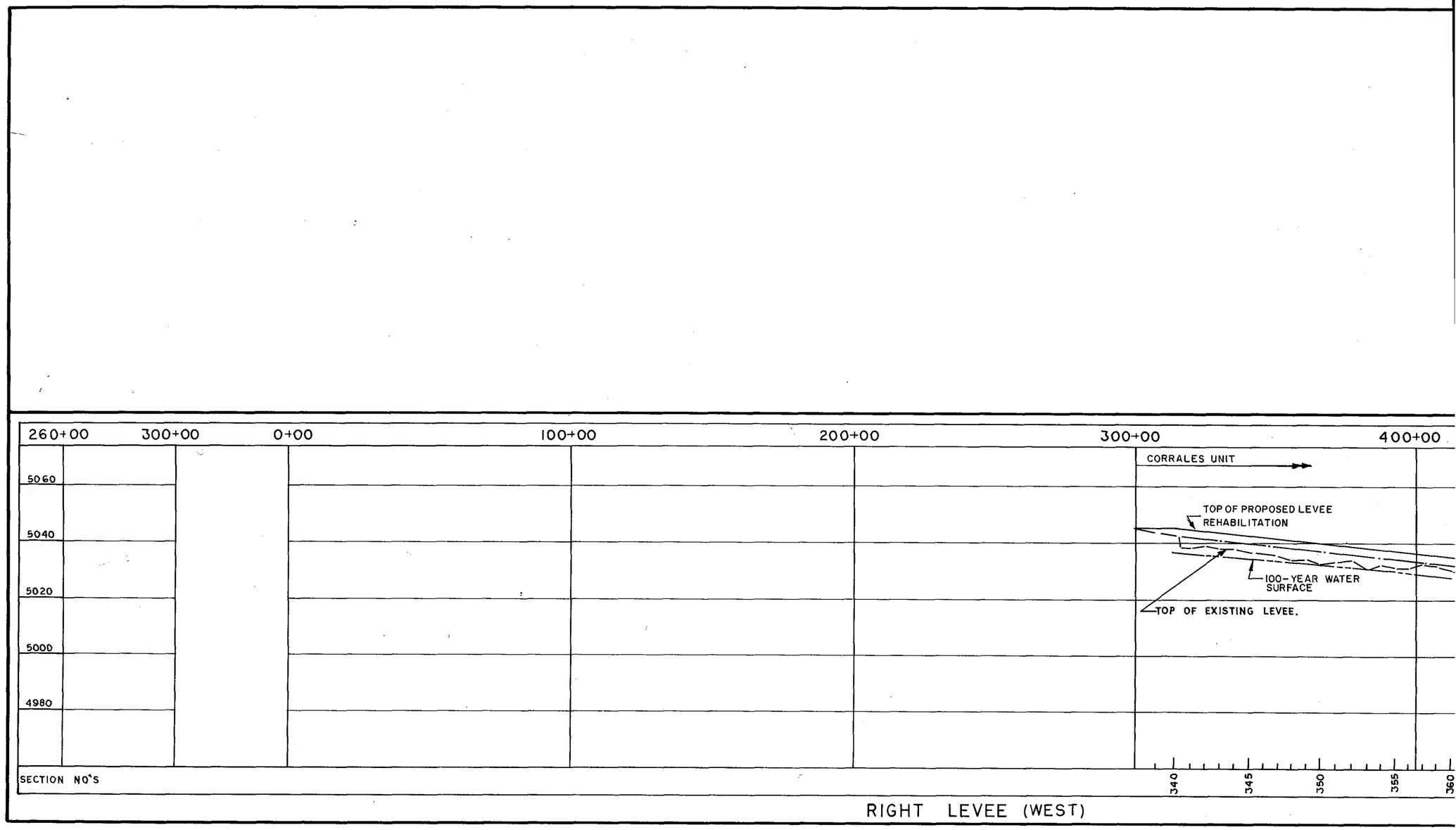
BERNALILLO TO BELEN, NEW MEXICO

SPF LEVEE PLAN A
SECTION 339 TO 389

TO ACCOMPANY INTERIM FEASIBILITY REPORT

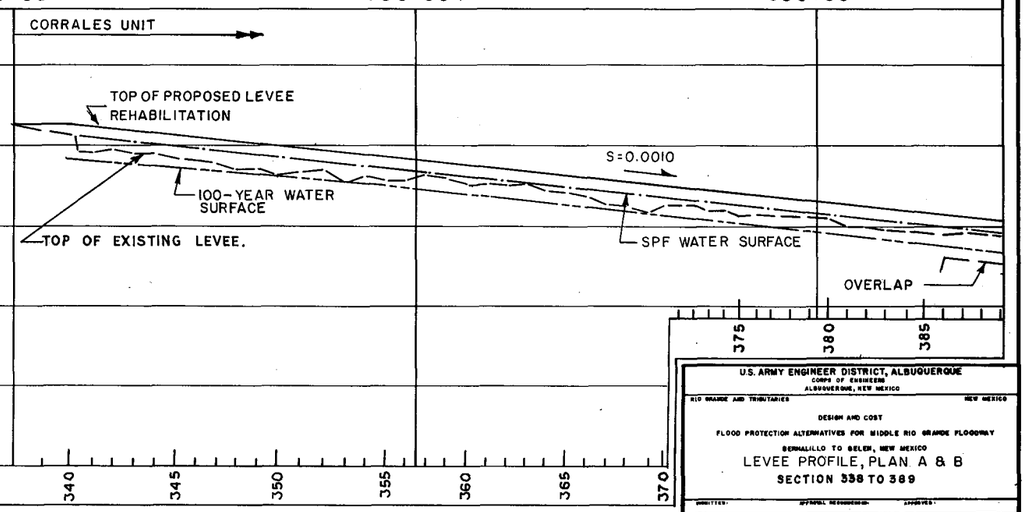
FILE NO.

PLATE 8-1



RIGHT LEVEE (WEST)

0+00 300+00 0+00 100+00 200+00 300+00 400+00 500+00



N NO'S

RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE, PLAN A & B

SECTION 338 TO 369

SUBMITTED: — APPROVED:

PROJECT NUMBER — CHIEF, PLANNING BRANCH — CHIEF, ENGINEERING DIVISION

TO ACCOMPANY INTERIM FEASIBILITY REPORT — FILE NO. — PLATE B-2

IRRIGATION & DRAINAGE

- (I1) NEW OVERLAP LEVEE
- (I2) NEW OVERLAP LEVEE
- (I3) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I4) RAISING OF EXISTING OVERLAP LEVEE
- (I5) NEW EXCESSIVE INFLOW PREVENTION STRUCTURE

HIGHWAYS

- (H2) S.R. 46 BRIDGE—NO WORK
- (H3) INTERSTATE 40 BRIDGE—NO WORK

BERNALILLO UNIT

SPF FLOOD PLAIN

NORTH OUTLET

ALB. DIVERSION CHAN.

ALBUQUERQUE UNIT - EAST

MATCH LINE - E

ARROYO DE LAS CALABACILLAS

SPF FLOOD PLAIN

CORRALES UNIT

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

- (I1) NEW OVERLAP LEVEE
- (I2) NEW OVERLAP LEVEE
- (I3) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I4) RAISING OF EXISTING OVERLAP LEVEE
- (I5) NEW EXCESSIVE INFLOW PREVENTION STRUCTURE

HIGHWAYS

- (H2) S.R. 46 BRIDGE—NO WORK
- (H3) INTERSTATE 40 BRIDGE—NO WORK

ALBUQUERQUE UNIT - EAST

CORRALES UNIT

ARROYO DE LAS CALABACILLAS

SPF FLOOD PLAIN

0 4000 8000

SCALE IN FEET

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

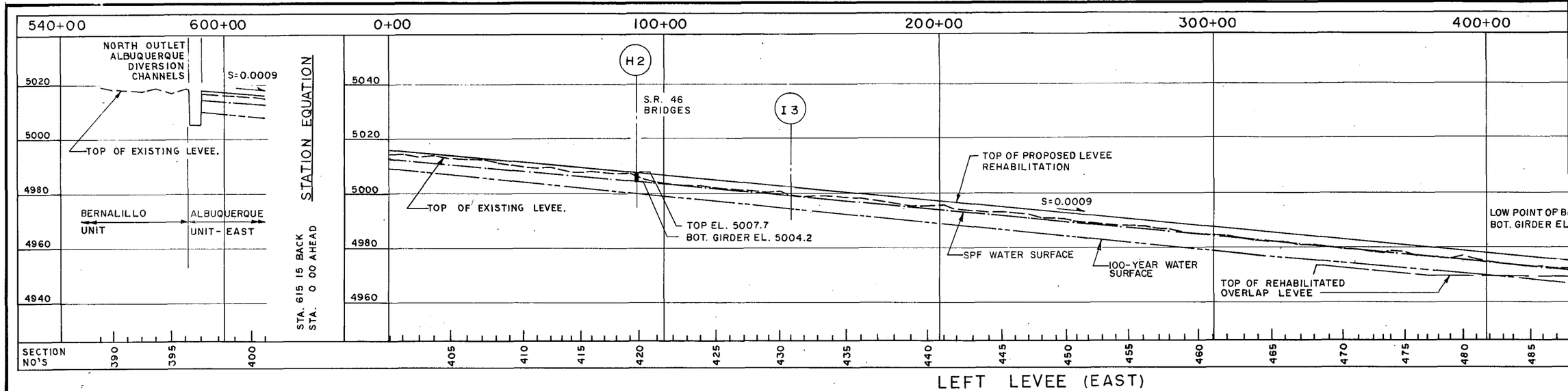
BERNALILLO TO BELEN, NEW MEXICO

SPF LEVEE PLAN A
SECTION 389 TO 508

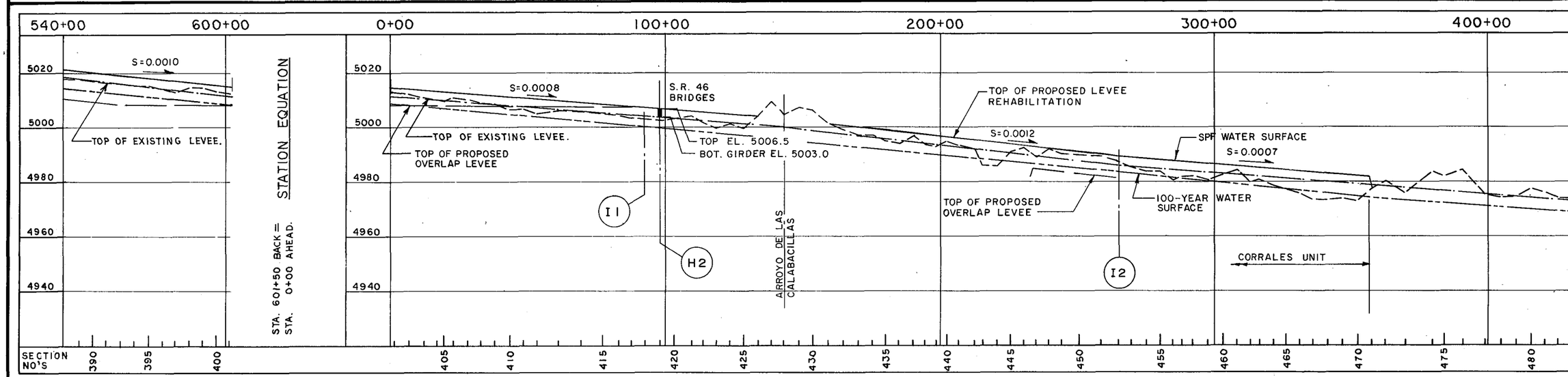
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

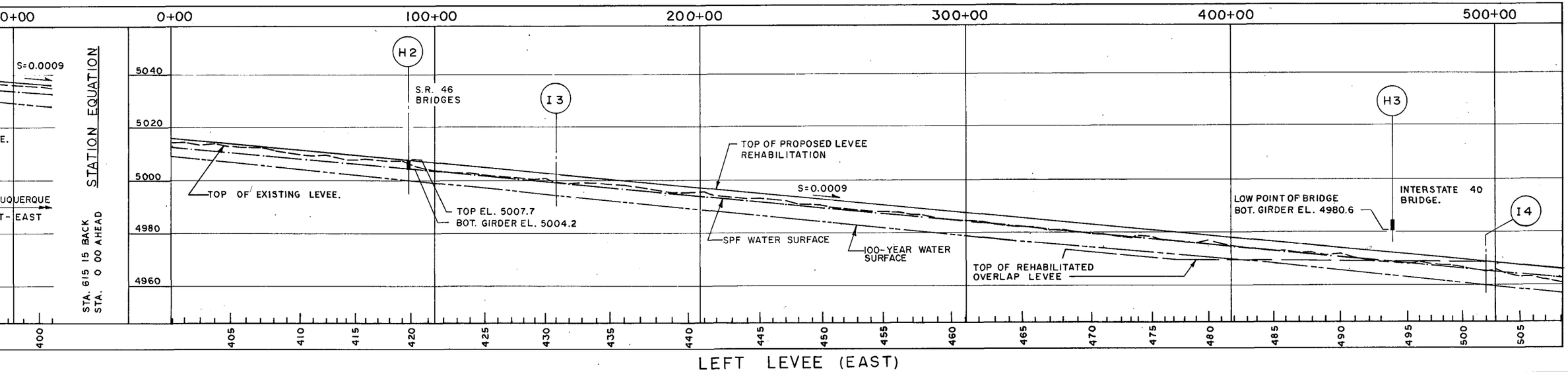
PLATE B-3



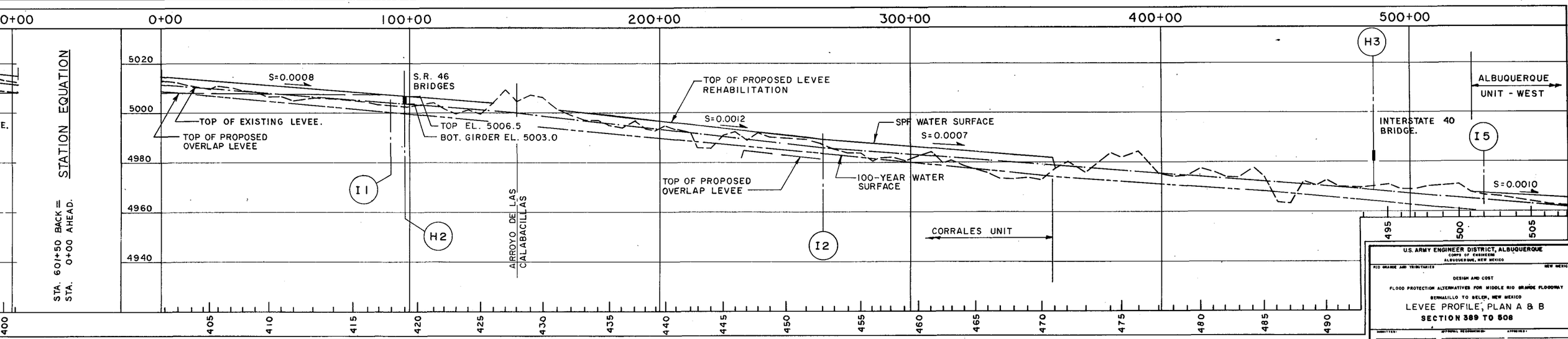
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

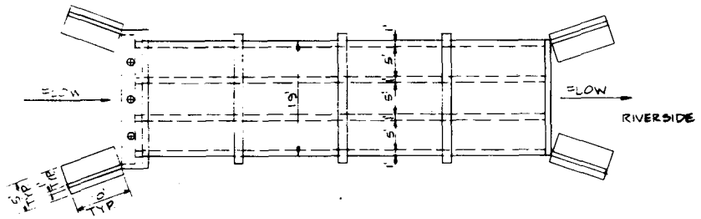
LEVEE PROFILE, PLAN A & B

SECTION 389 TO 508

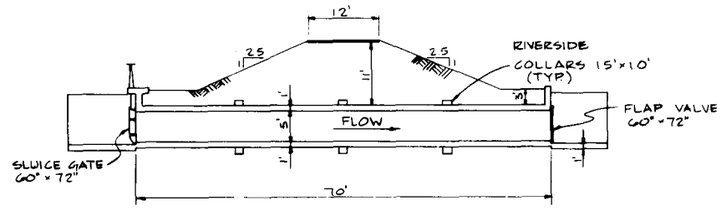
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT NUMBER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT — FILE NO. — PLATE B-4



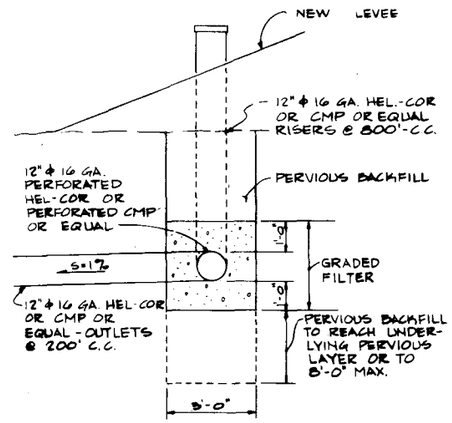
PLAN
SCALE: 1" = 10'



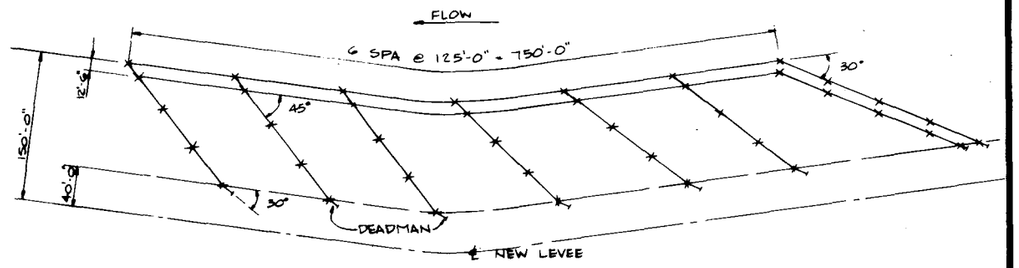
℄ SECTION
SCALE: 1" = 10'

TYPE A BACKFLOW PREVENTION STRUCTURE

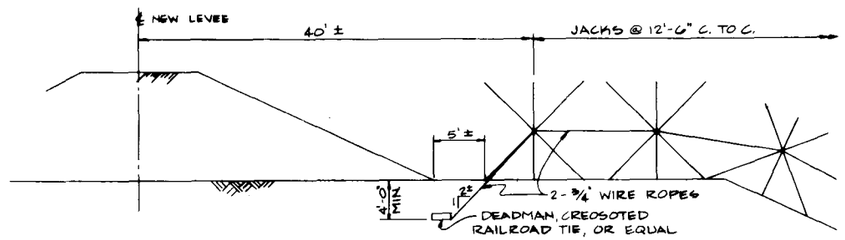
(19)



TYPICAL TOE DRAIN SECTION
SCALE: 1" = 2'

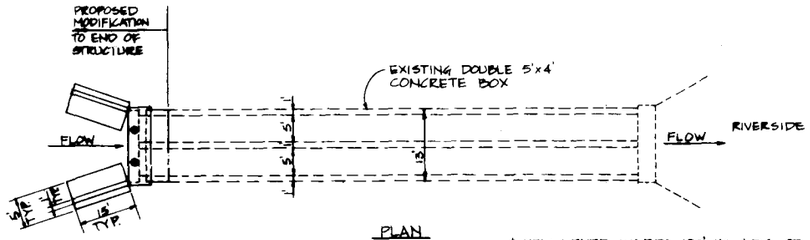


PLAN
NOT TO SCALE

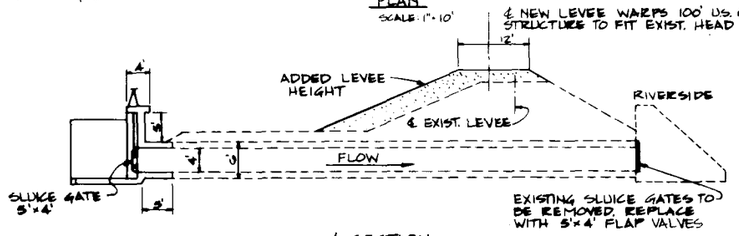


SECTION
NOT TO SCALE

TYPICAL JETTY FIELD



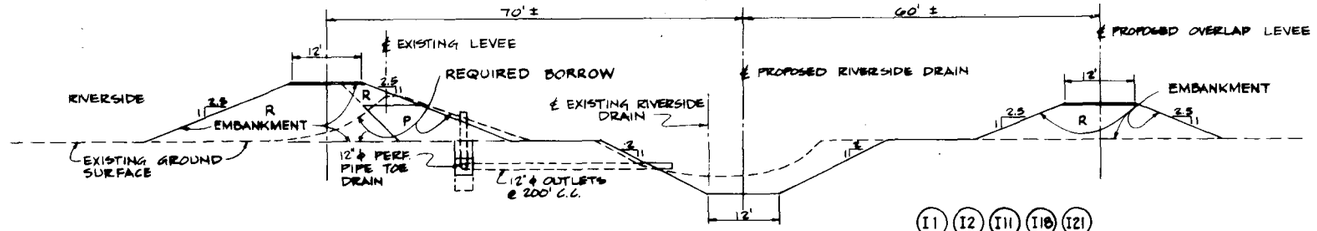
PLAN
SCALE: 1" = 10'



℄ SECTION
SCALE: 1" = 10'

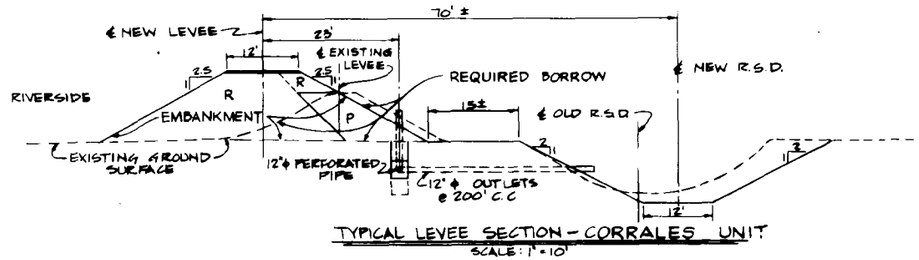
GRIEGOS WASTEWAY

(13)



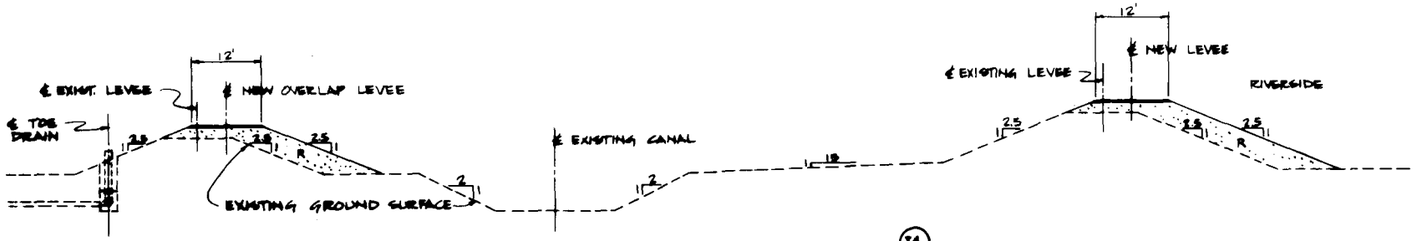
OVERLAP LEVEE - TYPICAL SECTION
SCALE: 1" = 10'

(I1) AS SHOWN (I2) (III) (I18) OPPOSITE HAND (I21)



TYPICAL LEVEE SECTION - CORRALES UNIT
SCALE: 1" = 10'

NOTE:
R = RANDOM MATERIAL
P = PERVIOUS MATERIAL



OVERLAP LEVEE - TYPICAL SECTION
SCALE: 1" = 10'

(14)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO

TYPICAL SECTIONS AND DETAILS

SURVEYED:	DESIGNED:	APPROVED:
DRAWN:	CHIEF, ENGINEERING DIV.	CHIEF, PLANNING DIV.
CHIEF, ENGINEERING DIV.	FILE NO.	SHT. NO. 8-5
TO ACCOMPANY INTERIM FEASIBILITY REPORT		

IRRIGATION & DRAINAGE

- (I6) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I7) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I8) NEW BACKFLOW PREVENTION STRUCTURE
- (I9) NEW BACKFLOW PREVENTION STRUCTURE

HIGHWAYS

- (H4) RAISING U.S. 66 BRIDGE AND AP
- (H5) RAISING U.S. 85 BRIDGE AND AP
- (H6) RIO BRAVO BRIDGE - NO WOR
- (H7) INTERSTATE 25 BRIDGE - NO

UTILITIES

- (U1) (U2) (U3) MODIFICATION OF EXISTING S TREATMENT PLANT OUTFALLS PREVENT BACKFLOW

ALBUQUERQUE UNIT - EAST

MOUNTAINVIEW UNIT

SOUTH OUTLET ALB. DIV. CHAN.

ALBUQUERQUE

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

- (I6) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I7) MODIFICATION OF EXISTING STRUCTURE TO PREVENT BACKFLOW
- (I8) NEW BACKFLOW PREVENTION STRUCTURE
- (I9) NEW BACKFLOW PREVENTION STRUCTURE

HIGHWAYS

- (H4) RAISING U.S. 66 BRIDGE AND APPROACHES
- (H5) RAISING U.S. 85 BRIDGE AND APPROACHES
- (H6) RIO BRAVO BRIDGE - NO WORK
- (H7) INTERSTATE 25 BRIDGE - NO WORK

UTILITIES

- (U1) (U2) (U3) MODIFICATION OF EXISTING SEWAGE TREATMENT PLANT OUTFALLS TO PREVENT BACKFLOW

ALBUQUERQUE UNIT - EAST

MOUNTAIN VIEW UNIT

ISLETA UNIT EAST

SOUTH OUTLET ALB. DIV. CHAN.

ALBUQUERQUE UNIT - WEST

0 4000 8000

SCALE IN FEET

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

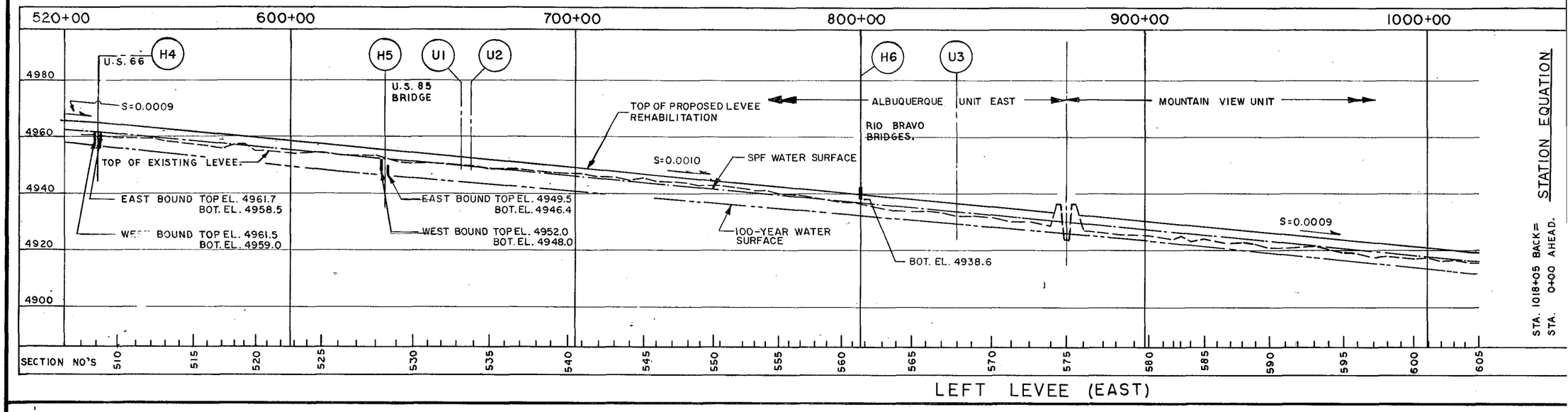
BERNALILLO TO BELEN, NEW MEXICO

SPF LEVEE PLAN A
SECTION 508 TO 626

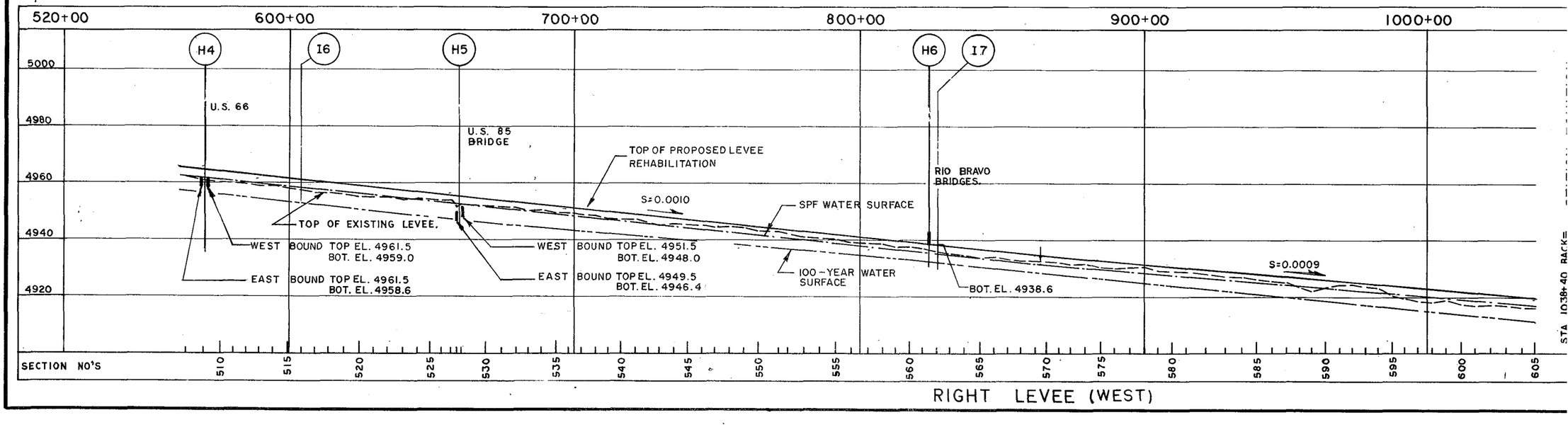
SUBMITTED: APPROVAL RECOMMENDED: APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERS BRANCH

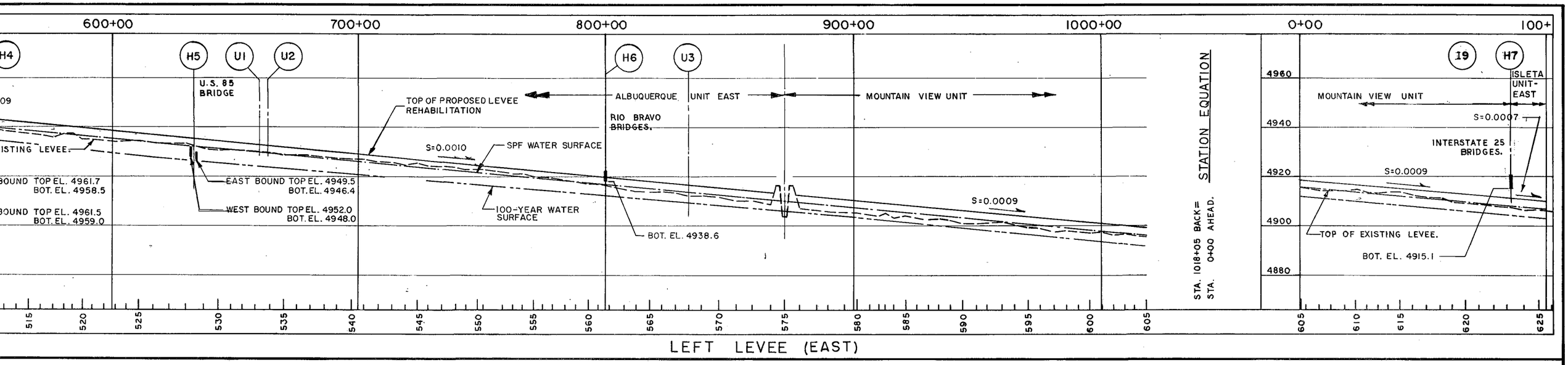
TO ACCOMPANY INTERIM FEASIBILITY REPORT | FILE NO. | PLATE B-



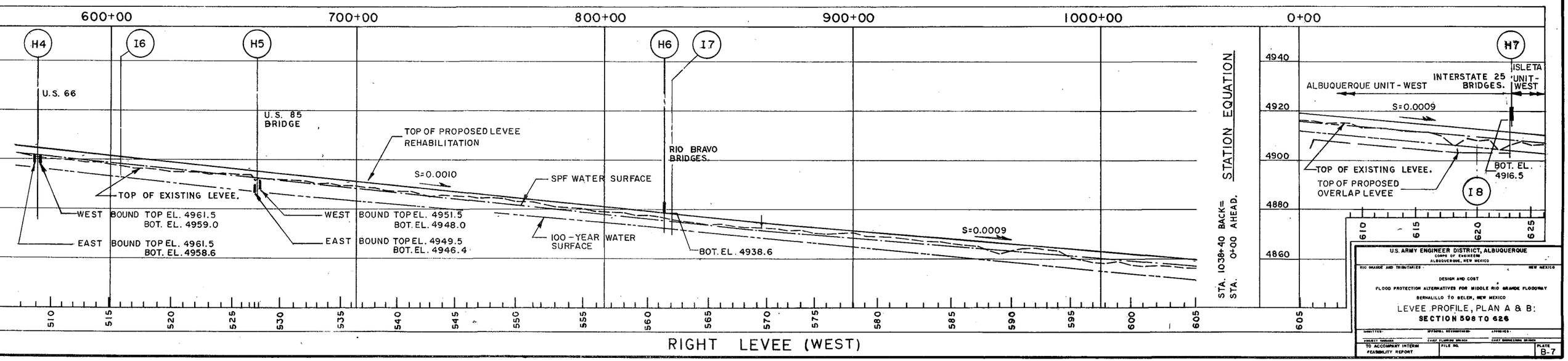
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES - NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE, PLAN A & B:

SECTION 508 TO 626

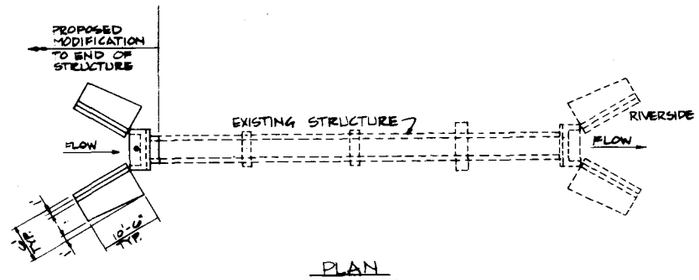
SUBMITTED: RECOMMENDED: APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

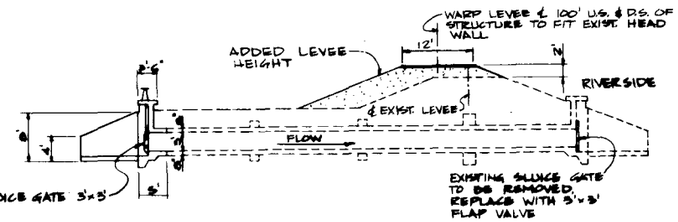
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-7

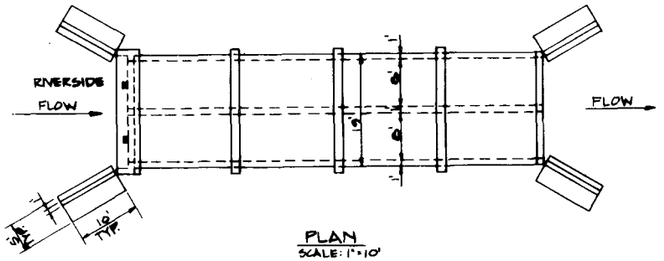


PLAN
SCALE: 1"=10'

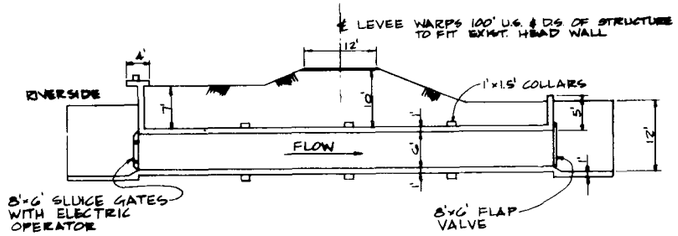


TYPICAL SECTION
SCALE: 1"=10'

ATRISCO WASTEWAY (16)

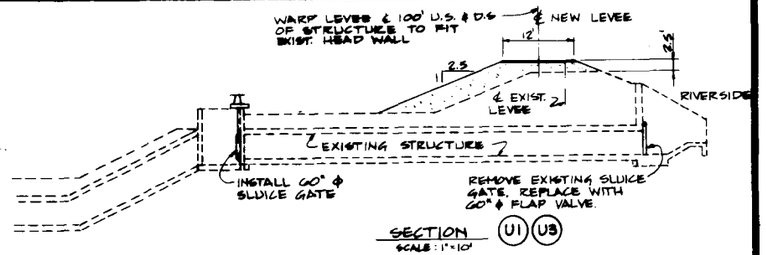


PLAN
SCALE: 1"=10'

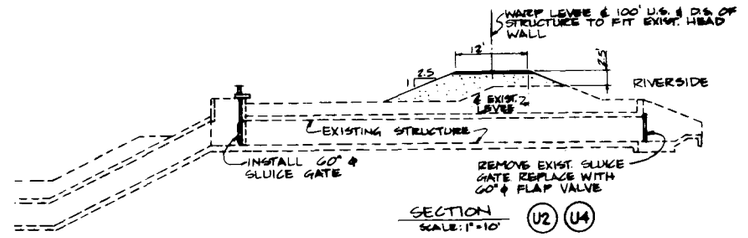


TYPICAL SECTION
SCALE: 1"=10'

TYPE D
EXCESSIVE INFLOW PREVENTION STRUCTURE (15) (14) (17)

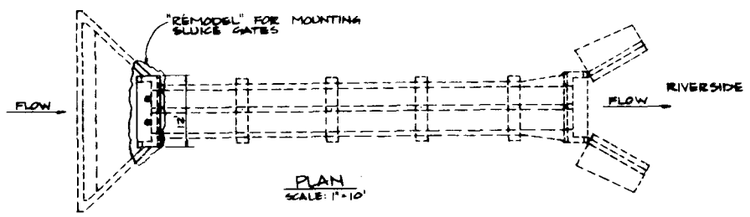


SECTION
SCALE: 1"=10' (U1) (U3)

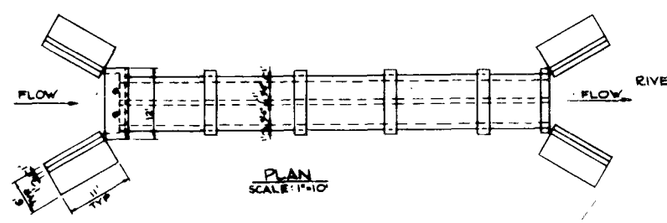


SECTION
SCALE: 1"=10' (U2) (U4)

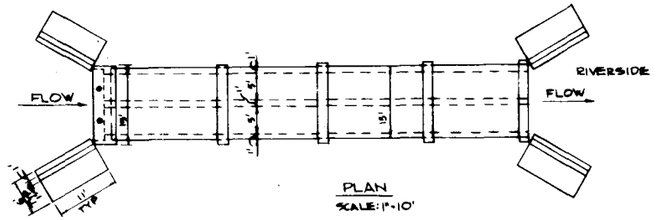
SEWAGE TREATMENT PLANT OUTFALLS



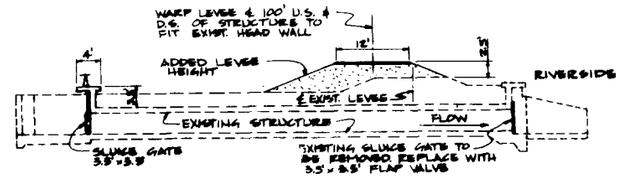
PLAN
SCALE: 1"=10'



PLAN
SCALE: 1"=10'

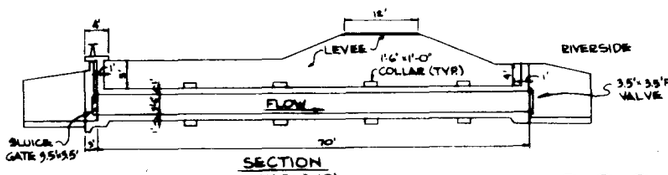


PLAN
SCALE: 1"=10'



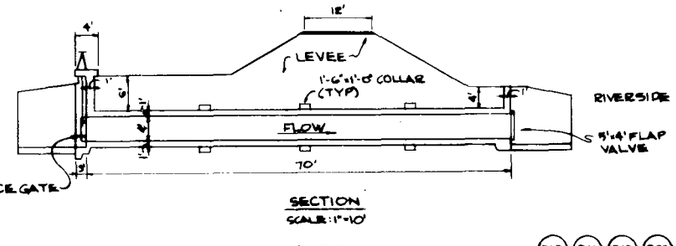
TYPICAL SECTION
SCALE: 1"=10'

PAJARITO WASTEWAY (17)



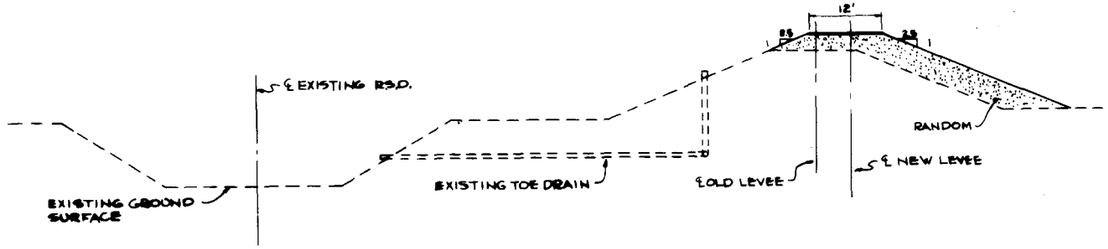
SECTION
SCALE: 1"=10'

TYPE C
BACKFLOW PREVENTION STRUCTURE (18) (18) (21)

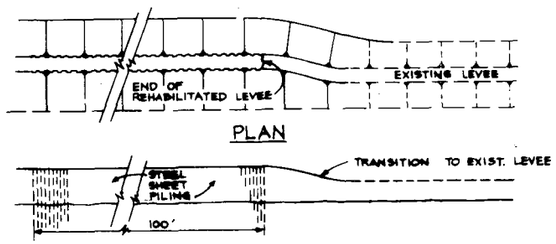


SECTION
SCALE: 1"=10'

TYPE B
BACKFLOW PREVENTION STRUCTURE (10) (11) (19) (22) (23)



TYPICAL LEVEE SECTION - ALBUQUERQUE UNIT
SCALE: 1"=10'



PLAN

PROFILE

LEVEE END PROTECTION
NOT TO SCALE

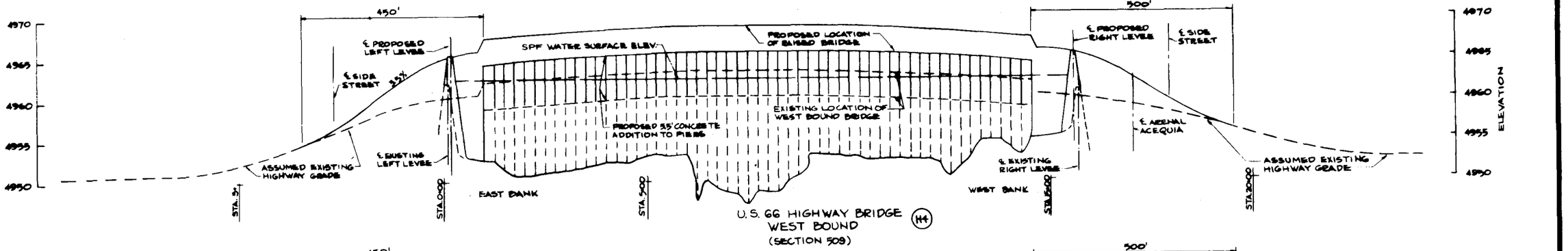
U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

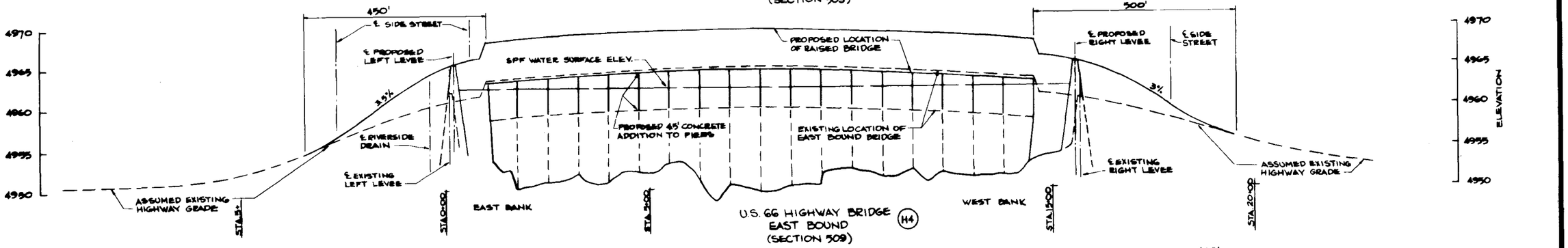
DESIGN AND COST
FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO

TYPICAL SECTIONS AND DETAILS

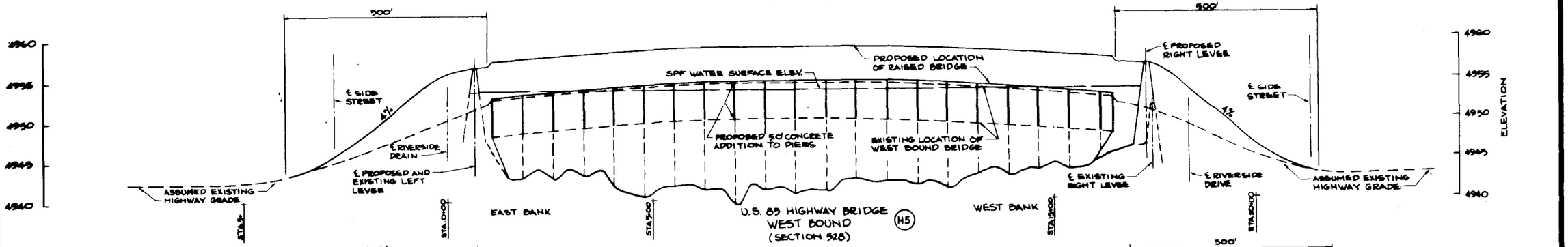
DRAWING NO. 8-8



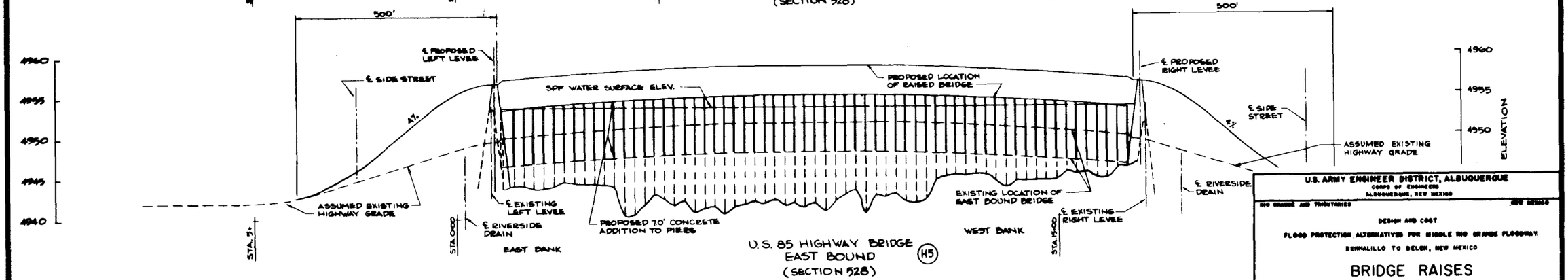
U.S. 66 HIGHWAY BRIDGE (H4)
WEST BOUND
(SECTION 509)



U.S. 66 HIGHWAY BRIDGE (H4)
EAST BOUND
(SECTION 509)



U.S. 85 HIGHWAY BRIDGE (H5)
WEST BOUND
(SECTION 528)



U.S. 85 HIGHWAY BRIDGE (H5)
EAST BOUND
(SECTION 528)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

BRIDGE RAISES

SUBMITTED: APPROVED: APPROVED:

PROJECT MANAGER CHIEF, PLANNING BRANCH CHIEF, ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-9

IRRIGATION & DRAINAGE

- I10 NEW BACKFLOW PREVENTION STRUCT.
- I11 NEW OVERLAP LEVEE
- I12 NEW EXCESSIVE INFLOW PREV. STRU.
- I13 NEW EXCESSIVE INFLOW PREV. STRU.
- I14 NEW EXCESSIVE INFLOW PREV. STRU.
- I15 ISLETA DIVERSION DAM - NO WORK
- I16 NEW BACKFLOW PREVENTION STRU.
- I17 NEW BACKFLOW PREVENTION STRU.
- I18 NEW OVERLAP LEVEE

HIGHWAYS

- H8 HUMPING BRIDGE APPROA
- H9 S.R. 47 - ISLETA BRIDGE -
- H10 HUMPING BRIDGE APPRO
- H11 S.R. 49 - LOS LUNAS BRID
- H12 HUMPING BRIDGE APPROA
- H13 HUMPING BRIDGE APPRO

RAILROAD

- R1 ISLETA RAILROAD BRIDGE - N

ISLETA UNIT - EAST

BELEN UNIT - EAST

SPF FLOOD PLAIN

MATCH LINE C

MATCH LINE C

ISLETA UNIT - WEST

BELEN UNIT - WEST

ISLETA MARSH

ISLETA RESERVATION

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

- (I10) NEW BACKFLOW PREVENTION STRUCT.
- (I11) NEW OVERLAP LEVEE
- (I12) NEW EXCESSIVE INFLOW PREV. STRU.
- (I13) NEW EXCESSIVE INFLOW PREV. STRU.
- (I14) NEW EXCESSIVE INFLOW PREV. STRU.
- (I15) ISLETA DIVERSION DAM - NO WORK
- (I16) NEW BACKFLOW PREVENTION STRU.
- (I17) NEW BACKFLOW PREVENTION STRU.
- (I18) NEW OVERLAP LEVEE

HIGHWAYS

- (H8) HUMPING BRIDGE APPROACH
- (H9) S.R. 47 - ISLETA BRIDGE - NO WORK
- (H10) HUMPING BRIDGE APPROACH
- (H11) S.R. 49 - LOS LUNAS BRIDGE - NO WORK
- (H12) HUMPING BRIDGE APPROACH
- (H13) HUMPING BRIDGE APPROACH

RAILROAD

- (R1) ISLETA RAILROAD BRIDGE - NO WORK

ISLETA UNIT - EAST

BELEN UNIT - EAST

ISLETA UNIT - WEST

BELEN UNIT - WEST

ISLETA MARSH

ISLETA RESERVATION

4000 0 4000 8000

SCALE IN FEET

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

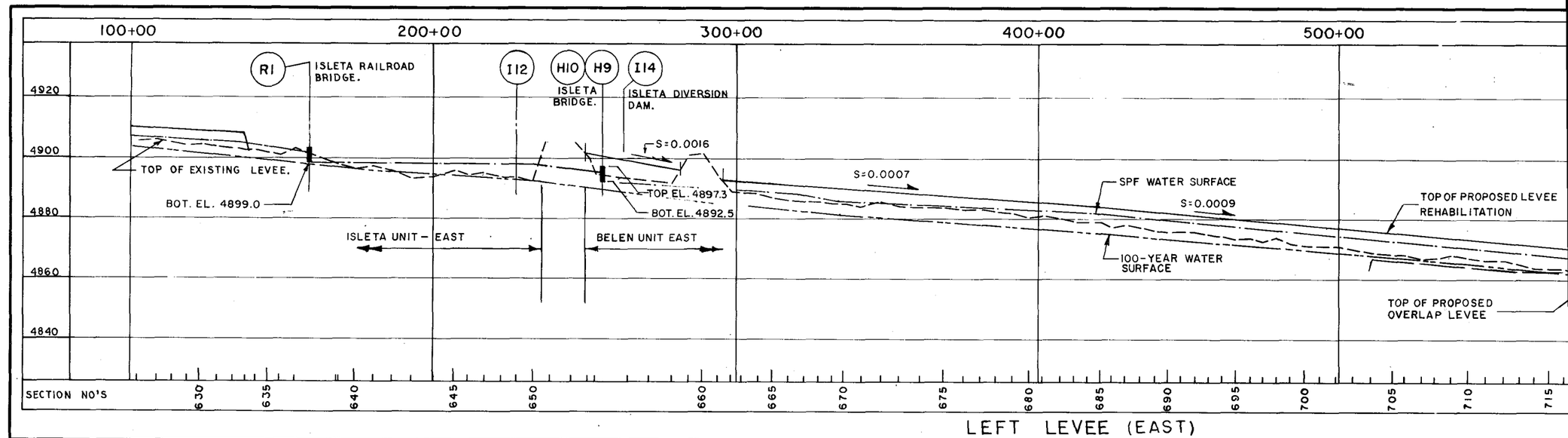
BERNALILLO TO BELEN, NEW MEXICO

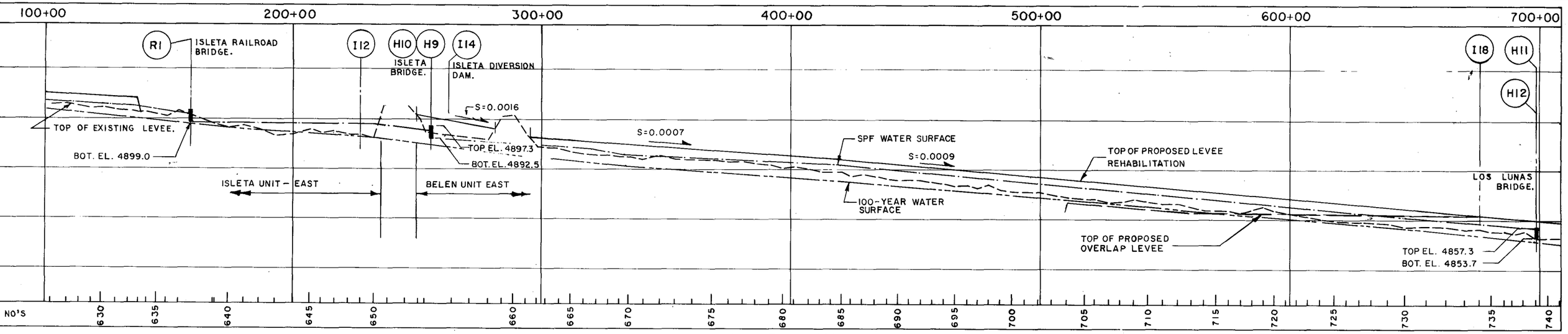
SPF LEVEE PLAN A
SECTION 626 TO 741

TO ACCOMPANY INTERIM FEASIBILITY REPORT

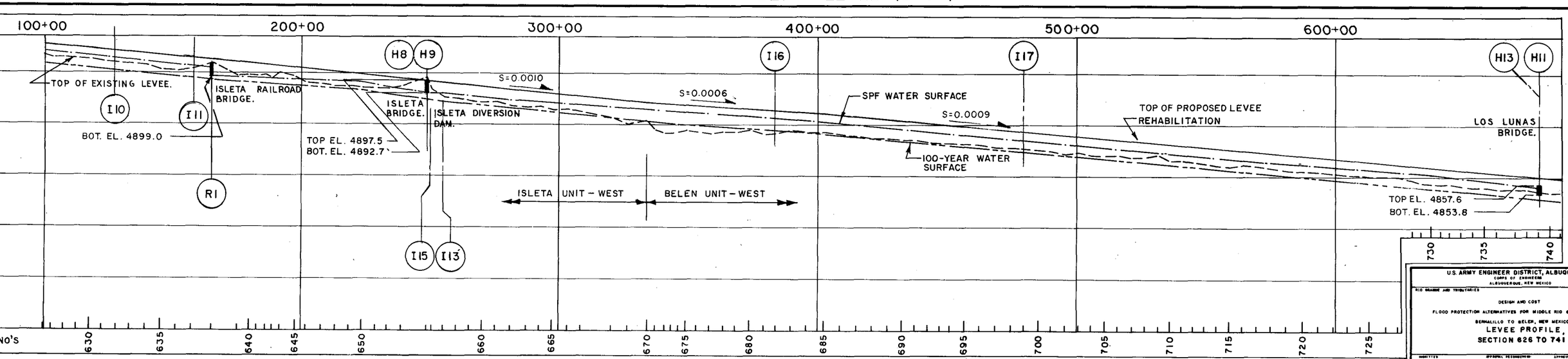
FILE NO.

PLATE B-10


100+00
200+00
300+00
400+00
500+00
4920
4900
4880
4860
4840
R1
ISLETA RAILROAD BRIDGE.
I12
H10
H9
ISLETA BRIDGE.
I14
ISLETA DIVERSION DAM.
S=0.0016
TOP OF EXISTING LEVEE.
BOT. EL. 4899.0
TOP EL. 4897.3
BOT. EL. 4892.5
S=0.0007
SPF WATER SURFACE
S=0.0009
100-YEAR WATER SURFACE
TOP OF PROPOSED LEVEE REHABILITATION
TOP OF PROPOSED OVERLAP LEVEE
ISLETA UNIT - EAST
BELEN UNIT EAST
SECTION NO'S
630
635
640
645
650
660
665
670
675
680
685
690
695
700
705
710
715
LEFT LEVEE (EAST)
100+00
200+00
300+00
400+00
500+00
4900
4880
4860
4840
4820
H8
H9
I16
I17
I10
I11
R1
I15
I13
TOP OF EXISTING LEVEE.
ISLETA RAILROAD BRIDGE.
ISLETA BRIDGE.
ISLETA DIVERSION DAM.
BOT. EL. 4899.0
TOP EL. 4897.5
BOT. EL. 4892.7
S=0.0010
S=0.0006
SPF WATER SURFACE
S=0.0009
100-YEAR WATER SURFACE
TOP OF PROPOSED LEVEE REHABILITATION
ISLETA UNIT - WEST
BELEN UNIT - WEST
SECTION NO'S
630
635
640
645
650
660
665
670
675
680
685
690
695
700
705
710
715
RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST
FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE, SECTION 626 TO 741

SUBMITTED	APPROVAL RECOMMENDED	APPROVED
PROJECT MANAGER	CHIEF PLANNING BRANCH	CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT — FILE NO. — PLATE B-11

IRRIGATION & DRAINAGE

(I19) NEW BACKFLOW PREVENTION STRUCT.

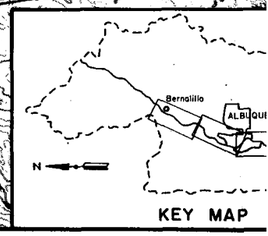
(I20) NEW BACKFLOW PREVENTION STRUCT.

UTILITIES

(U4) MODIFICATION OF EXISTING SEWAGE TREATMENT PLANT OUTFALLS TO PREVENT BACKFLOW

4000 0 4000 8000

SCALE IN FEET



KEY MAP

IRRIGATION & DRAINAGE

(19) NEW BACKFLOW PREVENTION STRUCT.

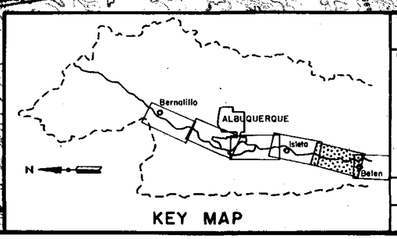
(20) NEW BACKFLOW PREVENTION STRUCT.

UTILITIES

(14) MODIFICATION OF EXISTING SEWAGE TREATMENT PLANT OUTFALLS TO PREVENT BACKFLOW

4000 0 4000 8000

SCALE IN FEET



KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

SPF LEVEE PLAN A
SECTION 741 TO 855

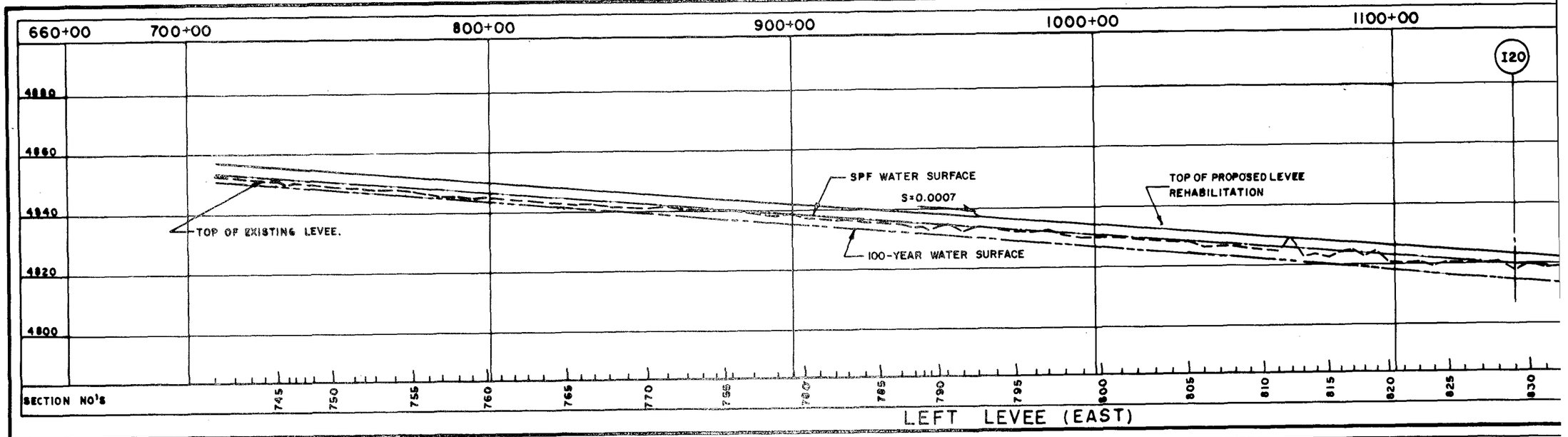
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

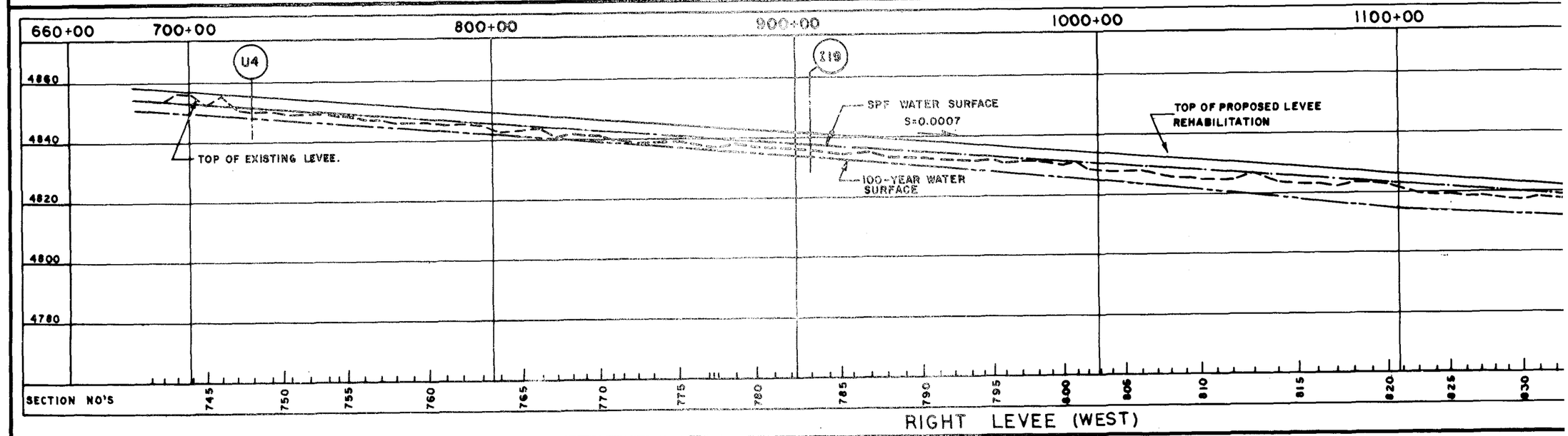
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

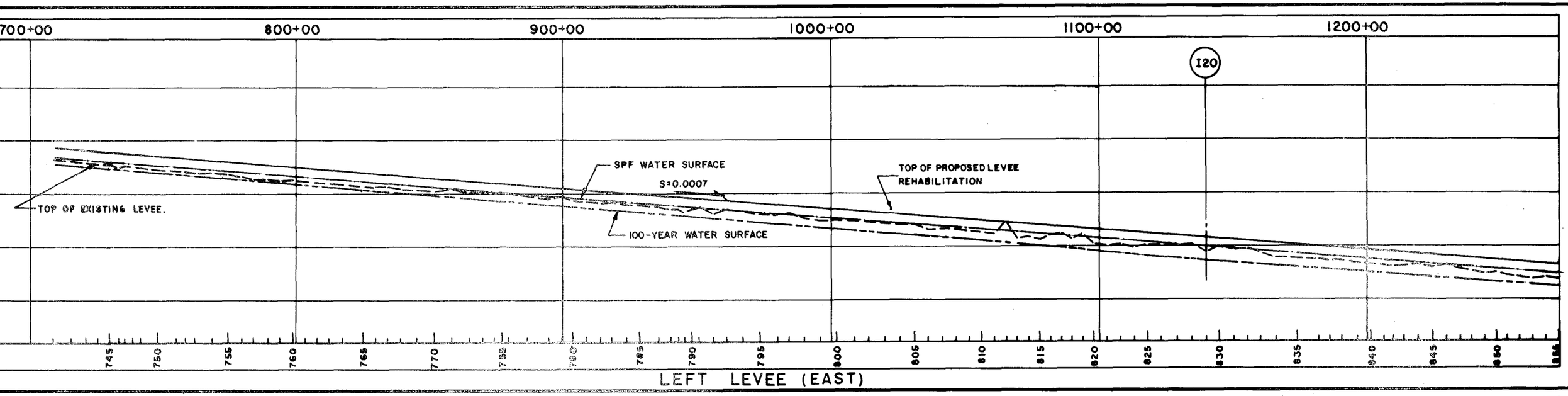
PLATE B-12



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



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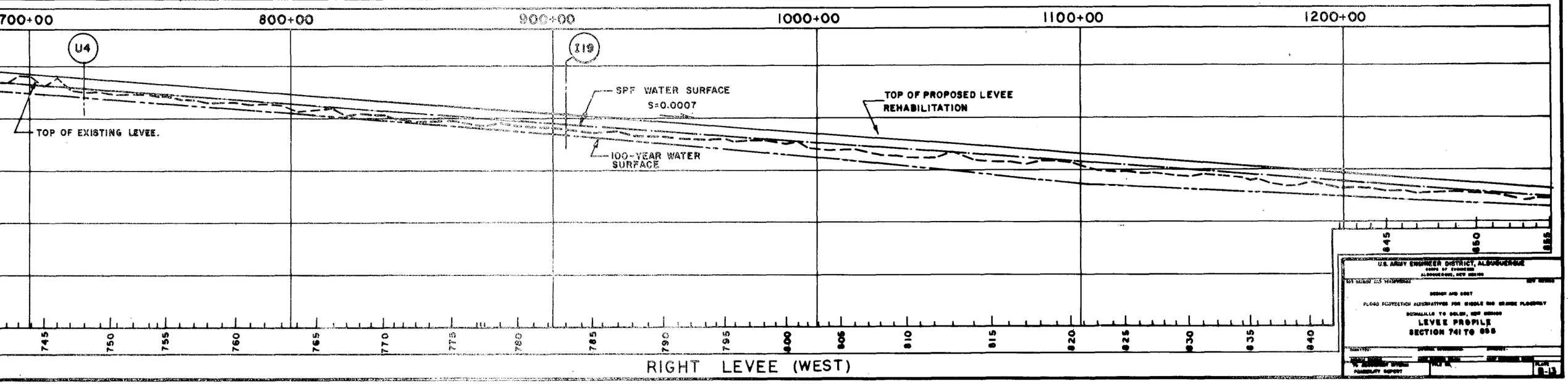


RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGN AND COST
FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE
SECTION 741 TO 855

PLATE
B-13

BELEN UNIT - EAST

BELEN UNIT - WEST

APPROXIMATE EXTENT OF BACKWATER DUE TO SPF (4790)

I21

I22

H14

H15

R2

IRRIGATION & DRAINAGE

(I21) NEW OVERLAP LEVEE

(I22) NEW BACKFLOW PREVENTION STRUCT.

HIGHWAY

(H14) S.R. 6 BELEN BRIDGE - NO WORK

(H15) HUMPING BRIDGE APPROACH

RAILROAD

(R2) BELEN RAILROAD BRIDGE - NO WORK

4000 0 4000 8000

SCALE IN FEET

KEY MAP

BELEN UNIT - EAST

BELEN UNIT - WEST

APPROXIMATE EXTENT OF BACKWATER DUE TO SPF (4790)

T21

T22

R2

RIO GRANDE

TOME GRANT

CASA COLORADA GRANT

BELEN GRANT

ATCHISON TOPEKA & SANTA FE RAILWAY

RRIGATION & DRAINAGE

EW OVERLAP LEVEE

EW BACKFLOW PREVENTION STRUCT.

IGHWAY

R. 6 BELEN BRIDGE - NO WORK

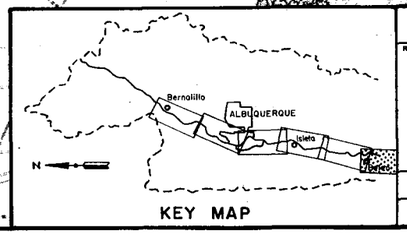
UMPING BRIDGE APPROACH

AILROAD

ELEN RAILROAD BRIDGE - NO WORK

1000 0 4000 8000

SCALE IN FEET



KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

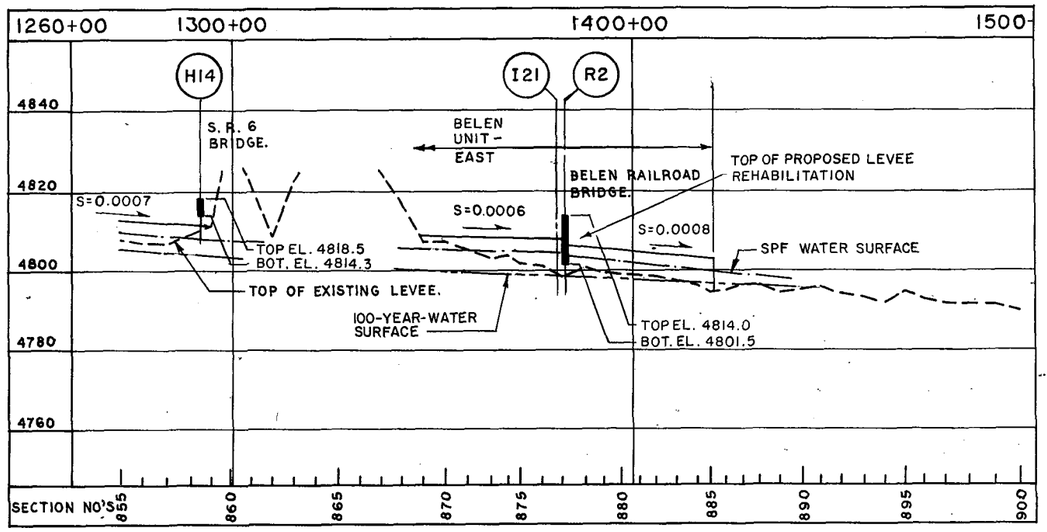
BERNALILLO TO BELEN, NEW MEXICO

SPF LEVEE PLAN A
SECTION 855 TO 900

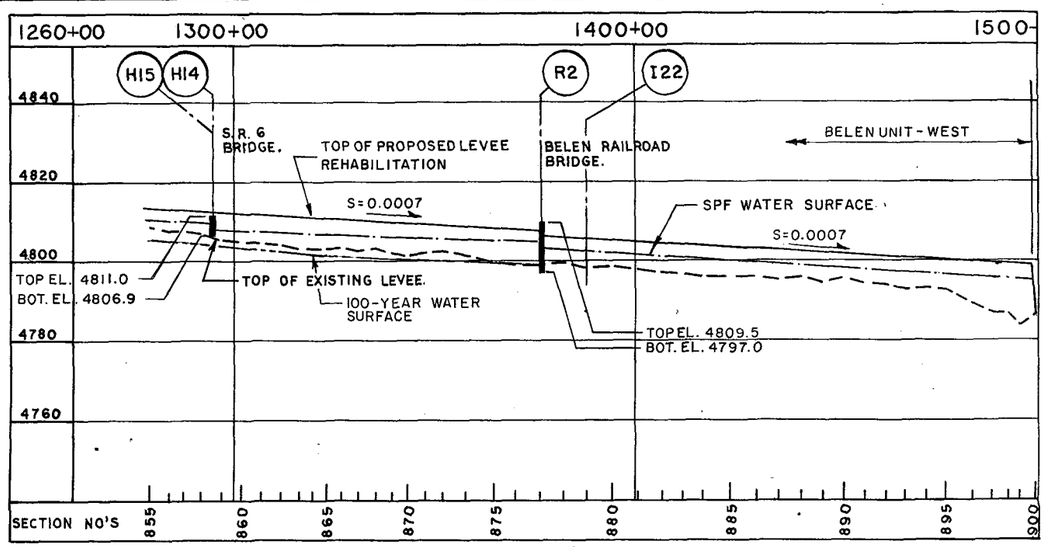
SUBMITTED: APPROVAL RECOMMENDED: APPROVED:

PROJECT MANAGER CHIEF PLANNING BRANCH CHIEF ENGINEERING BRANCH

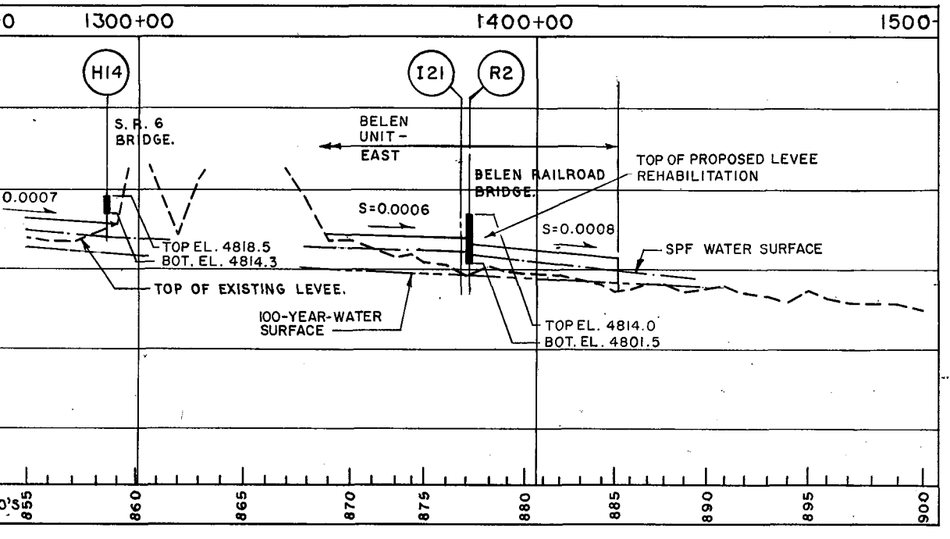
TO ACCOMPANY INTERIM FEASIBILITY REPORT FILE NO. PLATE B-14



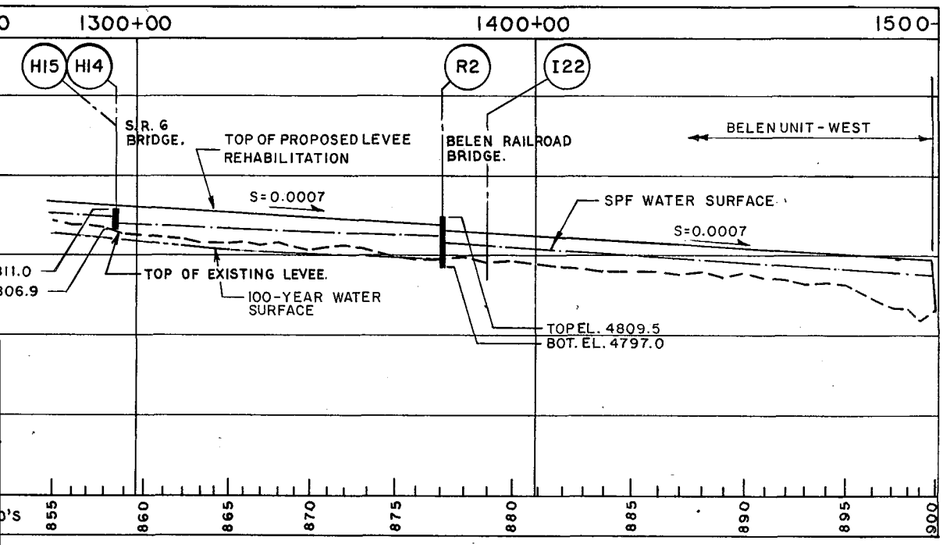
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE, PLAN A & B

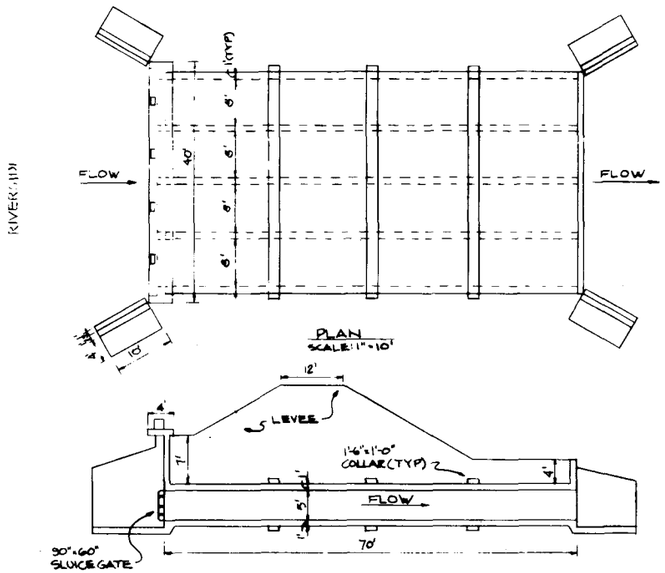
SECTION 855 TO 900

SUBMITTED:	APPROVAL RECOMMENDED:	APPROVED:
PROJECT MANAGER	CHIEF PLANNING BRANCH	CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

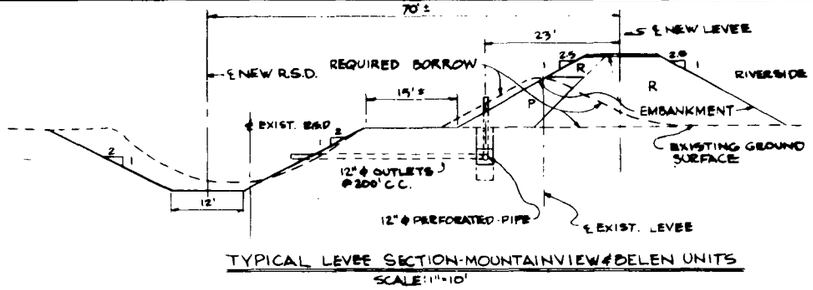
FILE NO.

PLATE B-15



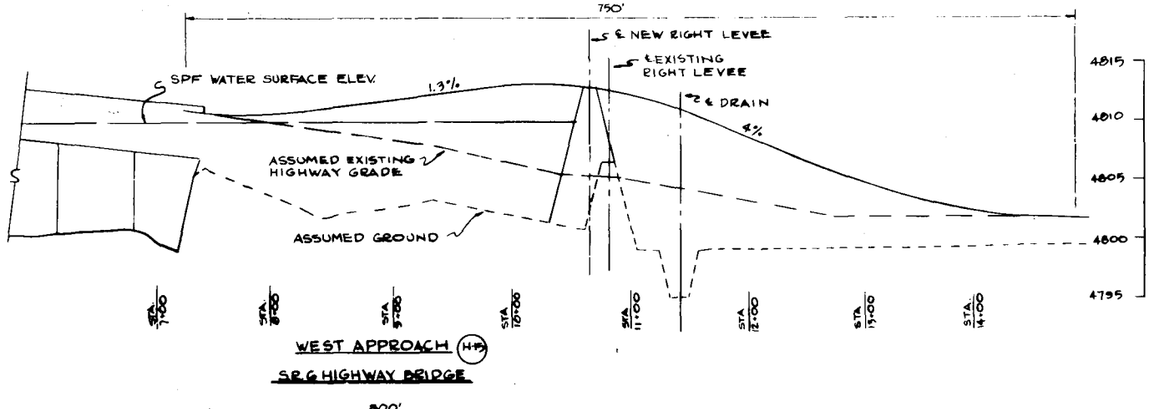
TYPE E (I13) (I14)

EXCESSIVE INFLOW PREVENTION STRUCTURE



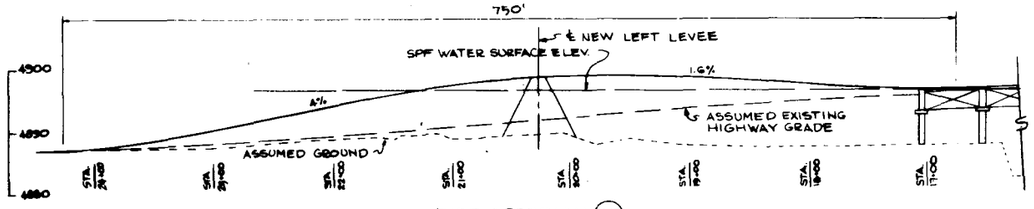
TYPICAL LEVEE SECTION-MOUNTAINVIEW & DELEN UNITS

SCALE: 1" = 10'

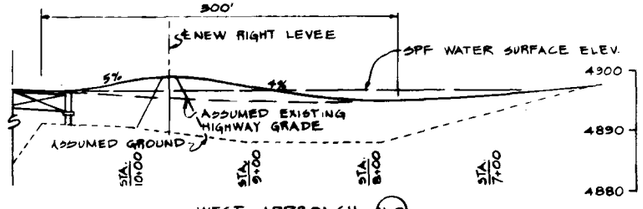


WEST APPROACH (H-11)

S.R. 6 HIGHWAY BRIDGE

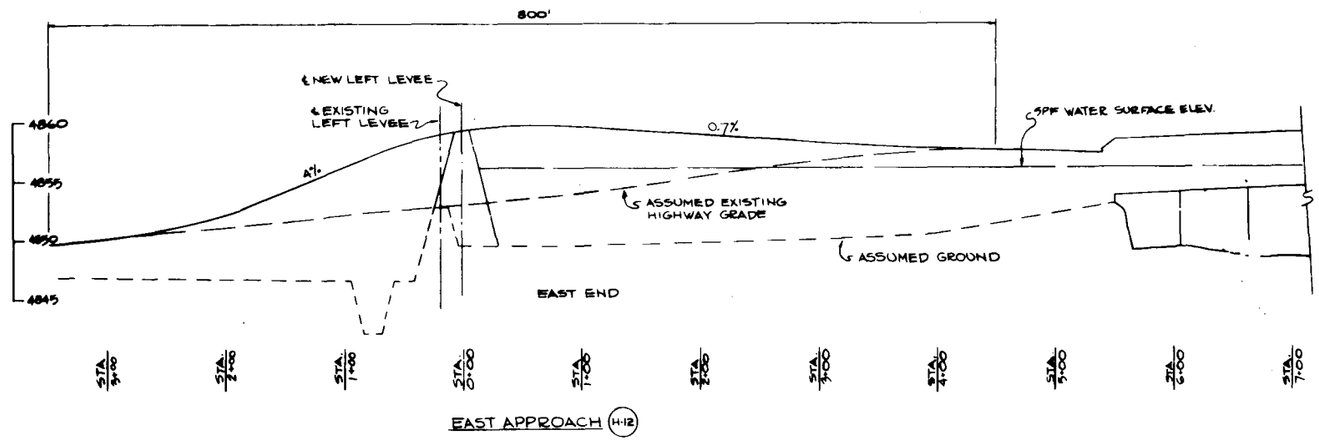


EAST APPROACH (H-10)

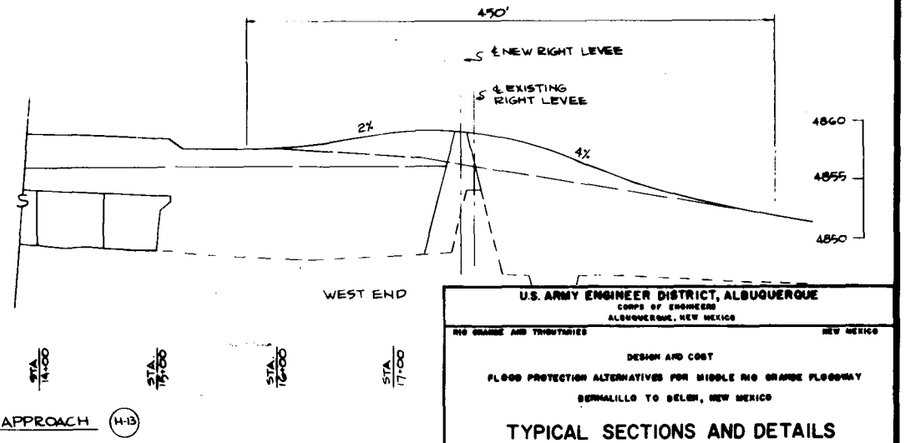


WEST APPROACH (H-9)

S.R. 47 HIGHWAY BRIDGE



EAST APPROACH (H-12)



WEST APPROACH (H-13)

S.R. 49 HIGHWAY BRIDGE

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

TYPICAL SECTIONS AND DETAILS

SUBMITTED: — APPROVED: — PROJECT MANAGER — CHIEF PLANNING DIVISION — CHIEF ENGINEERING DIVISION

TO ACCOMPANY INTERIM FEASIBILITY REPORT — FILE NO. — PLATE B-16

IRRIGATION & DRAINAGE

- (I10) NEW BACKFLOW PREVENTION STRUCT.
- (I11) NEW OVERLAP LEVEE
- (I12) NEW EXCESSIVE INFLOW PREV. STRU.
- (I13) NEW EXCESSIVE INFLOW PREV. STRU.
- (I14) NEW EXCESSIVE INFLOW PREV. STRU.
- (I15) ISLETA DIVERSION DAM-NO WORK
- (I16) NEW BACKFLOW PREVENTION STRU.
- (I17) NEW BACKFLOW PREVENTION STRU.
- (I18) NEW OVERLAP LEVEE

HIGHWAYS

- (H8) HUMPING BRIDGE APPROA
- (H9) S.R. 47- ISLETA BRIDGE-N
- (H10) HUMPING BRIDGE APPROA
- (H11) S.R. 49-LOS LUNAS BRID
- (H12) HUMPING BRIDGE APPROA
- (H13) HUMPING BRIDGE APPROA

RAILROAD

- (R1) ISLETA RAILROAD BRIDGE-N
- (R2) RAISE SANTA FE RAILROAD

ISLETA UNIT-EAST

BELEN UNIT-EAST

MATCH LINE C-3

SPF FLOOD PLAIN

I12

H10

I14

R1

650

640

620

I11

I10

H9

H8

I13

I15

690

680

700

710

720

SPF FLOOD PLAIN

I16

I17

RAILROAD RAISE R2

ISLETA MARSH

MATCH LINE C-4

ISLETA RESERVATION

ISLETA UNIT-WEST

BELEN UNIT-WEST

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

- (I10) NEW BACKFLOW PREVENTION STRUCT.
- (I11) NEW OVERLAP LEVEE
- (I12) NEW EXCESSIVE INFLOW PREV. STRU.
- (I13) NEW EXCESSIVE INFLOW PREV. STRU.
- (I14) NEW EXCESSIVE INFLOW PREV. STRU.
- (I15) ISLETA DIVERSION DAM - NO WORK
- (I16) NEW BACKFLOW PREVENTION STRU.
- (I17) NEW BACKFLOW PREVENTION STRU.
- (I18) NEW OVERLAP LEVEE

HIGHWAYS

- (H8) HUMPING BRIDGE APPROACH
- (H9) S.R. 47 - ISLETA BRIDGE - NO WORK
- (H10) HUMPING BRIDGE APPROACH
- (H11) S.R. 49 - LOS LUNAS BRIDGE - NO WORK
- (H12) HUMPING BRIDGE APPROACH
- (H13) HUMPING BRIDGE APPROACH

RAILROAD

- (R1) ISLETA RAILROAD BRIDGE - NO WORK
- (R2) RAISE SANTA FE RAILROAD

ISLETA UNIT - EAST

BELEN UNIT - EAST

SPF FLOOD PLAIN

RAILROAD RAISE (R2)

ISLETA MARSH

ISLETA UNIT - WEST

BELEN UNIT - WEST

4000 0 4000 8000

SCALE IN FEET

LINE B MATCH

KEY MAP

Bernalillo

ALBUQUERQUE

Belen

N

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN B

SECTION 626 TO 741

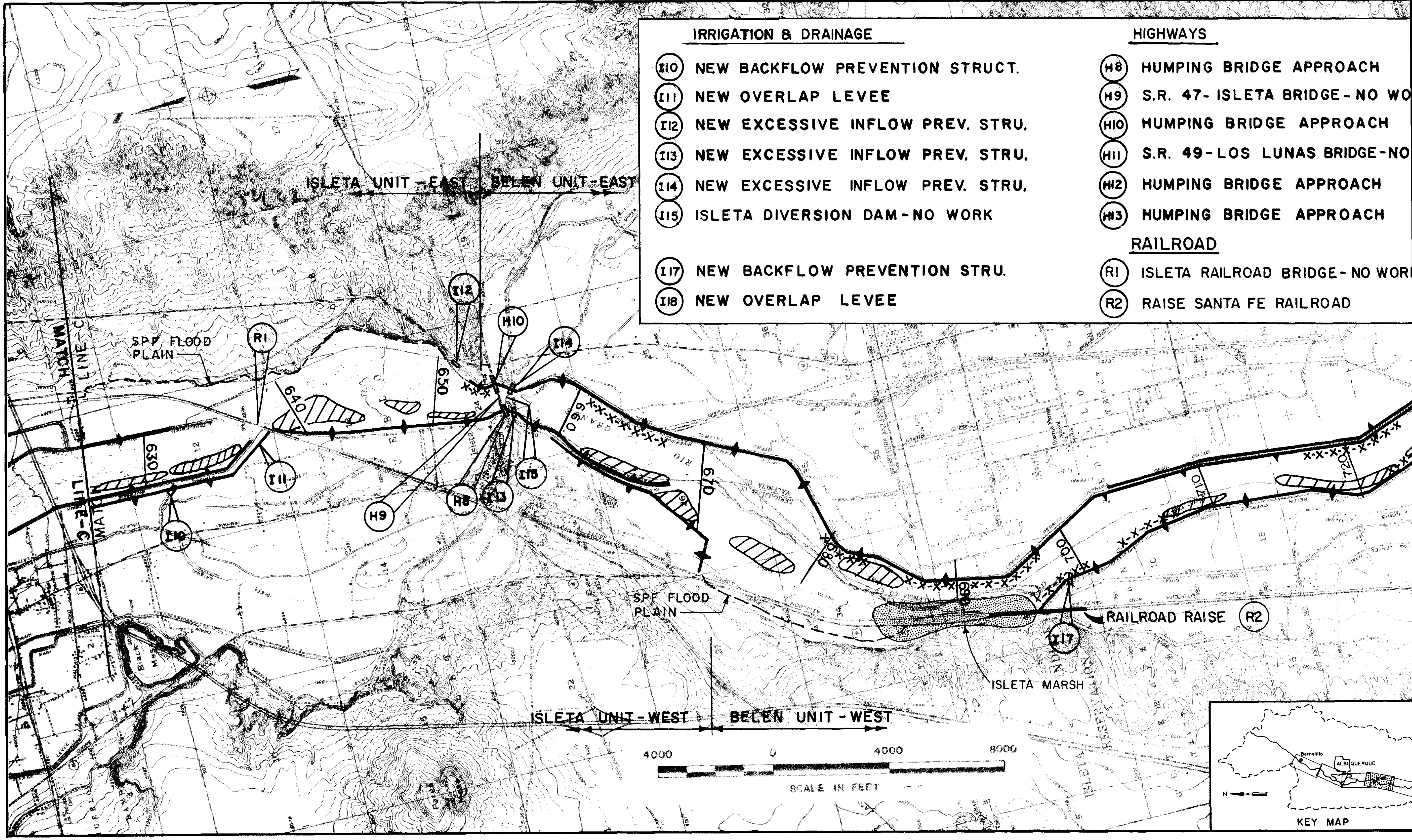
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE 17


IRRIGATION & DRAINAGE
I10 NEW BACKFLOW PREVENTION STRUCT.
I11 NEW OVERLAP LEVEE
I12 NEW EXCESSIVE INFLOW PREV. STRU.
I13 NEW EXCESSIVE INFLOW PREV. STRU.
I14 NEW EXCESSIVE INFLOW PREV. STRU.
I15 ISLETA DIVERSION DAM-NO WORK
I17 NEW BACKFLOW PREVENTION STRU.
I18 NEW OVERLAP LEVEE
HIGHWAYS
H8 HUMPING BRIDGE APPROACH
H9 S.R. 47- ISLETA BRIDGE-NO WO
H10 HUMPING BRIDGE APPROACH
H11 S.R. 49-LOS LUNAS BRIDGE-NO
H12 HUMPING BRIDGE APPROACH
H13 HUMPING BRIDGE APPROACH
RAILROAD
R1 ISLETA RAILROAD BRIDGE-NO WORK
R2 RAISE SANTA FE RAILROAD
ISLETA UNIT-EAST
BELEN UNIT-EAST
MATCH LINE-C
SPF FLOOD PLAIN
SPF FLOOD PLAIN
RAILROAD RAISE
ISLETA MARSH
ISLETA UNIT-WEST
BELEN UNIT-WEST
4000 0 4000 8000
SCALE IN FEET
KEY MAP
Bernalillo
ALBUQUERQUE

IRRIGATION & DRAINAGE

- I10 NEW BACKFLOW PREVENTION STRUCT.
- I11 NEW OVERLAP LEVEE
- I12 NEW EXCESSIVE INFLOW PREV. STRU.
- I13 NEW EXCESSIVE INFLOW PREV. STRU.
- I14 NEW EXCESSIVE INFLOW PREV. STRU.
- I15 ISLETA DIVERSION DAM - NO WORK
- I17 NEW BACKFLOW PREVENTION STRU.
- I18 NEW OVERLAP LEVEE

HIGHWAYS

- H8 HUMPING BRIDGE APPROACH
- H9 S.R. 47 - ISLETA BRIDGE - NO WORK
- H10 HUMPING BRIDGE APPROACH
- H11 S.R. 49 - LOS LUNAS BRIDGE - NO WORK
- H12 HUMPING BRIDGE APPROACH
- H13 HUMPING BRIDGE APPROACH

RAILROAD

- R1 ISLETA RAILROAD BRIDGE - NO WORK
- R2 RAISE SANTA FE RAILROAD

ISLETA UNIT - EAST | BELEN UNIT - EAST

ISLETA UNIT - WEST | BELEN UNIT - WEST

SPF FLOOD PLAIN

RAILROAD RAISE R2

ISLETA MARSH

LINE-B MATCH

4000 0 4000 8000

SCALE IN FEET

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

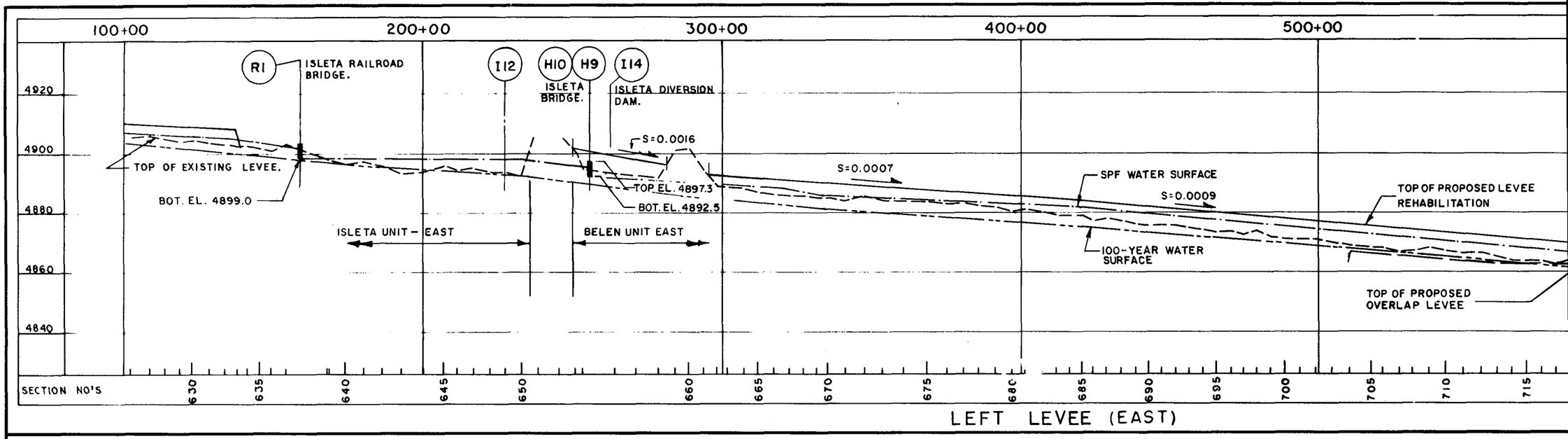
BERNALILLO TO BELEN, NEW MEXICO

PLAN B
SECTION 626 TO 741

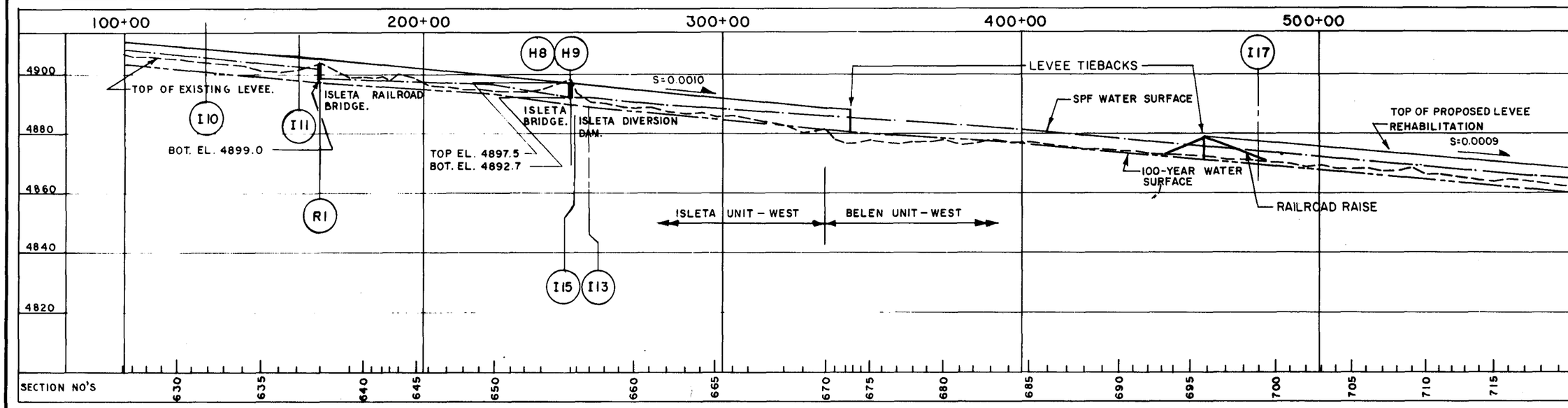
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

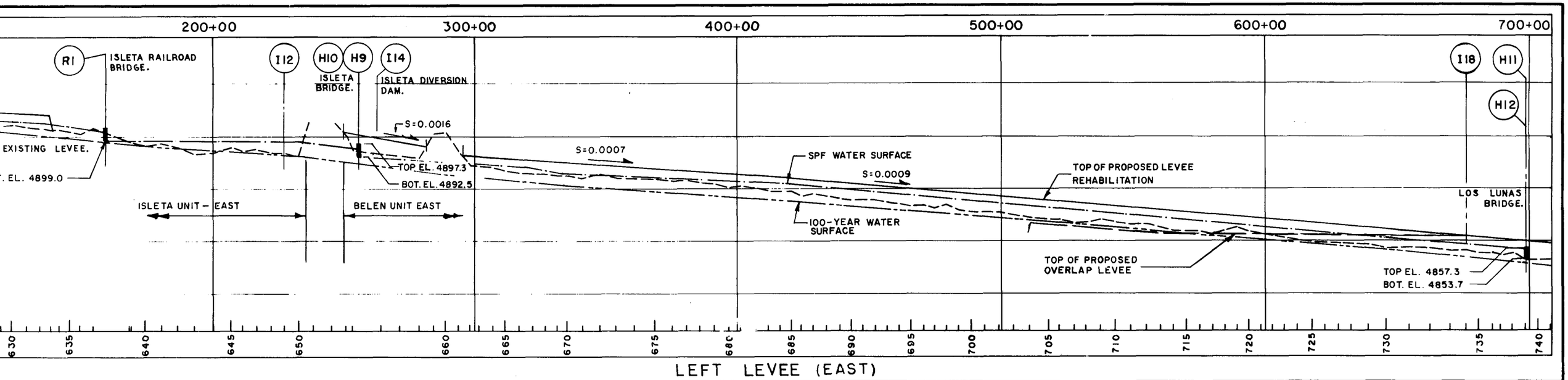
TO ACCOMPANY INTERIM FEASIBILITY REPORT | FILE NO. | PLATE B-17



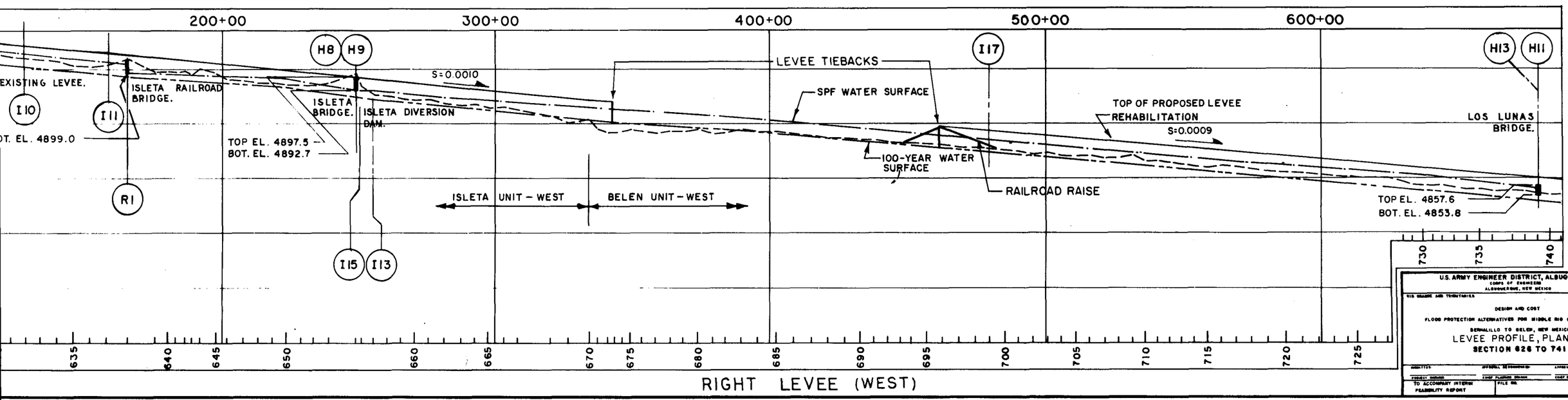
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO
RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

LEVEE PROFILE, PLAN B

SECTION 626 TO 741

SUBMITTED — APPROVED — APPROVED

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-18

42,000 CFS FLOOD PLAIN

CORRALES MAIN CANAL SIPHON

FUTURE SCS RESERVOIR

CORRALES UNIT

H1

LEGEND

- REHABILATATED LEVEE
- LEVEE AND OVERLAP LEVEE
- BACKFLOW PREVENTION STRUCTURE
- X-X-X-X KELLNER JETTY FIELD
- 450 CROSS SECTION NUMBER
- HIGHWAY WORK
- APPROXIMATE LIMITS OF FLOOD PONDING
- BORROW SITES
- INDICATION OF A SPECIFIC ITEM OF WORK

HIGHWAYS

(H1) S.R. 44 BRIDGE - NO WORK

4000 0 4000 8000

SCALE IN FEET

KEY MAP

42,000 CFS FLOOD PLAIN

CORRALES MAIN CANAL SIPHON

FUTURE SCS RESERVOIR

CORRALES UNIT

MATCH LINE E

MATCH LINE

LEGEND

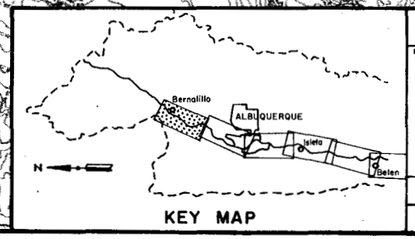
- ATATED LEVEE
- ND OVERLAP LEVEE
- W PREVENTION STRUCTURE
- JETTY FIELD
- ECTION NUMBER
- WORK
- MATE LIMITS OF FLOOD PONDING SITES
- N OF A SPECIFIC ITEM
- ORK

HIGHWAYS

(HI) S.R. 44 BRIDGE - NO WORK

0 4000 8000

SCALE IN FEET



KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

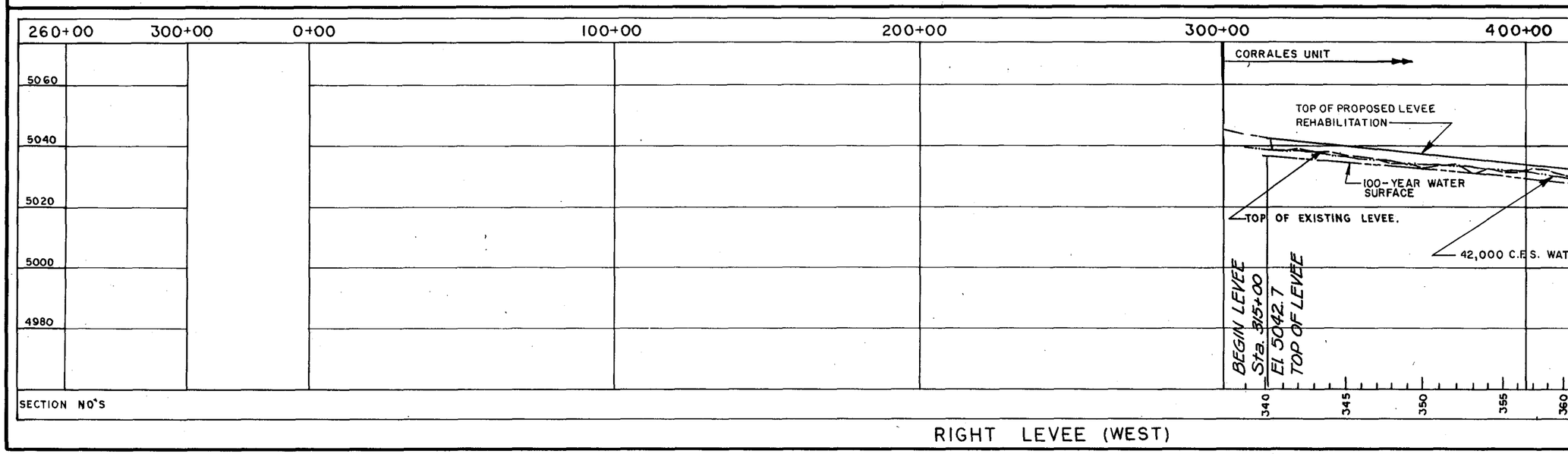
BERNALILLO TO BELEN, NEW MEXICO

PLAN C (42,000 CFS)

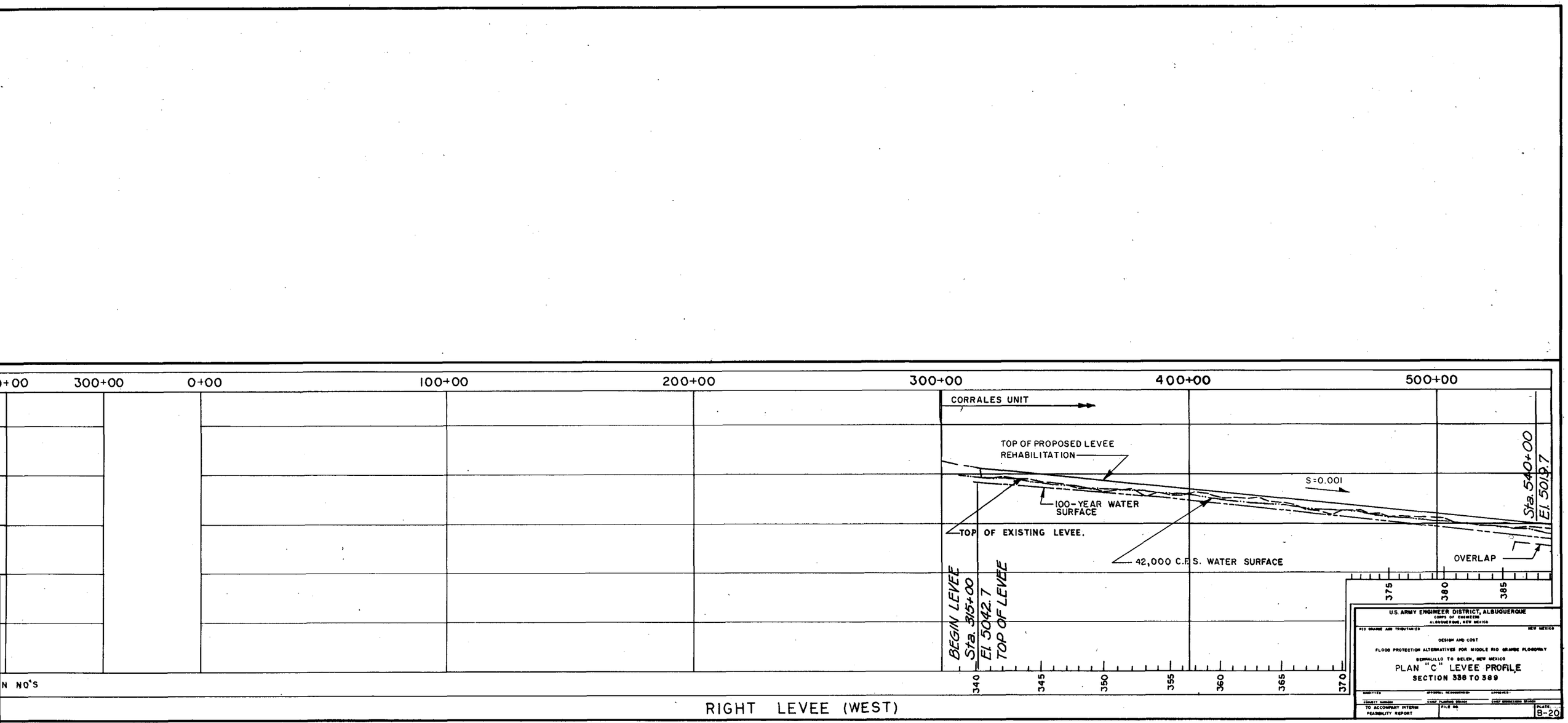
SECTION 339 TO 389

SUBMITTED:	APPROVAL RECOMMENDED:	APPROVED:
PROJECT MANAGER	CHIEF PLANNING BRANCH	CHIEF ENGINEERS BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT | FILE NO. | PLATE B-19



RIGHT LEVEE (WEST)


300+00
0+00
100+00
200+00
300+00
400+00
500+00
CORRALES UNIT
TOP OF PROPOSED LEVEE REHABILITATION
S=0.001
100-YEAR WATER SURFACE
TOP OF EXISTING LEVEE.
42,000 C.F.S. WATER SURFACE
OVERLAP
Sta. 540+00
El. 5019.7
BEGIN LEVEE
Sta. 315+00
El. 5042.7
TOP OF LEVEE
340
345
350
355
360
365
370
375
380
385
N NO'S
RIGHT LEVEE (WEST)
U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO
RIO GRANDE AND TRIBUTARIES
NEW MEXICO
DESIGN AND COST
FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO
PLAN "C" LEVEE PROFILE
SECTION 338 TO 389
SUBMITTED:
APPROVAL RECOMMENDED:
APPROVED:
PROJECT MANAGER
CHIEF PLANNING BRANCH
CHIEF ENGINEERING BRANCH
TO ACCOMPANY INTERIM FEASIBILITY REPORT
FILE NO.
PLATE
B-20

IRRIGATION & DRAINAGE

(I1) NEW OVERLAP LEVEE

(I2) NEW OVERLAP LEVEE

HIGHWAYS

(H2) S.R. 46 BRIDGE—NO WORK

(H3) INTERSTATE 40 BRIDGE—NO WORK

BERNALILLO UNIT

42,000 CFS FLOOD PLAIN

NORTH OUTLET ALB. CHAN. DIVERSION

ALBUQUERQUE UNIT - EAST

LINE E MATCH

410

420

430

440

450

460

470

480

ARROYO DE LAS CALABACILLAS

42,000 CFS FLOOD PLAIN

CORRALES UNIT

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

(I1) NEW OVERLAP LEVEE

(I2) NEW OVERLAP LEVEE

HIGHWAYS

(H2) S.R. 46 BRIDGE—NO WORK

(H3) INTERSTATE 40 BRIDGE—NO WORK

ALBUQUERQUE UNIT - EAST

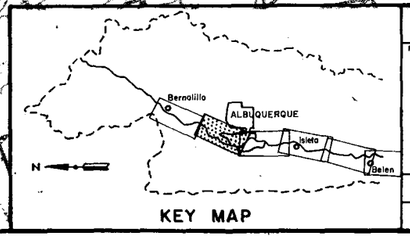
CORRALES UNIT

ARROYO DE LAS CALABACILLAS

42,000 CFS FLOOD PLAIN

0 4000 8000

SCALE IN FEET



KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN C (42,000 CFS)
SECTION 389 TO 508

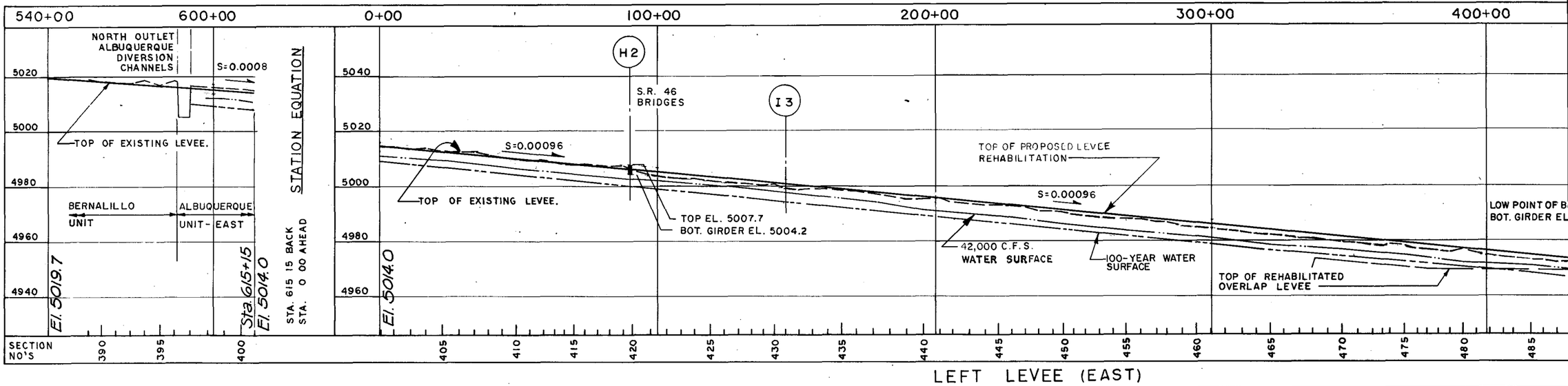
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

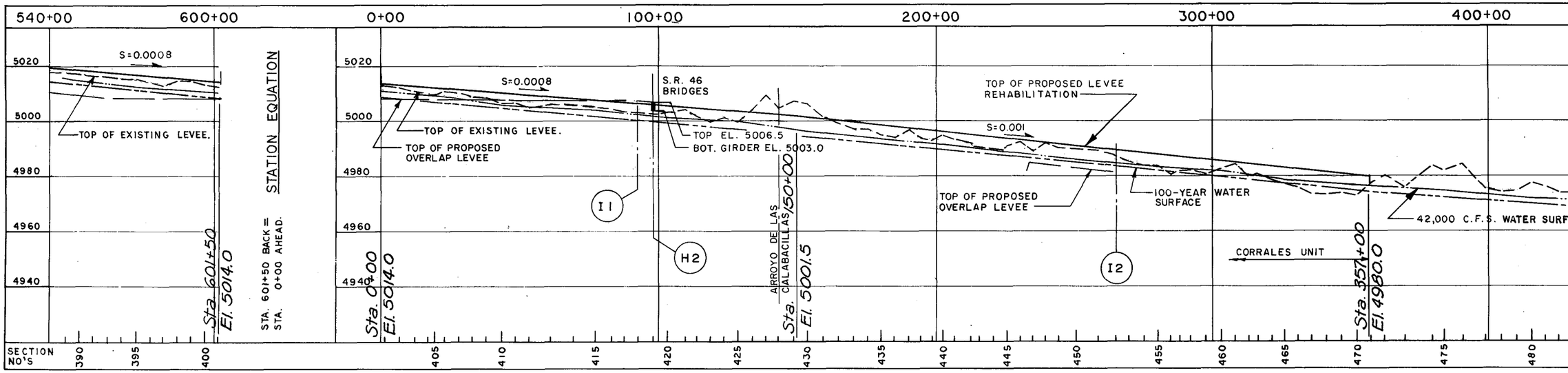
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

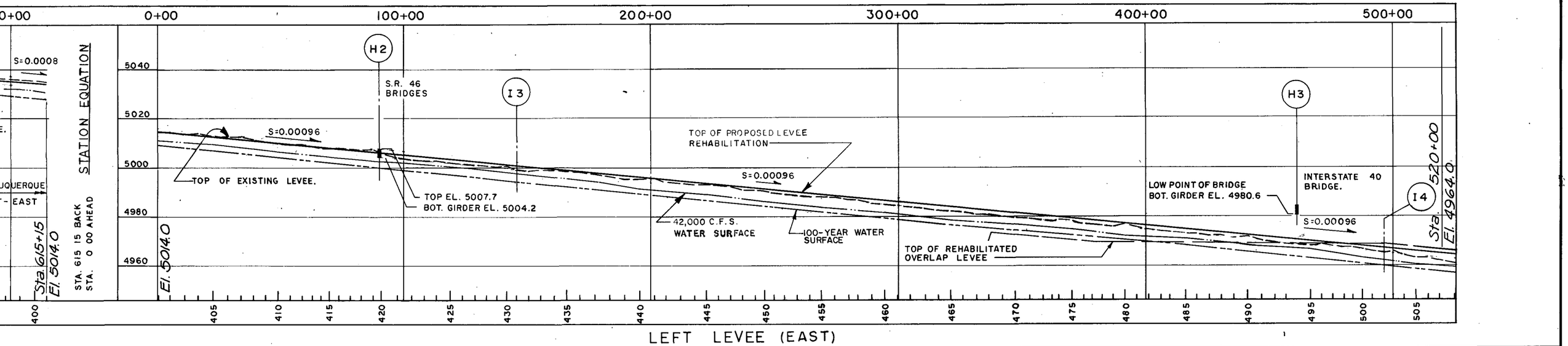
PLATE B-21



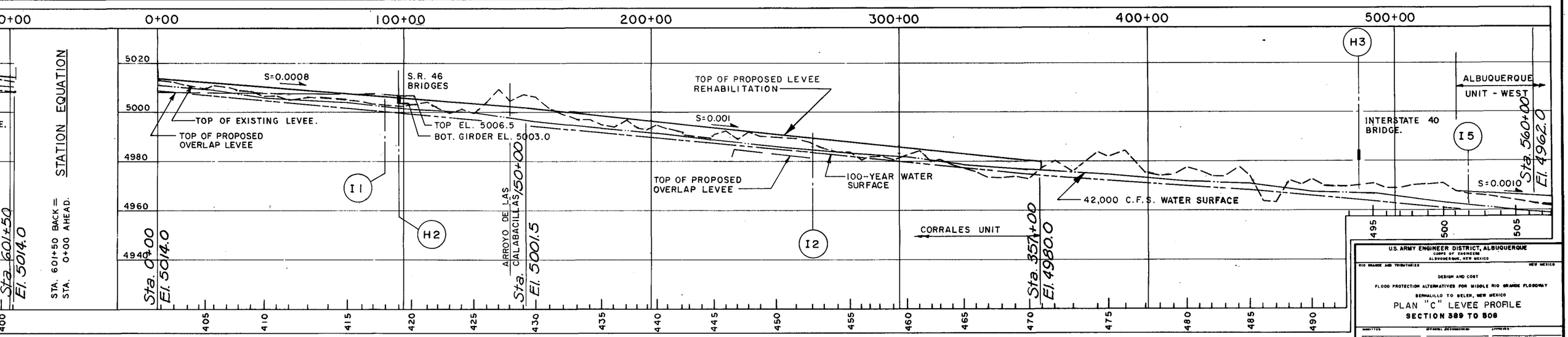
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

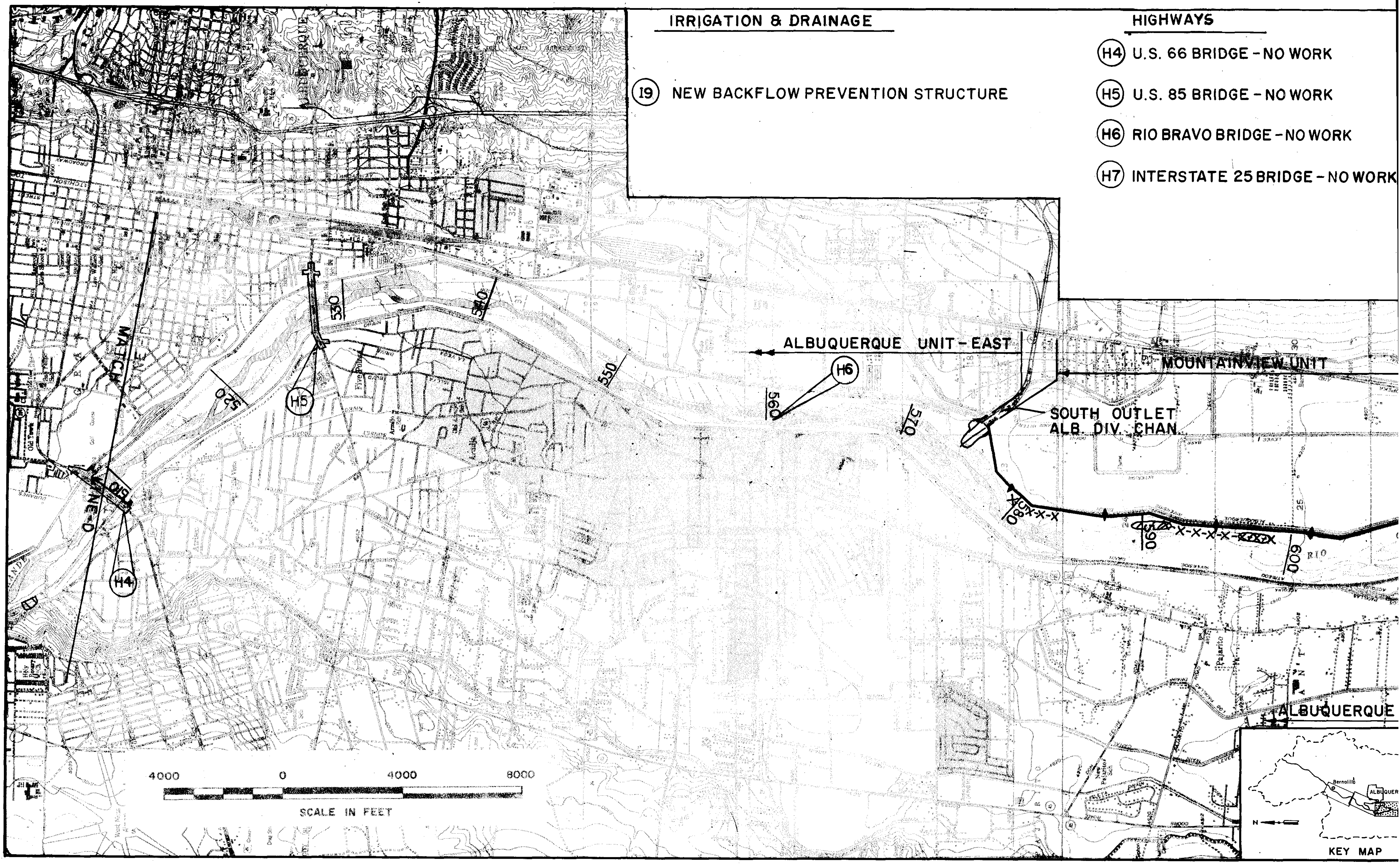
FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY
BERNALILLO TO BELEN, NEW MEXICO

PLAN "C" LEVEE PROFILE
SECTION 389 TO 508

SUBMITTED — APPROVED — APPROVED

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT — FILE NO. — PLATE B-22



IRRIGATION & DRAINAGE
19 NEW BACKFLOW PREVENTION STRUCTURE
HIGHWAYS
H4 U.S. 66 BRIDGE - NO WORK
H5 U.S. 85 BRIDGE - NO WORK
H6 RIO BRAVO BRIDGE - NO WORK
H7 INTERSTATE 25 BRIDGE - NO WORK
ALBUQUERQUE UNIT - EAST
MOUNTAINVIEW UNIT
SOUTH OUTLET
ALB. DIV. CHAN.
MATCH LINE D
H4
H5
H6
510
520
530
540
550
560
570
580
590
600
ALBUQUERQUE
4000
0
4000
8000
SCALE IN FEET
KEY MAP

IRRIGATION & DRAINAGE

(I9) NEW BACKFLOW PREVENTION STRUCTURE

HIGHWAYS

(H4) U.S. 66 BRIDGE - NO WORK

(H5) U.S. 85 BRIDGE - NO WORK

(H6) RIO BRAVO BRIDGE - NO WORK

(H7) INTERSTATE 25 BRIDGE - NO WORK

ALBUQUERQUE UNIT - EAST

MOUNTAINVIEW UNIT

ISLETA UNIT EAST

SOUTH OUTLET ALB. DIV. CHAN.

ISLETA UNIT WEST

ALBUQUERQUE UNIT - WEST

0 4000 8000

SCALE IN FEET

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN C (42,000 CFS)
SECTION 508 TO 626

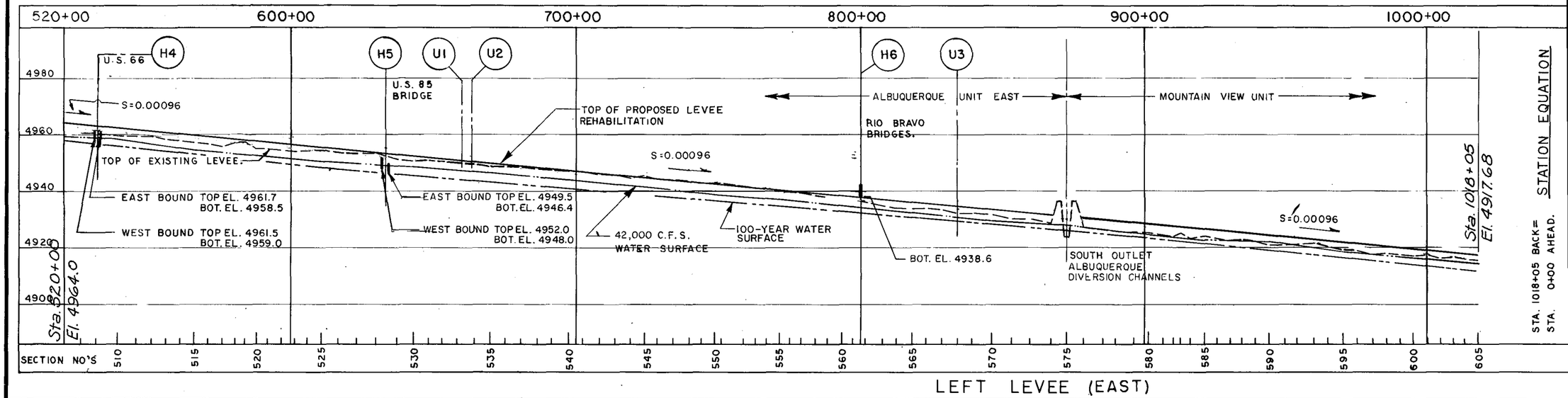
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

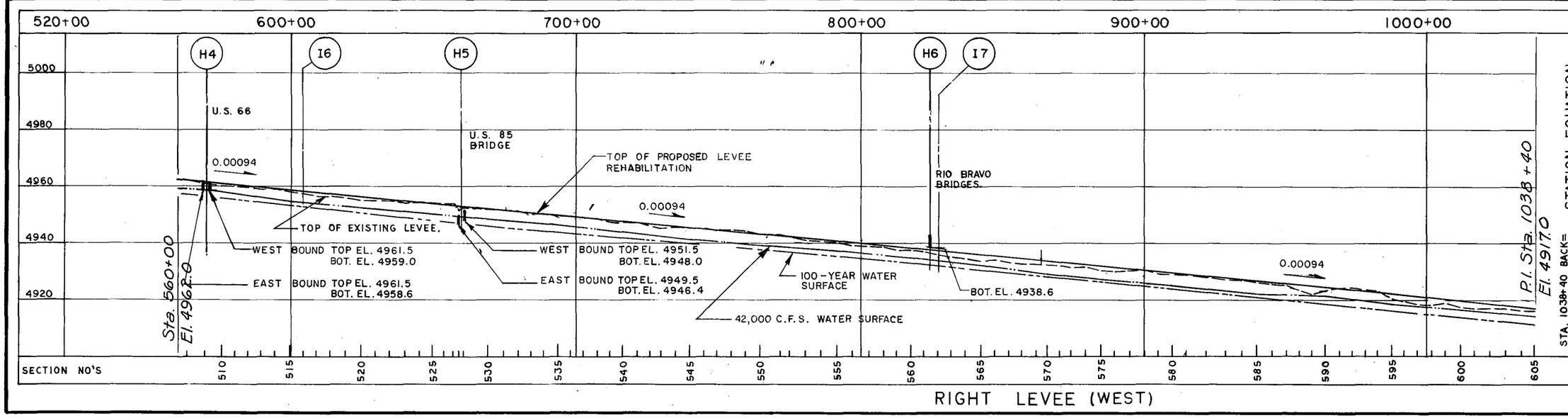
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

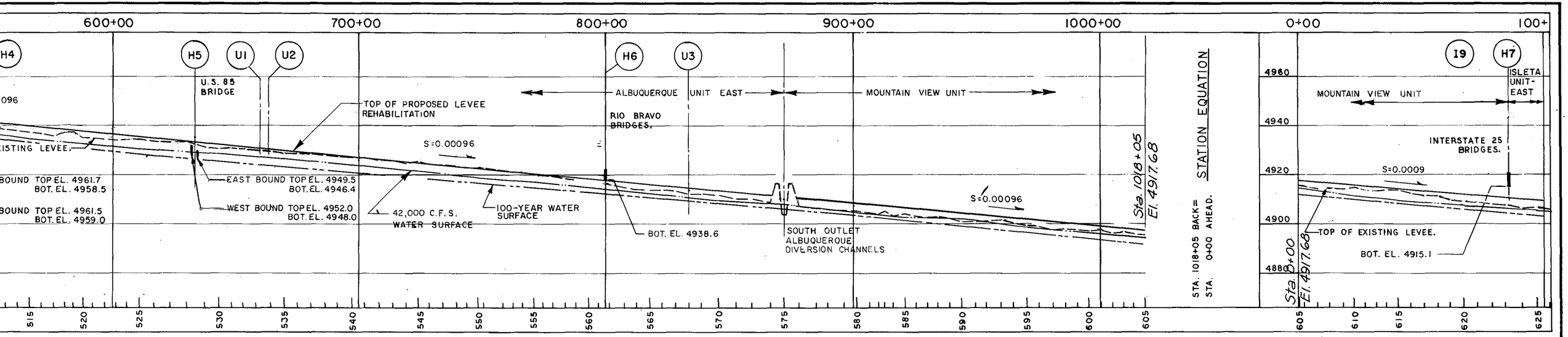
PLATE B-23



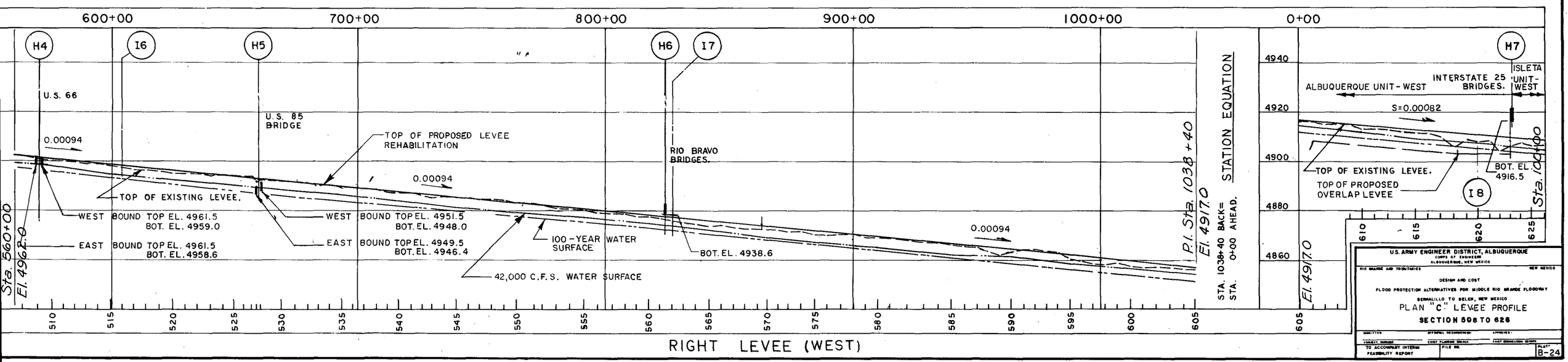
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN "C" LEVEE PROFILE

SECTION 508 TO 626

SUBMITTED — OFFICIAL RECOMMENDATION — APPROVED

PROJECT ENGINEER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-24

IRRIGATION & DRAINAGE

- (I10) NEW BACKFLOW PREVENTION STRUCT.
- (I11) NEW OVERLAP LEVEE
- (I12) NEW EXCESSIVE INFLOW PREV. STRU.
- (I13) NEW EXCESSIVE INFLOW PREV. STRU.
- (I14) NEW EXCESSIVE INFLOW PREV. STRU.
- (I15) ISLETA DIVERSION DAM - NO WORK
- (I16) NEW BACKFLOW PREVENTION STRU.
- (I17) NEW BACKFLOW PREVENTION STRU.
- (I18) NEW OVERLAP LEVEE

HIGHWAYS

- (H8) HUMPING BRIDGE APPROACH
- (H9) S.R. 47 - ISLETA BRIDGE - NO WOR
- (H10) HUMPING BRIDGE APPROACH
- (H11) S.R. 49 - LOS LUNAS BRIDGE - NO
- (H12) HUMPING BRIDGE APPROACH
- (H13) HUMPING BRIDGE APPROACH

RAILROAD

- (R1) ISLETA RAILROAD BRIDGE - NO WORK
- (R2) RAISE SANTA FE RAILROAD

ISLETA UNIT - EAST

BELEN UNIT - EAST

42,000 CFS FLOOD PLAIN

640

650

660

670

680

700

720

630

RAILROAD RAISE (R2)

ISLETA MARSH

ISLETA UNET WEST

BELEN UNIT - WEST

4000 0 4000 8000

SCALE IN FEET

KEY MAP

IRRIGATION & DRAINAGE

- (I10) NEW BACKFLOW PREVENTION STRUCT.
- (I11) NEW OVERLAP LEVEE
- (I12) NEW EXCESSIVE INFLOW PREV. STRU.
- (I13) NEW EXCESSIVE INFLOW PREV. STRU.
- (I14) NEW EXCESSIVE INFLOW PREV. STRU.
- (I15) ISLETA DIVERSION DAM - NO WORK
- (I16) NEW BACKFLOW PREVENTION STRU.
- (I17) NEW BACKFLOW PREVENTION STRU.
- (I18) NEW OVERLAP LEVEE

HIGHWAYS

- (H8) HUMPING BRIDGE APPROACH
- (H9) S.R. 47 - ISLETA BRIDGE - NO WORK
- (H10) HUMPING BRIDGE APPROACH
- (H11) S.R. 49 - LOS LUNAS BRIDGE - NO WORK
- (H12) HUMPING BRIDGE APPROACH
- (H13) HUMPING BRIDGE APPROACH

RAILROAD

- (R1) ISLETA RAILROAD BRIDGE - NO WORK
- (R2) RAISE SANTA FE RAILROAD

ISLETA UNIT - EAST

BELEN UNIT - EAST

640

650

660

670

680

700

710

720

730

42,000 CFS FLOOD PLAIN

RAILROAD RAISE (R2)

ISLETA MARSH

ISLETA RESERVATION

MATCH LINE B

ISLETA UNET WEST

BELEN UNIT - WEST

4000 0 4000 8000

SCALE IN FEET

KEY MAP

Bernalillo

ALBUQUERQUE

Belen

N

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN C (42,000 CFS).
SECTION 626 TO 741

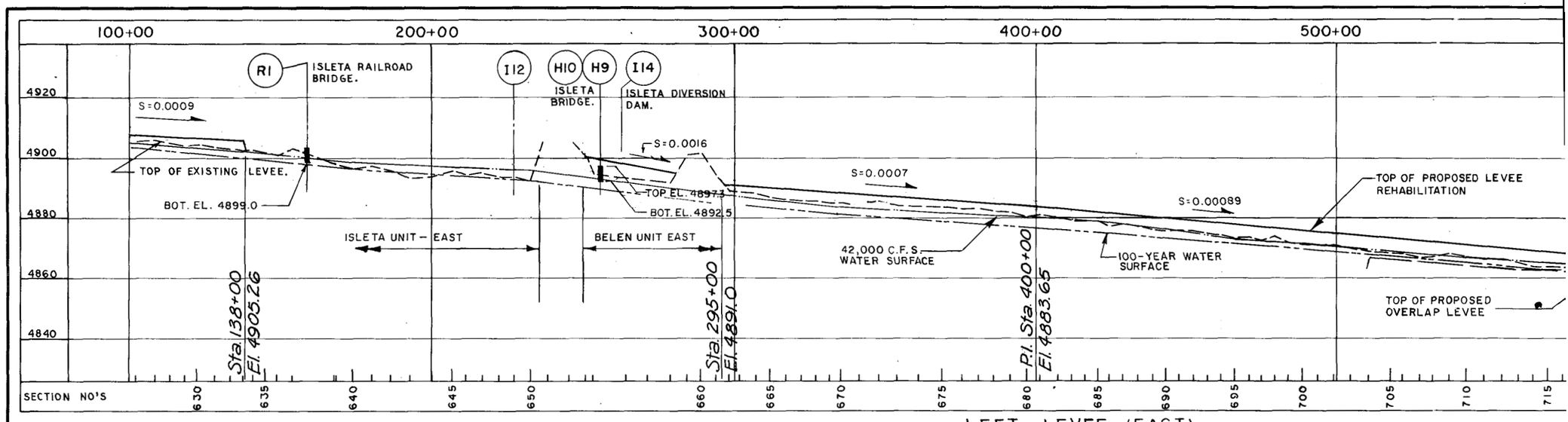
SUBMITTED: — APPROVED RECOMMENDED: — APPROVED:

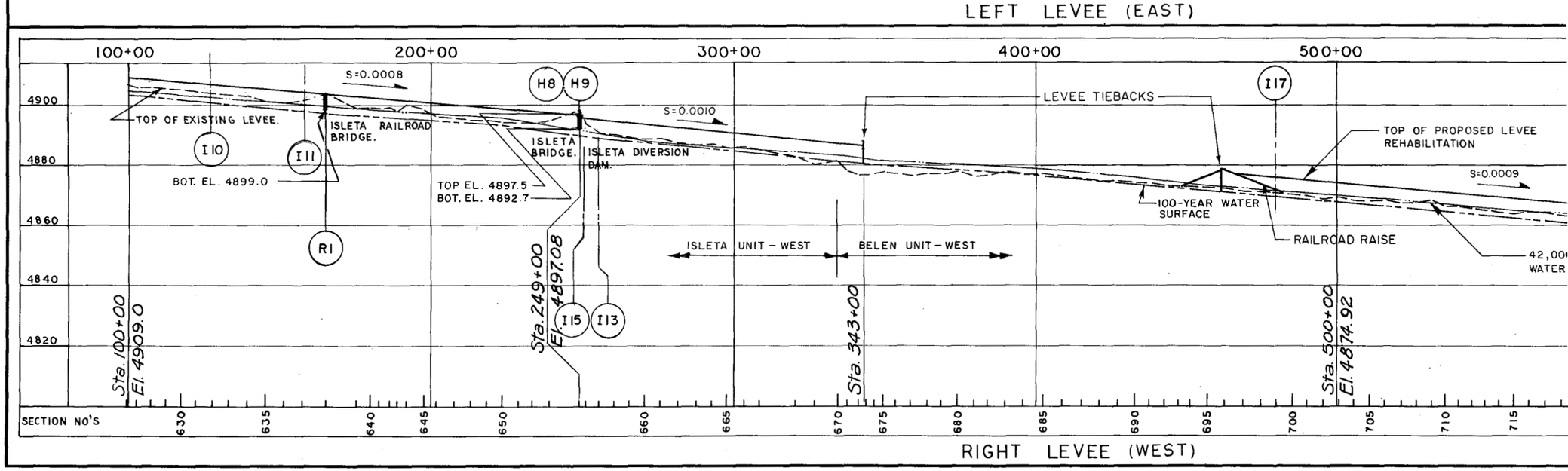
PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

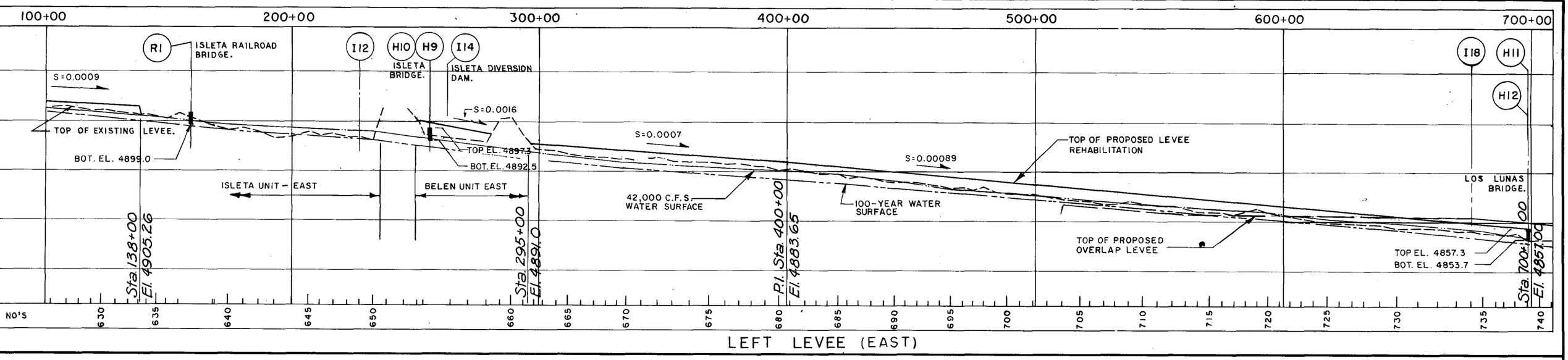
TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

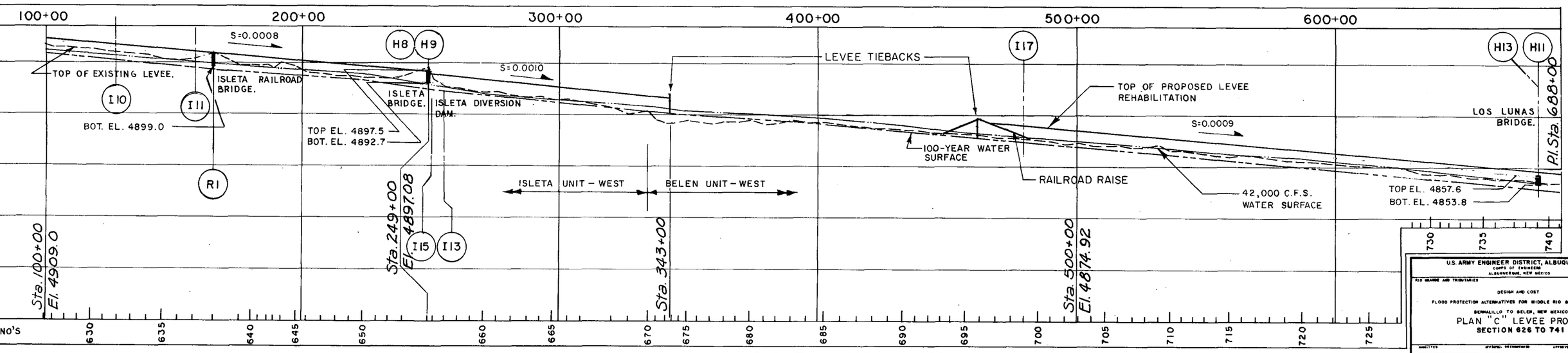
PLATE B-25


100+00
200+00
300+00
400+00
500+00
4920
4900
4880
4860
4840
R1
ISLETA RAILROAD BRIDGE.
I12
H10
H9
I14
ISLETA BRIDGE.
ISLETA DIVERSION DAM.
S=0.0009
S=0.0016
S=0.0007
S=0.00089
TOP OF EXISTING LEVEE.
BOT. EL. 4899.0
TOP EL. 4897.5
BOT. EL. 4892.5
ISLETA UNIT – EAST
BELEN UNIT EAST
42,000 C.F.S. WATER SURFACE
100-YEAR WATER SURFACE
TOP OF PROPOSED LEVEE REHABILITATION
TOP OF PROPOSED OVERLAP LEVEE
Sta. 138+00
El. 4905.26
Sta. 295+00
El. 4891.0
P.I. Sta. 400+00
El. 4883.65
SECTION NO'S
630
635
640
645
650
660
665
670
675
680
685
690
695
700
705
710
715
LEFT LEVEE (EAST)


100+00
200+00
300+00
400+00
500+00
4900
4880
4860
4840
4820
S=0.0008
H8
H9
I17
LEVEE TIEBACKS
TOP OF EXISTING LEVEE.
I10
I11
R1
ISLETA RAILROAD BRIDGE.
S=0.0010
ISLETA BRIDGE.
ISLETA DIVERSION DAM.
BOT. EL. 4899.0
TOP EL. 4897.5
BOT. EL. 4892.7
TOP OF PROPOSED LEVEE REHABILITATION
S=0.0009
100-YEAR WATER SURFACE
RAILROAD RAISE
42,000
WATER
ISLETA UNIT – WEST
BELEN UNIT – WEST
I15
I13
Sta. 100+00
El. 4909.0
Sta. 249+00
El. 4897.08
Sta. 343+00
Sta. 500+00
El. 4874.92
SECTION NO'S
630
635
640
645
650
660
665
670
675
680
685
690
695
700
705
710
715
RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

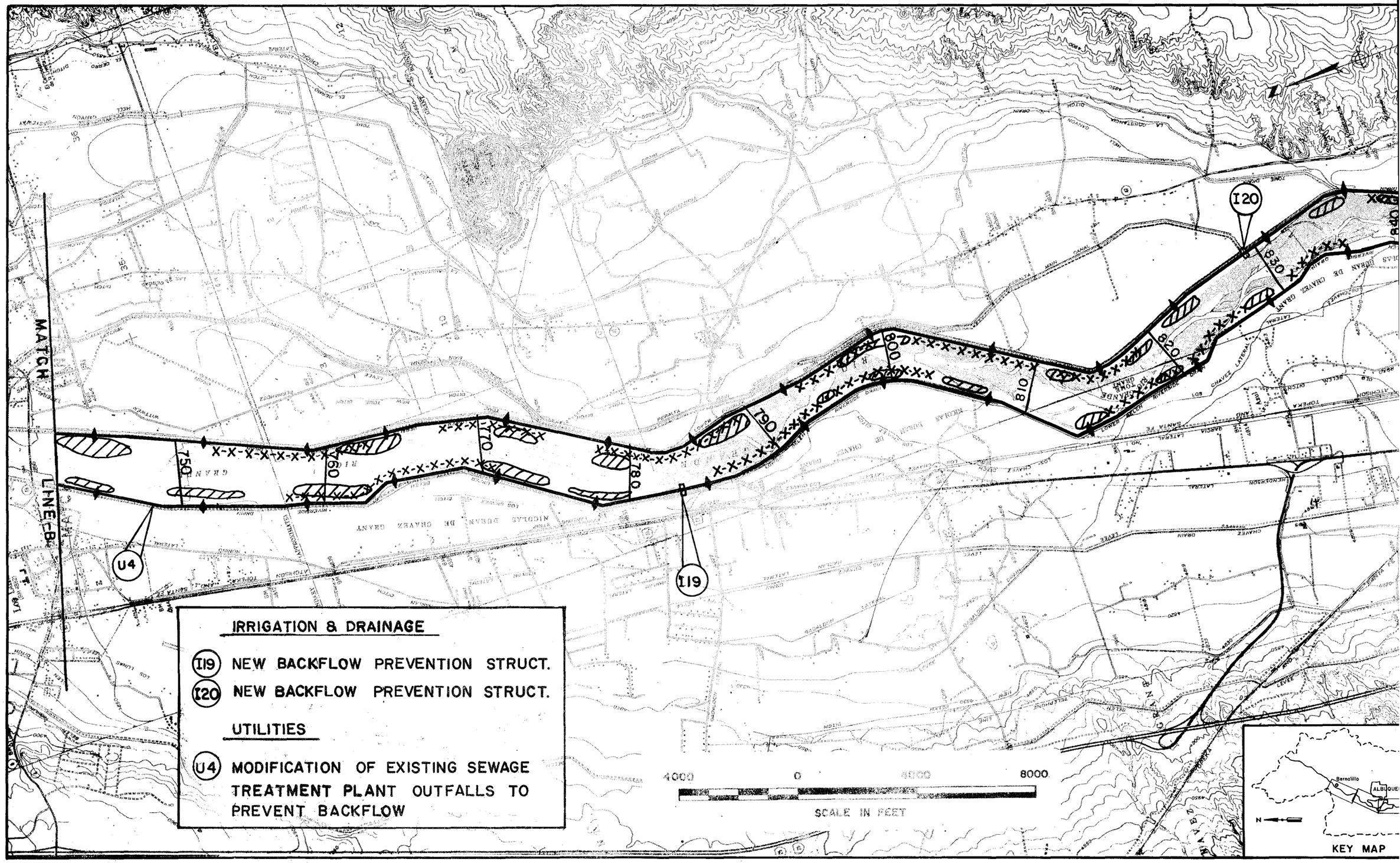
PLAN "C" LEVEE PROFILE
SECTION 626 TO 741

SUBMITTED	APPROVAL RECOMMENDED	APPROVED
PROJECT MANAGER	CHIEF PLANNING BRANCH	CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-26



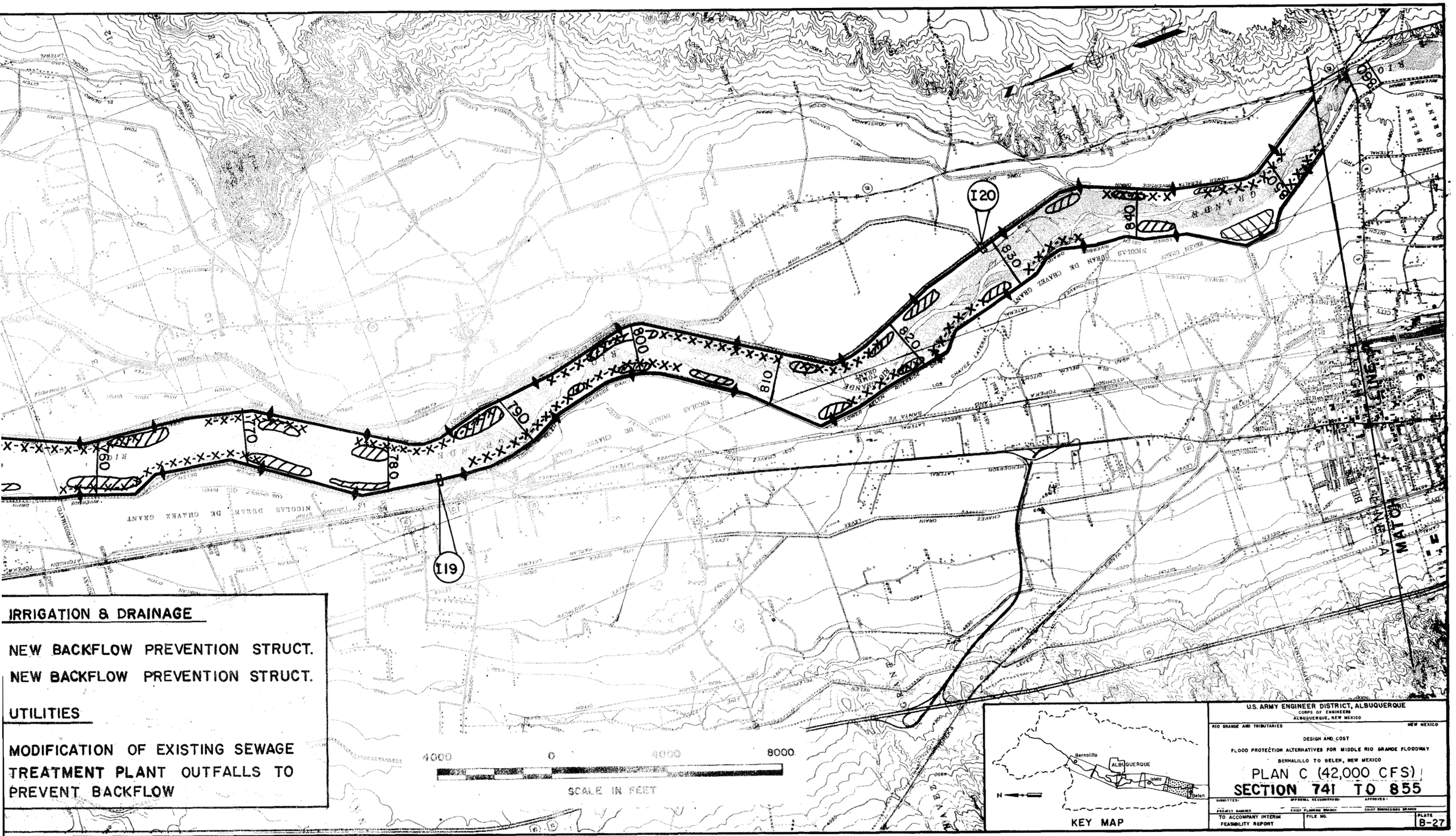
IRRIGATION & DRAINAGE

(I19) NEW BACKFLOW PREVENTION STRUCT.

(I20) NEW BACKFLOW PREVENTION STRUCT.

UTILITIES

(U4) MODIFICATION OF EXISTING SEWAGE TREATMENT PLANT OUTFALLS TO PREVENT BACKFLOW



IRRIGATION & DRAINAGE

NEW BACKFLOW PREVENTION STRUCT.

NEW BACKFLOW PREVENTION STRUCT.

UTILITIES

MODIFICATION OF EXISTING SEWAGE TREATMENT PLANT OUTFALLS TO PREVENT BACKFLOW

KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN C (42,000 CFS)

SECTION 741 TO 855

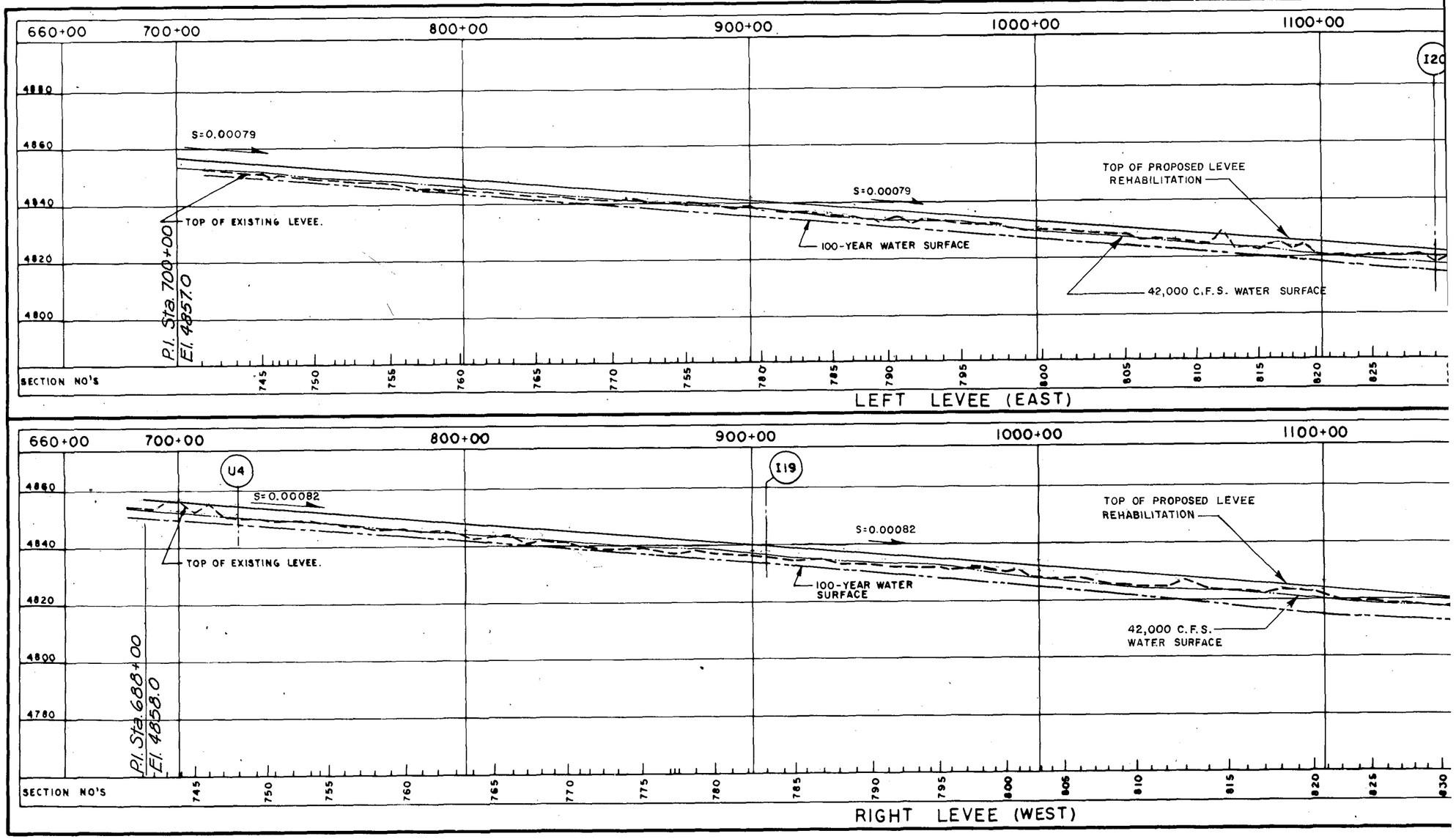
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

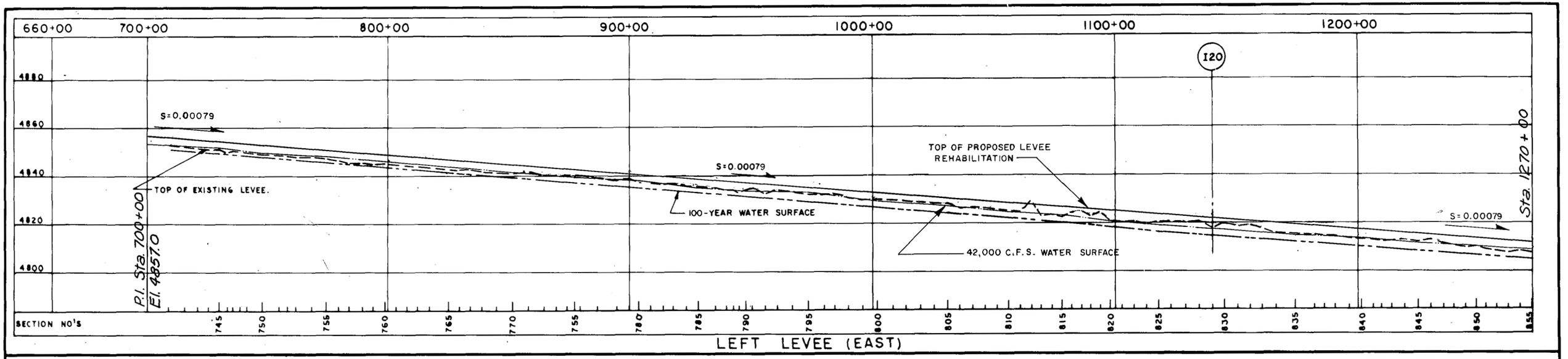
PROJECT MANAGER — CHIEF, PLANNING BRANCH — CHIEF, ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

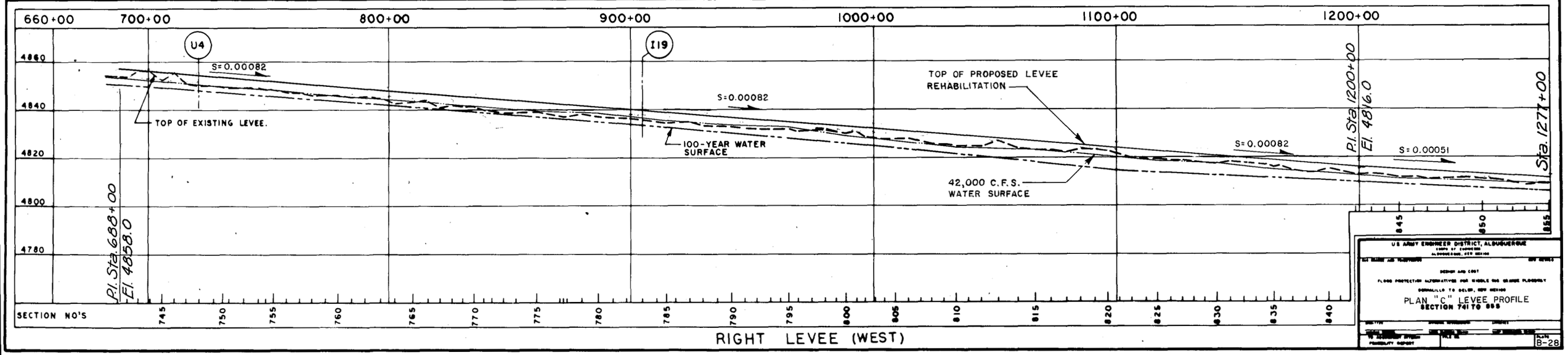
FILE NO.

PLATE B-27


660+00
700+00
800+00
900+00
1000+00
1100+00
I20
4880
4860
4840
4820
4800
S=0.00079
TOP OF EXISTING LEVEE.
P.I. Sta. 700+00
El. 4857.0
S=0.00079
100-YEAR WATER SURFACE
TOP OF PROPOSED LEVEE REHABILITATION
42,000 C.F.S. WATER SURFACE
SECTION NO'S
745
750
755
760
765
770
755
780
785
790
795
800
805
810
815
820
825
LEFT LEVEE (EAST)
660+00
700+00
800+00
900+00
1000+00
1100+00
U4
I19
4860
4840
4820
4800
4780
S=0.00082
TOP OF EXISTING LEVEE.
P.I. Sta. 688+00
El. 4858.0
S=0.00082
100-YEAR WATER SURFACE
TOP OF PROPOSED LEVEE REHABILITATION
42,000 C.F.S. WATER SURFACE
SECTION NO'S
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



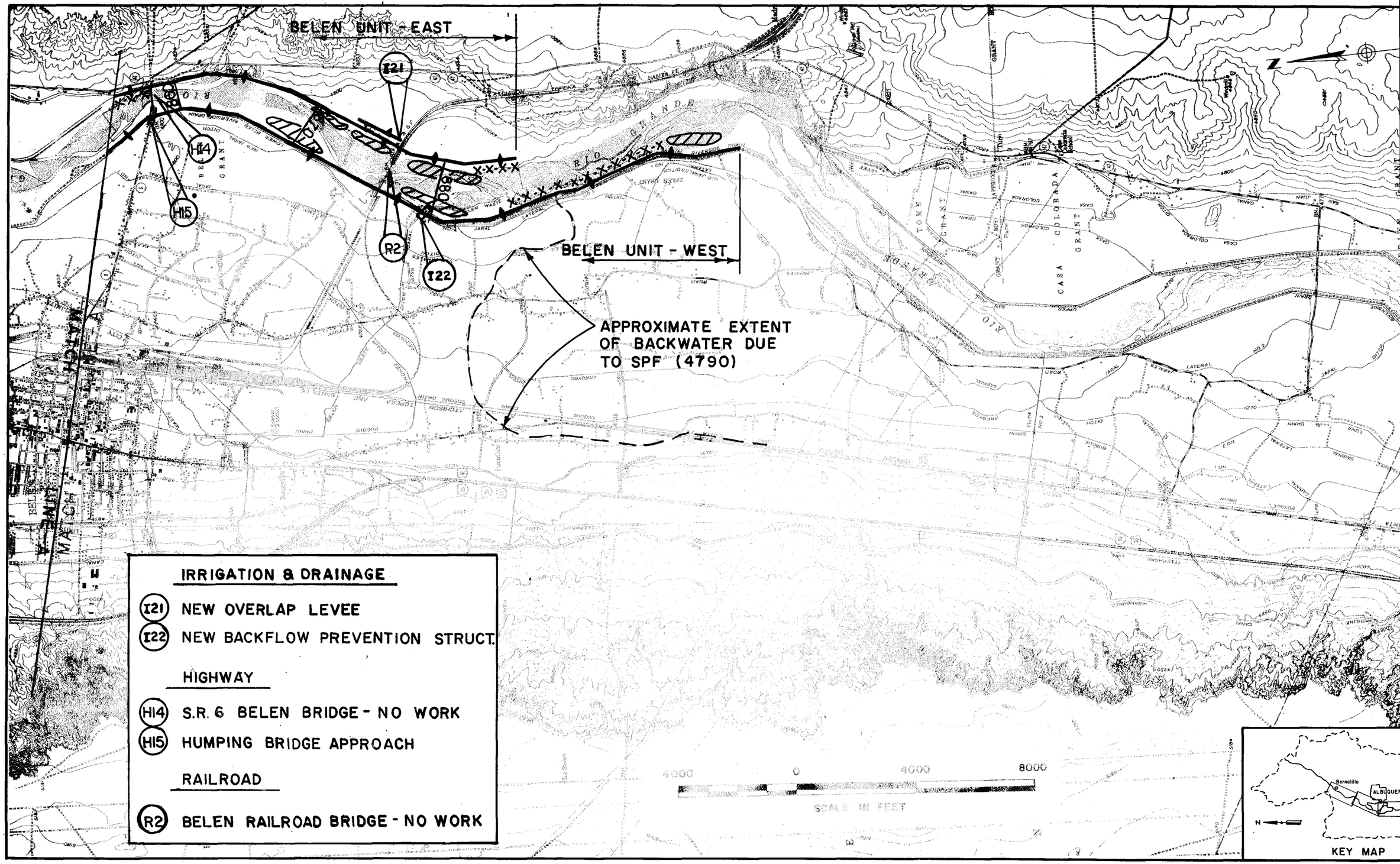
RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE

DESIGN AND COST

PLAN "C" LEVEE PROFILE
SECTION 741 TO 855

B-28


BELEN UNIT - EAST
BELEN UNIT - WEST
I21
I22
R2
H14
H15
APPROXIMATE EXTENT
OF BACKWATER DUE
TO SPF (4790)
IRRIGATION & DRAINAGE
I21 NEW OVERLAP LEVEE
I22 NEW BACKFLOW PREVENTION STRUCT.
HIGHWAY
H14 S.R. 6 BELEN BRIDGE - NO WORK
H15 HUMPING BRIDGE APPROACH
RAILROAD
R2 BELEN RAILROAD BRIDGE - NO WORK
4000 0 4000 8000
SCALE IN FEET
Bernalillo
ALBUQUERQUE
N
KEY MAP

BELEN UNIT - EAST

I21

R2

I22

BELEN UNIT - WEST

APPROXIMATE EXTENT OF BACKWATER DUE TO SPF (4790)

RIO GRANDE

CASA COLORADA GRANT

SELAN GRANT

VALENCIA CO

SAN JUAN RIVERSIDE DR

ATION & DRAINAGE

OVERLAP LEVEE

BACKFLOW PREVENTION STRUCT.

WAY

BELEN BRIDGE - NO WORK

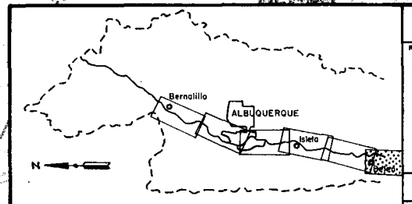
ING BRIDGE APPROACH

OAD

N RAILROAD BRIDGE - NO WORK

4000 0 4000 8000

SCALE IN FEET



KEY MAP

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

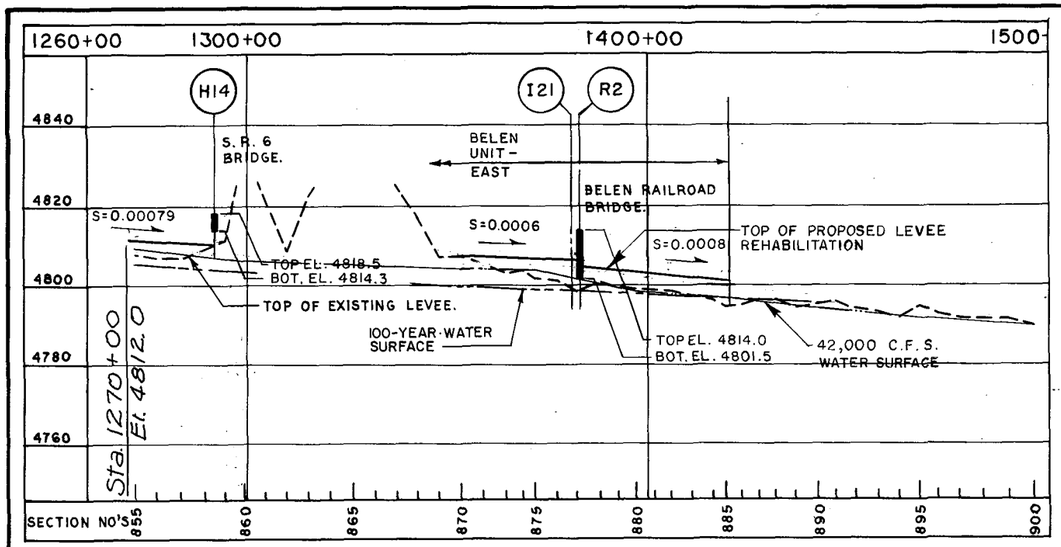
PLAN C (42,000 CFS)

SECTION 855 TO 900

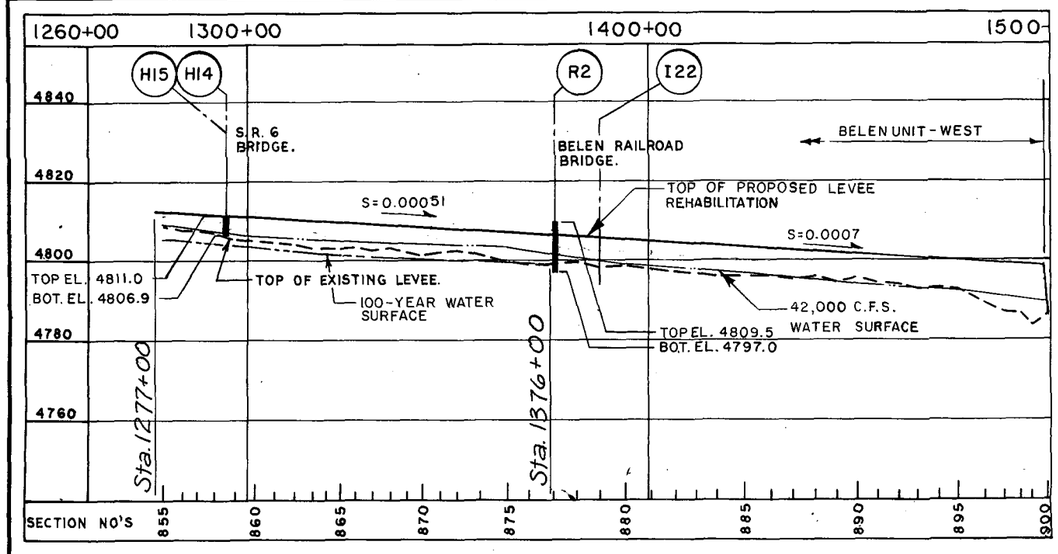
SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT NUMBER — CHIEF PLANNING BRANCH — CHIEF ENGINEERS BRANCH

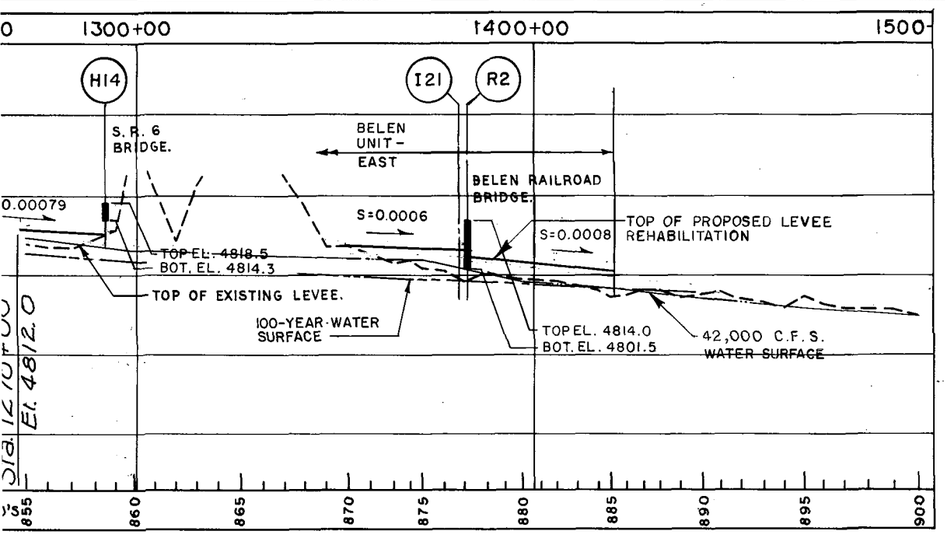
TO ACCOMPANY INTERIM FEASIBILITY REPORT | FILE NO. | PLATE B-29



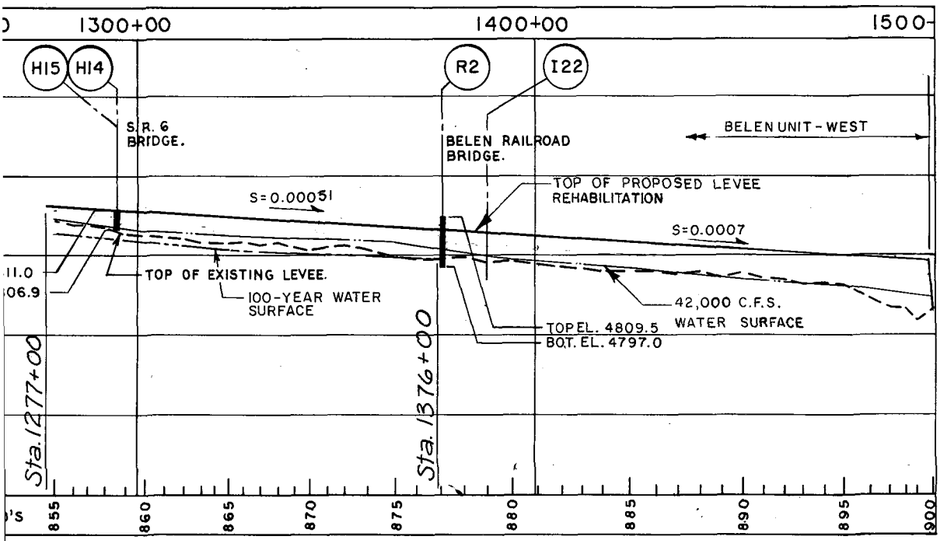
LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)



LEFT LEVEE (EAST)



RIGHT LEVEE (WEST)

U.S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

RIO GRANDE AND TRIBUTARIES — NEW MEXICO

DESIGN AND COST

FLOOD PROTECTION ALTERNATIVES FOR MIDDLE RIO GRANDE FLOODWAY

BERNALILLO TO BELEN, NEW MEXICO

PLAN "C" LEVEE PROFILE
SECTION 855 TO 900

SUBMITTED: — APPROVAL RECOMMENDED: — APPROVED:

PROJECT MANAGER — CHIEF PLANNING BRANCH — CHIEF ENGINEERING BRANCH

TO ACCOMPANY INTERIM FEASIBILITY REPORT

FILE NO.

PLATE B-30

APPENDIX C

PUBLIC INVOLVEMENT

The studies and report have been continually coordinated with interested and affected Federal, State and local agencies and the general public to insure total consideration of their needs and desires, and to arrive at an acceptable and implementable plan. The draft report was distributed for Federal and non-Federal interagency and public review on 2 February 1979. Their replies and responses are contained in Appendix D.

This appendix documents the public involvement program implemented by Albuquerque District to achieve participation by and coordination with interested and affected individuals, organizations, and agencies. The following chronology of events describes the methods used to inform the public and obtain its input for the study.

January 1975. Formation of urban study Review Panel. To assure coordination of and input from all levels of government, a Review Panel consisting of representatives of local, State and Federal agencies was established to direct the study efforts. Agencies represented on the panel were:

New Mexico State Engineer Office
New Mexico State Planning Office
New Mexico Environmental Improvement Agency

Environmental Protection Agency
Middle Rio Grande Council of Governments
City of Albuquerque
Corps of Engineers

The Review Panel was chaired by the Albuquerque District Engineer.

April 1975. First newsletter published to inform readers of initiation of total water resource and related land use study for the Greater Albuquerque Area, including Rio Grande flood control.

8, 9, and 10 April 1975. Initial public meetings were held in Belen, Albuquerque, and Bernalillo, respectively, to present the purpose and proposed methodology of study. Attendance was light.

May 1975. Function committee composed of individuals with intimate knowledge of and experience in the area's flood problems was organized to identify flood control problems and to recommend methodology for investigation. Committee makeup consisted of the following people:

John B. Robert, Chairman - Executive Engineer, Albuquerque Metropolitan Arroyo Flood Control Authority
Colonel James L. Sutton, Retired, Vice Chairman - Former Albuquerque District Engineer
R.E. Rowen, U.S. Bureau of Reclamation
John Baker, Bureau of Indian Affairs
Kleston H. Laws, Hydrologist, City of Albuquerque
Joe Pino, Albuquerque Metropolitan Arroyo Flood Control Authority
Chuck Youberg, Soil Conservation Service

Diego Abeita, Middle Rio Grande Pueblo Irrigation Commission

Austin D. Lovett, Citizen, City of Belen

Rufus H. Carter, Civil Engineer

Boyd D. Lare, Corps of Engineers, Flood Plain Management

William E. Huntley, Corps of Engineers, Urban Studies Group

September 1975. After five meetings and 5 months of deliberation, the function committee delivered its report to the Review Panel identifying major flood control problems and recommending study priorities.

October 1975. The draft Plan of Study for the urban study was furnished all interested and affected agencies, organizations, and individuals for review and comment.

December 1975. The second newsletter was published.

May 1976. The third newsletter was published.

February 1977. The fourth newsletter was published. Also, KOAT-TV in Albuquerque provided news coverage of the flood control study and accompanying flood damage survey.

5 October 1977. The formulation stage public meeting was held in Albuquerque to inform the public of the alternatives which had been investigated during the Stage 2 formulation process and which ones remained for detailed evaluation in Stage 3.

1 December 1977. The Albuquerque District Engineer addressed the Middle Rio Grande Flood Control Authority, a local interest group concerned with water resource management within

the study area. He described the plans of improvement presented in this report.

17 February 1978. The Albuquerque District Engineer met with the Board of the Middle Rio Grande Conservancy District to seek local sponsorship of the project and to specify the requirements of the local sponsor. The Board acknowledged its role as the local sponsor.

9 May 1978. Albuquerque District representatives met with New Mexico Highway Department bridge engineers to discuss impact project would have on river crossings.

9 June 1978. Project manager gave project presentation to Middle Rio Grande Council of Governments Transportation Board.

5 October 1978. District Engineer addressed entire Middle Rio Grande Council of Governments on the flood control study.

5 December 1978. District Engineer addressed Middle Rio Grande Flood Control Authority on status and findings of study.

9 January 1979. District Engineer met with the Middle Rio Grande Conservancy District to explain President Carter's cost-sharing proposals and seek formal interest to sponsor the project.

12 January 1979. The District Engineer briefed the Middle Rio Grande Council of Governments Transportation Board concerning the results of the soon-to-be-released flood control report for the Rio Grande and what effect its findings are in relation to renovation and construction of bridge across the Rio Grande between Bernalillo and Belen.

1 February 1979. The Middle Rio Grande Council of Governments Board of Directors was briefed by the District Engineer concerning the status of the flood control study on the Rio Grande between Bernalillo and Belen. A preview was given of the draft report which was going to be released the next day.

2 February 1979. A news conference was held by the District Engineer announcing the release of the draft report concerning the proposed flood control alternatives for the Rio Grande between Bernalillo and Belen. Besides reporters from the local newspapers being present, the conference was also covered by KOAT-TV and KOB-TV cameras and reporters.

22 February 1979. At the invitation of the Sierra Club, the Albuquerque District staff addressed the membership and interested parties present in a meeting concerning the contents and results of the flood control report on the Rio Grande. An informative discussion for both parties ensued.

27 February 1979. The District Engineer appeared before the Land-use Planning and Zoning Committee of the Albuquerque City Council. The topics of flood protection and the criteria for a higher standard of protection than what Albuquerque already has and that standard's implications for the City Planning Committee were discussed.

1 March 1979. The topic of increased flood protection for communities along the Rio Grande from Bernalillo and Belen was again discussed by the Middle Rio Grande Council of Governments (COG) Board of Directors and the District Engineer was present to provide any technical information required by the COG and to give them an update on the status of the report review.

5 March 1979. At the request of Mayor Ann Dunlap of the village of Corrales, the District Engineer addressed a Corrales town meeting on how a flood control peoject to provide SPF protection along the Rio Grande would affect the Corrales area. A question-and-answer session followed. Approximately 50 people were in attendance.

12 March 1979. The late-stage (Stage 3) public meeting was held in the Albquerque City Council Chamber to inform the public of the results of the flood control studies for the Rio Grande flood plain from Bernalillo to Belen and to officially announce the District Engineer's recommended plan for flood control for the above-stated area. Ninety-six people were in attendance including reporters from the local media and a member from U.S. Senator Domenici's staff. Besides the opening introduction, presentation, and recommendation made by the District Engineer, official statements were made by Mr. Robert Pacific of the U.S. Fish & Wildlife Service; Mr. Steve Reynolds, the New Mexico State Engineer; Mr. Kenneth Bower, Jr., of the New Mexico State Highway Department; Mr. Robert Hawk of the Bernalillo County Commission; Mayor Ann Dunlap of the village of Corrales; Mayor Robert W. Fisher of the village of Bosque Farms; Councillor Marion Cottrell of the city of Albuquerque; Mr. Ernie G. Sanchez of the Middle Rio Grande Conservancy District; Mr. Solomon Martinez of the Middle Rio Grande Conservancy District; Mr. Richard Barcelona of the Wildlife Society; Mr. Edwin Machin of the Albuquerque Wildlife Federation; Mr. David Lange of the Central New Mexico Audubon Society; Mr. Kevin Reilly of the Sierra Club; Mr. Lavelle Thompson of the Society for Range Management; Ms. Kathleen Anderson and Ms. L.T. Lachenmyrdyer (representing themselves).

15 March 1979. The Deputy District Engineer addressed the Council of Governors of the Southern Ten Pueblos at the Indian Cultural Center in Albuquerque concerning the results of the Stage 3 study, its evaluations and recommendations for flood control along the Rio Grande between Bernalillo and Belen. Also in attendance were representatives of the Bureau of Indian Affairs of the U.S. Department of Interior.

23 March 1979. The District Engineer met with individuals representing groups in Los Lunas and Bosque Farms areas. The concerns discussed dealt with the proposed flood control project along the Rio Grande and the rising ground water table in those communities and, if there were no affiliation between the two, what work could be initiated, in conjunction with the flood control project, to address the high ground-water-table problem.

9 April 1979. The project manager gave a project presentation to the Isleta Pueblo Council meeting at the Isleta Reservation. Along with the Council president, the Governor, their aides, and legal advisor, a representative of the U.S. Bureau of Indian Affairs was also present.

Throughout the study, Conservancy District staff and the State Engineer have been kept informed of the direction and progress of the investigation. The District Engineer has offered to meet with any organization interested in learning firsthand the status of the flood control study. Senators Domenici and Schmitt and Congressmen Lujan and Runnels have monitored the status as a result of inquiries from their constituency.