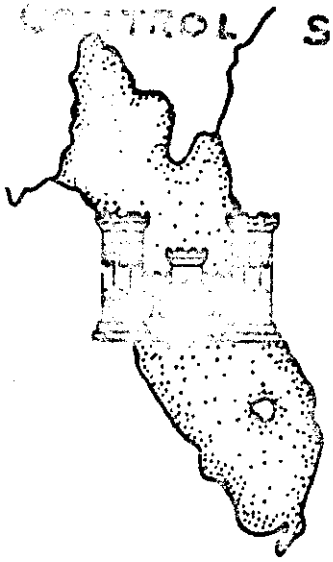
SURVEY REPORT
ON
PHILLIPPI CREEK BASIN, FLORIDA

FLOOD CONTROL SAJWY



U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

OCTOBER 31, 1963

SERIAL NO.

U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA. 32202

SAJWF (Phillippi Creek) November 1, 1963

SUBJECT: Survey Report on Phillippi Creek Basin, Fla.

TO: Division Engineer
U. S. Army Engineer Division, South Atlantic
Atlanta, Georgia

1. There are inclosed four copies of the subject report, with appendixes A, B, and C, and Senate Resolution 148 supplement; one reduced-size, colored print of the key drawing (plate 1); and one copy of the indirect cost summary. A copy of the public hearing transcript and exhibits was forwarded with letter dated July 31, 1963, same subject as above.

2. In compliance with SAD letter dated August 22, 1962, SADER, subject "Processing of Survey Reports," there are inclosed five copies each of drafts of reports of the Board of Engineers for Rivers and Harbors and the Chief of Engineers.

3. A mailing list for distribution of notice of submission of the report is also inclosed. The cost of reproduction (for sale to the public) is $4.00.

6 Incl
1. Survey report (4 cys) (serial Nos. 1, 14, 23, and 24)
2. One reduced-size print (file No. 59-28,401)
3. Indirect cost summary
4. Draft of OCE report (5 cys)
5. Draft of R&H Bd. report (5 cys)
6. Mailing list (20 cys)

H. R. PARFITT
Colonel, Corps of Engineers
District Engineer

SYLLABUS

Phillippi Creek is a shallow alluvial stream which drains about 58 square miles of coastal lowlands in Sarasota County, Fla. Tributaries flowing through predominantly agricultural lands join to form the 5.3-mile-long creek which winds through suburban areas of the city of Sarasota. Local interests have requested that the United States provide flood control in Phillippi Creek Basin to prevent recurrence of periodic disastrous flooding such as occurred in 1962.

Plans have been analyzed for several alternative degrees of protection for the area. Improvement of Phillippi Creek to about 60 percent of standard project flood capacity was found to provide a reasonably adequate outlet for floodwaters of the basin. That degree of protection--with associated secondary works to be provided by local interests--would eliminate all flooding in the area from floods up to the 1-in-30-year magnitude. It would reduce stages and durations of floods of greater magnitude, permitting full utilization of the lands for agriculture and the expected urban needs. The estimated benefit-cost ratio for the selected plan is 1.3.

Accordingly, it is recommended that the plan for flood control and other purposes, as proposed in this report, be adopted subject to the stated provisions of local cooperation.

SURVEY REPORT ON
PHILLIPPI CREEK BASIN, FLA.

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U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

SAJWY (Phillippi Creek) October 31, 1963

SUBJECT: Survey Report on Phillippi Creek Basin, Florida

THROUGH: Division Engineer
U. S. Army Engineer Division, South Atlantic
Atlanta, Ga.

TO: Chief of Engineers
Department of the Army
Washington, D. C.

I. INTRODUCTION

1. Authority.--This report is submitted in compliance with Section 208 of the Flood Control Act of July 14, 1960 (P. L. 86-645), which authorized and directed the Secretary of the Army, acting through the Chief of Engineers, "to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and floods aggravated by or due to wind or tidal effects, to be made * * * in drainage areas of the United States * * * which include the following-named localities: * * * Phillippi Creek, Florida * * *." The duty of making the investigation and report thereon was assigned to the District Engineer by the Division Engineer, South Atlantic Division, on August 5, 1960.

2. Scope of investigation.--This report considers the flood- and water-control problems in the Phillippi Creek watershed and presents a plan of improvement to meet the needs of the area, insofar as is practicable. Field investigations for this report included meteorologic, hydrographic, geologic, and economic surveys of the area. Consideration was given to available data developed in prior reports of local, State, and Federal agencies. Special attention was given to reports prepared by consultants engaged by the County of Sarasota. Several field inspections were made concerning the areas subject to flooding, and many local homeowners were consulted. Coordination with other Federal, State, and local agencies has been effected as discussed later in this report.

3. Prior reports.--There are no prior reports of survey scope on Phillippi Creek.

II. DESCRIPTION

4. Area under consideration.--a. Location and extent.--Phillippi Creek Basin is located in southwest peninsular Florida about 50 miles south of Tampa. The watershed comprises about 58 square miles of coastal lowlands, all within Sarasota County except for a small fringe area in southern Manatee County. Phillippi Creek is one of a number of small streams interspersed with the major Florida west coast watersheds which drain local areas to coastal bays, to the Intracoastal Waterway, or directly to the Gulf of Mexico. Maps of the basin are shown on plate 1.

b. Physical characteristics.--Phillippi Creek is a shallow, alluvial stream about 5.3 miles long, which winds toward Little Sarasota Bay through suburban areas south and east of Sarasota. About 40 years ago, the natural stream was extended by construction of about 80 miles of main canals and laterals which are well distributed throughout the drainage area. The main stream is about 400 feet wide at the mouth and gradually narrows to about 50 feet at its juncture with the canal system. Below the junction of the main tributary canals, the stream slope averages about 0.9 foot a mile. Above the junction, the average fall is about 4.0 feet a mile. Throughout its length, the channel is fairly well defined. The bankfull discharge of Phillippi Creek is less than 1,000 cubic feet a second. The basin is subject to infestations of hyacinths and other prolific weeds which reduce channel capacities and aggravate flood problems. The stream is tidal up to an existing water-control structure 3.6 miles above the mouth. The watershed consists of level or gently sloping plains separated by low, flat ridges. Elevations vary from sea level to about 30 to 40 feet* in the headwater reaches. The soils are mostly fine sands with some shallow areas of peat and muck in the eastern portion of the basin.

III. ECONOMIC DEVELOPMENT

5. Development of the area.--a. General.--About 45 percent of the area under consideration is now developed for urban, agricultural, and other related uses. The remainder of the watershed is woodland, native range, and other undeveloped land. About 47 percent of the developed land is urbanized, including commercial, industrial, recreational, and residential areas. Agricultural uses--excluding native rangelands--account for about 53 percent of the developed area. The usually favorable climate, proximity to the gulf beaches, and abundant recreational facilities all contribute to expanding tourism in the area of interest. The principal agricultural activities in the study area are the production of citrus fruits, vegetable crops, beef cattle,

NOTE: *Unless otherwise stated, all stages and elevations throughout this report and accompanying appendixes refer to mean sea level datum.

and dairy products. Minor acreages are used for the growing of specialty crops, such as ornamental plants and flowers; since these areas are small, they are not identified on the existing-land-use map. A large part of the city of Sarasota is located within the Phillippi Creek drainage area. Sarasota County had a population of 76,895 on April 1, 1960. The estimated population on January 1, 1963--according to reliable estimates--was about 90,000. A summary of the most important land uses and acreages in the basin is given in table 1.

TABLE 1

Phillippi Creek Basin

Existing land use

Land use	Area (acres)
Urban	5,035
Sparse urban	2,025
Citrus groves	1,290
Vegetables	1,430
Improved dairy pasture	620
Improved beef pasture	5,175
Golf courses, parks, etc.	510
Native range, other, and undeveloped land	20,845
Total	36,930

b. Transportation.--The study area is served by United States Highways 41 and 301 and State Roads 72, 780, and 785 in addition to numerous secondary roads. (United States highways are generally alined north-south, with State roads providing the east-west links in the road system.) The Seaboard Air Line and Atlantic Coast Line Railroads serve the area with both passenger and freight service. Commercial airline service is available at the Sarasota-Bradenton Airport. The study area is also served by two national bus lines.

c. Urban development.--The only city of any size is Sarasota, which lies partly within the study area. Population estimates based on densities of persons per acre and sample house counts in urban and sparse urban areas indicate that about 30,000 persons now reside within the watershed. The average density is about 1.5 houses per acre and about three persons per house. During the decade 1952-62, the estimated population of Sarasota County increased over 154 percent--from about 35,000 to about 89,000. In-migration is high because of the excellent

climate and Florida's favorable tax structure, coupled with other economic factors such as adequate housing and recreational facilities of a varied nature. Past studies show that about 15 percent of the urban area is used for industrial, commercial, and related service activities and that the remainder is residential. The past population trends for the entire county for 10-year intervals during the period 1930-60 and estimated trends for 5-year intervals from 1963 to 1973 are given in table 2.

TABLE 2

Sarasota County

Population

Years	Population
1930 (1)	12,440
1940 (1)	16,106
1950 (1)	28,827
1960 (1)	76,895
1963 (2)	90,000
1968 (2)	120,000
1973 (2)	161,000

NOTES: (1) Federal Census.
(2) Estimated.

e. Agriculture.--The study area now produces citrus fruits on about 2 square miles of suitable soils. Those groves are scattered largely throughout the western portion of the drainage area, generally west of Cattlemen Road. Types of citrus trees found in the area are oranges, grapefruit, tangerines, mandarins, lemons, and limes. The more important groves are orange and grapefruit. Truck crops are produced annually on about 1,400 acres, with some acreage planted more than once during the year. Those crops are generally planted on the organic soils, the more important crops being celery, cabbage, and escarole. About 5,800 acres of improved pastures are located generally east of Cattlemen Road. The principal improved pasture grasses are Pensacola Bahia and Pangola. Some white clover is also used as pasture cover during part of the year. On an annual basis, improved beef pastures can support approximately one cow on 1-1/2 to 2 acres. Improved dairy pastures can support one cow per acre annually if sufficient supplemental feed is provided. Some woodland and native range are also used for grazing cattle. Native range--depending on soils, drainage, and pasture cover--supports one animal annually on from 10 to 50 acres. Net returns from agriculture vary from year to year. Table 3 gives an indication of average net returns for several years.

TABLE 3

Phillippi Creek Basin

Agricultural net returns

Land use	Net return (per acre)
Vegetables	$265
Citrus fruits	175
Improved dairy pasture	44
Improved beef pasture	11
Native range	2 or less

e. Fish and wildlife.--Many kinds of native birds and animals live on the expanses of undeveloped lands in Sarasota County. The open flatwoods, prairies, swamps, marshes, shallow ponds, and dense hammocks have provided them with favorable habitat. Sarasota County is on the major flyways of migratory birds, and many of those birds winter in the area. Sportsmen and many landowners in the county have an active interest in wildlife preservation. Much of the Phillippi Creek watershed, however, is developed for urban use, which is expected to continue to expand eastward. Landward of the bay or estuary area, fishery utilization and public hunting are limited, and improvement for flood control is not likely to have a significant effect on fish and wildlife.

f. Navigation.--Boating activity in Phillippi Creek, which consists principally of recreational cruising, has been restricted by channel shoaling, especially since the September 1962 flood. The reach from United States Highway 41 bridge upstream to the existing dam is navigable only by outboards during favorable tides. Outboards and small inboards navigate with caution the reach from the bridge downstream to the Intracoastal Waterway. In order to facilitate boating in that reach after the September 1962 flood, local boating interests spent about $600 to have a shoal area deepened by propeller wash. Most of the damage incurred by boats navigating the creek results from grounding on shoals, which usually necessitates propeller repair or replacement. Few of the properties along the creek have docks. One housing development of about 40 lots has a boat ramp for the exclusive use of property owners in that development and their guests. Three other developments--totaling about 2,000 lots--include tentative plans for similar private ramps. The only public-use boating facility along the creek is a privately operated marina, consisting of 55 berths and supply and service facilities, just above the United States Highway 41 bridge. Some boats formerly berthed

along the creek have been sold because of increased shoaling of the channel. Investigation indicated that other residents along the creek would purchase boats if the creek were improved.

IV. METEOROLOGY AND HYDROLOGY

6. Climatology.--a. General.--The area under consideration is in the transitional zone between temperate and subtropical climates and is influenced by proximity to the Gulf of Mexico. There are not now any long-term climatological stations within the watershed. Twenty-one years of record for rainfall station Sarasota 5 E, which was centrally located, together with data from stations near, but outside, the Phillippi Creek drainage area, are sufficient to indicate the climatological characteristics of the area. Summer temperatures are moderately high, but rarely reach maximums of 95 degrees. Pleasant days and cool nights are usual during the winter months, although minimums of 32 degrees or below occasionally occur during the months of November through February. Winds are generally light to moderate but may be strong and gusty in the vicinity of frequent summer thunderstorms. Occasional winds of hurricane force are caused by tropical storms, which pass over or near the area about once in three years, on the average. Seasonal rainfall distribution is well defined.

b. Rainfall.--Rainfall over the area averages about 54 inches a year, with wide variations in annual amounts and amounts for any month. About 65 percent occurs during the four wettest months, June through September, while only about 15 percent occurs during the four driest months, November through February. Monthly and annual means and extremes for 21 years of record for station Sarasota 5 E are given in table 4. Most summer rainfall is produced by thunderstorms, although heavy, prolonged rainfall is usually caused by tropical disturbances, which are most likely to occur in September and October. Unusual storms may cause locally heavy rainfall during any month of the year. About 15.3 inches of rain occurred over the area on September 20-21, 1962.

TABLE 4

Rainfall at station Sarasota 5 E (1)

Monthly and annual means and extremes, 1930-50

Month	Observed rainfall				
	Highest (2)		Mean	Lowest	
	Inches	Year	(in.)	Inches	Year
January----------	4.53	1936	1.86	0	1950
February----------	8.48	1936	2.55	0.12	1950
March----------	7.46	1947	2.86	0.02	1939
April----------	8.36	1933	2.77	0.09	1946
May----------	6.18	1939	2.59	0.03	1945
June----------	21.77	1943	7.81	1.58	1931
July----------	18.78	1938	8.96	3.82	1932
August----------	22.60	1939	10.38	3.45	1938
September----------	19.94	1935	8.06	2.29	1937
October----------	7.47	1938	2.70	0	1942
November----------	5.31	1941	1.25	0	1931
December----------	5.71	1941	1.78	0.14	1938
Annual----------	75.93	1943	53.57	35.75	1944

NOTES: (1) This station located 5 miles east of Sarasota.
(2) Observations at nearby stations indicate that some of these maximums have been exceeded since 1950.

7. Runoff and streamflow data.--Available data are limited to records from two recently installed crest-stage indicators and one ground-water well. Stages and other pertinent data for those gages are given in table A-3 of appendix A. In the absence of streamflow data and long-term periods of record, runoff relations developed for areas of similar topographic characteristics were used in determining runoff criteria for developing design floods. These synthesized relations are presented in appendix A.

8. Floods of record.--a. General.--Intense rainfall combined with inadequate drainage facilities causes frequent flooding over much of the Phillippi Creek watershed. The more serious floods usually result from rainfalls of varying durations associated with storms, or a sequence of storms. Storms may occur at any time during the year but are most frequent during the five summer months, centered on the period June through September. The region is also subject to occurrences of tropical hurricanes during the rainy season. The principal cause of flooding is the limited capacity of outlet channels. There is some flooding almost annually in the lowland areas. Flood damages occur to both agriculture and residences, but with the rapid urban expansion of the last few years, damage to urban development has

increased considerably. Several of the most severe floods of recent record are discussed in the following subparagraphs.

b. Flood of 1962.--The September 1962 flood was the most damaging of record in the Phillippi Creek Basin. A low-pressure cell which moved in from the Gulf of Mexico caused extremely heavy rainfall over the coastal area from Tampa to Naples on September 19-21. Most of the rain fell between midnight of September 19 and 8 a.m. of September 21. Phillippi Creek Basin was in the area of heaviest rainfall. Over 16 inches fell during a 48-hour period. That amount and others in areas of heaviest rainfall have an estimated occurrence frequency of once in about 100 years. The highest stages and discharges of known record were recorded in Phillippi Creek Basin. The resultant flooding was widespread and disastrous throughout the basin. The County Sheriff's Department, assisted by the County Public Works Department and volunteer Civil Defense units, conducted rescue operations throughout the area. Several hundred families were moved by those departments from their flooded homes to areas of safety. Shelter, food, clothing, and other necessities were provided by the local chapter of the American National Red Cross, assisted by the local Welfare Department. Flood durations ranged from 1 to 3 days in areas adjacent to streams and drainage canals and up to several weeks in some crop and pasture lands. Practically all crop and pasture lands were inundated to depths of 3 feet or more. About 500 homes sustained minor to major flooding. Many of those homes and a number of commercial installations were flooded to depths of 3 to 7 feet. Virtually all streets and roads in and around Sarasota were under water. Several feet of water stood over main highway bridges crossing Phillippi Creek and drainage canals. Estimated damages to agriculture, private property (homes, lawns, automobiles, and personal effects), and public properties totaled about $2,300,000.

c. Flood of September 1960.--The summer of 1960 was one of the wettest of record in peninsular Florida. The 10-week (July 21 to September 30) rainfall amounts for Phillippi Creek Basin averaged about 39 inches. The most intense rainfall was associated with hurricane "Donna," which passed over central Florida on September 10 and 11. The heavy rains during the latter part of July caused widespread flooding throughout the area. Those floodwaters had barely subsided before the intense rainfall accompanying hurricane "Donna" subjected the area to major flooding for the second time within 60 days. Virtually all the agricultural lands in the basin were inundated from 1 to 7 days. Extensive damages were sustained by urban developments. Many homes were flooded and roads, bridges, and other public facilities suffered heavy damages. Total estimated damages from the flood in Phillippi Creek Basin exceeded $1,000,000. Estimated frequency of occurrence for this flood is once in about 20 years.

d. Flood of 1959.--Rainfall over Phillippi Creek Basin was above normal much of the year. Two minor floods occurred in the basin

prior to the heavy rainfall of September 16, which caused widespread and disastrous flooding in both agricultural and urban developments. Practically all farmlands in the basin were inundated for 1 to 3 days. Improved pastures sustained extensive damages. The fall and winter vegetable crops had not been planted, but preparation of croplands for planting was delayed for several weeks, causing considerable loss to the affected farmers. Heavy damage was inflicted on urban developments by the floodwaters. About 30 homes along Phillippi Creek had to be evacuated and about 250 others had enough water around them to cause flood damage. Extensive damages were inflicted on roads, bridges, and other public facilities. Estimated frequency of occurrence of this flood is once in about 10 years.

e. Flood of 1958.--The month of March 1958 was one of the wettest of record in Phillippi Creek Basin. Rainfall totals for the month rank among the greatest on record at many points in south Florida. The heavy rainfall of March 19--on the area already saturated from above-normal rainfall--resulted in damaging flooding in agricultural and urban developments. Damages estimated at about $700,000 were inflicted on agricultural developments where about 700 acres of mature truck crops, principally celery, were destroyed. About 12 homes were subjected to 1 to 2 feet of flooding, with 3 homes on the bank of the creek seriously damaged by the moving water. Substantial damages were inflicted on roads, bridges, and other public facilities. The flood is estimated to have a frequency of once in about 5 years.

9. Standard project flood.--The standard project flood was derived by application of daily rainfall-excess values of the standard project storm to inflow unit hydrographs for the contributing area. Estimated antecedent and base flow rates were added to the direct runoff values to produce the total inflow hydrograph. Standard project storm rainfall depths were established as 125 percent of the 100-year-frequency rainfall values, in accordance with established criteria. The frequency of the standard project storm and the standard project flood--considered to be the most severe flood reasonably likely to occur, except for extraordinarily rare combinations of meteorological conditions--is estimated to be in excess of 200 years. Standard project flood estimates are given in appendix A.

10. Design flood.--The design flood is usually determined from consideration of several alternative degrees of protection, with selection of the design which would provide the greatest excess of benefits over costs. Studies in other areas have shown that the maximum excess of benefits over costs is obtained with improvements designed to remove flooding expected once in about 10 years in agricultural areas and flooding up to standard project flood magnitude in wholly urban areas. The studies presented herein considered design floods up to standard project magnitude. A 30-percent standard project flood corresponds to about a 1-in-10-year frequency of

occurrence, while the 60-percent standard project flood corresponds to about a 1-in-30-year occurrence.

11. Extent and character of flooded area.--A description of the area is given in chapter II above. Thousands of acres of low valley and plain lands are susceptible to flooding from moderate storms which occur almost yearly. During major floods, such as that of September 1962, about 8,000 acres are inundated. Flooding results primarily from limited primary outlet capacity. About 33 percent of the problem area is now developed for urban or agricultural uses, including about 900 acres of truck-farming lands, 600 acres of improved pasture, and 775 acres of residential development. In addition, about 5,400 acres of undeveloped lands used as native range are subject to flooding. With the city of Sarasota extending into the drainage area and expanding rapidly, most of those flood-prone lands are ideally situated for urban development except for flooding. Elimination of flooding would permit maximum use of those lands and increase their value to that of surrounding suitable lands. Existing development and estimated future normal development are discussed in detail in appendix B and are shown on figures B-1 and B-2, respectively.

12. Flood damages.--a. General.--The estimates presented herein are applicable to the flood-plain area along Phillippi Creek and canals. They exclude that portion of the agricultural area east of Cattlemen Road which will be served by the watershed work plan of the Department of Agriculture. Damage estimates were made for the 1959 and 1962 floods and are based on: Flooded-area charts which were constructed from high-water marks; information obtained in the field or furnished by local individuals or agencies; and unit-damage relations used in combination with land-use data.

b. Damage estimates.--The flooded-area maps for the 1959 and 1962 floods are shown on figures B-5 and B-4, respectively, of appendix B. Existing and estimated future land use without project incentive are shown on figures B-1 and B-2 of appendix B. Flooded-area maps, together with duration data, were compared with maps of existing and estimated 2020 land use without project incentive to obtain the area, depth, and duration of flooding on each type of land use. Project life was considered to begin in 1970 for the economic analysis and damage estimates were projected accordingly by use of the appropriate land-use development factor. Estimated damages for the 1959 and 1962 floods for the years 1970 and 2020 are given in the following tabulation.

Flood	Estimated damages	
	1970 land use	2020 land use
1959--------	$243,400	$509,300
1962--------	2,120,000	3,571,800

c. Annual damages.--Damage-frequency curves constructed directly from the damage and frequency estimates for 1970 and 2020 land use on existing drainage facilities are shown on figure B-12 of appendix B. Annual damages were estimated at $110,000 and $275,000 for 1970 and 2020 land use, respectively.

V. EXISTING AND DESIRED IMPROVEMENTS

13. Projects of the Corps of Engineers.--There are no Corps of Engineers' flood control projects in Phillippi Creek Basin. However, Phillippi Creek flows into the Intracoastal Waterway south of Sarasota Bay. That waterway project--authorized by the River and Harbor Act of March 2, 1945 (H. Doc. 371/76/1)--provides for a channel 9 feet deep by 100 feet wide. The project is 32 percent completed, with the reach from Dona Bay to Tampa Bay practically completed.

14. Improvements by other Federal and non-Federal agencies.--a. Federal agencies.--The Soil Conservation Service--under authority of Public Law 566--has prepared a work plan for the Sarasota West Coast Watershed. Construction of the project has been approved and initial construction is expected to begin before the end of calendar year 1963. The project area includes the eastern third of the Phillippi Creek watershed and the adjacent Cow Pen Slough. The planned works of improvement include land-treatment measures for watershed protection and structural measures for flood prevention and agricultural water management. The structural measures include 36 miles of channel improvement, one dike, one pumping plant, and nine grade-stabilization and water-conservation structures. The project calls for flood relief for 20.5 square miles of vegetable and surrounding farming areas in upper Phillippi Creek Basin by improving parts of two existing canals, constructing spillway control structures in those canals, excavating a new diversion channel, and providing a pumping plant to divert 735 cubic feet a second of peak flood flows to Cow Pen Slough--outside the basin--when runoff is too great to be handled safely through Phillippi Creek. Runoff not diverted by pumping will flow by gravity through existing Phillippi Creek channels in the Sarasota urban area. Locations of pertinent portions of this plan are shown on figure A-1.

b. Non-Federal agencies.--(1) The Sarasota-Fruitville Drainage District.--This district covers the major areas of Phillippi Creek Basin. It was absorbed by Sarasota County on June 30, 1961. In the past, an extensive system of canals and laterals was developed by the district to drain sawgrass marsh bottoms for muckland farming. The canal system also included some limited control devices consisting mainly of weirs and sluice gates. In portions of the district, local farming interests often provide their own supplementary control devices which include a number of drainage pumps placed on district property. Recent developers in the area have provided similar local

drainage works. In general, the canal system--which is for the most part over 35 years old--was designed for drainage of agricultural lands.

(2) Hyde Park Drainage District.--This district comprises about 4 square miles southwest of the Sarasota-Fruitville Drainage District. Existing development in the district is predominantly urban. Phillippi Creek bisects the district, which for the most part lies within the basin. The southwestern fringe and northwestern corner of the district lie within the city limits of Sarasota. Except for Phillippi Creek, the entire Hyde Park canal system consists of minor canals. The system does not include any control devices. However, within the district on Phillippi Creek is an existing dam, which, according to local interests, was initially constructed to provide irrigation supply for citrus groves in the vicinity. Control of the dam was originally effected by gates, supplemented by stoplogs. When maintained and operative, the dam provided a measure of flood control and ground-water conservation, and also acted as a salinity barrier. After most of the groves were subdivided for urban development, the stoplogs were removed and the dam became inoperative. The dam causes considerable restriction to flow during flood conditions. In an effort to improve this condition, the county acquired the dam and converted it to an uncontrolled low weir. This work--along with some channel improvements--was completed about June 1962.

15. Improvements desired by local interests.--a. General.--Until fairly recently, Phillippi Creek Basin was oriented almost entirely toward agriculture. Agricultural drainage districts provided improvements suitable for agricultural needs. However, unprecedented urban development now existing and in prospect in the area and corresponding changes in runoff from those developed areas have created a serious flood hazard. Frequency of damaging flooding during the past few years has brought about an ever-increasing demand for flood relief and water control for the basin. In addition to information obtained from local interests at the public hearing regarding the flood problem (see subparagraph c below), there were numerous consultations with officials of State and county government agencies, with the consulting engineers hired by the Sarasota County Commissioners, and with other interested local officials. In addition, improvements desired were reflected in resolutions adopted by local organizations.

b. Consultants' reports.--Following the damaging floods of 1957 and 1958, the county engaged consultants to investigate and report on several of the more important water- and flood-control problems. After the disastrous flooding in 1960, the county authorized a firm of consulting engineers to conduct a far more complete study covering the entire basin. The Board of County Commissioners, as coordinator of this program, administered the consultants' contracts and obtained the completed reports. Material from the reports was presented at the public hearing in November 1962. Copies of the completed reports were made available to the Corps and they have been used to considerable advantage in this investigation.

c. Public hearing.--The views of local interests regarding the need for improvement of Phillippi Creek were presented at a public hearing held in Sarasota November 30, 1962. About 165 persons attended, including Congressman James A. Haley; representatives of State and Federal agencies, Sarasota County, and the City of Sarasota; and private citizens whose property had been lost or damaged by flooding of the creek. All the speakers stressed the urgent need for immediate provision of improvements to prevent another recurrence of the disastrous flooding which they have experienced several times in recent years--most recently in September 1962, when the basin suffered more than $2 million flood damages. No opposition was expressed. Small-boat owners would like existing navigation preserved, if possible; however, they consider flood control to be of paramount importance. A transcript of the hearing accompanies this report.

VI. PLAN OF IMPROVEMENT

16. Flood problem.--The flood problem is discussed in paragraphs 11 and 12 of this report. The discharge capacities of Phillippi Creek and its main tributaries are inadequate even for moderate floods. The urbanization of a large portion of the watershed has increased the frequency of damage-producing runoff, thus aggravating the already severe flood hazard. The need is for primary drainage works to remove the runoff from frequent and intense rainfall.

17. Salinity intrusion.--In general, salinity intrusion is a problem along the gulf coastal areas. Increased demand from urban population, agriculture, and industry and excessive drainage lower the water table. Heavy pumping assists intrusion of salt water into the aquifer laterally and vertically--laterally, seepage from the ocean and from saline tidal canals and streams; and vertically, from underlying ancient residual sea water. While the problem in Phillippi Creek watershed may not be as severe as in other areas, planning for water-control facilities requires cognizance of the salt-intrusion hazard. Control by gates and spillways would be provided to prevent overdrainage of the land after floodwaters have been discharged. In tidal areas, control spillways act as salt-water barriers by preventing the flow of salt water up the channels. Maintaining a head of fresh water behind the spillways would recharge the ground water and prevent infiltration of salt water.

18. Solutions considered.--Reconnaissance and office studies indicated that there was little or no storage capacity available in the basin that could be used to reduce flood stages along Phillippi Creek. Diversion to the coast would involve very expensive rights-of-way and was considered impracticable. In general, flood damages are caused when the creek overflows, primarily because of a lack of adequate outlet capacity. Remedial works for expediting the runoff from the area are needed. The most practicable means of accomplishing this increased removal rate is to

improve the existing main channels. Major channel improvement was considered to the extent necessary to alleviate the problem in the areas having the major flood damages. No improvements were considered for the area generally east of Cattlemen Road where the watershed work plan to be provided by the Department of Agriculture under Public Law 566 will serve the existing development.

19. The plan of improvement.--a. General.--The plan of improvement would provide for gravity drainage of the area by enlargement of Phillippi Creek and its major tributary channels, realinement of the channel at United States Highway 41, and provision of the spillway and inlet structures required for flood control of the area. Where practicable, the channel would be constructed within the limits of rights-of-way established by local interests. The secondary drainage improvements required to convey storm runoff to the project canals would be a local responsibility. The plan of improvement would perform the following functions:

(1) Remove the once-in-30-year-flood (approximately 60 percent of the standard project flood) runoff from the area contributing to the canal;

(2) Reduce the depth and duration of floods of greater magnitude than the 30-year flood;

(3) Prevent erosion and siltation in project canals by provision of spillways and inlet structures; and

(4) Provide water control for the area by maintaining optimum water levels above control structures, insofar as practicable.

b. Proposed works.--The proposed plan includes enlargement of 15.1 miles of primary canals and construction of 4 primary control structures, 3 terminal control structures, 3 railroad bridges, 13 highway bridges, 2 private road bridges, and provision of the necessary inlet structures and appurtenant works. The plan would require enlargement of the following: 5.3 miles of Phillippi Creek from the Intracoastal Waterway to the confluence of Main A and Main B Canals, including realinement of the canal at United States Highway 41; 5.2 miles of canal along Main A Canal and Branch AA from Phillippi Creek to Sugar Bowl Road (State Road 72A); 3.4 miles of Main B Canal from its confluence with Phillippi Creek to 1.2 miles north of 17th Street; and 1.2 miles of Branch BA from its confluence with Main B Canal to Gocio Road. The existing weir on Phillippi Creek would be replaced with a gated concrete spillway. Two gated spillway structures would be provided on Main B Canal and one on Main A Canal. Terminal control structures would be provided for erosion control at the limit of improvement on Branch AA, Main B Canal, and Branch BA. The plan of improvement and the location of proposed works are shown on plate 1.

c. Recreational boating.--The proposed flood-relief channel would be more than adequate for recreational boating. In order to develop full boat usage of the channel, the plan of improvement includes provision for navigation aids to mark the intersection of the channel with the Intracoastal Waterway; and a public boat ramp, parking area, and small wharf downstream from the existing dam. The ramp would be suitable for launching boats customarily transported by trailer. The public wharf would be suitable for servicing boats up to 30 feet long.

VII. SPECIAL SUBJECTS

20. Multiple-purpose features.--There is no potential water-power development. There is no apparent need at this time for facilities in the plan for municipal and industrial water supply except those required to provide water control and to prevent salt water entering the aquifer. No problems relative to malaria control, fish and wildlife conservation, or general recreational developments are apparent or have been brought out during the course of the studies. There are potential public health hazards present when septic tanks, private wells, public wells, water plants, and homes are flooded. Prevention of floods would remove the critical health hazards existing during and after floods. Recreational boating is generally restricted by channel shoaling. Improvement of Phillippi Creek would enhance recreational boating and reduce boating damage in the area.

VIII. COSTS AND BENEFITS

21. Estimates of initial costs.--The total initial costs of primary works in the plan of improvement are estimated at $7,854,800. Initial costs of associated works would total about $118,000. Table 5 presents a summary of initial costs (Federal and non-Federal) at current prices for the plan of improvement (primary works and associated works). Detailed estimates of costs are given in appendix A. No costs are included for boating-terminal facilities since these costs would be largely self-liquidating.

22. Estimates of annual costs.--The total annual costs (financial) of primary works in the plan of improvement are estimated at $352,100. Total annual costs of associated works would be about $8,400. A summary of those costs is presented in table 5. The financial costs for the plan are the estimated annual costs to build, maintain, and operate the project. The "economic costs" used in the comparison of benefits and costs are financial costs plus estimated charges representing the loss in productive value of lands acquired for the project over and above the costs of acquiring the lands. Detailed estimates of annual costs are given in appendix A.

TABLE 5

Phillippi Creek Basin

Plan of improvement

Summary of Federal and non-Federal initial and annual financial costs
(Date of estimate: July 1963)

(All costs are in thousands of dollars)

Item	Contract price	Supervision, inspection, and overhead	Construction costs	Federal initial costs: Federal share of construction costs	Federal initial costs: Engineering	Federal initial costs: Total	Federal annual costs: Interest and amortization	Non-Federal initial costs: Non-Federal share of construction costs	Non-Federal initial costs: Lands and private relocations	Non-Federal initial costs: Public relocations	Non-Federal initial costs: Total	Non-Federal annual costs: Interest and amortization	Non-Federal annual costs: Maintenance and operation	Non-Federal annual costs: Total	Total primary costs (Federal and non-Federal): Initial	Total primary costs (Federal and non-Federal): Annual financial	Total associated costs (non-Federal): Initial	Total associated costs (non-Federal): Annual
		(8 pct. of (1))	((1)&(2))	(78 pct. of (3))	(7 pct. of (1))	((4) & (5))	(0.03887x(6))	(22 pct. of (3))			((8),(9),&(10))	(0.04263x(11))		((12)&(13))	((6)&(11))	((7)&(14))		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Canal improvement---	$3,294.8	$263.6	$3,558.4	$2,794.6	$230.6	$3,025.2	$117.5	$763.8	$1,076.9	$1,020.8	$2,861.5	$122.0	$16.6	$138.6	$5,886.7	$256.1		
Inlet structures----	330.0	26.4	356.4	279.9	23.2	303.1	11.7	76.5	-	-	76.5	3.2	3.4	6.6	379.6	18.3		
Structures----------	1,054.8	84.3	1,139.1	894.6	73.7	968.3	37.5	244.5	-	-	244.5	10.5	11.1	21.6	1,212.8	59.1		
Railroad bridges----	368.3	7.4*	375.7	295.0	-	295.0	11.4	80.7	-	-	80.7	3.5	3.7	7.2	375.7	18.6		
Total----------	5,047.9	381.7	5,429.6	4,264.1	327.5	4,591.6	178.1	1,165.5	1,076.9	1,020.8	3,263.2	139.2	34.8	174.0	7,854.8#	352.1#	$118.0	$8.4

NOTES: * 2 percent on railroad bridges.
Estimated initial costs for aids to navigation equal $4,000 (includes three day markers at $200 and one lighted 3-pile dolphin at $3,000).
Estimated annual maintenance costs equal $400. Federal responsibility (United States Coast Guard).

(R 12-5-63)

23. Estimates of annual benefits.--Benefits to be expected from provision of the plan of improvement would be from (1) reduction of flood damages to residential, commercial, and agricultural development, (2) increased land use, and (3) recreational boating. Benefits from reduction of flood damages are the difference between the estimated average annual damages that would occur during the ensuing period of 50 years with the plan of improvement and those that would occur under land-use conditions that would prevail without the plan. Benefits claimed from increased land use are the increases in net income that would result from changed land use because of the plan. In this case, the proposed plan would make possible the development of lands for urban use. Improvement of Phillippi Creek would also enhance recreational boating and reduce boating damage in the area. All estimates of benefits reflect current price levels. The benefits are converted to average annual equivalents for the 50-year period 1970 to 2020 by discounting, using compound interest factors at 3 percent. A detailed analysis of benefits is given in appendix B. Estimates of average annual benefits creditable to the proposed plan of improvement are summarized as follows:

Type of benefit	Estimated average annual benefits	Percent
Prevention of flood damages (general)	$172,300	36.3
Increased land use (local)	280,900	63.7
Navigation, recreational boating (local)	22,000	
Total	475,200	100.0

24. Comparison of benefits and costs.--Evaluated annual benefits and costs for the proposed plan of improvement for the Phillippi Creek Basin are summarized below. These estimates include associated works in addition to primary works. The annual costs include $400 for maintenance of aids to navigation.

Annual benefits	$475,200
Annual economic costs	377,400
Benefit-cost ratio	1.3

25. Apportionment of costs.--Under the usual requirements of existing law for flood control projects of this nature, the Federal Government would construct--at project cost--the canals, control structures, and all related works. Local interests would furnish the lands, easements, rights-of-way, and spoil-disposal areas; assume the complete cost of associated works and of relocations; and operate and maintain the project after completion.

26. Because of the local nature of the benefits from increased land use and recreational boating, a cash contribution would be required in accordance with established criteria. The procedure used is outlined in Corps of Engineers' regulations EM 1120-2-109, dated May 23, 1960, subject: "Federal Participation in Major Drainage Improvements." Under that procedure, the initial costs of the primary works are regarded as divided into general (flood damages prevented) and local (increased land use and navigation) portions according to the relative benefits (in this case 36.3 percent and 63.7 percent, respectively). The general portion is considered as not subject to cash contribution. The local portion is subject to a cash contribution to bring the total local share up to a minimum of 50 percent of the cost. Where the allocated value of the lands, relocations, etc., contributed by local interests is less than 50 percent of the cost of that portion, cash is required to make up the difference. The computation results in a cash contribution of $1,165,500, which is 20.2 percent of the cost of the construction work to be performed by the Federal Government. This non-Federal cash contribution is equal to 22 percent (to the nearest whole number) of the total of the contract price plus supervision and administration thereof ($5,429,600). The latter formula is the one used for authorized flood control projects in computing the actual cash amounts. Classification of initial costs by functions, as detailed in appendix A, is summarized in table 6.

TABLE 6

Phillippi Creek Basin

Plan of improvement

Classification of initial costs by functions

Item	General portion (36.3 percent)	Local portion (63.7 percent)	Total
Construction, etc. (project costs)-------	$2,089,800	$3,667,300	$5,757,100*
Lands, highway bridges, etc. (local costs)----	761,500	1,336,200	2,097,700
Total----------	2,851,300	5,003,500	7,854,800*

NOTE: *All these costs exclude preauthorization survey costs and costs of associated works.

The apportionment of initial costs between the Federal Government and local interests is given in table 7.

TABLE 7

Phillippi Creek Basin

Plan of improvement

Computation of Federal and non-Federal shares of initial costs (1)

(Date of estimate: July 1963)

Item	Tentative apportionment		Adjustment to assign all lands, etc., to non-Federal interests		Total
	Federal	Non-Federal	Federal	Non-Federal	
Flood-damage-prevention portion:					
Construction	$2,089,800	-	$2,089,800	-	$2,089,800
Lands, etc.	-	$761,500	-	$761,500	761,500
Subtotal	2,089,800	761,500	2,089,800	761,500	2,851,300
Increased-land-use and navigation portion:					
Construction	1,833,700	1,833,600	2,501,800	1,165,500	3,667,300
Lands, etc.	668,100	668,100	-	1,336,200	1,336,200
Subtotal	2,501,800	2,501,700	2,501,800	2,501,700	(3) 5,003,500
Total initial costs:					
Construction	3,923,500	1,833,600	4,591,600 (79.8 pct.)	(2) 1,165,500 (20.2 pct.)	5,757,100 (100 pct.)
Lands, etc.	668,100	1,429,600	-	2,097,700	2,097,700
Total	4,591,600	3,263,200	4,591,600 (58.5 pct.)	3,263,200 (41.5 pct.)	7,854,800 (100 pct.)

NOTES: (1) Excludes preauthorization survey costs and costs of associated works.
(2) Local interests' cash contribution.
(3) $4,642,200 allocated to increased land use and $361,300 to navigation.

IX. LOCAL COOPERATION

27. Proposed local cooperation.--For the proposed plan of improvement in Phillippi Creek Basin, local interests would be required to:

a. Contribute in cash 22 percent of the contract price plus supervision and administration thereof for all items of work to be provided by the Corps of Engineers, an amount now estimated at $1,165,500, to be paid in a lump sum prior to start of construction, or in installments prior to start of pertinent work items in accordance with construction schedules as required by the Chief of Engineers, the final allocation of costs to be made after the actual costs have been determined.

b. With appropriate jurisdiction, construct and thereafter maintain such lateral drainage facilities as are necessary to realize the benefits made available by the improvements in Phillippi Creek Basin (this requirement would not prohibit the assistance of other Federal and local conservation programs in constructing and/or maintaining lateral drainage works under authorizations not connected with this project); and

c. Furnish assurances satisfactory to the Secretary of the Army that they will:

(1) Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project, when and as required;

(2) Assume the cost of (a) construction of all new highway bridges and relocations of existing highway bridges and (b) alterations to miscellaneous utilities and other existing improvements (except railroad facilities) incident to construction of the project;

(3) Hold and save the United States free from damages due to the construction works;

(4) Prohibit encroachment on the flood-carrying capacity of the improved channels; and

(5) Except for the aids to navigation, which would be maintained by the United States Coast Guard, operate and maintain the improved channels and appurtenant works after completion in accordance with regulations prescribed by the Secretary of the Army.

28. Assurances of local cooperation.--The public hearing was witness to the statement that the Board of County Commissioners, Sarasota County, stood ready to perform its share, under applicable Federal laws. The County representatives have long recognized the

flood problem and have initiated and expedited actions toward a final solution, including the engagement of consulting engineers to make plans and to determine rights-of-way requirements. On July 10, 1963, representatives of this office met with representatives of the Board of County Commissioners and the consulting engineers retained by the County to review all details of the proposed plan and the approximate local cooperation requirements. The County lacks the financial ability to meet the terms of local cooperation at this time. However, a proposal is to be placed before the voters this fall on formation of a flood control district which would have responsibility for complying with the local requirements for the plan for Phillippi Creek Basin. The District Engineer believes there is no doubt that either the Board of County Commissioners or the flood control district currently under consideration would be able and willing to meet the requirements outlined above.

X. COORDINATION WITH OTHER AGENCIES

29. General.--The District Engineer outlined the improvements proposed in this report and the functions those works were designed to perform in letters dated April 11, 1963, to the United States Fish and Wildlife Service, the State Game and Fresh Water Fish Commission, the State Conservationist of the United States Soil Conservation Service, and the Director, Florida Board of Conservation; and letters dated July 16, 1963, to the Regional Engineer, United States Bureau of Public Roads, and the Chairman, State Road Department. Those agencies were asked to comment on the flood control plans considered for the Phillippi Creek watershed. Replies which have been received to date are presented in appendix C and summarized in the following paragraphs.

30. Fish and wildlife agencies.--Views of the Bureau of Sport Fisheries and Wildlife, United States Fish and Wildlife Service, are presented in a letter dated June 26, 1963. The United States Bureau of Commercial Fisheries, the Florida Game and Fresh Water Fish Commission, and the Florida Board of Conservation concur in these views. Urbanization has displaced most game populations from the watershed area considered for improvement and the natural stream has already been channelized, so that project construction would not be expected to have significant effects on fresh-water fish. It was pointed out that the project should be designed to minimize sedimentation in the estuary.

31. Florida Board of Conservation.--In letter dated May 3, 1963, the Director intimated that silt-removal works should be provided to reduce adverse effects to estuarine plants and animals. He also stated that the proposed realinement of the main channel at United States Highway 41 is badly needed.

32. United States Soil Conservation Service.--Several conferences were held with agency representatives during the investigation. In letter dated April 18, 1963, the State Conservationist expressed the opinion that the proposals generally as outlined in letter of April 11, 1963, were compatible with the Sarasota West Coast Watershed Work Plan developed under Public Law 566. The plan proposed herein does not conflict with nor duplicate the authorized Soil Conservation Service project.

33. United States Bureau of Public Roads.--Replies of the Federal agency's Regional and Division Engineers, dated July 24 and 26, 1963, respectively, are included in appendix C.

Federal-aid highway funds will not be available to defray any part of the cost of relocating highways that local interests are required or agree to assume as a condition to the undertaking of the flood control project.

34. Florida State Road Department.--In letter dated October 14, 1963 (appendix C), the Chairman indicated that bridge plans would be prepared soon to comply with proposed channel requirements at United States Highway 41. The Chairman stated that any improvements beyond the limits of the highway right-of-way would have to be financed with funds other than Primary Highway funds.

XI. DISCUSSION AND CONCLUSIONS

35. Discussion.--The flood problem in Phillippi Creek Basin is one of mounting severity. A stream that at one time drained agricultural and undeveloped lands now serves an area which is in part highly urban and may ultimately be entirely urban. Changing land use and canalization have intensified runoff to a stream already taxed to the limit of its capacity. The creek's lack of capacity to carry off the floodwaters results in flood damages and in restriction of development. During the span of the last few years, severe and damaging floods occurred in April 1957, March 1958, September 1959, and September 1962. Hydrologic and economic studies show that improvement of Phillippi Creek and two of its major canal tributaries to accommodate the 30-year flood would provide the maximum excess of benefits over costs. That degree of protection--with adequate associated works--would also substantially reduce stages of larger floods. In addition to prevention of flood damage, reduction of flooding to minor extent and infrequent occurrence would permit full utilization of land for expected urban needs. The costs of any additional protection would be considerably more than the benefits to be expected.

36. Additional information on alternative considerations called for by Senate Resolution 148, 85th Congress, adopted January 28, 1958, is contained in supplement I which follows appendix C of this report.

37. Conclusions.--It is concluded that the plan of improvement presented in this report is the most feasible and economical solution to the drainage problem in the Phillippi Creek Basin. The plan would provide the primary flood control works required to remove without

damaging ponding the 30-year-flood runoff from the area contributing to the canal; reduce the depth and duration of floods of greater magnitude; prevent erosion and siltation in project canals; and greatly improve water control in the subject area. Comparison of annual benefits with annual costs results in a benefit-cost ratio of 1.3. Therefore, the plan is economically justified and Federal participation to the extent outlined herein is believed warranted.

XII. RECOMMENDATIONS

38. Recommendations.--It is recommended that the plan of improvement described in chapter VI above, and shown on plate 1, be constructed. The estimated initial cost to the United States for the plan of improvement is $4,595,600 (including $4,000 for aids to navigation). It is further recommended that local interests:

a. Contribute in cash 22 percent of the contract price plus supervision and administration thereof for all items of work to be provided by the Corps of Engineers, an amount now estimated at $1,165,500, to be paid in a lump sum prior to start of construction, or in installments prior to start of pertinent work items in accordance with construction schedules as required by the Chief of Engineers, the final allocation of costs to be made after the actual costs have been determined.

b. With appropriate jurisdiction, construct and thereafter maintain such lateral drainage facilities as are necessary to realize the benefits made available by the improvements in Phillippi Creek Basin (this requirement would not prohibit the assistance of other Federal and local conservation programs in constructing and/or maintaining lateral drainage works under authorizations not connected with this project); and

c. Furnish assurances satisfactory to the Secretary of the Army that they will:

(1) Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project, when and as required;

(2) Assume the cost of (a) construction of all new highway bridges and relocations of existing highway bridges and (b) alterations to miscellaneous utilities and other existing improvements (except railroad facilities) incident to construction of the project;

(3) Hold and save the United States free from damages due to the construction works;

(4) Prohibit encroachment on the flood-carrying capacity of the improved channels; and

(5) Except for the aids to navigation, which would be maintained by the United States Coast Guard, operate and maintain the improved channels and appurtenant works after completion in accordance with regulations prescribed by the Secretary of the Army.

H. R. PARFITT
Colonel, Corps of Engineers
District Engineer

SADER (31 Oct 63) 1st Ind
SUBJECT: Survey Report on Phillippi Creek Basin, Florida

U. S. Army Engr Div, South Atlantic, Atlanta, Ga., 15 November 1963

TO: Chief of Engineers, Department of the Army, Washington, D. C.

Concur in the recommendation of the District Engineer.

A. C. WELLING
Major General, USA
Division Engineer

SURVEY REPORT ON PHILLIPPI CREEK BASIN, FLA.

APPENDIX A

PLAN OF IMPROVEMENT AND COSTS

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U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

SAJWY (Phillippi Creek) October 31, 1963

SURVEY REPORT ON PHILLIPPI CREEK BASIN, FLA.

APPENDIX A

PLAN OF IMPROVEMENT AND COSTS

I. INTRODUCTION

1. General.--This appendix presents the following information relative to the proposed improvements for the Phillippi Creek Basin: Topography, geology and soils, details of the plan of improvement, hydrology and hydraulic design, structural design, and details of initial and annual costs.

2. Drainage area.--The area under consideration totals about 58 square miles of coastal lowlands. About 57 square miles of the watershed is located in the northwest corner of Sarasota County, Fla. A small headwater area extends into southern Manatee County. Most of the basin is drained by two main tributaries, Main A and Main B Canals. These converge near the middle of the western drainage divide, which lies roughly north and south. Main A Canal, the principal tributary, and its branches drain the eastern part of the basin. This is predominantly an agricultural area of improved pasture, truck farms, and rangeland. Main B Canal and its branches drain the northwestern portion of the basin, an area with similar drainage characteristics. Both streams receive flow from expanding urban areas in their lower reaches. Below their confluence, urban developments border both banks of Phillippi Creek for most of its 5.3-mile course. Much of the watershed is nearly level sandy plains interspersed with slightly higher flatlands and low ridges. Elevations range from about 45 feet along the extreme northeast divide to sea level at the mouth of Phillippi Creek. Drainage divides and area subdivisions are shown on figure A-1. The proposed works of the Department of Agriculture's watershed work plan, which are described in paragraph 14 of the main report, are also shown on figure A-1.

3. Plan of improvement.--The plan of improvement, as described in the main body of this report and shown on plate 1, would require the following: Enlargement of Phillippi Creek from the Intracoastal

Waterway to the confluence of Main A and Main B Canals, Main A Canal from Phillippi Creek to Branch AA, Branch AA from its confluence with Main A Canal to Sugar Bowl Road (State Road 72A), Main B Canal from the confluence of Phillippi Creek to 1.2 miles north of 17th Street, and Branch BA from its confluence with Main B Canal to Gocio Road; and construction of gated spillway controls, terminal structures, railroad and highway bridges, inlet structures, and appurtenant works. The works proposed are listed in table A-1.

TABLE A-1

Phillippi Creek Basin

Proposed works

Canal	Canal enlargement (miles)	No. of structures	Number of bridges	
			Railroad	Highway
Phillippi Creek------	5.3	1	-	5
Main A Canal---------	2.7	1	1	1
Branch AA----------	2.5	1	-	2
Main B Canal---------	3.4	3	2	2
Branch BA----------	1.2	1	-	3

4. Geology and soils.--a. Investigations performed.--Ten core borings were taken along the proposed canal alinement to determine the types of material to be excavated, foundation conditions at structure sites, and maximum permissible canal side slopes and velocities. Continuous samples were taken at each boring location; samples were placed in core boxes and stored at the Dredge Depot in Jacksonville. Hard rock and highly indurated materials were sampled using an NX diamond bit and double-tube core barrel. Unconsolidated or slightly indurated materials and soft rock were sampled using a 2-inch-inside-diameter sample spoon driven with a 300-pound hammer falling 18 inches. Sampling some of the indurated and compact material presented a problem. On numerous occasions, several hours were required to remove one sample from the spoon. The core boring locations are shown on figure A-2.

b. Physiography.--Phillippi Creek Basin lies within Florida's Terraced Coastal Lowlands. The topography is controlled largely by a series of marine terraces formed during Pleistocene time, when the sea several times stood above or below its present level. The Pamlico terrace, upon which Phillippi Creek flows, is the youngest of the Pleistocene terraces. This terrace forms a relatively flat coastal lowland which slopes gently from about elevation 25 feet to sea level.

c. Geology.--Relatively clean, fine, quartz sand (Pleistocene formation) occurs at the surface. This clean sand varies in thickness from a few feet at the western end of the alinement to about 30 feet along the northern and eastern ends. The sand rests on a series (Hawthorn formation) of partially indurated or very compact clays and silts and limestones of varying hardness. Geologic sections along the proposed alinement are shown on figures A-2 and A-3.

d. Slope stability.--The design canal side slopes of 1 vertical on 2 horizontal would be stable. Steeper slopes would probably be permissible in the indurated clay and limestone reaches of the canal.

e. Foundation conditions and problems.--The proposed control structures would probably be founded on the indurated clay and silt or on limestone. Both types of material would provide adequate bearing capacity. The limestones and indurated clay and silt are relatively impervious and would present no dewatering problems.

II. HYDROLOGY AND HYDRAULIC-DESIGN CRITERIA

5. General.--Rainfall and design-flow criteria used as a basis for design of the works included in the plan of improvement are developed herein. Sufficient rainfall records were available to make an adequate study of precipitation. Insufficient streamflow data made it necessary to develop design hydrographs synthetically, using unit hydrograph relationships determined for areas with similar topographic and development characteristics. Design discharges were based on runoff to be expected from urban-type development. Flows were derived for storms of 10-year, 30-year, and standard project magnitudes.

6. Rainfall.--A generalized rainfall-frequency study was made for the basin. Because of the relatively short time of concentration for the basin, a storm duration of 5 days was considered sufficient to define runoff when applied to wet antecedent conditions such as occurred in 1960 and 1962. Rainfall data for periods up to 5 days' duration were taken from climatological records and used to develop frequency curves for individual stations. Daily rainfall amounts for the maximum 5 days of the 10-year, 30-year, and standard project storms are listed in table A-2. The standard project storm--considered to be the severest storm that could reasonably be expected--was 125 percent of the 100-year storm.

TABLE A-2

Phillippi Creek Basin

Design rainfall data

Period (days)	Rainfall (inches)		
	10-year storm	30-year storm	Standard project storm
1----------	6.4	9.4	15.0
2----------	1.7	2.2	3.1
3----------	0.9	1.1	1.5
4----------	0.7	0.9	1.1
5----------	0.7	0.8	0.9
Total (maximum 5-day period)---	10.4	14.4	21.6

7. Water losses.--Water losses determined in previous studies for Four River Basins, Fla., were used to apply to rainfall for application to unit hydrographs. The loss used herein is that portion of the rainfall which does not go into direct runoff; it consists of outseepage, contribution to ground-water storage, and evapotranspiration. For the storms considered for design, losses were estimated to be 5 inches for the 5-day period. Daily distribution made in accordance with ratio of daily rainfall depths to the 5-day total depth for the standard project storm is shown on figure A 6.

8. Development of design-flow criteria.--a. General.--Records of streamflow on Phillippi Creek are limited to data for two recently installed crest-stage indicators and flood data collected during the record September 1962 flood. Available streamflow data, mainly for the 1962 flood, are listed in table A-3 and shown on figure A-7. For derivation of unit hydrographs, recourse was made to the runoff relations developed in connection with the Four River Basins study. Supplementary criteria were derived to reflect urban runoff characteristics for application to the Phillippi Creek area. These generalized relations are shown on figure A-4.

TABLE A-3

Phillippi Creek Basin

Streamflow data

Item	Phillippi Creek	
Location of gage----------	Bahia Vista St. bridge, Sarasota	Cattlemen Road bridge (S.R. 785)
Type of gage----------	Crest-stage indicator	Crest-stage indicator
Period of record		
From----------	1960	1962
To----------	1963	1963
Maximum stage known		
Stage (ft.)----------	14.4	22.0
Date----------	Sept. 21, 1962	Sept. 21, 1962
Maximum discharge known		
Discharge (c.f.s.)-------	6,000+	1,950
Date----------	Sept. 21, 1962	Sept. 21, 1962

b. Unit hydrographs.--Unit hydrographs for appropriate subdivisions of the drainage area were derived from the runoff relations. These drainage subareas, which are based on topographic and drainage features, are shown on figure A-1. A typical unit hydrograph is shown on figure A-5.

9. Runoff.--a. Standard project flood.--The standard project flood was computed by application of direct runoff-producing rainfall to the unit hydrographs derived for the drainage area subdivisions. Base and antecedent flow rates of about 5 cubic feet per second per square mile were added to the direct runoff values to give the total runoff. Streamflow records of adjacent or nearby areas were used to estimate base flow rates. Figure A-6 shows the computed standard project flood for a typical subdrainage area along with the rainfall-loss and rainfall-excess hydrograph. Table A-4 lists the computed standard project flows at major points in the Phillippi Creek system.

b. 10- and 30-year floods.--Runoffs from these floods were computed in the same manner as for the standard project flood, applying appropriate rainfall to the unit hydrograph. Peak inflow rates, also listed in table A-4, are approximately 30 percent and 60 percent of the standard project flood peaks for the 10-year and 30-year floods, respectively.

c. Flood of record.--Estimates for the flood of record (Sept. 1962) were modified, based on unit hydrograph characteristics, to represent urban runoff conditions that could be expected during project life. These estimates are also given in table A-4.

d. Design discharge.--Design discharge data are listed in table A-4 and shown on hydraulic-design profiles on figure A-7.

TABLE A-4

Phillippi Creek Basin

Peak inflow rates

Location	Drainage area (1) (sq. miles)	Peak discharge (c.f.s.) (2)			Maximum of record (3)
		10-yr. flood	30-yr. flood	Standard project flood	
Branch AA					
At Cattlemen Rd.-----	4.6	400	650	1,100	950
Main A Canal					
At structure (sta. 88+00)----------	31.4	1,550	3,050	6,200	-
Main B Canal					
At structure (sta. 13+00)----------	9.8	750	1,300	2,400	2,000
Phillippi Creek					
At structure (sta. 190+00)----------	51.1	2,600	4,750	9,350	7,600
At mouth----------	57.7	2,800	5,000	9,850	-

NOTES: (1) See figure A-1 for locations of subareas.
(2) Excludes 750 c.f.s. to be pumped to Cow Pen Slough.
(3) Modified for project conditions.

10. Water-surface elevations.--Design water-surface elevation for Phillippi Creek at the Intracoastal Waterway was based on mean high water elevation 0.7 foot in Sarasota Bay as determined from tidal data records of the United States Coast and Geodetic Survey. The maximum lunar tide and storm or wind tides could be expected to exceed that elevation. The maximum hurricane tide is estimated to be 10 to 11 feet. In planning flood control and drainage for the area, due consideration was given to the expected character of ultimate urban development, adequate stages in canals for maintenance and prevention of overdrainage, and economical canal and structure design. The design water elevation in the canal was held a sufficient depth below ground elevations in the adjacent area to provide adequate slope for the secondary drainage system.

11. Maximum permissible velocities.--Subsurface explorations indicate that the materials to be excavated for the canal prism would vary from sand and silt in the upper reaches to hard limestone overlain with partially indurated clay with lenses of limestone in the lower reaches. Although the consolidated materials would permit velocities of 3.5 feet a second, a maximum permissible velocity of 2.5 feet a second has been used for canal design because of the depth of sand overlying the consolidated materials.

III. HYDRAULIC DESIGN OF CANALS AND STRUCTURES

12. Canal design.--a. General.--Hydraulic-design criteria and procedures used for design of canals are in accordance with standard practice and applicable provisions of engineering manuals and in accordance with standard procedures used for the design of canals in Central and Southern Florida.

b. Canal characteristics.--Side slopes for the canals were based on the type of materials encountered. Side slopes of 1 vertical on 2 horizontal were considered stable for sand, while steeper slopes were considered permissible in consolidated materials. In order to avoid the use of compound side slopes, a slope of 1 vertical on 2 horizontal was used throughout. Canal cross section was based on the most economical section that would carry the design discharge at the design water-surface elevation and slope. The materials to be excavated and the limits of practicable and economical canal width were considered in determination of the canal section. A minimum practicable section with a 10-foot bottom width and a depth of 10 feet below water-control elevation was used in the upper reaches of the canals. The coefficient of roughness "n" used in Manning's formula was varied to meet the conditions of the materials in particular reaches of canals. An "n" value of 0.030 was used for reaches to be excavated predominantly through sand, and a value of 0.035 was used for reaches where the canal would be in limestone and partially indurated clay.

c. Design procedure.--Canal water-surface profiles were computed by application of Manning's formula. Transitions would be made at changes in canal section, and changes in velocity head would be negligible. The head loss through railroad and highway bridges was determined by D'Aubuisson's formula. In general, new bridges were considered to span the design channel section.

d. Summary of canal design.--Hydraulic design of the canals is shown on figure A-7 and typical sections are shown on figure A-8. Design discharge and hydraulic-design data are summarized in table A-5. Hydraulic-design data for bridges are summarized in table A-6, and typical bridge sections are shown on figure A-10.

TABLE A-5

Phillippi Creek Basin

Summary of hydraulic-design data for canals

(30-year-flood protection)

Approximate station	Location	Discharge (c.f.s.)	Design: Water-surface elevation (ft.)	Design: Canal section* Bottom elevation (ft.)	Design: Canal section* Bottom width (ft.)
	PHILLIPPI CREEK--5.3 MILES				
0+00	Intracoastal Waterway-----	5,000	0.7	-10.0	200
2+00	End of transition---------	5,000	0.8	-16.0	100
71+00	Transition----------	4,950	1.5	-16.0	100
76+00	do. ----------	4,950	1.5	-22.1	40
140+00	Clark Lakes Branch--------	4,900	2.2	-21.0	40
140+50	Above branch----------	4,700	2.2	-20.2	40
153+50	Below Bee Ridge Rd.-------	4,675	2.3	-20.2	40
154+50	Above Bee Ridge Rd.-------	4,675	2.4	-20.2	35
190+00	Control structure---------	4,600	2.8	-20.2	35
190+50	Above structure----------	4,600	5.0	-19.4	26
282+80	Main A and Main B Canals--	4,500	5.8	-18.3	26
	MAIN A CANAL--2.7 MILES				
0+00	Confluence Phillippi Creek----------	3,200	5.8	-7.8	70
88+00	Control structure---------	3,000	7.0	-6.0	70
88+50	Above structure----------	3,000	13.0	-3.2	45
144+00	Branch AA----------	2,850	13.6	-2.0	45
	BRANCH AA--2.5 MILES				
144+00	Confluence Main A Canal---	910	13.6	2.0	10
191+00	Cattlemen Rd.----------	680	14.5	3.0	10
274+60	End of canal----------	280	15.0	3.0	10
	MAIN B CANAL--3.4 MILES				
0+00	Confluence Phillippi Creek----------	1,300	5.8	-8.2	10
13+00	Control structure---------	1,300	6.1	-8.0	10
13+50	Above structure----------	1,300	15.0	0.9	10
96+00	Control structure---------	1,100	16.6	3.8	10
96+50	Above structure----------	1,100	19.0	6.2	10
100+00	Branch BA----------	1,100	19.1	6.3	10
100+50	Above Branch BA----------	600	19.1	9.0	10
180+00	End of canal----------	400	19.9	9.0	10
	BRANCH BA--1.2 MILES				
0+00	Confluence Main B Canal---	500	19.1	9.0	10
65+90	End of canal----------	350	19.6	9.0	10

NOTE: *All side slopes would be 1 vertical on 2 horizontal.

TABLE A-6

Phillippi Creek Basin

Summary of hydraulic-design data for bridges

Approximate station	Location	Design discharge (c.f.s.)	Design water-surface elevation (ft.)	Net area required below water surface (sq. ft.)
	PHILLIPPI CREEK CANAL			
40+00	U. S. Hwy. 41------	5,000	1.2	1,800
154+00	Bee Ridge Rd.------	4,675	2.4	1,690
178+00	Tuttle Ave.--------	4,625	2.6	1,660
198+50	Webber St.---------	4,600	5.1	1,710
257+00	Bahia Vista St.----	4,525	5.7	1,680
	MAIN A CANAL			
18+00	S.A.L. RR.---------	3,175	6.2	1,190
63+00	Bahia Vista St.----	3,075	6.7	1,140
	BRANCH AA			
154+00	Private road-------	870	13.8	320
191+00	Cattlemen Rd.------	680	14.5	300
208+00	Bee Ridge Rd.------	600	14.7	300
	MAIN B CANAL			
15+00	S.A.L. RR.---------	1,300	15.0	485
16+00	A.C.L. RR.---------	1,300	15.1	485
45+00	Fruitville Rd.-----	1,250	15.6	465
87+00	Bobby Jones Rd.----	1,150	16.4	430
114+00	17th St.----------	565	19.3	285
	BRANCH BA			
13+00	17th St.----------	470	19.2	280
48+00	27th Parkway-------	390	19.5	290
58+50	Prudence Dr.-------	370	19.6	290

13. Design of control structures.--a. General.--Four primary water-control structures would be required to control velocity of flow in the improved channels while maintaining water levels sufficiently high to prevent overdrainage. The structures would dissipate the energy produced by the fall in water-surface elevations at the structures. Three terminal water-control structures would be required at the upstream limits of the proposed channel improvement for erosion control and energy dissipation at the transition from the improved channel to the existing channel. Locations of the proposed structures are shown on plate 1. Hydraulic criteria and procedures used for design are in accordance with standard engineering practices and with the applicable provisions and criteria of Engineering Manuals 1110-2-1602, "Hydraulic Design, Reservoir Outlet Structures," and 1110-2-1603, "Hydraulic Design, Spillways." Criteria presented in "Design of Small Dams," United States Department of the Interior, Bureau of Reclamation, were used in the design of stilling basins for the hydraulic-jump spillways.

b. Water-control structures.--The existing weir on Phillippi Creek will require replacement if the downstream channel is improved. With the downstream channel improved to 30-year-flood capacity, tailwater elevation at the structure would be lowered to about 3.0 feet during the design flood and to about 5.0 feet during the standard project flood. The increased fall in water surface at the structure would cause the overflow jet during design and larger floods to fall downstream of the apron. Preliminary investigations indicate that the cost of modifying the existing structure would exceed the cost of a new structure. The existing weir would be replaced with a concrete spillway with an apron sufficiently deep and long to dissipate the increased energy resulting from the lowered tailwater. Each of the four primary water-control structures would be ogee weirs with horizontal stilling basins for energy dissipation. The structures would be equipped with conventional vertical-lift gates which would be operated automatically by a simple headwater control. Auxiliary power would be available for emergency use during power failures. A summary of hydraulic-design data for the Phillippi Creek structure, Main A structure, and two Main B structures is given in table A-7. A typical spillway section is shown on figure A-9.

c. Terminal structures.--Concrete sheet-pile weirs would be provided at the upper limits of improvement on Main B Canal and Branch BA. The foundation material at the site of the terminal structure on Branch AA, while subject to erosion, is considered to be too hard for economical installation of sheet pile. A concrete chute with training walls and horizontal stilling basin is therefore proposed for erosion control and energy dissipation at that location. Hydraulic-design data for the terminal structures are summarized in table A-8. Typical sections of the sheet-pile weirs and concrete chute are shown on figure A-9.

TABLE A-7

Phillippi Creek Basin

Water-control structures

Summary of hydraulic-design data

Item	Phillippi Creek structure	Main A structure	Main B	
			Structure 1	Structure 2
Design conditions;				
Discharge (c.f.s.)----------	4,600	3,000	1,300	1,100
Headwater elevation (ft.)----	5.0	13.0	15.0	19.0
Tailwater elevation (ft.)----	2.8	7.0	6.1	16.6
Water-control conditions:				
Headwater elevation (ft.)----	3.0	13.0	15.0	19.0
Tailwater elevation (ft.)----	1.0	3.0	3.0	15.0
Ogee crest:				
Elevation (ft.)----------	-4.0	5.0	7.0	11.0
Net length (ft.)----------	54.0	39.0	18.0	17.0
Gates:				
Number----------	3	2	1	1
Width by height (ft.)--------	18.0x7.0	19.5x8.0	18.0x8.0	17.0x8.0
Apron:				
Elevation (ft.)----------	-10.0	-4.0	-6.0	8.0
Length (ft.)----------	60.0	80.0	70.0	55.0

TABLE A-8

Phillippi Creek Basin

Terminal control structures

Summary of hydraulic-design data

Item	Main B structure	Branch BA structure	Branch AA structure
Design conditions:			
Discharge (c.f.s.)	400	350	280
Headwater elevation (ft.)	23.0	24.3	24.0
Tailwater elevation (ft.)	19.9	19.6	15.0
Type of structure	Concrete sheet pile	Concrete sheet pile	Concrete chute
Crest:			
Elevation (ft.)	20.0	22.0	20.0
Net length (ft.)	30.0	39.0	13.0
Chute:			
Length (ft.)	-	-	44.0
Slope (pct.)	-	-	50
Apron:			
Elevation (ft.)	-	-	9.0
Length (ft.)	-	-	20.0

d. Inlet structures.--Inlet structures, weirs, or channel transitions would be provided at locations where existing channels enter the project canal to prevent siltation of the canal. The number, locations, and types of inlets would be determined during detail design studies.

14. Performance.--The water-surface profile that would result from a recurrence of the flood of record (Sept. 1962 flood) as modified by existing and proposed improvements is shown on figure A-7. In order to determine damages and benefits for project works, approximate routings were made for the standard project flood on the proposed plan of improvement. It was assumed in the routings that storm runoff to canals would be in accordance with unit-hydrograph characteristics and that runoff in excess of removal capacity would be accumulated as level pool storage over local ponding reaches. Duration of flooding during the standard project flood would be about 1 day. Maximum stages above main spillway structures, as determined by routing studies, are given in table A-9.

TABLE A-9

Phillippi Creek Basin

Maximum stages above main spillway structures

Canal	Station	Water-surface elevation (ft.)
Phillippi Creek----------	190+00	9.7
Main A Canal----------	88+00	17.0
Main B Canal----------	13+00	17.1
Do. ----------	96+00	21.7

IV. STRUCTURAL DESIGN

15. General.--The proposed plan of improvement would require the construction of one principal outflow canal along Phillippi Creek, three main feeder canals, and two branch canals. Practically all of the canal construction would consist of enlarging small existing canals or creeks. The total length of canal improvement would be 15.1 miles. In addition to the canal improvements, the plan would require the construction of 4 primary control structures, 3 terminal control structures, 13 highway bridges, and 3 railroad bridges.

16. Canals.--a. General.--The canals would be constructed to the bottom elevations and widths shown on figure A-7. Side slopes would be 1 vertical on 2 horizontal. Spoil would be placed as stated in subparagraph b below. Typical canal sections are shown on figure A-8.

b. Construction methods.--It is considered that the most economical method of construction would be as follows: (1) Excavation by hydraulic pipeline dredge from the west end of the Phillippi Creek improvement (station 0+00) to station 71+00 and material pumped to a spoil area in the bay (see plate 1); (2) excavation by dragline from station 71+00 to the junction with the main feeder canals (station 282+80) and material hauled to central spoil areas located within a haul distance of 5 miles; and (3) excavation by dragline for the remaining canals and spoil placed directly into a continuous spoil bank along one side of the canal, as shown on figure A-8.

c. Type of excavating equipment.--It is expected that a medium-size dredge and dragline could most economically accomplish the work.

d. Maintenance.--Maintenance would be accomplished by dragline except at the westerly end where floating equipment would be required.

e. Lands.--Local interests would be required to furnish all lands, easements, and rights-of-way necessary for construction and maintenance of the project. Canal rights-of-way requirements are shown on figure A-8.

17. Control structures.--a. Locations.--Proposed structure locations are shown on plate 1 and figure B-3. Topographic, hydrologic, and geologic considerations will determine the exact locations of the structures.

b. Foundation conditions.--The proposed control structures would probably be founded on the indurated clay and silt or on limestone. Both types of material would provide adequate bearing capacity. The limestones and indurated clay and silt are relatively impervious and would present no dewatering problems.

c. Type of structures.--(1) The main structure, Main A structure, Main B structure 1, and Main B structure 2.--These structures would be reinforced-concrete, U-shaped, ogee-type gated spillways. Each structure would be provided with automatically controlled, vertical-lift gates which would be operated by individual hydraulically powered gate hoists mounted on the reinforced-concrete operating platform. A reinforced-concrete service bridge and reinforced-concrete wingwalls constructed at a 45° angle of divergence from the flow line would be provided at each structure. Facilities would be provided for dewatering each gate bay individually and for servicing and inspecting the gates. General structure features are shown on figure A-9.

(2) The Main B structure 3 and the Branch BA structure.--These structures would be concrete sheet-pile weirs. An elevation of a typical weir is shown on figure A-9.

(3) Branch AA structure.--This would be a reinforced-concrete, U-shaped, chute spillway. General features of this structure are shown on figure A-9.

d. Vertical-lift gates.--Wheeled vertical-lift gates would be provided. The gates would be of standard manufacture, all-welded construction of structural carbon steel.

18. Access roads.--During construction, access would be by means of existing roads and the berm resulting from the canal construction. After construction, the berms would afford access for maintenance equipment.

19. Interference with local activity.--a. Canals.--The construction of the canals would cause very little interference with local activity.

b. Bridges.--(1) Railroad bridges.--There would be only minor interference with rail traffic, since runaround tracks would be provided where existing bridges would be replaced.

(2) Highway bridges.--Some interference with local activity would result from construction and replacement of highway bridges. For economy, where possible, highway traffic would be detoured by other roads during construction.

20. Construction contracts.--The work would be publicly advertised for bids and awarded to the lowest responsible bidders. The project could be divided into parts in order to invite the greatest amount of competition between contractors, both large and small, but at the same time provide units that would produce benefits when they were completed.

21. Construction period and schedule.--The sum of the construction periods for all canals is about 2 years. However, it is expected that several canal contracts would be programed concurrently after funds were made available, thereby reducing the time required. The construction schedule would depend on population pressures and future flood events not now predictable with any degree of certainty and would be based on the need and relative economic justification for the individual canals.

V. ANALYSIS OF COSTS

22. Basis of estimates.--a. General.--Estimates of excavation quantities were made for all the canals, and estimates of costs were made for the canals, structures, bridges, and appurtenant works. Quantity estimates for Phillippi Creek, Main B Canal, Branch BA, and a portion of Main A Canal were based on cross sections taken at approximately 1,000-foot intervals. Quantity estimates for the remainder of Main A Canal and for Main C Canal and Branch AA were based on a survey made by a consulting engineering firm for the County of Sarasota. Separate unit prices were applied for the following excavation operations: (1) Excavation by dredge at the mouth with spoil being pumped to an area in the bay; (2) excavation by dragline through the populous reach southeast of Sarasota with spoil being hauled to areas not farther away than 5 miles; and (3) excavation by dragline for the remainder of the canals with spoil being placed directly into continuous spoil banks. Subsurface information was based on nine core borings taken at about 1-1/2-mile intervals. Land costs were based on a limited search of county records and inspection along points of access on the proposed rights-of-way. The estimated costs of private relocations were based on removing several residences and removing and replacing two private bridges. Maintenance would consist of periodic excavation of the canals and normal maintenance of the structures.

b. Bridges.--Estimates for bridge construction were based on the following criteria:

(1) Bridges would provide a horizontal clearance of 25 feet and a vertical clearance of 6 feet above the design water surface.

(2) Highway bridges would be concrete bridges at an estimated unit cost of $12 a square foot of roadway deck.

(3) Railroad bridges would be single-track bridges at an estimated unit price of $800 a linear foot of track, including the temporary runaround track.

(4) Excavation required for construction of each bridge was estimated to cost $1.50± a cubic yard.

23. Estimates of costs.--a. Primary works.--(1) Initial costs.--Estimated initial costs for the canals and appurtenant works are given in table A-10 and for the control structures in table A-11.

(2) Annual costs.--Financial and economic annual costs of primary works are also given in tables A-10 and A-11. Interest rates used were 3 percent for Federal costs and 3-1/2 percent for non-Federal costs.

(3) Summary of costs.--Table A-12 presents a summary of initial and annual costs (Federal and non-Federal) for all works in the plan of improvement, including associated works.

b. Aids to navigation.--The Federal Government would be responsible for providing aids to navigation at the mouth of Phillippi Creek. These would consist of three day markers and one lighted 3-pile dolphin. Total initial cost is estimated at $4,000. Maintenance--by the United States Coast Guard--is estimated to cost about $400 annually.

c. Associated works.--In addition to the major drainage canals, collecting and lateral works would be necessary to convey the runoff from the land area to the outlet canal. New secondary canals, enlargement of existing laterals, and construction of tertiary works would be needed to utilize the capacity of the main canals. The ultimate cost of interior works would depend on many factors--for example, type and changes in development, extent of individual landowner responsibilities, degree of adherence to long-range plans, acquisition of rights-of-way, extent of roadway systems and capacities provided by their borrow ditches, etc. Some lateral works would be provided regardless of the project. Those would be the works which would accompany normal development in the area. Estimates presented herein include costs for secondary works only on lands where increased land use would result from the Federal project. Costs were developed for new canals and for the increase in canal capacities required to serve the areas of intensified development. The initial costs of associated works for the subject area were estimated at $118,000. Annual costs, based on a 6-percent rate for interest and amortization and including maintenance, would be about $8,400. Estimates of initial and annual costs for associated works are included in table 5 in the main body of this report.

TABLE A-10

Phillippi Creek Basin

Plan of improvement--primary works

Canals and related works

Estimates of initial and annual costs

(Date of estimate: July 1963)

	Item	Estimates of costs					
		Phillippi Creek	Main A	Branch AA	Main B	Branch BA	Total
	INITIAL COSTS						
	Excavation, unclassified						
a	Quantity (cu. yd.)	1,550,000	730,000	260,000	270,000	130,000	
b	Unit price	$1.45	$0.25	$0.25	$0.25	$0.25	
c	Amount	2,247,500	182,500	65,000	67,500	32,500	$2,595,000
d	Highway bridge excavation (amount)	74,300	18,200	11,300	9,800	9,000	122,600
e	Clearing (amount)	6,000	10,200	3,000	4,800	4,000	28,000
f	Subtotal (items c, d, and e)	2,327,800	210,900	79,300	82,100	45,500	2,745,600
g	Contingencies (20 pct. of item f)	465,600	42,200	15,900	16,400	9,100	549,200
h	Contract price, excavation (items f and g)	2,793,400	253,100	95,200	98,500	54,600	3,294,800
i	Engineering and design (7 pct. of item h)	195,500	17,700	6,700	6,900	3,800	230,600
j	Supervision and administration (8 pct. of item h)	223,500	20,200	7,600	7,900	4,400	263,600
k	Subtotal, excavation (items h, i, and j)	3,212,400	291,000	109,500	113,300	62,800	3,789,000
	Lands and rights-of-way						
l	Amount	110,600	203,800	59,600	219,100	62,900	656,000
m	Acquisition cost (5 pct.)	5,500	10,200	3,000	11,000	3,100	32,800
n	Subtotal, lands and rights-of-way (items l and m)	116,100	214,000	62,600	230,100	66,000	688,800
	Bridges and relocations						
o	Railroad bridges (No.)	-	1	-	2	-	3
p	Base cost	-	$150,300	-	$156,600	-	$306,900
q	Contingencies (20 pct. of item p)	-	30,100	-	31,300	-	61,400
r	Contract price (items p and q)	-	180,400	-	187,900	-	368,300
s	Government costs (2 pct. of item r)	-	3,600	-	3,800	-	7,400
	Subtotal, railroad bridges (items r and s)	-	184,000	-	191,700	-	375,700
t	Highway bridges (No.)	5	1	2	2	3	13
u	Base cost	$404,300	$91,800	$70,300	$69,000	$104,200	$739,600
v	Contingencies (20 pct. of item u)	80,900	18,400	14,100	13,800	20,800	148,000
w	Contract price (items u and v)	485,200	110,200	84,400	82,800	125,000	887,600
x	Engineering, supervision, inspection, and overhead (15 pct. of item w)	72,800	16,500	12,700	12,400	18,800	133,200
y	Subtotal, highway bridges (items w and x)	558,000	126,700	97,100	95,200	143,800	1,020,800

(Continued)

TABLE A-10--Continued

	Item	Estimates of costs					
		Phillippi Creek	Main A	Branch AA	Main B	Branch BA	Total
	INITIAL COSTS--Continued						
	Bridges and relocations--Continued						
z	Relocations						
aa	Base cost	$215,000	-	$32,700	$33,600	-	$281,300
bb	Contingencies (20 pct. of item aa)	43,000	-	6,500	6,700	-	56,200
cc	Contract price (items aa and bb)	258,000	-	39,200	40,300	-	337,500
dd	Engineering, supervision, inspection, and overhead (15 pct. of item cc)	38,700	-	5,900	6,000	-	50,600
ee	Subtotal, relocations (items cc and dd)	296,700	-	45,100	46,300	-	388,100
	Inlet structures						
ff	Base cost	50,000	$62,500	50,000	75,000	$37,500	275,000
gg	Contingencies (20 pct. of item gg)	10,000	12,500	10,000	15,000	7,500	55,000
hh	Contract price (items ff and gg)	60,000	75,000	50,000	90,000	45,000	330,000
ii	Engineering and design (7 pct. of item hh)	4,200	5,300	4,200	6,300	3,200	23,200
jj	Supervision and administration (8 pct. of item hh)	4,800	6,000	4,800	7,200	3,600	26,400
kk	Subtotal, inlet structures (items hh, ii, and jj)	69,000	86,300	69,000	103,500	51,800	379,600
ll	Total initial costs (Federal and non-Federal) (items k, n, s, y, ee, and kk)	4,252,200	902,000	383,300	780,100	324,400	6,642,000
mm	Construction period (months)	12	6	2	2	1	

(Continued)

TABLE A-10--Continued

	Item	Phillippi Creek		Main A		Branch AA		Main B		Branch BA		Total	
		Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic
	ANNUAL COSTS												
nn	Interest and amortization* (on item 11)	$171,400	$171,400	$36,700	$36,700	$15,800	$15,800	$32,000	$32,000	$13,400	$13,400	$269,300	$269,300
oo	Economic adjustment for land (6 pct. - 3-1/2 pct. = 2-1/2 pct. on item 1)	-	2,800	-	5,100	-	1,500	-	5,500	-	1,600	-	16,500
	Maintenance												
pp	Canal	3,700	3,700	1,000	1,000	800	800	1,000	1,000	400	400	6,900	6,900
qq	Bridges	4,900	4,900	2,900	2,900	1,200	1,200	3,100	3,100	1,300	1,300	13,400	13,400
rr	Inlet structures	600	600	800	800	600	600	900	900	500	500	3,400	3,400
ss	Subtotal, maintenance (items pp, qq, and rr)	9,200	9,200	4,700	4,700	2,600	2,600	5,000	5,000	2,200	2,200	23,700	23,700
tt	Total annual costs (Federal and non-Federal) (items nn, oo, and ss)	180,600	183,400	41,400	46,500	18,400	19,900	37,000	42,500	15,600	17,200	293,000	309,500

NOTE: *Interest and amortization computed at 3 pct. on the total Federal initial costs and at 3-1/2 pct. on the total non-Federal initial costs.

TABLE A-11

Phillippi Creek Basin

Plan of improvement--primary works

Control structures

Estimates of initial and annual costs

(Date of estimate: July 1963)

	Item	Estimates of costs							
		Phillippi Creek (Spillway)	Main A (Spillway)	Branch AA (Chute)	Main B Structure 1 (Spillway)	Main B Structure 2 (Spillway)	Main B Structure 3 (Concrete sheet-pile weir)	Branch BA (Concrete sheet-pile weir)	Total
				INITIAL COSTS					
	Base costs								
a	Structure	$232,000	$222,000	$35,000	$159,000	$104,000	$20,000	$23,000	$795,000
b	Machinery and equipment	35,000	24,000	-	13,000	12,000	-	-	84,000
c	Subtotal, base costs (items a and b)	267,000	246,000	35,000	172,000	116,000	20,000	23,000	879,000
d	Contingencies (20 pct. of item c)	53,400	49,200	7,000	34,400	23,200	4,000	4,600	175,800
e	Contract price (items c and d)	320,400	295,200	42,000	206,400	139,200	24,000	27,600	1,054,800
f	Engineering and design (7 pct. of item e)	22,400	20,700	2,900	14,400	9,700	1,700	1,900	73,700
g	Supervision and administration (8 pct. of item e)	25,600	23,600	3,400	16,500	11,100	1,900	2,200	84,300
h	Construction costs (items e, f, and g)	368,400	339,500	48,300	237,300	160,000	27,600	31,700	1,212,800
i	Lands and rights-of-way (included in canal costs)	-	-	-	-	-	-	-	-
j	Total initial costs (Federal and non-Federal) (item h)	368,400	339,500	48,300	237,300	160,000	27,600	31,700	1,212,800
k	Construction period (months)	15	15	4	12	10	3	3	18
				ANNUAL COSTS					
l	Interest and amortization (1) (on item j)	$14,600	$13,400	$1,900	$9,500	$6,300	$1,000	$1,300	(2) $48,000
	Maintenance and operation								
m	Operation and care	2,500	2,000	500	1,500	1,500	500	500	9,000
n	Replacement of operating equipment at structure after 25 years	900	600	-	300	300	-	-	2,100
o	Subtotal (items m and n)	3,400	2,600	500	1,800	1,800	500	500	11,100
p	Total annual costs (2) (Federal and non-Federal) (items l and o)	18,000	16,000	2,400	11,300	8,100	1,500	1,800	(2) 59,100

NOTES: (1) Interest and amortization computed at 3 pct. on the total Federal initial costs and at 3-1/2 pct. on the total non-Federal initial costs.
(2) Economic costs are the same as financial costs, since lands are included in canal costs.
(3) In addition to the above (Federal) costs, estimated initial costs for aids to navigation equal $4,000 (includes three day markers at $200 and one lighted 3-pile dolphin at $3,000). Estimated annual maintenance costs equal $400. (These are responsibility of United States Coast Guard.)

(R 12-5-63)

TABLE A-12

Phillippi Creek Basin

Plan of improvement

Summary of Federal and non-Federal initial and annual financial costs

(Date of estimate: July 1963)

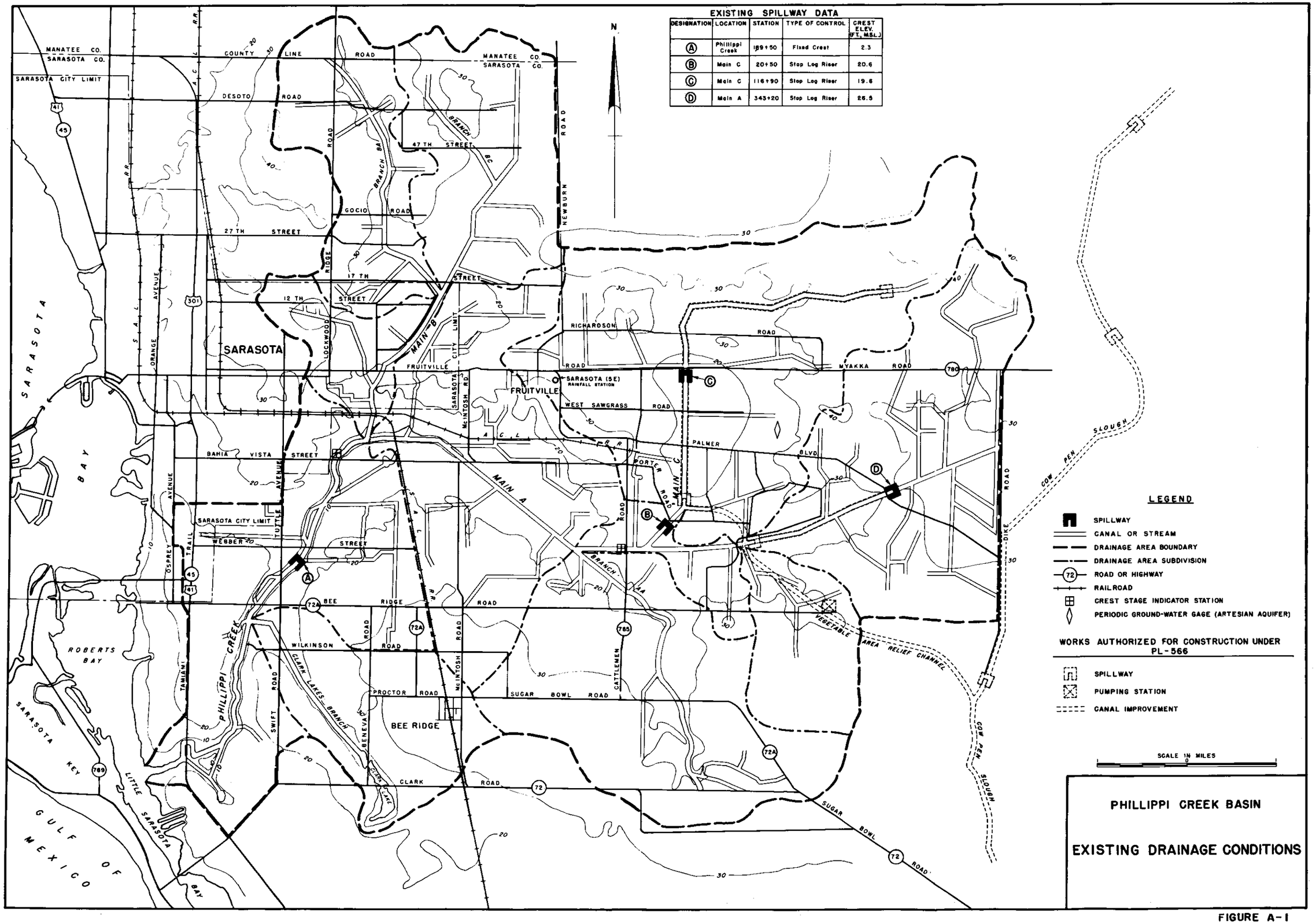
(All costs are in thousands of dollars)

Item	Contract price	Supervision, inspection, and overhead	Construction costs	Federal initial costs			Federal annual costs	Non-Federal initial costs				Non-Federal annual costs			Total primary costs (Federal and non-Federal)		Total associated costs (Non-Federal)	
				Federal share of construction costs	Engineering	Total	Interest and amortization	Non-Federal share of construction costs	Lands and private relocations	Public relocations	Total	Non-Federal interest and amortization	Non-Federal maintenance and operation	Total	Initial	Annual financial	Initial	Annual
		(8 pct. of (1))	((1)&(2))	(78 pct. of (3))	(7 pct. of (1))	((4)&(5))	(0.03887x(6))	(22 pct. of (3))			((8),(9)&(10))	(0.04263x(11))		((12)&(13))	((6)&(11))	((7)&(14))		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Phillippi Creek																		
Canal	$2,793.4	$223.5	*3,016.9	$2,369.3	$195.5	$2,564.8	$99.7	$647.6	$412.8	$558.0	$1,618.4	$69.0	$8.6	$77.6	$4,183.2	$177.3		
Control structure	320.4	25.6	346.0	271.7	22.4	294.1	11.4	74.3	-	-	74.3	3.2	3.4	6.6	368.4	18.0		
Inlet structures	60.0	4.8	64.8	50.9	4.2	55.1	2.1	13.9	-	-	13.9	0.6	0.6	1.2	69.0	3.3		
Main A																		
Canal	253.1	20.2	273.3	214.7	17.7	232.4	9.0	58.6	214.0	126.7	399.3	17.0	2.1	19.1	631.7	28.1		
Control structure	295.2	23.6	318.8	250.4	20.7	271.1	10.5	68.4	-	-	68.4	2.9	2.6	5.5	339.5	16.0		
Inlet structures	75.0	6.0	81.0	63.6	5.3	68.9	2.7	17.4	-	-	17.4	0.7	0.8	1.5	86.3	4.2		
Railroad bridge	180.4	3.6*	184.0	144.5	-	144.5	5.6	39.5	-	-	39.5	1.7	1.8	3.5	184.0	9.1		
Branch AA																		
Canal	95.2	7.6	102.8	80.7	6.7	87.4	3.4	22.1	107.7	97.1	226.9	9.7	2.0	11.7	314.3	15.1		
Control structure	42.0	3.4	45.4	35.7	2.9	38.6	1.5	9.7	-	-	9.7	0.4	0.5	0.9	48.3	2.4		
Inlet structures	60.0	4.8	64.8	50.9	4.2	55.1	2.1	13.9	-	-	13.9	0.6	0.6	1.2	69.0	3.3		
Main B																		
Canal	98.5	7.9	106.4	83.6	6.9	90.5	3.5	22.8	276.4	95.2	394.4	16.8	2.2	19.0	484.9	22.5		
Control structures (3)	369.6	29.5	399.1	313.4	25.8	339.2	13.1	85.7	-	-	85.7	3.7	4.1	7.8	424.9	20.9		
Inlet structures	90.0	7.2	97.2	76.3	6.3	82.6	3.2	20.9	-	-	20.9	0.9	0.9	1.8	103.5	5.0		
Railroad bridges (2)	187.9	3.8*	191.7	150.5	-	150.5	5.8	41.2	-	-	41.2	1.8	1.9	3.7	191.7	9.5		
Branch BA																		
Canal	54.6	4.4	59.0	46.3	3.8	50.1	1.9	12.7	66.0	143.8	222.5	9.5	1.7	11.2	272.6	13.1		
Control structure	27.6	2.2	29.8	23.4	1.9	25.3	1.0	6.4	-	-	6.4	0.3	0.5	0.8	31.7	1.8		
Inlet structures	45.0	3.6	48.6	38.2	3.2	41.4	1.6	10.4	-	-	10.4	0.4	0.5	0.9	51.8	2.5		
Total	5,047.9	381.7	5,429.6	4,264.1	327.5	4,591.6	178.1	1,165.5	1,076.9	1,020.8	3,263.2	139.2	34.8	174.0	7,854.8#	352.1#	$118.0	$8.4

NOTES: *2 percent on railroad bridges.

#Estimated initial costs for aids to navigation equal $4,000 (includes three day markers at $200 and one lighted 3-pile dolphin at $3,000). Estimated annual maintenance costs equal $400. Federal responsibility (United States Coast Guard).

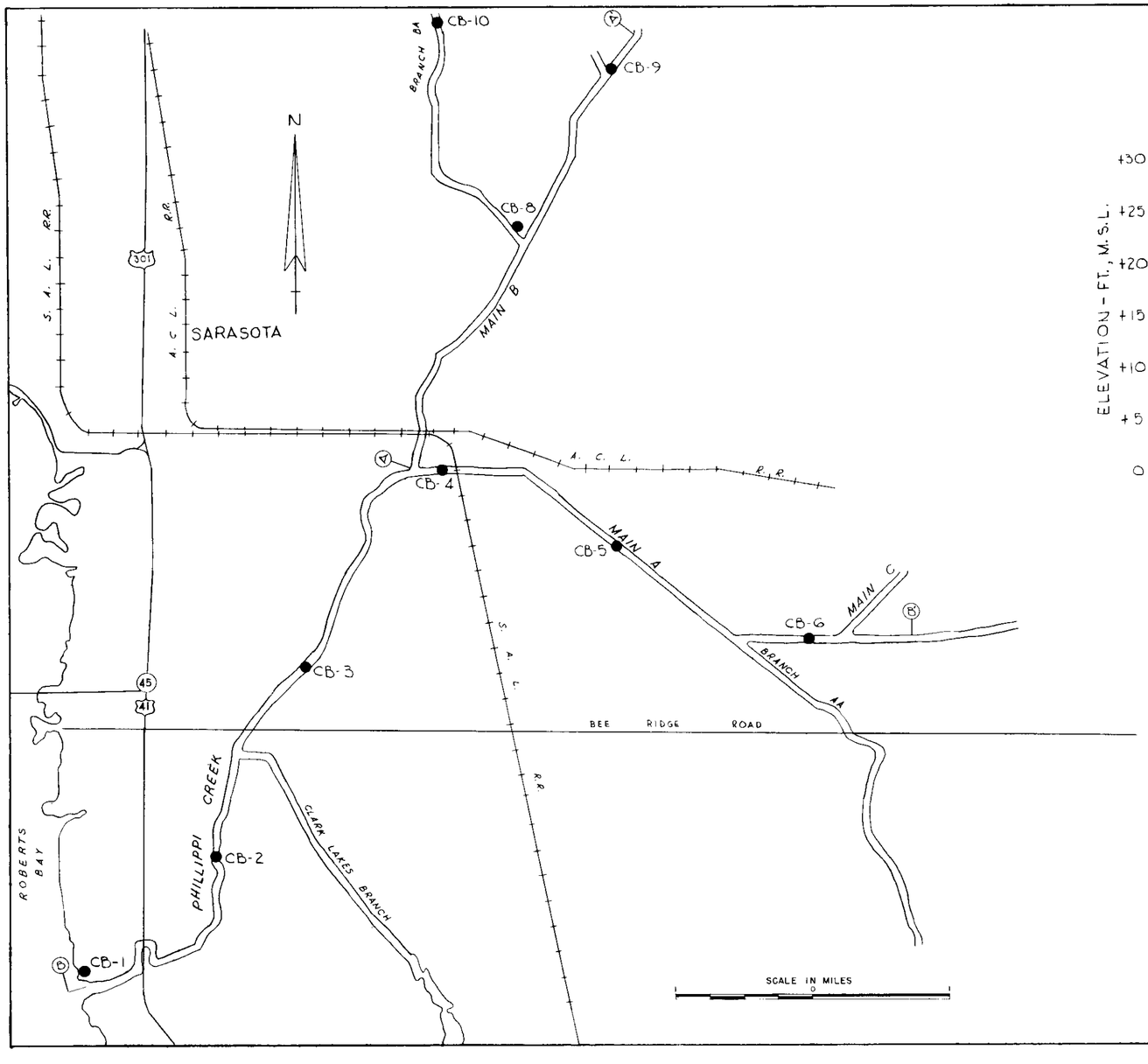
(A 12-5-63)

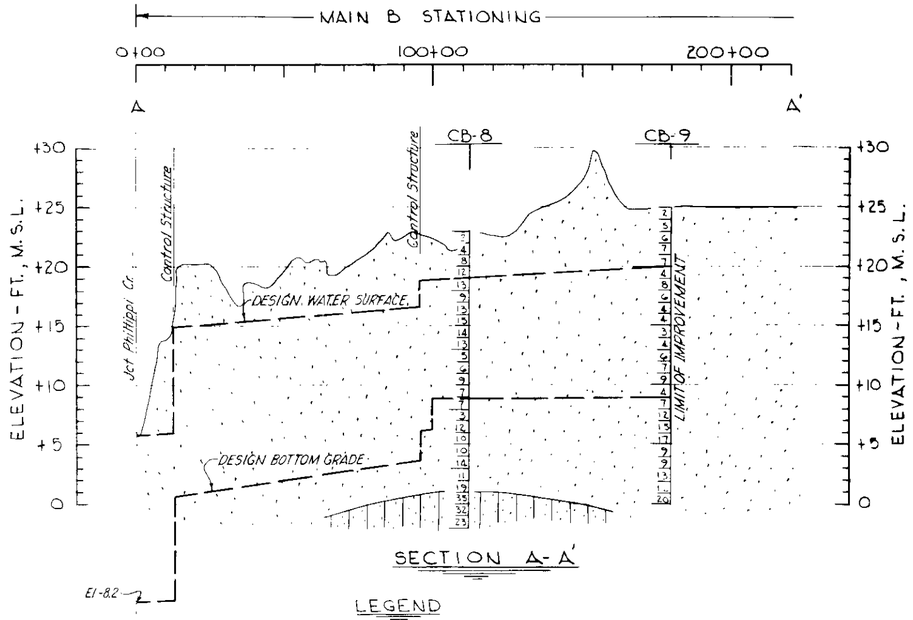


PHILLIPPI CREEK BASIN

EXISTING DRAINAGE CONDITIONS

FIGURE A-1





SECTION A-A'

LEGEND

- SAND (SP)
- SILTY SAND (SM)
- CLAYEY SAND (SC)
- LIMESTONE, DIFFICULT OR IMPOSSIBLE TO PENETRATE BY DRIVING SAMPLE SPOON
- LIMESTONE, PENETRATED BY DRIVING SAMPLE SPOON
- CLAY, HIGH PLASTICITY (CH)
- CLAY, LOW PLASTICITY (CL)
- SILT, LOW PLASTICITY (ML)
- PARTIALLY INDURATED CLAY AND SILT, VERY COMPACT
- NUMBER OF HAMMER BLOWS (450 FT. LBS. ENERGY) REQUIRED TO ADVANCE A 2-INCH I. D. SAMPLE SPOON 1 FOOT
- DIA DRILLED WITH "NX" DIAMOND BIT

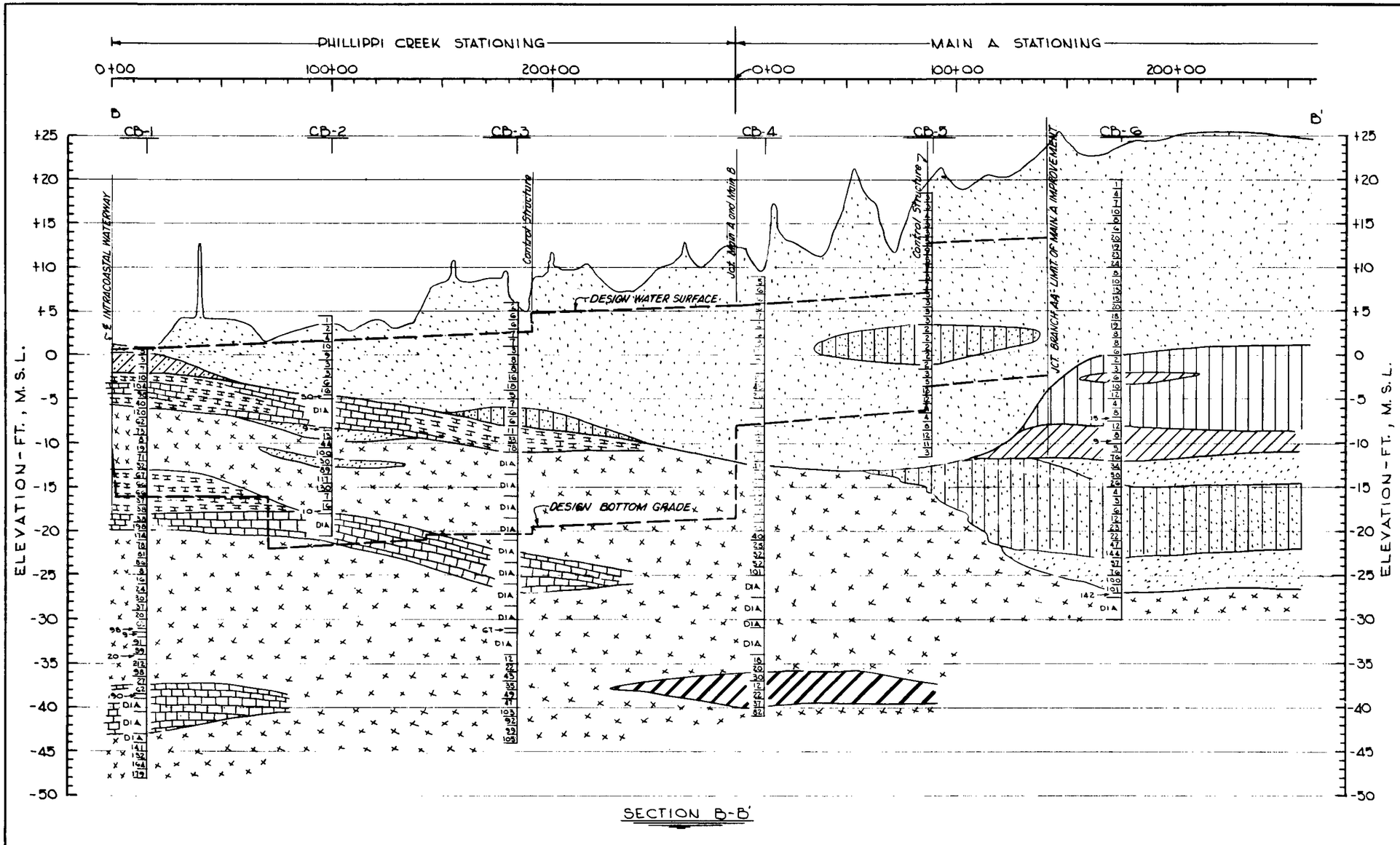
NOTES:

1. (SC), (CL), ETC, REFERS TO THE CORPS OF ENGINEERS' UNIFIED SOILS CLASSIFICATION SYSTEM.
2. BORINGS WERE LOCATED BY PICTURE POINT; LOCATIONS SHOWN ARE APPROXIMATE.

PHILLIPPI CREEK BASIN

GEOLOGIC SECTION A-A' AND BORING LOCATIONS

FIGURE A-2



FOR NOTES, LEGEND, AND BORING LOCATIONS, SEE FIGURE A-2.

PHILLIPPI CREEK BASIN

GEOLOGIC SECTION B-B'

FIGURE A-3

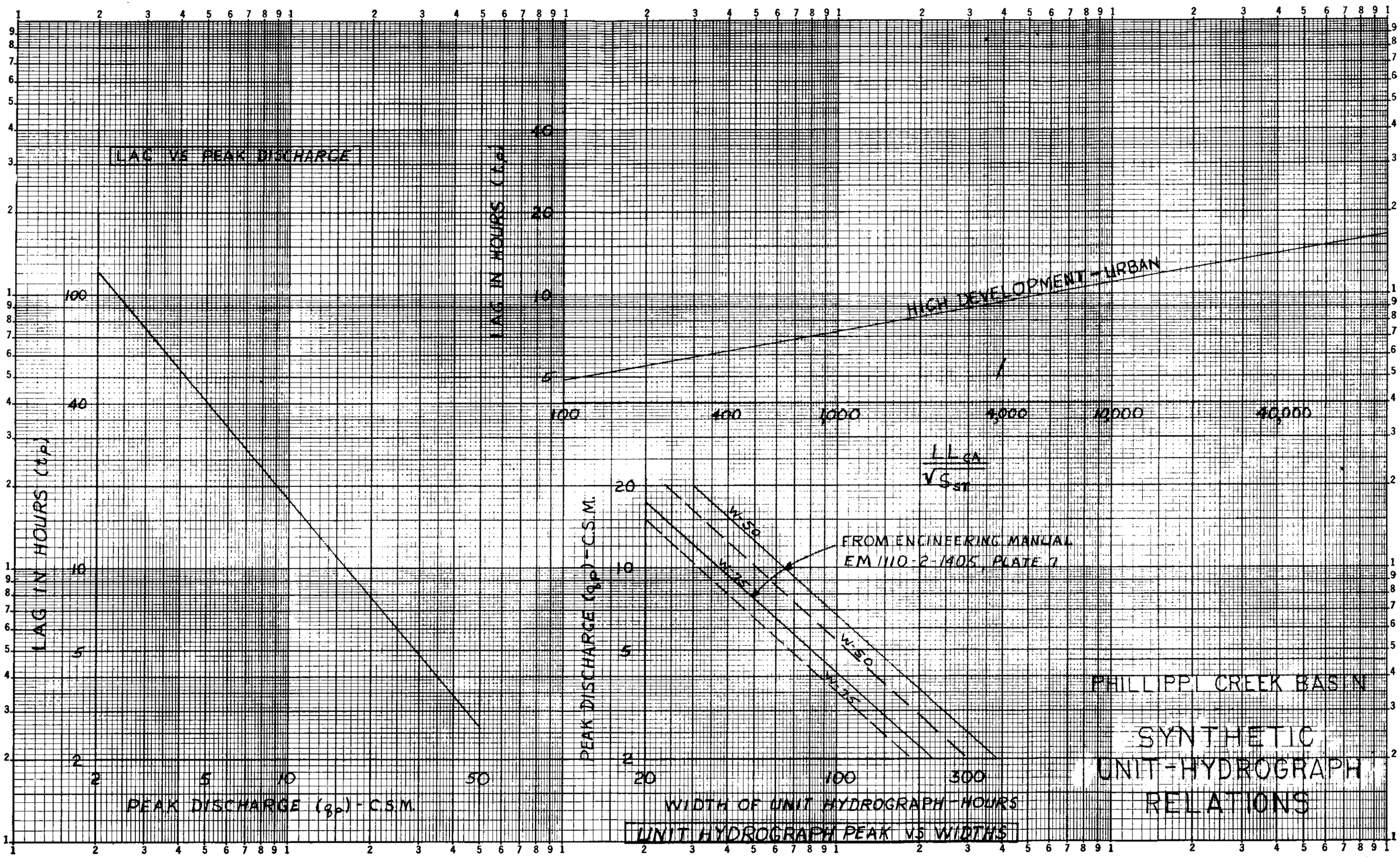

LAG VS PEAK DISCHARGE
LAG IN HOURS (t_p)
PEAK DISCHARGE (q_p) - C.S.M.
HIGH DEVELOPMENT - URBAN
$\frac{L L_{CA}}{\sqrt{S_{ST}}}$
FROM ENGINEERING MANUAL EM 1110-2-1405, PLATE 7
W-50
W-75
W-90
PEAK DISCHARGE (q_p) - C.S.M.
WIDTH OF UNIT HYDROGRAPH - HOURS
UNIT HYDROGRAPH PEAK VS WIDTHS
PHILLIPPI CREEK BASIN
SYNTHETIC UNIT-HYDROGRAPH RELATIONS

FIGURE A-4

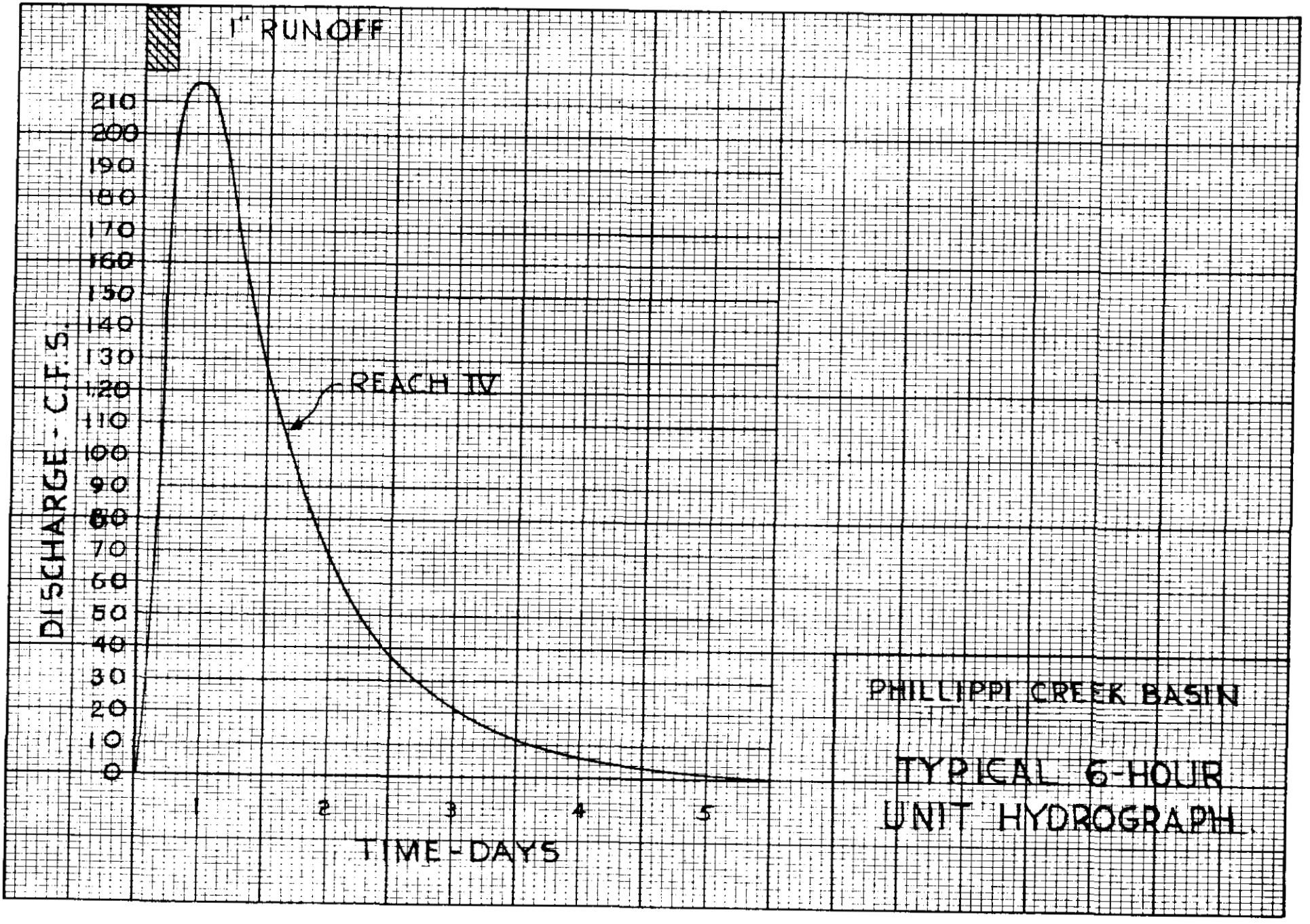


FIGURE A-5

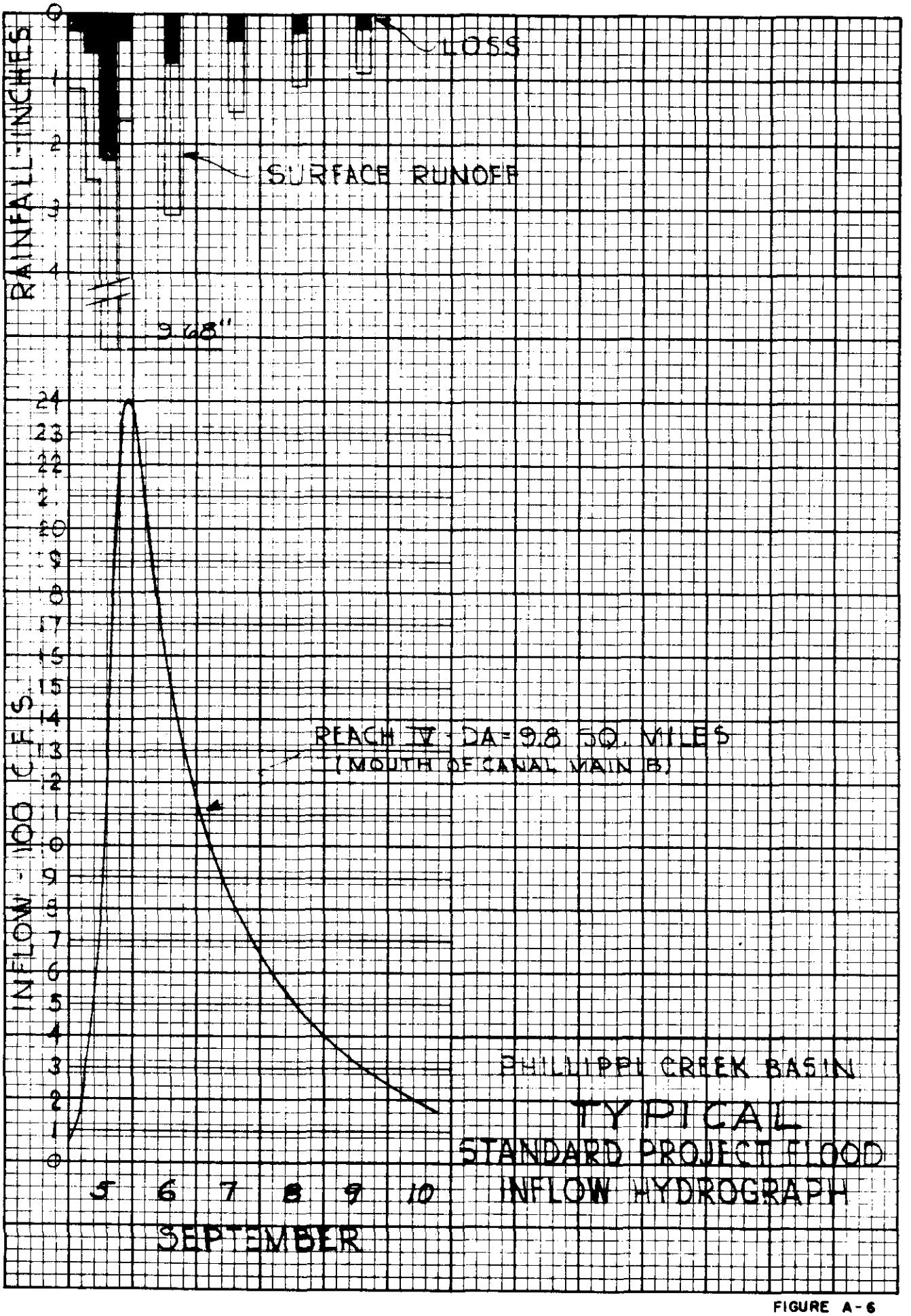
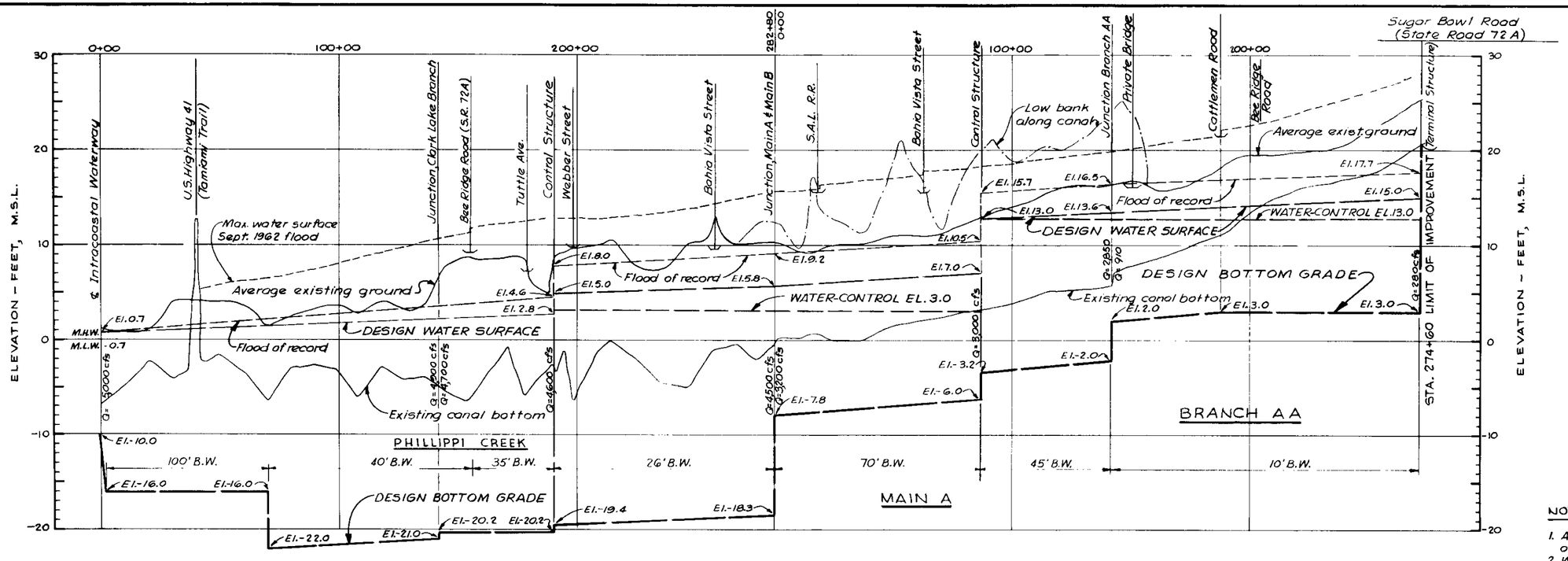
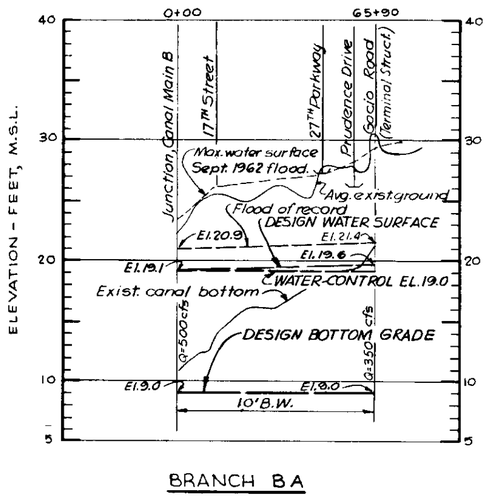
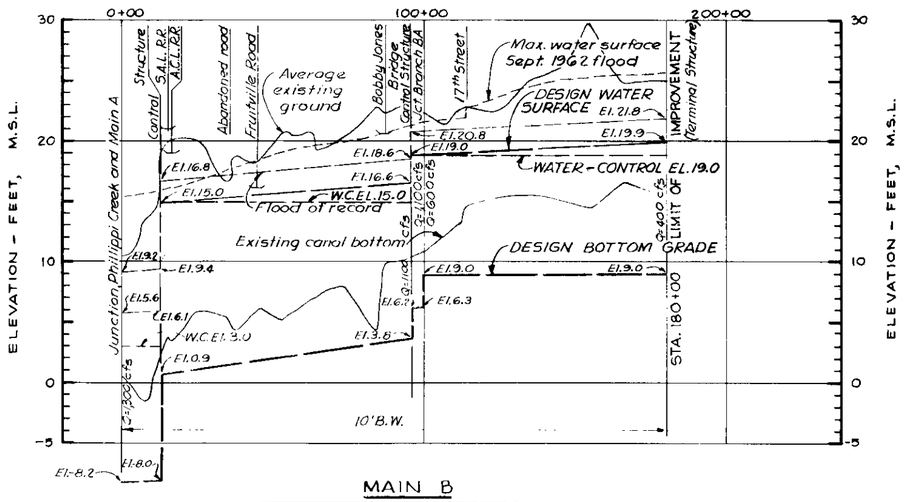


FIGURE A-6







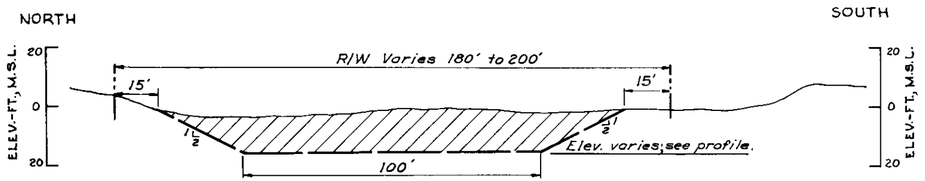
NOTES:

1. All side slopes are 1 vertical on 2 horizontal.
2. Water-surface profile for flood of record is the maximum stage that would result from recurrence of September 1962 flood with the project plan.
3. Maximum water-surface profile for Sept. 1962 flood from Smalley, Wellford and Nolven, Consulting Engineers.

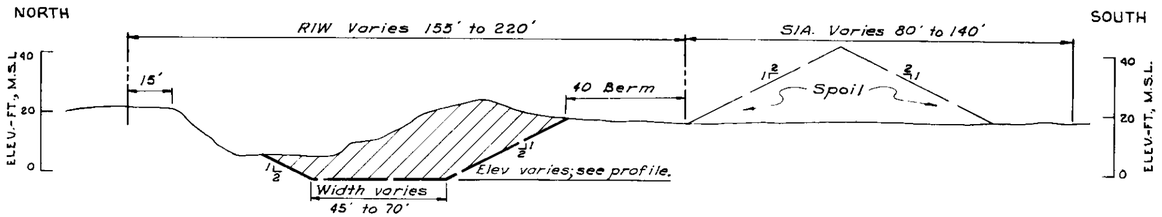
PHILLIPPI CREEK BASIN,

HYDRAULIC-DESIGN PROFILES

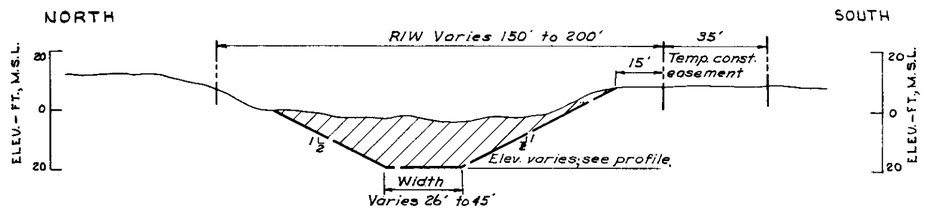
FIGURE A-7



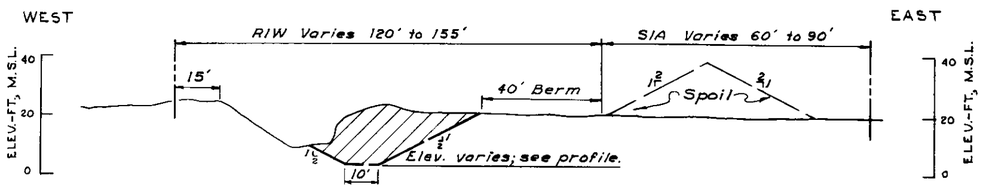
TYPICAL SECTION
PHILLIPPI CREEK
STA. 0+00 to 71+00



TYPICAL SECTION
MAIN A
STA. 0+00 to 144+00



TYPICAL SECTION
PHILLIPPI CREEK
STA. 71+00 to 282+80



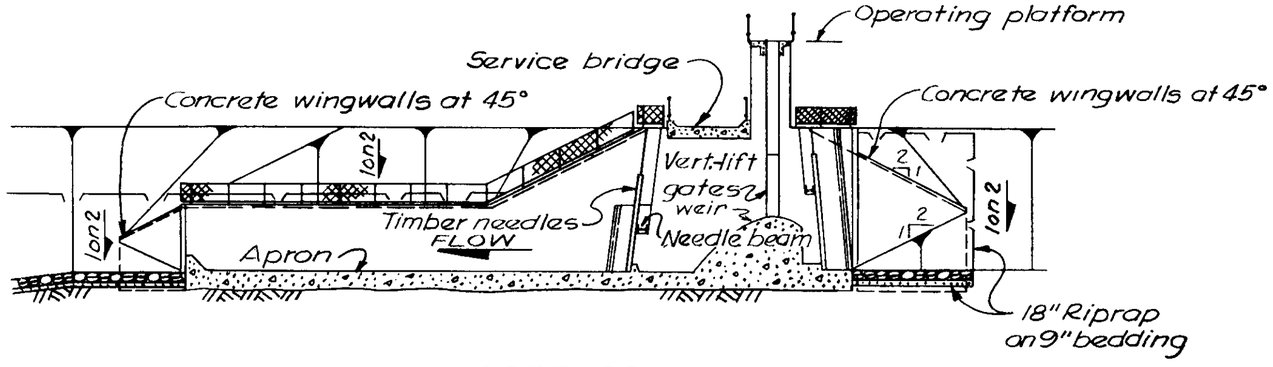
TYPICAL SECTION
MAIN B
STA. 0+00 to 180+00

SCALE IN FEET
20' 0 20' 40'

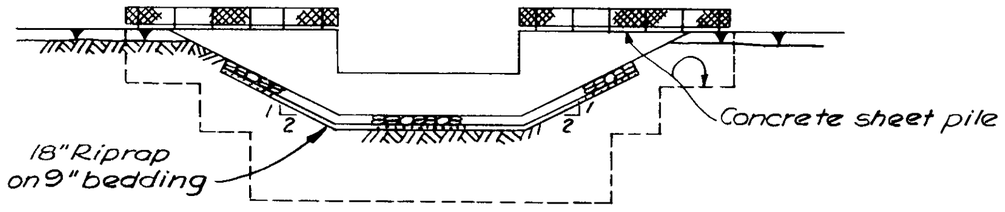
PHILLIPPI CREEK BASIN

TYPICAL SECTIONS

FIGURE A-8



OGEE SPILLWAY
(NOT TO SCALE)



SHEET-PILE WEIR
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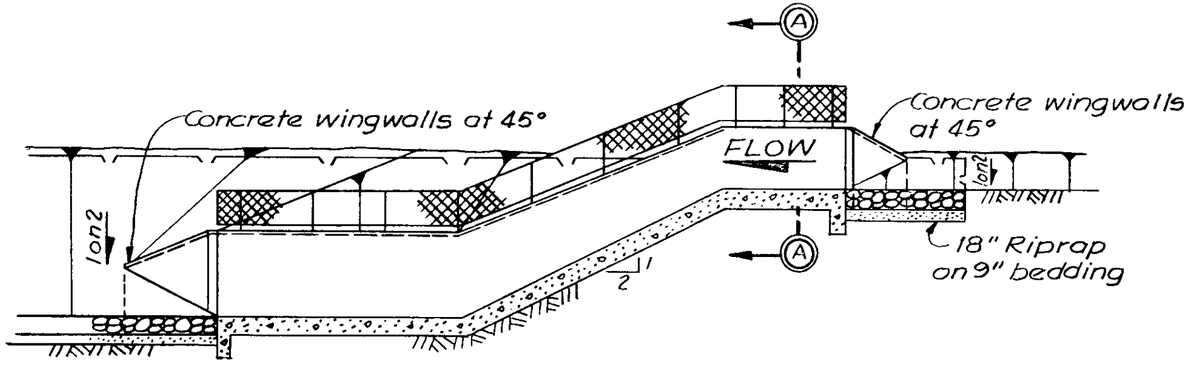

CHUTE SPILLWAY
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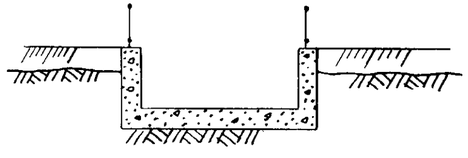


SECTION A-A

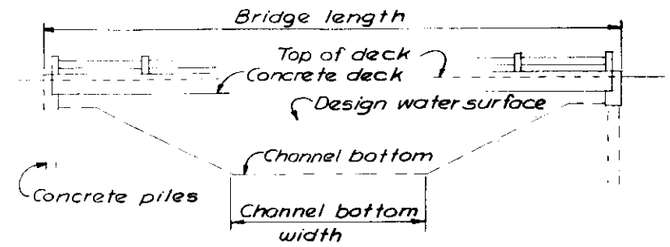
PHILLIPPI CREEK BASIN

TYPICAL CONTROL STRUCTURES

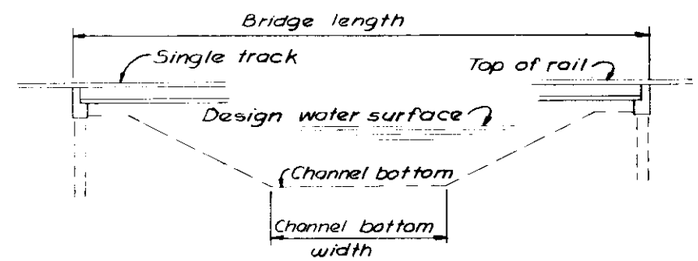
FIGURE A-9

BRIDGE DATA

STATION	LOCATION	NET AREA PROVIDED (SQ. FT.)	DESIGN W.S. EL. (FT., M.S.L.)	CHANNEL BOTTOM WIDTH (FT.)	CHANNEL BOTTOM ELEVATION (FT., M.S.L.)	ANGLE OF BRIDGE TO CHANNEL	PROPSED NEW BRIDGE LENGTH (FT.±)	PROPSED NEW BRIDGE WIDTH (FT.±)	PROPSED NEW BRIDGE TOP OF DECK OR TOP OF RAIL EL.± (FT. M.S.L.)	PROPSED NEW BRIDGE TYPE OF BRIDGE	EXISTING BRIDGE OR CULVERT TO BE REMOVED
PHILLIPPI CREEK											
40+00	U.S. HWY. 41	1800	1.2	85	-15.5	70°	212	26	13.0	CONC. (DUAL BR.)	NONE
154+00	BEE RIDGE RD.	1690	2.3	40	-20.2	56°	200	28	11.3	CONCRETE	140'± CONC. BRIDGE
178+00	TUTTLE AVE.	1660	2.6	35	-20.2	60°	187	28	11.6	CONCRETE	99'± CONC. BRIDGE
198+50	WEBBER ST.	1710	5.1	28	-19.3	77°	166	28	14.1	CONCRETE	117'± CONC. BRIDGE
257+00	BAHIA VISTA ST.	1680	5.7	28	-18.5	90°	161	28	14.7	CONCRETE	100'± CONC. BRIDGE
PHILLIPPI CREEK MAIN A											
18+00	S.A.L. R.R.	1190	6.2	70	-7.4	78°	184	14	20.0	SINGLE TRACK	152'± TIMBER BRIDGE
63+00	BAHIA VISTA ST.	1140	6.7	70	-6.5	40°	263	28	18.3	CONCREIE	100'± CONC. BRIDGE
PHILLIPPI CREEK BRANCH AA											
154+00	PRIVATE RD.	320	13.6	10	2.7	90°	90	28	19.1	CONCRETE	30'± CONC. BRIDGE
191+00	CATTLEMEN RD.	340	14.5	10	3.0	62°	109	28	24.6	CONCRETE	30'± CONC. BRIDGE
208+00	BEE RIDGE RD.	350	14.7	10	3.0	90°	93	28	23.7	CONCRETE	1-84" C.M.P. CULVERT
PHILLIPPI CREEK MAIN B											
15+00	S.A.L. R.R.	480	15.0	10	0.9	90°	96	14	22.4	SINGLE TRACK	76'± TIMBER BRIDGE
16+00	A.C.L. R.R.	480	15.1	10	1.0	90°	92	14	21.4	SINGLE TRACK	70'± TIMBER BRIDGE
45+00	FRUITVILLE RD.	470	15.6	10	1.9	60°	116	40	24.6	CONCRETE	30'± CONC. BRIDGE
87+00	BOBBY JONES BR.	420	16.4	10	3.5	90°	98	28	25.4	CONCRETE	40'± CONC. BRIDGE
114+00	17 TH. ST.	290	19.3	10	9.0	90°	87	28	28.3	CONCRETE	2-72" CONC. PIPE CULVERT
PHILLIPPI CREEK BRANCH BA											
13+00	17 TH. ST.	280	19.2	10	9.0	47°	119	28	28.2	CONCRETE	2-72" CONC. PIPE CULVERT
48+00	27 TH. PARKWAY	290	19.5	10	9.0	90°	94	28	30.0	CONCRETE	27'± CONC. BRIDGE
58+00	FRUDENCE DR.	290	19.6	10	9.0	90°	88	28	28.6	CONCRETE	30'± CONC. BRIDGE



TYPICAL HIGHWAY BRIDGE



TYPICAL RAILROAD BRIDGE

NOTE:
All channel side slopes are 1 vertical on 2 horizontal.

PHILLIPPI CREEK BASIN

BRIDGES

FIGURE A-10

SURVEY REPORT ON
PHILLIPPI CREEK BASIN, FLA.

APPENDIX B

BENEFITS AND ECONOMIC JUSTIFICATION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES
(Figures follow text)

U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

SAJWY (Phillippi Creek) October 31, 1963

SURVEY REPORT ON PHILLIPPI CREEK BASIN, FLA.

APPENDIX B

BENEFITS AND ECONOMIC JUSTIFICATION

I. ANALYSIS OF BENEFITS

1. General.--The analysis presented herein is based on the effect the proposed improvements would have on flood damages, land use, and navigation. Average annual flood damages are based on estimates of damages that would result from occurrence of floods of known magnitude and frequency on expected future development. Increased-land-use benefits as considered herein are based on estimates of average annual net return from the expected increase in future development that would occur as a result of the proposed improvements. Navigation benefits on the tidal reach of Phillippi Creek are based on prospective increases in recreational boating contingent on provision of the proposed works. Consideration has also been given to the effects of the plan on fish and wildlife resources.

2. Existing and future land use.--a. Land capability.--The soils of the watershed are mostly light, fine sands with some scattered areas of muck and peat in the eastern part of the basin. The muck lands are especially suitable for growing celery and other vegetables. The light, sandy soils are suitable for raising cattle on both improved and native pastures. Some of the better drained sandy areas are used for the production of citrus fruits. A detailed analysis of the classes and capabilities of the soils in Sarasota County is given in a report titled "Soil Survey, Sarasota County, Florida," issued in November 1959 by the United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Florida Agricultural ExperimentStation.

b. Existing (1963) land use.--Almost half of the 58-square-mile basin is developed for urban or agricultural uses. The remainder is principally woodland, native range, or other undeveloped land. About half of the developed area is urbanized, including residential, commercial, and recreational lands. Most of the urban development is located

in and adjacent to the city of Sarasota in the western half of the basin. Except for a number of citrus groves, agricultural development is virtually limited to the area east of Cattlemen Road. Existing land use in the overall area--as determined by field investigations and consultations with representatives of Sarasota County, local landowners, and other interests--is shown on figure B-1 and summarized in table B-1. Land uses projected to 1970 (assumed date of project completion) are also given in table B-1.

c. Future urban land use.--Estimates of future urban development in the study area were based on an analysis of past population trends and on forecasts made for the State, for selected regions within the State, and for more completely developed counties which have experienced growth characteristics similar to those of Sarasota County. The present population of Sarasota County is about 90,000. Populations for previous decades and near-term projections for the county are tabulated in the main body of this report. Analysis of the above factors indicates that Sarasota County population will exceed 400,000 by the year 2020. Stages of urban growth projected for the county and analysis of urban supporting potential of prospective population centers were used to estimate concurrent development in the study area. Delineation of lands needed to serve future urban needs in Phillippi Creek watershed is consistent with hydrologic suitability of the areas involved. Estimated future (2020) urban land use with and without the incentive of the proposed flood control works is shown on figures B-3 and B-2, respectively, and summarized in table B-1.

d. Future agricultural land use.--With provision of adequate flood control and drainage facilities, it is considered that agricultural development in the western portion of the basin would be gradually replaced for residential uses. The proximity of these lands to Sarasota and other gulf coast attractions makes it evident that agricultural interests would move to other undeveloped areas in the southwest Florida area.

e. Summary.--Existing land use and estimates of land use in 1970 and 2020, both with and without the proposed improvements, are given by land-use types in table B-1. Land-use maps for existing development and for 2020 development, with and without improvements, are shown on figures B-1, B-3, and B-2, respectively.

TABLE B-1

Phillippi Creek Basin

Land use

Land use	Area (acres)			
	Existing drainage facilities			With project improvements
	1963	1970	2020	2020
Urban	5,035	8,000	31,655	34,315
Sparse urban	2,025	1,700	0	0
Citrus groves	1,290	1,290	0	0
Vegetables	1,430	1,500	2,105	2,105
Improved pasture	5,795	5,100	0	0
Golf courses, parks, etc.	510	510	510	510
Undeveloped	20,845	18,830	2,660	0
Total	36,930	36,930	36,930	36,930

3. Flood damages.--a. Floods and flooded areas.--(1) Present conditions.--There are no stage or discharge records available for Phillippi Creek drainage area except those from two recently installed crest-stage indicators. Basic flood information was obtained from field reconnaissances made in connection with the floods of 1958, 1959, 1960, and 1962. This was supplemented by information furnished by local residents on high-water marks. Much valuable information on the 1962 flood was furnished by Smally, Wellford, and Nalven, Consulting Engineers, who represent the Board of County Commissioners of Sarasota County. Flooded-area maps for the 1959 and 1962 floods were made by constructing the peak floodwater surface over the area from plottings of available peak stages. The flood surface was compared to contours of the ground surface to obtain the areas of ground-surface inundation. Those areas and flood durations are shown on figures B-4 and B-5. Photographs of flooding that occurred during the 1962 flood are shown on figures B-6 through B-9.

(2) Design conditions.--The effects of the proposed improvements on flooding were determined by routing the standard project flood and the maximum flood of record (1962) with Phillippi Creek and its main tributaries designed for 30-year flood removal. Results of the routing are given in appendix A.

b. Unit flood damages.--(1) Agricultural.--Flood damages on agricultural lands are related primarily to flood duration. For each type of agricultural land use, the relation between unit flood damages and flood duration was established from field surveys, various

publications of the Department of Agriculture and the University of Florida Agricultural Experiment Station, and interviews with the county agricultural agent, Soil Conservation Service personnel, landowners, and other local interests. Derivation of unit damages for improved pastures is based on the cost of supplemental feed which must be supplied while pastures are inundated. Although damage to grasses begins after about 1 week of flooding, replanting costs are not included because flood durations characteristic of Phillippi Creek Basin are not long enough to kill pasture grasses. The unit damage-duration curve for improved beef pasture is shown on figure B-10. Similar unit-damage relations were prepared for the other agricultural commodities produced in the area.

(2) Urban.--Damages to urban development are the combination of lawn, shrubbery, street, structural, and furnishings damages. There are usually no significant structural damages unless the depth of water exceeds the height of the floor levels of the buildings, which average about 1.5 feet above ground. Estimates of structural damages to houses and damages to interior furnishings are based on past experience and extensive interviews with tax assessors, insurance adjustment agencies, representatives of the Federal Housing Administration, and other local interests concerned with urban flood damages. These data were supplemented by surveys in which about 100 owners of homes in Tampa were interviewed with regard to damages sustained in the 1960 Hillsborough River floods. A curve on figure B-11 shows the estimated relation between flood depth and structural and furnishings damages. Estimates of damages to lawns, shrubs, and streets are based on information obtained from local horticulturists, park superintendents, county agricultural agents, and city, county, and state engineers. Those damages depend primarily on duration of flooding. Lawns are affected in much the same manner as pasture grasses. Local horticulturists estimate an average of about 33 shrubs a house at a value of $3 each. Total replacement costs would be about $100 for each house. With an average of 110 square yards of street pavement for each urban house, complete replacement of base and pavement is $154, based on an estimated construction cost of $1.40 a square yard. A separate curve of damages to lawns, shrubs, and streets as related to flood duration is also shown on figure B-11. The urban-damage relationships include consideration of nonresidential-type developments such as schools, churches, parks, commercial areas, and service facilities. Studies show that such nonresidential-type areas amount to about 15 percent of the total urbanized area.

c. Total flood damages.--The flooded-area map for the 1959 flood (figure B-5), which has an estimated frequency of occurrence of once in 10 years, was compared to land-use maps for existing and 2020 development without project incentive to obtain the area, depth, and duration of flooding on each type of land use. The damages on existing land use were projected to the year 1970 (which is considered the start of project life) by the use of flood-plain development factors. The 1962 flood (see figure B-4) was also used in the damage analysis.

That flood has an estimated frequency of occurrence of once in excess of 50 years. The total estimated damage from the 1962 flood was projected to 1970 and 2020 by use of development factors to obtain total damages from recurrence of that flood on expected future land uses. A summary of total flood damages is given in table B-2. These damage estimates exclude consideration of the agricultural area east of Cattlemen Road.

TABLE B-2

Phillippi Creek Basin

Estimates of total flood damages

Condition and flood	Estimated flood damages	
	1970 land use	2020 land use
EXISTING DRAINAGE FACILITIES		
1959 flood	$243,400	$509,300
1962 flood	2,120,000	3,571,800
IMPROVED DRAINAGE FACILITIES		
100-pct. S.P.F. with 30-year design	68,500	280,000

d. Flood frequencies.--Stage and discharge records for Phillippi Creek Basin are not of sufficient length to be useful in establishing flood frequencies. Therefore, recourse was made to other available data. Frequency relations developed for adjacent basins were used as a guide to evaluate magnitudes of major floods that have occurred in the southwest Florida area during the past 5 years. These were correlated with Phillippi Creek conditions using rainfall records from a number of stations in the vicinity of Sarasota. Consideration was also given to a report titled "Floods in Florida, Magnitudes and Frequency," by R. W. Pride, United States Geological Survey. That report includes generalized relations that are used to evaluate runoff rates from ungaged areas during remote-frequency floods. Frequency relations derived for existing conditions were adjusted to reflect increases in runoff rates that would result from urbanization of Phillippi Creek Basin. These runoff rates were determined from Jacksonville District design memorandum studies on other similar areas. Estimated frequencies of significant floods are given in table B-3.

TABLE B-3

Phillippi Creek Basin

Estimated flood frequencies

Flood	Estimated frequency (yr.)
1958	5
1959	10
1960	20
1962	50+
S.P.F.	200+
60-pct. S.P.F. (approximate)	30
30-pct. S.P.F. (do.)	10

e. Average annual flood damages.--Since flood damages in the Phillippi Creek drainage area are related to more than one hydrologic factor, it was not practicable to plot a stage-damage curve or similar relation. Damage-frequency curves for future normal and design conditions were plotted directly from the estimated flood damages and frequencies. The resulting curves for existing drainage facilities and for the proposed plan of improvement are shown on figures B-12 and B-13. Annual damages for 1970 and 2020 land use, obtained by determining the areas under the curves, are summarized in table B-4.

TABLE B-4

Phillippi Creek Basin

Summary of annual flood damages and damages prevented

Land use	Annual flood damages		Annual flood damages prevented
	Existing drainage facilities	30-year design	
1970	$110,000	$1,300	$108,700
2020	275,000	3,600	271,400

4. Estimates of annual benefits.--a. General.--The proposed improvements and necessary associated works would generate flood control and recreational boating benefits in the area served. Development trends in and near the watershed indicate that future growth in the overall

benefit area would be uniform. Therefore, future benefits creditable to flood control over the 50-year project life were discounted on a straight-line basis. Recreational-boating benefits would be limited to the lower, tidal reach of Phillippi Creek. At present, that 3.6-mile reach is developed largely for residential uses. Recreational-boating benefits were averaged over the assumed project life of 50 years, using accelerated growth for the first 25 years and no increase thereafter. Future increases in all benefits were discounted by compound interest methods, using the above growth rates and an interest rate of 3 percent.

b. Flood damages prevented.--Flood damages prevented are the difference between annual damages with existing drainage facilities and those with the proposed plan of improvement. Estimated flood damages prevented which would be creditable to the proposed plan of improvement are summarized in table B-4 for 1970 and 2020 land use. Flood damages prevented were plotted for the period 1970-2020 and the slopes of the curves were patterned after the estimated trends of future growth. Average annual equivalent flood damages prevented with the proposed (30-year) design total $172,300. With standard project flood design, equivalent average annual flood damages prevented would be $197,000, including a nominal allowance for prevention of channel scour.

c. Increased land use.--Estimates of future land use, both with and without the proposed flood control improvements, were made in accordance with development trends for both Sarasota County and the Phillippi Creek drainage area. With existing drainage facilities, there is considerable acreage that is not hydrologically suitable for development because of frequent flooding. In view of recurring flood losses, the Board of County Commissioners took action in 1960 to prevent further platting of residential subdivisions in the watershed. Land prices for a limited number of sales in the area and inspection at a number of points of access on the proposed right-of-way indicate that land costs average more than $10,000 an acre along Phillippi Creek and about $2,500 an acre in the vicinity of the main tributaries. A $7,500-an-acre price differential prevails in those two areas despite their common flood problem, and they are both contiguous to, or near, high-type urban development. Much of the differential is attributed to the existing residential building restrictions and to the state of facilities needed to permit urban development. Provision of the proposed flood control improvements would permit the development of 2,660 acres of undeveloped lands for urban use. Most of those lands are located along the main tributaries of Phillippi Creek. It is estimated that those marginal lands would have an average value of about $5,400 an acre for future residential use if adequate flood protection were provided. Development costs for such items as access roads and streets amount to about $900 an acre, leaving a net value of $4,500 an acre. Invested at 6 percent, the net value would produce an annual net return of $270 an acre for urban lands. Table B-5 indicates the change in land use, change in total return, and average annual equivalent increased-land-use benefits.

TABLE B-5

Phillippi Creek Basin

Estimates of increased-land-use benefits

Land use	Year 2020			
	Change in land use due to proposed improvements (acres)	Net return per acre	Change in total return	Average annual equivalent benefits
Urban----------	2,660	$270	$718,200	
Undeveloped----------	-2,660	-	-	
Total----------	-	-	718,200	$280,900

d. Recreational boating.--Improvement of Phillippi Creek would enhance recreational boating and reduce boat damages in the area. Monetary benefits therefrom were computed by the recreational small-boat formula and are developed in table B-6. The tabulation presents estimated benefits from improvement of the channel from the Intracoastal Waterway upstream to the existing dam, 3.6 miles. It is assumed that the vertical clearances of the bridges spanning the channel would be similar to and not less than existing clearances--that is, 8.6 feet mean high water at United States Highway 41, 8.4 feet at Bee Ridge Road, and 6.4 feet at Tuttle Avenue. Those clearances limit boat traffic to outboards and inboards of about 30-foot length or less. The depreciated values listed are 50 percent of the estimated average cost new. Estimated percent restriction is based on interviews in April 1963 with a representative sample of local boatmen and property owners. The percentage given is the average for the existing boats along the entire 3.6-mile reach considered. The estimated number of existing boats is based on a search of county boat-license registrations for the immediate locality and a reconnaissance and boat count in the creek area. Without improvement, no future increase in the number of boats is expected. The estimated number of future boats with improvement is based on the expected number of waterfront property owners that would acquire boats as indicated by experience in other similar areas with navigable waters. The damage estimates are based on interviews with a representative sample of local boating interests.

TABLE B-6

Phillippi Creek Basin

Estimates of recreational-boating benefits

Item	Outboard		Inboard	
	Runabout	Cruiser	Runabout	Cruiser
Average depreciated value----	$1,000	$2,000	$2,000	$3,500
Percent annual return--------	12	11	10	8
Unit annual return----------	$120	$220	$200	$280
Percent restriction---------	10	10	12	15
Unit annual benefit---------	$12	$22	$24	$40
Number of existing boats-----	155	20	5	2
Boats that would be added with improvement:				
By 1970----------	1	2	0	8
By 1995----------	36	6	2	59
Enhancement benefit:				
Existing boats----------	$1,900	$400	$100	$100
Added boats:				
By 1970----------	100	400	0	2,200
By 1995----------	4,300	1,300	400	16,500
Reduced damage----------	$800	$100	0	0
Subtotal, benefits:				
By 1970----------	2,800	900	100	2,300
By 1995----------	7,000	1,800	500	16,600
Total benefit:				
1970----------				$6,100
1995----------				25,900
Average annual benefit----------				22,000*

NOTE: *$6,100 + ($25,900 - $6,100) 0.803 = $22,000.

e. Fish and wildlife.--Present fish and wildlife resources in Phillippi Creek Basin are of limited value. No damages or evaluable benefits to those resources are expected to result from improvement of the basin for flood control.

f. Summary of benefits.--Average annual equivalent benefits are summarized in table B-7. Those benefits are attributable to the primary works together with the necessary associated works.

TABLE B-7

Phillippi Creek Basin

Summary of estimated average annual benefits
(Discounted, using compound interest factors)

Degree of improvement	Average annual benefits			
	Flood damages prevented	Increased land use	Recreational boating	Total
30-year design---------	$172,300	$280,900	$22,000	$475,200
S.P.F. design----------	197,000	280,900	22,000	499,900

II. ECONOMIC JUSTIFICATION

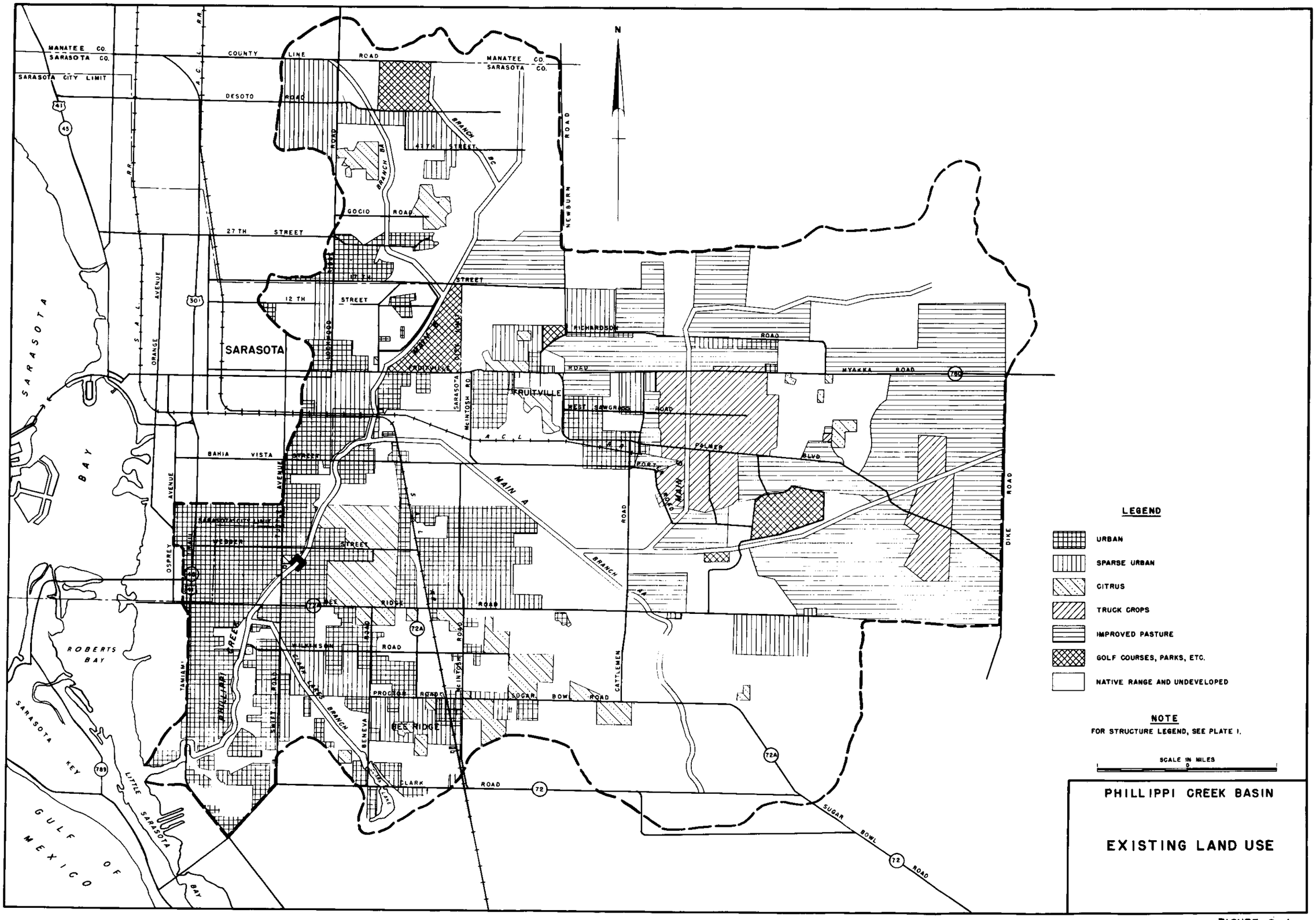
5. Comparison of benefits and costs.--Evaluated benefits and costs for the plans of improvement under consideration are given in table B-8 and shown graphically on figure B-14. These estimates include associated works in addition to primary works. The comparison shows the 30-year (60-percent standard project flood) design would give the maximum excess of benefits over costs. Therefore, that design has been selected for the proposed plan of improvement.

TABLE B-8

Phillippi Creek Basin

Cost and benefit summary

Item	Degree of improvement	
	30-year design (60-percent S.P.F.)	S.P.F. design
Total initial costs----------	$7,976,800	$13,644,000
Total annual economic costs------	377,400	604,600
Total annual benefits----------	475,200	499,900
Excess of benefits over costs----	97,800	-104,700
Benefit-cost ratio----------	1.3	0.83



LEGEND

- URBAN
- SPARSE URBAN
- CITRUS
- TRUCK CROPS
- IMPROVED PASTURE
- GOLF COURSES, PARKS, ETC.
- NATIVE RANGE AND UNDEVELOPED

NOTE

FOR STRUCTURE LEGEND, SEE PLATE 1.

SCALE IN MILES
0

PHILLIPPI CREEK BASIN

EXISTING LAND USE

FIGURE B-1

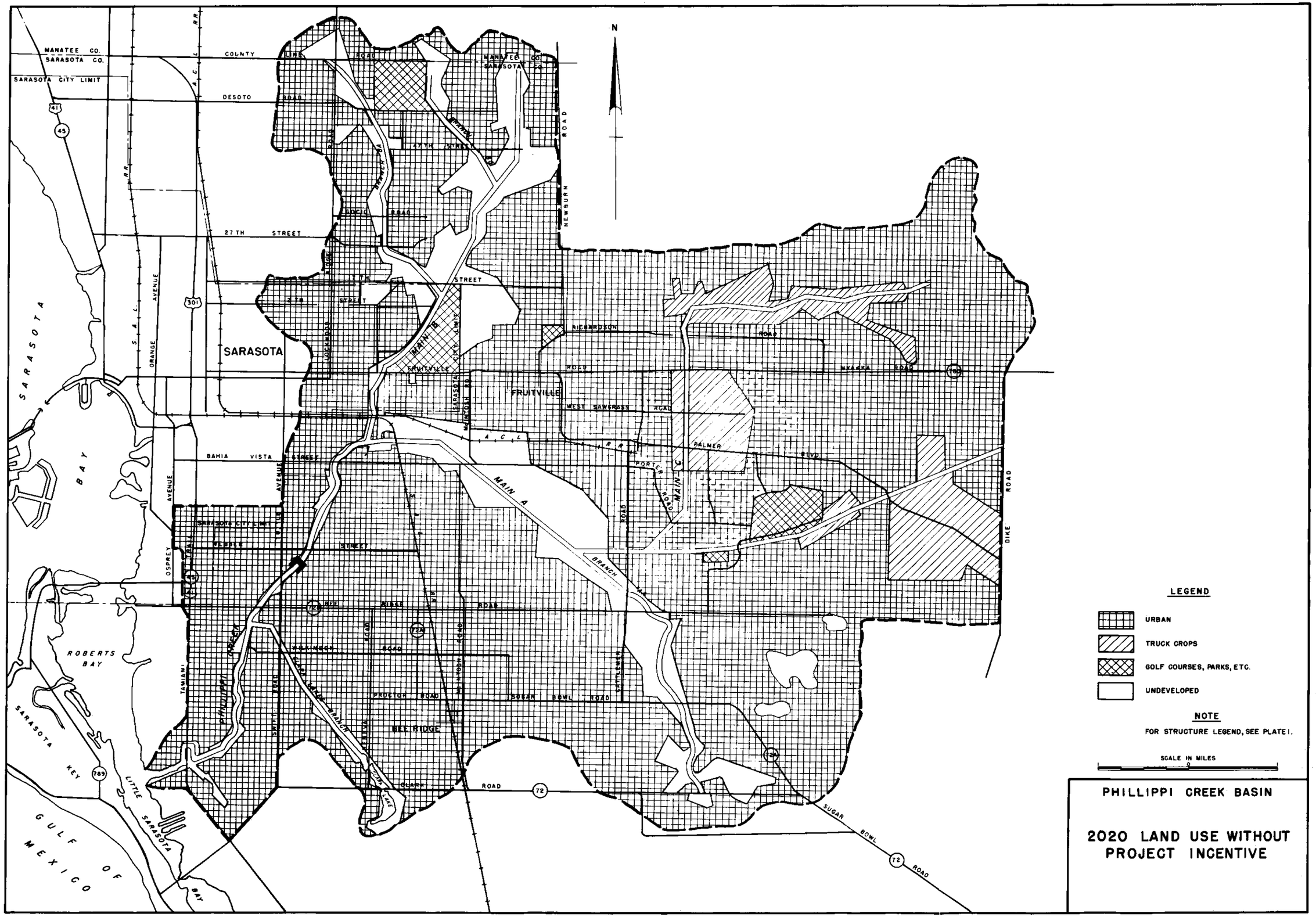
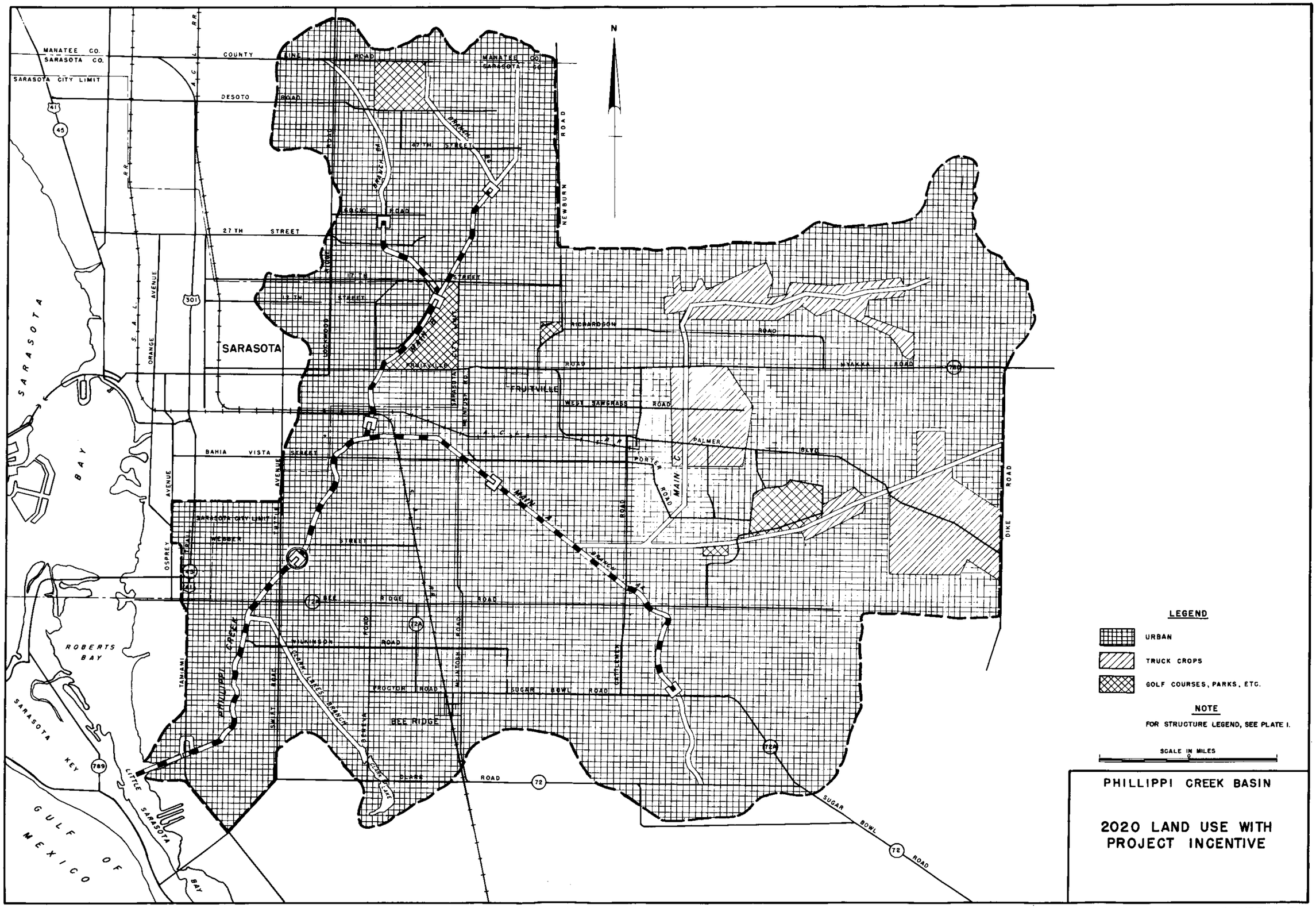

N
MANATEE CO.
SARASOTA CO.
SARASOTA CITY LIMIT
COUNTY LINE ROAD
DESOTO ROAD
27TH STREET
EDEN ROAD
NEWBURN ROAD
SARASOTA
BAY
ORANGE AVENUE
S.A.L. RR.
A.C.L. RR.
SARASOTA
MAIN
FRUITVILLE
NICHOLSON ROAD
MYAKKA ROAD
WEST SAWGRASS ROAD
PALMER BLVD.
PORTER ROAD
BAHIA VISTA STREET
MAIN A BRANCH
DIKE ROAD
OSPREY AVENUE
TAMIAMI TRAIL
WEBBER STREET
BEE RIDGE ROAD
ROBERTS BAY
PHILLIPPI CREEK
HARTMAN ROAD
PROCTOR ROAD
SUGAR BOWL ROAD
BEE RIDGE
SARASOTA KEY
LITTLE SARASOTA BAY
GULF OF MEXICO
CLARK ROAD
SUGAR BOWL ROAD
LEGEND
URBAN
TRUCK CROPS
GOLF COURSES, PARKS, ETC.
UNDEVELOPED
NOTE
FOR STRUCTURE LEGEND, SEE PLATE I.
SCALE IN MILES
0
PHILLIPPI CREEK BASIN
2020 LAND USE WITHOUT PROJECT INCENTIVE

FIGURE B-2



PHILLIPPI CREEK BASIN

2020 LAND USE WITH PROJECT INCENTIVE

FIGURE B-3

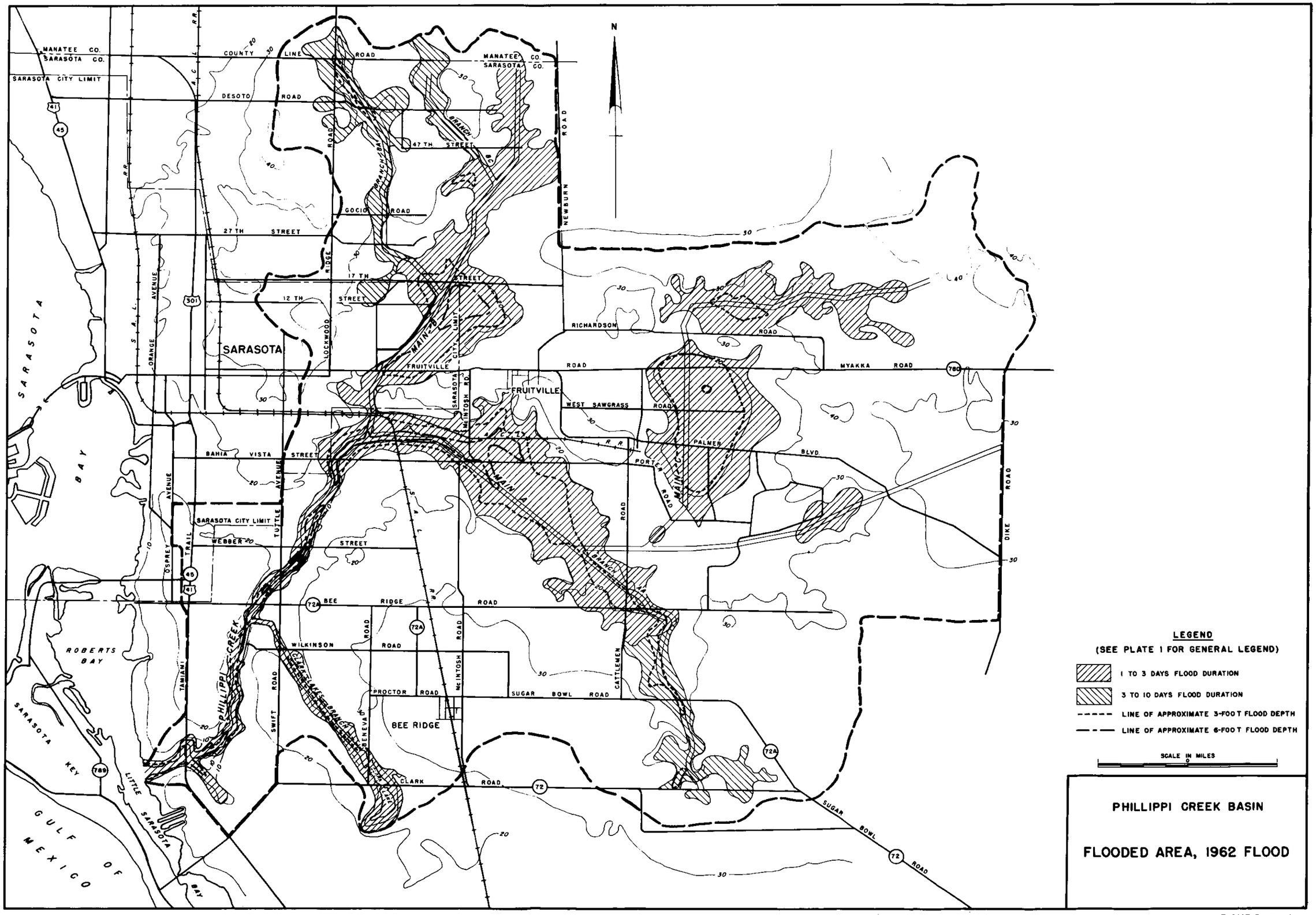
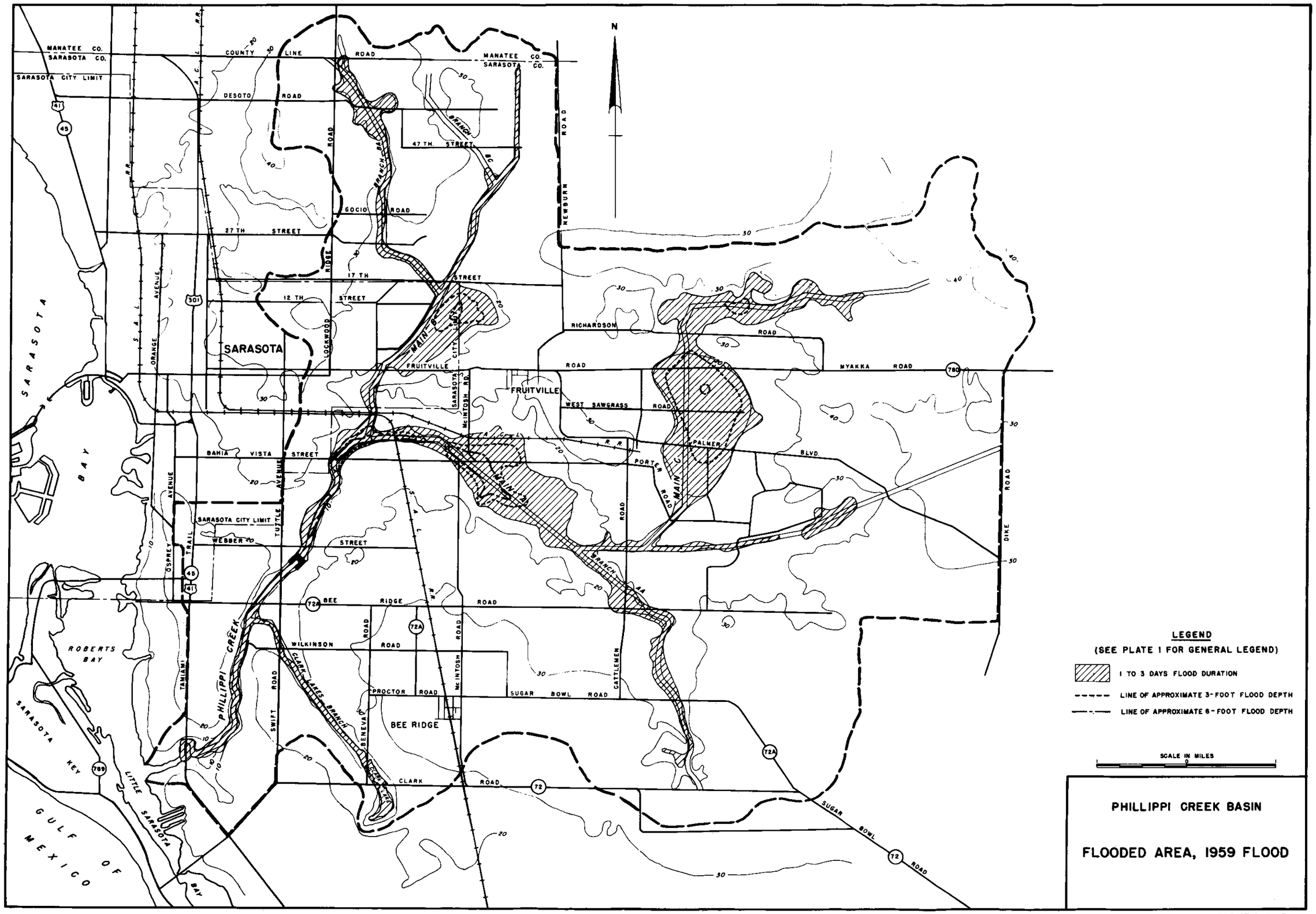

N
MANATEE CO.
SARASOTA CO.
SARASOTA CITY LIMIT
COUNTY LINE ROAD
DESOTO ROAD
47 TH STREET
GOCIO ROAD
27 TH STREET
17 TH STREET
12 TH STREET
SARASOTA
FRUITVILLE ROAD
FRUITVILLE
RICHARDSON ROAD
MYAKKA ROAD
WEST SAWGRASS ROAD
PALMER BLVD
PORTER ROAD
BAHIA VISTA STREET
WEBBER STREET
BEE RIDGE ROAD
WILKINSON ROAD
PROCTOR ROAD
SUGAR BOWL ROAD
CLARK ROAD
BEE RIDGE
SARASOTA BAY
ROBERTS BAY
SARASOTA KEY
GULF OF MEXICO
LITTLE SARASOTA BAY
PHILLIPPI CREEK
CLARK LAKES BRANCH
MAIN CANAL
LOCKWOOD RIDGE ROAD
NEWBURN ROAD
ORANGE AVENUE
TUTTLE AVENUE
OSPREY TRAIL
TAMIAMI
SWIFT ROAD
GENEVA ROAD
McINTOSH RD.
CATTLEMEN ROAD
DIKE ROAD
S.A.L. RR
A.C.L. RR
LEGEND
(SEE PLATE 1 FOR GENERAL LEGEND)
1 TO 3 DAYS FLOOD DURATION
3 TO 10 DAYS FLOOD DURATION
LINE OF APPROXIMATE 3-FOOT FLOOD DEPTH
LINE OF APPROXIMATE 6-FOOT FLOOD DEPTH
SCALE IN MILES
PHILLIPPI CREEK BASIN
FLOODED AREA, 1962 FLOOD

FIGURE B- 4



PHILLIPPI CREEK BASIN

FLOODED AREA, 1959 FLOOD

FIGURE 8-5

PHOTO 1. FLOODED RESIDENTIAL AREA ALONG PHILLIPPI CREEK AT WEBBER STREET. (SEPT. 1962)

(Photo from Sarasota Herald-Tribune)

PHOTO 2. FLOODED RESIDENTIAL AREA ON PHILLIPPI CREEK DOWNSTREAM FROM TUTTLE AVENUE BRIDGE. (SEPT. 1962)

(Photo from Sarasota Herald-Tribune)

FIGURE B-6

PHOTO 3. FLOODED AREAS ALONG PHILLIPPI CREEK IN VICINITY OF BAHIA VISTA STREET BRIDGE. (SEPT. 1962)

(Photo from Sarasota Herald-Tribune)

PHOTO 4. PHILLIPPI CREEK AT U. S. HIGHWAY 41 BRIDGE. FLOODED BUSINESSES AND RESIDENCES. (SEPT. 1962)

(Photo from Sarasota Herald-Tribune)

FIGURE B-7

PHOTO 9. FLOODED LIVING ROOM AND OUTSIDE PORCH OF HOME ON. LOWER PHILLIPPI CREEK, IN RIVER FOREST ESTATES.

PHOTO 10. OUTSIDE OF ABOVE HOME.

(Photos from St. Petersburg Times, 22 Sept. 1962)

FIGURE B-8

PHOTO 11. RESIDENTS BEING EVACUATED, CONRAD AVENUE AND IRVING STREET, SARASOTA. (SEPT. 1962)

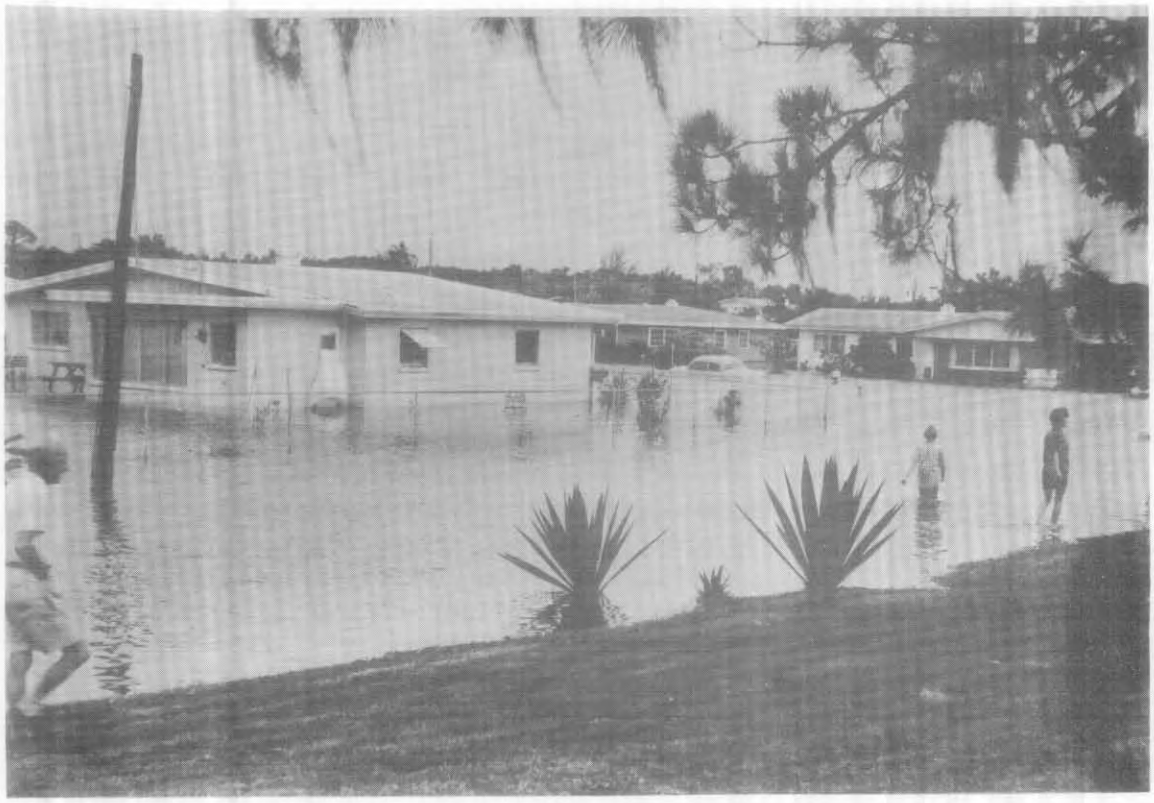


PHOTO 12. RESIDENTIAL FLOODING, CONRAD AVENUE AND HATTON STREET, SARASOTA. WATER DEPTH ESTIMATED TO BE 5 FEET DURING STORM. (SEPT. 1962)

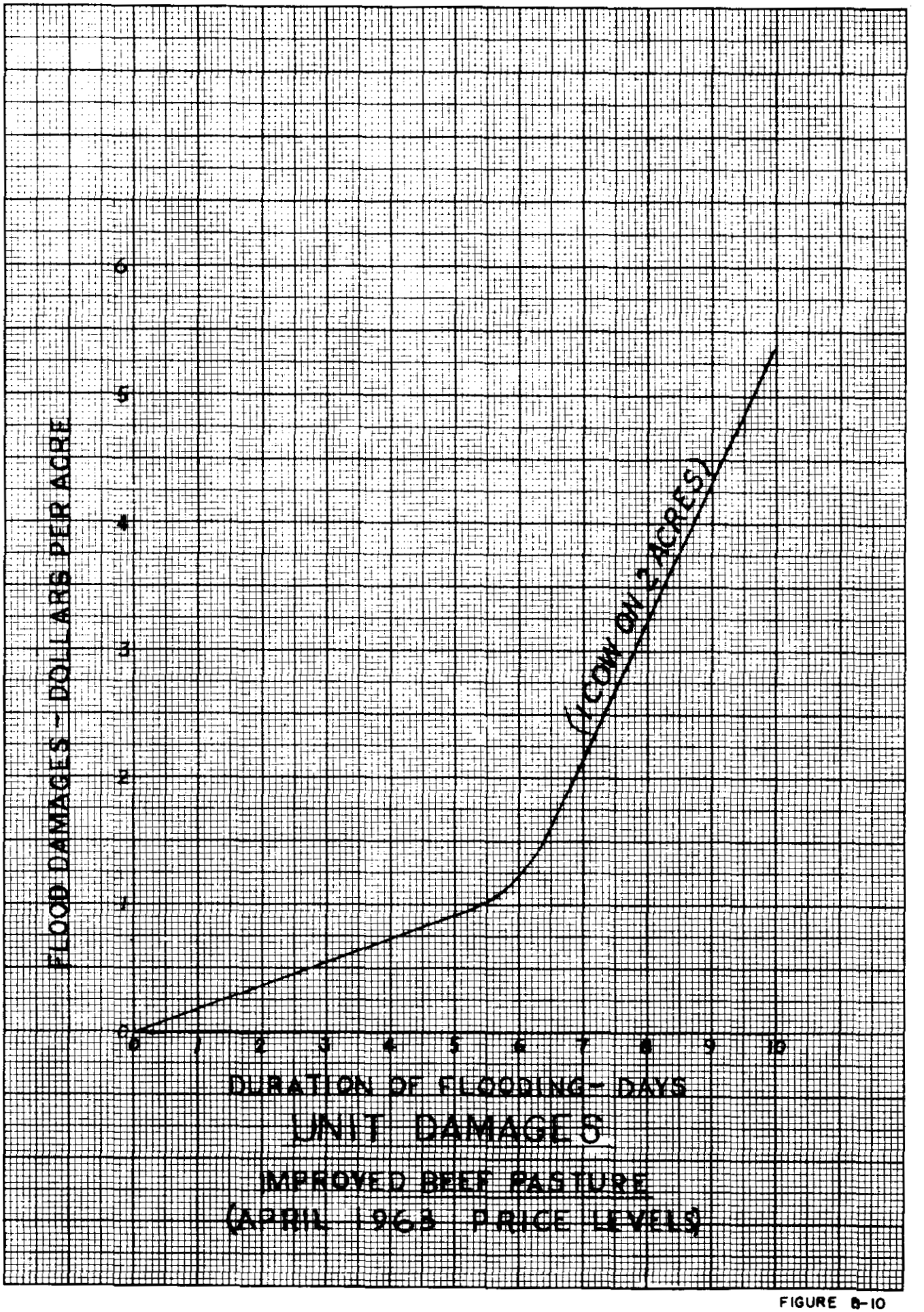
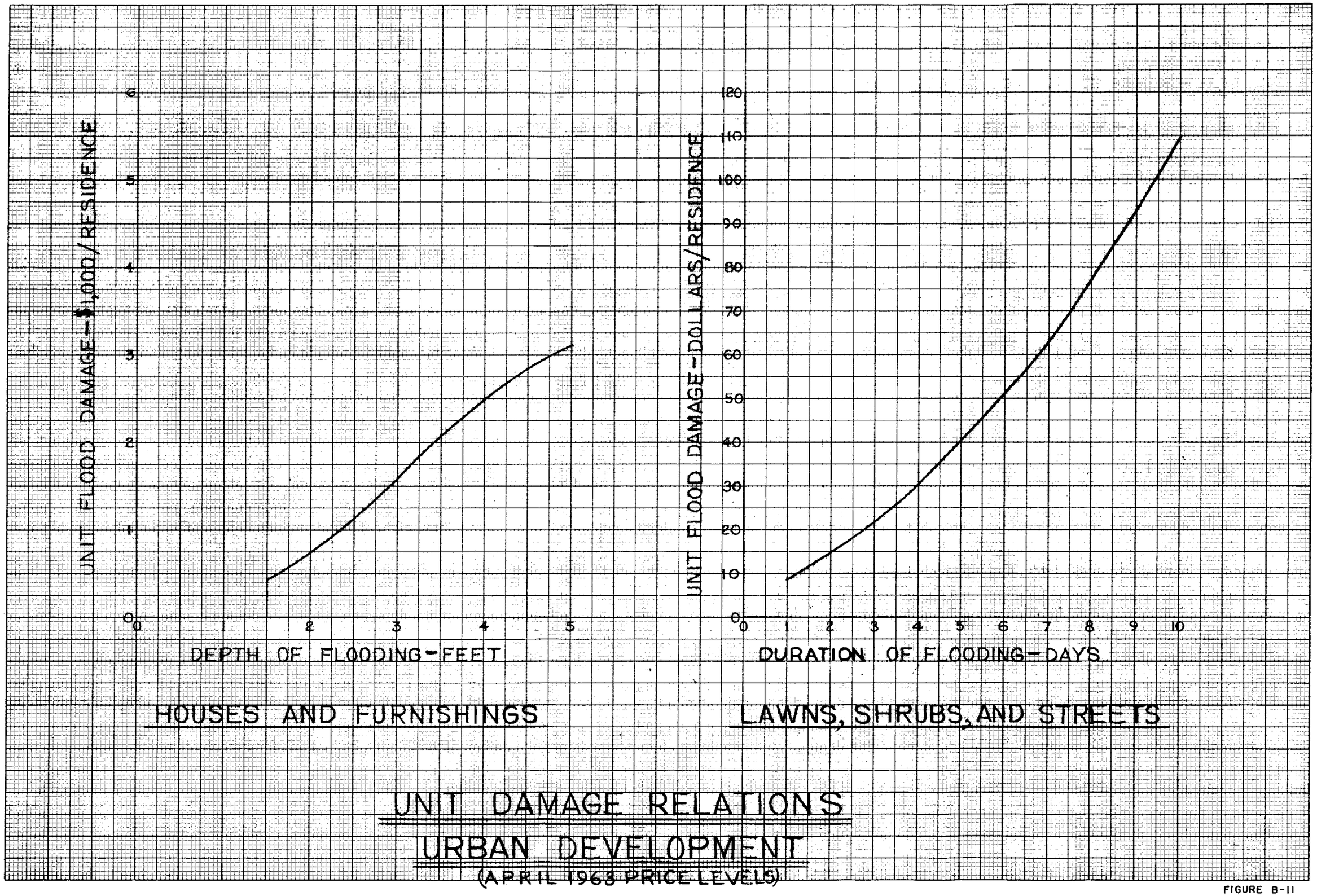

FLOOD DAMAGES - DOLLARS PER ACRE
0
1
2
3
4
5
6
(1 COW ON 2 ACRES)
0
1
2
3
4
5
6
7
8
9
10
DURATION OF FLOODING - DAYS
UNIT DAMAGES
IMPROVED BEEF PASTURE
(APRIL 1963 PRICE LEVELS)

FIGURE B-10

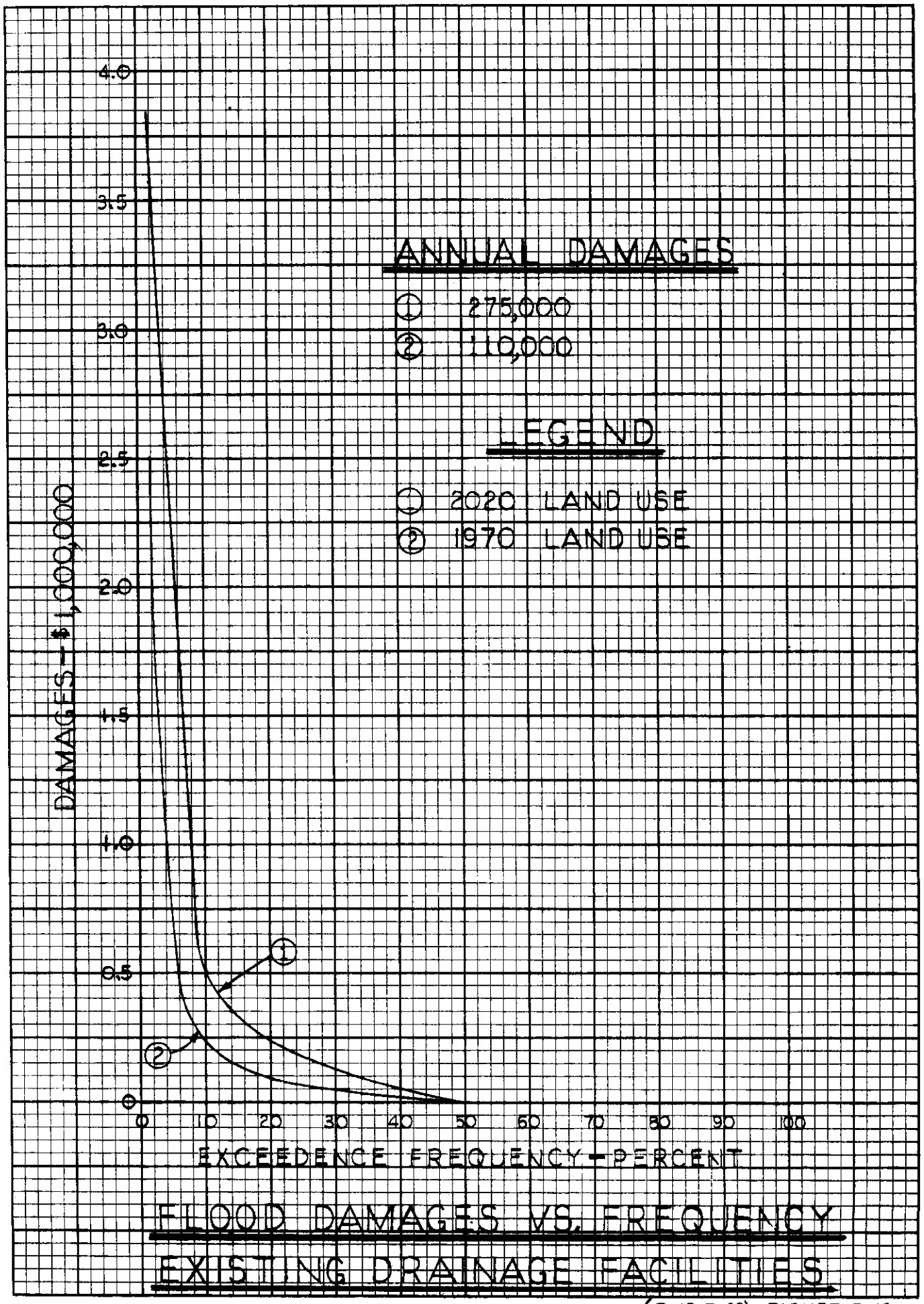


UNIT DAMAGE RELATIONS

URBAN DEVELOPMENT

(APRIL 1968 PRICE LEVELS)

FIGURE B-11



FLOOD DAMAGES VS. FREQUENCY

EXISTING DRAINAGE FACILITIES

(R 12-5-63) FIGURE B-12

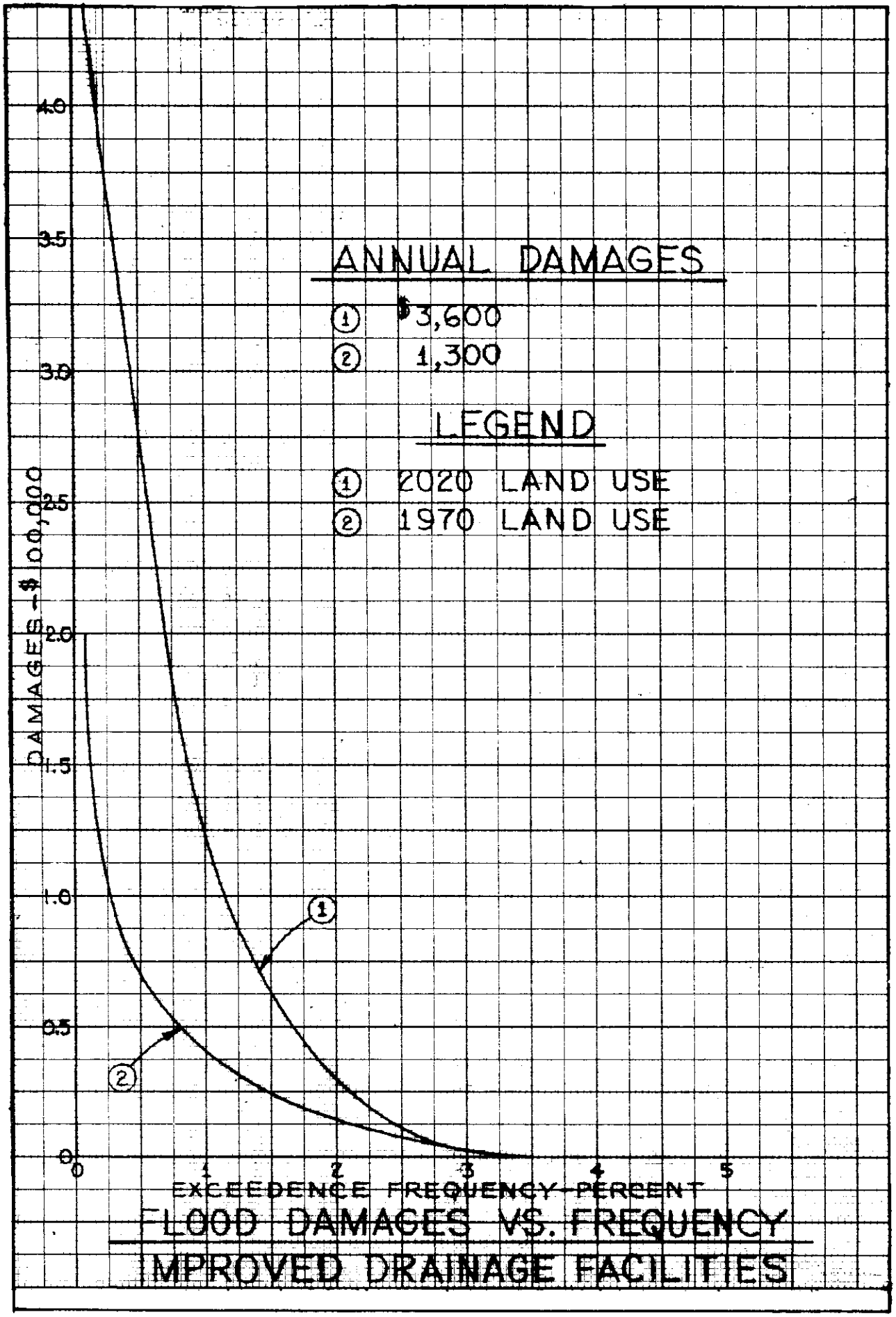

ANNUAL DAMAGES
① $3,600
② 1,300
LEGEND
① 2020 LAND USE
② 1970 LAND USE
DAMAGES – $100,000
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0
1
2
3
4
5
EXCEEDENCE FREQUENCY–PERCENT
FLOOD DAMAGES VS. FREQUENCY
IMPROVED DRAINAGE FACILITIES

FIGURE B-13

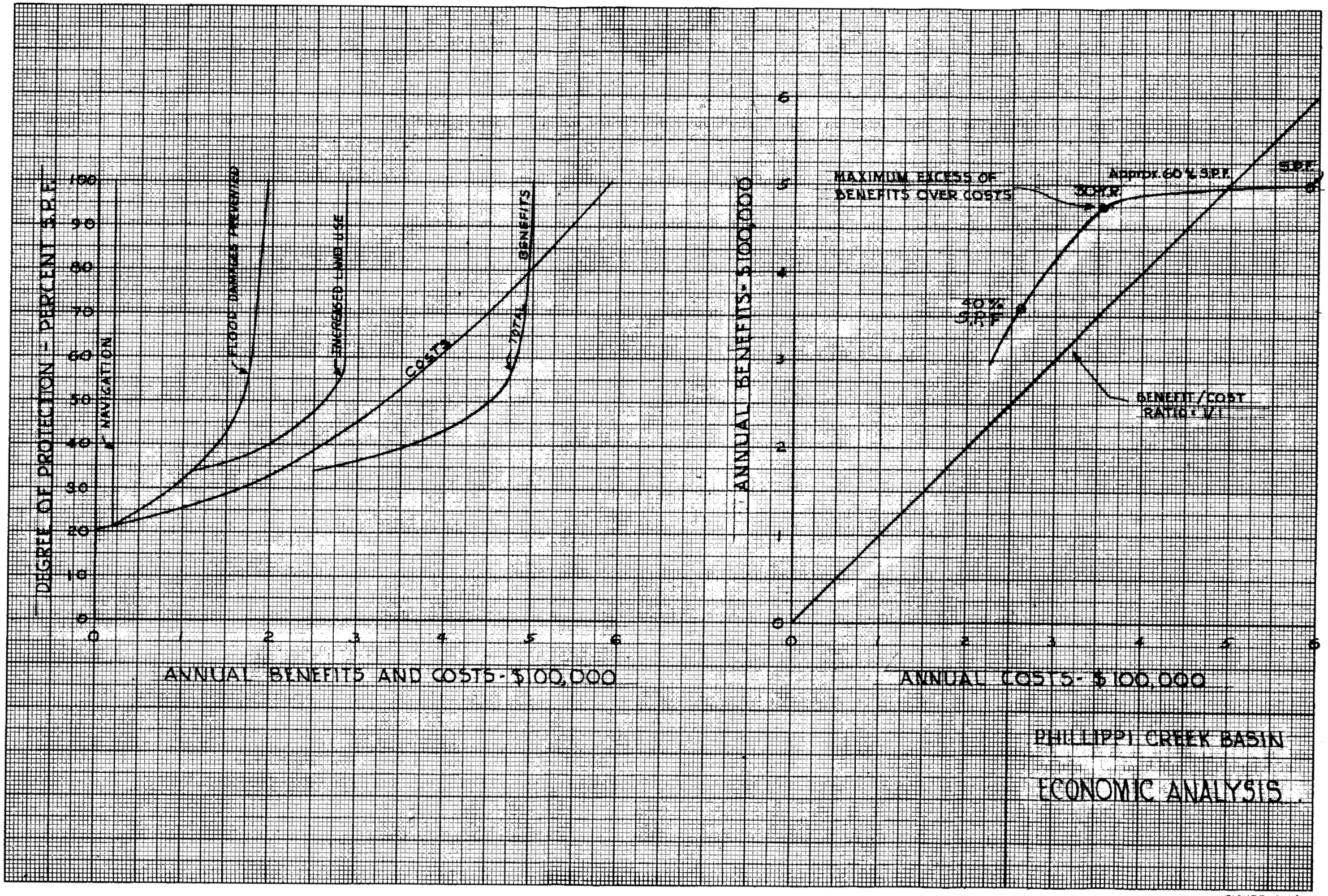

DEGREE OF PROTECTION - PERCENT S.P.F.
100
90
80
70
60
50
40
30
20
10
0
NAVIGATION
FLOOD DAMAGES PREVENTED
INCREASED LAND USE
COSTS
TOTAL BENEFITS
0
1
2
3
4
5
6
ANNUAL BENEFITS AND COSTS - $100,000
ANNUAL BENEFITS - $100,000
MAXIMUM EXCESS OF BENEFITS OVER COSTS
Approx. 60% S.P.F.
S.P.F.
50% S.P.F.
BENEFIT/COST RATIO = 1.1
ANNUAL COSTS - $100,000
PHILLIPPI CREEK BASIN
ECONOMIC ANALYSIS

FIGURE 8-14

U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

SAJWY (Phillippi Creek) October 31, 1963

SURVEY REPORT ON PHILLIPPI CREEK BASIN, FLORIDA

APPENDIX C

COMMENTS OF OTHER AGENCIES

This appendix presents the comments of the State Conservationist, United States Soil Conservation Service; the Acting Regional Director, Bureau of Sport Fisheries and Wildlife; the Director, Florida Game and Fresh Water Fish Commission; the Director, Florida Board of Conservation; the Regional and Division Engineers, United States Bureau of Public Roads; and the Chairman, Florida State Road Department, regarding the proposed plan of improvement as related to their spheres of interest in the Phillippi Creek Basin. Copies of the District Engineer's letters to those and other agencies requesting coordinating comments are included herein. Replies from other agencies will be appended when received.

U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

SAKWY April 11, 1963

Mr. A. D. Aldrich
Director
Florida Game and Fresh Water
Fish Commission
Tallahassee, Florida

Dear Mr. Aldrich:

As you know, the survey report on Phillippi Creek is under preparation. In accordance with Corps policy and to permit review and comments by interested agencies, description of works under consideration for flood protection in the Phillippi Creek watershed is furnished. While details of design are yet to be completed, appropriate review and comments on the planning to date will help to expedite the report.

Existing development in Phillippi Creek watershed is principally urban in the western half and agricultural in the area east of Cattlemen Road. Development trends and population studies as well as other factors indicate that the overall area will become predominantly urban in the future. The plan of improvement under consideration would provide adequate flood protection for existing development and sufficient capacity to give protection to possible future development.

Inclosure 1 shows the major facilities which are being considered in the plan of improvement. Number and location of water-control structures are tentative. The existing water-control structure will be modified, if necessary, to accommodate design discharges. It is considered that the works of the Soil Conservation Service's watershed work plan, provided under Public Law 566, gives adequate protection to the existing agricultural area. It is also considered that the pump outlet capacity to Cow Pen Slough would be available for flood removal under design conditions.

It will be noted from examination of inclosure 1 that the primary plan of improvement would extend to the proposed water-control structure west of Cattlemen Road. Extension of improvements to the east would depend on economic justification and future needs. In any case, capacity downstream would be provided in the event the area east of Cattlemen Road should develop to urban use, requiring future protection in excess of a 1-in-10-year flood.

SAKWY
Mr. A. D. Aldrich

April 11, 1963

Designs are being prepared to provide up to standard project flood protection for urban areas. The degree of protection is usually based on that plan of improvement which would give maximum excess of benefits over costs. Based on design studies for other areas, the selected design for Phillippi Creek would give at least 60 percent standard project flood protection for the urban areas. That degree of protection would practically eliminate damages from the 1-in-30-year flood. Hydrographs for the standard project flood and 60 percent of the standard project flood at the mouth of Phillippi Creek are shown in inclosure 2. Inclosure 3 is a tabulation of the peak discharges at key locations for those floods. In addition, peak discharges of the maximum flood of record (September 1962), estimated to have a frequency of occurrence of about once in 50 years, are shown.

The report is expected to be submitted to our higher authority this fiscal year. Your comments on the plan of improvement relative to your area of interest would be appreciated.

Similar letters are being sent to other State and Federal agencies.

Sincerely yours,

H. R. PARFITT
Colonel, Corps of Engineers
District Engineer

3 Incl
1. Preliminary plan of improvement
2. Hydrographs
3. Table of discharges

Copy furnished (w/cy incl):
Wildlife Biologist
Florida Game and Fresh Water Fish Commission
P. O. Box 1838
Vero Beach, Fla.

This same letter (with inclosures) sent to the following:

Mr. Warren S. Henderson
Chairman, Board of County Commissioners
Sarasota County
P. O. Box 271
Sarasota, Fla.
(w/copy to: Mr. Charles Morgan, County Engineer
Sarasota, Fla.)

Regional Director
Bureau of Sport Fisheries and Wildlife
U. S. Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta 23, Ga.
(w/copy to: Biologist in Charge
U. S. Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife
1031 Miracle Mile
Vero Beach, Fla.)

Mr. J. W. Hammett, State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 162
Gainesville, Fla.

U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
OFFICE OF THE DISTRICT ENGINEER
CORPS OF ENGINEERS
JACKSONVILLE, FLA.

SAKWY

July 18, 1963

Regional Engineer
Bureau of Public Roads
50 Seventh Street, NE.
Atlanta 23, Georgia

Dear Sir:

As you may know, the Corps of Engineers' survey report on Phillippi Creek is under preparation. In accordance with Corps policy and to permit review and comments by interested agencies, description of works under consideration for flood protection in Phillippi Creek watershed is furnished.

Existing development in Phillippi Creek watershed is principally urban in the western half and agricultural in the area east of Cattlemen Road. Development trends, population studies, and other factors indicate that the overall area will become predominantly urban in the future. The Phillippi Creek area and the plan of improvement under consideration are shown on accompanying inclosure 1.

The proposed plan of improvement would provide protection from the 30-year flood for urban and urban-oriented areas of the watershed and would reduce stages and durations of larger floods. Major elements of the plan include enlargement of Phillippi Creek and portions of its main tributaries, provision of the necessary water-control structures, and realinement of the main channel at United States Highway 41. Details of the 30-year hydraulic design and a summary of corresponding minimum hydraulic requirements for bridge openings are given in inclosures 2 and 3.

The survey is expected to be submitted to our higher authority in the near future. Your comments on the plan of improvement relative to your area of interest would be appreciated.

Similar letters have been sent to other State and Federal agencies.

Sincerely yours,

H. R. PARFITT
Colonel, Corps of Engineers
District Engineer

3 Incl
1. Plan of improvement
2. Design data for channels
3. Design data for bridges

Copy furnished:
Bureau of Public Roads
Tallahassee, Fla. (w/incl)

This same letter sent to the following:

Chairman
State Road Department
Tallahassee, Florida

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

State Office
P.O. Box 162
Gainesville, Florida

April 18, 1963

H. R. Parfitt
Colonel, Corps of Engineers
District Engineer
575 Riverside Avenue
Jacksonville 2, Florida

Dear Colonel Parfitt:

We have reviewed with interest the planning to date of works for flood protection in the Phillippi Creek Watershed as requested in your letter of April 11th. We believe the proposals are compatible with the Sarasota West Coast Watershed Work Plan developed under Public Law 566. We agree that extension of Phillippi Creek improvements to the East through Cattlemen Road should be deferred until urban and related uses would have increased to the point that additional protection is required.

We would appreciate the opportunity of commenting on the report when it has been completed.

Sincerely yours,

J. W. Hammett
State Conservationist

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
PEACHTREE-SEVENTH BUILDING
ATLANTA 23, GEORGIA

June 26, 1963

CE-SE-gm (Phillippi Creek)

District Engineer
U. S. Army, Corps of Engineers
Jacksonville, Florida

Dear Sir:

By letter of April 11, 1963, you requested our comments on the proposed Phillippi Creek, Florida, project, for flood control and allied purposes. Authorization for your survey report on this project is contained in Section 208 of the Flood Control Act of 1960, approved July 14, 1960. These comments are furnished in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Existing canals in the project area are of inadequate capacity to control flooding. Your considered plan includes improvement of about 11 miles of these canals and provision of several water-control structures. Improvement of the remaining canals may be accomplished when future conditions warrant such action.

Urbanization has displaced most game populations from the watershed area considered for improvement. The natural stream has been channelized, so that project construction is not expected to have significant effects on fresh water fish.

Changes in runoff characteristics are not expected to have a significant effect on fish and wildlife resources. Runoff damage could result if sedimentation increases in the estuary as a result of the project. Therefore, the project should be designed to minimize sedimentation in these waters. Aside from this aspect, we have no objections to the plan.

This report has been reviewed and concurred in by the Bureau of Commercial Fisheries, St. Petersburg Beach, Florida; Florida Game and Fresh Water Fish Commission; and the Florida State Board of Conservation. Letters of concurrence from the State agencies are attached.

Sincerely yours,

Enclosures 2

James R. Fielding
Acting Regional Director

Florida Board of Conservation
DIVISION OF ADMINISTRATION · TALLAHASSEE

10 June 1963

Mr. Walter A. Gresh
Regional Director
Bureau of Sport Fisheries and Wildlife
U. S. Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta 23, Georgia

Dear Mr. Gresh:

We concur with the U. S. Fish and Wildlife Service report on Phillippi Creek project, Sarasota County, Florida.

Yours very truly,

Randolph Hodges
Director

RH/lhj

cc: Mr. Arthur Marshall
Mr. K. D. Woodburn
Col. H. J. Kelly

STATE OF FLORIDA
GAME AND FRESH WATER FISH COMMISSION
TALLAHASSEE

June 21, 1963

Regional Director
Fish and Wildlife Service
Peachtree - Seventh Building
Atlanta 23, Georgia

Dear Sir:

The Florida Game and Fresh Water Fish Commission has reviewed and concurs with your proposed report on the Phillippi Creek, Florida, project (reference letter, June 5, 1963, W. L. Towns).

Very truly yours,

GAME AND FRESH WATER FISH COMMISSION

A. D. Aldrich,
Director

ADA/rb

Florida Board of Conservation
DIVISION OF ADMINISTRATION · TALLAHASSEE

3 May 1963

Colonel H. R. Parfitt
District Engineer
U. S. Army Corps of Engineers
575 Riverside Avenue
Jacksonville 2, Florida

Dear Colonel Parfitt:

The project plans submitted to us do not specify settling basins for silt. These may be incorporated with spillway structures but this is not stated. Reducing siltation during heavy rains and resultant discharges of fresh water would mitigate damages to estuarine plants and animals in Phillippi Creek, Roberts Bay and Little Sarasota Bay.

The bridge causeway on U. S. 41 (Tamiami Trail) forms an impediment to Phillippi Creek flow. During heavy rains, the flood waters back up to the east and cover valuable real estate. A proposed canal in the Corps plans will eliminate the bottleneck at the U. S. 41 bridge. This project is badly needed as was evident when Harold Watson and K. D. Woodburn flew over the flooded areas last fall on a red tide survey.

Yours very truly,

Randolph Hodges
Director

RH/Ihj

cc: Mr. Walter Gresh
Mr. Arthur R. Marshall
Col. H. J. Kelly
Mr. K. D. Woodburn

U. S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION THREE
828 Peachtree-Seventh Bldg.
50 Seventh Street N. E.
Atlanta 23, Georgia

July 24, 1963

District Engineer
U.S. Army Engineer District, Jacksonville
P. O. Box 4970
Jacksonville 1, Florida

Ref: File No. SAKWY

Dear Sir:

Your letter of July 18, 1963 transmitted maps and proposed plan of improvement showing works under consideration for flood protection in Phillippi Creek watershed. Your thoughtfulness in supplying these maps to us is appreciated.

The Bureau of Public Roads cooperates with the several State Highway Departments in matters pertaining to public highways. Our operating procedure is for the State Highway Department to initiate plans for construction or improvement of such highways on the approved Federal-aid Highway Systems. These plans are reviewed in our Division offices which are located in the same cities as the State Highway Department central offices. Our Regional offices and our Washington office are advised of the findings of this review.

Information is not readily available to this office which indicate how highways on the Federal-aid network might be affected by your proposed plans. We note that a copy of your letter with enclosures was addressed to our Division Engineer in Tallahassee. If he requests us, we will assist him in his analysis of your proposed work. We are sure he will supply you with information that is available to him.

We will appreciate receiving similar plans for other projects which may affect highways that are on the Federal-aid Systems. The Bureau of Public Roads desires to strengthen interagency cooperation on water resources developments which may affect existing or proposed highway facilities.

Very truly yours,

Rex S. Anderson,
Regional Engineer

cc: Mr. J. S. Call - Florida

U. S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION THREE

P. O. Box 1079
Tallahassee, Florida

July 26, 1963

Colonel H. R. Parfitt
District Engineer
U. S. Engineer Office
575 Riverside Avenue
Jacksonville 2, Florida

Dear Sir:

Subject: Florida - Phillippi Creek - Flood Control

We acknowledge receipt of a copy of your letter to the Regional Engineer of July 18, 1963, and attached data relating to the proposed plan of improvement for the captioned watercourse.

Realinement of the main channel at its intersection with U. S. Route 41 (Federal-aid Route 11) entails the construction of a new highway bridge over the new channel. The hydraulic design, live loading, design and detail of elements and geometric design should conform to the State's standard practice and AASHO standard specifications for highway bridges.

Receipt of the information concerning the proposed improvement is appreciated.

Yours very truly,

J. S. Call
Division Engineer

FLORIDA STATE ROAD DEPARTMENT

TALLAHASSEE

October 14, 19-Safety-3

District Engineer
U. S. Army Engineer District, Jacksonville
P. O. Box 4970
Jacksonville 1, Florida

Re: File SAKWY
Section 17020, Sarasota County
Phillipi Creek

Gentlemen:

At the request of the Board of County Commissioners we are soon to prepare plans for realignment of the channel of Phillipi Creek at U.S. Highway 41. Presently our plans are to provide a bridge which will accommodate the channel your preliminary report proposes, this being a 100' bottom width at elevation (-) 16.0 and with one vertical to two horizontal side slopes. We do not as yet know whether a low bulkhead will be carried under the bridge, but should such be the case no significant reduction in channel capacity will result.

I believe that Sarasota County is now in the process of securing rights-of-way for this work. I presume that any work done toward implementing your plans would be applicable to the local agency's share of any project which the Congress should authorize and finance.

We are in no way interested in the development of the channel either up or downstream of the limits of the US 41 right-of-way. Any improvements to the channel and or bridges outside that right-of-way will have to be financed with funds other than Primary Highway funds.

Very truly yours,

John R. Phillips
Chairman

JRP:CJS:om

SUPPLEMENT I

SURVEY REPORT ON PHILLIPPI CREEK BASIN, FLA.

Information called for by
Senate Resolution 148, 85th Congress
Adopted January 28, 1958

1. Project description and economic life.--The Phillippi Creek Basin covers about 58 square miles of coastal lowlands, all in northwest Sarasota County, Fla., except a small headwater area in southern Manatee County. Two principal tributaries--Main A and Main B, draining predominantly agricultural areas, converge and form Phillippi Creek which flows about 5.3 miles through urban areas of Sarasota, Fla. In 2020, development in the area is expected to be predominantly urban. The proposed plan of improvement includes enlargement and straightening the existing channels to provide gravity removal of about 60 percent of the standard project flood runoff from the area. The plan includes a cutoff near United States Highway 41 and the necessary control structures and highway and railroad bridge crossings. The plan presumes the existence of the authorized Sarasota West Coast Watershed Work Plan of the Soil Conservation Service which would provide flood protection for 20.5 square miles of the upper Phillippi Creek drainage area. Estimated economic life is 50 years.

2. Project costs and benefits.--Detailed estimates of costs and benefits for the proposed plan of improvement are presented in appendixes A and B of the report. Tangible benefits creditable to that plan would be derived from prevention of flood damages, from increased land use, and from recreational boating. Comparison of costs and benefits for 50-year and 100-year economic lives is given below. Benefit growth is not forecast after the initial 50-year period.

Item	50-year economic life	100-year economic life
Initial costs		
Excavation	$3,907,000	$3,907,000
Highway bridges	1,020,800	1,020,800
Railroad bridges	375,700	375,700
Relocations	388,100	388,100
Inlet structures	379,600	379,600
Control structures	1,212,800	1,212,800
Lands and rights-of-way	688,800	688,800
Aids to navigation	4,000	4,000
Total initial costs	7,976,800	7,976,800
Annual costs		
Interest and amortization at 3 percent and 3-1/2 percent for primary works and 6 percent for associated works	325,700	270,500
Operation and maintenance	33,100	33,100
Replacement of control-structure operating equipment every 25 years	2,100	3,000
Economic adjustment for lands	16,500	16,500
Total annual costs	377,400	323,100
Average annual benefits	475,200	567,700
Benefit-cost ratio	1.3	1.8

3. Intangible project effects.--These effects would consist primarily of enhancement of the general health, welfare, and security of the people affected by reduction of the depth, duration, and frequency of flooding. The primary channels, their control structures, and the system of associated drainage works would permit conservation and greater use of the available water and land resources of the area.

4. Physical feasibility and cost of providing for future needs.--Design of the proposed plan of improvement is based on future needs of the area anticipated during the 50-year economic life. It is considered that the degree of protection proposed would be adequate for the urban expansion which can be reasonably expected in the study area during a 100-year economic life.

5. Allocation of costs.--No allocation of costs among water uses or purposes is involved in this report, the principal purpose being flood control and navigation being an incidental beneficiary.

6. Extent of interest in the project.--Local interests in the study area are at present represented by the Board of County Commissioners of Sarasota County, Fla. In view of the County's interest and cooperation in seeking a solution to the flood problem, and the proposed referendum for the purpose of establishing a flood control district, no difficulty is expected in securing the necessary cooperation for the works recommended herein. As evidenced by statements at the public hearing in November 1962, the project has the vigorous support of the governments of the State of Florida, Sarasota County, and the City of Sarasota; local landowners; and the members of Congress representing the area.

7. Repayment schedules.--Not involved.

8. Alternative considerations.--The relatively flat lands that make up the area contain no valley or lake areas that would provide storage reservoirs for use in reduction of flooding. Consideration was given to levees and diversions. These were considered objectionable because they would be costly and not meet project objectives. Consequently, the most practicable means of removing excess runoff would be through provision of adequate primary and associated drainage and flood control works.