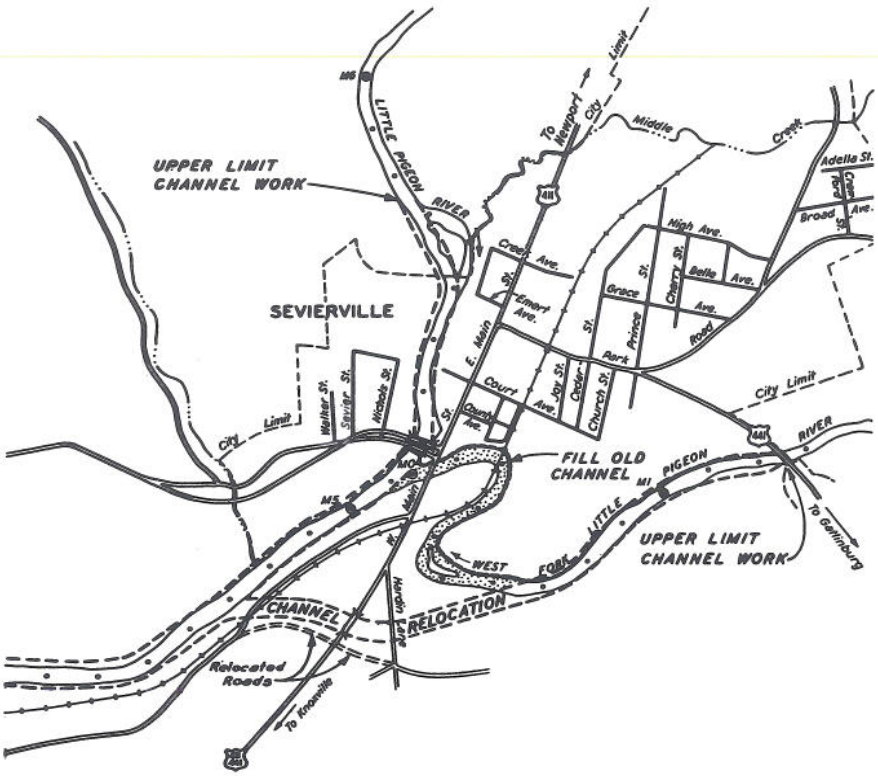
SEVIERVILLE, TENNESSEE

FLOOD RELIEF



CHANNEL IMPROVEMENT PLAN

PLANNING REPORT NO. 0-6456

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
FLOOD CONTROL BRANCH

Tennessee Valley Authority
Division of Water Control Planning
Flood Control Branch

No. 0-6456

SEVIERVILLE, TENNESSEE

FLOOD RELIEF

A Plan for Channel Improvement

Planning Report

Knoxville, Tennessee
September 1964

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

DATE: September 16, 1964

TO : L. J. Van Mol, General Manager

FROM : Reed A. Elliot, Director of Water Control Planning

SUBJECT: SEVIERVILLE, TENNESSEE, FLOOD RELIEF - A PLAN FOR CHANNEL IMPROVEMENT - PLANNING REPORT

The accompanying planning report No. 0-6456 describes and recommends construction of a $2.7 million project of channel improvement to give a high degree of relief from Little Pigeon River and West Fork flood overflow at Sevierville, Tennessee. The project is estimated to return benefits totaling 2.5 times its cost.

This plan is essentially the same as that set out in a feasibility report transmitted with my memorandum of June 26, 1963. At that time we recommended against adoption of a channel improvement plan until studies could be completed of flood relief measures on a broader basis including a possible combination of channel improvement and reservoirs. Such studies have been carried out and, while they indicate that a plan including reservoirs would be economically feasible, we find that there is not sufficient local interest to support the multipurpose plan. On the other hand there is strong support for the channel improvement plan.

In view of the expressed local interest, construction of the channel enlargement project for the city is recommended as soon as funds can be made available and satisfactory participation can be negotiated with the city.

Reed A. Elliot

Reed A. Elliot

BJB:REF:JH

CONTENTS

CONTENTS (Continued)

TABLES

FIGURES

(At end of report)

SEVIERVILLE, TENNESSEE

FLOOD RELIEF

SUMMARY

This planning report recommends construction of flood control works for Sevierville, Tennessee, consisting of 3.5 miles of channel enlargement and improvement along Little Pigeon River and its West Fork and a 0.6-mile relocation of the latter stream. Total cost of the project is estimated to be $2,700,000. On an average annual basis, estimated benefits will be 2.5 times the costs.

As an integral part of the plan for control works, participating agreements with the city would include provision for practical flood plain regulations to preserve and ensure effectiveness of the works and assurances that reasonable efforts will be made to stimulate practical amounts of floodproofing of structures to minimize residual flood damages.

TVA work on the Sevierville flood problems began in 1957 when, after the flood of February, the city through the State Planning Commission requested an analysis of the flood problem. In February 1958 TVA issued a report[1] detailing the past flood history and the possibility of future flooding. In

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1. "Floods on Little Pigeon and West Fork Little Pigeon Rivers, Vicinity of Sevierville, Tennessee," No. 0-5805.

March 1962 TVA met with and at the request of local leaders to organize for a cooperative study of plans to alleviate flood problems in the watershed. A local Flood Study Committee was organized and work was well underway when the March 1963 rains produced two high floods within one week causing damages of some $1,300,000. To determine promptly if there was an economically feasible flood relief plan for this hard-hit city, the broader studies were temporarily restricted to a plan for Sevierville only. A feasible plan was formulated and reported in June 1963.[1] Work was then resumed on the comprehensive plan for the broader area and an economically feasible plan of three multiple-purpose reservoirs, plus some Sevierville channel improvement, was reported in June 1964.[2] The comprehensive plan would provide flood relief not only for Sevierville but for some 36 miles of flood-prone land in the county as well. The reservoirs were planned to include recreation lakes.

Over the period of studying flood control measures the local Flood Study Committee worked closely with TVA engineers to assist in the effort and to be in a better position to interpret the results. After consideration of TVA's engineering findings the consensus of the committee and local leaders was in favor of the more limited plan for flood relief confined to Sevierville as

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1. "Flood Relief for Little Pigeon River and West Fork at Sevierville, Tennessee," No. 0-6367.

2. "Sevierville and Sevier County, Tennessee - Flood Relief and Water Resource Development," No. 0-6439.

a practical way to achieve the most immediate needs of the area. This course would not prevent constructing reservoirs of the comprehensive plan at some future time. The additional works would provide Sevierville with a still higher degree of flood control than now contemplated by either plan. Feasibility of future extension of works would require local support and participation.

Studies for this planning report have revealed no necessary significant modification to the 1963 plan of channel enlargement. Therefore, this report (1) repeats in abbreviated form the earlier description of the watershed, the city, and the flood and potential flood damage problem, (2) describes the proposed channel improvement plan in somewhat more detail than formerly, and (3) updates the measurable benefits, estimated costs, interest rate, and economic analysis.

The city of Sevierville is located on a broad, flat flood plain between the Little Pigeon River and its West Fork which join within the corporate limits. This is the concentration point of a 350-square-mile watershed draining a high potential rainfall area heading in some of the most rugged mountains of eastern United States. Floods causing some damage occur at about average 2-year intervals. Five floods since 1867 would have caused damages ranging from $1,300,000 to $3,500,000 at today's values and state of development. Floods high enough to cause

over $6,600,000 in damages may be expected in the future. Estimated average annual losses amount to $156,000.

Although no practical or economically feasible plan has been found to protect Sevierville from maximum expected floods, the proposed channel improvements would prevent more than 90 percent of estimated annual damage, considerably improve property values in floodable areas, and be a major stimulant to the safe, orderly development and growth of the city. The proposed improvements would carry a flood like that of March 12, 1963 (a $1.3 million flood), essentially within the banks and would eliminate significant damage in a flood to be expected at average 60- to 70-year intervals (about 15 percent greater in flow than that of 1963).

The work would consist of clearing, cleaning, widening, and limited deepening over 2.8 miles of the Little Pigeon River and 1.2 miles of the West Fork including a relocation and straightening of the lower 0.7 mile of the latter stream. The relocation would shorten the stream 0.1 mile and move its junction with the Little Pigeon River about 0.4 mile downstream. The entire project would require about 1 million cubic yards of excavation.

Annual charges are estimated at $89,000 using a 3-1/8 percent interest rate and 100-year life. Operation and maintenance are estimated to cost $5,000 annually giving total annual costs of $94,000.

Average annual benefits from the project total $232,000 of which $142,000 are prevented damages, $66,000 are from improved property values directly attributable to the project, and $24,000 are secondary and redevelopment benefits.

The benefit-cost ratio is 2.5.

LITTLE PIGEON RIVER WATERSHED

The Little Pigeon River system flows generally northwest from the peaks in the Great Smoky Mountains National Park to a junction with the French Broad River about 5 miles below Douglas Dam. Of the 381-square-mile drainage area the upper 115 square miles are in the park and the entire watershed is in Sevier County, Tennessee. Headwaters of the system drain some of the highest, most rugged mountains in eastern United States. The city of Sevierville lies near the lower extremity of the watershed in the path of floodwaters collected by a rugged and efficient drainage system in a region of high rainfall potential.

The Drainage System

As shown on figure 1, Middle Prong and Porters Creek join in Greenbrier Cove within the national park to form the Little Pigeon River. Downstream the river is joined by Webb Creek at Pittman Center, Bird Creek, East Fork Little Pigeon River at Harrisburg, and West Fork Little Pigeon River and Middle Creek at Sevierville. The West Fork heads at Newfound Gap in the park. LeConte Creek and Roaring Fork are tributaries lying mostly in the park but which join the West Fork outside, at Gatlinburg. Other principal tributaries of the West Fork are Mill and Walden Creeks entering from the west.

The two main prongs divide the drainage above their junction at Sevierville into 201 square miles on the east and

151 square miles on the west. Together they comprise 92 percent of the watershed area at the mouth, 5 miles below Sevierville. Drainage areas at important locations in the system are shown in table 1.

Table 1

DRAINAGE AREAS

LITTLE PIGEON RIVER WATERSHED

Stream	Place	Mile	Drainage Area, Sq. Miles
Little Pigeon River	Mouth	0	381
	Sevierville Stream Gage	4.5	353
	Above West Fork Little Pigeon River	5.1	201
	Above Middle Creek	5.6	186
	Above East Fork	9.6	110
	Near Pittman Center	24.6	48.5
	At Park Boundary	25.7	46.1
West Fork Little Pigeon River	Mouth	0	151
	Above Walden Creek	7.9	76.7
	Former USGS Stream Gage	9.2	76.2
	Pigeon Forge	10.9	74.7
	Above Dudley Creek (Gatlinburg)	17.1	49.2
	Above LeConte Creek	18.7	33.4
Walden Creek	Mouth	0	64.6
Middle Creek	Mouth	0	15.1
East Fork	Mouth	0	70.1
Mill Creek	Mouth	0	13.3

With minor exceptions roughly the upper three-fourths of the drainage system flows in steep, narrow, mountain gorges, heading at elevations ranging up to over 6000 feet at the southern boundary in the national park and to about 3000 feet on the east and west. The streams leave their steep gorges abruptly and then flow in broad, more gently sloping valleys with wide flood plains to a concentration at Sevierville. Through the city and in the reaches below, stream slopes are still flatter, a factor which inhibits effective downstream movement of rapid flood inflows from above and results in frequent overflow and flood damage in the city.

Sevier County was formed in 1794 and the town of Sevierville, now the county seat, was laid out in 1795 and incorporated in 1903. The other principal cities in the watershed and in Sevier County are Gatlinburg and Pigeon Forge, incorporated in 1945 and 1961 respectively. The estimated 1962 population of Sevier County is 24,500, of which about 5,600 live within the corporate limits of Sevierville, Pigeon Forge, and Gatlinburg. Thus the county is predominantly rural, although there are concentrations of population close to but outside the corporate limits of these cities. County and city populations as taken from the U. S. Census reports and other sources are given in table 2. The table also shows a projection for 1980.

Table 2

CENSUS POPULATION DATA

SEVIER COUNTY

Date	County Population	City Population		
		Sevierville	Gatlinburg	Pigeon Forge
1890	18,761			
1900	22,021			
1910	22,296	675		
1920	22,384	776		
1930	20,480	882	1,100	225
1940	23,291	1,161	-	
1950	23,375	1,620	1,301	
1960	24,251	2,890	1,764	
1961	-	-	-	917
1962	24,500	-	-	-
1980*	29,000	4,500		

*Projected

Modern hard-surface highways, generally paralleling the watercourses, provide good access to all segments of the watershed. See figure 1. Federal Highway 441 is a popular and scenic route from the north to the national park and is 4 lanes most of its way to the park boundary.

The Smoky Mountain Railroad, a 30-mile line from Knoxville to Sevierville, served the latter city in years past but has not been operated for several years. According to a news item the line has now been formally abandoned.

Tourism is the present base of principal commercial activity in the Little Pigeon River valley. It is stimulated by the Great Smoky Mountains National Park which attracted an estimated

5,200,000 visits in 1963, more than twice the number of any other national park. On holiday weekends the county population may be swollen by 10,000 to 15,000 visitors. Eating and sleeping accommodations and recreation and notion centers crowd the principal center of tourism, Gatlinburg, and are rapidly building up along Highway 441 through Pigeon Forge and as far north as Sevierville. An estimated $45,000,000 was spent by tourists in the general Smoky Mountain Park region in 1963.

Sevierville

As county seat, Sevierville is the principal political and trading center of Sevier County and of the Little Pigeon River watershed. The incorporated area of about 1.09 square miles lies largely on a broad, flat flood plain between the Little Pigeon River and its West Fork which join along the western corporate limit of town. Middle Creek flows through this urbanized flood plain to its junction with the main stem about one-half mile above the West Fork. Located as it is on low land between and at the confluence of steep, mountainfed streams, most of the corporate area, including all of the business district, and considerable area outside of the city are subject to inundation in large floods.

The principal business district lies closer to the confluence of the two main prongs than does the rest of the city and on generally the lowest ground. Practically all the potential

flood damage in and near Sevierville is concentrated within this area of roughly 20 blocks containing some 170 establishments. Most of these either have already been flooded in the past or, in the case of new establishments, would be flooded in a repetition of the maximum known flood. Some newer businesses are being located on the fringe of the older section up the West Fork generally on somewhat higher ground, but not so high as to be safe from damage in the greater floods that can reasonably be expected in the future.

The Sevierville business district is typical of small American towns with its share of grocery stores, hardware stores, clothing stores, appliance stores, offices, garages, filling stations, eating establishments, and municipal and other government buildings. In addition, two feed and flour mills are in the principal business district.

Older industries in and near Sevierville include the two feed and flour mills, a sand and gravel plant, a casting company, a flooring company, a cabinet shop, a lumber and concrete plant, three lumber producers, a canning plant, and a weekly newspaper. Two new textile firms, an expected new chemical corporation, and recent establishment of an industrial park foretell probable industrial expansion. Industrial employment totals more than 1,100.

Sevierville is also enjoying a rapid increase in tourist-related business. Although not a principal center for

this lucrative trade, Sevierville is accommodating part of the overflow business from the increasingly crowded, major center, Gatlinburg. The capacity of Sevierville and its surrounding area to expand visitor accommodations is virtually unlimited because of favorable topography and available open areas.

FLOODS AND FLOOD DAMAGES

Certainly the most conspicuous flood in the minds of Sevierville people was the one of March 12, 1963. It not only was recent, but it exceeded all others at the Sevierville gage since 1920 and caused more damage than any past flood. Figure 2 shows a stage hydrograph at the gage for the March 12, 1963, flood which exemplifies the rapid rate of rise typical of many floods from these mountain streams. The flood inundated about one-half of incorporated Sevierville as shown on figure 3. Floodwaters reached the tops of parking meters in the business district, closed through-traffic for several hours, entered many stores and homes, and caused an estimated $1,300,000 in damages. Typical flooding is shown in the photographs of figures 4, 5, 6, and 7. This March 12 flood followed by only 6 days an earlier flood that lacked about 1 foot of reaching the same height.

Sevierville has experienced at least four other large floods which would have caused damages exceeding $1,500,000 and ranging up to $3,500,000 at today's values and level of development. Comparable floods as well as much greater ones can be expected in the future. Present potential damages are estimated at $156,000 on an average annual basis. Unless control measures are undertaken, flood damages will increase as the city grows.

Past Floods

Since November 22, 1920, official flood records have been collected at the USGS gage on the Little Pigeon River just downstream from Sevierville. Marks for a number of floods have also been kept at Sevierville Mills above the West Fork. Flood history research has identified other floods. From these sources table 3 and figure 8 have been prepared to show dates of occurrences, crest elevations, and peak discharges for known floods which have exceeded bankfull stage of 8.5 feet at the Sevierville gage. The list is complete only for the period since streamflow records were begun in 1920.

Although 73 floods have exceeded bankfull stage, damage does not become significant until a stage of about 12 to 13 feet is reached. During the period of gage record, 25 floods have exceeded a 12-foot stage. All six of the earlier, known historic floods exceeded 14-foot stage.

Table 3

FLOOD CREST ELEVATIONS AND DISCHARGES ABOVE BANKFULL STAGE (8.5 FEET)

LITTLE PIGEON RIVER AT SEVIERVILLE GAGE, MILE 4.5

1867-1963

Date of Crest	At Gage			Elevation
	Stage, Feet	Elevation	Peak Discharge, CFS	At Sevierville Mills, Mile 5.24
March 7, 1867	16.5	897.9	43,000	
February 25, 1875	18.0	899.4	55,000	902.5
April 1, 1896	16.8	898.2	46,000	
1903				897.4
March 14, 1913	14.1	895.5	24,000	
March 5, 1917	14.5	895.9	27,000	899.4
April 2, 1920*	16.0	897.4	37,000	901.5
River gaging records begun November 22, 1920				
February 10, 1921	12.0	893.4	15,700	
January 21, 1922	9.32	890.8	9,820	
December 15, 1922	12.5	893.9	18,000	
December 8, 1924	11.6	893.0	13,900	896.5
February 23, 1927	10.44	891.9	10,200	
June 29, 1928	15.4	896.8	32,000	899.8
March 23, 1929	13.45	894.9	22,200	
May 7, 1929	9.14	890.6	8,590	
April 4, 1931	9.50	890.9	9,060	
January 30, 1932	11.00	892.4	11,600	
December 28, 1932	10.85	892.3	11,100	
February 15, 1933	12.54	894.0	18,000	897.3
March 3, 1934	10.5	891.9	10,400	
March 12, 1935	11.06	892.5	11,900	895.5
January 19, 1936	11.82	893.3	14,800	
February 4, 1936	12.84	894.3	19,400	897.5
March 24, 1936	11.91	893.35	15,300	
March 26, 1936	13.41	894.8	22,200	898.3
March 27, 1936	11.71	893.19	14,400	897.8
April 2, 1936	10.18	891.62	10,100	

*Marked profile available

Table 3 (Continued)

Date of Crest	At Gage			Elevation At Sevierville Mills, Mile 5.24
	Stage, Feet	Elevation	Peak Discharge, CFS	
April 6, 1936	12.45	893.9	17,500	897.2
February 9, 1937	9.25	890.7	8,760	
August 5, 1938	12.69	894.1	18,900	898.4
February 15, 1939	9.43	890.9	9,020	
August 14, 1940	9.17	890.6	8,760	
December 29, 1942	12.82	894.3	19,400	
February 18, 1944	10.08	891.5	9,950	
February 17, 1945	10.57	892.0	10,800	
January 8, 1946	12.20	893.6	16,600	
February 10, 1946	11.83	894.3	14,800	
January 20, 1947	13.67	895.1	23,500	898.9
February 12, 1948	11.49	892.9	13,400	
November 28, 1948	10.69	892.1	10,900	
January 5, 1949	9.86	891.3	9,450	
June 16, 1949	10.00	891.4	9,650	
July 13, 1949	9.79	891.2	9,360	
October 31, 1949	12.58	894.0	17,300	
February 7, 1950	9.45	890.9	8,730	
March 13, 1950	10.52	892.0	10,200	
December 7, 1950	9.89	891.3	9,350	
March 29, 1951*	13.26	894.7	20,400	899.2
December 21, 1951	9.65	891.1	9,010	
March 11, 1952	10.43	891.9	10,100	
February 21, 1953	11.70	893.1	13,300	
January 21, 1954	11.80	893.2	14,600	
February 23, 1955	9.80	891.2	9,290	
April 16, 1956	13.25	894.7	20,400	898.7
February 1, 1957*	14.71	896.2	27,300	900.6
November 18, 1957	10.46	891.9	9,660	
November 25, 1957	8.53	890.0	6,780	

*Marked profile available

Table 3 (Continued)

Date of Crest	At Gage			Elevation At Sevierville Mills, Mile 5.24
	Stage, Feet	Elevation	Peak Discharge, CFS	
April 25, 1958	8.94	890.4	7,940	
May 7, 1958	9.35	890.8	8,550	
January 22, 1959	12.65	894.1	19,000	
March 27, 1959	10.34	891.8	10,300	
June 25, 1959	9.33	890.7	8,350	
September 30, 1959	10.72	892.2	11,300	
November 28, 1959	12.43	893.9	18,000	
December 19, 1959	8.80	890.2	7,740	
February 23, 1961	9.22	890.7	8,350	
February 25, 1961	10.22	891.7	10,100	
March 8, 1961	13.20	894.6	21,500	
December 12, 1961	12.90	894.3	20,200	
December 18, 1961	14.53	896.0	27,500	
January 23, 1962	9.34	890.8	8,530	
January 25, 1962	8.52	890.0	7,360	
February 23, 1962	12.70	894.1	19,200	
February 24, 1962	10.40	891.8	10,500	
February 3, 1963	11.67	893.1	14,600	
March 6, 1963	14.70	896.1	30,300	
March 12, 1963*	15.74	897.2	36,900	902.4
March 5, 1964	11.20	892.6	12,800**	
March 15, 1964	10.79	892.2	11,500**	
April 7, 1964	13.8**	895.2**	25,100**	

*Marked profile available
**Tentative

Future Floods

Almost every year somewhere in the Nation a flood is noted in news headlines because it surpassed all prior floods for the place. The March 12, 1963, flood in the Little Pigeon

River basin came close to being such a flood. Adding to general observations of this kind the more scientific, hydrologic analysis of many years of official stream and rainfall records for many gaging stations proves that at most places it is reasonable to expect much greater floods in the future than have yet occurred in the past. Only complex hydrologic study can safely predict the magnitude of the greatest floods to be expected of a given watershed.

Such studies for Little Pigeon River watershed were prepared for an earlier TVA report depicting the flood problems of Sevierville.[1]

Maximum Probable Floods--The maximum probable flood is considered to be a reasonable upper limit of expected flooding. On the basis of great rainfalls that have occurred elsewhere but could have occurred over the Little Pigeon River watershed and with consideration for great floods which have been observed on similar streams, the maximum probable Little Pigeon River flood has been estimated to be 121,000 cfs at the Sevierville gage and 73,000 cfs above the West Fork. On the West Fork it would be 66,000 cfs. These are more than twice the highest known flood, that of February 1875.

Regional Floods--A lower but still an extreme flood that can be expected in the future has been given the TVA name

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1. "Floods on Little Pigeon and West Fork Little Pigeon Rivers, Vicinity of Sevierville, Tennessee," No. 0-5805, February 1958.

of regional flood. It may be defined as a flood comparable with the highest floods that have already occurred in a nearby region. It is commonly used as a lower limit for locating structures to keep them relatively free from flooding. Its crest on the Little Pigeon River would be 66,000 cfs and 51,000 cfs at the gage and above West Fork respectively. It would crest at 43,000 cfs on the West Fork.

Design Floods--The term "design flood" is used to describe the basic flood used for some particular phase of planning. Its magnitude depends on the design purpose.

Although several design floods were tested for the feasibility report,[1] one which suited a maximum practical channel size yielded near maximum net benefits and was adopted. Such a flood can be expected at about 60- to 70-year average intervals and would crest at about 42,000 cfs at the Sevierville gage. The same design flood is used for this planning report.

Flood Profiles

Typical profiles for the Little Pigeon River are shown on figure 9 and for the West Fork on figure 10. Solid, continuous lines apply to existing conditions. Because it is the best marked flood, the recent, high, March 1963 flood profile is the only observed one shown. Profiles of varying completeness are also

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1. "Flood Relief for Little Pigeon River and West Fork at Sevierville, Tennessee," No. 0-6367, June 1963.

available for the 1920, 1951, and 1957 floods, and there is one mark for the 1875 flood. In addition, figures 9 and 10 show computed profiles for the regional and maximum probable floods. Streambed and approximate top of banks are also given.

The March 12, 1963, flood was from 3 to 7 feet above the banks of the Little Pigeon River in the developed areas. Along the West Fork the flood was above the banks by from 5 to 10 feet. Bank lines are not good indicators of the beginning of flood damage, however. Typical depths in important commercial buildings ranged from a few inches to nearly 3 feet depending on their location, and water stood 2 to 3 feet deep on several important streets.

Flooding during 1963 in the developed areas was increased markedly by heading-up at Hardin Lane, an access road which was built across the flood plain of the West Fork in recent years. This is supported by observed, comparative heights at the gage below and at Sevierville Hardware above. Whereas the 1963 flood was 0.3 foot lower than in 1920 at the gage it was 8 inches higher at the hardware store. Heading-up at Hardin Lane is also shown in the upper photograph of figure 7. After the flood, culverts under this roadway were increased in size, but it is doubtful if they are yet adequate.

The maximum probable Sevierville flood would be about 7 to 9 feet deeper than in 1963. The regional flood would be about midway between.

The three flood profiles shown by broken lines on figures 9 and 10 are for the same three floods--1963, regional, and maximum probable--but apply to improved channel conditions. Their significance will be discussed later in the report. Because of 0.1 mile of shortening of the West Fork due to relocation of its lower 0.7 mile, the profiles for improved conditions have a different origin from that for existing conditions. In the area of relocation, profiles along the two watercourses cannot be compared directly from figure 10. Above mile point 0.7 on the present stream, comparisons are valid.

Flood Damages

Potential flood damages for this report are from the earlier feasibility studies as appraised by means of a 1962 comprehensive field survey made in cooperation with the Flood Control Work Group of the local Flood Study Committee. Every one of the 183 business, industrial, public, and utility properties and 558 homes subject to flooding was visited in this survey. The potential flood damages were appraised for 4 different flood levels ranging as high as 12 feet for the maximum probable level. Later the actual March 1963 flood offered an opportunity to verify the appraisal of the previous year. By combining these potential damage appraisals with a flood series, average annual flood damages are estimated to be $156,000.

Business and Industrial--For business, industrial, public, and utility properties, potential damages were appraised through conferences with owners and managers who generally were able to estimate closely the value of their damageable stock stored below appraisal levels. These values with a proper deduction for salvage, an estimate of damage to machinery and other equipment, an appraisal of building damage, and the cost of cleanup were determined and summed for all properties to give the potential flood damage for each level appraised.

Typical appraisals of total damage for a depth of 3 feet are as follows: movie theater, $9,000; cafe, $4,000; service station, $4,000; furniture store, $12,000; beauty shop, $1,500; building supply company, $30,000; jewelry store, $1,000; and men's clothing shop, $12,000. Business and industrial damage in Sevierville accounts for about 75 percent of the total potential.

Residential--In the residential appraisal every house on the flood plain was viewed to classify it according to value, type of construction, number of stories, and number of rooms. Potential damage for the various depths of flooding was taken from room damage tables used for many years in similar surveys in the Valley but updated for price increases, for higher standard of living, and by comparisons with damage values used by other agencies.

The following examples are typical appraised residential flood damages, all of them for a 3-foot depth on the floor of a 1-story framehouse.

Class	Market Value, Structure and Contents	Potential Damage
I	$21,000	$6,500
II	12,000	3,400
III	3,300	700

Of the 558 homes in Sevierville subject to flooding, only 65 were judged to be first class and 304 were second class. Residential damage in Sevierville accounts for about 25 percent of the total potential.

Total Potential Flood Damage--Table 4 gives the potential flood damages for Sevierville for each of the 4 appraisal levels and figure 11 shows the damage curve for all flood levels. Amounts shown include an appropriate 20 percent allowance for indirect damages such as lost wages and profit and relief costs. Because of the relative uniformity of flood profiles along both the Little Pigeon and West Fork Little Pigeon Rivers, it is practical to relate potential damages to the stream gage at mile 4.53 on the Little Pigeon River.

Table 4

POTENTIAL FLOOD DAMAGES

STATUS OF 1962

SEVIERVILLE, TENNESSEE

Flood Elevation at Stream Gage	Damages			
	Residential	Business	Industrial	Total
905*	$1,705,000	$4,301,000	$643,000	$6,649,000
902	1,379,000	3,706,000	376,000	5,461,000
899	650,000	2,403,000	166,000	3,219,000
896	96,000	220,000	54,000	370,000

*Maximum probable flood

Verification Survey--The occurrence of the large flood on March 12, 1963, offered an excellent opportunity to check the potential damage appraisal of 1962. About 2 months after the flood two TVA engineers and a member of the Flood Control Work Group interviewed owners of a representative sampling of establishments concerning their recent flood losses. Actual owner-appraised direct losses for 15 establishments were $160,000 as compared with $140,000 obtained in the 1962 appraisal for the same places. The one other business included in the sample survey could not be fully appraised because of incomplete knowledge of damage to the structure and major equipment. The incomplete appraisal of this large business lowered the total to somewhat less than given by the 1962 survey. An allowance for damages prevented by local protective measures at this and all other businesses,

however, brought the total for the sample survey of 1963 damages solidly in line with the 1962 estimate and showed that it could be used without adjustment.

Annual Flood Damages--Sevierville is unique among small cities of the region in that official flood records for 44 years are available from the nearby stream gage, and historical flood data have been obtained covering a period of more than 100 years. From these flood data and the regional and maximum probable floods, a flood frequency relationship was developed for the Little Pigeon River at Sevierville.

Based on the potential flood damage curve and the flood elevation-frequency relationship, the total potential average annual flood damage at Sevierville is computed to be $156,000. This recognized procedure for determination of annual flood damages gives consideration not only to past floods but, in addition, proper weight to the probability of future floods and allows for incomplete or biased historical data.

PLAN OF IMPROVEMENT

This planning report adopts the same plan of flood control as was recommended in the feasibility report of 1963 in which several methods, degrees, and schemes of protection were considered.

Methods included use of levees, the relocation of damageable properties, the use of upstream reservoirs, and channel improvement by enlargement and relocation. Of these, only channel improvement was found to be practical and economically feasible for flood protection confined to the city of Sevierville alone.

Of several degrees of protection considered, a combination of the resulting net benefits, the practical size of channel with respect to existing developments, and the level of protection appropriate for a developed urban area dictated the use of a plan which would control without significant damage a flood to be expected at average intervals of 60-70 years.

Channel improvement would have to begin about 1.8 miles downstream from the Sevierville corporate limit so that the work would be effective in the developed areas. It would also have to extend upstream through the developed areas of the city on both streams. Three schemes of improvement were investigated. One involved cleaning, clearing, widening, and limited deepening of the streams in their present locations. A second involved

this same activity but with a relocation of the West Fork to cut off a bulge in the stream at the western corporate limits. In this scheme the relocated channel would be closer to the city than the old channel. The third plan substituted a relocation which would move the mouth of the West Fork to a new junction point with the Little Pigeon River about 0.4 mile below the present junction. This plan would carry the stream farther away from the city than it now lies. Of these three schemes, the one using the latter relocation was adopted as superior. Its advantages include shortening the West Fork by 0.1 mile, elimination of two 180-degree bends, carrying the discharge of this large contributor farther downstream away from the city, reducing enlargement costs on 0.4 mile of the Little Pigeon River, and creating desirable developable land adjacent to the city.

The relocation of West Fork Little Pigeon River breaches the old road to Knoxville along Little Pigeon River and Hardin Lane, an access route from the city to a subdivision. Rather than bridge the stream to continue the use of these routes, road relocations are planned. They would lie to the west of the new channel and connect with U. S. Highways 411 and 441.

Present plans do not include improvement of Middle Fork. Some flood reduction can be expected as a result of the improvement of the Little Pigeon River into which Middle Fork flows. In this general area the State Highway Department has

made some stream improvements of Middle Creek in connection with building new U. S. Highway 411. Additional improvement of this stream is not warranted at the present time because of the low benefits which would result in this area.

In abbreviated form the extent of the proposed work and the relocation of West Fork are shown on figure 12.

Channel Planning Criteria

The adopted bottom grades of the proposed enlargement and relocation are shown on the profile drawings, figures 9 and 10. These have been set in an effort to minimize rock excavation. Rock levels were defined by probings on both banks at roughly 0.1-mile intervals in the more heavily developed areas and about 0.2-mile intervals elsewhere and are shown on figures 9 and 10. In keeping with the intent to avoid excessive rock excavation, additional hydraulic analysis will be made during final design and construction to support plan modifications which would achieve this objective.

The improved and widened channels and the relocation are planned with a 1 on 2 side slope. This slope is generally somewhat flatter than the present banks. After stabilization the newly created banks should also be stable and reasonably easy to maintain. Side slopes should be grassed as a part of construction.

The proposed relocation of West Fork would follow the natural drainage course used by the stream during overflow floods. A "dryland" bridge on U. S. Highways 411 and 441 already provides for the passage of this overflow. The relocation will pass under this existing bridge. Fortunately, it is of sufficient total span to accommodate the new, deepened channel. Plans for this bridge show the base of piers to be on rock and lower than the adopted channel grade. Plans provide for protection of the piers and abutments with concrete work and placing of a trash curtain between the double-column piers.

Typical cross sections for the proposed channel improvement, including the bridge section over the relocation, are shown on figure 13.

Channel Dimensions

Width of the channel has been dictated largely by the maximum size which could be provided without relocating costly existing developments at critical places and by the need to maintain continuity in resulting capacity and reasonable uniformity and shape consistent with slope longitudinally along the streams. The adopted width was also the one among several widths considered which gave the near maximum net benefits. As now planned the proposed improvement requires widening the existing channels 60 to 100 percent depending on location. Figures 14-20 show planning details for the proposed channels on 1" = 100' scale Kelsh topographic maps. Table 5 gives limits of the improvement, cut grade elevations, and the bottom width at all points of change.

Table 5

LIMITS, CUT GRADES, AND WIDTHS

OF PROPOSED CHANNEL IMPROVEMENTS

Location, Mile	Comment	Cut Grade, Elevation Above MSL	Width at Cut Grade Elevation, Feet
	Little Pigeon River		
3.0	Downstream limit	870.8	120*
3.07	Upstream end of transition	871.0	285
3.26		871.5	285
3.50		875.0	285
3.80		877.0	285
4.10		878.5	285
4.33		881.0	285
4.70		882.0	285
4.73	Left bank line of relocated West Fork	882.5	285
4.76	Right bank line of relocated West Fork	883.0	190
4.84		884.0	190
4.89		884.5	190
5.02		885.1	190
5.48		887.0	190
5.74	Downstream end of transition	888.7	190
5.77	Upstream limit	889.0	130*
	West Fork Little Pigeon River		
0.0	Mouth of relocated West Fork	882.7	150
0.24	Downstream edge, U. S. Highways 411 and 441 bridge	886.0	150
0.60	Approximate junction with centerline of old channel	887.7	150
0.63	Downstream end of transition	887.9	150
0.68	Upstream end of transition	888.0	200
1.08	Downstream end of transition	889.6	200
1.17	Upstream limit	890.0	110*

*Existing channel

Land

Permanent easement rights will be required on approximately 78 acres of land for the widened channel, the West Fork channel and road relocations, and a 10-foot maintenance strip beyond the top of cut on both banks wherever this is practical without disturbing substantial existing structures. In addition, a temporary construction easement 30 feet wide will be necessary along most of the improvement length.

Spoil will be used to fill the old channel where relocated and to improve low, developable areas by means of filling. In addition, substantial amounts of spoil that cannot be so disposed will have to be hauled from the project area to land suitable for spoil.

Relocations and Removals

To make way for the relocation of West Fork, six houses must be removed or relocated from the low area where the mouth of the relocation joins the Little Pigeon River. Three additional houses and an outbuilding are in the right-of-way of the planned road relocation to connect with the old road to Knoxville along the Little Pigeon River. Three nonresidential buildings must be removed for right-bank widening of Little Pigeon River in back of the business district.

The dam of Sevierville Mills across Little Pigeon River must be removed and the stream gage would have to be relocated and rerated.

About 2000 feet of road relocation is needed to replace Hardin Lane and to connect with the old Knoxville road. An abandoned railroad track must be removed at the mouth of relocated West Fork.

About 1400 feet of sewerline and 6 manholes would have to be rebuilt where they lie in the path of Little Pigeon River widening. Two gaslines cross the West Fork relocation and would have to be lowered. An estimated 10 telephone and power poles need to be moved.

These adjustments are considered minimal for a project of this magnitude in a developed area.

Maintenance of Improvements

The flow carrying capacity of the improved channels and hence their ability to reduce flood levels as planned require that their dimensions and shape be maintained essentially as built and that the bank slopes be kept clean and smooth.

Grass seeded on the bank slopes as a part of construction and also natural growth will help to stabilize the bank lines, but vegetal growth of all forms must be kept under control so as not to cause an obstruction to flow. Periodic mowing and possibly selective poisoning would be satisfactory bank slope maintenance.

Large sediment loads are not expected from this watershed, but there is a constant redistribution from upstream of sand, gravel, and rock which are likely to be deposited in the improved reaches during flood recessions. If and when such deposits become compacted

and occupy an appreciable amount of the flow area, they must be removed to restore the effectiveness of the works.

Maintenance of the improved channel will be an agreed responsibility of the city of Sevierville.

Flood Plain Regulations

The proposed channel improvement work will be effective in providing the planned degree of flood relief and will limit residual flood damages to those given in this report only so long as future developments are properly planned, located, and built. This can be achieved through adoption and enforcement of local flood plain regulations which establish safe building floor elevations and prohibit buildings, fills, and other obstructions that would unduly restrict the flow carrying ability of the channels and a reasonable bordering floodway.

For these reasons the proposed plan is recommended for construction only if agreements can be reached which will assure that flood plain regulations compatible with the plan will be adopted. Toward this objective TVA will provide technical assistance needed to adapt existing or new regulations to the improved channels. This assistance would include engineering computations to fix dimensions of a floodway and minimum building floor elevations. Both TVA and state planners are available to assist in the preparation and adoption of comprehensive flood plain regulations by the city.

Floodproofing

Some existing buildings and most new buildings can be rendered externally watertight against reasonable depths of flooding by means of closures on all openings, waterproofing exposed surfaces, and structural measures to resist water pressure. Some 50 commercial structures and numerous houses on the flood plains at Sevierville are subject to infrequent damage in great floods which exceed that for which protection is provided by the proposed plan. Agreements with the city should include assurances that reasonable efforts will be made to stimulate practical amounts of floodproofing to minimize residual flood damages.

TVA will provide engineering assistance on methods and on levels to which floodproofing is advisable.

Future Expansion of Plans

Construction of channel improvements which provide flood relief for only the city of Sevierville would not prevent future provision of flood control to a broader area. Construction of any or all of the three multiple-purpose reservoirs described in the June 1964 feasibility report[1] would extend flood control along additional miles of stream, increase the degree of control in Sevierville, and provide shorelands and waters for a variety of recreation forms.

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1. "Sevierville and Sevier County, Tennessee - Flood Relief and Water Resource Development," No. 0-6439.

The economic feasibility of such a plan is continually threatened by expensive highways and other developments at damsites and in reservoir areas. If there is interest on the part of local people for broader flood relief and water resource development, they are advised to take any reasonable measures to preserve for future use the dam and reservoir sites described in engineering studies that have been furnished to the local Flood Study Committee through the Flood Control Work Group.

TVA would provide additional engineering assistance toward preparation of such broader plans.

BENEFITS

Total benefits that would result from construction of the channel improvement amount to $232,000 on an average annual basis. These benefits are made up of $142,000 from prevented flood damages, $66,000 from improved property values, and $24,000 from area redevelopment and secondary effects. Unappraised benefits would include possible prevention of loss of life in floods, a community and individual sense of well being and greater confidence in the future of the city and its development, and other intangible benefits.

Flood Reductions

The proposed improvement works would lower the $1.3 million March 12, 1963, flood within the developed parts of Sevierville more than 5 feet along the Little Pigeon River and more than 6 feet along the West Fork above the relocation. Because of the new position of the stream there is no simple basis for comparison of flood heights along the relocation. The lowering in developed areas is enough to put the flood within existing bank lines except in low areas which should be raised by filling with available spoil as a part of the project construction.

Virtually complete flood damage protection would be offered in floods as much as 15 percent greater in crest flow than that of 1963 even though some bank overflow would occur. Such a flood could be expected at average 60- to 70-year intervals.

As should be expected, flood reductions decrease as floods increase in size. The considerable broad overbank flows of extreme floods simply cannot be contained in an improved channel of practical width. The flood reduction capabilities of the proposed plan are shown in table 6 which compares reductions in the 1963, regional, and maximum probable floods.

Table 6

FLOOD HEIGHT REDUCTIONS DUE TO

PROPOSED CHANNEL IMPROVEMENT

Flood	Average Reduction, Feet	
	Little Pigeon River	West Fork
March 12, 1963	5.2	6.1
Regional	3.5	4.1
Maximum Probable	2.9	3.9

The heights of these floods and their relationship in the natural and regulated states are shown on the profile drawings, figures 9 and 10. It is noteworthy that the regional flood with a crest flow of 66,000 cfs at the Sevierville gage would be reduced in height to about the level of the 1963 flood which had a flow of 36,900 cfs.

Expected flood height reductions for all ranges of flood crests up to the maximum probable flood may be determined at the Sevierville stream gage from the rating curves of figure 21, applying to both existing and improved conditions.

Prevented Flood Damages

The proposed channel improvement would reduce flood damages in nearly all known floods to nominal amounts. The principal exception is the 1875 flood in which damages would be reduced $3.1 million but in which residual damages would still be $500,000.

By means of the damage curve and flood frequency distributions, average annual prevented damages are estimated to be $142,000. This is the difference between the total potential of $156,000 and the $14,000 residual expected to occur with the improvement. This is a reduction of more than 90 percent of the total potential damage. Damages with and without the improvement are shown in figure 22 for all floods which under existing conditions would cause damage of $200,000 or more. Prevented damage is represented by the cross-hatched area.

All potential damages and prevented damages are for values and state of development existing in 1962. General price indexes have since risen; so it is reasonable to assume that the estimated prevented damages used in this report are conservatively low.

Improved Property Values

The rough estimates of improved values to undeveloped property made for the 1963 feasibility studies were later appraised in detail to include both developed and undeveloped property for

use in the 1964 feasibility plan of comprehensive water resource development. These recent values remain unchanged and are also used in this planning report. Present worth of the appraised increase in values resulting from providing flood relief totals $2,165,000. This sum reduced for some overlap with prevented damages converts to a $66,000 annual equivalent.

Redevelopment and Secondary

Combined redevelopment and secondary benefits amount to $24,000.

Redevelopment--Benefits accrue to an area when the construction phase and/or operation and maintenance phase employ formerly unemployed and underemployed resources. The major unemployed or underemployed resource of an area normally is labor; but local materials needed for project construction, operation, and maintenance can also be unemployed resources. Sevier County is an area of substantial persistent unemployment.

Based in part on the Beech River project experience, total wage payment to local workers is estimated to be 29 percent of the total project cost. Also, this wage payment is divided among skilled, semi-skilled, and unskilled workers in the approximate amounts of 40 percent, 15 percent, and 45 percent respectively. For the estimated total project cost of $2,700,000, the bill for local labor will be about $780,000. Assuming that 20 percent of the skilled, 33 percent of the semi-skilled, and

50 percent of the unskilled locally employed labor would have been unemployed or underemployed, the wage component to this local group would be $280,000. This benefit based on a 100-year project life and a capital recovery factor of 3-1/8 percent converts to an annual value of $9,100 for redevelopment benefits.

Because of the uncertainties concerning the use of local materials for the project and future long-range unemployment rates, redevelopment benefits resulting from use of local material and from operation and maintenance are not included in the analysis.

Secondary--Any increased income and expenditures in a given area create a multiple turnover of new money in the region's economy. The estimated first-round increases in secondary activity in the watershed resulting from beneficial consequences of the project are estimated to average about $149,000 annually. Based on a net income of 10 percent on this first-round increase, the resulting annual secondary benefit is about $14,900.

Statistical Summary

The individual annual benefits and their $232,000 total are given in the benefit-cost comparison of table 8.

PROJECT COST

Estimated project costs for the channel improvement totaling $2,700,000 are given by items and accounts in table 7. This exceeds by 11 percent the $2,440,000 estimated for the 1963 feasibility report for the same plan due to general cost increases, more complete information concerning utility relocations, and improved accuracy of the estimates.

Annual Costs

Amortization charges on all project costs including land amount to $89,000 using a 100-year project life and 3-1/8 percent interest. Annual operation and maintenance costs are estimated to be $5,000, bringing total annual costs to $94,000.

Estimated operation and maintenance costs are broken down as follows:

Item	Annual Cost
Periodic inspection	$ 400
Minor repairs and removal of deposits (equipment and labor)	2,400
Mowing bank slopes (six times per year, equipment and labor)	1,200
Infrequent major repairs	1,000
Total	$5,000

Annual costs are given in the economic comparison of table 8.

Table 7

ESTIMATED COSTS

Account Number	Item	Quantity	Unit	Price	Amount	Total
20	LAND AND LANDRIGHTS					
200	Purchase Price of Land and Acquisition					
	Landrights for channel and 10-foot maintenance strip	75.7	Acre	Varies	$ 103,000	
	Construction easement, 30 feet		LS		43,000	
	Buildings and improvements		LS		65,000	
	Road right-of-way	2.1	Acre	Varies	18,000	
	Contingency		LS		26,000	
	Acquisition cost		LS		55,000	
	Remove dam		LS		10,000	
	Remove other structures		LS		15,000	
	Remove railroad tracks		LS		2,000	
	TOTAL PURCHASE PRICE OF LAND AND ACQUISITION				$ 337.000	
204	Relocating Highways		LS		$ 36,000	
207	Relocating and Protecting Other Structures and Improvements					
	Relocate - Gaslines		LS		$ 25,000	
	- Sewerlines		LS		40,000	
	- Power and telephone lines		LS		2,000	
	- Gage station		LS		10,000	
	Bridge abutment and pier protection		LS		25,000	
	Rework footbridge		LS		1,000	
	TOTAL RELOCATING AND PROTECTING OTHER STRUCTURES AND IMPROVEMENTS				$ 103,000	
	TOTAL LAND AND LANDRIGHTS					$ 476.000
22	RESERVOIRS, DAMS, AND WATERWAYS					
228	Channel Improvements					
	Clearing and grubbing		LS		$ 50,000	
	Excavation - Earth	1,005,850	cy	$ 1.20	1,207,000	
	- Rock	8,390	cy	10	84,000	
	Dewatering		LS		10,000	
	Seeding		LS		4,000	
	TOTAL CHANNEL IMPROVEMENTS				$1,355,000	
	TOTAL RESERVOIRS, DAMS, AND WATERWAYS					1,355,000
	TOTAL DIRECT COST					$1,831,000
	GENERAL EXPENSE					
	Construction - Distributable		LS		$ 89,000	
	- Field general		LS		150,000	
	Design		LS		90,000	
	Law		LS		10,000	
	Water Control Planning		LS		140,000	
	Administrative and General		LS		70,000	
	General Construction and Operation		LS		80,000	
	TOTAL GENERAL EXPENSE					$ 629,000
	CONTINGENCY ALLOWANCE				$ 240,000	240,000
	TOTAL PROJECT COST					$2,700,000

ECONOMIC ANALYSIS

Total annual project benefits for the recommended plan of channel improvement amounting to $232,000 exceed total annual costs of $94,000 giving net benefits of $138,000 and a benefit-cost ratio of 2.5. The capital and annual costs are compared with resulting benefits in table 8. On the basis of these comparisons the proposed project is economically feasible by a wide margin.

Table 8

AVERAGE ANNUAL CHARGES AND BENEFITS

(3-1/8 Percent, 100 Years)

Total Capital Cost	$2,700,000
Average Annual Charges	
Amortization of Project Costs	$ 89,000
Maintenance	5,000
Total Annual Charges	$ 94,000
Average Annual Benefits	
Prevented Flood Damage	$ 142,000
Improved Land Values	66,000
Redevelopment and Secondary	24,000
Total Annual Benefits	$ 232,000
Ratio of Annual Benefits to Annual Charges	2.5
Net Annual Benefits	$ 138,000

CONCLUSIONS

1. Under existing conditions flooding in Sevierville occurs from overflow of the Little Pigeon River and its West Fork at average 2-year intervals with estimated annual damage potential of $156,000. Five floods of record would today cause damages ranging from $1,300,000 to $3,600,000. Damage in the maximum probable flood would be $6,600,000.

2. A plan of channel enlargement and relocation beginning 1.8 miles below Sevierville and extending upstream 2.8 miles on the Little Pigeon River and 1.2 miles on its West Fork will reduce known floods by 5 to 6 feet and the maximum probable flood by 3 to 4 feet, will eliminate over 90 percent of the potential flood damages, and will provide improved property and other benefits at a cost of $2,700,000.

3. Annual benefits of the channel improvement amounting to $232,000 exceed annual costs of $94,000 by $138,000 in net benefits and give a benefit-cost ratio of 2.5.

4. This plan limited to channel improvement for Sevierville has been considered and compared by local leaders with a more comprehensive, multiple-use reservoir plan. A preference has been expressed for the more limited plan as best serving immediate needs.

5. Construction of the channel improvements will not prevent future construction of the more complete multiple-use plan.

6. Construction of the channel improvement project is recommended subject to satisfactory agreements whereby the city of Sevierville will share costs and accept responsibility to maintain the complete project, adopt compatible flood plain regulations, and encourage floodproofing.

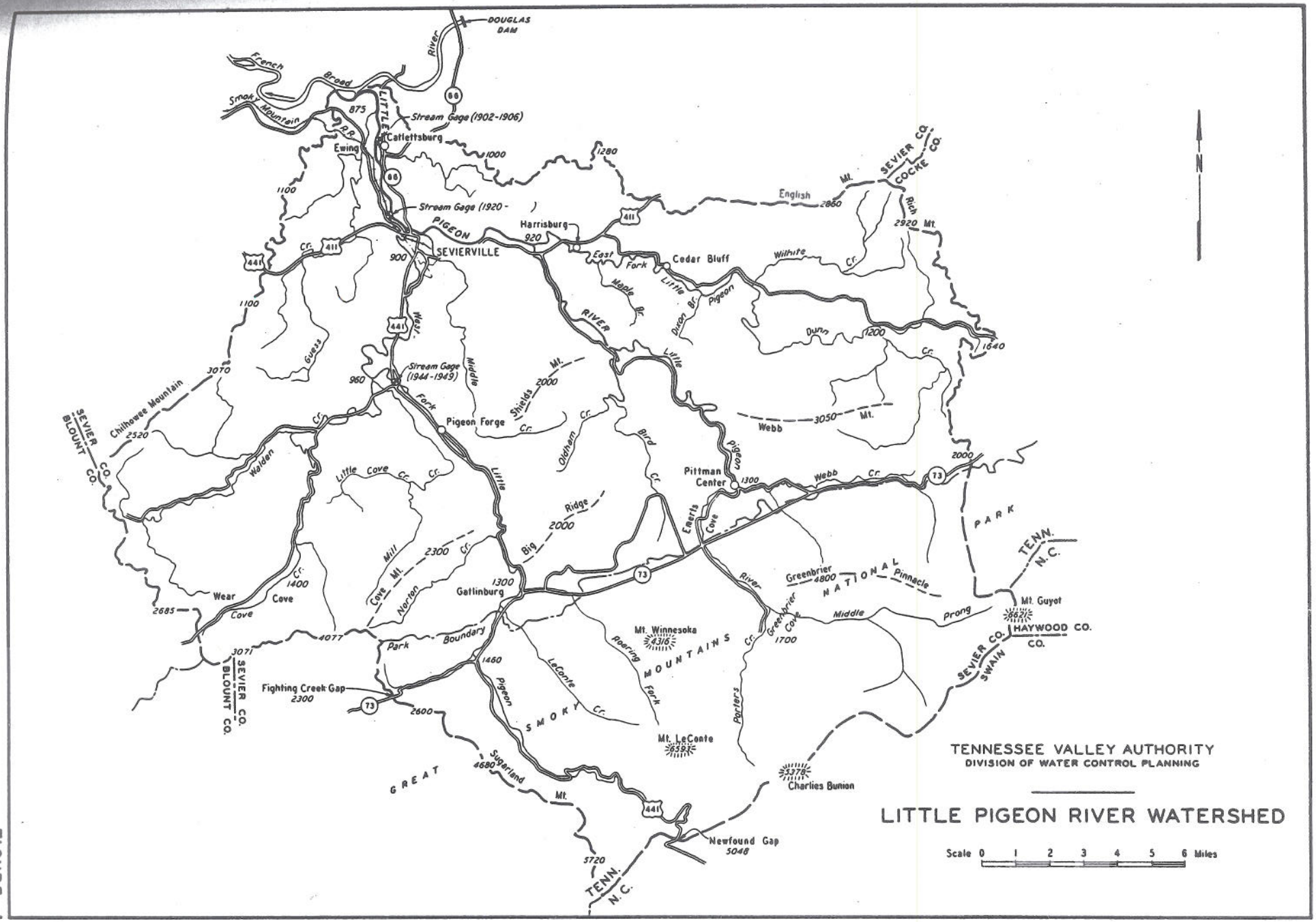
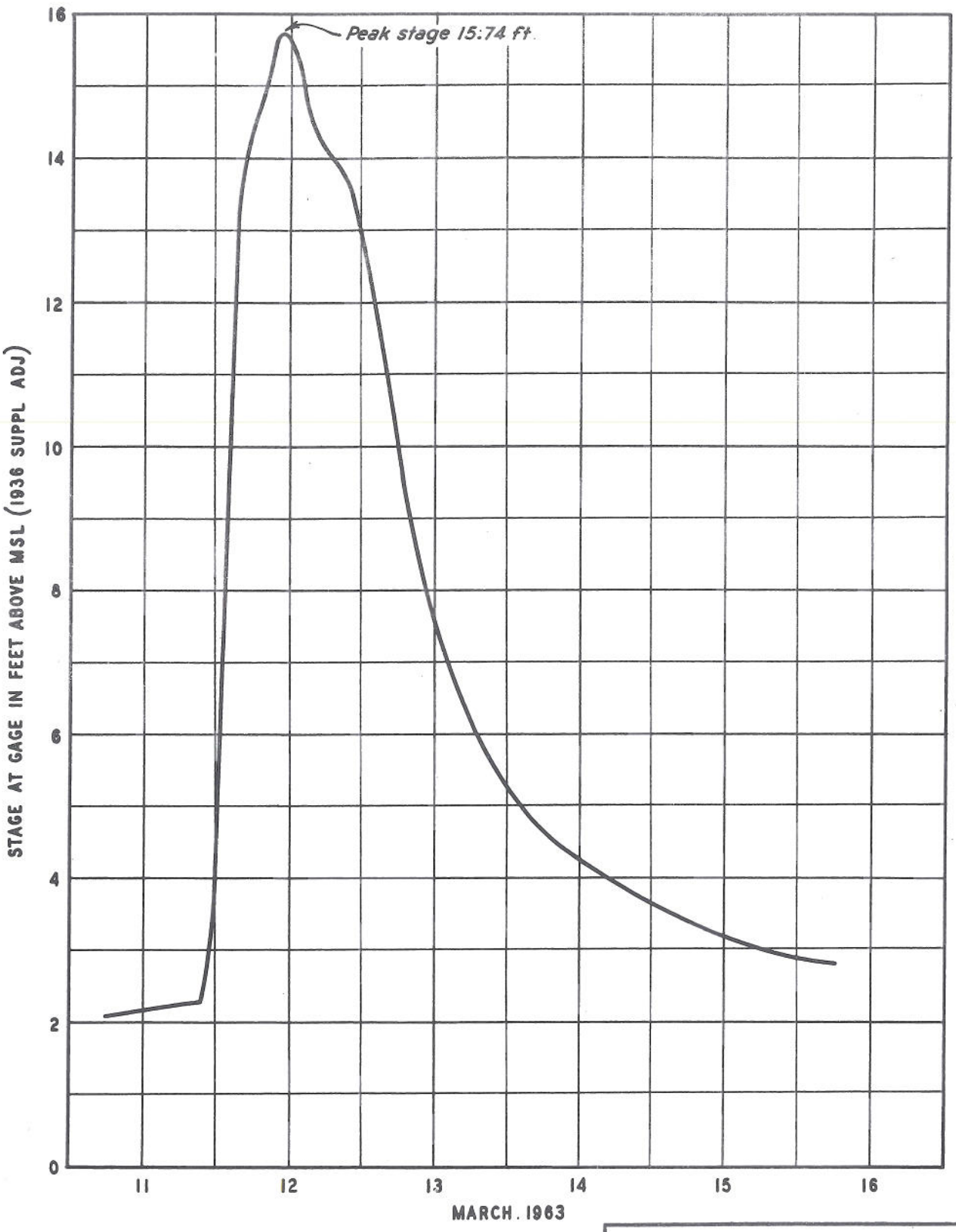

DOUGLAS DAM
French Broad River
Smoky Mountain
875
LITTLE
Stream Gage (1902-1906)
Catlettsburg
Ewing
66
1000
1280
1100
Stream Gage (1920-
PIGEON
Harrisburg
920
411
English Mt.
2860
SEVIER CO.
COCKE CO.
Rich Mt.
2920
441
Cr.
411
900
SEVIERVILLE
East Fork
Cedar Bluff
Wilhite Cr.
Maple Br.
Little Duran Br.
Pigeon
RIVER
1100
Dunn Cr.
1200
1640
Guess
Chilhowee Mountain
3070
Stream Gage (1944-1949)
960
Middle Fork
Shields Mt.
2000
Pigeon Forge
Cr.
Oldham Cr.
Bird Cr.
Little Pigeon
Webb Mt.
3050
SEVIER CO.
BLOUNT CO.
2520
Walden Cr.
Little Cove Cr.
Cr.
Pittman Center
1300
Webb Cr.
73
2000
Ridge
2000
Mill Cr.
2300
Big Cove Mt.
Eagle Cove
PARK
TENN.
N.C.
Wear Cove
Cove Cr.
1400
Norton Cr.
1300
Gatlinburg
River
Greenbrier Cove
Greenbrier
4800
NATIONAL Pinnacle
Mt. Guyot
6621
2685
4077
Park Boundary
Mt. Winnesoka
4316
Roaring Fork
Middle Prong
HAYWOOD CO.
SEVIER CO.
SWAIN CO.
3071
SEVIER CO.
BLOUNT CO.
Fighting Creek Gap
2300
73
2600
1460
Pigeon
LeConte Cr.
SMOKY MOUNTAINS
Mt. LeConte
6593
Porters Cr.
1700
GREAT
Sugarland Mt.
4680
5378
Charlies Bunion
441
Newfound Gap
5048
5720
TENN.
N.C.
N
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
LITTLE PIGEON RIVER WATERSHED
Scale 0 1 2 3 4 5 6 Miles

FIGURE 1



Gage zero - Elevation 881.44

LITTLE PIGEON RIVER - MILE 4.53

STAGE HYDROGRAPH FLOOD OF MARCH 12, 1963

SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bevan Brown	Bob Buchler	R.Q. Elliott

KNOXVILLE	5-20-63	W	FC	1	311A312

REV. NO.	DATE	MADE	CHKD	SUPV	INSP
DRWN L.A.G.					
TRCD W.H.O.					
CHKD					

COMPUTED L.R.H.
ENGINEER L.A.G.

FCB 69-27.13

FIGURE 2

View southeast on Joy Street toward Park Road. The picture was taken after the crest, but water has receded very little.

North along Park Road from Joy Street toward Main. Water has fallen a foot since the crest.

Rescue squad in action at Ingle Motel, Park Road and Main Street, several hours after crest. Water has receded about 1 foot.

FIGURE 4

Bruce Street southeast from intersection of Court Avenue, 5 to 6 hours after crest.

Court Street north toward Main Street, with courthouse lawn at left. Flood had receded about 2 feet in the 4 to 5 hours since the crest.

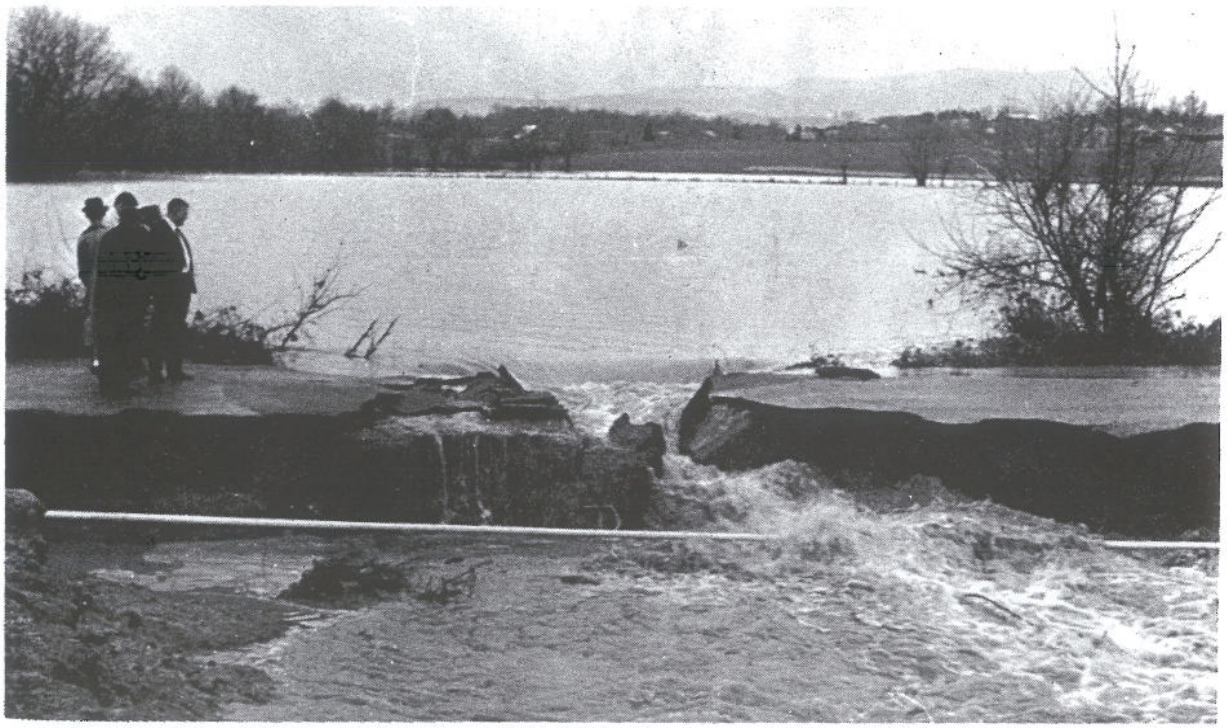
FIGURE 5

Rear of C. Davis Motor Company building, which fronts on Main Street. Floodwater is 3 feet below crest level. The Little Pigeon River channel is in background.

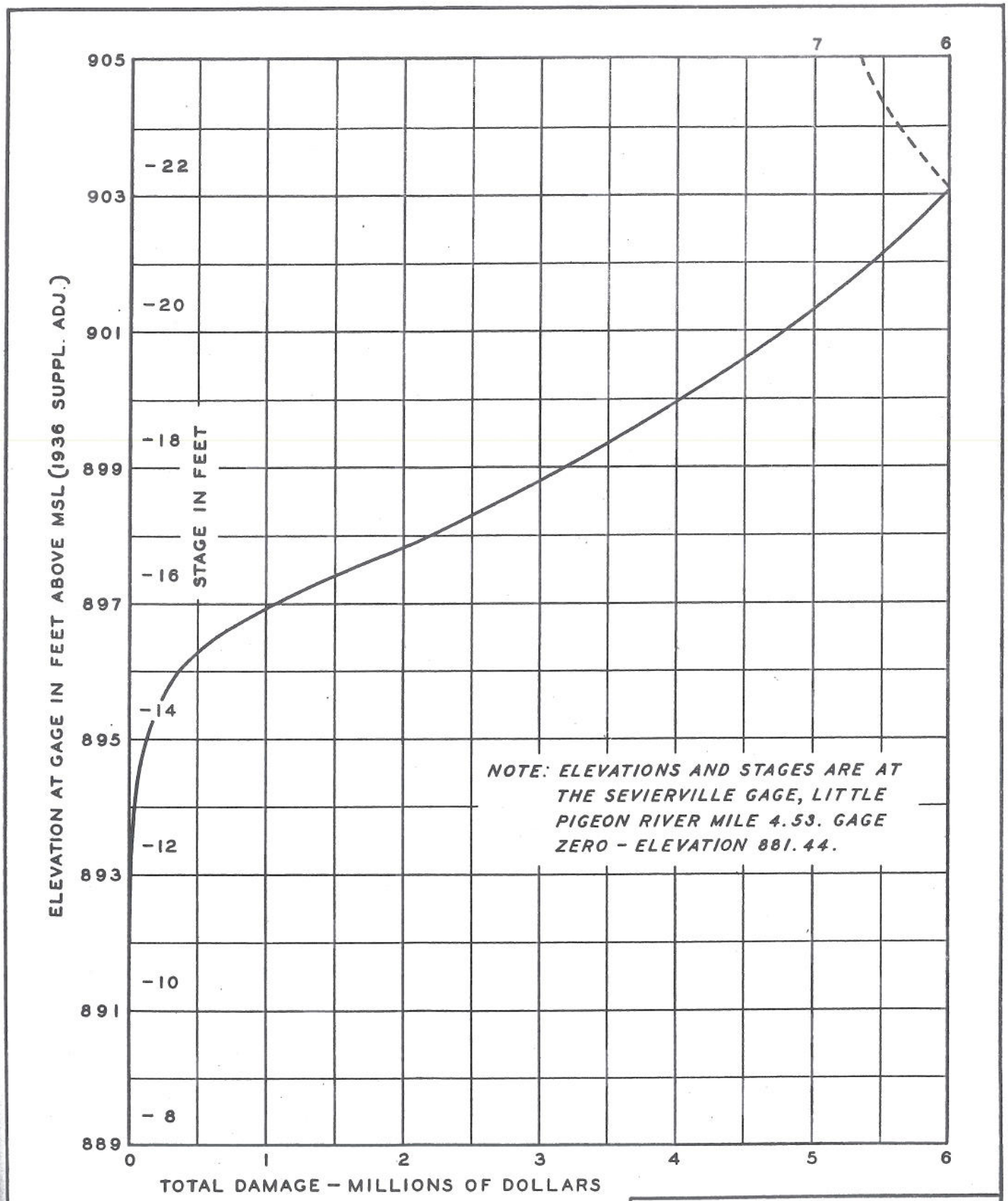
View is east on Nichols Street in the Love Addition.

FIGURE 6

View looking west at floodwater of West Fork Little Pigeon River crossing Hardin Lane about an hour after crest.



View south across Hardin Lane just after failure of the roadway, about 5 hours after flood crest.



LITTLE PIGEON RIVER AND W. FORK

POTENTIAL FLOOD DAMAGE STATUS OF 1962

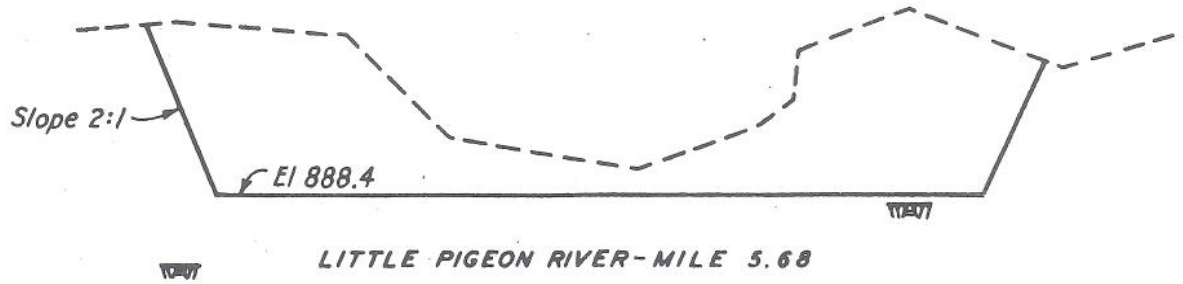
SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
E&W Reed	Bob Bushler	R.G. Elbert

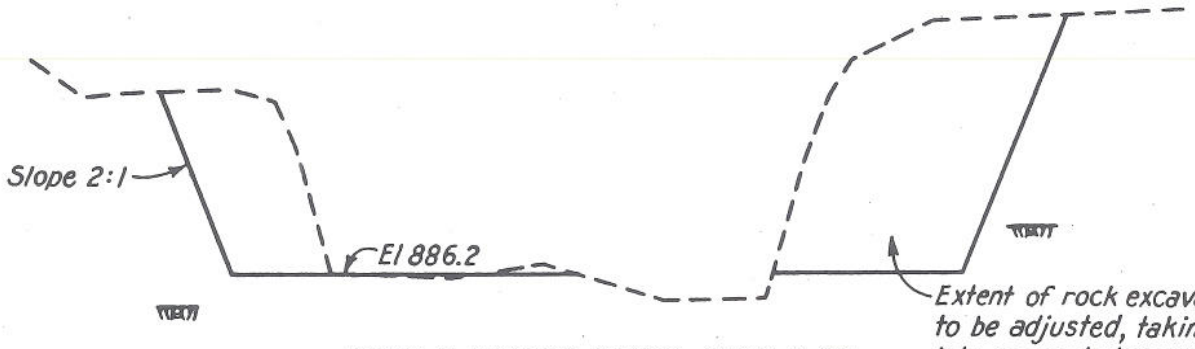
KNOXVILLE	4-17-63	W	FC	1	311A307

REV NO.	DATE	MADE	CHKD	SUPV	INSP
DRWN		COMPUTED			
TRCD D.C.W.		ENGINEER			
CHKD					

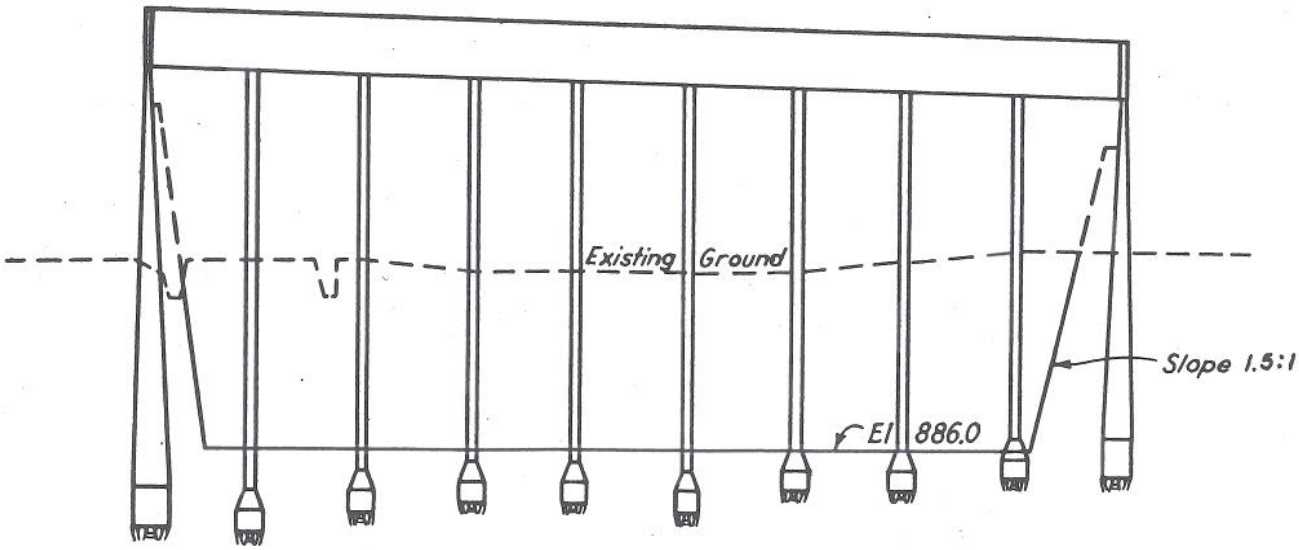
FCB 69-27 08



LITTLE PIGEON RIVER - MILE 5.68



LITTLE PIGEON RIVER - MILE 5.29



US HWY. 411 & 441 BRIDGE

Rock

Scale: Horizontal 1" = 50'
Verticle 1" = 10'

REV NO.	DATE	MADE	CHKD	SUPV	INSP

DRWN ..... COMPUTED .....
TRCD VRL ENGINEER .....
CHKD ..... L.A.G.

LITTLE PIGEON RIVER & W. FORK

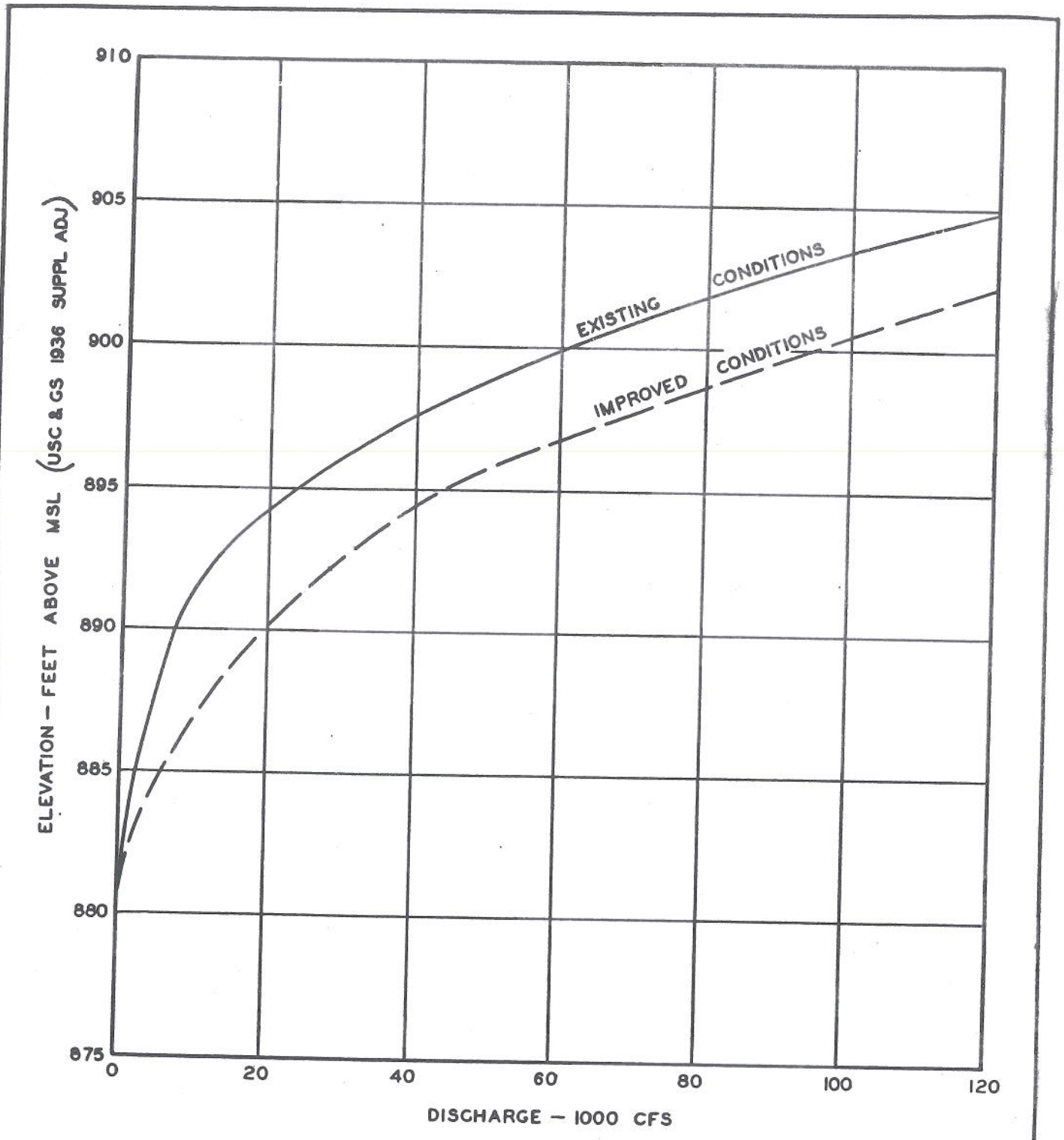
SELECTED CROSS SECTIONS IMPROVEMENT PLAN

SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bevan Brown	Bob Buehler	R.A. Bell

KNOXVILLE	8-31-63	W.	FC	1	311A317

FCR 69-27 29



REV NO.	DATE	MADE	CHKD	SUPV	INSP

DRWN
TRCD
CHKD
COMPUTED L.R.H.
ENGINEER L.A.G.

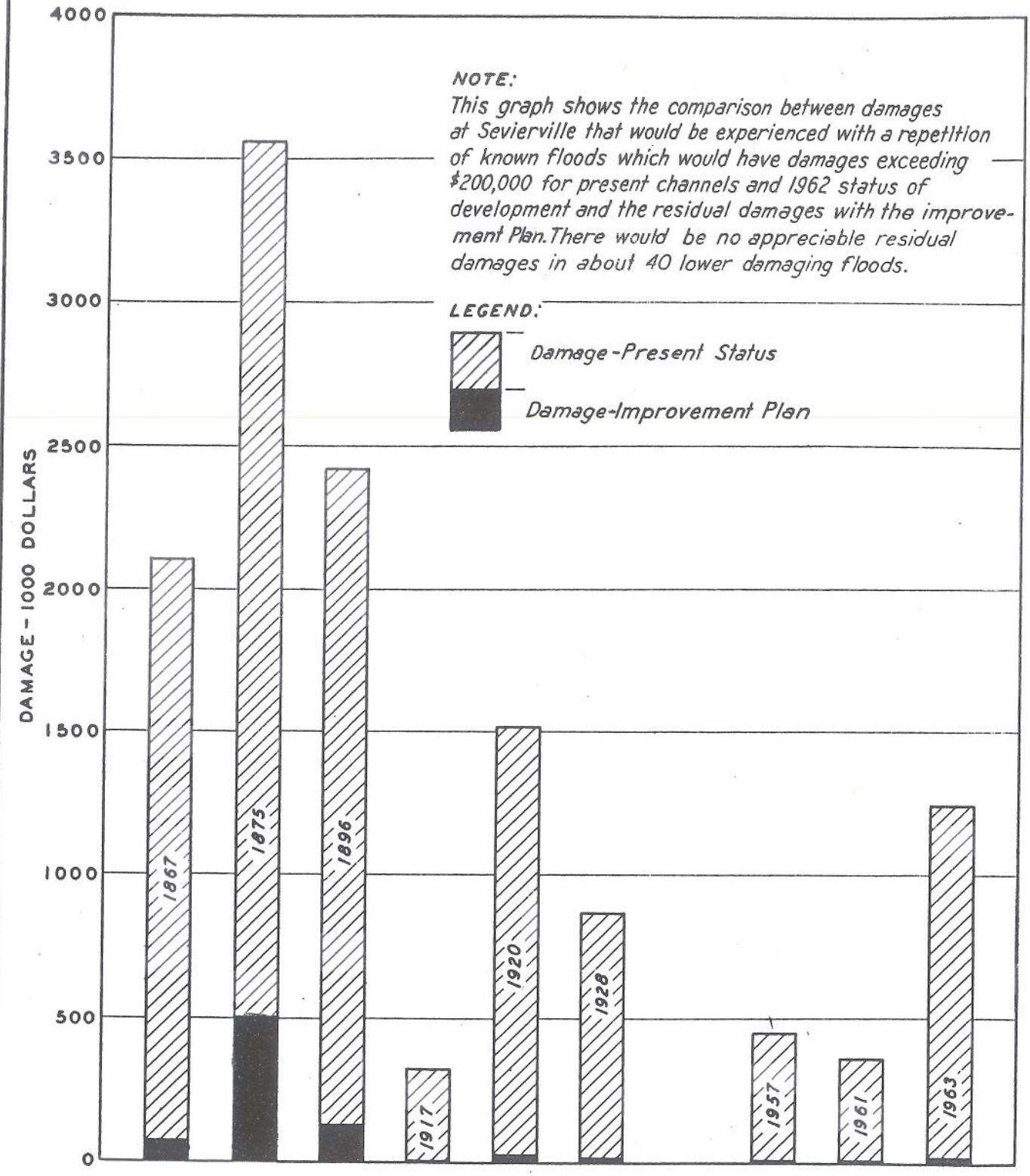
LITTLE PIGEON RIVER – MILE 4.53

GAGE RATING CURVES EXISTING AND IMPROVED CONDITIONS

SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bevan Brown	Bob Buehler	K. W. Greene

KNOXVILLE | 9-11-64 | W FC | 1 | 312A54



REV NO.	DATE	MADE	CHKD	SUPV	INSP
	4-11-63	LAG			
	Note & Legend				

DRWN ____ COMPUTED ____
TRCD RHL ENGINEER L.A.G.
CHKD ____

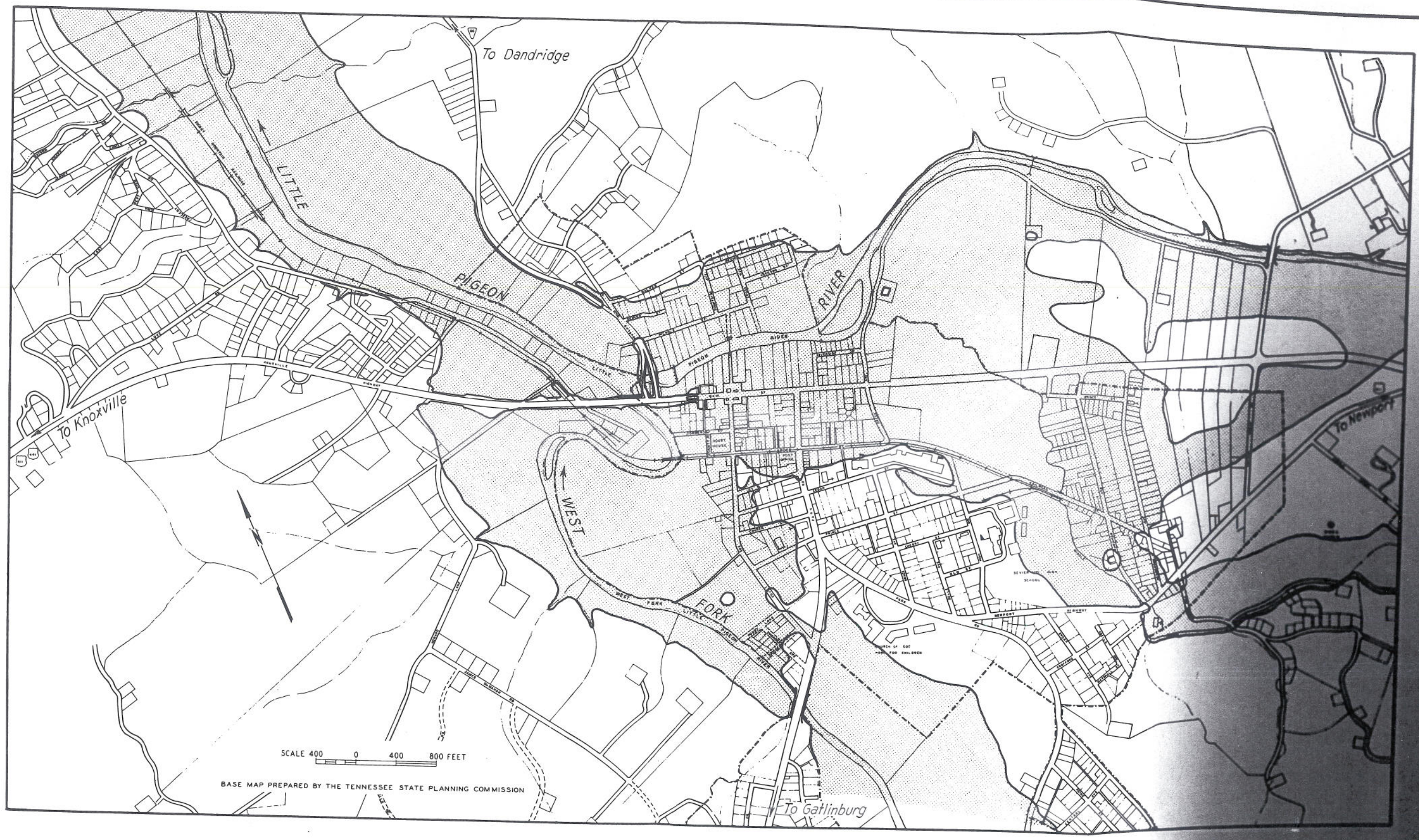
LITTLE PIGEON RIVER AND W. FORK

POTENTIAL DAMAGES FOR SELECTED FLOODS

SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Below Brown	Bob Bueller	R.A. Elliott

KNOXVILLE | 6-7-63 | W | FC | 1 | 311A322R1



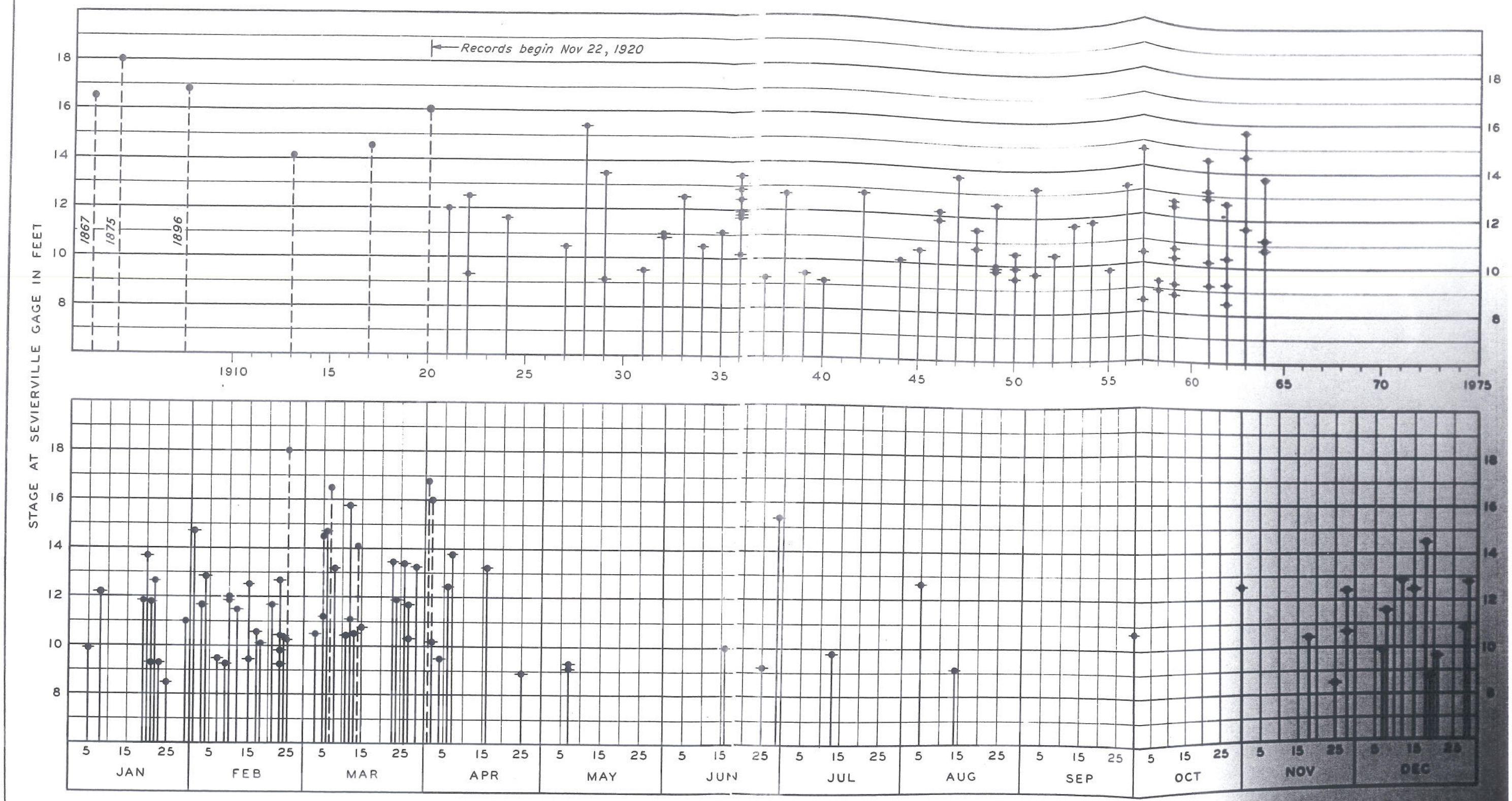
REV NO	DATE	MADE	CHKD	SUPV	INSP
DRWN		COMPUTED			
TRCD		L. R. H.			
CHKD		ENGINEER			
		L. A. G.			

FCB 69-27.12

LITTLE PIGEON RIVER & W. FK.

AREA FLOODED BY MARCH 12, 1963 FLOOD

SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY



Drainage Area - 353 sq mi
Gage Zero - El 881.44 (1936 Supp Adj)
Bankfull Stage - 8.5 feet

NOTES:
Stages since November 22, 1920 are crests from USGS recording gage at the present site and datum. Earlier crest stages have been estimated by Hydraulic Data Branch from high water marks or other historical information. Reported crests are indicated thus, ●.

REV NO	DATE	MADE	CHKD	SUPV	INSP
DRWN		COMPUTED L.R.H.			
TRCD WHO		ENGINEER L.A.G.			
CHKD					

LITTLE PIGEON RIVER - MILE A 33

DISTRIBUTION OF FLOOD AT SEVIERVILLE, TENN.

FLOOD CONTROL BRANCH TENNESSEE VALLEY AUTHORITY

LEGEND:
Rock probing
L Left bank
R Right bank
Existing Conditions
Improved Conditions

MAXIMUM PROBABLE FLOOD
MAXIMUM PROBABLE FLOOD
REGIONAL FLOOD
REGIONAL FLOOD
MARCH 12, 1963 FLOOD
MARCH 12, 1963 FLOOD
APPROXIMATE EXISTING TOP OF BANK
ADOPTED CHANNEL GRADE
APPROXIMATE STREAM BED

USGS Stream Gage
Relocated W. Fork
Existing W. Fk. Little Pigeon R
Old Tenn Hwy 66
New Tenn Hwy 66
Sevierville Mill Dam
Middle Creek

ELEVATION IN FEET (USC & GS 1936 SUPPL ADJ)
910
906
902
898
894
890
886
882
878
874
870
3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2
5.4 5.6 5.8
MILES ABOVE MOUTH

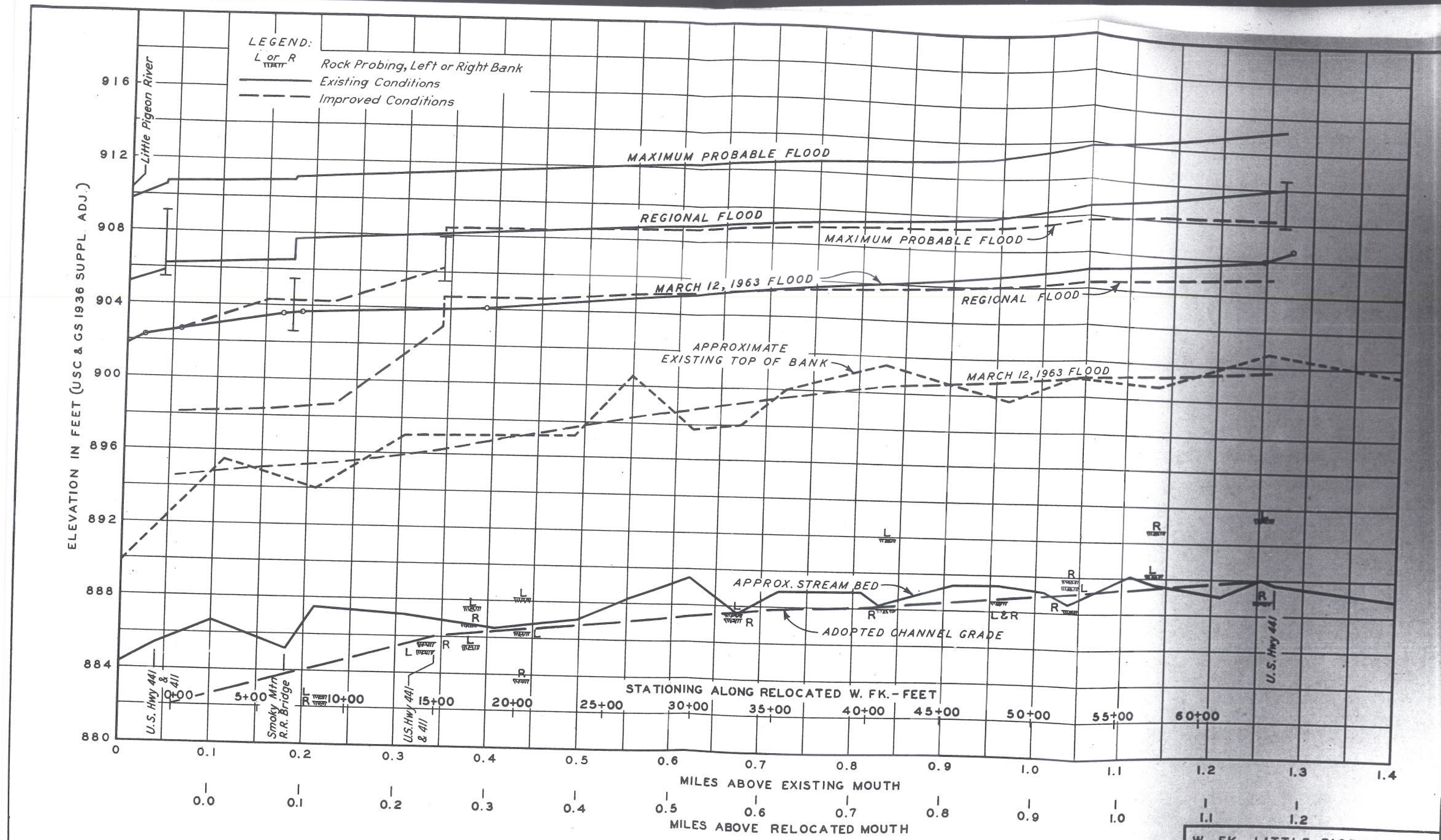
REV NO.	DATE	MADE	CHKD	SUPV	INSP
DRWN TRCD DCW		COMPUTED L.E.H.			
CHKD		ENGINEER L.A.G.			

ECB 69 - 2756

LITTLE PIGEON RIVER
HIGH WATER PROFILES EXISTING & IMPROVED CONDITIONS
SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
KNOXVILLE	5-20-69	31183 44

FIGURE 9



REV NO.	DATE	MADE	CHKD	SUPV	INSP
DRWN		COMPUTED			
TRCD DCW		L.R.H.			
CHKD		ENGINEER L.A.G.			

FCB 69 - 27 57

W. FK. LITTLE PIGEON RIVER

HIGH WATER PROFILES EXISTING & IMPROVED CONDITIONS

SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bevan Brown	Bob Burton	Pasquill

LEGEND:

RELOCATED AND ENLARGED CHANNEL

EXISTING CHANNEL TO BE FILLED

UPPER LIMIT CHANNEL WORK

LOWER LIMIT CHANNEL WORK

FILL OLD CHANNEL

CHANNEL RELOCATION

Relocated roads

SEVIERVILLE

LITTLE PIGEON RIVER

W. FORK LITTLE PIGEON RIVER

Smoky Mountain Railroad

To Dandridge

To Newport

To Gatlinburg

To Knoxville

City Limit

Middle Creek

Creek

Hardin Lane

M0 M1 M2 M3 M4 M5 M6

FIGURE 14

FIGURE 15

FIGURE 16

FIGURE 17

FIGURE 18

FIGURE 19

FIGURE 20

66 411 441

Walker St. Sevier St. Nichols St. E. Main St. Court St. County Ave. Joy St. Cedar Ave. Church St. Park Ave. Prince St. Grace St. Cherry St. Belle Ave. High Ave. Emert Ave. Creek Ave. Broad St. Road

Scale 1000 0 1000 2000 Feet

REV NO	DATE	MADE	CHKD	SUPV	INSP
	9-12-61	LAG			
	General Revision				

DRWN ..... COMPUTED

TRCD RHL ENGINEER L.A.G.

CHKD .....

FCR 60-27375

LITTLE PIGEON RIVER AND W. FORK

IMPROVEMENT PLAN

SEVIERVILLE, TENN.
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bevan Brown	Bob Budlin	Rufus Ellicott

LEGEND:

Channel Bottom — Top of cut

Rock Probing

NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT FROM PHOTOGRAPHY DATED 2-20-62.

LITTLE PIGEON

W.S. 889.20 (2-20-62)

REV NO.	DATE	MADE	CHKD	SUPV	INSP
DRWN		COMPUTED			
TRCD		L.M.R. G.D.S.			
CHKD		ENGINEER			
		L.A.G.			

MATCH LINE

FLOW

RIVER

RIVER GAGING STA

TANK

TANKS

PIPES

PARKING

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FORK

IMPROVEMENT PLAN

SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED

LEGEND:

Channel Bottom — Top of cut

Rock Probing

TE:

TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT FROM PHOTOGRAPHY DATED 2-20-62.

MATCH LINE

PIGEON RIVER

FLOW

WEST FORK CHANNEL

SEE FIGURE 18

RELOCATION

RELOCATED ROAD

ROAD AND RAILROAD TO BE CLOSED

SEWER MH

ELECTRIC

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FO

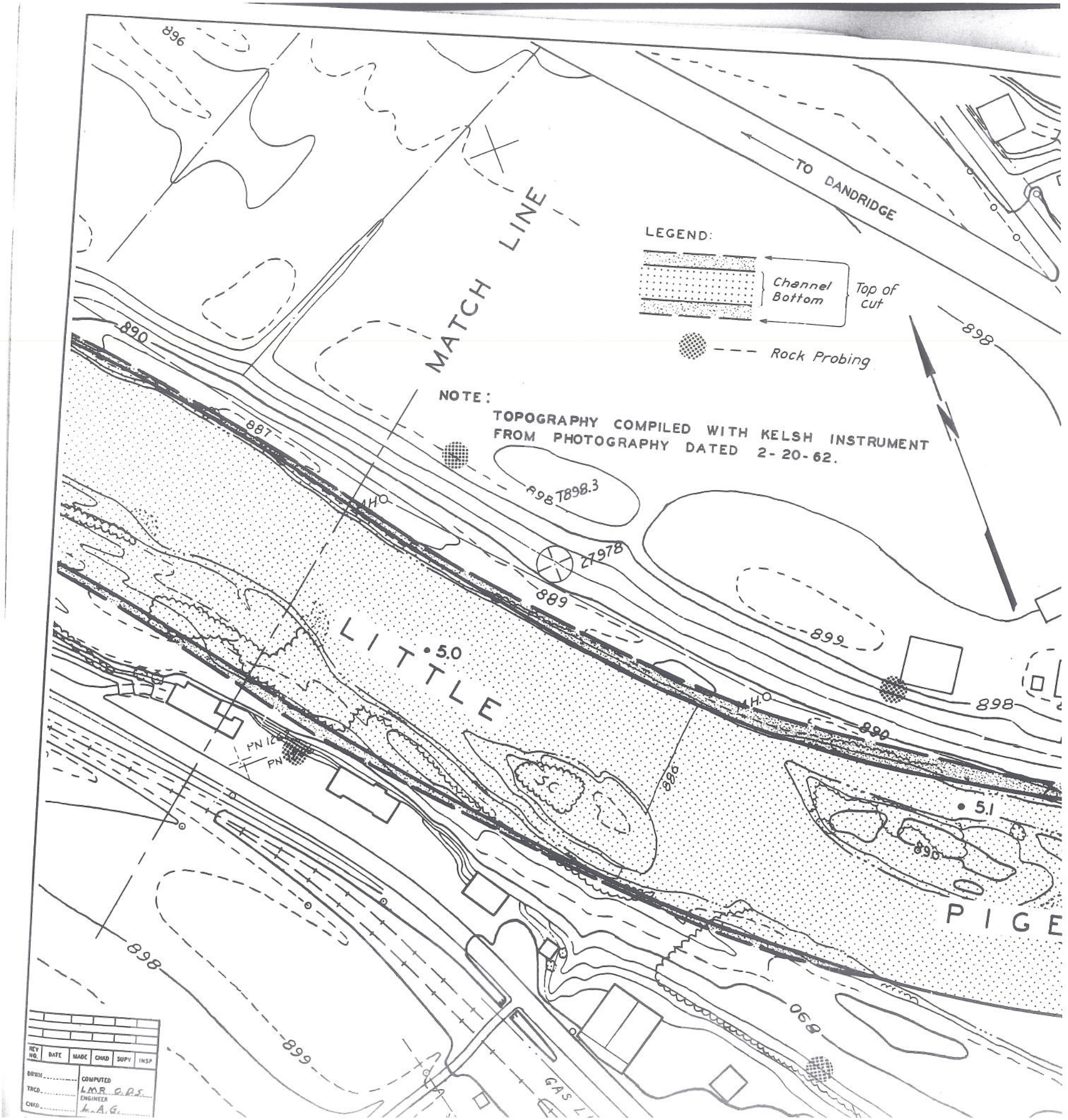
IMPROVEMENT PLAN

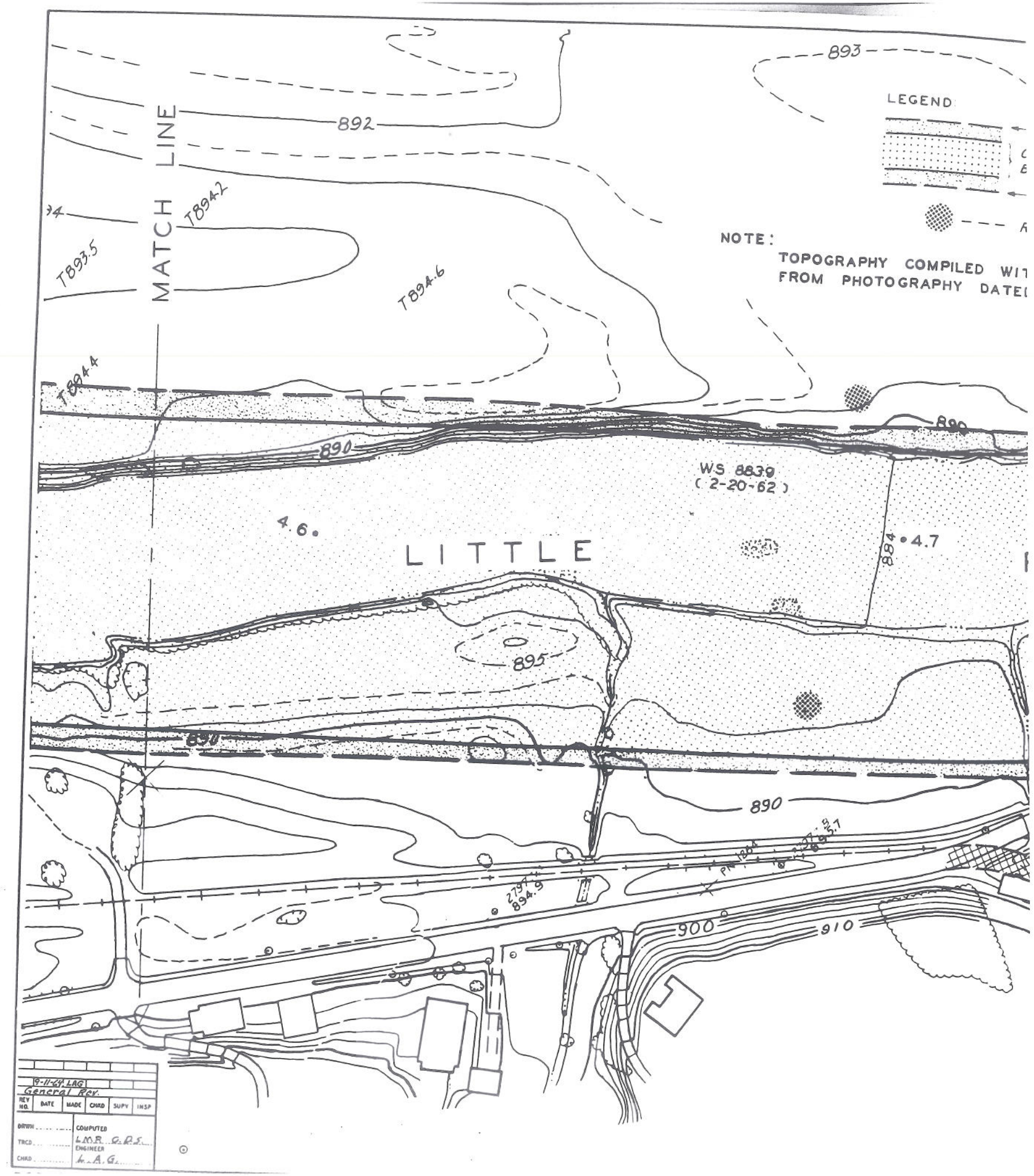
SEVIERVILLE, TENNESSEE

TENNESSEE VALLEY AUTHORITY

DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Brown	Bob Buchler	


896
MATCH LINE
TO DANDRIDGE
LEGEND:
Channel Bottom
Top of cut
Rock Probing
NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT FROM PHOTOGRAPHY DATED 2-20-62.
890
887
898
898.3
897.8
889
899
LITTLE
5.0
5.1
PN 12
PN
SC
898
890
899
898
890
PIGE
REV NO.
DATE
MADE
CHKD
SUPV
INSP
DRWN
TRCD.
CHKD.
COMPUTED
LMR G.D.S.
ENGINEER
L. A. G.


MATCH LINE
T8942
T8935
T8946
T8944
893
892
890
LEGEND
NOTE:
TOPOGRAPHY COMPILED WIT
FROM PHOTOGRAPHY DATE
WS 8839
(2-20-62)
4.6.
LITTLE
884•4.7
895
890
900
910
9-11-62 LAG
General Rev.
REV NO.
DATE
MADE
CHKD
SUPV
INSP
DRWN
COMPUTED
L.M.R. O.R.S.
TRCD
ENGINEER
CHKD
L.A.G.

TO DANDRIDGE

hannel / ottom — Top of cut

ock Probing

ELSH INSTRUMENT
20-62.

898

T-CABLE TELEPHONE

4-WIRE ELECTRIC

899

27979B
898.9

T897.6

T897.0

PN 1305

MATCH LINE

PN 1307

900

901

T901.0

WS 893.2
(2-20-62)

• 5.4

Footbridge

FLOW

RIVER

WS T893.2 • 5.3

MILL DAM TO BE REMOVED

PIGEON

• 5.1

• 5.2

STATE 66

Parking Area

Parking Area

PN 1309 Sidewalk

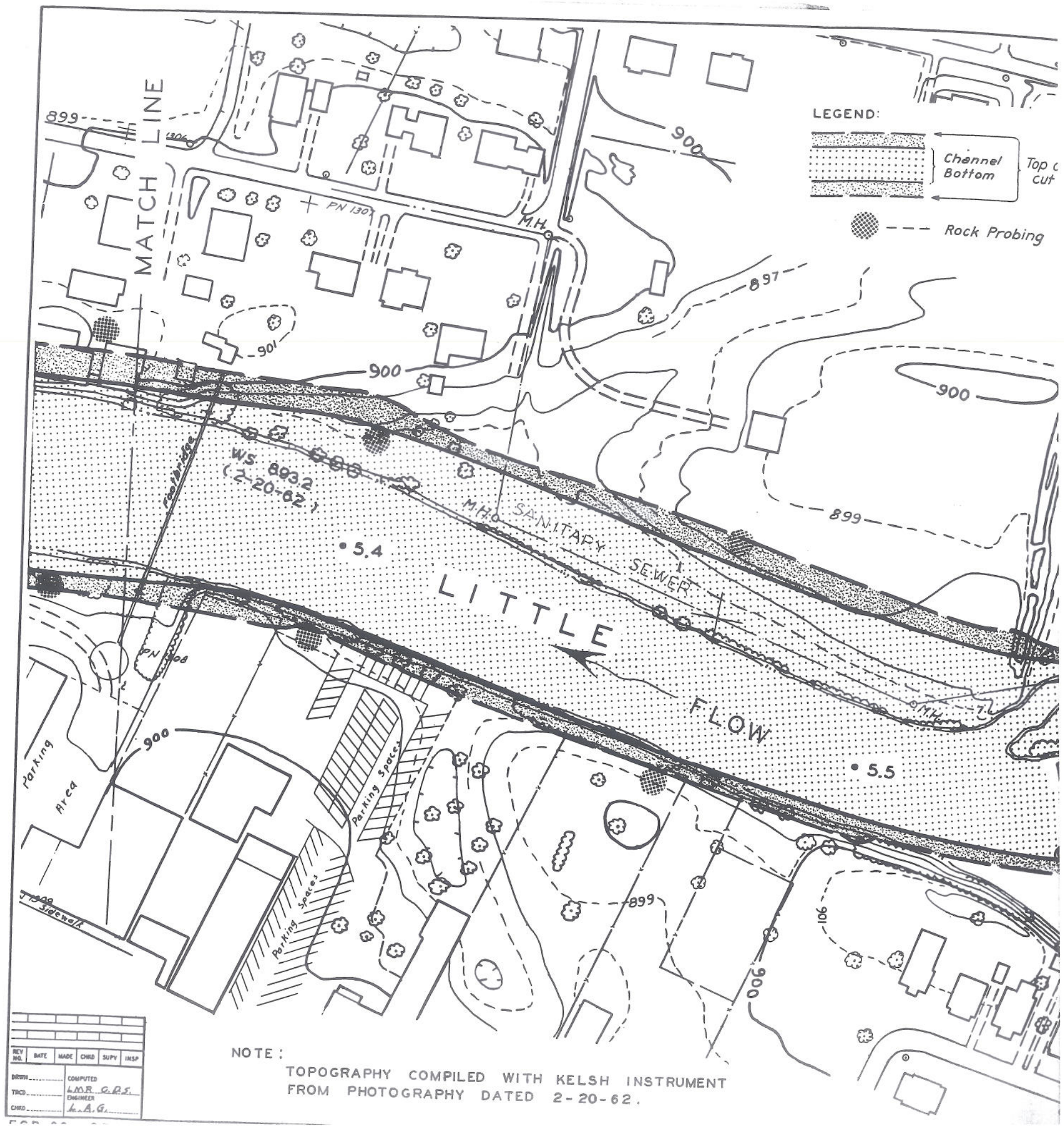
Sidewalk

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FORK

IMPROVEMENT PLAN

SEVIERVILLE, TENNESSEE


LEGEND:
Channel Bottom
Top of cut
Rock Probing
MATCH LINE
899
900
897
901
PN 130
M.H.
W.S. 893.2 (2-20-62)
M.H.
SANITARY SEWER
5.4
LITTLE FLOW
5.5
PN 108
Parking Area
Parking Spaces
Parking Spaces
Parking Spaces
Sidewalk
899
900
106
900
NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT
FROM PHOTOGRAPHY DATED 2-20-62.
REV NO. | DATE | MADE | CHKD | SUPV | INSP
DRWN
COMPUTED L.M.R. G.P.S.
TRCD
ENGINEER L.A.G.
CHKD

LEGEND:

Channel Bottom — Top of cut

Rock Probing

PIGEON RIVER

MIDDLE CREEK

Footbridge

T 898.8

27980 B 903.9

28009 A 898.6

PN 1269

M.H.

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FORK

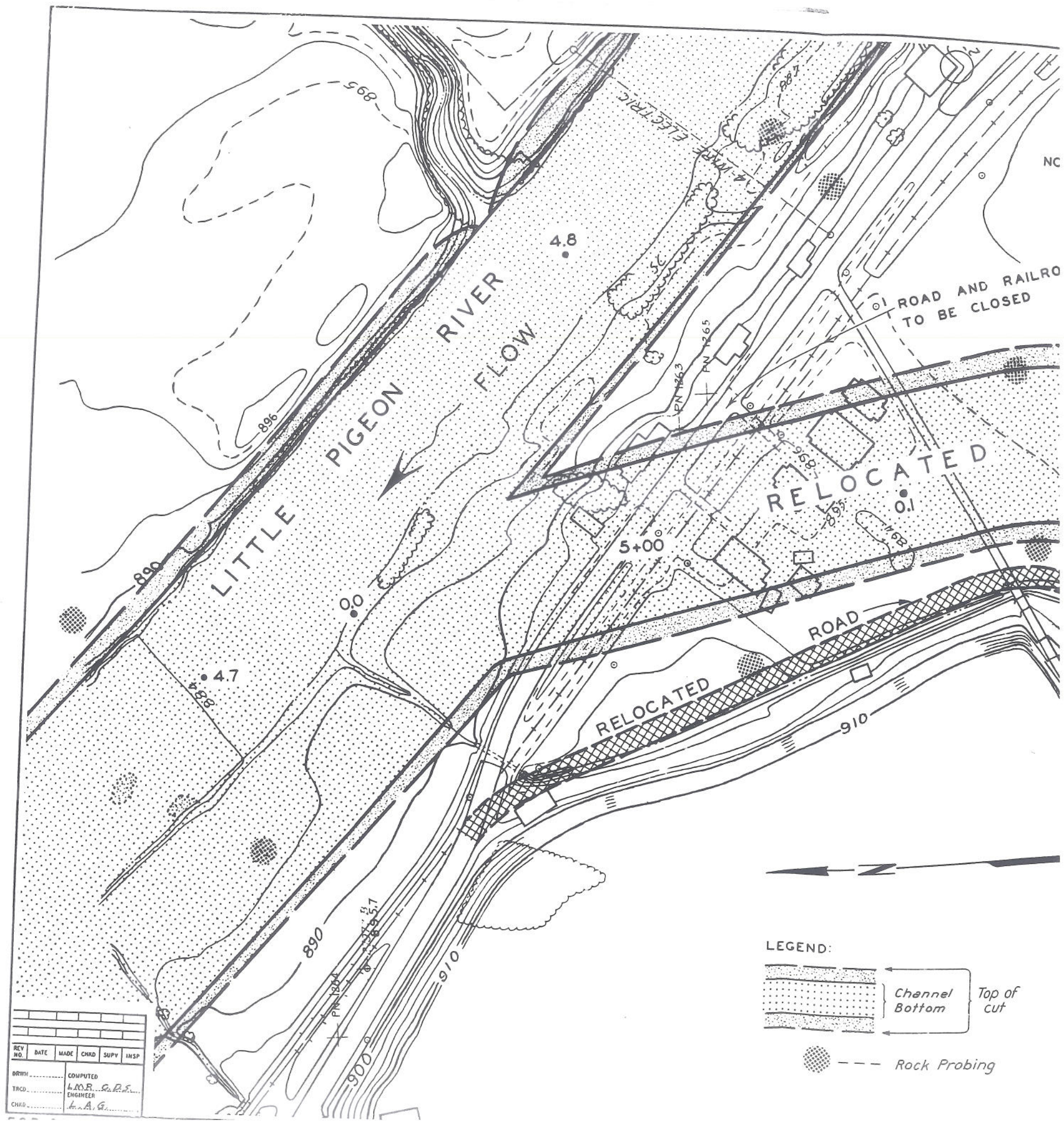
IMPROVEMENT PLAN

SEVIERVILLE, TENNESSEE

TENNESSEE VALLEY AUTHORITY

DIVISION OF WATER CONTROL PLANNING

SUBMITTED | RECOMMENDED


ELECTRIC
4.8
PIGEON RIVER
FLOW
LITTLE
ROAD AND RAILRO
TO BE CLOSED
RELOCATED
0.1
5+00
0.0
4.7
ROAD
RELOCATED
890
895
900
910
LEGEND:
Channel Bottom
Top of cut
Rock Probing
REV NO.
DATE
MADE
CHKD
SUPV
INSP
DRWN
COMPUTED
TRCD.
L.M.B. G.P.S.
ENGINEER
CHKD.
L.A.G.

NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT
FROM PHOTOGRAPHY DATED 2-20-62.

ROAD AND RAILROAD TO BE CLOSED

RELOCATED ROAD

FLOW WEST FORK

MATCH LINE

US 411 & 441

HARDIN LANE

TO BE REMOVED

ELECTRIC

2-CABLE TELEPHONE

RELOCATED ROAD

TO KNOXVILLE

10+00

15+00

20+00

0.1

0.2

0.3

0.4

T898.4

T897.6

27977C 909.6

27977

LEGEND:

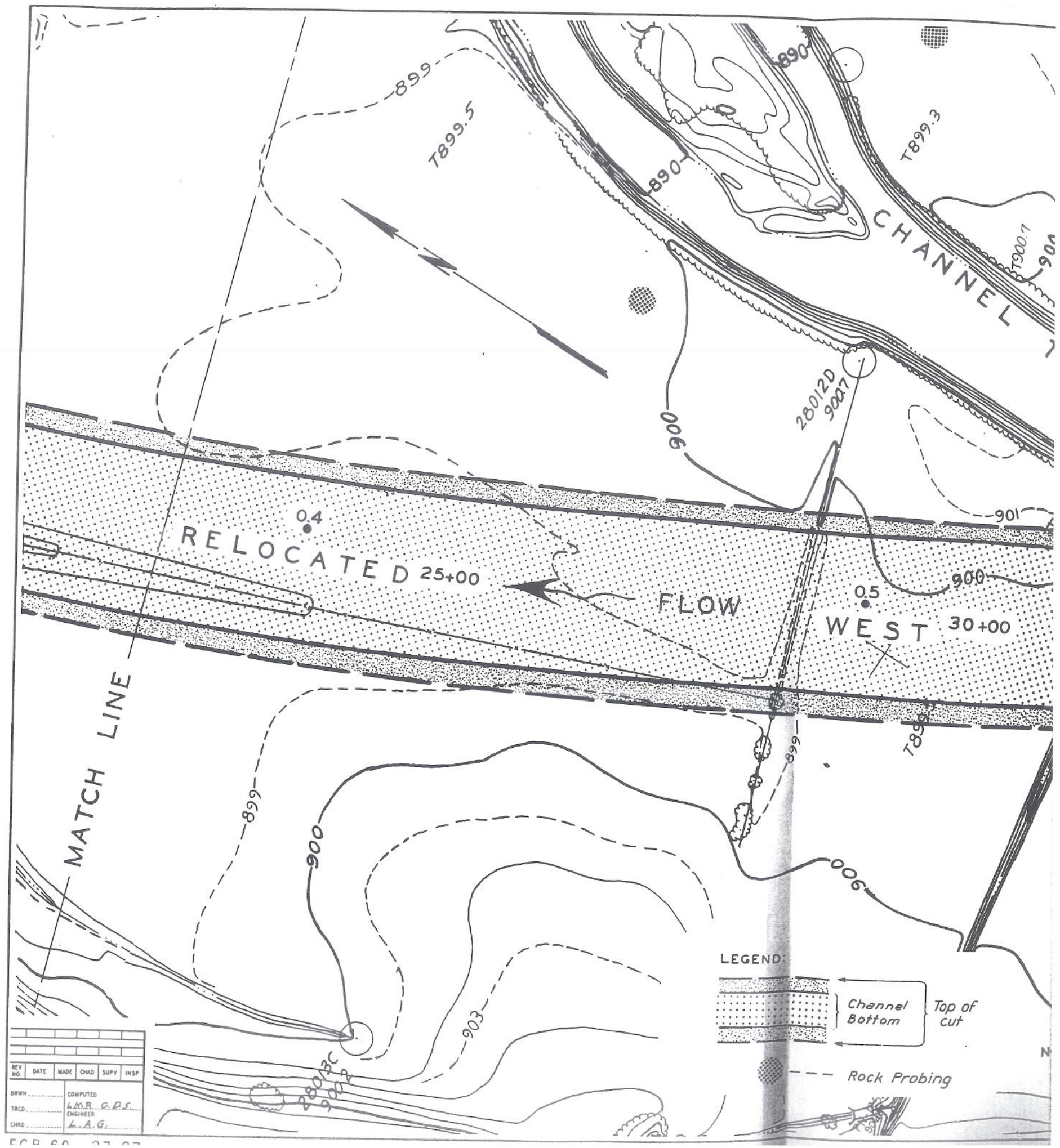
Channel Bottom — Top of cut

Rock Probing

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FORK					
IMPROVEMENT PLAN					
SEVIERVILLE, TENNESSEE TENNESSEE VALLEY AUTHORITY DIVISION OF WATER CONTROL PLANNING					
SUBMITTED	RECOMMENDED	APPROVED			
Berna Brown	Bob Buchler	R.A. Scarlett			
KNOXVILLE	5-24-63	W	FC	1	311C315-5

FIGURE 18


899
T899.5
890
T899.3
CHANNEL
T900.7
28012D
9007
900
901
0.4
RELOCATED 25+00
FLOW
0.5
WEST 30+00
900
MATCH LINE
899
900
903
906
LEGEND:
Channel Bottom
Top of cut
Rock Probing
28012C
9008
REV NO. | DATE | MADE | CHKD | SUPV | INSP
DRWN
TRCD
CHKD
COMPUTED
L.M.R. O.P.S.
ENGINEER
L.A.G.

CHANNEL TO BE FILLED

W.S. 890.6 (2-20-62)

MATCH LINE

WEST FORK

30+00

35+00

40+00

T899.3 T898.6 T900.7 T899.5 T900.3 T899.8 T895.0 T900.3 T900.3 T900.2 T898.6 T900.5 T901.3 T901.1 T900.2 T899.6 T901.8 T902.3 T901.5

28012D 9007

28012

28019 900.5

0.5 0.6 0.7 0.8

LEGEND:

Channel Bottom — Top of cut

Rock Probing

NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT FROM PHOTOGRAPHY DATED 2-20-62.

Scale: 1"=100'

LITTLE PIGEON RIVER & W. FORK

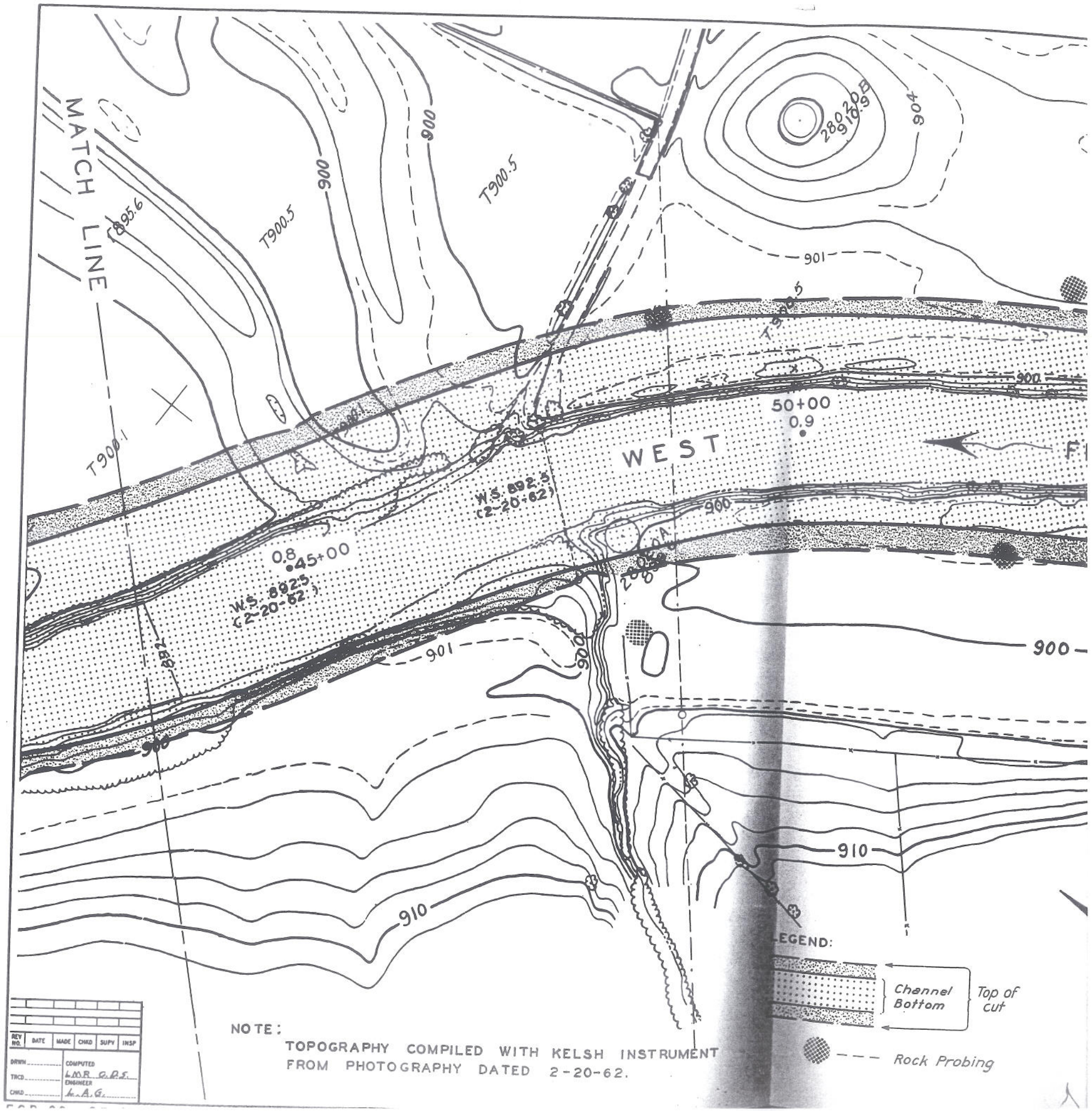
IMPROVEMENT PLAN

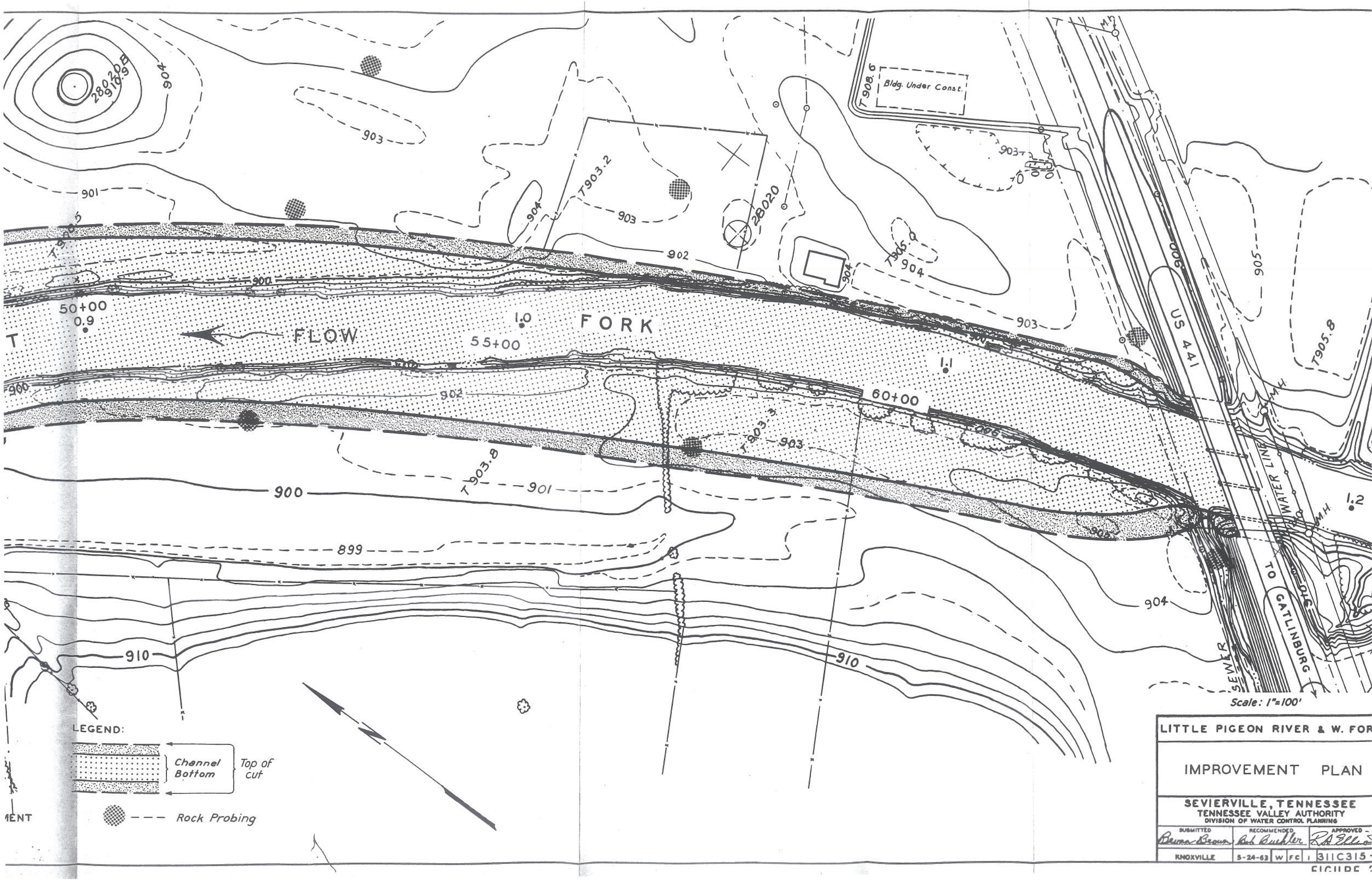
SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Bruce Brown	Bob Buchler	R.A. Elkins

KNOXVILLE	5-24-63	W	FC	1	311C315-

FIGURE


MATCH LINE
T900.5
T900.1
900
901
904
910
WEST
50+00
0.9
45+00
0.8
W.S. 892.5
(2-20-62)
897
280
910.9
LEGEND:
Channel Bottom
Top of cut
Rock Probing
NOTE:
TOPOGRAPHY COMPILED WITH KELSH INSTRUMENT
FROM PHOTOGRAPHY DATED 2-20-62.
REV NO. | DATE | MADE | CHKD | SUPV | INSP
DRWN
TRCD
CHKD
COMPUTED
L.M.R. O.P.S.
ENGINEER
L.A.G.



LITTLE PIGEON RIVER & W. FOR

IMPROVEMENT PLAN

SEVIERVILLE, TENNESSEE
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

SUBMITTED	RECOMMENDED	APPROVED
Berma Brown	Bob Buchler	R.A. Ellis

KNOXVILLE	5-24-63	W	FC	1	311C315

FIGURE