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FLOODS ON VALLEY RIVER, TATHAM CREEK, AND JUNALUSKA CREEK IN THE VICINITY OF ANDREWS, NORTH CAROLINA

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Flood Report
TVA/OECD/FPM—82/4
August 1982

TENNESSEE VALLEY AUTHORITY

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Office of Economic and Community Development

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FLOODS ON VALLEY RIVER, TATHAM CREEK, AND JUNALUSKA CREEK IN THE VICINITY OF ANDREWS, NORTH CAROLINA

INTRODUCTION

This floodplain information study provides flood information for the Valley River and Tatham and Junaluska Creeks in the vicinity of Andrews, North Carolina. The study was requested by the town of Andrews to provide information reflecting current flood conditions in order for the town to better administer its floodplain management program.

A TVA report, "Floods on Valley River, Tatham Creek, and Junaluska Creek in Vicinity of Andrews, North Carolina," issued in November 1965 contains detailed information on historical, regional, and maximum probable floods.

Since the TVA report was issued, U.S. Highway 19-129, which formerly ran through the business district of Andrews, has been relocated to bypass the town to the north. This 4-lane divided highway is part of the Appalachian Corridor Highway which will extend from Asheville, North Carolina, to Chattanooga, Tennessee. The highway in the vicinity of Andrews is located in the Valley River and lower Junaluska Creek floodplains, crosses each stream once, and has a significant effect on the hydraulic characteristics of both streams. The town is also experiencing development pressure along the highway corridor.

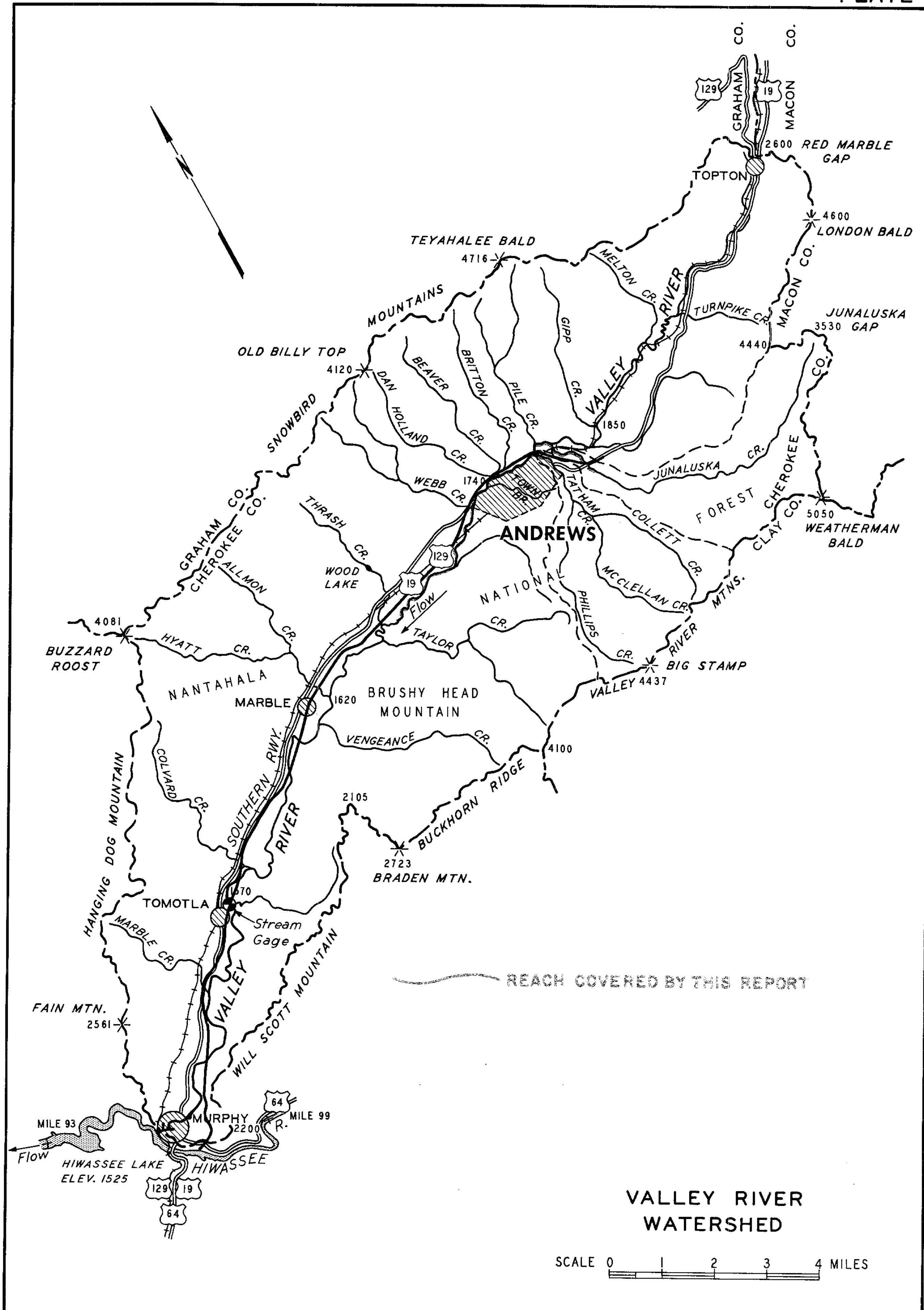
STUDY AND SCOPE

This investigation covers the Valley River from mile 15.32 to the mouth of Junaluska Creek at mile 20.55, Tatham Creek from the mouth upstream to the old U.S. Highway 19-129 bridge at mile 0.48, and Junaluska Creek from the mouth upstream to the old U.S. Highway 19-129 bridge at mile 0.92.

Andrews, North Carolina, is located on the Valley River approximately 19 miles above the river's confluence with the Hiwassee River at Murphy, North Carolina. Tatham Creek, a tributary with a drainage area of 8.41 square miles, joins the Valley River at the eastern corporate limits of Andrews; and Junaluska Creek, with a drainage area of 8.35 square miles, flows into the Valley River one-half mile upstream from Andrews. Andrews' corporate limits extend 1.78 miles along the Valley River from mile 18.24 to the mouth of Tatham Creek at mile 20.02 and along Tatham Creek to mile 0.74. At the Main Street (old U.S. Highway 19-129) bridge at the lower edge of town, the Valley River drains an area of 49.4 square miles.

WATERSHED DATA

The Valley River has a total drainage area of 117 square miles lying entirely within Cherokee County. The watershed is roughly rectangular in shape, approximately 22 miles long and 7 miles wide. The topography is marked by sharp ridges around the basin rim and a broad, flat valley floor. Elevations around the north rim are between 3000 and 4000 feet with a high point of 4716 feet at Teyahalee Bald. Along the south rim elevations are 1000 to 3000 feet at the lower end of the basin and from 4000 to 4400 feet along most of the Valley River Mountains. Weatherman Bald, the highest point in the watershed, located 6 miles southeast of Andrews, is 5050 feet above mean sea level. The tributaries are mostly short and steep, dropping off sharply from the ridges to the valley floor. In the vicinity of Andrews the average elevation


GRAHAM CO.
MACON CO.
129
19
2600 RED MARBLE GAP
TOPTON
4600 LONDON BALD
TEYAHALEE BALD
4716
MELTON CR.
VALLEY RIVER
TURNPIKE CR.
MACON CO.
JUNALUSKA GAP
3530
4440
MOUNTAINS
OLD BILLY TOP
4120
DAN HOLLAND CR.
BEAVER CR.
BRITTON CR.
PILE CR.
GIPP CR.
SNOWBIRD
1850
JUNALUSKA CR.
CO.
CHEROKEE
1740
TOWN BR.
WEBB CR.
TATHAM CR.
COLLETT CR.
FOREST
5050
WEATHERMAN BALD
CLAY CO.
GRAHAM CO.
CHEROKEE CO.
THRASH CR.
ANDREWS
WOOD LAKE
ALLMON CR.
NATIONAL
McCLELLAN CR.
PHILLIPS CR.
Flow
TAYLOR CR.
RIVER MTNS.
4081
BUZZARD ROOST
HYATT CR.
BIG STAMP
VALLEY 4437
NANTAHALA
MARBLE
1620
BRUSHY HEAD MOUNTAIN
VENGEANCE CR.
4100
COLVARD CR.
SOUTHERN RWY.
RIVER
2105
BUCKHORN RIDGE
HANGING DOG MOUNTAIN
2723
BRADEN MTN.
TOMOTLA
1570
Stream Gage
MARBLE CR.
VALLEY
WILL SCOTT MOUNTAIN
REACH COVERED BY THIS REPORT
FAIN MTN.
2561
MILE 93
MURPHY
2200
64
MILE 99
R.
Flow
HIWASSEE LAKE ELEV. 1525
HIWASSEE
VALLEY RIVER WATERSHED
SCALE 0 1 2 3 4 MILES

is approximately 1800 feet. A map of the watershed indicating the reaches studied is shown on plate 1.

REVIEW OF HISTORIC FLOODS

Local residents, newspaper articles, reports, and U.S. Geological Survey (USGS) stream gage records at Tomotla (Valley River mile 6.6) provided information about major flooding on the lower reaches of the Valley River below Andrews back to 1898 when the largest known flood occurred. Based on high water marks, this September 1898 flood reached elevation 1578.3 at mile 6.7. (All elevations are feet above mean sea level, USC&GS 1936 Supplementary Adjustment.) The largest flood since the stream gage at Tomotla was installed in 1904 occurred in November 1906, reaching elevation 1577.0 at the gage. Other large floods occurred in February 1936 and January 1957. Both were approximately 4 feet lower than the 1906 flood at the gage.

Information on past flooding on the Valley River in the vicinity of Andrews is limited to investigations following large floods, including the 1936 and 1957 floods. These investigations indicate that the February 1936 flood reached elevation 1769.0 at mile 19.96 (upstream of the Tatham Gap Road bridge), and the January 1957 flood was approximately 0.6 foot higher than the 1936 flood.

More detailed flood information on the Valley River is available in the 1965 flood report (reference 1). No information on past flooding is available on Tatham or Junaluska Creeks.

COMPUTED FLOODS

Flood discharges and elevations have been computed for the 100- and 500-year and maximum probable floods to assist the town of Andrews in administering its floodplain management program. The data and plates included in this report have been prepared by the Flood Hazard Analysis Branch, Division of Water Resources, Office of Natural Resources.

HYDROLOGY

Computed flood discharges on the Valley River are based on stream gage records at Tomotla. Discharges on Tatham and Junaluska Creeks are based on stream gage records from similar watersheds in the region (reference 2). All stream gage analyses follow standard procedures outlined in reference 3.

One Hundred-Year Flood

The 100-year flood is defined as a flood which has 1 chance in 100 (1 percent) of being equaled or exceeded in any 1-year period. In a normal 30-year mortgage period there is about 1 chance in 4 of a flood of this size or larger occurring. On the Valley River the 100-year flood would average about 1.5 feet higher than the 1957 flood. The 100-year flood is the minimum standard adopted by the Federal Insurance Administration for participation in the National Flood Insurance Program (NFIP).

Five Hundred-Year Flood

Although the 500-year flood may occur at any time, it is a rare event which has 1 chance in 500 (0.2 percent) of being equaled or exceeded in any 1-year period. In a normal 30-year mortgage period there is about 1 chance in 17 of a flood of this size or larger occurring. The 500-year flood on the Valley River would average about 2.5 feet higher than the 1957 flood. The 1906 flood approached a 500-year flood in magnitude at the USGS gage site on Valley River at mile 6.6. The 500-year flood is provided as a guide for planning community and industrial development when a more restrictive standard than the 100-year flood is necessary.

Maximum Probable Flood

The maximum probable flood represents the reasonable upper limit of expected flooding and is provided as a guide for planning community and industrial development where a substantial reduction in the risk of flooding is desirable. The magnitude of this flood approaches that of the largest observed storms and floods in the region. Although it is an extremely rare event for which a chance of occurrence is not computed, it may occur in any given year and even larger floods are possible. The maximum probable flood would be approximately 5.5 to 6.5 feet higher than the 1957 flood and 4 to 5 feet higher than the 100-year flood.

HYDRAULICS

The hydraulic characteristics of the Valley River and Tatham and Junaluska Creeks were analyzed using the U.S. Army Corps of Engineers HEC-2N backwater computer program (reference 4) to provide estimates of the 100- and 500-year and maximum probable flood elevations at selected cross sections. The cross sections were field surveyed at bridges and other locations and supplemented with valley cross sections plotted from aerial photography to accurately define the floodplains of the Valley River and Tatham and Junaluska Creeks. Locations of the cross sections used in the hydraulic analyses are shown on the flooded area maps (plates 2-5).

The computed elevations at the cross sections were plotted on a graph at the stream mile locations of the cross sections and joined with straight lines to create flood profiles (plates 6-9). The elevations are shown in feet above mean sea level and the stream miles are measured from the mouth upstream. Tabulations of the 100- and 500-year and maximum probable flood elevations and discharges for the Valley River and Tatham and Junaluska Creeks are included in tables 1-3.

The computed flood elevations are based on the assumption that bridges and other hydraulic structures remain open and unobstructed. The accumulation of debris or other obstructions under bridges during the time of flooding may raise the flood elevations higher than those shown on the stream profile.

The flooded area maps show the approximate areas that would be inundated by the 100- and 500-year and maximum probable floods. Using the flood profiles and orthophotographic maps produced from recent aerial photography, the flood elevations from the profiles were plotted at the corresponding ground elevation locations on the maps to establish the limits of flooding.

Table 1

VALLEY RIVER PROFILE TABULATION

Cross Section		100-Year Flood		500-Year Flood		Maximum Probable Flood	
No.	Mile	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)
1	15.32	9,890	1659.3	13,580	1660.0	35,000	1662.9
2	15.57	9,720	1664.4	13,350	1665.0	34,420	1667.4
3	16.00	9,530	1671.5	13,100	1672.1	33,790	1674.8
*	16.06	9,510	1672.4	13,080	1673.1	33,720	1676.0
*	16.18	9,460	1676.6	13,010	1677.1	33,560	1679.6
4	16.55	9,310	1683.6	12,820	1684.5	33,060	1687.9
5	16.97	9,130	1690.2	12,590	1691.1	32,480	1694.3
*	17.07	9,090	1692.6	12,530	1693.3	32,340	1696.1
6	17.46	8,950	1701.1	12,340	1701.8	31,850	1704.4
7	17.72 DS[a]	8,840	1706.6	12,200	1707.5	31,500	1710.4
7	17.72 US[a]	8,840	1708.7	12,200	1710.2	31,500	1714.5
8	17.83	8,770	1709.8	12,110	1711.1	31,300	1715.2
*	17.91	8,730	1710.8	12,060	1712.2	31,180	1716.5
9	18.08	8,630	1715.2	11,920	1716.5	30,880	1721.1
10	18.46 DS	8,480	1724.2	11,720	1725.4	30,420	1730.7
10	18.46 US	8,480	1729.9	11,720	1730.8	30,420	1733.7
11	18.53	8,410	1730.6	11,640	1731.7	30,240	1735.5
*	18.63	8,360	1731.8	11,570	1733.2	30,080	1737.2
12	18.93	8,220	1737.0	11,380	1738.2	29,660	1742.1
*	19.03	8,170	1738.5	11,310	1739.4	29,510	1743.0
13	19.28 DS	8,040	1746.7	11,150	1747.6	29,140	1750.4
13	19.28 US	8,040	1748.5	11,150	1750.7	29,140	1754.0
14	19.55	7,900	1756.1	10,960	1756.9	28,720	1759.4
15	19.87 DS	7,740	1768.1	10,740	1769.3	28,230	1773.7
15	19.87 US	7,740	1769.4	10,740	1771.3	28,230	1775.5

Table 1
(Continued)

Cross Section		100-Year Flood		500-Year Flood		Maximum Probable Flood	
No.	Mile	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)
*	19.95	7,700	1770.0	10,690	1771.7	28,110	1775.9
16	20.05 DS[a]	6,600	1772.0	9,230	1772.8	25,360	1777.6
16	20.06 US[a]	6,600	1775.0	9,230	1776.8	25,360	1784.3
17	20.34	6,340	1778.5	8,870	1779.8	24,390	1785.8
*	20.40	6,280	1779.3	8,800	1780.5	24,180	1786.1
18	20.52	6,150	1783.5	8,620	1784.3	23,700	1787.1

* Sections not shown on flooded area maps or profiles.

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a. Downstream and upstream at bridges.
b. cfs (cubic feet per second) is a measurement of the volume of water flowing past a given point.
c. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

Table 2

TATHAM CREEK PROFILE TABULATION

Cross Section		100-Year Flood		500-Year Flood		Maximum Probable Flood	
No.	Mile	Discharge (cfs)[b]	Elevation[d] (feet)	Discharge (cfs)[b]	Elevation[d] (feet)	Discharge (cfs)[b]	Elevation[d] (feet)
1	0.04 DS[a]	2,720	1771.6[c]	3,960	1773.7[c]	10,500	1777.3[c]
1	0.04 US[a]	2,720	1771.6[c]	3,960	1773.7[c]	10,500	1777.3[c]
*	0.06	2,720	1771.6[c]	3,960	1773.7[c]	10,500	1777.3[c]
2	0.12 DS	2,710	1775.9	3,950	1776.6	10,500	1778.3
2	0.12 US	2,710	1777.0	3,950	1778.2	10,500	1783.1
*	0.14	2,710	1777.5	3,950	1778.4	10,500	1783.1
3	0.24	2,700	1782.0	3,940	1782.3	10,500	1784.0
*	0.27	2,700	1783.5	3,940	1784.4	10,500	1786.4
4	0.46	2,680	1795.9	3,910	1796.6	10,500	1799.2

* Sections not shown on flooded area maps or profiles.

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a. Downstream and upstream at bridges.
b. cfs (cubic feet per second) is a measurement of the volume of water flowing past a given point.
c. Valley River mile 20.02 elevations at the mouth of Tatham Creek.
d. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

Table 3

JUNALUSKA CREEK PROFILE TABULATION

Cross Section		100-Year Flood		500-Year Flood		Maximum Probable Flood	
No.	Mile	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)	Discharge (cfs)[b]	Elevation[c] (feet)
1	0.02 DS[a]	2,700	1786.4	3,940	1787.4	10,500	1790.3
1	0.02 US[a]	2,700	1787.4	3,940	1789.5	10,500	1794.2
*	0.04	2,700	1787.7	3,940	1789.7	10,500	1794.2
*	0.20	2,690	1792.5	3,920	1793.0	10,500	1794.7
2	0.25	2,690	1794.0	3,920	1794.6	10,500	1796.5
*	0.45	2,680	1801.4	3,910	1803.1	10,500	1804.7
3	0.49	2,670	1804.3	3,880	1804.9	10,500	1807.1
4	0.57	2,670	1811.1	3,880	1813.0	10,500	1815.0
5	0.72 DS	2,660	1824.1	3,880	1824.9	10,500	1827.7
5	0.72 US	2,660	1827.2	3,880	1827.9	10,500	1830.0
6	0.75 DS	2,660	1827.3	3,880	1828.1	10,500	1830.8
6	0.76 US	2,660	1830.2	3,880	1831.7	10,500	1839.0
*	0.86	2,650	1840.4	3,870	1840.9	10,500	1841.7
7	0.90	2,650	1845.2	3,870	1845.5	10,500	1847.4

* Sections not shown on flooded area maps or profiles.

a. Downstream and upstream at bridges.
b. cfs (cubic feet per second) is a measurement of the volume of water flowing past a given point.
c. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

Floodways

Encroachments on the floodplain such as fills or structures reduce its flood-carrying capacity and increase the danger of flooding in other areas. In reviewing floodplain development proposals the economic gain of the proposed development must be compared to the possibility of increased flood damage both to the development and to existing neighboring developments. However, prohibiting any further floodplain development may be excessively restrictive.

Frequently the community must decide how much further floodplain development to allow, what the effects of such development will be, and where the development should take place. If the community is participating in the National Flood Insurance Program, it must not allow further development which will cumulatively increase the existing level of the 100-year flood by more than 1 foot at any point along the stream.

To accommodate some floodplain development, the floodplain can be divided into two separate parts--the floodway and the flood fringe. This division recognizes the natural functions of the floodplain. The <u>floodway</u> is the stream channel and that portion of the adjacent floodplain which must remain open and unobstructed to permit passage of floodwaters. The floodwaters are deepest and swiftest in the floodway, and structures and other uses located in this area are subject to the greatest danger during times of flooding. The remainder of the floodplain is called the <u>flood fringe</u>. Here the water is shallower and may have little or no movement. Therefore, most communities permit development in this portion of the floodplain if the development is elevated or otherwise protected to the regulatory (usually 100-year) flood level.

While a community may have some flexibility in setting limits, a floodway must be determined which is capable of handling all of the water which now occupies the entire floodplain. When making this determination it is assumed that the community will permit development in the remainder of the floodplain (that is, in the flood fringe) and that ultimately total development of the flood fringe will occur, thereby preventing water from flowing through the developed area.

The areas needed to pass floodwaters through the community without causing increases in flood heights by more than the National Flood Insurance Program requirement or to a lesser amount if desired by the community are determined by engineering calculations. After the floodway boundaries are determined and officially designated by local ordinance, total filling or development of the flood fringe will not increase flood levels by more than the previously determined amount (usually 1 foot).

FLOODPLAIN MANAGEMENT

Although a detailed investigation containing specific solutions to the flood problem is beyond the scope of this report, technical data presented here may be used in developing an effective floodplain management program. Measures taken to reduce flood damage may be classified into structural and nonstructural solutions. Structural measures may include dams, levees, and channel modification; nonstructural measures include floodplain regulations, flood insurance, floodproofing, flood warning, and evacuation.

STRUCTURAL MEASURES

Dams

Dams or retention reservoirs may be useful to temporarily impound floodwaters upstream of the area for which protection is needed. Water can be gradually released over a period of several days to avoid increased downstream flooding. Retention reservoirs are most beneficial when they can be built on only one or two major tributaries above the area being protected in order to control the majority of the drainage area.

At Andrews the two major tributaries, Junaluska and Tatham Creeks, contain only 34 percent of the drainage area of the Valley River above the old U.S. Highway 19-129 bridge at the lower end of the town; therefore, dams may not be a viable alternative. In addition, high construction costs, interest rates, and environmental constraints usually preclude consideration of this type of flood damage reduction measure.

Levees

Levees or walls may be used to protect against flood damage. However, certain problems such as internal drainage and street and utility relocation do arise with their use. When a levee is used, it must be designed to protect against infrequent floods of large magnitude as failure or overtopping of the levee brings immediate disaster. The Soil Conservation Service investigated the use of a levee for the entire town of Andrews several years ago, but it was found to be infeasible. Levees or walls, however, may be feasible in some cases to provide localized protection.

Channel Modifications

Channel enlargements to carry additional amounts of floodwaters have been used in some locations as a relief against flood damage. However, because of the wide floodplain and flat slopes of the Valley River and environmental constraints, channel enlargement would probably not be a viable alternative for Andrews.

NONSTRUCTURAL MEASURES

Floodplain Regulations

Floodplain regulations are useful in providing an orderly development of the floodplain without causing an undue increase in flood heights and in minimizing potential flood damage. The floodplain is divided into a floodway and flood fringe. The floodway should be kept free from further development. Development may be permitted in the flood fringe by local ordinances if it is elevated or floodproofed to the regulatory flood elevation.

Floodplain regulations including floodway information are included in the zoning ordinance and the subdivision regulations adopted by the town of Andrews. The town presently enforces the regional flood, which is of approximately the same magnitude as the 500-year flood in this report.

Flood Insurance

While flood insurance does not reduce flood damage, it can help alleviate financial losses. The town of Andrews became eligible for the sale of flood insurance under the National Flood Insurance Program (NFIP) on July 29, 1975. Andrews is presently in the emergency phase of the program, and in 1980 ten policies totaling $647,000 were in force. Communities participating in the NFIP must, as a condition of their eligibility, utilize and enforce the best available data as the basis for requiring that:

1. All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated to or above the base (100-year) flood level.

2. All new construction and substantial improvements of nonresidential structures have the lowest floor (including basement) elevated or floodproofed to or above the base (100-year) flood level.

3. The proposed development (meaning any manmade change to improved or unimproved real estate) does not create any adverse effect on the flood-carrying capacity of the stream. "Adverse effect" means any increase in flood elevations on adjacent properties.

Enforcement of the 100-year flood elevations and the floodway delineations in this study will ensure that the community has met these requirements, although the community may continue to enforce or adopt a more restrictive standard.

For further information concerning the National Flood Insurance Program, the user may contact the regional office of the Federal Emergency Management Agency at the following address:

Federal Emergency Management Agency
Region IV
1375 Peachtree Street, NE.
Atlanta, Georgia 30309
(404) 881-2391

Floodproofing

Although it is sometimes possible to floodproof existing buildings, it is easier to floodproof new buildings during construction.

Floodproofing may include either making buildings reasonably impregnable to water or raising floor elevations (either on fill or by other means) to an elevation above the 100-year flood elevation. An example of the latter method of floodproofing is the newer wing of the Andrews Hospital, which was built above the regional flood elevation. The Federal Insurance Administration requires that new and substantially improved residential buildings have all floors, including basement, raised above the 100-year flood elevation. Nonresidential buildings may be floodproofed to the 100-year flood elevation. The art of floodproofing is complex and requires detailed engineering or architectural skills. When floodproofing is considered, the services of a qualified engineer or architect should be obtained.

Flood Warning

Some communities have a flood warning system which enables their citizens to temporarily evacuate the floodplain in time of danger. Adequate warning time, coupled with an evacuation plan, can prevent loss of life and possible damage to property. Although TVA participates in the development of flood warning systems, the National Oceanic and Atmospheric Administration (NOAA) has primary responsibility for the development and overall coordination of such systems.

Evacuation

Evacuation from the floodplain can be either permanent or temporary. Temporary evacuation occurs when people leave the floodplain in advance of large floods. Areas which experience chronic flood problems should be considered for permanent evacuation. Limited Federal assistance for evacuation may be available depending on fiscal budgets.

SUMMARY

A community's flood problems are usually as diverse as the methods the community uses to solve them. No measure will solve all of a community's flood problems. A community must look for a combination of measures to fit its individual needs and resources to provide the best solution which will be most effective in reducing flood damage.

DEFINITION OF TERMS

Base Map - A map from which other maps are prepared by adding such features as floodplain and floodway boundaries.

Computed Flood - An estimated future flood based on a hydraulic analysis of the potential storm runoff from an area and flow of water through the floodplain.

Contour - A line on a map which represents points of equal elevation.

Cross Section of a Floodplain - A vertical section of the floodplain surface, normally taken at right angles to the direction of the floodflow.

Effective Stream Mileage - The point along the centerline of the stream channel which has the same flood elevation as a specified location in the floodplain.

Flood - A temporary rise in water levels or an accumulation of water runoff, resulting in inundation of areas not ordinarily covered by water.

1-Percent-Chance (100-Year) Flood - A flood having 1 chance in 100 of being equaled or exceeded in any 1-year period.

0.2-Percent-Chance (500-Year) Flood - A flood having 0.2 chance in 100 (1 chance in 500) of being equaled or exceeded in any 1-year period.

Flood Boundary - The estimated outermost limit the waters of a flood of a certain magnitude will reach.

Flood Elevation or Water Surface Elevation - The height (expressed in relation to mean sea level) reached by floods or channel flows of various magnitudes.

Flood Fringe - The area of a floodplain which is outside of the floodway.

Floodflow Line - A line drawn on a map indicating the general direction of the flow of floodwaters in a floodplain.

Flood Map - A map which shows the horizontal flood limits for one or more floods.

Floodplain - Any land area susceptible to inundation by water from any source including, at a minimum, that area subject to a 1-percent or greater chance of flooding in any given year.

Floodplain Management - A term applied to the full range of public policy and action for ensuring wise use of the floodplains. It includes, but is not limited to, collection and dissemination of flood control information, acquisition of floodplain lands, enactment and administration of floodplain regulations including building codes, and construction of flood-modifying structures.

Floodplain Regulations - A general term applied to the full range of codes, ordinances, and other regulations relating to the use of land and construction within designated floodplain limits.

Flood Profile - A graph of flood elevations along a stream.

Flood Stage - The vertical distance to the surface of the floodwater as measured from or compared to some arbitrarily fixed and generally accepted point such as a United States Geological Survey stream gage. Local residents may more commonly use the term "flood depth," which is the vertical distance from the water surface to some point such as a floor, road, or the ground.

Floodway - The channel of the stream and those portions of the adjoining floodplain which carry and discharge floodwaters of a particular flood event.

Historical Flood - A flood known to have occurred in a specific area.

Maximum Known Flood - The largest flood known to have occurred on a stream or in an area.

Maximum Probable Flood - A flood comparable to the largest floods known to have occurred in the eastern part of the United States. It is used in planning flood protection works, failure of which might be disastrous, and in establishing critical elevations of major water control structures.

Mean Sea Level - The average height of the sea for all stages of the tide over a 19-year period.

Peak Discharge - The greatest rate of flow normally expressed in cubic feet per second (cfs) occurring during a period of high water.

Reach - Segments of a stream which mark boundaries such as the limits of a study, corporate limits, State or county lines, or other definable features.

Stream Gage - An instrument which makes regular observations of either the water surface elevation (measures from some arbitrary point) or streamflow at a particular site on a stream, canal, lake, or reservoir.

Stream Mileage - Distance measured along the centerline of the stream from some designated point, usually where the stream enters into a larger stream or body of water.

TVA Regional Flood - A flood comparable to the largest floods known to have occurred on streams of similar physical characteristics in the same general geographical region as that of the stream being studied. Ordinarily, the region considered is within a radius of 100 miles or less. Extraordinarily large and rare floods are not included in this determination.

U.S. Coast and Geodetic Survey Levels - The vertical control surveys conducted to establish permanent elevation references.

BENCH MARKS

Elevation[a]	Number and Description
1799.590	BM No. USBM 1799.7 - located 0.77 mile southeast of station at Andrews, on U.S. Highway 19 at concrete bridge over Tatham Creek. A chiseled square on south parapet wall of east abutment.
1827.122	BM-RV-239 - located 1.6 miles east by rail from Andrews in top of concrete back wall of east abutment of Valley River railroad bridge, 6 feet north of north rail and on level with base of rail. A monel metal rivet.
1772.808	BM-G-54 - in Andrews, 60 feet south of south rail, 25 feet west of west end of depot in top of concrete post 10 inches above grade and at east end of park between railroad and street.
1661.539	BM-E-54 - 3.8 miles west by rail from Andrews, 2 miles northeast of Marble, 825 feet east of milepost 111, 70 feet west of U.S. Highway 19 50 feet south of south rail, 15 feet north of U.S. Highway 19, 10 inches above ground in top of concrete post.
1706.660	BM-F-54 - 1.5 miles west by rail from Andrews in top and 1 foot from south end of east concrete abutment of Valley River railroad bridge, No. 12-T-108.5, 8 feet south of south rail and 3.5 feet below base of rail. Standard disk.
1706.972	BM-RV-237 - 1.5 miles west by rail from Andrews in top and 1 foot from north end of west concrete pier of Valley River railroad bridge, 12-T-108.5, 8 feet north of north rail and 3.5 feet below base of rail. A monel metal rivet.

a. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment)

REFERENCES

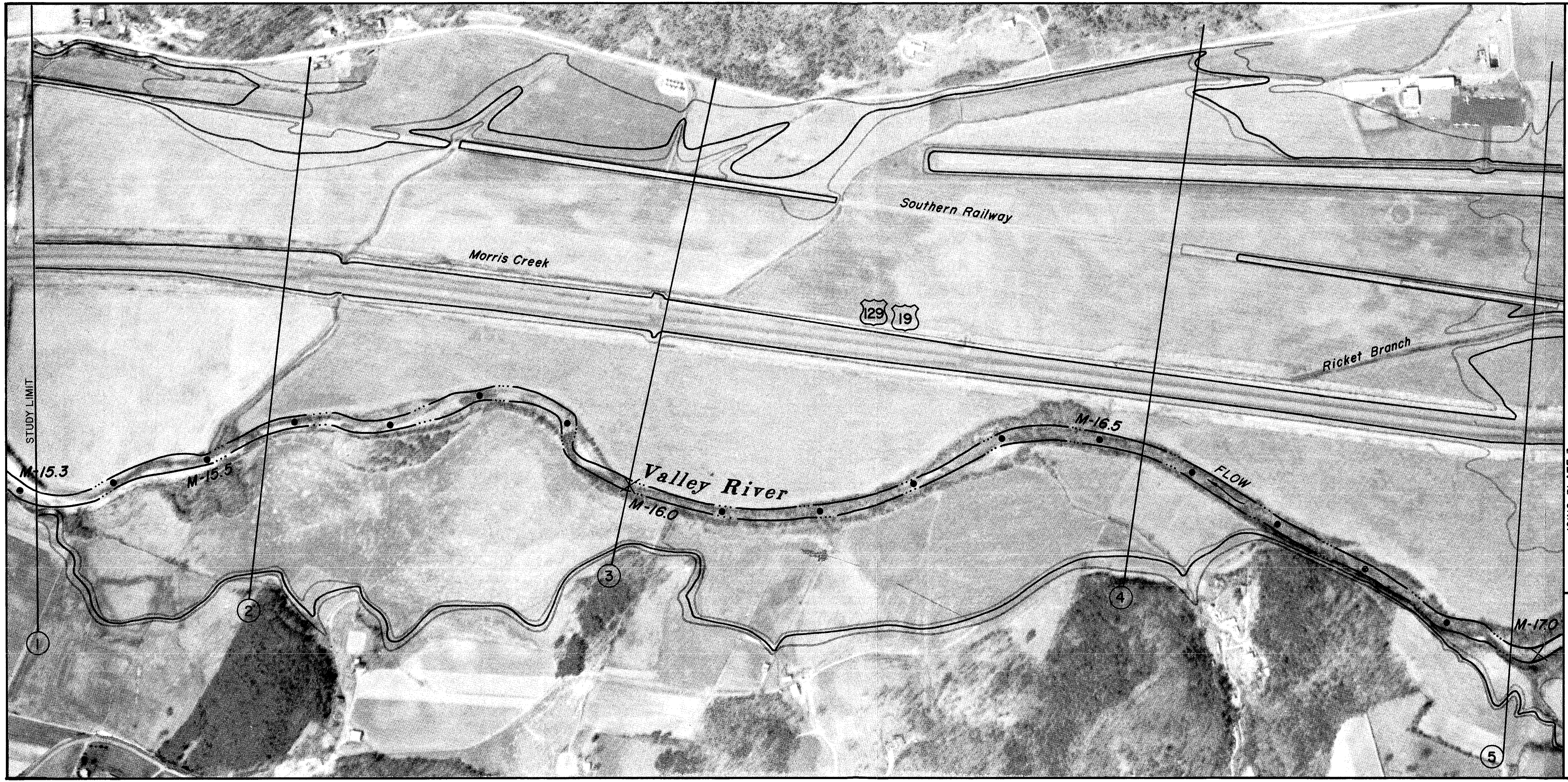
1. Tennessee Valley Authority, Floods on Valley River, Tatham Creek, and Junaluska Creek in Vicinity of Andrews, North Carolina, Division of Water Control Planning, Report No. 0-6504, Knoxville, Tennessee, November 1965.

2. Jackson, N. M., Jr., Magnitude and Frequency of Floods in North Carolina, U.S. Geological Survey, Water Resources Investigations 76-17, Raleigh, North Carolina, March 1976.

3. U.S. Water Resources Council, Guidelines for Determining Flood Flow Frequency, Bulletin 17A of the Hydrology Committee, Revised June 1977.

4. U.S. Army Corps of Engineers, HEC-2N Water Surface Profiles Generalized Computer Program, Hydrologic Engineering Center, Davis, California, June 1973.

PLATE 2



LEGEND:

OVERFLOW LIMITS:
- MAXIMUM PROBABLE FLOOD
- 500 YEAR FLOOD
- 100 YEAR FLOOD

× M-16.0 MILES ABOVE MOUTH

• $\frac{1}{10}$ MILE MARK

(3)— CROSS SECTION

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

TENNESSEE VALLEY AUTHORITY

OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS

VALLEY RIVER

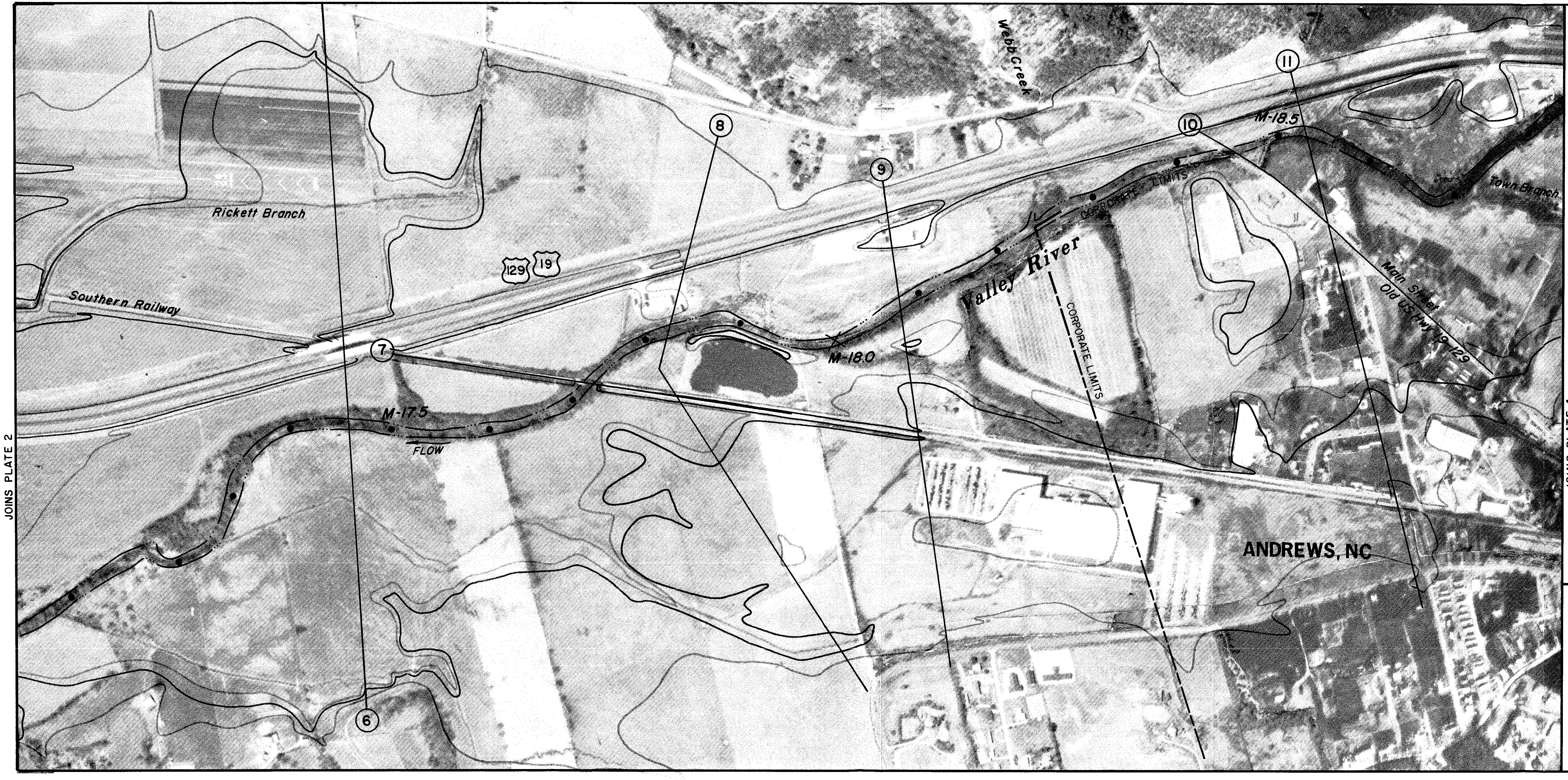
MILE 15.32 to 17.03

ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982

PLATE 3



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-18.0 MILES ABOVE MOUTH
$\frac{1}{10}$ MILE MARK
8 CROSS SECTION

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

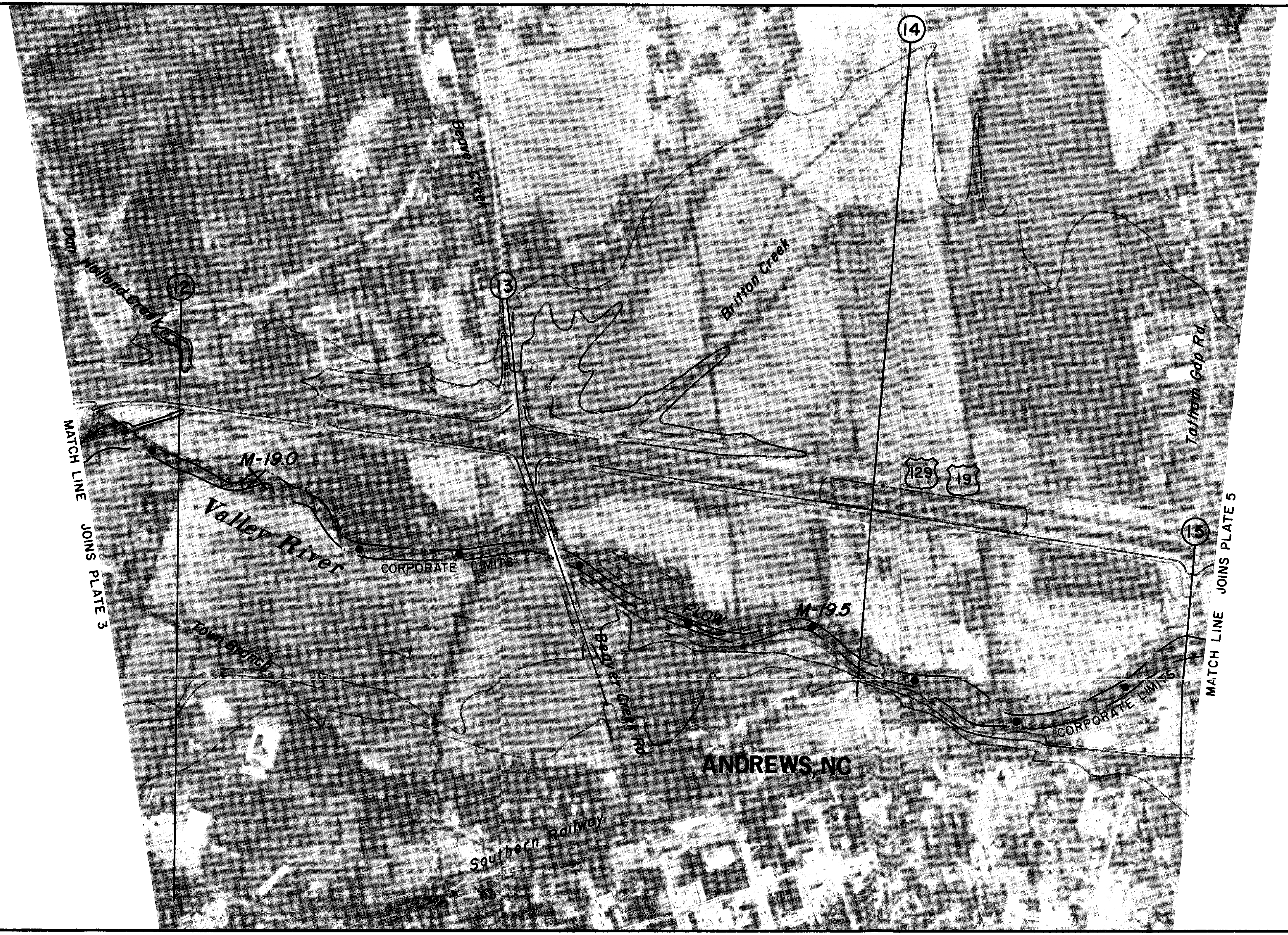
TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS

VALLEY RIVER
MILE 17.03 to 18.84
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-19.0 MILES ABOVE MOUTH
1/10 MILE MARK
12 CROSS SECTION

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

N

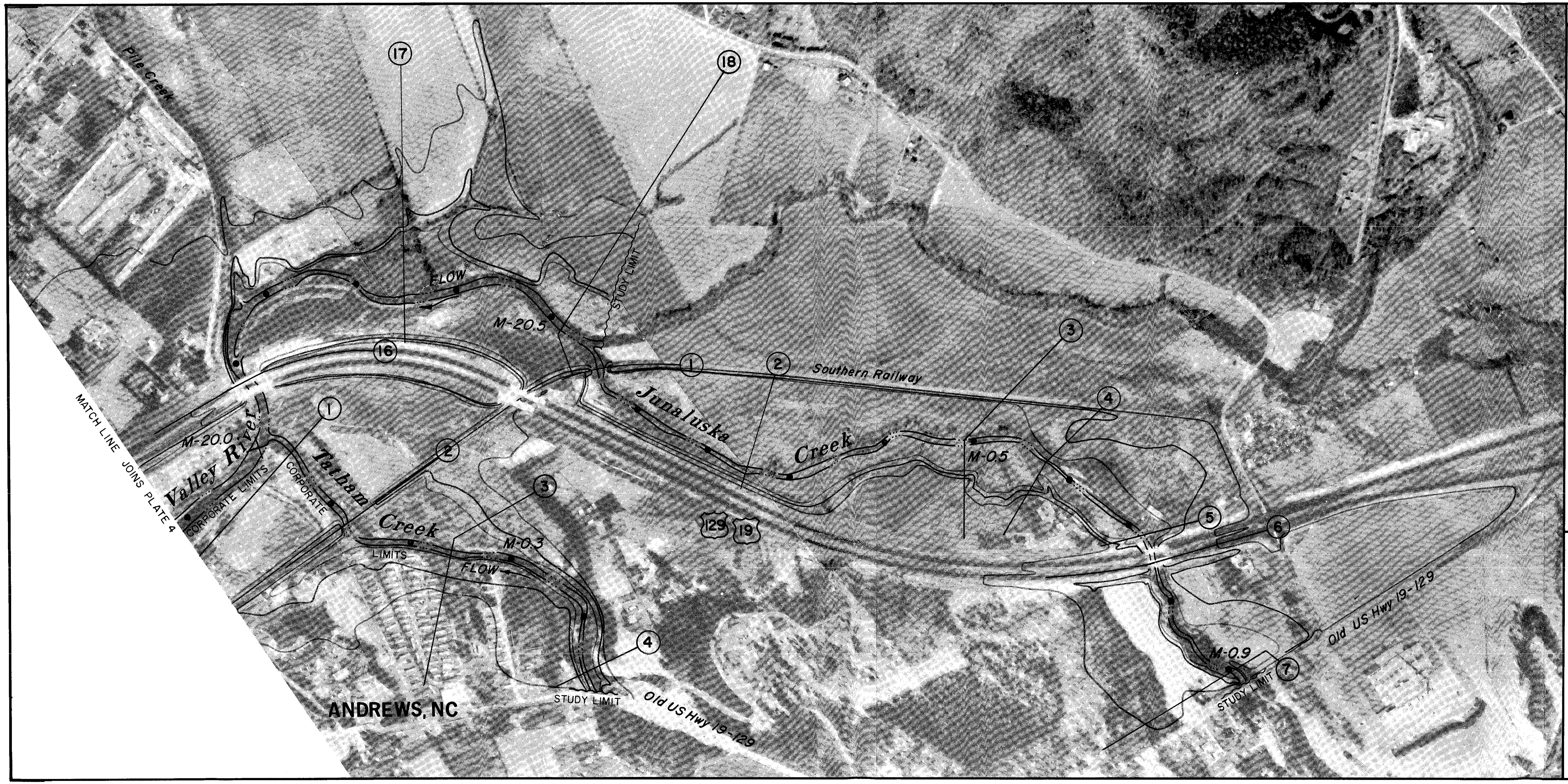
TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS

VALLEY RIVER
MILE 18.84 to 19.88
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-20.0 MILES ABOVE MOUTH
1/10 MILE MARK
(18) CROSS SECTION

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

N

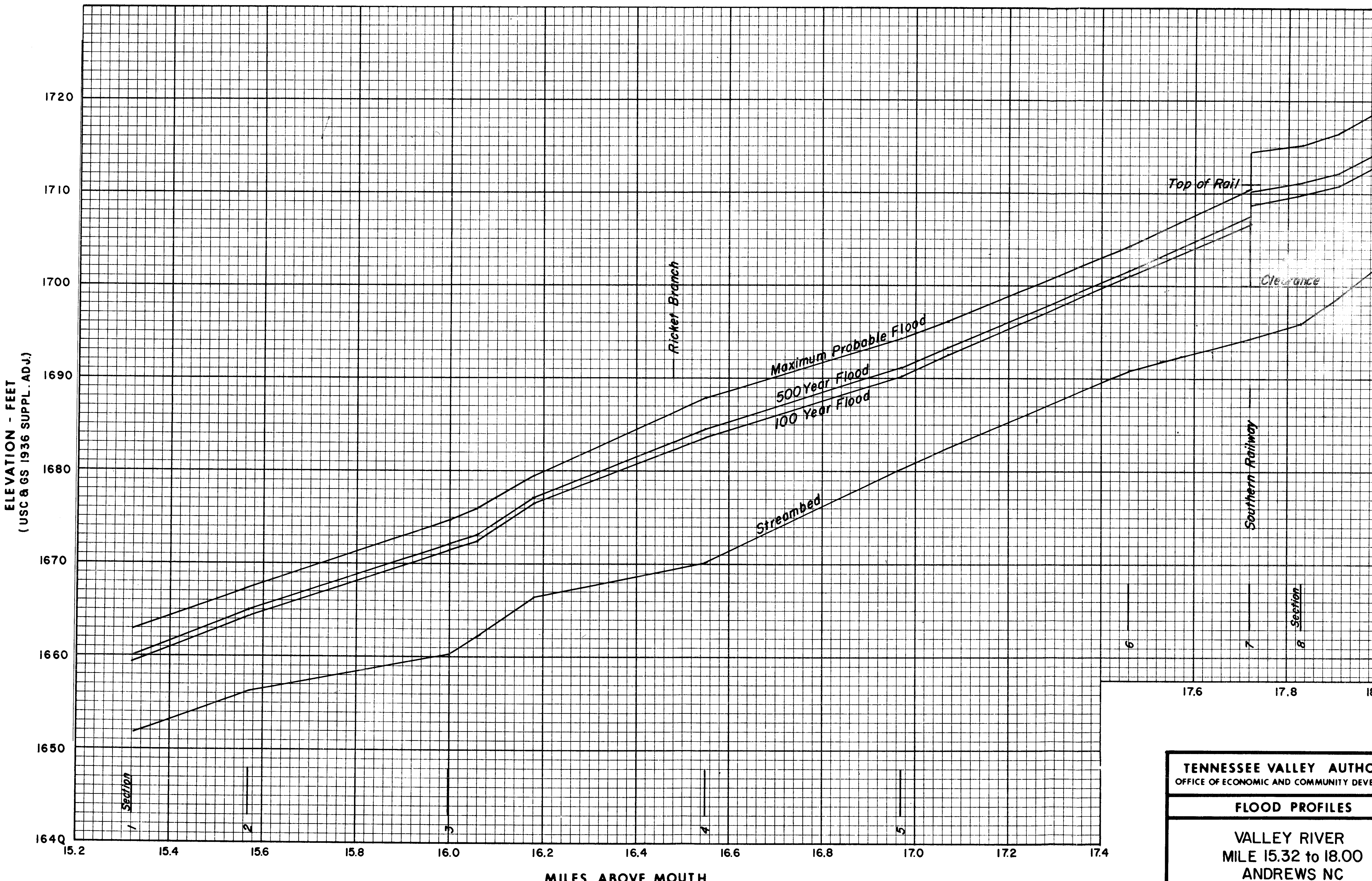
TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS

VALLEY RIVER
MILE 19.88 to 20.55
TATHAM CREEK
MILE 0.00 to 0.48
JUNALUSKA CREEK
MILE 0.00 to 0.92
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982

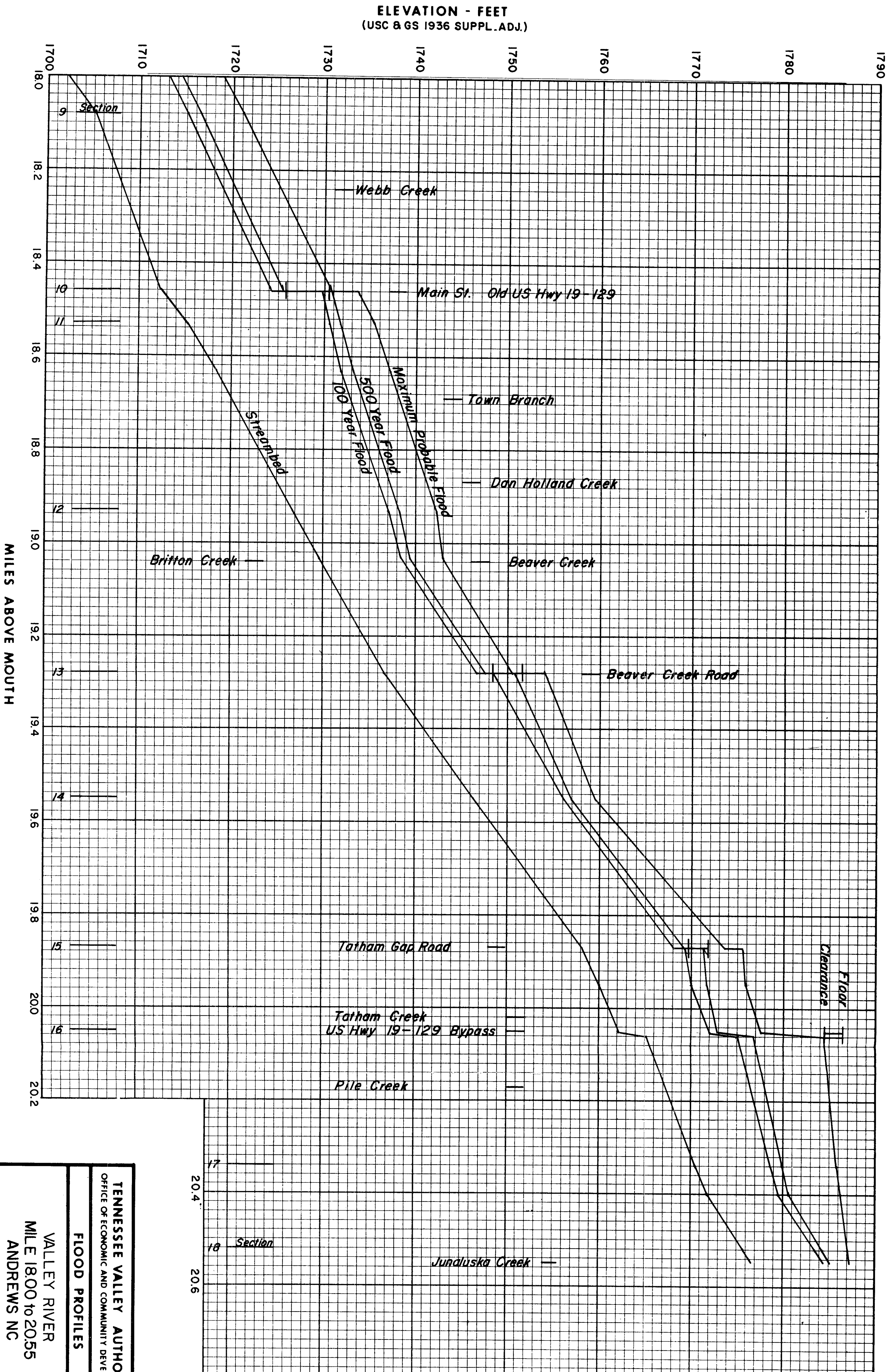


TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOOD PROFILES

VALLEY RIVER
MILE 15.32 to 18.00
ANDREWS NC

MARCH 1982



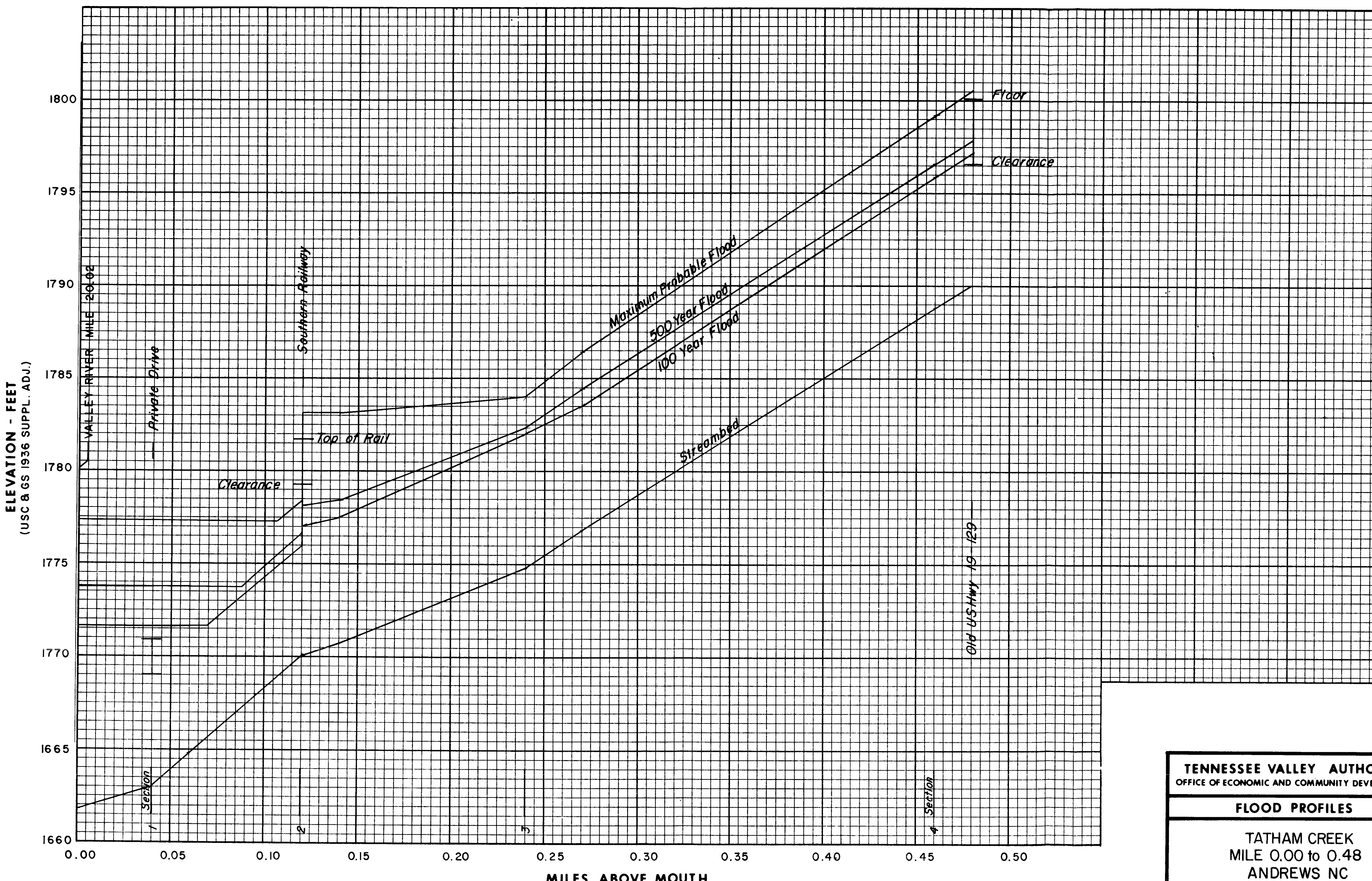
TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOOD PROFILES

VALLEY RIVER
MILE 18.00 to 20.55
ANDREWS NC

MARCH 1982

PLATE 7

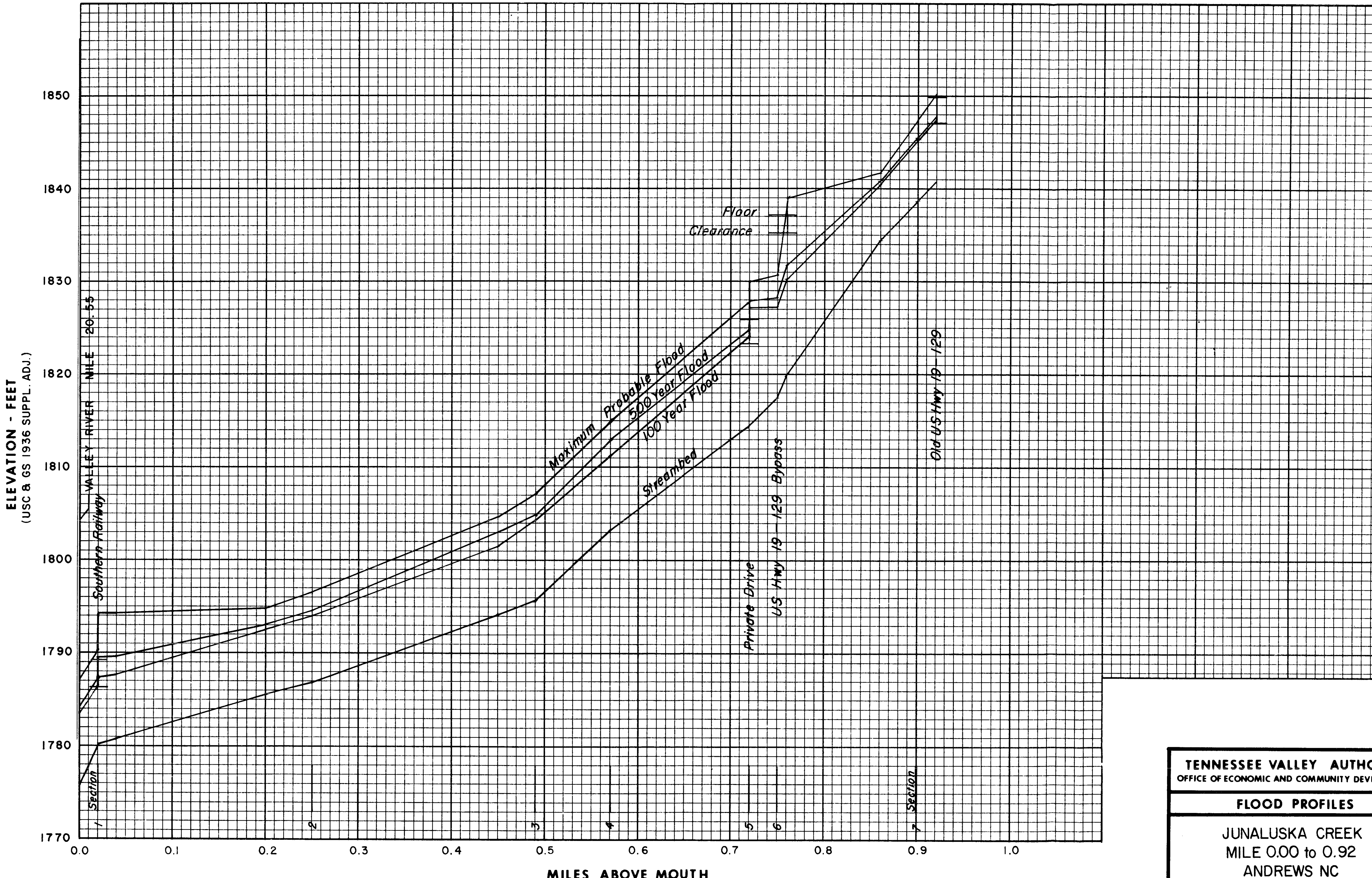


TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOOD PROFILES

TATHAM CREEK
MILE 0.00 to 0.48
ANDREWS NC

MARCH 1982



TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOOD PROFILES

JUNALUSKA CREEK
MILE 0.00 to 0.92
ANDREWS NC

MARCH 1982

APPENDIX

Table 1A

VALLEY RIVER 100-YEAR FLOODWAY

Cross Section		Floodway			Water Surface Elevation[c]		
No.	Mile	Width (feet)	Section Area (sq. ft.)	Mean Velocity (fps)[b]	With Floodway	Without Floodway	Difference
1	15.32	560	2,265	4.4	1660.3	1659.3	1.0
2	15.57	700	1,874	5.2	1665.2	1664.4	0.8
3	16.00	620	3,033	3.1	1672.5	1671.5	1.0
4	16.55	380	2,277	4.1	1684.6	1683.6	1.0
5	16.97	350	1,780	5.1	1690.9	1690.2	0.7
6	17.46	370	1,783	5.0	1702.1	1701.1	1.0
7	17.72 DS[a]	300	1,195	7.4	1707.6	1706.6	1.0
7	17.72 US[a]	300	1,653	5.3	1709.3	1708.7	0.6
8	17.83	240	1,923	4.6	1710.7	1709.8	0.9
9	18.08	240	1,300	6.6	1715.3	1715.2	0.1
10	18.46 DS	150	1,127	7.5	1724.5	1724.2	0.3
10	18.46 US	150	2,083	4.1	1730.9	1729.9	1.0
11	18.53	250	2,000	4.2	1731.6	1730.6	1.0
12	18.93	320	1,988	4.1	1737.7	1737.0	0.7
13	19.28 DS	170	1,203	6.7	1746.9	1746.7	0.2
13	19.28 US	170	1,469	5.5	1748.5	1748.5	0.0
14	19.55	210	743	10.6	1756.1	1756.1	0.0
15	19.87 DS	140	1,249	6.2	1769.1	1768.1	1.0
15	19.87 US	140	1,352	5.7	1769.8	1769.4	0.4
16	20.05 DS	100	573	11.5	1772.5	1772.0	0.5
16	20.06 US	160	1,228	5.4	1775.8	1775.0	0.8
17	20.34	170	1,048	6.0	1779.1	1778.5	0.6
18	20.52	90	479	12.8	1784.2	1783.5	0.7

a. Downstream and upstream at bridges.
b. fps (feet per second) is a measurement of how fast the water is moving.
c. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

Table 2A

TATHAM CREEK 100-YEAR FLOODWAY

Cross Section		Floodway			Water Surface Elevation[d]		
No.	Mile	Width (feet)	Section Area (sq. ft.)	Mean Velocity (fps)[b]	With Floodway	Without Floodway	Difference
1	0.04 DS[a]	250	684	4.0	1770.5	1769.5	1.0[c]
1	0.04 US[a]	250	828	3.3	1771.1	1770.1	1.0[c]
2	0.12 DS	120	391	6.9	1776.1	1775.9	0.2
2	0.12 US	120	450	6.0	1777.1	1777.0	0.1
3	0.24	65	356	7.6	1782.8	1782.0	0.8
4	0.46	40	285	9.4	1796.9	1795.9	1.0

a. Downstream and upstream at bridges.
b. fps (feet per second) is a measurement of how fast the water is moving.
c. Backwater effects from Valley River not considered.
d. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

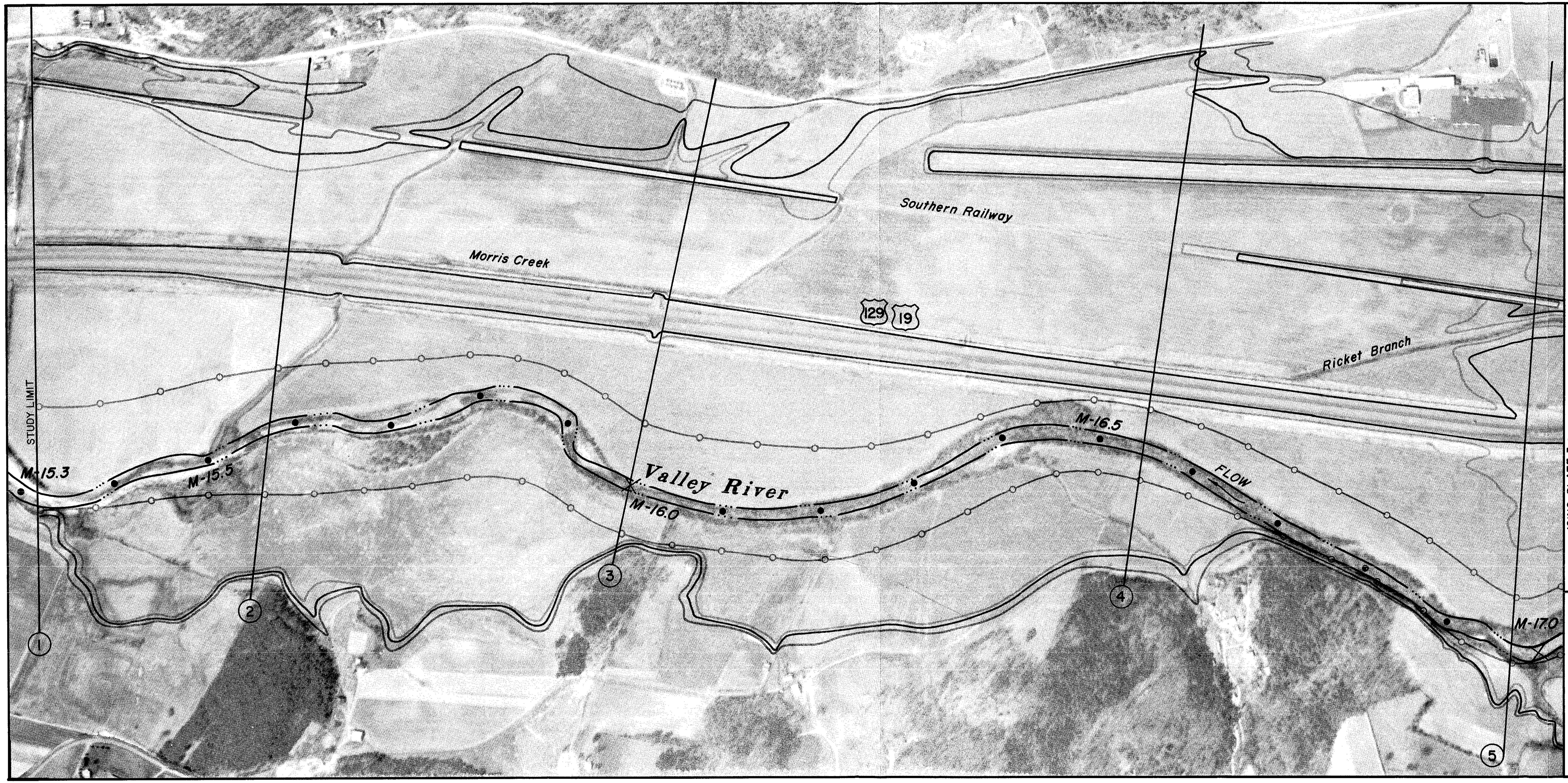
Table 3A

JUNALUSKA CREEK 100-YEAR FLOODWAY

Cross Section		Floodway			Water Surface Elevation[c]		
No.	Mile	Width (feet)	Section Area (sq. ft.)	Mean Velocity (fps)[b]	With Floodway	Without Floodway	Difference
1	0.02 DS[a]	80	477	5.7	1787.4	1786.4	1.0
1	0.02 US[a]	80	517	5.2	1787.9	1787.4	0.5
2	0.25	90	407	6.6	1795.0	1794.0	1.0
3	0.49	70	373	7.2	1804.3	1804.3	0.0
4	0.57	40	204	13.1	1811.1	1811.1	0.0
5	0.72 DS	70	311	8.6	1824.2	1824.1	0.1
5	0.72 US	90	628	4.2	1828.2	1827.2	1.0
6	0.75 DS	90	427	6.2	1828.3	1827.3	1.0
6	0.76 US	90	287	9.3	1830.5	1830.2	0.3
7	0.90	110	312	8.5	1846.2	1845.2	1.0

a. Downstream and upstream at bridges.
b. fps (feet per second) is a measurement of how fast the water is moving.
c. Feet above mean sea level (USC&GS 1936 Supplementary Adjustment).

PLATE 2A



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-16.0 MILES ABOVE MOUTH
1/10 MILE MARK
3 CROSS SECTION
FLOODWAY

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

N

TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

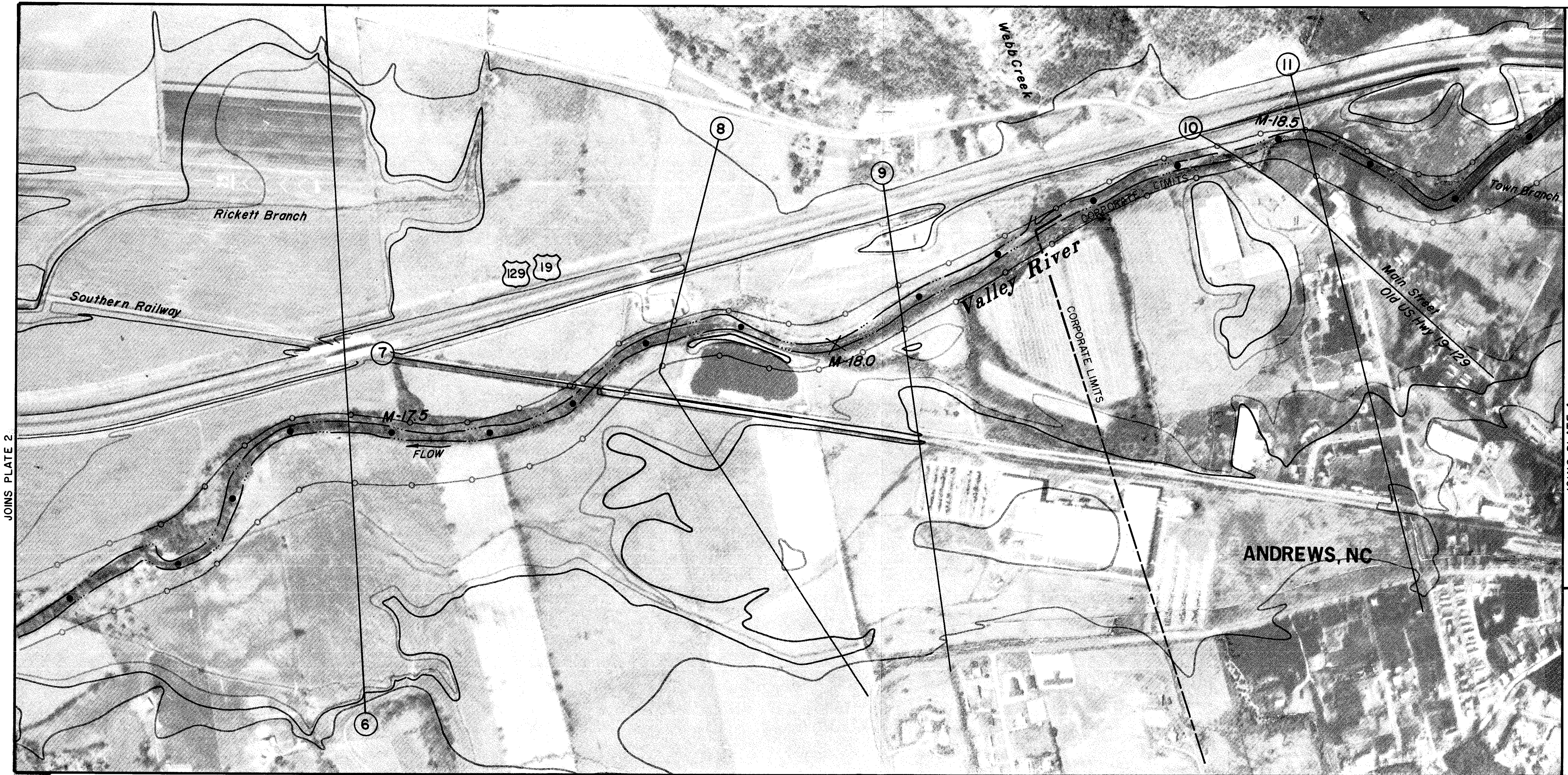
FLOODED AREAS
WITH PROPOSED FLOODWAY

VALLEY RIVER
MILE 15.32 to 17.03
ANDREWS, NC

SCALE 0 400 800FEET

MARCH 1982

PLATE 3A



LEGEND:

OVERFLOW LIMITS:
- MAXIMUM PROBABLE FLOOD
- 500 YEAR FLOOD
- 100 YEAR FLOOD

X M-18.0 MILES ABOVE MOUTH
• 1/10 MILE MARK
(8) CROSS SECTION
FLOODWAY

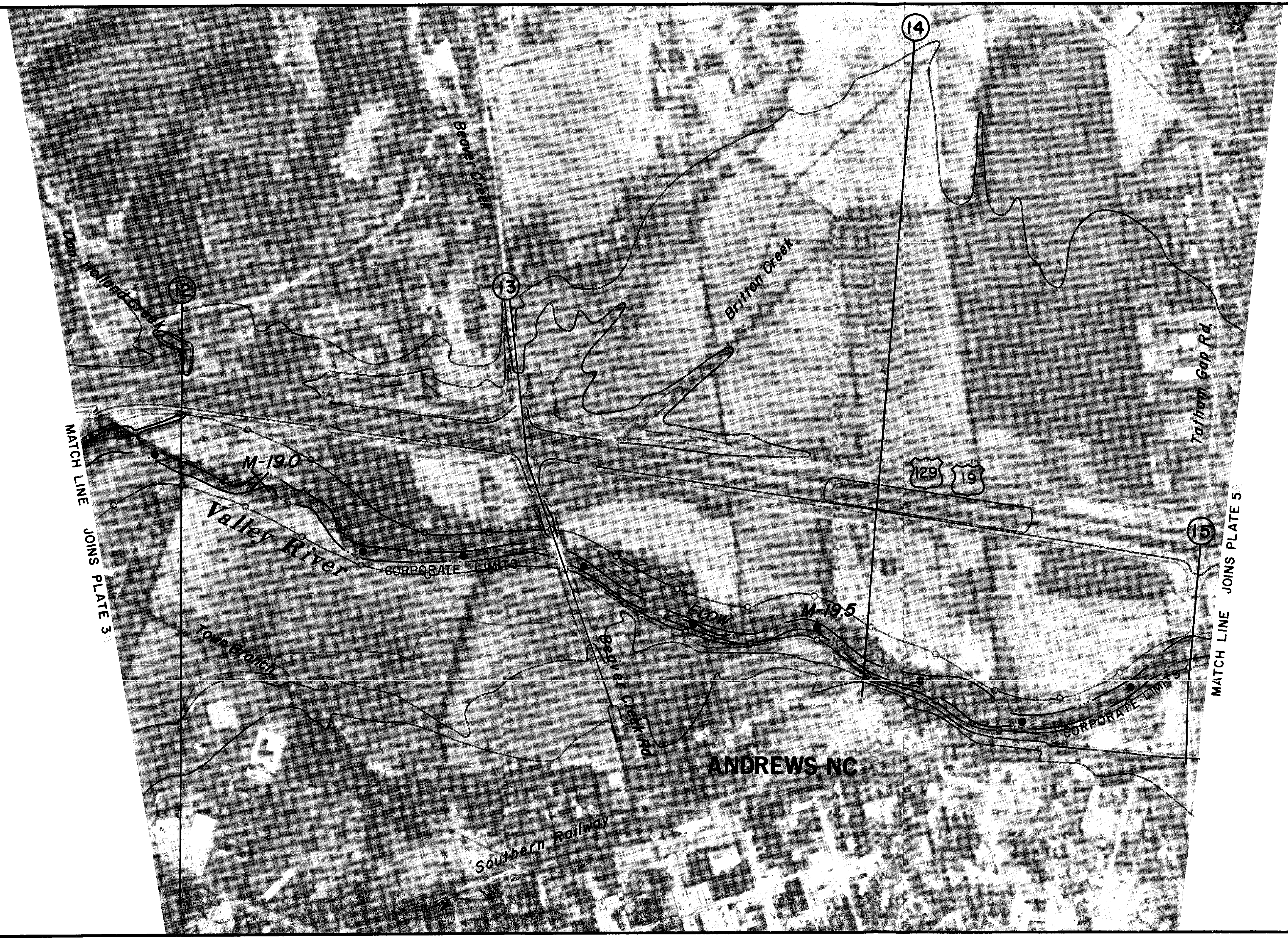
The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS
WITH PROPOSED FLOODWAY
VALLEY RIVER
MILE 17.03 to 18.84
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-19.0 MILES ABOVE MOUTH
$\frac{1}{10}$ MILE MARK
CROSS SECTION
FLOODWAY

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

N

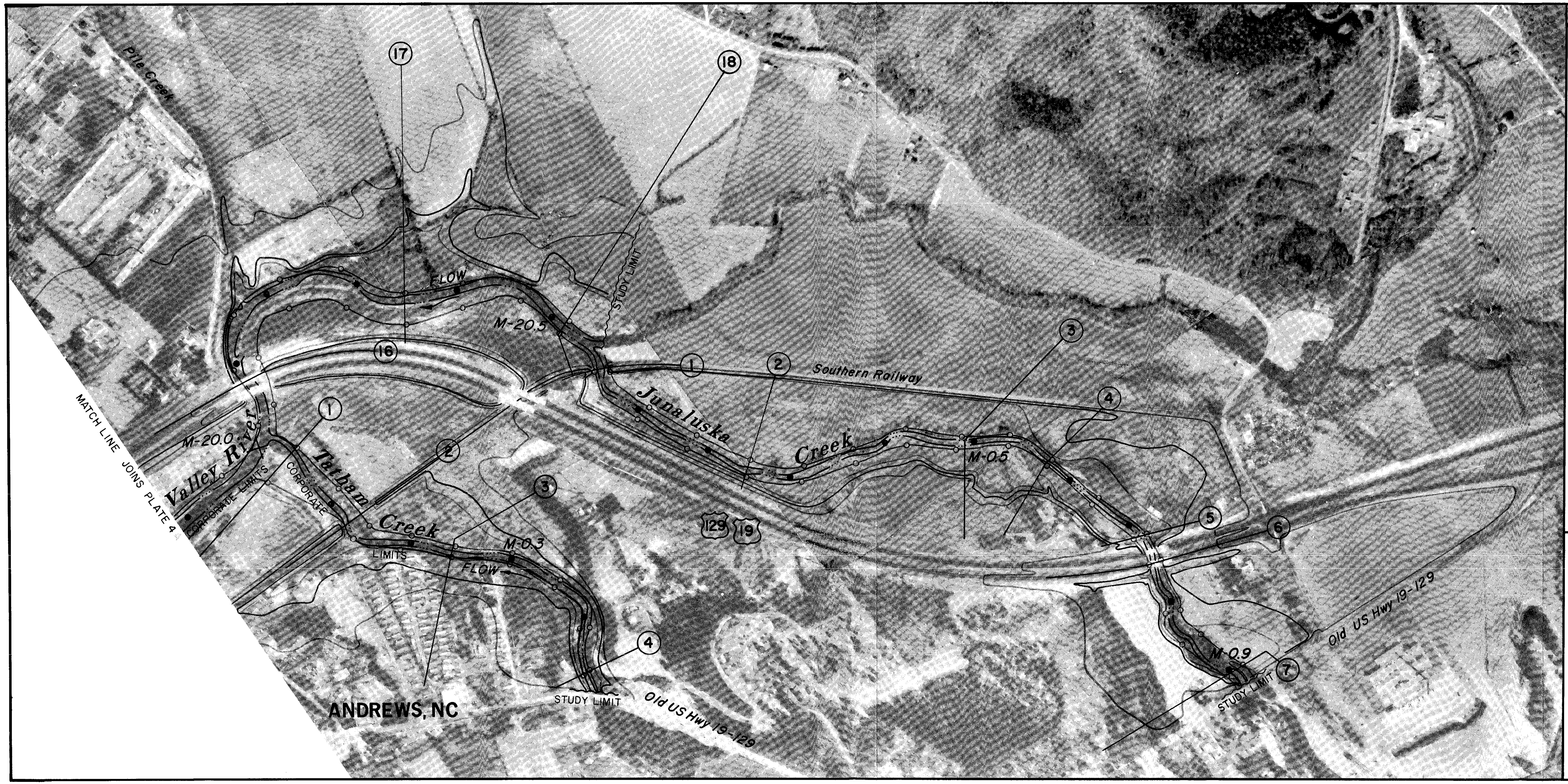
TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS
WITH PROPOSED FLOODWAY
VALLEY RIVER
MILE 18.84 to 19.88
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982

PLATE 5A



LEGEND:

OVERFLOW LIMITS:
MAXIMUM PROBABLE FLOOD
500 YEAR FLOOD
100 YEAR FLOOD
M-20.0 MILES ABOVE MOUTH
1/10 MILE MARK
(18) CROSS SECTION
FLOODWAY

The extent of flood overflow is based on data and measurements from aerial photography. Because of the methods used, the flooded areas as shown may not represent exact conditions on the ground.

N

TENNESSEE VALLEY AUTHORITY
OFFICE OF ECONOMIC AND COMMUNITY DEVELOPMENT

FLOODED AREAS
WITH PROPOSED FLOODWAY
VALLEY RIVER
MILE 19.88 to 20.55
TATHAM CREEK
MILE 0.00 to 0.48
JUNALUSKA CREEK
MILE 0.00 to 0.92
ANDREWS, NC

SCALE 0 400 800 FEET

MARCH 1982