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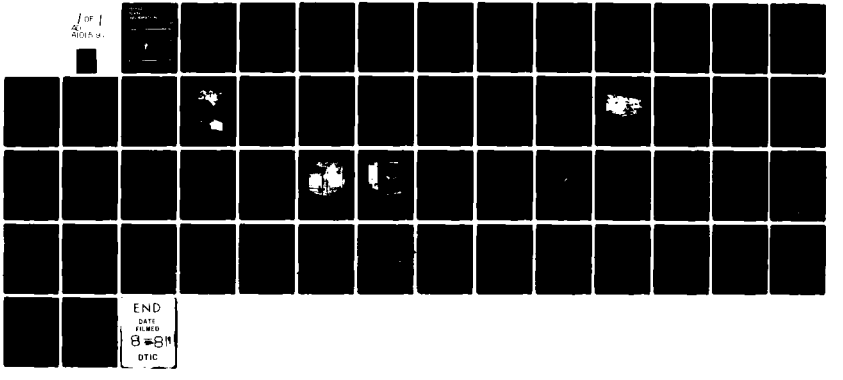

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FLOOD PLAIN INFORMATION

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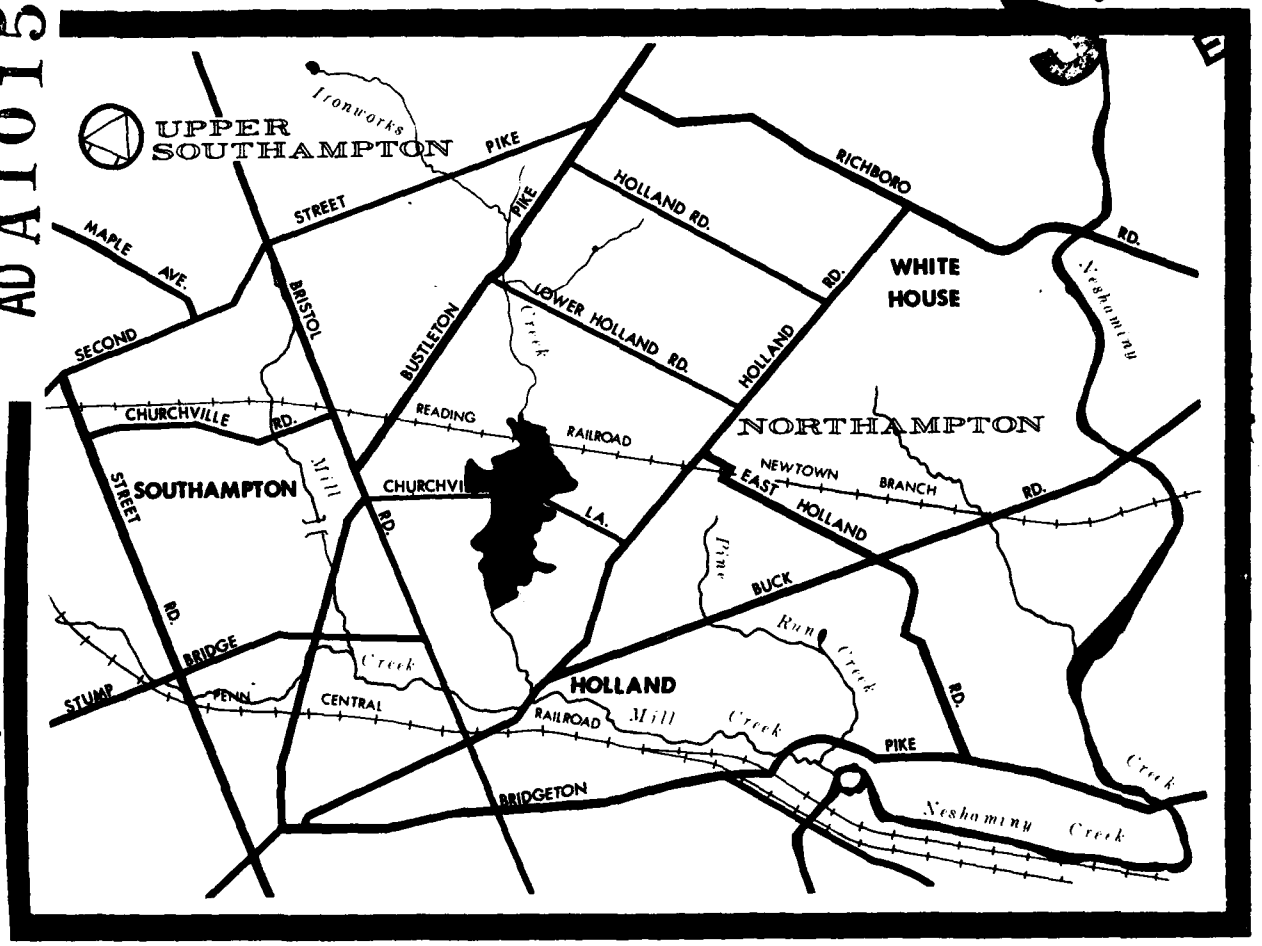
MILL CREEK AND IRONWORKS CREEK

BUCKS COUNTY, PENNSYLVANIA



PREPARED FOR THE BUCKS COUNTY PLANNING COMMISSION BY THE DEPT. OF THE ARMY, PHILADELPHIA DISTRICT, CORPS OF ENGINEERS, PHILADELPHIA, PA.

REPT. NO: DAEN/NAP-82040/FPI27-74/05

MAY 1974

TO THE REQUESTOR:

This Flood Plain Information (FPI) Report was prepared by the Philadelphia District office of the U.S. Army Corps of Engineers, under the continuing authority of the 1960 Flood Control Act, as amended. The report contains valuable background information, discussion of flood characteristics and historical flood data for the study area. The report also presents through tables, profiles, maps and text, the results of engineering studies to determine the possible magnitude and extent of future floods, because knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning floodplain utilization. These projections of possible flood events and their frequency of occurrence were based on conditions in the study area at the time the report was prepared.

Since the publication of this FPI Report, other engineering studies or reports may have been published for the area. Among these are Flood Insurance Studies prepared by the Federal Insurance Administration of the Federal Emergency Management Agency, Flood Insurance Studies generally provide different types of flood hazard data (including information pertinent to setting flood insurance rates) and different types of floodplain mapping for regulatory purposes and in some cases provide updated technical data based on recent flood events or changes in the study area that may have occurred since the publication of this report.

It is strongly suggested that, where available, Flood Insurance Studies and other sources of flood hazard data be sought out for the additional, and, in some cases, updated flood plain information which they might provide. Should you have any questions concerning the preparation of, or data contained in this FPI Report, please contact:

U.S. Army Corps of Engineers
Philadelphia District
Custom House, 2nd and Chestnut Streets
Philadelphia, PA 19106

ATTN: Flood Plain Mgt. Services Branch, NAPEN-M

Telephone number: (215) 597-4807

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Portions of Northampton, Upper Southampton and Lower Southampton Townships, Bucks County, Pa. which were subject to flooding from Mill Creek and Ironworks Creek were described in this study. The properties along these floodplains were severely damaged by the floods of August 19, 1955 and July 23, 1938. This report included the history of flooding in these areas and provided description thru maps, photographs, profiles and cross sections.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

Under authority of Section 206 of the 1960 Flood Control Act as amended the flood plain information was prepared by the U.S. Army Corps of Engineers Philadelphia District at the request of the Bucks County Planning Commission. The information should be considered for its historical nature. Since the publication of this FPI report, other Flood Insurance studies have been undertaken and should also be consulted for more current information.

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*Original contains color plates: All DTIC reproductions will be in black and white.

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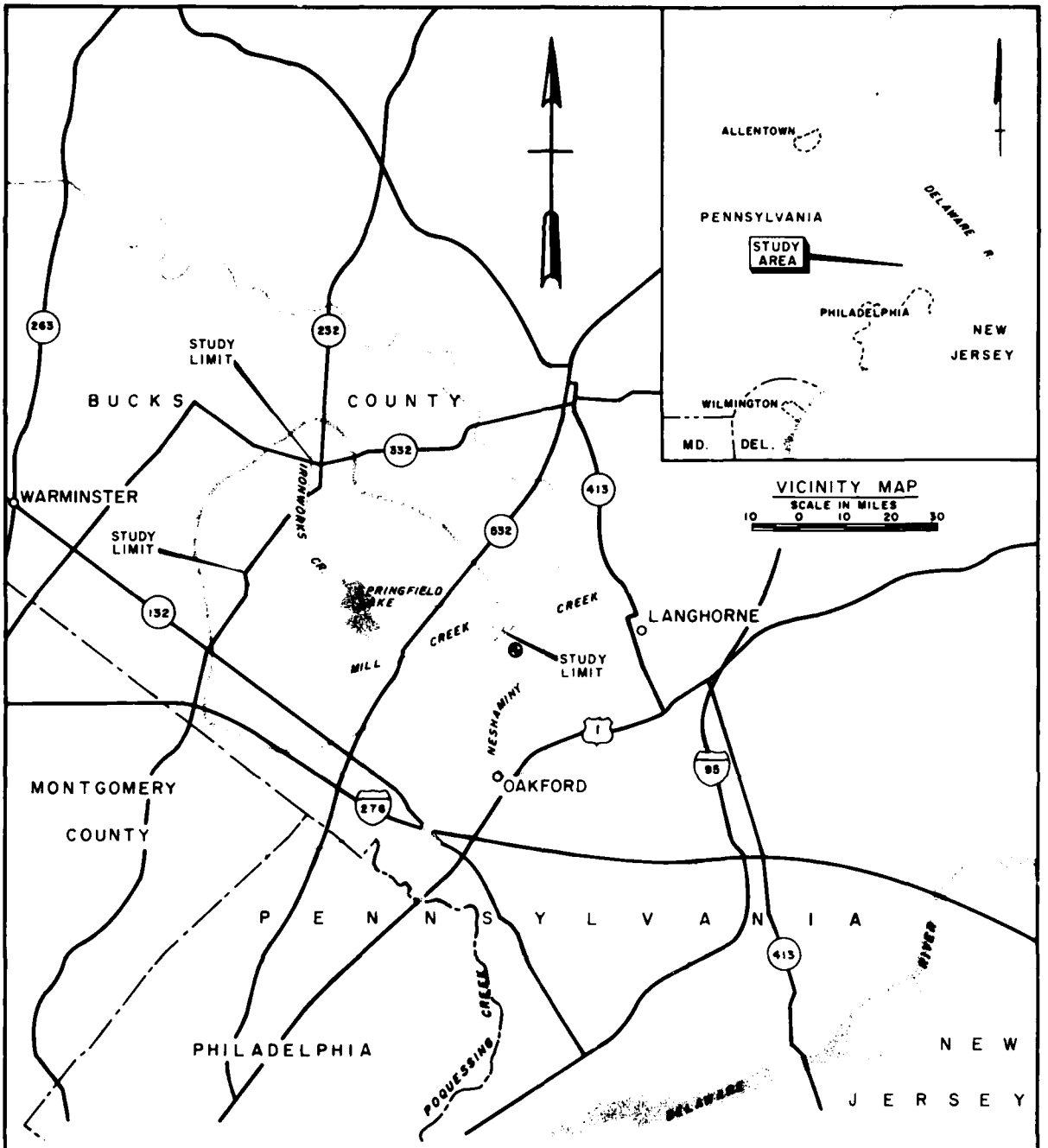


DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

GENERAL MAP

PLATE I

PREFACE

The portions of Northampton, Upper Southampton and Lower Southampton Townships, Bucks County, Pa., covered by this report are subject to flooding from Mill Creek and Ironworks Creek. The properties on the flood plains along these streams are primarily residential and industrial and have been severely damaged by the floods of August 19, 1955, and July 23, 1938. The open spaces in the flood plains which may come under pressure for future development are extensive. Although large floods have occurred in the past, studies indicate that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning flood plain utilization. It includes a history of flooding in Northampton, Upper Southampton, and Lower Southampton Townships, and identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, profiles, and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of the loss problems. It will also aid in the identification of areas where other flood damage reduction techniques such as works to modify flooding and adjustments including flood proofing might be embodied in an overall Flood Plain Management (FPM) program. Other FPM program studies--those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings--would also profit from this information.

At the request of the Bucks County Planning Commission and indorsement of the Pennsylvania Department of Environmental Resources, this report was prepared by the Philadelphia District Office of the Corps of Engineers, Department of the Army, under continuing authority provided in Section 206 of the 1960 Flood Control Act, as amended.

Assistance and cooperation of the U. S. Geological Survey (U.S.G.S.), Bucks County Planning Commission and private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the Bucks County Planning Commission, Division of Natural Resources. The Philadelphia District Office of the Corps of Engineers, Department of the Army, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented as well as planning guidance and further assistance, including the development of additional technical information.

BACKGROUND INFORMATION

Settlement

Prior to the intense settlement of the lower Bucks County area by William Penn, the chief inhabitants of the area were the Lenni-Lenape Indians. Situated near the confluence of Mill Creek with Neshaminy Creek was one of the major villages of this tribe called Playwicki.

Generally, the Indian villages of the Lenni-Lenape tribe were seldom permanent since the tribe was migratory in nature, moving with the seasons to their planting grounds or to the mountains for hunting. Still, Playwicki seemed to be one of their favorite winter encampments and hunting grounds since it had good water supply and drainage, good soil for crops, and an abundance of wild turkeys. The village itself was permanent enough to be referred to by William Penn in some of his land purchases when describing boundaries, although little concrete evidence exists to pinpoint its exact location.

In the early 18th Century, a group of farmers whose Dutch grandfathers had settled in New York came to the Mill Creek Valley. As their grain crops began to thrive, they soon found the need for a grinding mill closer to them. So in 1787, a grist mill was built at the confluence of Ironworks and Mill Creeks. The mill continued to operate until 1918 when a fire destroyed the mill and left nothing remaining but the stone walls. It was soon rebuilt and the old wooden wheel was replaced by an iron water turbine and the mill continued to operate until 1961. The town that grew up around the mill was named Rocksville because of the many rocks in the stream and the surrounding farmlands. The town was later renamed Holland honoring the heritage of the founders.

Two other towns in the vicinity of Mill Creek which were important in the settlement of the valley were Churchville and Richboro. Churchville had its beginning in 1816 when the Low Dutch Reformed Congregation of the Southampton Reformed Chruch at Feasterville, relocated to its present site near Bristol Road and Bustleton Pike, and built what is now known as the Churchville Reformed Church. Richboro, located at the intersection of Second Street Pike and Almshouse Road, was known as Bear or Black Bear from the sign on its tavern for many years. The name of Richboro orginated from the name of the first postmaster of the town, Richard Thomas.

In addition to Holland, Churchville and Richboro, the Mill Creek Valley includes portions of Northampton, Lower Southampton and Upper Southampton Townships. These areas remained agriculturally oriented until the 1950's when suburban expansion from Philadelphia began to take over the farmland. The trend continues today with the Towns of Holland, Churchville and Richboro serving as cores for major housing developments. Mill Creek's flood plain, because of its attractiveness and the decreasing number of nearby choice homesites, will continue to come under pressure for development.

The Stream and Its Valley

Mill Creek, with a drainage area of 17.4 square miles, originates in Northampton Township, Bucks County, and wanders in a southeasterly direction to its confluence with Neshaminy Creek at Playwicki Park, Bucks County. The watershed is rolling, agricultural land with some development scattered along the stream. The flood plain is generally narrow in the upper reach, being more confined by the hilly terrain, but the width increases in the lower reach. The 5.53 mile study reach has a uniform slope averaging 33.2 feet per mile.

Ironworks Creek, with a drainage area of 6.3 square miles, also originates in Northampton Township, Bucks County, and flows in a southerly direction to its confluence with Mill Creek in Holland, Bucks County. The watershed is similar to that of Mill Creek with development in progress along the upper reach of the stream. Generally, the flood plain of Ironworks Creek is narrow and confined by the more rugged terrain except where it broadens to form Springfield Lake. The 3.87 mile study reach has a uniform slope averaging 45.8 feet per mile. The portions of Mill Creek and Ironworks Creek included in this study are shown on the general map. Drainage areas contributing to runoff at locations in the study area are shown in Table 1.

The climate is characterized by warm summers, when temperatures may rise above 85 degrees, and cool winters, when temperatures reach below 20 degrees. Annual precipitation over the basin averages 44 inches and is evenly distributed throughout the year.

TABLE 1
DRAINAGE AREA
Mill Creek and Ironworks Creek

Location	Mileage Above Mouth	Drainage Area Tributary sq. mi.	Drainage Area Total sq. mi.
Mill Creek			
Mill Creek at the mouth	0.0	----	17.4
Pine Run Tributary	.12	2.7	17.3
Ironworks Creek	1.96	6.3	14.0
Unnamed tributary	3.14	2.7	6.7
End of study area	5.53	----	2.4
Ironworks Creek			
At confluence with Mill Creek	0.0	----	6.3
Downstream of Springfield Lake Dam	0.56	----	5.9
Downstream of Elm Road	1.51	----	4.9
Unnamed tributary	2.55	0.8	3.3
Unnamed tributary	2.91	0.7	2.2
End of study area	3.87	------	0.4

Developments in the Flood Plain

Most of the flood plain along Mill Creek is sparsely occupied although there has been some development. Encroachment on the flood plain has occurred in the northern portion of the watershed above Gravel Hill Road, where the suburban area has been expanding. The gently sloping flood plain in this area is occupied by a housing development. There are two restaurants on Mill Creek, both of which have suffered damages from past flooding. The flood plain of Ironworks Creek is similar to that of Mill Creek with development now underway in the upper reach of the stream.

There is one dam on Mill Creek and it has no flood storage capacity. Two dams are constructed across Ironworks Creek. One dam forms Springfield Lake, which is used for water supply. This structure was not designed for flood control, but could lessen peak flows of smaller flood events through its limited storage and ponding effect. The other dam on Ironworks Creek has no flood storage capacity.

In addition to the residential, industrial, and commercial buildings in the flood plain, numerous state roads, local roads and utility lines would be subject to flooding. Rapid development of residential areas is occurring in the watersheds at the present time, and future growth and expansion of both residential and commercial areas will result in additional pressures to utilize the flood plain of both Mill Creek and Ironworks Creek.

FLOOD SITUATION

Sources of Data and Records

The United States Geological Survey maintains a gaging station on the Neshaminy Creek at Langhorne, Pennsylvania, which has recorded maximum daily peak discharges from the year 1933 to the present. Information from this gage was valuable in evaluating the flood potential of both Mill Creek and Ironworks Creek for which there are no peak discharge records available.

To supplement the records at the gaging station, newspaper files, historical documents and records were searched for information concerning past floods. These records have helped in developing a knowledge of floods which have occurred on Mill Creek and Ironworks Creek.

Maps prepared for this report were based on U. S. Geological Survey Quadrangle Sheets entitled "Hatboro, Pennsylvania" dated 1966 and "Langhorne, Pennsylvania," dated 1966. Structural data on bridges and culverts were obtained by field surveys performed by Corps of Engineers, Philadelphia District, personnel. Crest stages and discharges for known floods at the gaging station on Neshaminy Creek at Langhorne, Pennsylvania, are shown in Table 2 on page 10. The gage location is shown on Plate 1 and Plate 3.

Flood Season and Flood Characteristics

Major floods have occurred in the study reaches of Mill Creek during all seasons of the year with the greatest recorded flood occurring in August 1955. Floodflow stages can rise from normal flow to extreme flood peaks in a relatively short period of time with high velocities in the main channel of the streams.

In addition to floods caused by runoff from general rainfall, the Mill Creek and Ironworks Creek Watersheds are susceptible to hurricane activity and floods from snowmelt in combination with rain fall. The reach of Mill Creek between its confluence with Neshaminy Creek and Holland Road may also be affected by high flood stages on Neshaminy Creek.

Factors Affecting Flooding and Its Impact

Obstructions to floodflows - Natural obstructions to floodflows include trees, brush and other vegetation growing along the stream banks in floodway areas. Man-made encroachments on or over the streams such as dams, bridges and culverts can also create more extensive flooding than would otherwise occur. Representative obstructions to floodflows are shown in Figures 1 and 2.

During floods, trees, brush and other vegetation growing in floodways impede floodflows, thus creating backwater and increased flood heights. Trees and other debris may be washed away and carried downstream to collect on bridges and other obstructions to flow. As floodflow increases, masses of debris break loose and a wall of water and debris surges downstream until another obstruction is encountered. Debris may collect against a bridge until the load exceeds its structural capacity and the bridge is destroyed. The limited capacity of obstructive bridges or culverts, debris plugs at the culvert mouth or a combination of these factors retard floodflows and result in flooding upstream, erosion around the culvert entrance and bridge approach embankments and possible damage to the overlying roadbed.

In general, obstructions restrict floodflows and result in overbank flows and unpredictable areas of flooding, destruction of or damage to bridges and culverts, and, an increased velocity of flow immediately downstream. It is impossible to predict the degree or location of the accumulation of debris; therefore, for the purposes of this report, it was necessary to assume that there would be no accumulation of debris to clog any of the bridge or culvert openings in the development of the flood profiles.

Mill Creek and Ironworks Creek are spanned 23 times by bridges and culverts. Pertinent information on these bridges and culverts can be found in Table 4 on Page 19. Many of these bridges are obstructive to floodflows. As previously stated, the dams on Mill Creek and Ironworks Creek will have no significant effect on floodflows with the exception of Springfield Lake, which could lessen peak flows of small flood events.

FIGURE 1 - Debris in Mill Creek is caught on the pier of Bridgetown Pike in Northampton Township.

FIGURE 2 - Debris in Mill Creek is accumulating on a sand bar upstream of Bristol Road in Lower Southampton Township.

Flood damage reduction measures - There is only one community, Northampton Township, along Mill Creek and Ironworks Creek which has a flood plain zoning ordinance. Lower Southampton Township is in the process of writing an ordinance. Upper Southampton Township has no oridnance pending but has a regulation which states that there can be no building within 100 feet of the stream and they also use Bucks County Flood Plain Maps as guidelines for development restrictions. All three townships have applied for flood insurance under the National Flood Insurance Program, and to remain eligible they are required to adopt regulations governing future development in the flood plain.

Other factors and their impacts - The impact of flooding along Mill Creek and Ironworks Creek can be affected by the ability of local residents to anticipate and effectively react to a flood emergency. Efficient flood warning and forecasting systems can give homeowners, business, and industry valuable time to remove damageable materials from low-lying areas. Increased damages to downstream areas can be reduced if floatable materials stored on the flood plain can be removed before being carried downstream to block bridge and culvert openings. Implementation of effective flood fighting and emergency evacuation plans can further reduce flood damages and the incidence of personal injury and death once the creek has reached flood stage.

Flood warning and forecasting - The National Weather Service Branch of the National Oceanic and Atmospheric Administration (NOAA) maintains year-round surveillance of weather conditions in the study area with stations at Philadelphia, Pa., and Trenton, N.J. Flood warnings and predicted flood peaks are issued by the NOAA flood forecasting centers at Harrisburg, Pennsylvania, and Trenton, New Jersey. In times of a flood emergency, the Bucks County Civil Defense Office maintains communications with the State Civil Defense Headquarters and The National Weather Service in order to establish a "floodwatch" during the earliest stages of a flood threat. Usual warnings are issued by these agencies to the inhabitants of the area through radio, television, and the local press.

Flood fighting and emergency evacuation plans - Although there are no formal flood fighting or emregency evacuation plans for Mill Creek and Ironworks Creek, provisions for alerting area residents through local communications media and coordinating operations for Bucks County are accomplished through the Bucks County Civil Defense Office. This office coordinates flood fighting, evacuation and rescue activities on a countywide basis with local agencies. Plans have been made by the county to provide emergency mass care centers for residents that have been displaced from their homes by floodwater. During past floods, assistance in carrying out rescue operations has been provided by the Naval Air Development Center at Johnsville, Pennsylvania, and the Willow Grove Naval Air Station in Horsham, Pennsylvania.

Material storage on the flood plain - Large portions of the flood plains of Mill Creek and Ironworks Creek are undeveloped at the present time and in the areas of existing residential development, there is little or no material storage on the flood plains. In the future, as the flood plains of Mill Creek and Ironworks Creek come under increasing pressure for development, increased quantities of buoyant materials may be stored on the flood plains. Floatable materials from residential, commercial and industrial development may be carried away by floodflows and swept downstream to block bridge and culvert openings and create more hazardous flooding conditions.

PAST FLOODS

Summary of Historical Floods

Floods have occurred on Mill Creek and Ironworks Creek in 1882, 1938, 1955, 1971, and 1973. There are no gage records available for these streams, but the U. S. Geological Survey Gaging Station No. 4655, located on the main stem of Neshaminy Creek at Langhorne, Pennsylvania, recorded its peak flow on August 19, 1955. This flood event was also the greatest flood on Mill Creek in recent history.

Flood Records

Since no gage records are available for Mill Creek and Ironworks Creek, information on historical floods was obtained from stream gaging records at the U.S.G.S. Gage on the Neshaminy Creek at Langhorne, Pa.

To supplement the records at the gaging station, newspaper files, historical documents and records were searched for information concerning past floods. These records have helped in developing a knowledge of floods which have occurred on Mill Creek and Ironworks Creek. Crest stages for known floods at the gaging station on Neshaminy Creek at Langhorne, Pennsylvania, are shown in Table 2.

TABLE 2

FLOOD CREST ELEVATIONS

Neshaminy Creek

U. S. G. S. Gaging Station No. 4655 at Langhorne, Pennsylvania (a)

Date of Crest	Estimated Peak Discharge cfs	Stage (b) ft	Elevation (c) ft. - m.s.l.d.
August 19, 1955	49,300	22.8	63.4
June 30, 1973	35,450	19.0	59.5
August 23, 1933	30,000	17.3	57.9
July 23, 1938	24,800	15.9	56.5
November 9, 1972	21,800	15.0	55.6
November 26, 1950	21,700	14.9	55.5
August 28, 1971	20,700	14.7	55.3
June 2, 1946	20,500	14.5	55.1
September 13, 1971	19,900	14.3	54.9
September 13, 1960	19,400	14.4	55.0
March 7, 1967	16,600	13.0	53.6

(a) Drainage area equals 210 square miles.

(b) Overbank flooding begins at a stage of 7 feet as per U. S. G. S.

(c) Feet, mean sea level datum. Gage datum is 40.57 feet above mean sea level datum, 1929 adjustment.

Flood Descriptions

July 23, 1938 - On this date the Neshaminy Creek crested at its third highest level in its recorded history. The flood was produced by a stationary cold front which condensed moist warm air from the ocean into five or six days of rainfall. The upper watershed area of Mill Creek sustained much damage from overland flow as seen in the following article.

EXCERPTS FROM THE NEWTOWN ENTERPRISE [a]
JULY 28, 1938, RELATIVE TO THE FLOOD OF JULY 23, 1938

Raging Floodwaters Five Feet Deep In A Newtown Street; Gardens Destroyed, Pavements Swept Away, Stored Automobiles Damaged, Nearly A Thousand Chickens Drowned

Several days of dashing rainstorms have caused thousands of dollars of loss throughout this community. The heavy downpour of Saturday morning blocked several roads in this vicinity and for three hours made travelling south out of Richboro almost impossible.

On Bristol Road just north of the Second Street Pike, a large sink occurred when the waters undermined the road and finally lifted the macadam surfacing away leaving only mud, which entrapped four cars before being blocked off by the State Highway Department. It was necessary to employ the use of trucks in removing the cars from the hole and had much time elapsed before the rescue it was said by highwaymen, that the cars might possibly been drawn several feet into the hole.

In Richboro, the townspeople received their share of the misfortune when the rains drained away from the road and into the cellars and garages. In some cellars in the upper end of the village, the water reached the level of the first floor and it was necessary to use small auxiliary pumps and electrical systems. On the firehouse lot, over two feet of water was in evidence and the majority of this drained into the basement of the firehall making it necessary that fire engines be used to pump it out before it damaged property which is stored in the basement. At two places on Bustleton Pike the water covered the road, making travelling impossible.

August 19, 1955 - Hurricane Diane brought nearly six inches of rainfall in eight hours to the Neshaminy Basin just one week after Hurricane Connie had drenched the watershed. The resulting flood, the worst in the recorded history of the Neshaminy, created hovoc in Lower Bucks County. Personal interviews with residents along Mill Creek indicate that this flood was higher than the August 28, 1971, flood by two or three feet at Buck Road.

EXCERPTS FROM THE BRISTOL DAILY COURIER [a]
AUGUST 19, 1955

Bucks Floods Bring Death As Families Run For Lives 18 Year Old Girl Dies In Wild Water

Floodwater swept through Bucks County last night taking the life of at least one person and stranding scores of others in treetops and rooftops.

The floodwaters have closed off roads and damaged homes from Yardley to Richboro to Bristol taking in a hugh rectangular area flooded by Little Neshaminy, Neshaminy Creek, the Delaware River, and other numerous small creeks.

Possible casualties in the area which experienced the most serious flooding over a quarter mile strip were not readily accounted for because many homes were still not accessible.

Red Cross disaster units were alerted to survey damage along the entire Neshaminy Valley Area and Red Cross units worked along with other volunteers all night to rescue and care for evacuees.

(a) Simulated from newspaper clippings.

EXCERPTS FROM THE BRISTOL DAILY COURIER [a]
AUGUST 20, 1955, RELATIVE TO THE FLOOD OF AUGUST 19, 1955

County Digs Out Of Hard Flood After A Night Of Horror One Life Taken, Property Loss In Millions

Lower Bucks County and the surrounding areas began cleanup operations after a night of horror and destruction caused by the worst flood conditions in the history of the Delaware Valley.

Waters which reached 22 feet or more above normal at crest began slowly receding about 8 A.M. but officials estimated the floodwaters could take as much as 16 hours to reach a level approaching normal.

Lower Bucks County today stood in the midst of more than a million dollars worth of damage as the aftermath of this area's flood caused the loss of one life and left a record number of flooded homes and basements.

Rampaging nature shifted its scene of destruction from the Neshaminy Creek to the Delaware during the night in local communities and the predicted back up of river water into the Neshaminy was minor.

August 28, 1971 - A fairly uniform rainfall distribution resulting from the passage of Tropical Storm Doria through Bucks County produced the sixth highest flood of record in the Neshaminy Basin. Personal interviews with residents along Mill Creek indicate that flooding caused major damage. Although the flood level was known by one resident to be less than that of August 19, 1955, the Mill Race Restaurant at Buck Road had nearly 18 inches of floodwater in its lower dining room. The Valley Stream Restaurant at Bridgetown Pike also sustained considerable damage as seen in Figure 3 on Page 13.

EXCERPTS FROM THE BUCKS COUNTY COURIER TIMES [a]
AUGUST 28, 1971

Lower Bucks Drying Out From Storm, Heavy Damage Seen

Bucks County was drying out today from a heavy tropical storm which left thousands of dollars in damage and caused some to flee their homes.

Tropical Storm Doria dropped 6.57 inches of rain in the Philadelphia Area from the time the downpour started late Thursday night till it ceased about daybreak this morning. The rain and winds reached 50 miles per hour, toppled trees and pulled down electric lines throughout Bucks County.

Many communities had power failures and this morning volunteer firemen, first aid and civil defense people were on the alert most of the night. Police switchboards were jammed with calls.

Firemen pumped out dozens of flooded basements. The worst flooding was reported along creek basins. By daybreak the Neshaminy Creek was flooding its banks and people along its banks were warned to leave their homes.

(a) Simulated from newspaper clippings.

FIGURE 3 - Floodwaters from the August 28, 1971, flood surround the Valley Stream Bar and Restaurant located on Bridgetown Pike. (Photo from September 2, 1971, issue of *Delaware Valley Advance).*

June 29, 1973 - Neshaminy Creek rose to near record heights when 6.5 inches of rain fell in a 27 hour period beginning early Friday morning. The creek was at its highest since Hurricane Diane in 1955. The Valley Stream Restaurant at Bridgetown Pike was again damaged as water from the Neshaminy Creek backed up into Mill Creek and surrounded the restaurant with swirling water.

EXCERPTS FROM THE DELAWARE VALLEY ADVANCE,[a] JULY 5, 1973, RELATIVE TO THE FLOOD OF JUNE 30, 1973

Bucks To Be Declared Disaster Area Neshaminy At Highest Since 1955

Most of the families driven out by last Friday's floods in Lower Bucks had returned to their homes by Monday for an enormous clean-up job in the wake of the storm that brought the Neshaminy Creek to its highest crest since 1955. The creek crested at 18.86 feet at 2 A.M. Saturday at Langhorne.

The 1955 crest was 22.4 feet. The next highest crest, 14 feet was recorded for floods after heavy rainfall in 1960, 1971, and 1972.

Rainfall recorded in Doylestown between 5 A.M. Friday and 8 A.M. Saturday was 6.5 inches with the heaviest rainfall between noon and 3 P.M. In one 40 minute period in the afternoon 1.75 inches of rain fell. "Minor tributaries became major tributaries," said John Carson, Director of Bucks County Department of Natural Resources.

The rampaging Neshaminy Creek did most of the serious damage, Charles McGill, Head of the County Civil Defense Unit said Monday. He expected damage to exceed a million dollars in Lower Bucks but Carson said it might possibly reach $5 million.

Carson counted 25 homes damaged in Langhorne Terrace but could not estimate damage in the lower end of the creek because he could not get into the area. Carson said that possibly a million dollars in damages was avoided when water was held back at the North Branch Dam now operating on the Neshaminy Creek in Upper Bucks. The branch held water to a 30 foot depth over a 200 acre area completely eliminating flooding in Chalfont, Carson said.

(a) Simulated from newspaper clippings.

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past could occur in the future. Larger floods have been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall and runoff which caused these floods could occur in the study area. Therefore, to determine the flooding potential of the study area, it was necessary to consider storms and floods that have occurred in regions of like topography, watershed cover and physical characteristics. Discussion of the future floods in this report is limited to those that have been designated as the Intermediate Regional Flood and the Standard Project Flood. The Standard Project Flood represents a reasonable upper limit of expected flooding in the study area. The Intermediate Regional Flood may reasonably be expected to occur more frequently although it will not be as severe as the infrequent Standard Project Flood.

Intermediate Regional Flood

The Intermediate Regional Flood is defined as one that occurs once in 100 years on the average although it could occur in any year. The peak flow on this flood was developed from statistical analyses of streamflow records at Langhorne, Pennsylvania, in conjunction with regional synthetic analyses at selected locations along Mill Creek and Ironworks Creek. Peak flows thus developed for the Intermediate Regional Flood at selected locations in the study area are shown in Table 3 on Page 16.

Standard Project Flood

The Standard Project Flood is defined as a major flood that may be expected to occur from a severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the study area is located, excluding extremely rare combinations. The Corps of Engineers, in cooperation with the NOAA Weather Service, has made comprehensive studies and investigations based on the past records of experienced storms and floods and has developed generalized procedures for estimating the flood potential of streams. Peak discharges for the Standard Project Flood at selected locations in the study area are shown in Table 3. Discharge hydrographs for the Standard Project Flood at the mouths of Mill Creek and Ironworks Creek are shown on Plate 10. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are shown on Plates 7 and 8.

TABLE 3
PEAK FLOWS FOR THE INTERMEDIATE REGIONAL AND
STANDARD PROJECT FLOODS

Location	Mileage Above Mouth	Intermediate Regional Flood Discharge cfs	Standard Project Flood Discharge cfs
Mill Creek			
At the Mouth	0.0	5,950	9,500
Upstream of Pine Run Tributary	0.12	5,250	8,130
Downstream of Ironworks Creek	1.96	5,070	7,850
Downstream of Unnamed Tributary	3.14	2,835	4,460
Ironworks Creek			
At the Mouth	0.0	2,730	3,900
Downstream of Elm Road	1.51	2,207	3,070
Downstream of Unnamed Tributary	2.55	1,627	2,610
Downstream of Unnamed Tributary	2.91	1,207	1,900

Frequency

Discharge frequency values were determined at various locations within the study area from generalized curves developed in the Delaware River Basin Report. The curve presents the frequency of floodflows up to the magnitude of once in 100 years (Intermediate Regional Flood). Frequencies of floods equivalent to the Standard Project Flood and larger can be obtained through extrapolation of the curve, but it is not practical to assign a frequency to such large flows as their occurrence is so extremely rare. The curve, which is available upon request, reflects the judgement of engineers who have studied the area and are familiar with the region; however, it must be regarded as approximate and should be used with caution in connection with any planning of flood plain use.

Hazards of Large Floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise, and developments in the flood plain. An Intermediate Regional or Standard Project Flood on Mill Creek and Ironworks Creek would result in inundation of residential and commercial sections in the study area. Deep floodwater flowing at high velocity and carrying floating debris can create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater 3 or more feet deep and flowing at a velocity of 3 or more feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Waterlines can be ruptured by deposits of debris and the force of floodwaters thus creating the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters creating health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flooded areas and flood damages - The areas along the study reach of Mill Creek and Ironworks Creek that would be flooded by the Standard Project Flood are shown on Plate 2, which is also an index map to Plates 3 through 6. Areas that would be flooded by the Intermediate Regional and Standard Project Floods are shown in detail on Plates 3 through 6. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the 20 foot contour interval and scale of the maps do not permit precise plotting of the flooded area boundaries. As may be seen from these plates, floodflows from Mill Creek and Ironworks Creek inundate a large portion of Northampton, Upper Southampton and Lower Southampton Townships and several small communities adjacent to the stream. The highest stages of flooding throughout the study area occur when the floodwaters from Mill Creek meet with the high stages of Neshaminy Creek. The areas that would be flooded by the Intermediate Regional and Standard Project Floods include commercial, industrial, and residential sections and the associated streets, roads, and private and public utilities in the study area. Considerable damage to these facilities would occur during an Intermediate Regional Flood. However, due to the wider extent, greater depths of flooding, higher velocity flow and longer duration of flooding during a Standard Project Flood, damage would be even more severe than during an Intermediate Regional Flood. Plates 7 and 8 show water surface profiles of the Intermediate Regional and Standard Project Floods. Depth of flow in the channel can be estimated from these illustrations. Typical cross sections of the flood plain at selected locations, together with the water surface elevation and lateral extent of the Intermediate Regional and Standard Project Floods are shown on Plate 9.

Obstructions - During floods, debris collecting on bridges and culverts could decrease their carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing profiles of the Intermediate Regional and Standard Project Floods. Similarly, the maps of flooded areas show the backwater effect of obstructive bridges and culverts, but do not reflect increased water surface elevation that could be caused by debris collecting against the structures, or by deposition of silt in the stream channel under structures. As previously indicated, there is one dam on Mill Creek and it has no flood storage capacity. One large dam on Ironworks Creek forms Springfield Lake, which is used for water supply. This dam was not designed for flood control and will have no appreciable effect on floodflows of large flood events. The remaining small dam on Ironworks Creek also has no flood storage capacity. Of the 23 bridges and culverts crossing the streams in the study area, most of them are obstructive to the Intermediate Regional Flood and even more are obstructive to the Standard Project Flood. In some cases, bridges may be high enough so as not to be inundated by floodflows; however, the approaches to these bridges may be at lower elevations and subject to flooding and rendered impassable. Table 4 lists water surface elevations for the Intermediate Regional and Standard Project Floods at all bridges and culverts on Mill Creek and Ironworks Creek.

TABLE 4

ELEVATION DATA

Bridges Across Mill Creek and Ironworks Creek

Indentification	Mileage Above Mouth	Underclearance Elevation Ft. – Mean Sea Level Datum	Water Surface Elevation	
			Intermediate Regional Flood Ft. – Mean Sea Level Datum	Standard Project Flood Ft. – Mean Sea Level Datum
Mill Creek				
Bridgetown Pike	0.35	58.6	68.4	75.1
Buck Road	1.94	86.6	87.8	89.8
Bristol Road	2.64	92.1	89.7	91.5
Bustleton Pike	3.38	106.5	106.0	107.8
Footbridge	3.41	104.7	106.2	107.8
Gravel Hill Road	3.83	122.7	125.2	125.8
Rydal Road	4.06	136.9	135.3	136.6
Churchville Road	4.38	142.4	141.8	143.2
Reading R.R.	4.62	155.3	154.6	156.3
Private Drive	5.11	190.2	191.9	192.3
2nd St. Pike (Pa. Rte. 232) and Bristol Road – Study Limit	5.53	232.7	233.5 (a)	235.6 (a)
Ironworks Creek				
Chinquapin Road	0.19	86.5	88.0	90.0
Private Road	0.54	131.5	121.3	123.2
Chruchville Lane	1.18	136.8	137.1	138.1
Reading R.R.	1.50	131.5	137.8	140.3
Elm Avenue	1.51	132.8	138.8	141.0
Lower Holland Road	2.56	170.9	171.0	172.9
Bustleton Pike	2.62	174.2	172.7	175.2
Willow Road	2.69	178.2	178.7	180.9
Private Road	2.80	186.1	187.8	188.3
2nd St. Pike, Pa. Rte. 232	3.30	213.6	212.0	213.3
Private Road	3.36	214.0	215.7	216.9
Pa. Rte. 332 – Study Limit	3.87	258.2	259.8 (a)	259.9 (a)

(a) Downstream side of bridge.

Velocities of flow - Water velocities during floods depend largely on the size and shape of the cross sections, conditions of the stream, and the bed slope, all of which vary on different streams and at different locations on the same stream. During an Intermediate Regional Flood, velocities of main channel flow in the study area would be 1 to 9 feet per second. Water flowing at this rate is capable of causing severe erosion to streambanks and fill around bridge abutments and transporting large objects. Overbank flow in the study area would be 1 to 3 feet per second. Water flowing at 2 feet per second or less would deposit debris and silt. It is expected that velocity of flow during a Standard Project Flood would be slightly higher than during an Intermediate Regional Flood. Table 5 lists the maximum velocities that would occur in the main channel and overbank areas at selected locations on Mill Creek and Ironworks Creek during the Intermediate Regional and the Standard Project Floods.

TABLE 5
MAXIMUM VELOCITIES
Mill Creek and Ironworks Creek

Location	Mileage Above Mouth	Maximum Velocity			
		Intermediate Regional Flood		Standard Project Flood	
		Channel	Overbank	Channel	Overbank
		ft/sec	ft/sec	ft/sec	ft/sec
Mill Creek					
Cross Section Number:					
5	3.02	6.9	1.8	7.8	2.2
8	4.93	9.6	2.9	8.0	2.2
9	5.36	9.0	1.5	10.0	2.1
Ironworks Creek					
14	2.18	8.8	3.3	10.3	3.9
15	2.90	8.9	3.4	9.9	4.2
16	3.15	8.4	2.9	9.7	3.4

Rates of rise and duration of flooding - Mill and Ironworks Creeks are susceptible to "flash" flooding from heavy rainfall associated with severe storm fronts--flooding that is characterized by a rapid rate of rise and relatively short duration. However, flooding may also occur from a series of rainfalls or from rainfall associated with hurricane activity that would probably have a slower rate of rise and longer duration. Table 6 gives the maximum rate of rise, height of rise (from bankfull stage to maximum floodflow level), time of rise, and duration of flooding for the Standard Project Flood at selected cross section locations on Mill Creek and Ironworks Creek. Standard Project Flood Hydrographs for Mill and Ironworks Creeks may be found on Plate 10.

TABLE 6
RATES OF RISE AND DURATION
Standard Project Flood

Location	Maximum Rate of Rise ft/hr	Height of Rise ft	Time of Rise hrs	Duration of Flooding hrs
Mill Creek				
Cross Section 4	1.66	4.87	5.4	20.9
Cross Section 6	1.02	4.11	7.0	24.5
Ironworks Creek				
Cross Section 11	1.70	4.52	7.0	27.0

Photographs, future flood heights - The levels that the Intermediate Regional and Standard Project Floods are expected to reach at various locations along Mill Creek and Ironworks Creek are indicated on the following photographs.

FIGURE 4 - Future flood heights of Mill Creek at Bridgetown Pike near the Valley Stream Bar and Restaurant.

FIGURE 5 - Future flood height of Mill Creek at the Mill Race Restaurant near Buck Road.

GLOSSARY

Backwater. The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary and the land is adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Plain. The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Hurricane. An intense cyclonic windstorm of tropical origin in which winds tend to spiral inward in a counterclockwise direction toward a core of low pressure, with maximum surface wind velocities that equal or exceed 75 miles per hour (65 knots) for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 75 miles per hour.

Hydrograph. A graph showing flow values against time at a given point, usually measured in cubic feet per second. The area under the curve indicates total volume of flow.

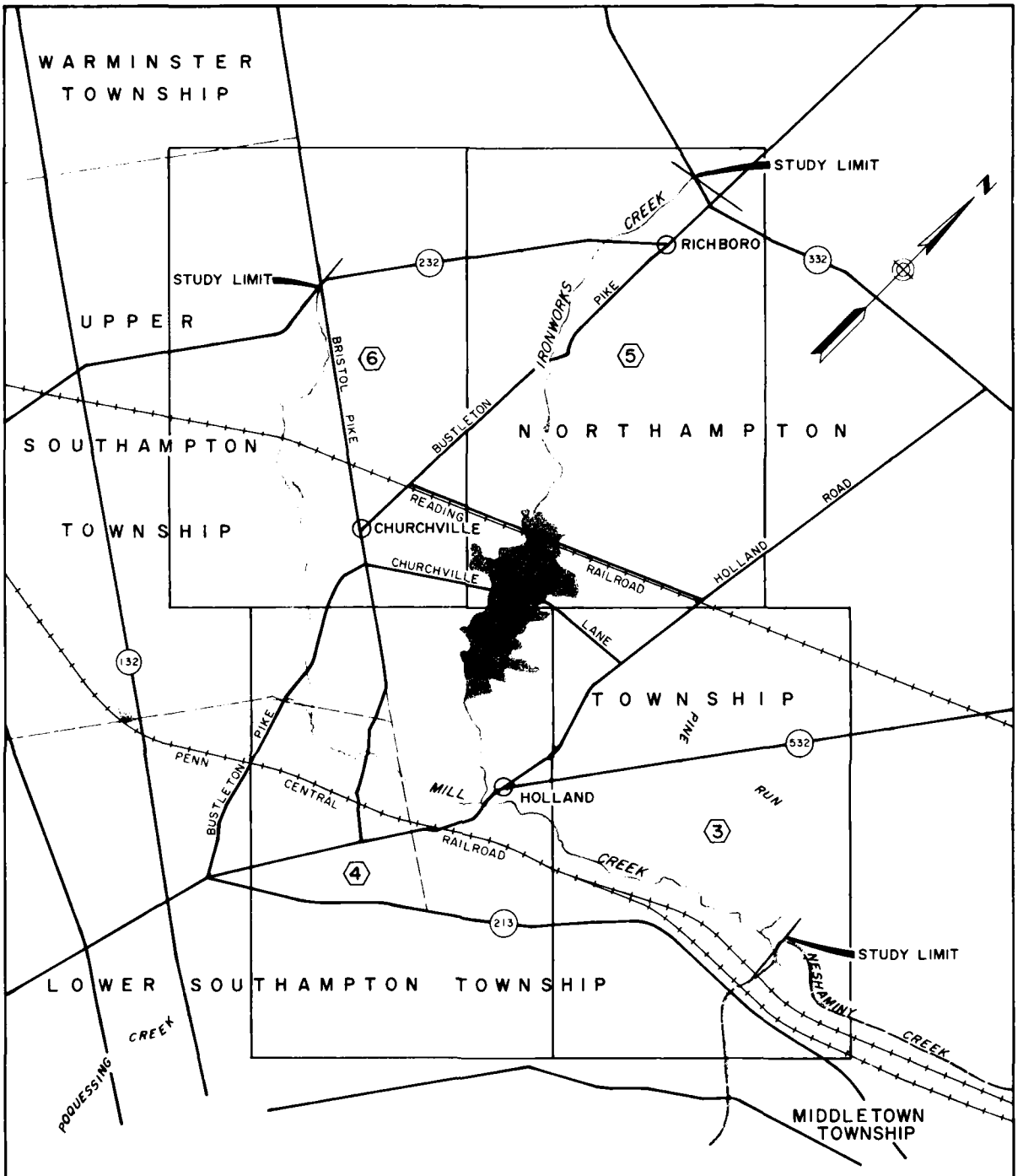
Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of railfall and runoff characteristics in the general region of the watershed.

Left Bank. The bank on the left side of a river, stream, or watercourse, looking downstream.

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40-60 percent of the Probable Maximum Floods for the same basins. As used by the Corps of Engineers, Standard Project Floods are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance Elevation. The elevation at the top of the opening of a culvert, or other structure through which water may flow along a watercourse.



SCALE IN FEET
2000 0 2000 4000

LEGEND

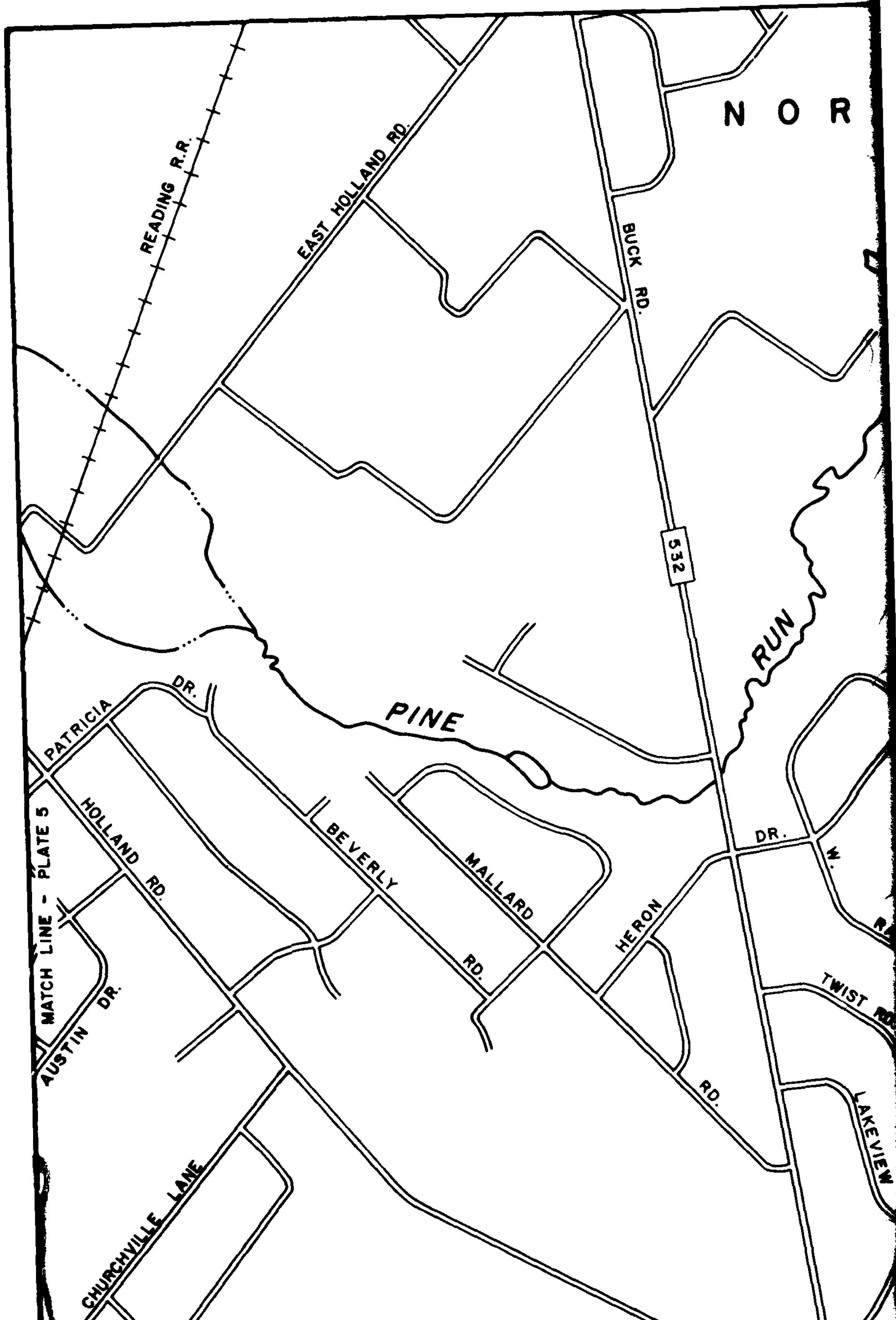
(3) PLATE NUMBER
— — — TOWNSHIP LIMITS
(213) STATE HIGHWAY
STREAM
STANDARD PROJECT FLOOD

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

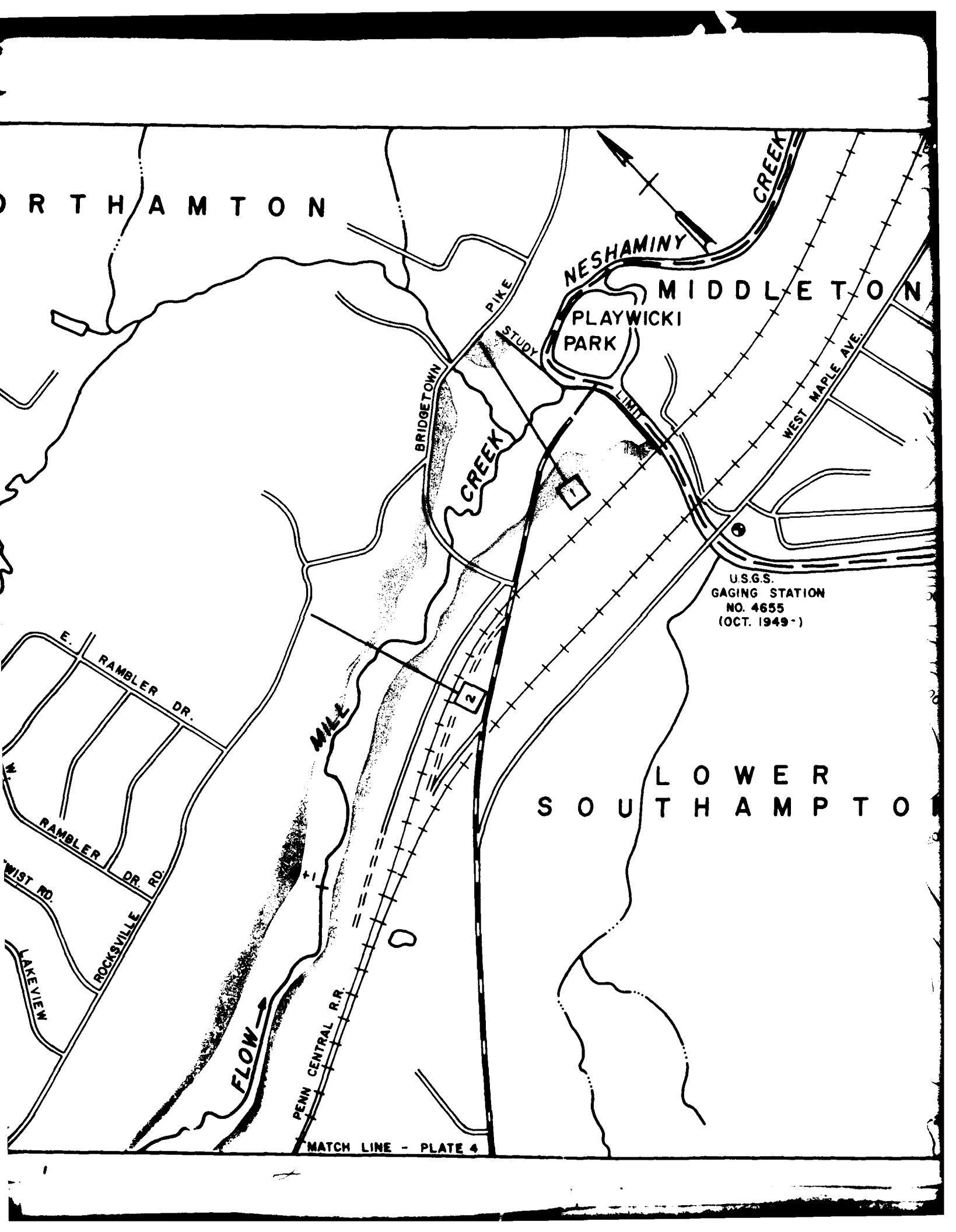
FLOOD PLAIN INFORMATION
MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

INDEX MAP

PLATE 2



NOR
READING R.R.
EAST HOLLAND RD.
BUCK RD.
532
PINE
RUN
PATRICIA DR.
HOLLAND RD.
BEVERLY RD.
MALLARD RD.
HERON RD.
DR.
W.
TWIST RD.
LAKEVIEW
MATCH LINE - PLATE 5
AUSTIN DR.
CHURCHVILLE LANE


ORTHAMTON
NESHAMINY CREEK
MIDDLETON
PLAYWICKI PARK
STUDY LIMIT
PIKE
BRIDGETOWN CREEK
WEST MAPLE AVE.
U.S.G.S. GAGING STATION NO. 4655 (OCT. 1949-)
1
2
E. RAMBLER DR.
RAMBLER DR. RD.
ROCKSVILLE
LAKEVIEW
MILL
+1
FLOW
PENN CENTRAL R.R.
LOWER SOUTHAMPTO
MATCH LINE - PLATE 4

LEGEND

OVERFLOW LIMITS

	INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD

M+I — MILES ABOVE MOUTH

[1] — CROSS SECTION

GROUND ELEVATION IN FEET SEA LEVEL DATUM

[532] — STATE ROUTE

—— —— TOWNSHIP OR BORO LIMITS

NOTES

1. MAP BASED ON U S.G.S 7 5 MIN. QUADRANGLE SHEETS HATBORO, PA -1966, AND LANGHORNE PA.-1966 ADDITIONS AND ADJUSTMENTS MADE BY CORPS OF ENGINEERS
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT
3. AREAS OUTSIDE THE FLOODPLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
4. MINIMUM CONTOUR INTERVAL IS 20 FT

SCALE IN FEET

0 800 1600

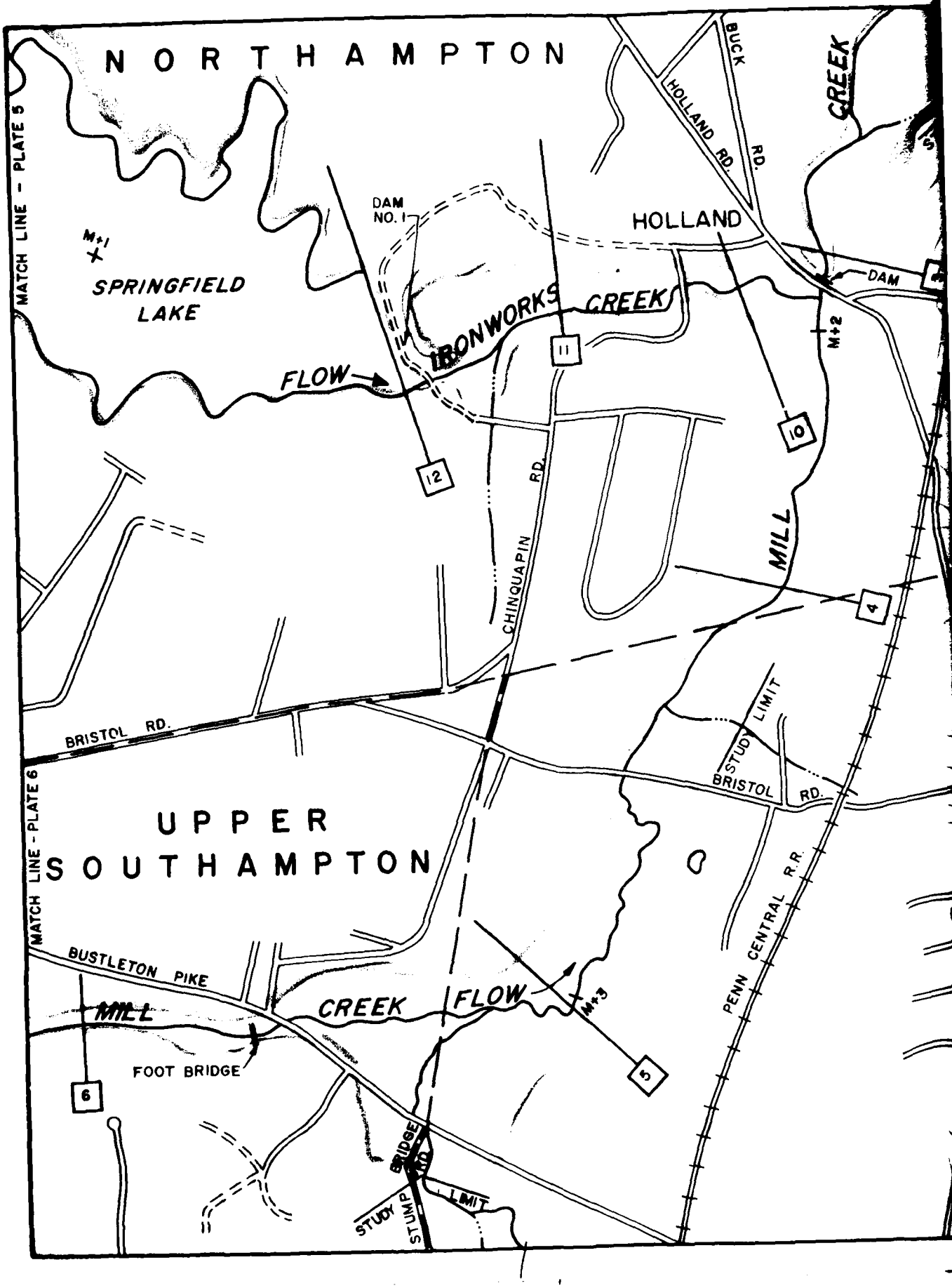
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

FLOODED AREAS

PLATE 3


NORTHAMPTON
MATCH LINE - PLATE 5
BUCK
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DAM
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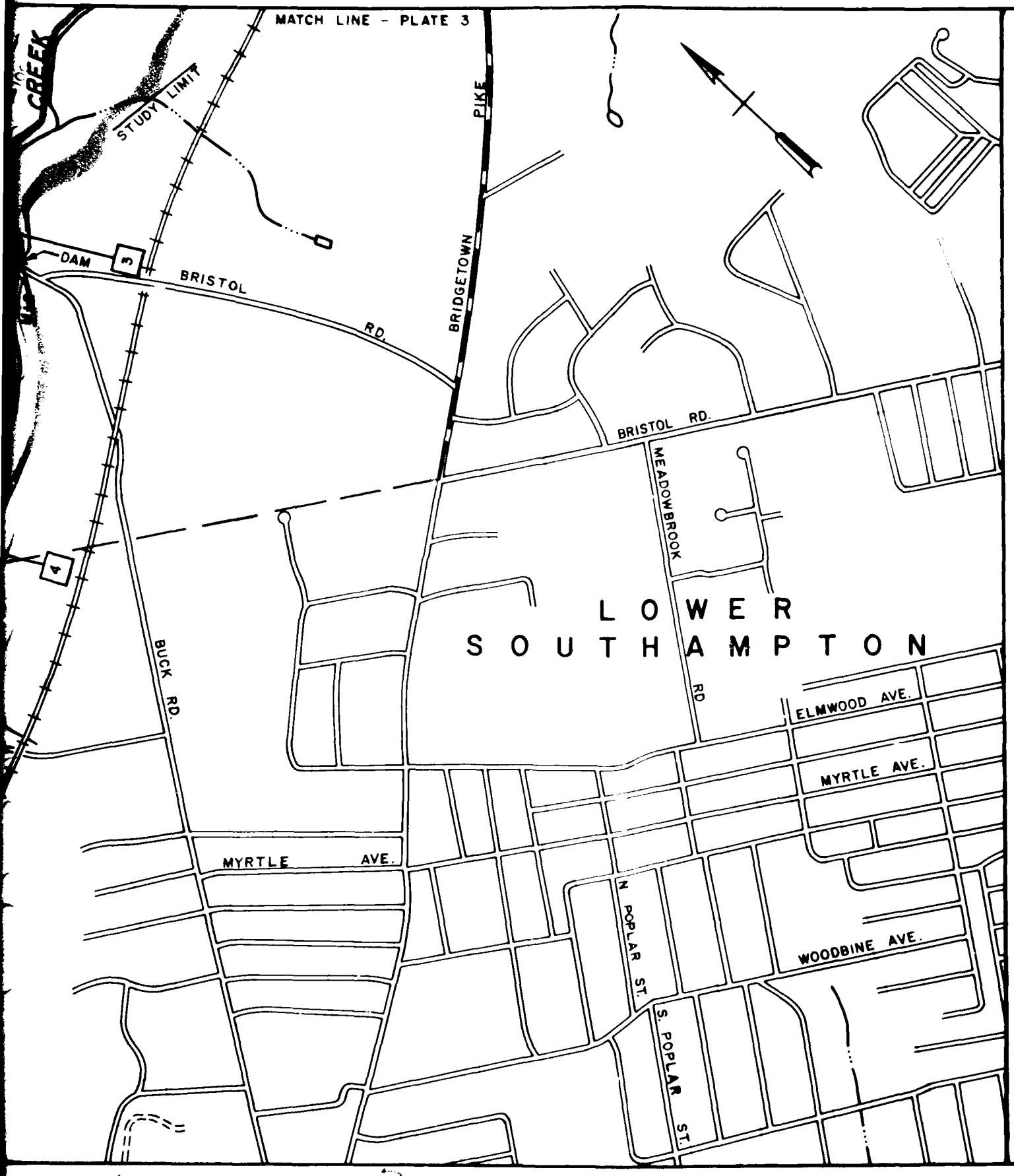
HOLLAND
M+1
SPRINGFIELD
LAKE
IRONWORKS
CREEK
DAM
M+2
FLOW
11
10
12
CHINQUAPIN
RD.
MILL
4
BRISTOL RD.
STUDY LIMIT
BRISTOL
RD.
UPPER
SOUTHAMPTON
MATCH LINE - PLATE 6
PENN CENTRAL R.R.
BUSTLETON PIKE
MILL
CREEK
FLOW
M+3
FOOT BRIDGE
6
5
BRIDGE
RD.
STUDY
STUMP
LIMIT


MATCH LINE - PLATE 3
CREEK
STUDY LIMIT
PIKE
BRIDGETOWN
DAM
3
BRISTOL
RD.
BRISTOL RD.
MEADOWBROOK
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SOUTHAMPTON
BUCK RD.
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ELMWOOD AVE.
MYRTLE AVE.
MYRTLE AVE.
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S. POPLAR ST.
NOTES
1
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LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M +2 MILES ABOVE MOUTH

[3] CROSS SECTION

GROUND ELEVATION IN FEET SEA LEVEL DATUM

—— —— TOWNSHIP OR BORO LIMITS

NOTES

1 MAP BASED ON U S G S 7 5 MIN. QUADRANGLE SHEETS HATBORO PA -1966. AND LANGHORNE PA -1966 ADDITIONS AND ADJUSTMENTS MADE BY CORPS OF ENGINEERS

2 LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT

3 AREAS OUTSIDE THE FLOODPLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF

4 MINIMUM CONTOUR INTERVAL IS 20 FT

SCALE IN FEET

0 800 1600

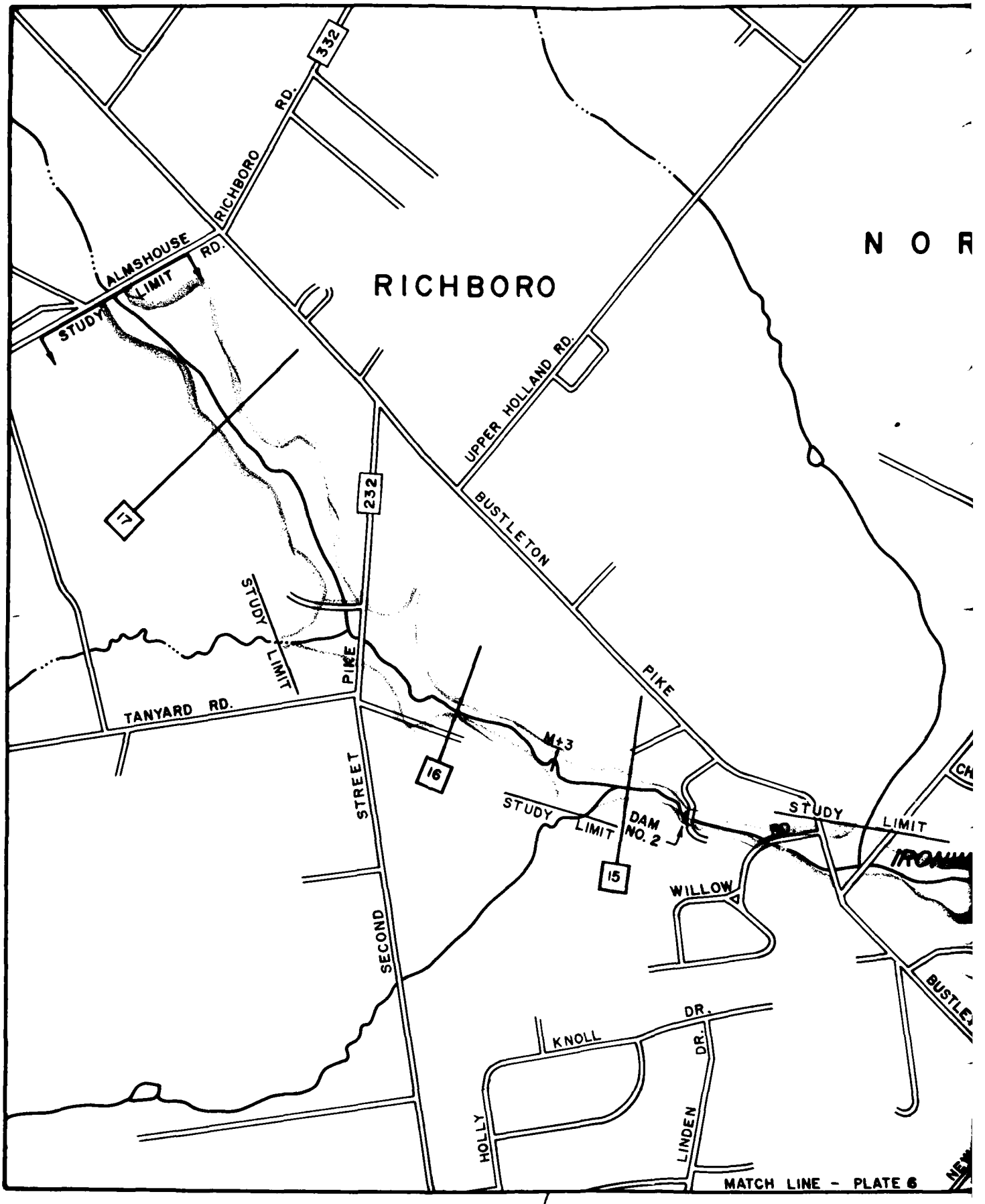
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION

MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

FLOODED AREAS

PLATE 4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STUDY LIMIT
UPPER HOLLAND RD.
BUSTLETON PIKE
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STUDY LIMIT
PIKE
TANYARD RD.
STREET
16
M+3
STUDY LIMIT
DAM NO. 2
STUDY LIMIT
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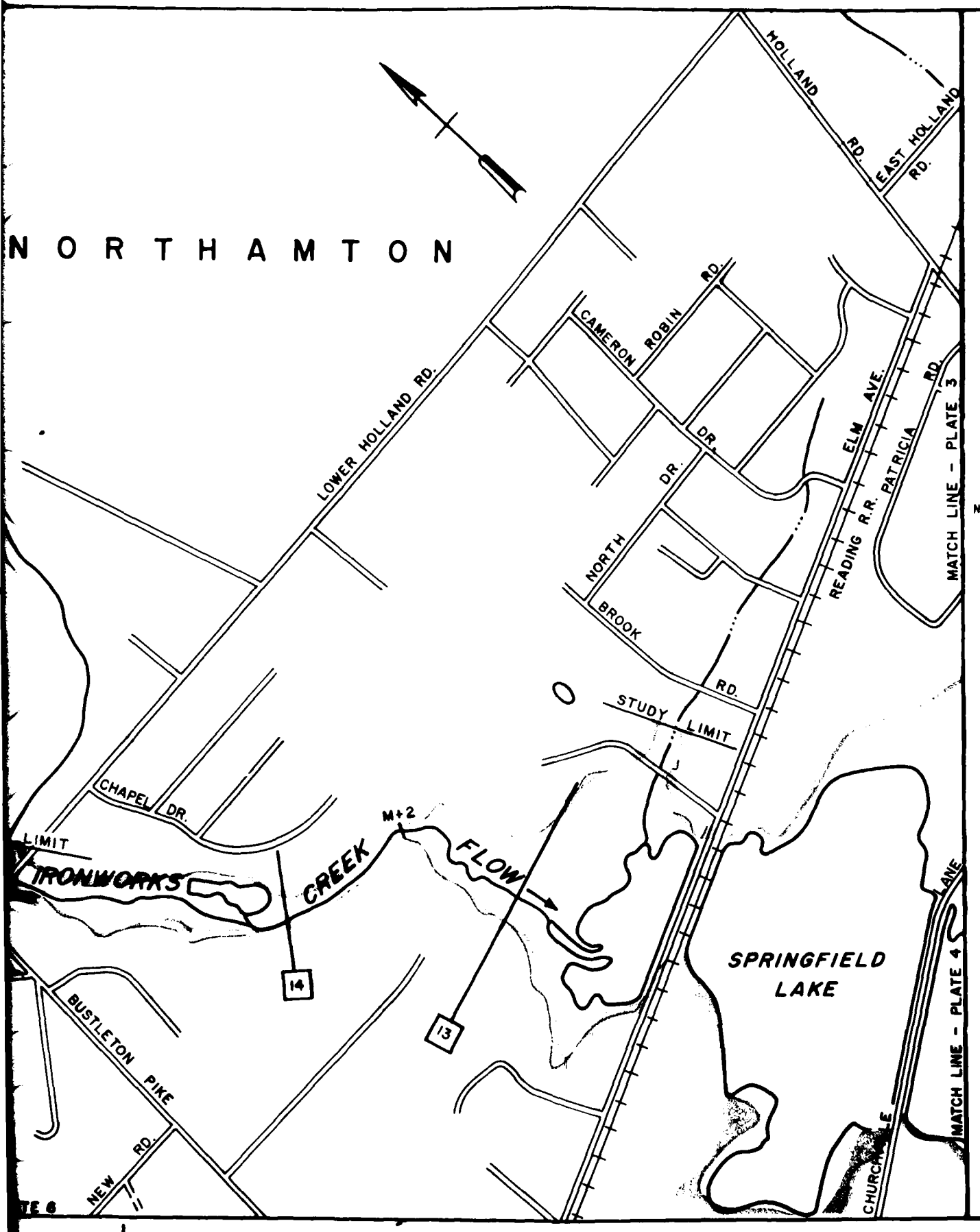
WILLOW
SECOND
KNOLL DR.
DR.
HOLLY
LINDEN
MATCH LINE - PLATE 6


NORTHAMTON
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LOWER HOLLAND RD.
CAMERON RD.
ROBIN DR.
NORTH BROOK RD.
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READING R.R.
PATRICIA RD.
MATCH LINE - PLATE 3
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CHAPEL DR.
LIMIT
IRONWORKS CREEK
M+2
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MATCH LINE - PLATE 4
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OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD	STANDARD PROJECT FLOOD

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GROUND ELEVATION IN FEET
SEA LEVEL DATUM

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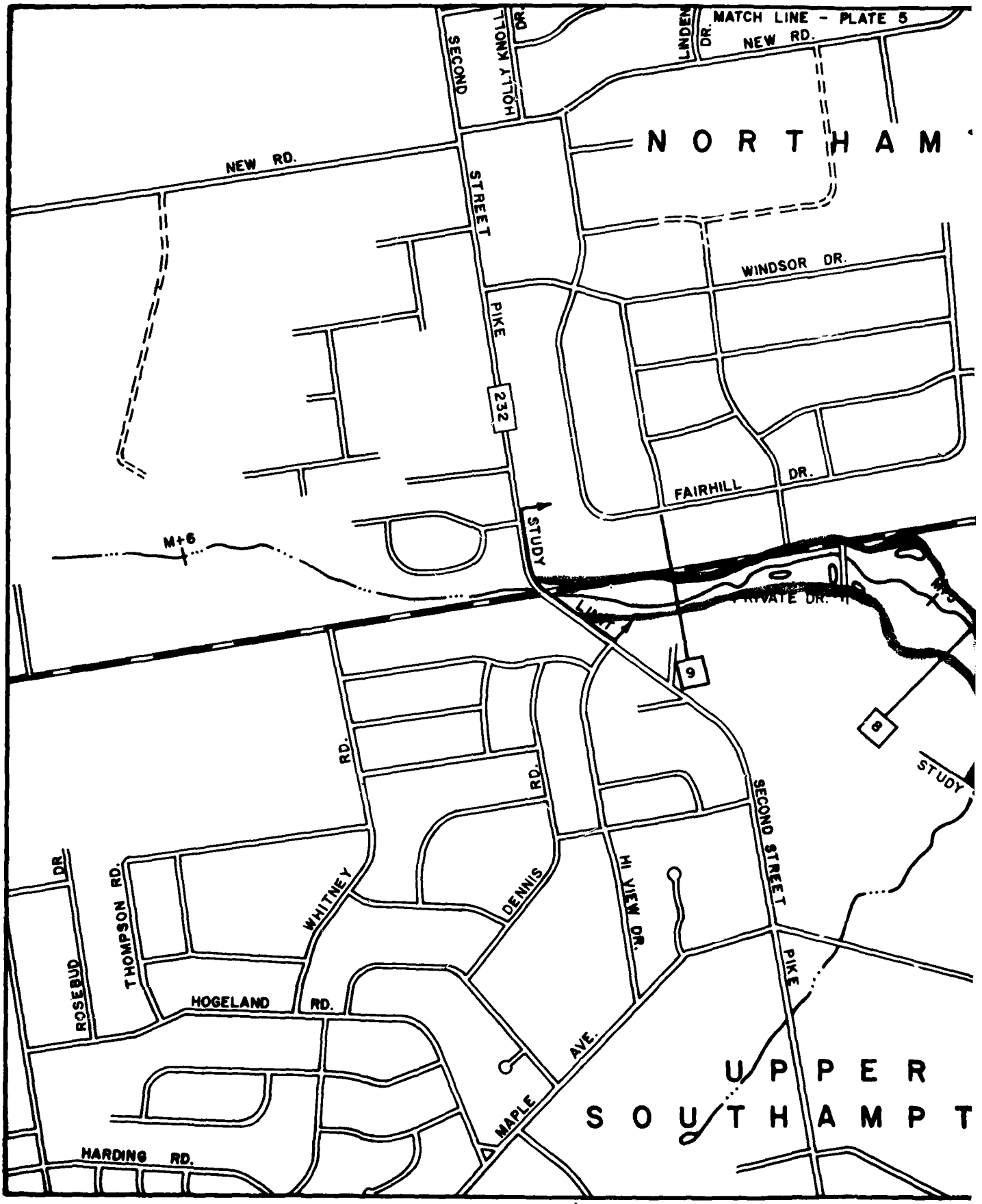
DEPARTMENT OF THE ARMY
NIA DISTRICT CORPS OF ENGINEERS
PHILADELPHIA PENNSYLVANIA

LOOD PLAIN INFORMATION

CREEK & IRONWORKS CREEK
BUCKS COUNTY PA

FLOODED AREAS

PLATE 2


MATCH LINE - PLATE 5
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NEW RD.
NORTHAM
WINDSOR DR.
PIKE
232
FAIRHILL DR.
STUDY
M+6
PRIVATE DR.
9
STUDY
SECOND STREET
RD.
RD.
DR.
ROSEBUD
THOMPSON RD.
WHITNEY
DENNIS
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HOGELAND RD.
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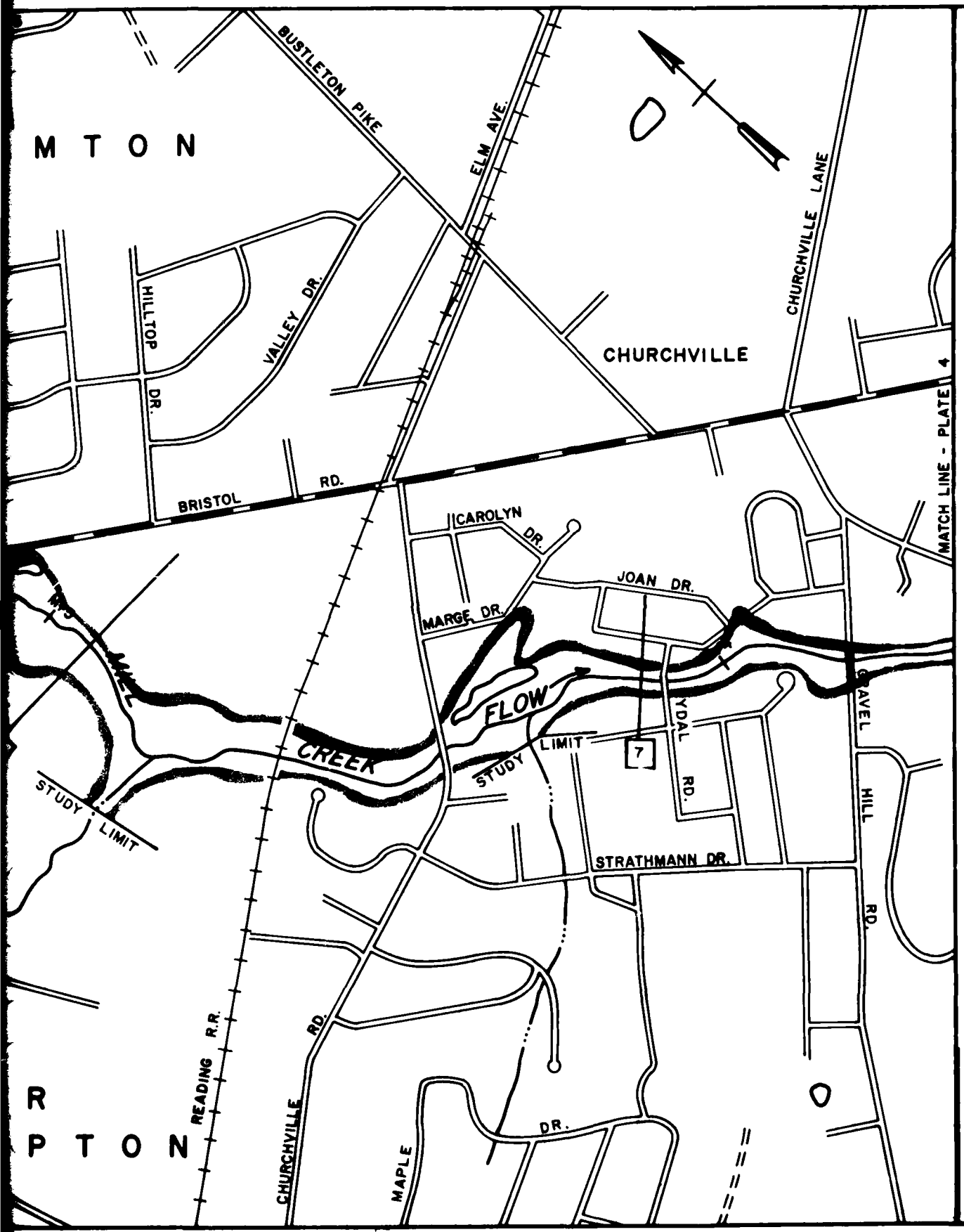
SOUTHAMPT



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LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+4 MILES ABOVE MOUTH

7 CROSS SECTION

GROUND ELEVATION IN FEET SEA LEVEL DATUM

232 STATE ROUTE

—— TOWNSHIP OR BORO LIMITS

BASED ON U S.G.S 7 5 MIN. QUADRANGLE
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-1968 *ADDITIONS AND ADJUSTMENTS MADE*
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UM CONTOUR INTERVAL IS 20 FT

SCALE IN FEET

0 800 1600

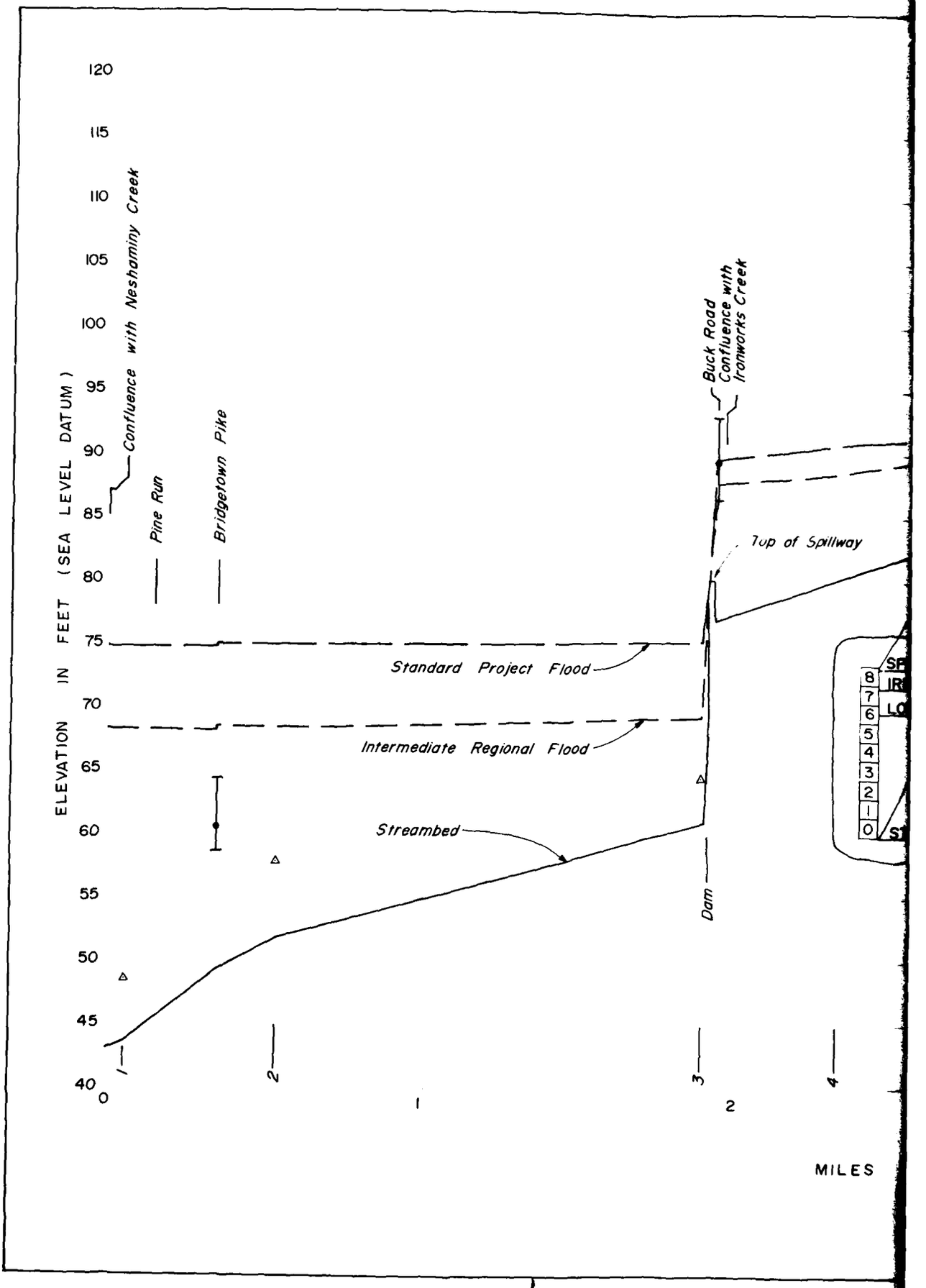
DEPARTMENT OF THE ARMY
ELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

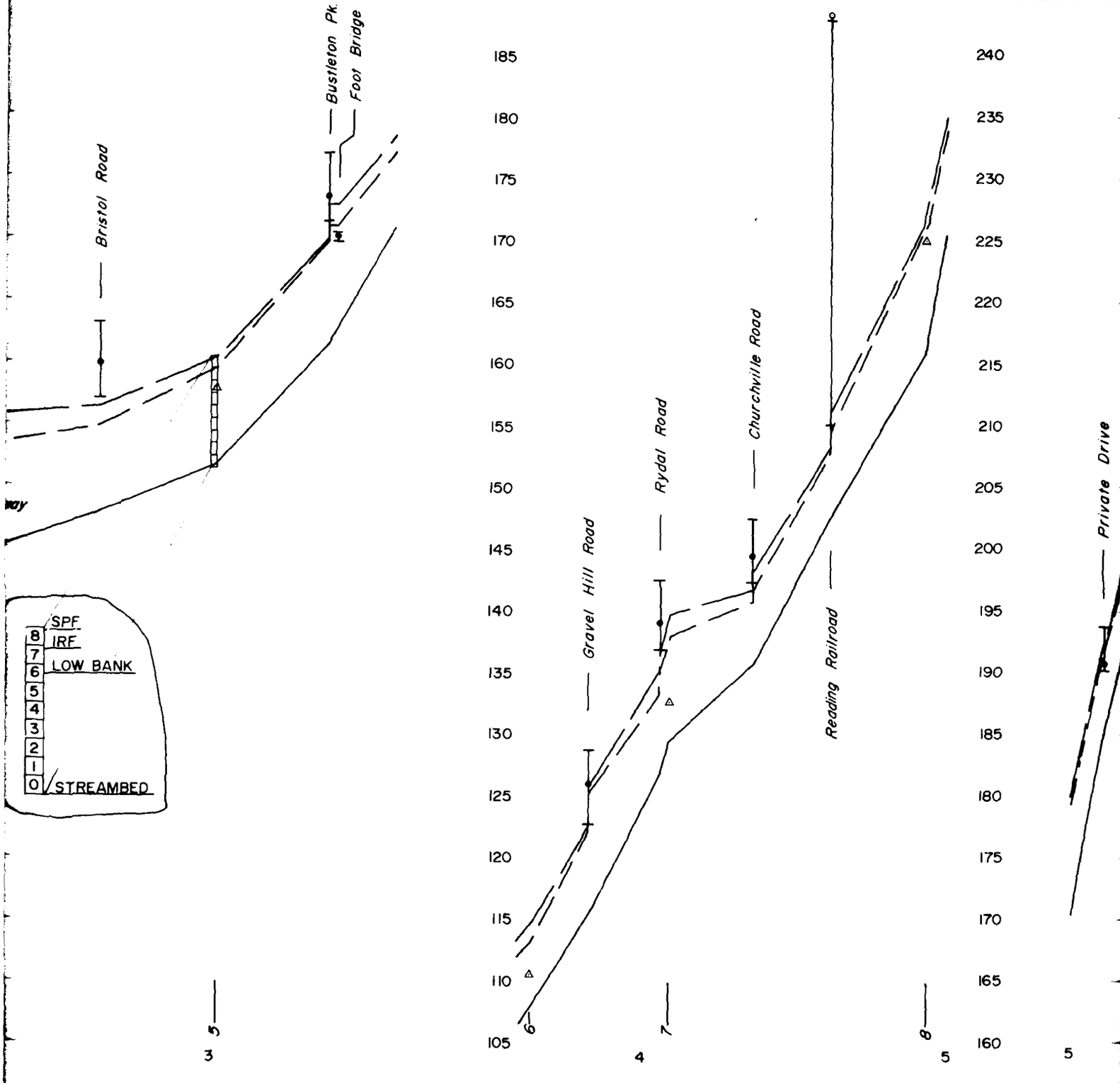
FLOOD PLAIN INFORMATION

LL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA

FLOODED AREAS

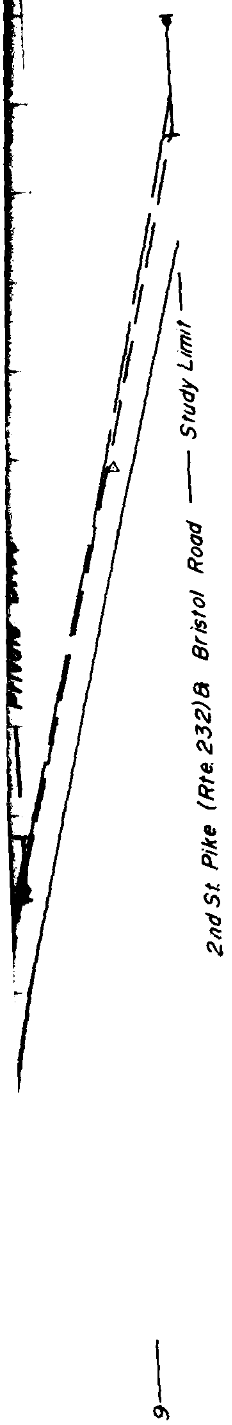
PLATE 6


ELEVATION IN FEET (SEA LEVEL DATUM)
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
Confluence with Neshaminy Creek
Pine Run
Bridgetown Pike
Buck Road
Confluence with Ironworks Creek
Top of Spillway
Standard Project Flood
Intermediate Regional Flood
Streambed
Dam
0
1
2
3
4
MILES



LES ABOVE MOUTH

1 2



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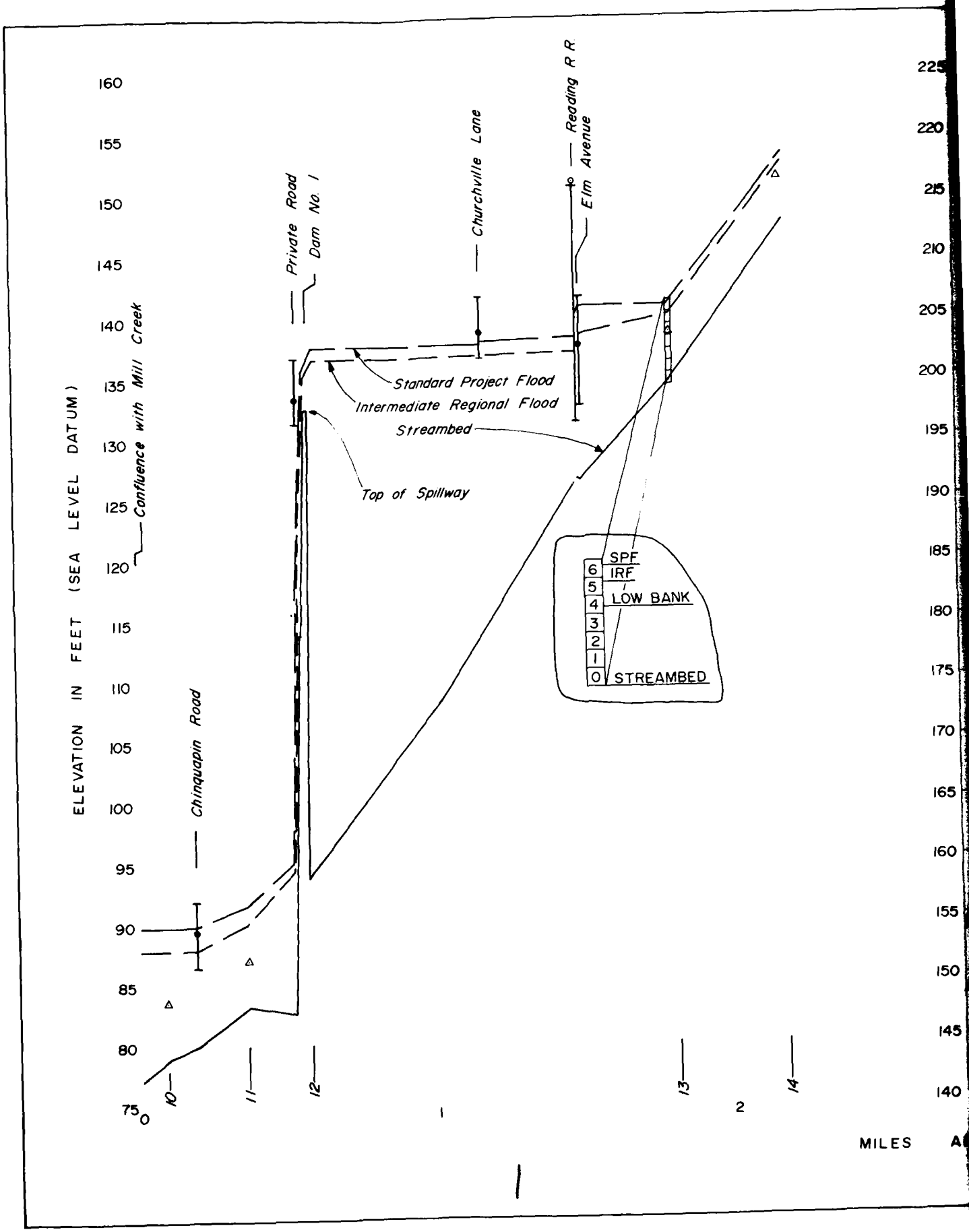
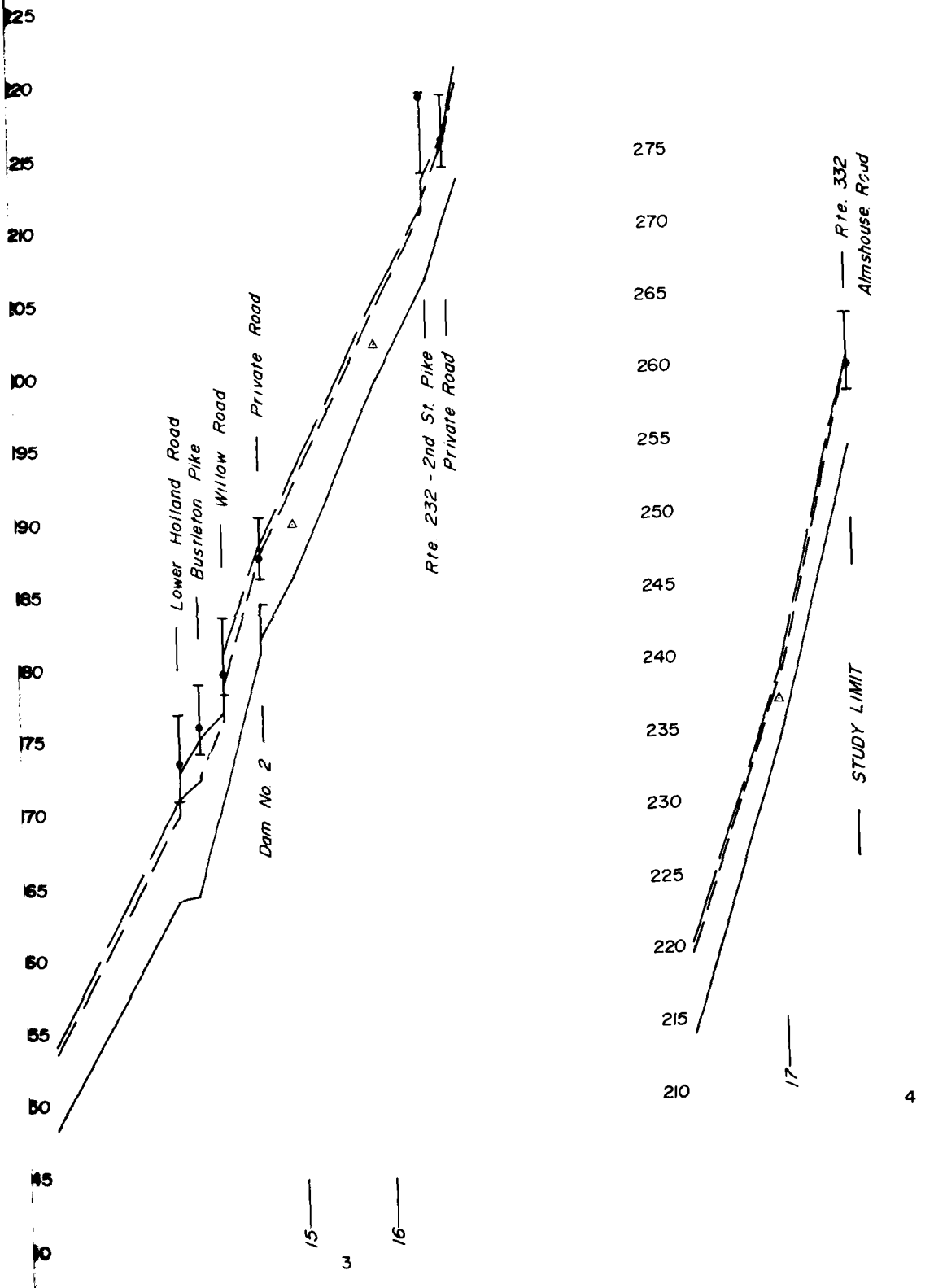
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

HIGH WATER PROFILE
MILL CREEK

PLATE 7


ELEVATION IN FEET (SEA LEVEL DATUM)
160
155
150
145
140
135
130
125
120
115
110
105
100
95
90
85
80
75
225
220
215
210
205
200
195
190
185
180
175
170
165
160
155
150
145
140
Confluence with Mill Creek
Chinquapin Road
Private Road
Dam No. 1
Churchville Lane
Reading R R
Elm Avenue
Standard Project Flood
Intermediate Regional Flood
Streambed
Top of Spillway
SPF
IRF
LOW BANK
STREAMBED
6
5
4
3
2
1
0
10
11
12
13
14
0
1
2
MILES

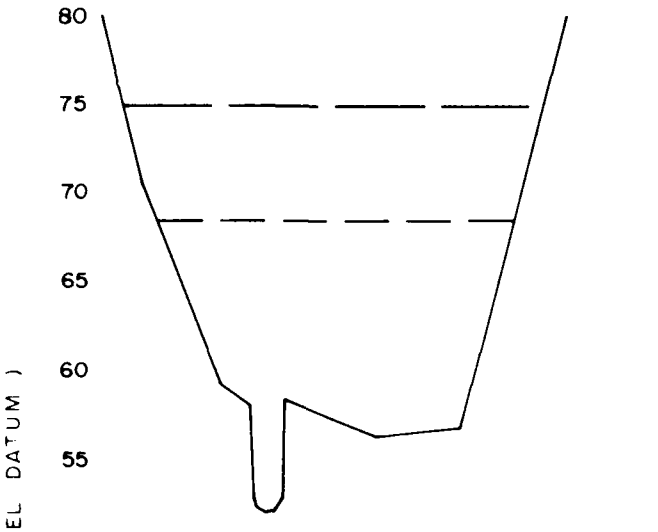


DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

HIGH WATER PROFILE
IRONWORKS CREEK

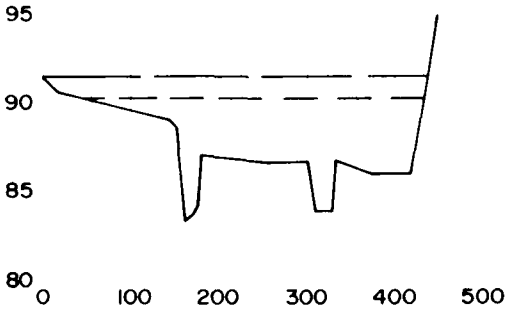
PLATE 8



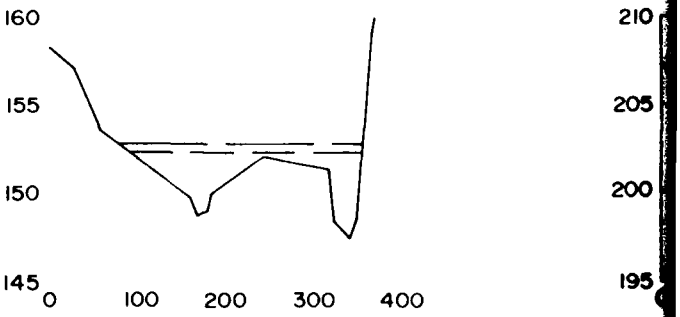
MILL CREEK
CROSS SECTION NO. 2
MILE 0.54

MILL CREEK
CROSS SECTION NO. 7
MILE 4.09

ELEVATION IN FEET (SEA LEVEL DATUM)

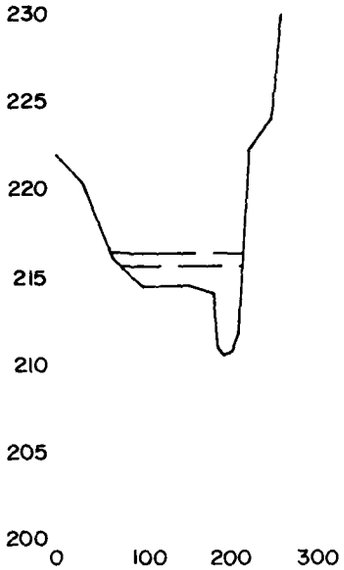


IRONWORKS CREEK
CROSS SECTION NO. 11
MILE 0.36



IRONWORKS CREEK
CROSS SECTION NO. 14
MILE 2.18

HORIZONTAL DISTANCE IN HUNDREDS OF FEET



MILL CREEK
CROSS SECTION NO.9
MILE 5.36

IRONWORKS CREEK
CROSS SECTION NO. 16
MILE 3.14

NOTES:

1. The 11 sections on Mill Creek and Ironworks Creek not shown in this report are on file at the Philadelphia District, Corps of Engineers and are available for inspection upon request.
2. Cross sections taken looking downstream.

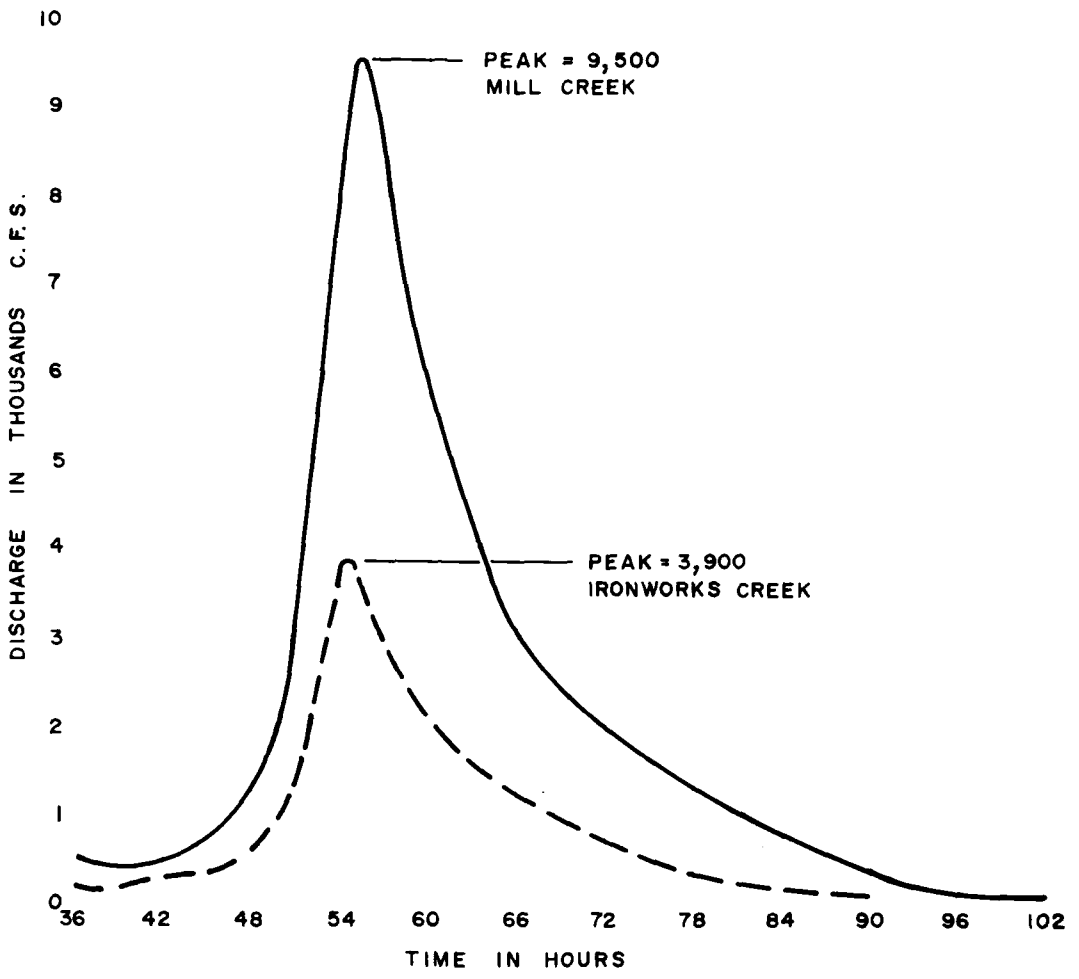
LEGEND

- Standard Project Flood
- Intermediate Regional Flood
- Ground Line

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
MILL CREEK AND IRONWORKS CREEK
BUCKS COUNTY, PA.

SELECTED CROSS SECTIONS
MILL CREEK AND IRONWORKS CREEK



NOTES:

HYDROGRAPHS ARE AT MOUTHS

DRAINAGE AREAS	SQ. MILES
MILL CREEK	17.4
IRONWORKS CREEK	6.3

DEPARTMENT OF THE ARMY
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PHILADELPHIA, PENNSYLVANIA
FLOOD PLAIN INFORMATION
MILL CREEK & IRONWORKS CREEK
BUCKS COUNTY, PA.

STANDARD PROJECT FLOOD
HYDROGRAPHS

PLATE 10