CUMBERLAND RIVER BASIN

VOLUME IV

CHEATHAM
WATER CONTROL MANUAL

U.S. ARMY CORPS OF ENGINEERS

Nashville District

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Prepared by

SVERDRUP CORPORATION

For

U.S. ARMY CORPS OF ENGINEERS

Nashville District

December 1998

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CHEATHAM DAM & LAKE
PERTINENT DATA

DAM LOCATION

- Dam Location

State:	Tennessee
County:	Cheatham & Dickson
Nearest Community:	Ashland City located 13 miles east of the project via SR 12 East
River:	Cumberland
Mile:	148.7
Latitude:	North 36°18'56"
Longitude:	West 87°13'10"

- Adjacent Water Control Facilities

Upstream			
Old Hickory Dam	-	Cumberland River,	Mile 216.2
J. Percy Priest Dam	-	Stones River,	Mile 6.8
Downstream			
Barkley Dam	-	Cumberland River,	Mile 30.6

ORIGINAL AUTHORIZATION AND HISTORY

• Primary Project Purposes	• Authorizing Legislation
Navigation	PL 79-525, River and Harbor Act of 1946
Hydropower	PL 79-525, River and Harbor Act of 1946
• Additional Operating Purposes	
Recreation	PL 78-534, Flood Control Act of 1944
Fish and Wildlife	PL 85-624, Fish and Wildlife Coordination Act of 1958
Water Quality	PL 92-500, Federal Water Pollution Control Act Ammendments of 1972
Water Supply	Although storage space is not allocated for water supply on either a permanent (PL 85-500) or temporary (PL 78-534) basis, water is being withdrawn for municipal and industrial purposes. Consequently, during drought, consideration is given to keeping the lake level above the supply pipe intake.

- Construction Dates

Began	-	6 Apr 50
Closure	-	19 Nov 53
Impoundment	-	Sept 56
Inservice		
Lock	-	Aug 54
Power		
Unit 1	-	13 May 58
Unit 2	-	20 Sept 58
Unit 3	-	5 Nov 58

PHYSICAL COMPONENTS OF DAM

- Type of Structure
  - Concrete gravity

- Dam Section Lengths

Spillway Section	-	495 feet	150.9 m
Power Section	-	306 feet	93.3 m
Lock Section	-	180 feet	54.9 m
Total Dam Length	-	981 feet	299.0 m

- Structure Elevations

Top of Gates	-	386 NGVD	117.65 m
Spillway Crest	-	359 NGVD	109.42 m

- Outlet Works

Spillway			
Total Effective Width	-	420 feet	128.0 m
Tainter Gates			
Number	-	7	
Width	-	60 feet	18.3 m
Height	-	27 feet	8.2 m

- Power Plant - 3 Kaplan adjustable blade propeller turbines

Nominal Head	-	22 feet	6.7 m
Nominal Discharge	-	22,050 cfs	624 cu. m/sec
		(7,350 cfs each)	208 cu. m/sec
Nameplate Power Rating	-	36 Mw	
		(12 Mw each)	
Minimum Head	-	9 feet	2.7 m
Maximum Head	-	29 feet	8.8 m
Intake			
Width	-	74.25 feet	22.6 m
Height	-	43.0 feet	13.1 m

PHYSICAL COMPONENTS OF DAM
(continued)

- Navigation Lock

Chamber				
Length	-	800	feet	243.8 m
Width	-	110	feet	33.5 m
Top of Structure Elevations				
Chamber	-	392	NGVD	119.48 m
Guide Walls				
Upper	-	392	NGVD	119.48 m
Lower	-	392	NGVD	119.48 m
Sills				
Upper	-	368	NGVD	112.16 m
Lower	-	342	NGVD	104.24 m
Water Surface Elevations				
Tailwater				
Minimum	-	354	NGVD	107.9 m
Normal	-	359	NGVD	109.4 m
Headwater				
Minimum	-	382	NGVD	116.4 m
Normal	-	385	NGVD	117.3 m
Lift				
Normal	-	26	feet	7.9 m
Maximum	-	31	feet	9.4 m
Average Single Lockage Time	-	20	minutes	

REAL ESTATE

- Acquisition

Fee Holdings	-	5,715	acres	2314 hectares
Easement Holdings	-	1,209	acres	489 hectares

- Elevation of Taking Line

At Dam	-	Elevation 390 plus area within tangents connecting the 390 contour points
At Upper End (Old Hickory tailwater)	-	Elevation 397 plus area within tangents connecting the 397 contour points
Intermediate Areas	-	Various elevations between 390 and 397 plus area within tangents

HYDRAULICS AND HYDROLOGY

- Drainage Areas

Project				
Total	-	14,160	sq. mi.	36,671 sq. km.
Local Uncontrolled	-	1,594	sq. mi.	4,128 sq. km.
(between Cheatham and Old Hickory & J. Percy Priest)				
Downstream Project - Barkley				
Total	-	1 7,598	sq. mi.	45,595 sq. km.
Local Uncontrolled	-	3,438	sq. mi.	8,904 sq. km.
(between Barkley and Cheatham)				

- Surface Area (at elevation 385) - 7,450 acres | 3016 hectares

- Length of Pool (up to Old Hickory Dam) - 67.5 miles | 108.6 km.

- Top of Pool Elevations

	NGVD	Meters
Hydropower	385.00	117.34
Inactive	382.00	116.43

- Storage Volumes

	Acre Feet	Day Second Feet (day cfs)	Cu. Hectometers
Hydropower	20,000	10,000	25
Inactive	84,000	42,000	104
TOTAL	104,000	52,000	128

- Average Outflows (cfs) (1959 - 1996)

Month	Generation	Spill	Total	Cu. Meters/Sec Total
Jan	16,613	18,606	35,219	997
Feb	16,944	17,049	33,993	963
Mar	15,631	25,020	40,651	1,151
Apr	15,156	19,940	35,096	994
May	14,735	9,927	24,663	698
Jun	12,987	4,114	17,101	484
Jul	11,691	1,752	13,443	381
Aug	11,571	972	12,543	355
Sep	9,418	1,334	10,751	304
Oct	9,112	1,463	10,575	299
Nov	11,667	3,938	15,605	442
Dec	15,767	12,697	28,464	806
Annual	13,419	9,705	23,123	655

HYDRAULICS AND HYDROLOGY
(continued)

- Maximum Pool Frequencies

Period of Record	-	1958 - 1996
2 Year	-	387.22
5 Year	-	390.51
10 Year	-	392.92
25 Year	-	396.08
50 Year	-	398.44
100 Year	-	400.80
200 Year	-	403.14
Maximum Observed	-	398.95 - March, 1962

Note - Statistics based on daily midnight readings

- Maximum Observed Discharge 204,000 cfs, March, 1975

ACCESS LOCATIONS

	River Mile	CLEARANCE Horiz.	Vert. Pool Elev. 385	Vert. Regulated High Water
Bridge Crossings				
State Highway 49	158.0	275	61	46
Briley Parkway	182.2	307	70	44.5
Nashville & Ashland City RR	185.2	128	43	18 drawbridge
U.S. Highway 41A	185.9	300	69	40
I-265	189.0	300	67	41
Jefferson Street	190.0	under construction		
CSX Railroad	190.4	116	47	20 drawbridge
Victory Memorial Bridge	190.6	300	70	43
Woodland Street	190.7	300	70	43
Shelby Street	191.1	300	81	54
I-65, I-24	191.7	300	71	43
CSX Railroad	193.8	230	99	70
Briley Parkway	199.9	300	77	45
Old Hickory Boulevard	212.1	300	93	55

- Former Project Locations in Pool

Lock & Dam A	150.6	R
Lock & Dam 1	188.4	R
Lock & Dam 2	201.0	L

ACCESS LOCATIONS
(continued)

- Recreational Areas
  - Corps of Engineers

Cheatham Damsite Tailwater	148.2 R	
Johnson Creek	149.5 L	
Cheatham Damsite	149.9 R	
Lock A	150.8 R	
Pardue	153.0 L	
Harpeth River Bridge	1.7 R	(on Harpeth River - CRM 153.0)
Sycamore Creek	154.2 R	
Big Bluff Creek	156.6 L	
Brush Creek	160.7 L	
Sams Creek	161.5 L	
Bull Run Creek	164.2 R	
Old Hickory Tailwater	215.7 L	

  - By Other Agencies

Metro Riverfront Park	191.0 L	
Shelby Park	193.7 R	

- Commercial Docks

Dozier Boat Dock	0.2 L	(on Harpeth River - CRM 153.0)
River View (Asland City) Dock	158.1 L	
Commodore Yacht Club	172.4 L	
Rock Harbor Marina	175.4 L	
Opryland U.S.A.	197.4 L	
Belle Carol Riverboat	198.5 L	

- Industrial Docks

Nashville Bridge Company	163.7 R
Hunter Marine	175.5 L
Haileys Harbor Terminal	180.5 R
Texaco	182.8 L
Missouri Portland Cement	182.9 L
Shell Oil	183.0 L
Exxon U.S.A.	185.0 L
Southern States Asphalt	187.2 R
Nashville River Terminal	188.8 R
Lone Star Cement	189.1 L
Signal Mt. Cement	189.4 L
Lion Oil	189.5 L
Cherokee Marine Terminal	189.8 R
Metro Materials	189.9 L
Asland Oil & Refining	190.5 R
Ingram Materials	190.8 R
Nashville Bridge Company	191.0 R
Steiner-Liff Iron & Metal Company	191.3 R
Cities Service Oil	191.5 R
M. Cohn Iron & Metal	191.6 R
Triangle Refineries	191.6 L
Namolco	191.7 R
Dundee Cement	192.4 L
Mid South Wire	193.2 L
Ergon, Inc.	193.3 L

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CHAPTER I
INTRODUCTION

1.1. Authorization. This manual was prepared for the U.S. Army Corps of Engineers, Nashville District, by the Sverdrup Corporation under contract DACW62-87-C-0068, modification P00011 in accordance with ER 1110-2-240, ETL 1110-2-251, and EC 1110-2-256.

1.2. Purpose. The purpose of this manual is to serve as a guide for the day to day and emergency regulation of the Cheatham project, and to provide background information on the project.

1.3. Scope. This manual presents the plan of regulation for the Cheatham project and furnishes information pertinent to its operation.

1.4. Emergency Regulation Assistance Procedures. In the event that unusual conditions arise, contact can be made by telephone to the CELRN-EP-H Water Management Section at the phone number listed in Appendix E. During nonduty hours, assistance can be obtained by contacting one of the officials also listed in Appendix E.

1.5. Update Procedure. Regulations specify that this Water Control Manual be published in loose leaf form, and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current.

1.6. Responsible Agencies.

- Project Owner: U.S. Army Corps of Engineers
- Operating Agency: U.S. Army Corps of Engineers
- Regulating Agency: U.S. Army Corps of Engineers
- Hydropower Marketing Agency: Southeastern Power Administration (SEPA)
- Hydropower Scheduling: Tennessee Valley Authority (TVA)

1.7. Related Manuals and Reports.

1.7.1. Original Water Control Manuals.

Master Regulation Manual for Reservoirs in the Cumberland River Basin Revised March, 1954		
	Appendices	Date
A:	Regulation Manual for Wolf Creek	Revised March, 1954
B:	Regulation Manual for Dale Hollow	Revised March, 1954
C:	Regulation Manual for Center Hill	Revised March, 1954
D:	Regulation Manual for Old Hickory	November, 1959
E:	Regulation Manual for Cheatham	November, 1959
F:	Regulation Manual for Barkley Reservoir	April, 1969
G:	Regulation Manual for J. Percy Priest Reservoir	April, 1977

1.7.2. Revised Water Control Manuals.

Cumberland River Basin Water Control Manuals		Published
Volume I	Master Water Control Reference Manual	April, 1990
Volume II	Master Water Control Plan	December, 1998
Volume III	Barkley Water Control Manual	December, 1998
Volume IV	Cheatham Water Control Manual	December, 1998
Volume V	Old Hickory Water Control Manual	December, 1998
Volume VI	Cordell Hull Water Control Manual	December, 1998
Volume VII	J. Percy Priest Water Control Manual	December, 1998
Volume VIII	Center Hill Water Control Manual	December, 1998
Volume IX	Dale Hollow Water Control Manual	December, 1998
Volume X	Wolf Creek Water Control Manual	December, 1998
Volume XI	Laurel Water Control Manual	December, 1998
Volume XII	Martins Fork Water Control Manual	December, 1998

1.7.3. Related Manuals.

1. Cheatham Dam Instructions for Reservoir Regulation - Revised December, 1998.
2. Old Hickory Dam Instructions for Reservoir Regulation - Revised December, 1998.
3. Cumberland River Basin Drought Contingency Plan - November, 1994.

CHAPTER II
WATER CONTROL PLAN

2.1. Primary Objectives. The Water Control Plan for Cheatham has two primary objectives. These are:

1. To provide a nine foot slackwater pool to permit commercial navigation from the dam upstream to Old Hickory Dam.
2. To generate hydropower.

2.2. Regulation Curve.

2.2.1. The regulation curve, or guide curve, represents the primary guidance for operating the Cheatham project. It defines operating limits of reservoir elevations and is presented graphically on Plate A-1. The guide curve separates the storage volume in the lake into two distinct zones as described below.

2.2.2. Inactive Pool. Inactive storage at Cheatham extends from the bottom of the lake up to elevation 382. Water is not released if it would bring the surface of the pool below the top of this zone. Inactive storage is provided primarily to offset lake sedimentation and provide head for hydropower. Other benefits of this permanent pool include depth for slack water navigation, recreation, and water intake installation, habitat for fish and other aquatic life, and insurance water for drought periods.

2.2.3. Power Pool. The authorized power pool extends only three feet from elevation 382 to elevation 385 and this zone remains constant year round. It is not unusual for daily hydropower operations to pass the equivalent of this entire volume of water as it is simultaneously replenished by releases from Old Hickory and J. Percy Priest Dams. Headwater levels up to elevation 386 are permissible under normal conditions as described below.

2.2.4. Modified Operating Range. Based on operating experience gained following completion of Cheatham, adjustment to the power operating range was needed to meet navigation depth requirements in the upper reaches of the pool. After a thorough study was completed in 1961, a slightly altered operating guide was instituted at Cheatham. During low and moderate flow periods, the headwater was allowed to range between elevations 382.8 and 386.0 in order to assure adequate commercial navigation depths from Nashville upstream to the Old Hickory tailwater.

2.3. Normal Regulation.

2.3.1. During periods of normal regulation, the water surface elevation behind the Cheatham Dam is maintained within the hydropower pool limits and all releases are made through the turbines as governed by the demand for power. Changes in generation are limited to one unit per hour, up or down, to benefit downstream navigation. These procedures are in effect as long as inflows to the project remain less than the discharge capacity of the turbines. When reservoir inflows exceed turbine capacity, and the lake tends to rise above the power pool, spillway releases are initiated to augment power discharges, and spill is increased as required to keep the lake from exceeding top of power pool until free flow is reached. Powerplant operators have the authority to initiate spillway releases from this pool.

2.3.2. Daily Water Management. As a result of a daily analysis of current hydrologic conditions, the Water Management Section directs TVA to schedule a specific amount of energy production for the following day at Cheatham and, if needed, to modify the generating schedule for the current day. TVA accepts this daily total generation and then schedules the energy on an hourly basis to best meet power demands. The District discourages TVA from deviating from the daily total generation prescribed, especially at mainstem projects like Cheatham.

2.3.3. Operators. Lock operators are stationed at Cheatham 24 hours a day, year-round. This is not the case for the power house which is controlled remotely from Old Hickory. Spillway gate changes during non-duty hours are made by calling in off-duty power house maintenance personnel. The instructions regarding the starting and stopping of hydropower units come directly from the TVA load coordinators to the Old Hickory powerplant operators. Plant personnel are to insure that headwater levels are above the minimum allowable, that changes in generation are limited to one unit per hour and that the machinery is operated within allowable limits. If instructions are issued from TVA which conflict with these criteria, plant personnel are to inform TVA that such a conflict exists and the execution of such instructions is not permitted. The attending personnel are supervised by the Construction and Operations Division but it is the responsibility of the Water Management Section of the Engineering-Planning Division to issue specific project release instructions and to insure adherence to the water control plan.

2.3.4. Modified Operating Range. In order to maintain adequate depths for navigation through the upper end of Cheatham Reservoir, the tailwater level at Old Hickory must be maintained at elevation 385 or above. When Old Hickory's releases are cut to zero for a period of more than two or three hours, a negative surge is generated below the dam. This amounts to about one-half foot with a zero discharge period of six hours. With Cheatham headwater at elevation 385, it is necessary to compensate for this surge by making intermittent releases from Old Hickory. During low-flow periods, such releases during off-peak hours reduce the ability of the project to meet the load during the high demand hours, and are thus highly undesirable from the standpoint of power. For this reason a tolerance of up to one foot above elevation 385 is permitted in the Cheatham headwater during periods of low and moderate flows. The operating goal for Cheatham is to maintain the headwater level between elevations 385 and 386 during these periods. When spillway releases are needed to supplement turbine discharges, the desired headwater range is generally lowered to between elevations 384 and 385.

2.4. Flood Regulation.

2.4.1. The Cheatham project does not have any flood control storage capabilities, and unlike the other two run-of-river projects in the basin, Old Hickory and Cordell Hull, Cheatham does not have flood surcharge storage above the power pool. As flood flows develop at Cheatham the spillway gates are raised clear of the water surface and the reservoir reverts to open river conditions.

2.4.2. Reservoir Regulation during Floods. When the headwater level tends to rise above elevation 386.0, the spillway gates will be operated as necessary to lower the headwater to elevation 385.0 and to maintain it at this level. Increases in spillway discharge should be limited to about 7,500 cfs per hour, which corresponds to about a one foot per hour rise in the tailwater at near bankfull stage. In some rare cases, the 7,500 cfs per hour limitation may cause the headwater to rise above elevation 385.0 before the spillway gates have been lifted clear of the water surface. In these cases, the 7,500 cfs per hour restriction will be applicable until the headwater tends to exceed elevation 386.0, after which releases must be increased to prevent any further rise until the gates are fully open.

2.4.3. If during the course of a flood, it becomes necessary to stop the generating units because of loss of head, the spillway discharge should be increased as necessary to lower the headwater to elevation 383.0, if possible. During extreme events, Water Management Section personnel may direct that efforts be made to further lower the headwater to elevation 382.0. After the crest of the flood has passed, the spillway discharge should be gradually reduced as necessary to raise the headwater level to elevation 385.0. The purpose of these guidelines is to moderate rapid drawdowns in the Nashville Harbor area as floodwaters recede. Reducing the rate at which the river falls in the harbor benefits the navigation and other riverine industries in the area.

2.4.4. Initially, the spillway gates at Cheatham were capable of being operated in either the raised or submerged position. Operators could have selected the submerged position to minimize gate changes during periods when small spillway releases were required. This position was also utilized to facilitate passing of floating trash. However, the capability to operate the spillway gates in the submerged position no longer exists.

2.5. Drought Regulation.

2.5.1. As specified in the Cumberland River Basin Drought Contingency Plan, the system-wide priorities for drought operation in the basin are as follows:

1. Water Supply*
2. Water Quality*
3. Navigation
4. Hydropower
5. Recreation

* For Public Health and Safety

2.5.2. Authorization. Of these operating purposes, navigation and hydropower were specifically authorized by Congress. Cheatham Dam is also operated for water quality and fish and wildlife under the general authorities of the Federal Water Pollution Control Act Amendments and the Fish and Wildlife Coordination Act respectively. While there is no general authority at Cheatham for storage allocated for water supply on either a permanent (PL 85-500) or temporary (PL 78-534) basis, water is being withdrawn for municipal and industrial purposes. Consequently, in the interest of public health and safety, high priority is given to maintaining the lake level above the minimum operating elevations of all water supply intakes.

2.5.3. Overview. Due to its limited storage capabilities and run of river type of operation, the regulation of Cheatham Dam will not significantly change during a drought. Maintaining the minimum power pool of elevation 382 will protect the water intake structures and sustain partial navigation and recreation in the Cheatham pool. A headwater level of elevation 385 must be maintained to fully support navigation within the lake. Water quality in the lake is always dependent upon the quality of upstream releases but may decline during a drought as retention times increase and the assimilative capacity of the river decreases. Hydropower production will decrease in proportion to the decrease in flows.

2.5.4. Water Supply for Public Health and Safety. The first priority during drought conditions is the maintenance of water supply. As of 1990 Cheatham Lake is directly used by six public water supply systems which in turn supply water to seven additional systems. These thirteen systems supply a total population of approximately 480,000 people. The highest minimum operating elevation of the eight systems which draw from the lake is elevation 382. Elevation 382 also corresponds to the bottom of the power pool and is the normal minimum elevation for Cheatham. In the event of a drought, water supply to these systems will be maintainable unless the drought reached truly catastrophic proportions. Basic data on the systems which have water intakes in Old Hickory Lake is presented in Chapter III.

2.5.5. Water Quality for Public Health and Safety. Water quality is a primary concern within the Cheatham pool; however, little can be done operationally at Cheatham Dam to affect the quality of water in the lake. Releases from Cheatham are spread as evenly as possible throughout the day and week during seasonally low flow months to minimize the impact of TVA's Cumberland City Steam Plant which is located downstream in Lake Barkley. A presentation of Cheatham Lake water quality characteristics is addressed in Chapter III.

2.5.6. Navigation. Commercial navigation is considered a high priority function both above and below Cheatham Dam during normal periods as well as during droughts. An environment conducive to waterbound commerce is provided through slack water pools from Barkley Dam to Cheatham Dam and continues upstream upstream to Old Hickory Project. The Nashville Harbor area is located about midway between Cheatham and Old Hickory. Navigation is further enhanced by restrictions placed on hydropower production at both Cheatham and Old Hickory. During drought conditions these restrictions would remain in force; otherwise, as long as minimum headwater and tailwater elevations are met no special operations will be required to support navigation.

2.5.7. Hydropower. Hydropower is near the bottom of the priority list during drought conditions only because it uses such great quantities of water. As drought conditions worsened, hydropower would continue to be generated, but the quantities of power generated by this means would decrease proportionally to the decrease in availability of water.

2.5.8. Recreation. The water resource needs for the recreational use of Cheatham Lake are similar to those for the navigational use of the pool. Initial impacts to recreation do not occur until the lake elevation reaches elevation 381.5 which is actually 0.5 feet below the normal minimum level. Only in a severe drought of greater proportions than those yet experienced would result in a major impact to recreation. A summary of the impacts of lake levels on recreation is presented in Chapter III.

2.5.9. Summary. Unless a drought reaches catastrophic proportions, only very minor operational changes are anticipated at Cheatham. One example may involve evenly spreading generation throughout the week to improve flow conditions past the Cumberland City Steam Plant. The primary adverse effect of drought at Cheatham is expected to be a decrease in the generation of hydropower in direct proportion to the decrease in Cumberland River flows.

2.6. Special Regulation.

2.6.1. Stabilization for Spawning. Usually in late April or early May, the large mouth bass and crappie spawn occurs. For a two to three week period during this occurrence it is critical to keep a relatively stable pool for good spawning conditions. During this period, efforts are made to hold headwater elevations between 384.7 and 385.7. Because of the small storage volume within this one foot range, it is not unusual for the operator to deviate from the TVA provided hourly schedule to satisfy this need. Stabilization efforts are initiated when the Nashville District determines that the spawn is occurring, based on criteria established by the Tennessee Wildlife Resources Agency. TWRA criteria to identify the beginning of the spawning period for all lakes in Tennessee is water temperature at a five-foot depth at or above 60 degrees Fahrenheit. Proper lake level stabilization to enhance the fish spawn must be a cooperative effort between the Corps, TWRA, SEPA, and TVA.

2.6.2. In addition to the functional goals discussed in this chapter, there are often other miscellaneous requirements of reservoir regulation for special purposes or circumstances. These include such things as providing specific water levels or discharges for construction activities, project maintenance, inspections, and response to emergency situations such as drownings and oil and chemical spills. Normally special operations can be accomplished within the framework of the approved reservoir operating plan and therefore do not require approval of higher authority. In rare circumstances when deviation from the approved plan is necessary, prior approval of the Great Lakes and Ohio River Division (LRD) office is required.

2.7. Safety.

2.7.1. Maintaining the integrity of the structure under all conditions of streamflow, and assuring the safety of the general public both at the project and in the river system below the project takes precedence over all functional requirements. The project design and this water control plan are intended to result in safe conditions for all anticipated circumstances. If however, conditions arise where adherence to this plan would jeopardize structural integrity or the general public, safety conditions should prevail.

2.8. Specific Operating Rules.

2.8.1. Normal and Drought Conditions.

(1) Maintain headwater elevation within the modified operating range (elevation 382.8 to 386.0) and release all water through the turbines as governed by hydropower generation schedules.

(2) Limit change in hydropower generation to one unit per hour, up or down.

(3) In coordination with Old Hickory and J. Percy Priest, maintain the water level in the Nashville harbor at or above elevation 385. To accomplish this, a tolerance of one foot above the power pool, up to elevation 386, is permitted in the Cheatham headwater.

(4) There is no designated minimum release rate or volume for Cheatham Dam.

2.8.2. Flood Periods.

(1) Continue to pass as much flow as practical through the hydropower turbines, however changes in hydropower generation are still limited to one unit per hour.

(2) If river flows increase to the point that more water is available than that which can pass through the turbines, raise spillway gates to maintain the water surface elevation within the hydropower pool limits (elevation 383 to 385) subject to the criteria that follows.

(3) Limit increases in total discharge (turbine and spill) to 7,500 cfs per hour until tailwater reaches bankfull stage. To accomplish this, a tolerance of one foot

above the power pool, up to elevation 386, is permitted in the Cheatham headwater.

(4) When headwater level reaches 386, increase releases as necessary to prevent further rises until the gates have been lifted clear of the water surface to the free flow position.

(5) Continue open river flow conditions until the headwater level recedes to elevation 386.

(6) After headwater recedes to elevation 386, lower gates to limit decrease in total discharge to 15,000 cfs per hour and maintain pool above elevation 383 until normal conditions prevail.

2.9. Instructions to Operators. Additional instructions regarding normal and emergency operations and specific instructions on data collection and reporting duties can be found in the separate Cheatham Dam Instructions for Reservoir Regulation document.

2.10. Deviations from Water Control Plan. Permission to deviate from this plan must be obtained from the Great Lakes and Ohio River Division (LRD), Water Management Branch.

2.11. Standing Instructions. See next page.

STANDING INSTRUCTIONS

CHEATHAM

In the unlikely event that contact can not be established between operators of the Cheatham project and the Nashville District Water Management Section the following guidelines should be used by operators.

1. Maintain headwater elevation within normal operating limits, elevations 382.8 and 386.0, and release all water through the turbines as governed by hydropower generation schedules.

2. If the reservoir level approaches the lower limit of elevation 382.8, reduce or curtail hydropower discharges as necessary to prevent the headwater from falling below elevation 382.8 and notify the power scheduling agency.

3. Limit changes in hydropower generation to one unit per hour, up or down.

4. When inflows tend to cause the headwater to rise above elevation 386.0, increase hydropower discharges at one unit per hour to maximum turbine capacity releases as required to return the pool below elevation 386.0 and notify the power scheduling agency.

5. If the headwater continues to rise, supplement turbine capacity discharges with spillway releases. Increase spillway releases at a rate of about 7,500 cfs per hour in an effort to stop the rise and return the pool to elevation 385.0. Maintain the pool level within the elevation range of 383.0 and 385.0 while spillway releases are needed. All gates should be operated at approximately the same opening.

6. In some cases increasing spillway releases at 7,500 cfs per hour will not be sufficient to maintain the pool within the desired headwater range. If the headwater remains above or again exceeds elevation 386.0, increase releases as necessary to prevent further rises until the gates have been lifted clear of the water surface to the free flow condition.

7. As inflows recede maintain free flow spillway discharges until the headwater falls to elevation 386.0. Then, reduce spillway releases at a rate of about 15,000 cfs per hour. Maintain reservoir level above elevation 383.0 until normal conditions prevail.

CHAPTER III
EFFECT OF WATER CONTROL PLAN

3.1. Pool Elevation.

3.1.1. Plate III-1 shows the annual peak headwater elevation of Cheatham Lake for 39 years of history arranged in descending order. The pool elevation frequency curve, displayed as Plate III-2, shows the percent of time that the pool has been at or below the various elevations. During the history of this project, the water surface has been within the range of the official power pool approximately 40 percent of the time. It has been within the permitted one foot variance above the power pool approximately 97 percent of the time. The water surface has never gone below the bottom of the power pool.

3.1.2. The summary hydrograph, shown in the appendix as Plate D-1a, shows that the median pool elevation remains within the one foot variance above the top of the power pool year round. Plate III-3 shows the range of pool used during each year of the project's history. These statistics are based on the historical daily midnight pool elevations.

3.2. Project Discharge. The monthly average discharge for the project is shown on Plate III-4. This information is also shown in tabular form in the pertinent data section. From January through April, the average project spill is greater than the average outflow through the turbines and for the year, spill accounts for about 42% of total project discharge. Average annual discharge is presented as Plate III-5. As expected, the percentage of discharge which is spill increases proportionately in the higher flow years.

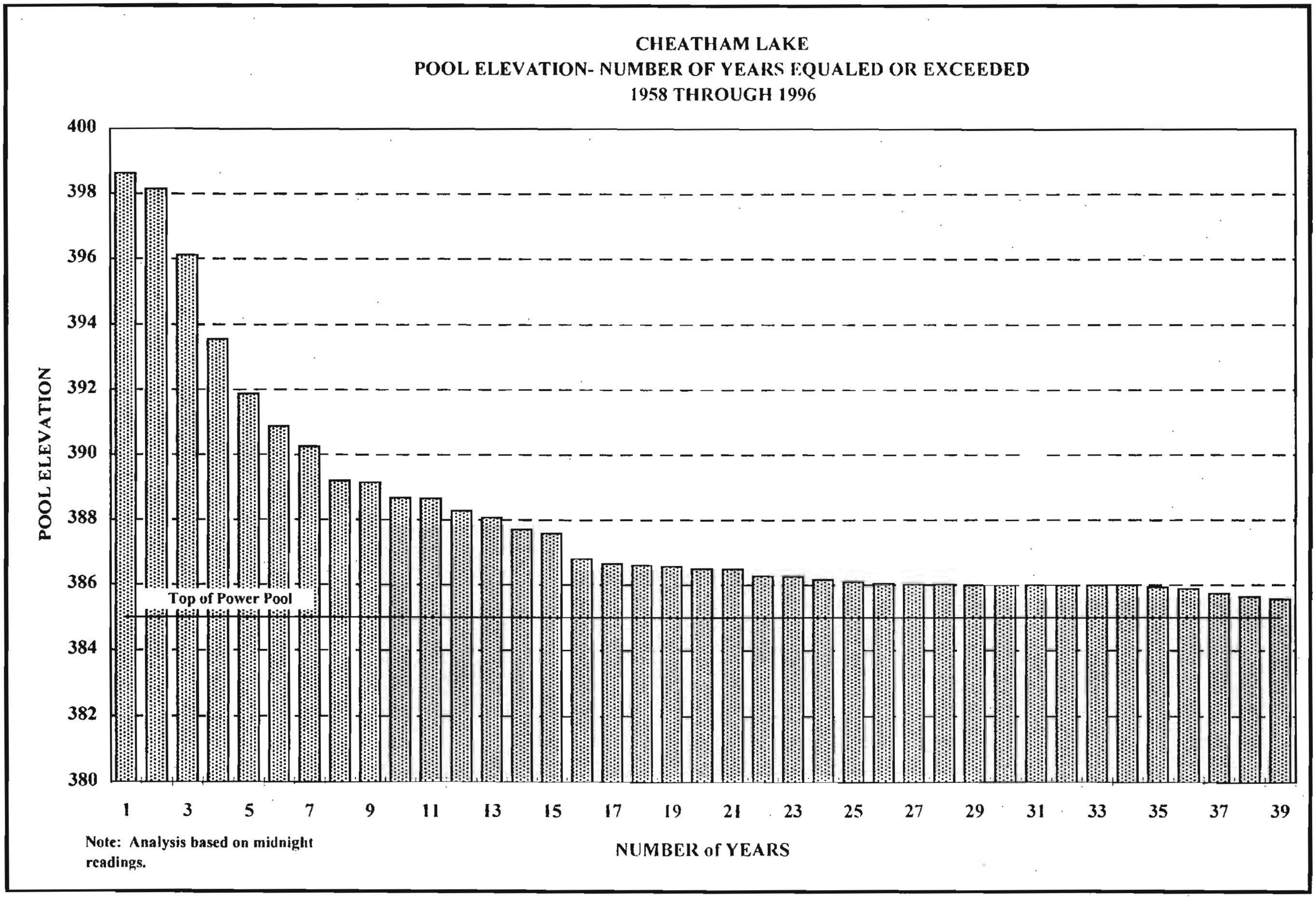

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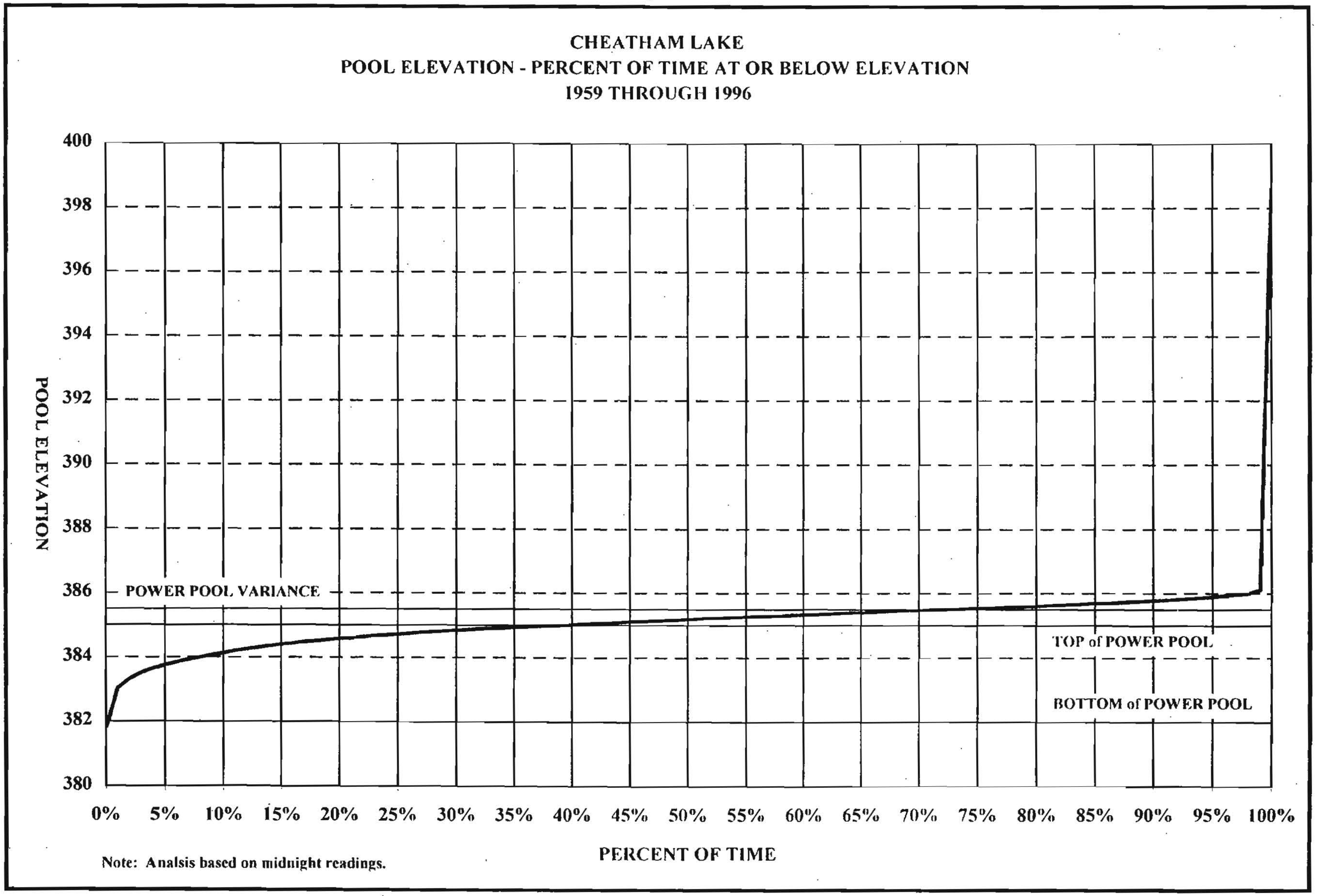
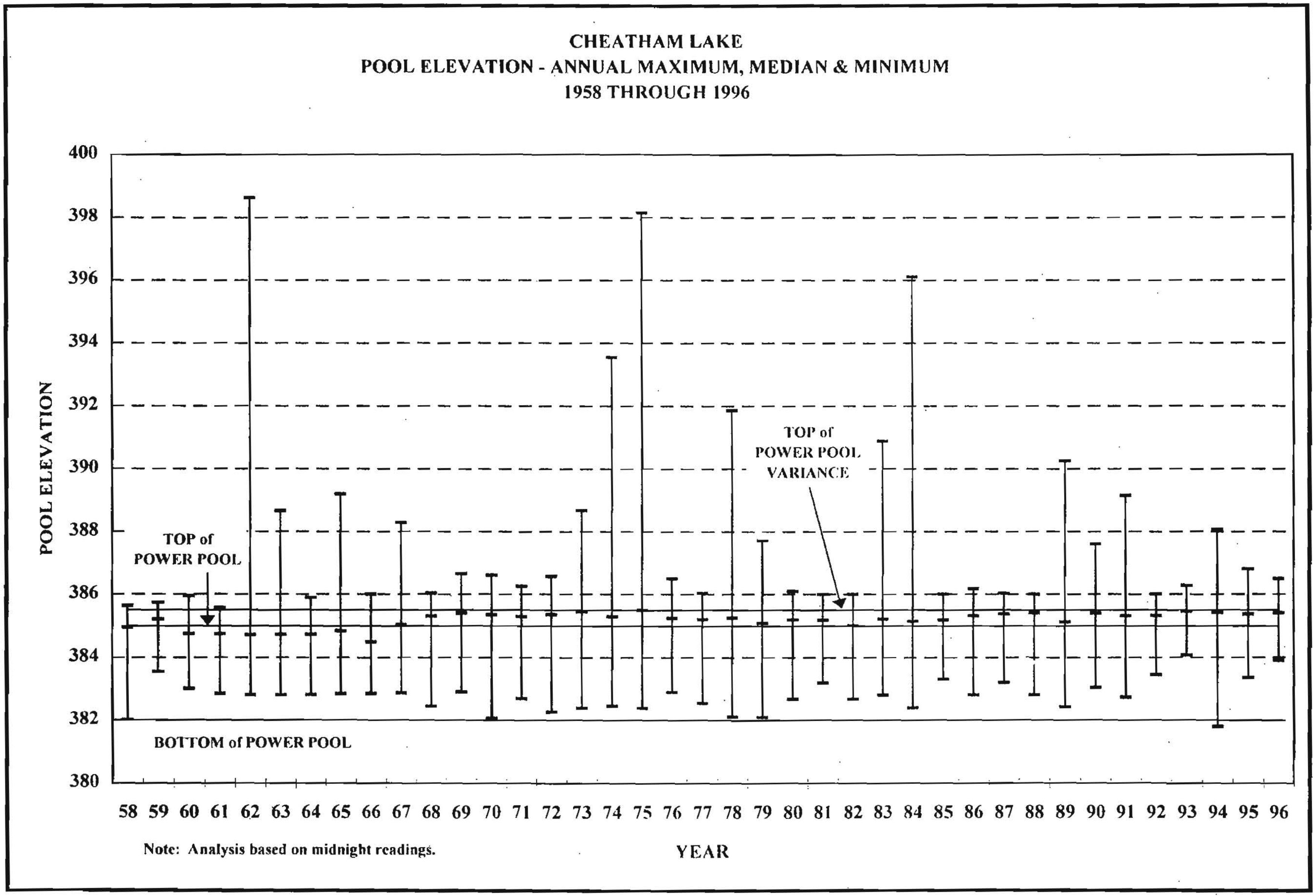
PLATE III-1


CHEATHAM LAKE
POOL ELEVATION - PERCENT OF TIME AT OR BELOW ELEVATION
1959 THROUGH 1996
POOL ELEVATION
400
398
396
394
392
390
388
386
384
382
380
POWER POOL VARIANCE
TOP of POWER POOL
BOTTOM of POWER POOL
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
55%
60%
65%
70%
75%
80%
85%
90%
95%
100%
PERCENT OF TIME
Note: Analsis based on midnight readings.



CHEATHAM LAKE
POOL ELEVATION - ANNUAL MAXIMUM, MEDIAN & MINIMUM
1958 THROUGH 1996
POOL ELEVATION
400
398
396
394
392
390
388
386
384
382
380
TOP of POWER POOL
TOP of POWER POOL VARIANCE
BOTTOM of POWER POOL
58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
YEAR
Note: Analysis based on midnight readings.

CHEATHAM DAM
AVERAGE MONTHLY TURBINE & SPILL RELEASE
1959 THROUGH 1996

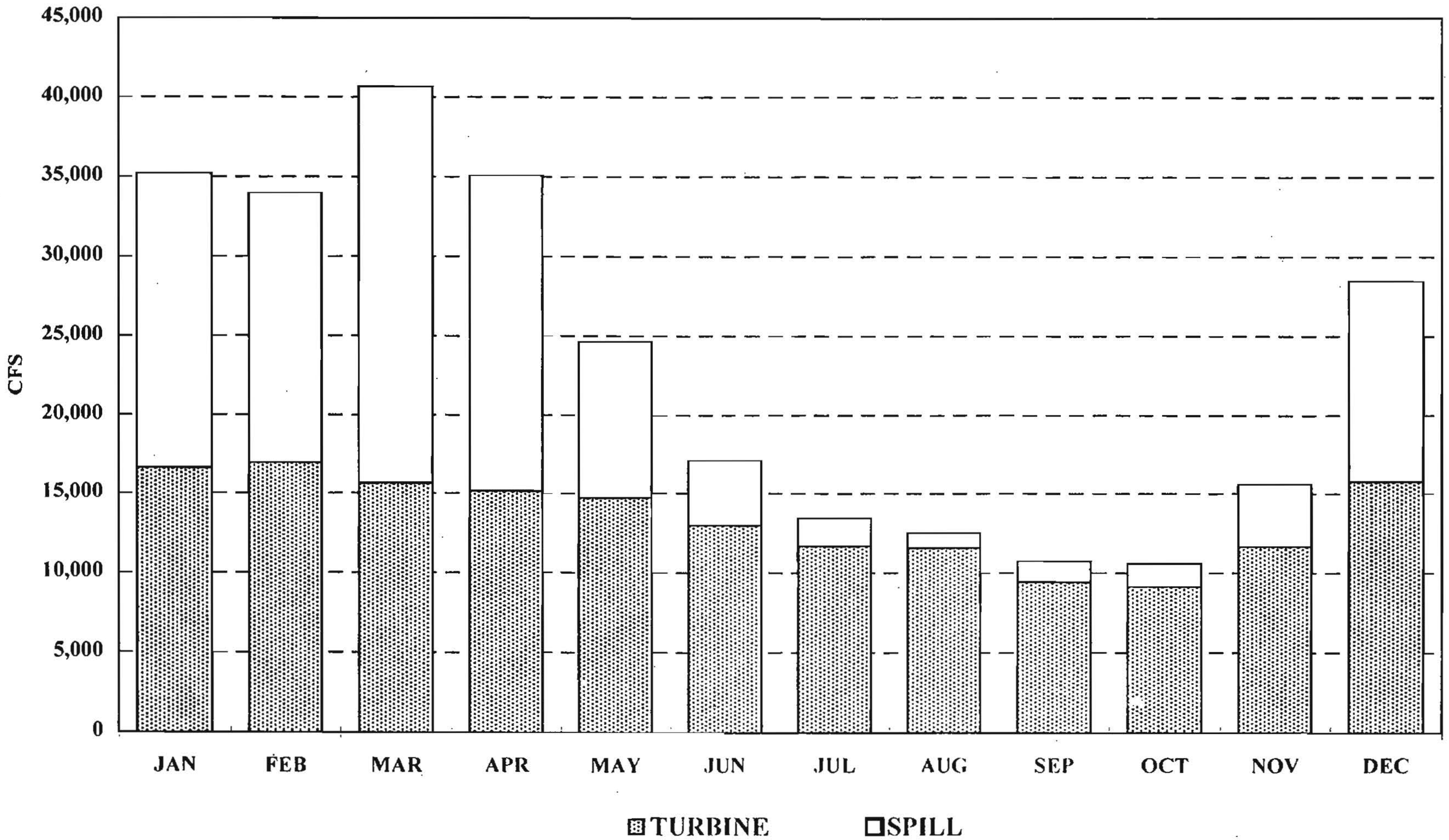


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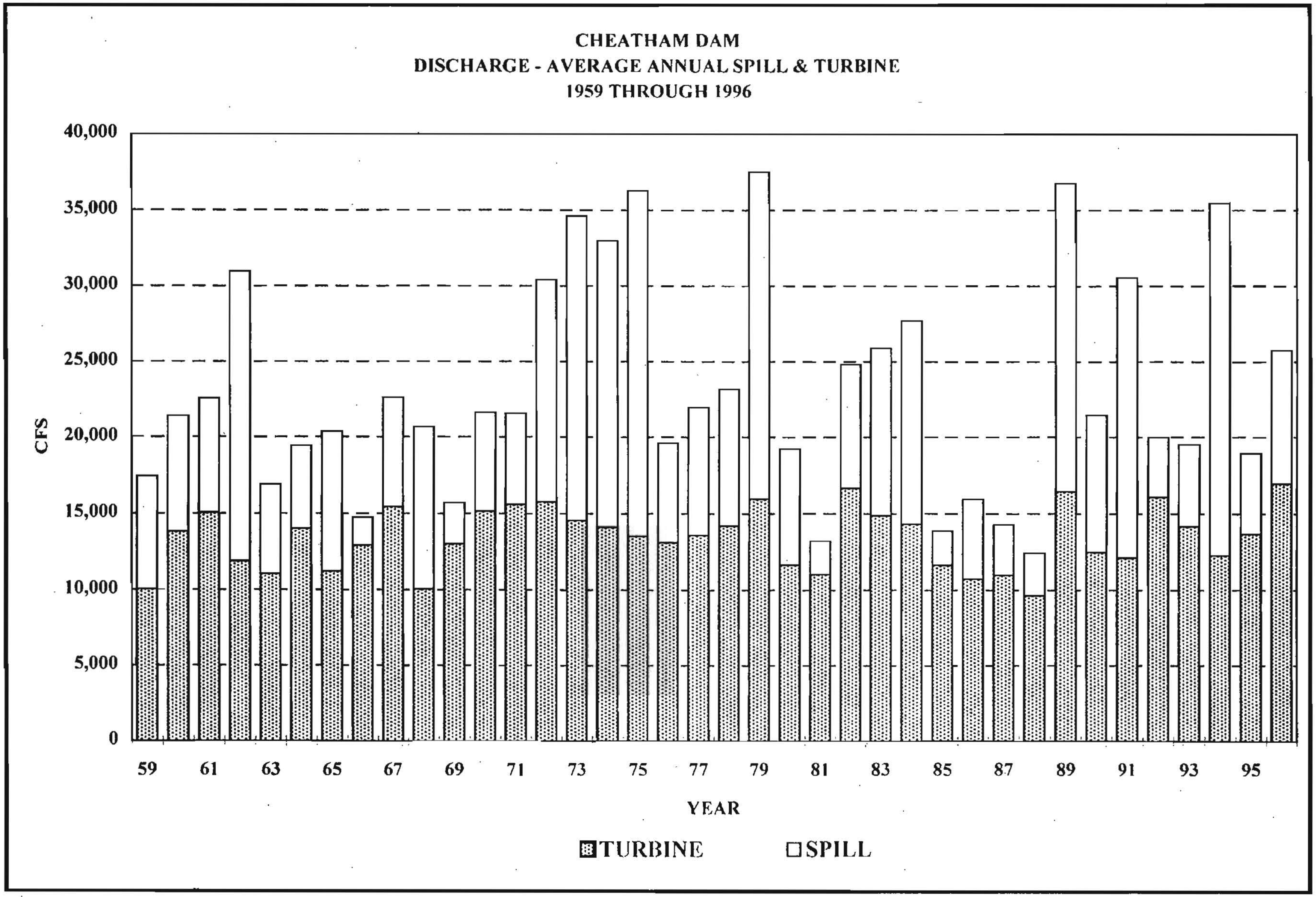
PLATE III-4


CHEATHAM DAM
DISCHARGE - AVERAGE ANNUAL SPILL & TURBINE
1959 THROUGH 1996
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
CFS
59
61
63
65
67
69
71
73
75
77
79
81
83
85
87
89
91
93
95
YEAR
TURBINE
SPILL

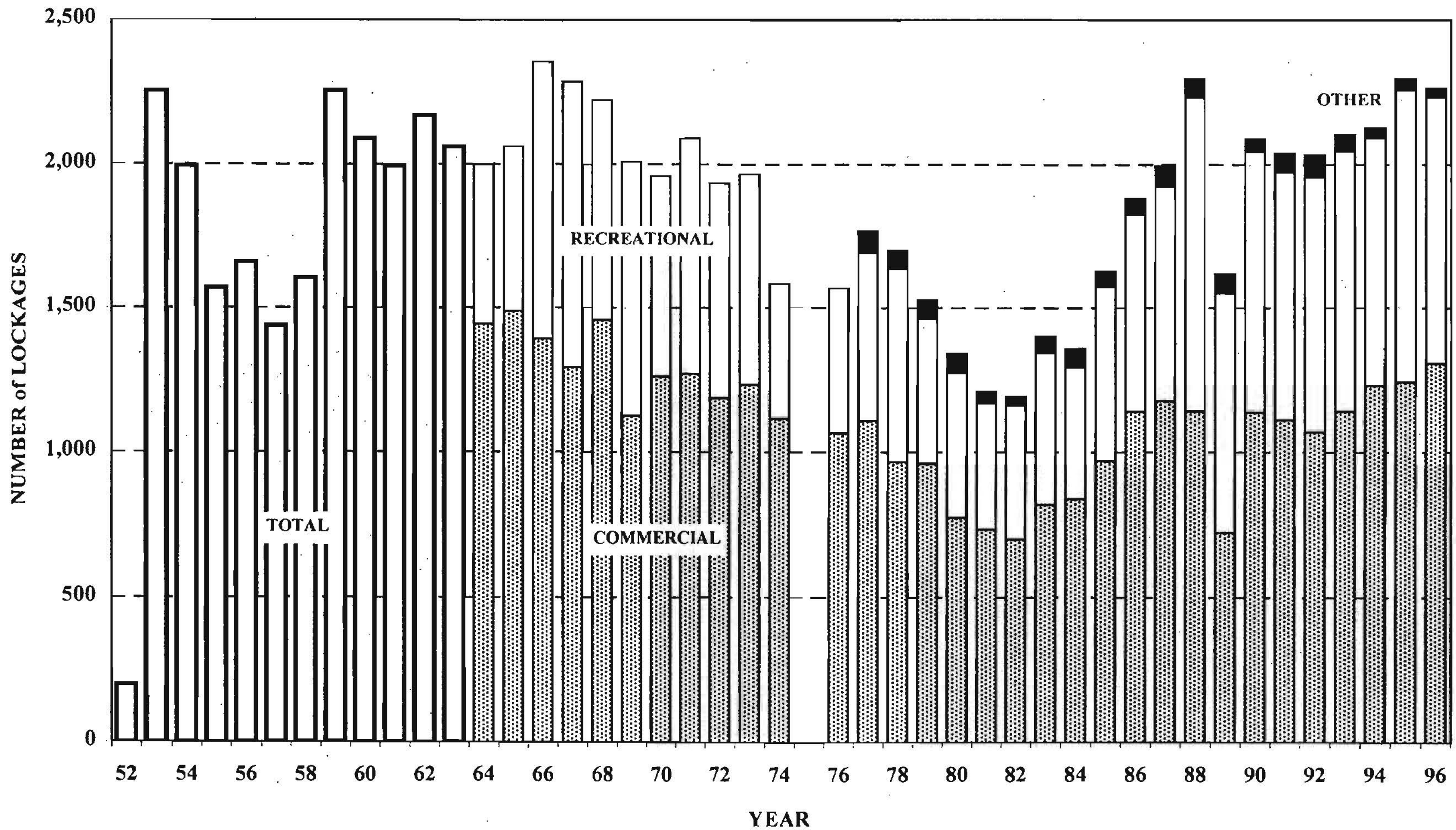
3.3. Navigation.

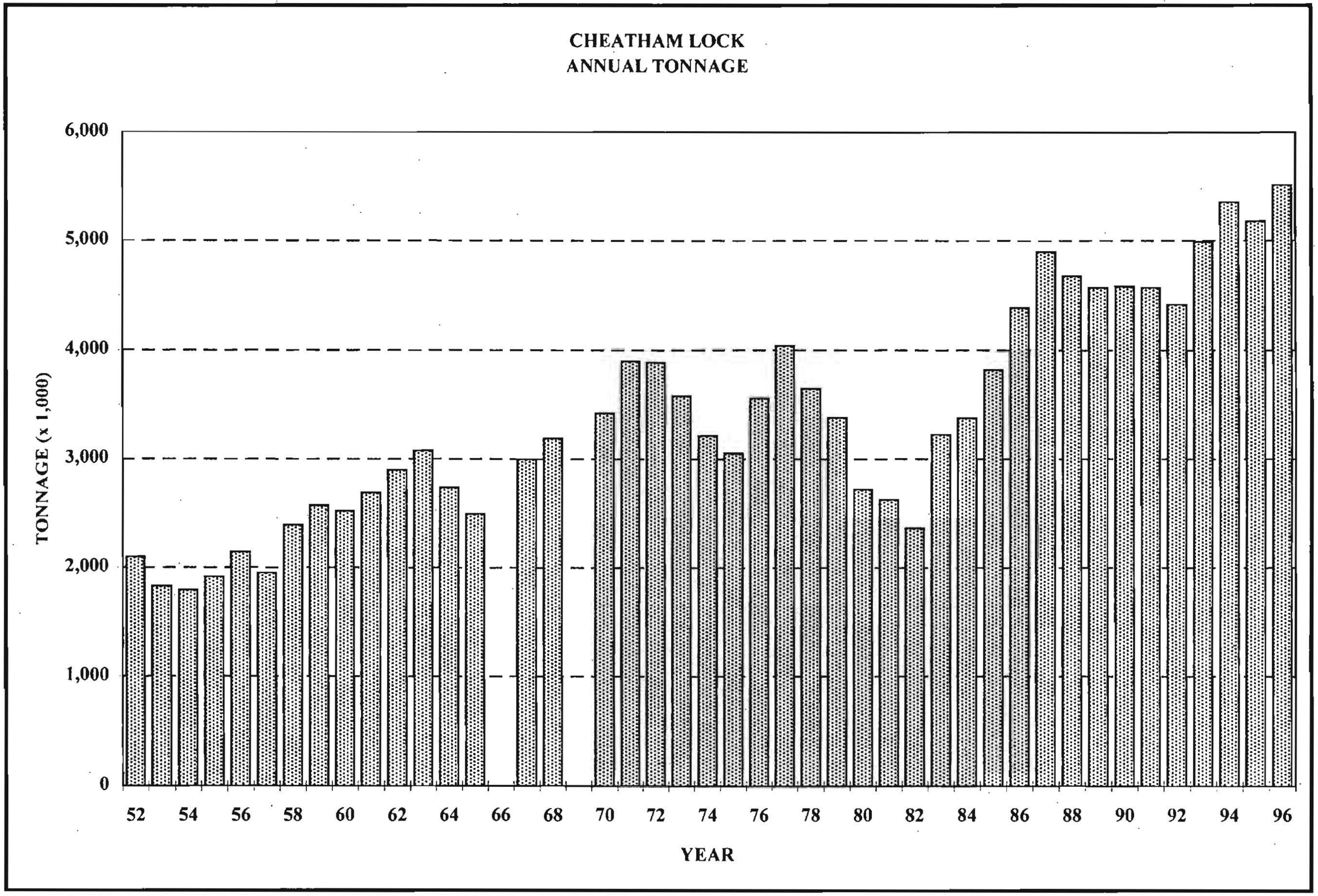
3.3.1. The 800 ft. by 110 ft. navigation lock at Cheatham receives a moderate level of use. Since initiation of operation in 1952, the lock has been used on the average just under five times per day. The number of lockages has remained fairly steady over the years as shown in Plate III-6. There have been between 500 and 1,000 recreational lockages and between 700 and 1,500 commercial lockages almost every year since the lock has been in operation. Both commercial and recreational lockages dropped during the early eighties, but both have returned to more typical levels in the late eighties and early nineties.

3.3.2. Even though the number of commercial lockages has remained fairly steady, as shown in Plate III-7, the amount of tonnage that has moved through Cheatham has risen steadily over the years. Tonnage did drop off in the early eighties, coinciding with the completion of the petroleum pipeline to Nashville. In particular, Exxon vastly reduced their petroleum shipments to Nashville by barge after this pipeline was completed. With the exception of this drop, the tonnage through the lock has risen steadily from about two million tons annually in the early fifties to over five million tons in the mid nineties.

3.3.3. Most of the tonnage moving through Cheatham Lock is upbound. Downbound tonnage includes a minor amount of scrap metal and manufactured goods. The primary commodities moving through the lock are steel and crude materials, such as sand and gravel, all destined for Nashville. Other primary commodities include coal destined for Nashville and the Gallatin Steam Plant, petroleum products delivered to Nashville and Celina, and chemicals bound for the DuPont Plant in Old Hickory.

CHEATHAM LOCK
ANNUAL LOCKAGES



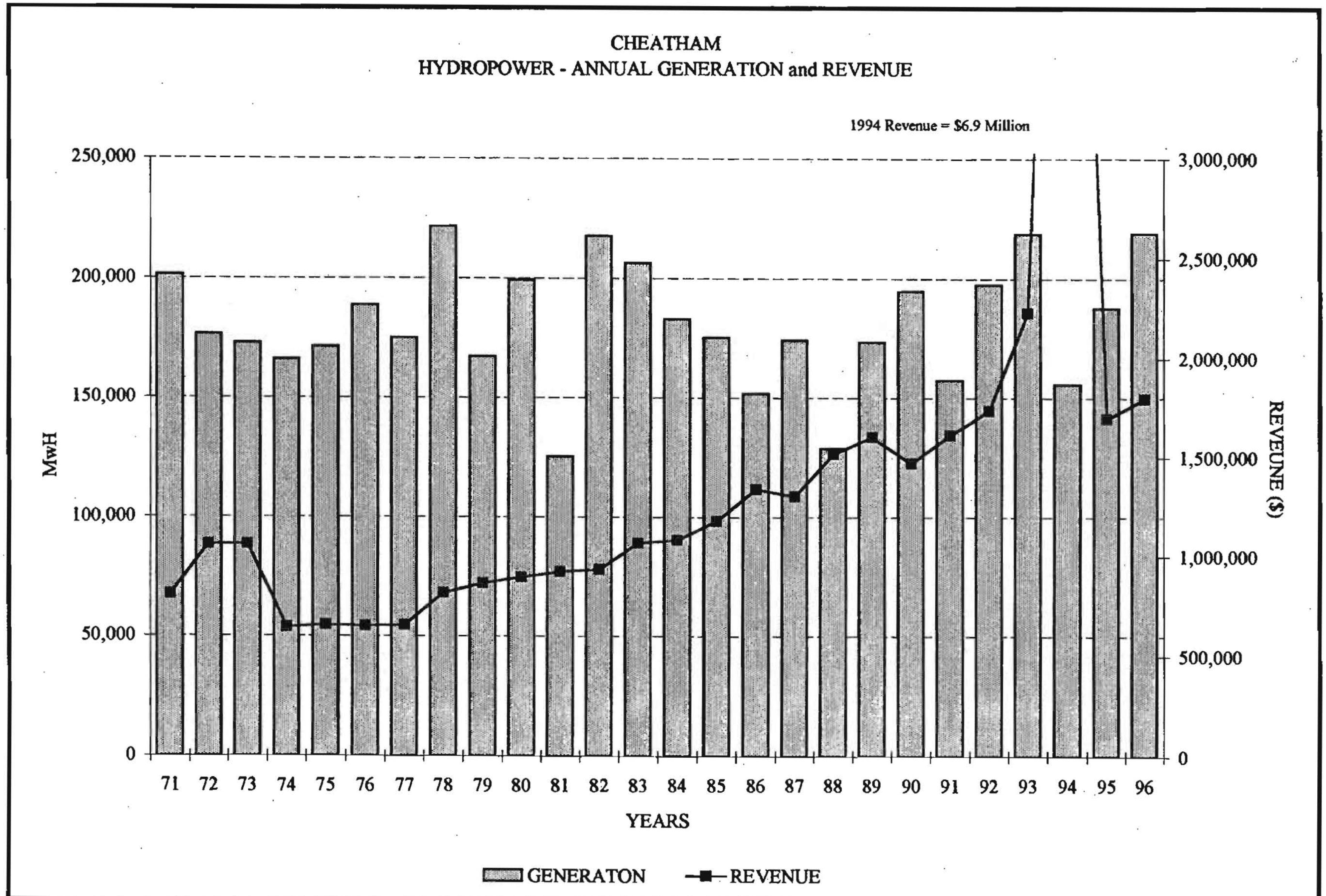

CHEATHAM LOCK
ANNUAL TONNAGE
TONNAGE (x 1,000)
6,000
5,000
4,000
3,000
2,000
1,000
0
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
YEAR

3.4. Hydropower.

3.4.1. Hydropower capacity at Cheatham is the second lowest of the nine plants in the Corps' Cumberland Basin system. Only the J. Percy Priest powerplant has a smaller capacity. The 36 MW capacity represents less than four percent of the District total. At only 22 feet nominal, Cheatham has the lowest head of the nine powerplants. It also spills the largest quantity and percentage of water. The average spill between 1959 and 1996 has been 9,705 cfs, or about 42% of the total flow past the project.

3.4.2. A summary of the hydropower output of Cheatham is presented on Plates III-8 and III-9. The net power generated at the project has remained generally constant over the years with no particular growth trend. There have been noticeable peaks and valleys in individual years, however, these are attributed to meteorological conditions and not to any difference in project operations. Fluctuations in revenue do not necessarily follow the same annual fluctuation pattern as generation. Hydropower revenue attributed to individual projects tends to be more a function of accounting, as total revenue is divided among the Cumberland Basin hydropower projects. This was particularly true in 1994, when almost 7 million dollars of revenue was attributed to this project while hydropower production at the project was slightly down for the year. In addition, only about one third of a project's hydropower revenue comes from the actual generation of power, while the remainder comes from selling power "capacity".

3.4.3. The regulation of other Cumberland Basin projects has an effect on hydropower production at Cheatham. Those releases from Wolf Creek Dam which occur during the middle and latter parts of the work week generally reach Cheatham Dam on the weekend when power demand is low. There is not enough storage volume in the power pool to hold this water for the following weekday peaks and thus some power must be generated at less than optimum times. Similarly, normal cutbacks on upstream releases during the weekend result in less water available for power production at Cheatham on Mondays and Tuesdays. On a daily basis, there is generally a four to six hour lag before Old Hickory and J. Percy Priest releases reach Cheatham Dam. The water released during late afternoon peaking operations at these two upstream projects generally arrives at Cheatham Dam after the peak demand period has passed. Again, storage limitations and the requirement to maintain navigation depths in the Nashville harbor make it very difficult to schedule generation during daily peak periods. In spite of these peak hour scheduling problems the low head dam does not contribute enough to system hydropower production to warrant operational modifications at the upstream projects.


CHEATHAM
HYDROPOWER - ANNUAL GENERATION and REVENUE
1994 Revenue = $6.9 Million
250,000
200,000
150,000
100,000
50,000
0
MwH
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
REVEUNE ($)
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
YEARS
GENERATON
REVENUE

SUMMARY OF CHEATHAM DAM HYDROPOWER OUTPUT

FISCAL YEAR	ESTIMATED ANNUAL GENERATION (million kwh)	GROSS GENERATION (million kwh)	% INCREASE OVER ESTIMATED ANNUAL GENERATION	STATION USE (million kwh)	NET ① GENERATION (million kwh)	REVENUE ($ million)	REVENUE (¢ / kwh sold)
1971	160	203.7	27	2.2	201.5	0.81	.40
1972	160	178.6	12	2.1	176.5	1.06	.61
1973	160	175.0	9	2.1	172.9	1.06	.62
1974	160	167.6	5	1.6	166.0	0.64	.39
1975	160	173.2	8	1.8	171.4	0.65	.38
1976	160	190.3	19	1.5	188.7	0.65	.34
1977	160	176.8	11	1.9	174.9	0.65	.38
1978	160	223.7	40	2.0	221.7	0.81	.37
1979	160	169.2	6	2.0	167.2	0.86	.52
1980	160	200.9	26	1.7	199.2	0.89	.45
1981	160	127.2	-21	2.0	125.1	0.92	.74
1982	160	219.6	37	1.9	217.8	0.93	.43
1983	160	207.9	30	1.5	206.4	1.07	.52
1984	160	184.8	16	1.8	183.0	1.08	.52
1985	160	177.3	11	1.9	175.4	1.18	.67
1986	160	153.8	-4	1.9	151.9	1.34	.89
1987	160	176.2	10	2.0	174.2	1.30	.75
1988	160	131.1	-18	2.4	128.6	1.52	1.19
1989	160	175.8	10	2.3	173.4	1.60	.93
1990	160	197.1	23	2.4	194.7	1.47	.76
1991	160	160.1	0	2.6	157.5	1.61	1.03
1992	160	199.8	25	3.2	197.4	1.74	.88
1993	160	220.8	38	2.9	218.7	2.23	1.02
1994	160	157.8	-1	3.0	155.6	6.95	4.49
1995	160	190.0	19	2.9	187.8	1.70	.91
1996	160	221.4	38	3.2	219.1	1.80	.82

① Net generation plus station use may not equal gross generation due to rounding

Source LRNCO-H

Plate III - 9

3.5. Floods. The Cheatham project has no flood control capability. In fact during high water events the tailwater rises to the point that it approaches the upper pool elevation. At this time all the tainter gates are raised clear of the water and the river is allowed to flow almost unimpeded through the project. There is only a minor swellhead of less than one foot caused by the presence of gate piers within the channel. Channel improvements below the dam during its construction precludes the head differential from increasing flood stages. This type of operation is fairly common among low head navigation dams, however, Cheatham is the only Corps of Engineers project in the Cumberland Basin at which such "open river" conditions occur. The reduction of head which occurs during flood events requires hydropower generation to cease. The low head makes operation of the turbines impossible and all water is passed through the project via the spillway gates.

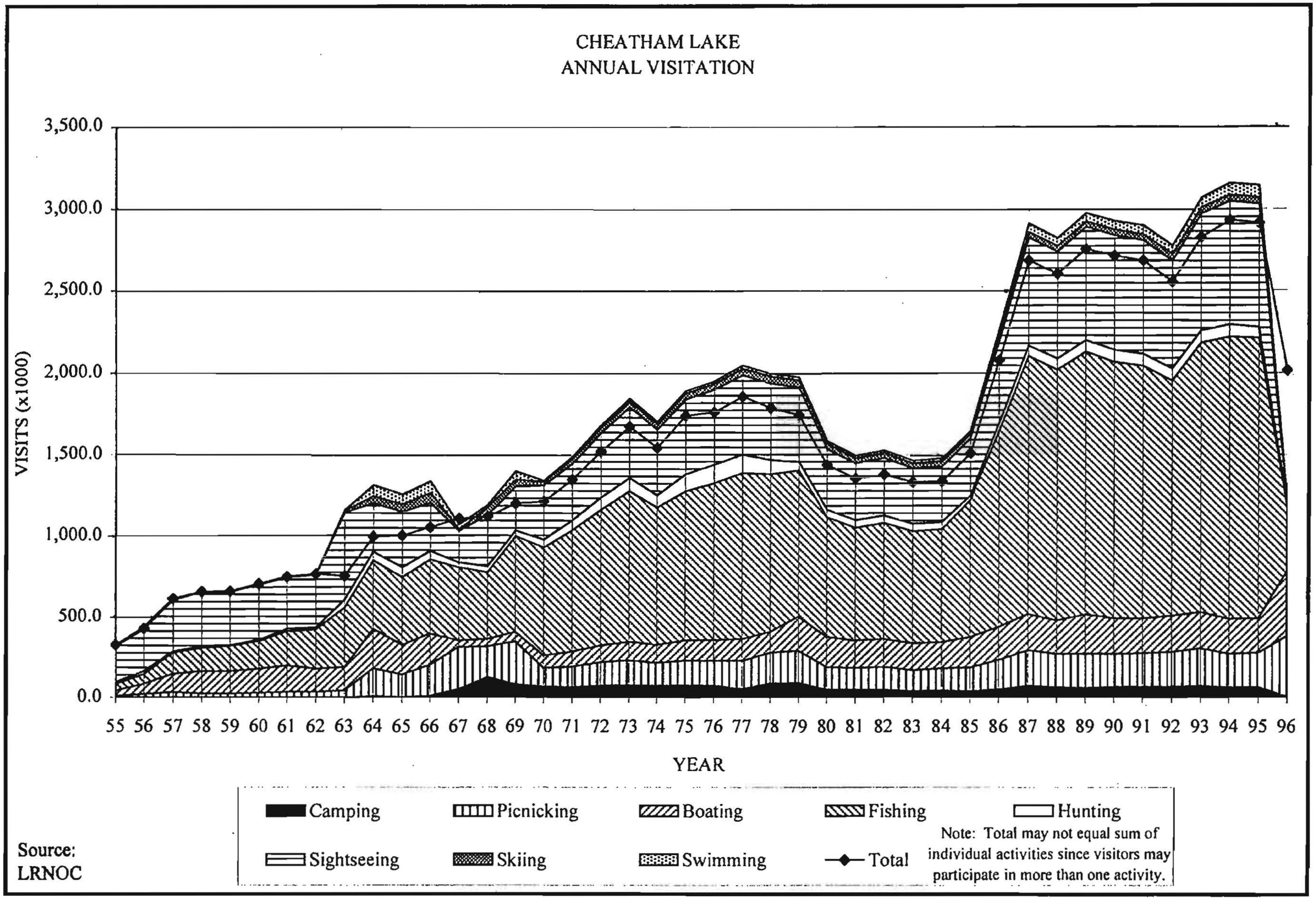
3.6. Recreation.

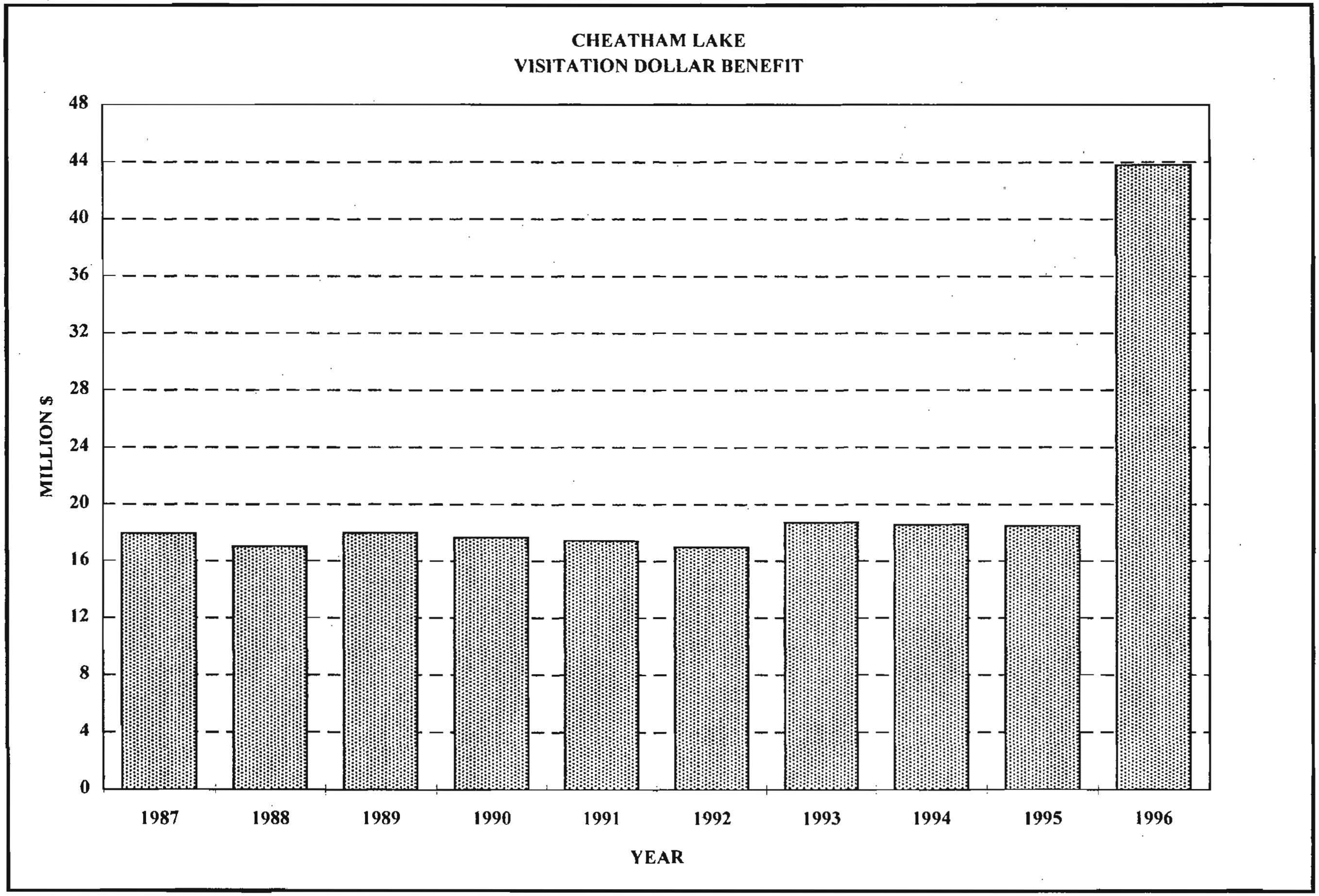
3.6.1. Recreation is not an original congressionally authorized primary purpose at Cheatham. However, like all Corps of Engineers projects in the Nashville District, there are recreational activities. Of the ten projects in the District, Cheatham Lake has the third lowest visitation rate ahead of only Martins Fork and Laurel. In general, Cheatham accounts for about six percent of the visits to Nashville District projects. The low level of usage is due primarily to the riverine nature of the lake. The dam is of relatively low head, and most of the impoundment remains within the natural banks of the Cumberland River. This limits the recreational capabilities of the impoundment, and results in low usage despite the location of over three quarters of the length of this impoundment inside the limits of Metropolitan Nashville.

3.6.2. As shown on Plate III-10 visitation growth at Cheatham has been erratic over the years. Spurts of growth have been mixed with relatively stable periods and periods of decline. The most significant recent growth period was between 1984 and 1987 during which visitation almost doubled. This growth was due primarily to an increase in fishing, but there was also a significant increase in sightseeing. The primary recreational use at Cheatham is fishing with over 55% of the visitors to the project participating in that activity. It has been the number one use at Cheatham since 1964. Prior to that, sightseeing had been the most popular activity.

3.6.3. The visitation dollar benefit attributed to Cheatham Lake is shown on Plate III-11. Prior to 1996, this was a very conservative rough estimate based on an average expenditure rate of $1.96 per visitor hour for all the various user groups, such as boaters, campers, hunters, etc. In addition, it was intended to reflect only those expenditures made in the vicinity of the lake and did not attempt to account for major expenditures prior to the visit, such as the purchase of camping gear or a boat. Plate III-12 shows the impacts of low lake levels on water based recreational facilities and water supply intakes.

3.6.4. For 1996, a distinct decrease in the visitation chart and increase in the dollar benefit chart can easily be detected. This is due to a change in methodology of how the District determines these recreational values. The Nashville District now uses the Visitor Information and Reporting System (VIRS) which was developed by the Waterways Experiment Station (WES). This system counts each "visitor" on Corps' property for recreation as "one", even if that visitor stayed a full week on the property. The previous method used by the District would have counted a full week stay as seven recreation use-days. This different methodology would account for the decrease in the visitation chart. The sharp increase in the dollar benefit is also attributed to the new VIRS system. It reflects a much greater average expenditure rate which varies depending on the recreational activity. However, similar to the previous technique, this new accounting method still does not attempt to account for major expenditures of durable goods.


CHEATHAM LAKE
ANNUAL VISITATION
VISITS (x1000)
3,500.0
3,000.0
2,500.0
2,000.0
1,500.0
1,000.0
500.0
0.0
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
YEAR
Camping
Picnicking
Boating
Fishing
Hunting
Sightseeing
Skiing
Swimming
Total
Note: Total may not equal sum of individual activities since visitors may participate in more than one activity.
Source:
LRNOC


CHEATHAM LAKE
VISITATION DOLLAR BENEFIT
MILLION $
48
44
40
36
32
28
24
20
16
12
8
4
0
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
YEAR

CHEATHAM LAKE
IMPACTS OF LAKE LEVELS ON RECREATION AND NATURAL RESOURCES

TOP OF HYDROPOWER POOL - ELEVATION 385.0 BOTTOM OF HYDROPOWER POOL - ELEVATION 382.0										
WATER BASED FACILITIES		INITIAL IMPACT (A) ELEVATION 381.5 (0.5 feet below bottom of hydropower pool)			MAJOR IMPACT (B) ELEVATION 381.0 (1.0 feet below bottom of hydropower pool)			SEVERE IMPACT (C) ELEVATION 380.0 (2.0 feet below bottom of hydropower pool)		
Type	Number	Usable	Marginal or Unusable	Percent Reduction	Usable	Marginal or Unusable	Percent Reduction	Usable	Marginal or Unusable	Percent Reduction
Beaches	0	-	-	N/A	-	-	N/A	-	-	N/A
Boat Ramps	14	11	3	21%	7	7	50%	3	11	79%
Marinas	3	3	0	0%	3	0	0%	3	0	0%
Wet Moorage at Marinas	195	195	0	0%	195	0	0%	120	75	38%
Private Docks	66	60	6	9%	40	26	39%	10	56	85%
Public Water Intakes	7	4	3	43%	4	3 (D)	43%	2	5 (E)	71%
Industrial Water Intakes	3	3	0	0%	0	3 (F)	100%	0	3 (F)	100%
Water Surface Acreage	7,450	5,400	2,050	28%	5,170	2,280	31%	4,830	2,620	35%

CHEATHAM LAKE
IMPACTS OF LAKE LEVELS ON RECREATION AND NATURAL RESOURCES

FOOTNOTES:

A. Initial Impacts - The level where recreation and natural resources management impacts are first observed: some ramps are unusable, most beaches are unusable or minimally usable, and/or navigation hazards begin to surface.

B. Major Impacts - The level where significant impact would occur: water or boating access would be significantly limited, a significant number of boat ramps would be unusable, major navigation hazards occur, channels to marinas would become impassable and/or slips would have to be relocated, exposed mud or rock bottom surfaces would make water access from recreation areas inaccessible, a majority of privately permitted boat docks would be unusable or relocated, and all swimming beaches are unusable.

C. Severe Impacts - The level where a majority of recreation facilities are virtually out of business: all or almost all boat ramps are closed, all swimming beaches are closed, major navigation hazards severely limit lake use, channels to marinas are impassable, and slips are unusable, and a majority of the privately permitted boat docks are unusable.

D. River Road Utility District (assuming normal power flow)
E. River Road Utility District, Madison Suburban Utility District, Cumberland Utility District, Ashland City, Harpeth Valley UD (assuming flat pool)
F. Ford Motor Co., Nashville Thermal Transfer Plant, Revenwood Golf Club (assuming flat pool)

3.7. Water Quality.

3.7.1. The passage of water through Cheatham normally does very little to affect water quality either in the reservoir or in project releases. The lake is the shallowest and retention time is the shortest of the ten Cumberland Basin projects. Mean depth is only fourteen feet. Temperatures in the lake are usually well mixed vertically, with only short periods of intermittent stratification in the downstream reaches. When the lake does stratify, the differential in temperature is quite small, usually less than three degrees Fahrenheit. Stratification typically occurs when releases from Old Hickory fall below 6,000 cfs. Destratification occurs quickly when flows increase. Retention times are generally too short to develop significant longitudinal temperature variations.

3.7.2. Normal water retention time in Cheatham is usually less than ten days but can be as little as two days. Low flow periods can produce hydraulic residence values of as much as 15 to 20 days.

3.7.3. The biggest water quality problem is low dissolved oxygen during the summer months when Old Hickory releases have low DO concentrations. This is especially true when hydraulic residence times exceed 10-15 days. Even with several large sewage treatment plants discharging into the lake, particularly those for Metropolitan Nashville, the DO levels along with other measured water quality parameters usually remain relatively constant between Old Hickory and Cheatham Dams. The three largest point sources of organic pollution are Nashville Central Sewage Treatment Plant with a design flow of 98.7 MGD, Whites Creek STP with 25 MGD and Dry Creek STP with 12.3 MGD. Additional point sources include the combined (sanitary and stormwater) sewers in Nashville, which may produce bacteriological problems. These effluents along with the urban runoff produce a relatively high nutrient loading in the lake.

3.7.4. Reaeration occurs in the upper reaches of the lake from Old Hickory to Nashville. Nearer the Cheatham Dam, DO stratification can occur even without temperature stratification and can produce bottom DO values between two to four mg/l lower than surface values. However, DO values do not normally dip below the Tennessee state standard of 5 mg/l.

3.7.5. A second water quality problem in the lake results from high iron and manganese concentrations in summer and fall releases from J. Percy Priest. This problem is minimized by requiring that at least one hydropower unit be generating at Old Hickory when releases are being made from J. Percy Priest. In addition, algae blooms primarily released from Old Hickory have caused sporadic taste and odor problems for municipal water treatment plants. These blooms are most likely to occur during summer low flow periods.

3.8. Fish and Wildlife.

3.8.1. The primary concern for regulating this run of river project for the fishery is during the fish spawning period as discussed earlier in paragraph 2.6.1. Both Cheatham Lake and the tailwater support a fairly productive to excellent fishery. Commercial species include the buffaloes, paddle fish, carp and catfish. The primary game fish in the lake include largemouth bass, sunfish, catfish and crappie. The tailwater area provides excellent conditions for sauger, white bass, striped bass (rock fish) and paddle fish. Even though fishing is the number one recreational activity at the lake, studies indicate that the fishing pressure does not seem to be too great and annual fishery growth rates are relatively good.

3.8.2. Although the practice is discouraged by the Corps of Engineers due to safety concerns, fishing immediately above and below Cheatham Dam remains popular. Above the dam, restricted areas have been designated near the hydropower intakes. In the Cheatham tailwater, a fisherman warning system including signals and lights has recently been installed. This warning system is activated five minutes in advance of a hydropower unit being brought on-line. At present, however, restricted areas below the dam have not been formally delineated.

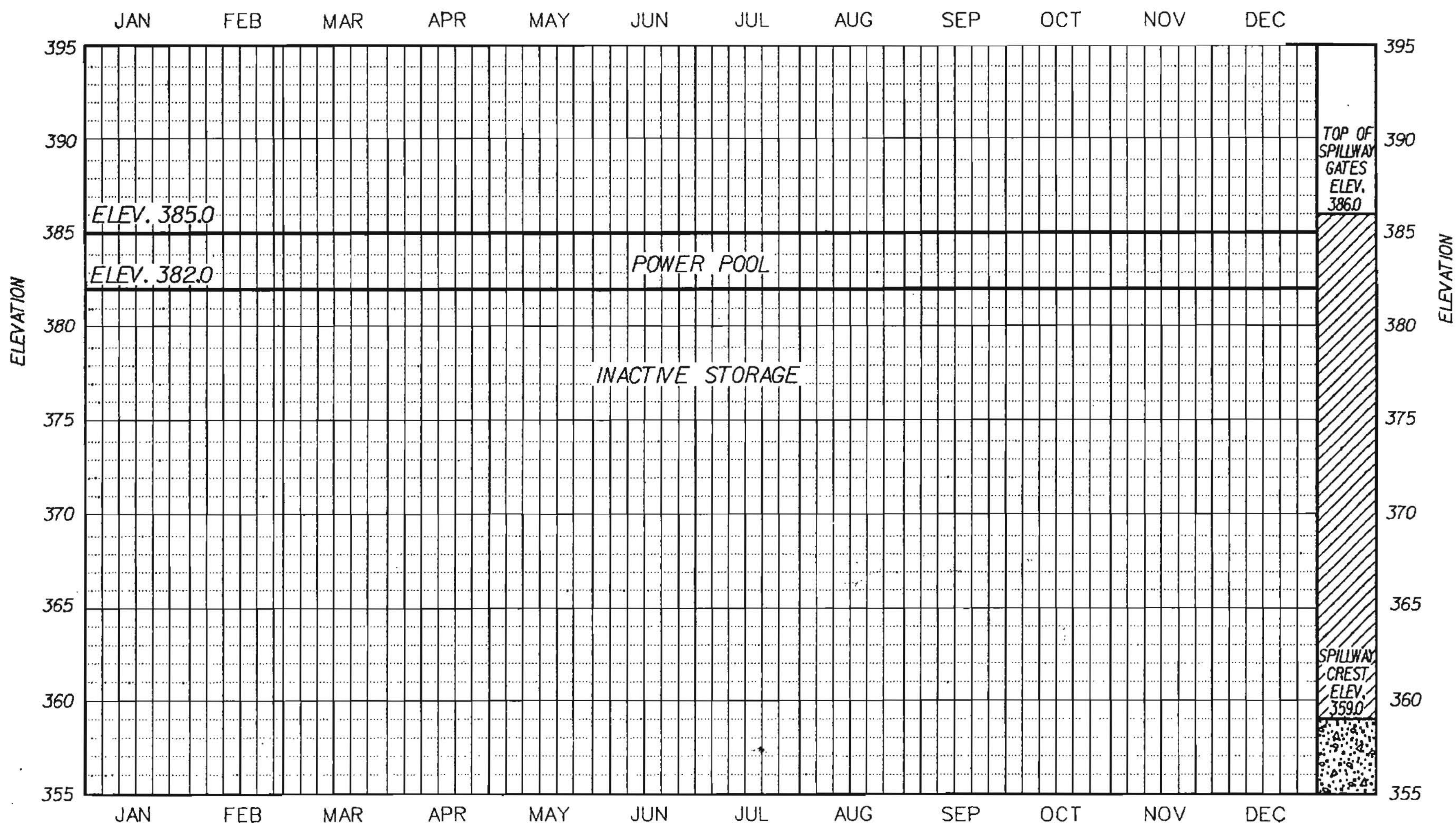
3.9. Water Supply. Although water supply is not an authorized project purpose at any Nashville District project, nine of them are used by municipalities for this purpose. Of these, Cheatham is the most intensively used for water supply. This is due to the location of Metropolitan Nashville along this lake. In 1990, it was estimated that this project served as the water supply source for about 480,000 people through six water systems which directly access the lake and through seven additional systems which purchase water from those systems with direct access. The six direct access systems withdraw approximately 177 cfs from Cheatham Lake at seven locations as listed in Plate III-13. A significant portion of this amount is returned to the Cumberland River via sewage treatment plant discharges.

CHEATHAM LAKE
WATER SUPPLY INTAKES

SYSTEM	STATE	COUNTY	RIVER NAME	RIVER BANK	RIVER MILE	EMBAYMENT NAME	EMBAYMENT BANK	EMBAYMENT MILE	INLET (ins.) DIA.	INLET TOP ELEV.	INLET OPER. ELEV.	SERVICES NUM.	SERVICES POP.
Ashland City	TN	Cheatham	Cumberland	[redacted]	[redacted]	Marrowbone Creek	[redacted]	[redacted]	8	[redacted]	[redacted]	1,100	3,454
River Road	TN	Cheatham	Cumberland	[redacted]	[redacted]	Brush Creek	[redacted]	[redacted]	2	[redacted]	[redacted]	425	1,335
Harpeth Valley UD	TN	Davidson	Cumberland	[redacted]	[redacted]				2@72	[redacted]	[redacted]	8,062	17,309
Nashville Omohundro	TN	Davidson	Cumberland	[redacted]	[redacted]				42&2@36	[redacted]	[redacted]		
Madison Suburban	TN	Davidson	Cumberland	[redacted]	[redacted]				2@30x30	[redacted]	[redacted]	15,237	39,311
Nashville Harrington	TN	Davidson	Cumberland	[redacted]	[redacted]				2@42	[redacted]	[redacted]	128,000	357,120
Cumberland UD	TN	Davidson	Cumberland	[redacted]	[redacted]				16 & 12	[redacted]	[redacted]	9,400	26,226

SYSTEM	PRODUCTION (gpd) AVERAGE DAILY	PRODUCTION (gpd) DESIGN CAPACITY	SURVEY DATE	PLANT PHONE NUMBER	OFFICE PHONE NUMBER	OFFICE CONTACT NAME	OFFICE CONTACT TITLE
Ashland City	586,000	1,000,000	6/20/9	[redacted]	[redacted]	[redacted]	
River Road	81,000	144,000	5/08/9	[redacted]	[redacted]	[redacted]	Billing
Harpeth Valley UD	6,350,000	9,200,000	6/19/9	[redacted]	[redacted]	[redacted]	Engineer
Nashville Omohundro		90,000,000	6/20/9	[redacted]	[redacted]	[redacted]	Asst.Dir.of Ops.
Madison Suburban	12,000,000	13,000,000	3/11/8	[redacted]	[redacted]	[redacted]	General Manager
Nashville Harrington	91,900,000	60,000,000	1/22/8	[redacted]	[redacted]	[redacted]	Asst.Dir.of Ops.
Cumberland UD	3,500,000	5,920,000	5/08/9	[redacted]	[redacted]	[redacted]	General Manager

CHEATHAM PROJECT
GUIDE CURVE



U.S. ARMY CORPS OF ENGINEERS
NASHVILLE DISTRICT

CHEATHAM RESERVOIR
CUMBERLAND RIVER, TENNESSEE

AREA & VOLUME TABLE

Elevation msl	Area acres	Volume acre-feet	Elevation msl	Area acres	Volume acre-feet
360	1,830	9,800	380	4,830	73,700
1	1,990	11,500	1	5,170	78,600
2	2,110	13,800	2	5,630	84,200
3	2,250	15,900	3	6,160	90,000
4	2,370	18,300	4	6,750	96,500
5	2,500	20,050	5	7,450	104,000
6	2,610	23,200	6	8,120	111,000
7	2,740	26,000	7	8,850	120,000
8	2,870	28,700	8	9,600	129,000
9	3,000	31,800	9	10,330	139,000
370	3,120	34,700	390	11,040	150,000
1	3,260	38,000	1	11,800	161,000
2	3,410	41,200	2	12,520	173,000
3	3,560	44,800	3	13,260	186,000
4	3,700	48,400	4	14,020	200,000
5	3,860	52,200	5	14,800	214,000
6	4,020	56,100	6	15,610	229,000
7	4,200	60,000	7	16,500	246,000
8	4,380	64,500	8	17,380	262,000
9	4,590	68,700	9	18,300	281,000
380	4,830	73,700	400	19,330	299,000

CHEATHAM RATING TABLE

KEY POINTS

Table A Cumberland River below Cheatham Dam, TN Rating No. 6	
Stage	Base Discharge (cfs)
2	4,800 *
3	5,850 *
4	6,900 *
5	8,000
6	9,100
7	10,200
8	11,300
9	12,400
10	13,500
11	14,600
12	15,700
13	16,800
14	17,900
15	19,000 *
16	20,100 *
17	21,250
18	22,400
19	23,550
20	24,700
21	25,850
22	27,000
23	28,150
24	29,300
25	30,450
26	31,600 *
27	32,800 *
28	34,100 *
29	35,500 *
30	37,000 *
31	38,650 *
31.5	39,550 *
31.6	39,740 *
31.7	39,940 *
31.8	40,150 *
31.9	40,370 *
32	40,600 *
33	43,000
34	45,400
35	47,800
36	50,200
37	52,600
38	55,000
39	57,400
40	59,800 *
41	62,300 *
42	64,800
43	67,300
44	69,800
45	72,300
46	74,800
47	77,300
48	79,800 *
49	82,400 *
50	85,000 *

Table B Fall below Cheatham Dam, TN Rating No. 3	
Fall Ratio	Discharge Ratio
0.01	0.102 *
0.1	0.319 *
0.2	0.450 *
0.3	0.550 *
0.4	0.634 *
0.5	0.708 *
0.6	0.775 *
0.8	0.894 *
1	0.998 *
1.5	1.22 *
2	1.41 *
2.5	1.57 *
3	1.72 *
4	1.98 *
5	2.21 *
6	2.42 *
7	2.62 *
8	2.79 *
10	3.12 *
12	3.42 *
14	3.69 *
16	3.94 *
18	4.18 *
20	4.40 *

NOTES:

To Use Rating You Need:

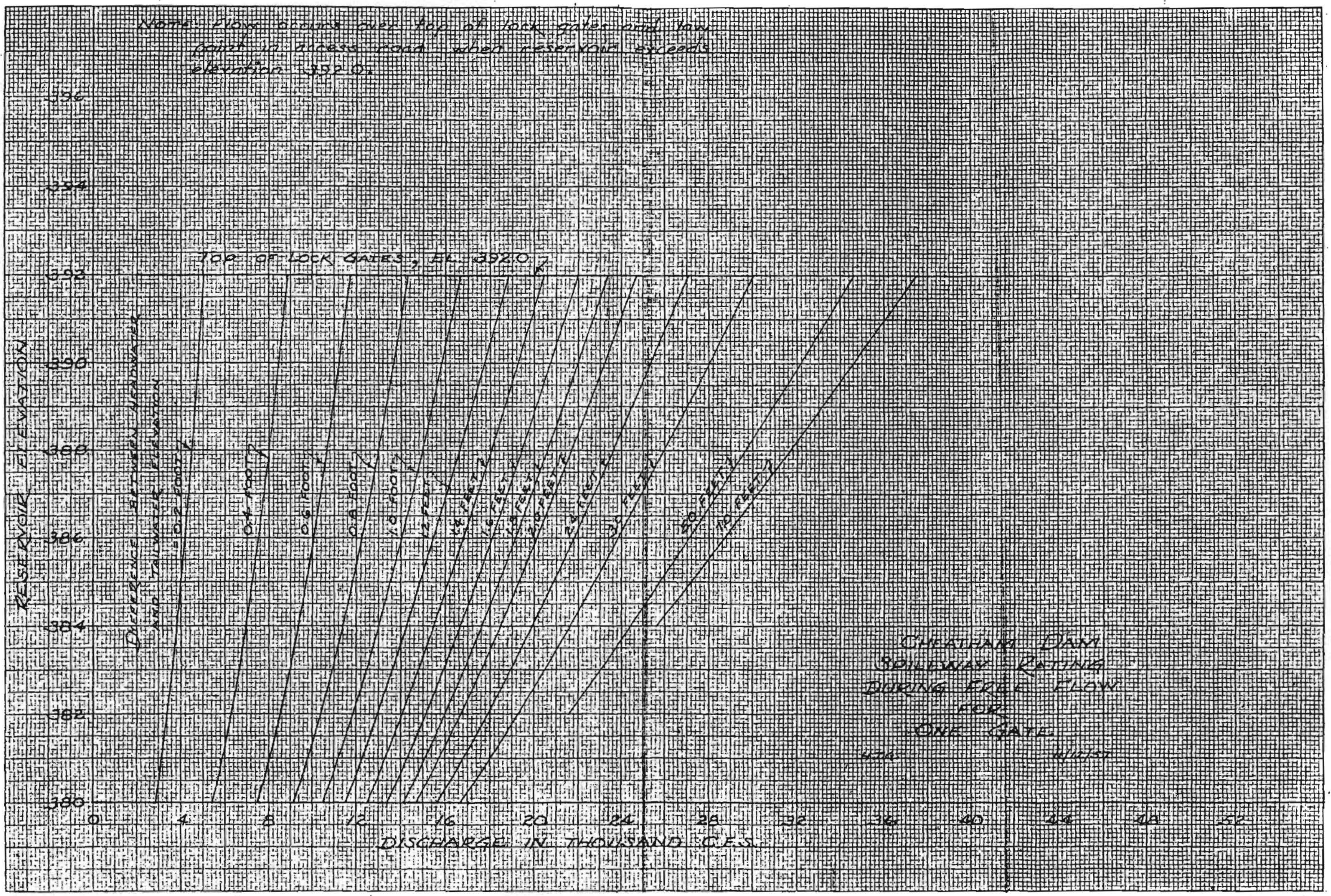
1. Stage reading: Cumberland River below Cheatham Dam (03435000)
2. Stage reading: Cumberland River near Clarksville (03435008)

Usage:

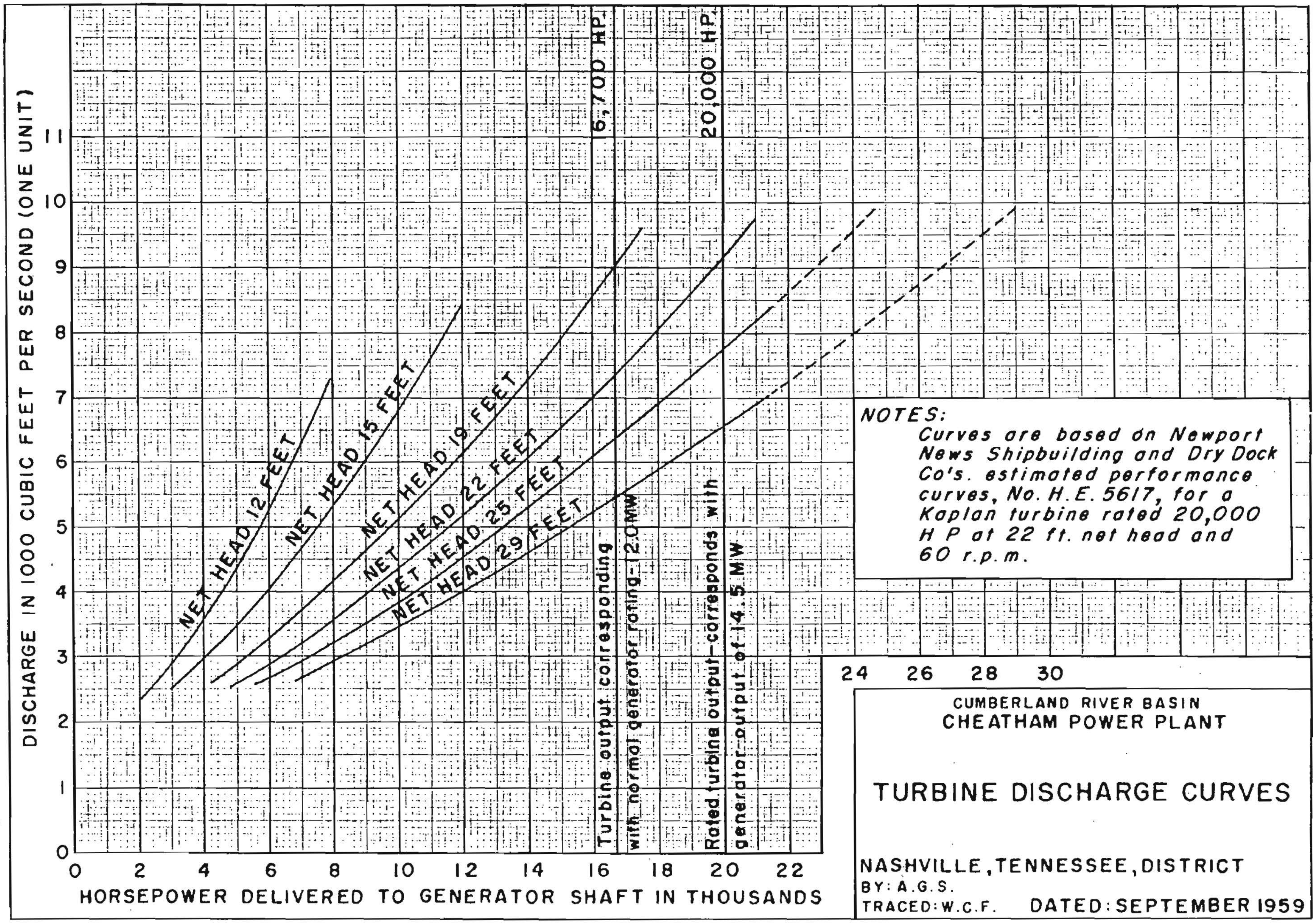
1. Use stage below Cheatham Dam to look up base discharge in Table A.
2. Compute fall ratio by dividing the difference between the Cheatham and Clarksville stages by the Cheatham stage.
3. Use this ratio to look up discharge ratio in Table B.
4. Compute discharge by multiplying base discharge by discharge ratio.

* Values which were included in USGS rating table. All other values were interpolated.

Source: USGS



Note: Flow occurs over top of lock gates and low point in access road when reservoir exceeds elevation 392.0.
TOP OF LOCK GATES, EL. 392.0
RESERVOIR ELEVATION
DIFFERENCE BETWEEN HEADWATER AND TAILWATER ELEVATION
0.2 FOOT
0.4 FOOT
0.6 FOOT
0.8 FOOT
1.0 FOOT
1.2 FEET
1.4 FEET
1.6 FEET
1.8 FEET
2.0 FEET
2.4 FEET
3.0 FEET
5.0 FEET
10 FEET
396
394
392
390
388
386
384
382
380
0
4
8
12
16
20
24
28
32
36
40
44
48
52
DISCHARGE IN THOUSAND C.F.S.
CHEATHAM DAM
SPILLWAY RATING
DURING FREE FLOW
FOR
ONE GATE



CUMBERLAND RIVER BASIN

CHEATHAM POWER PLANT

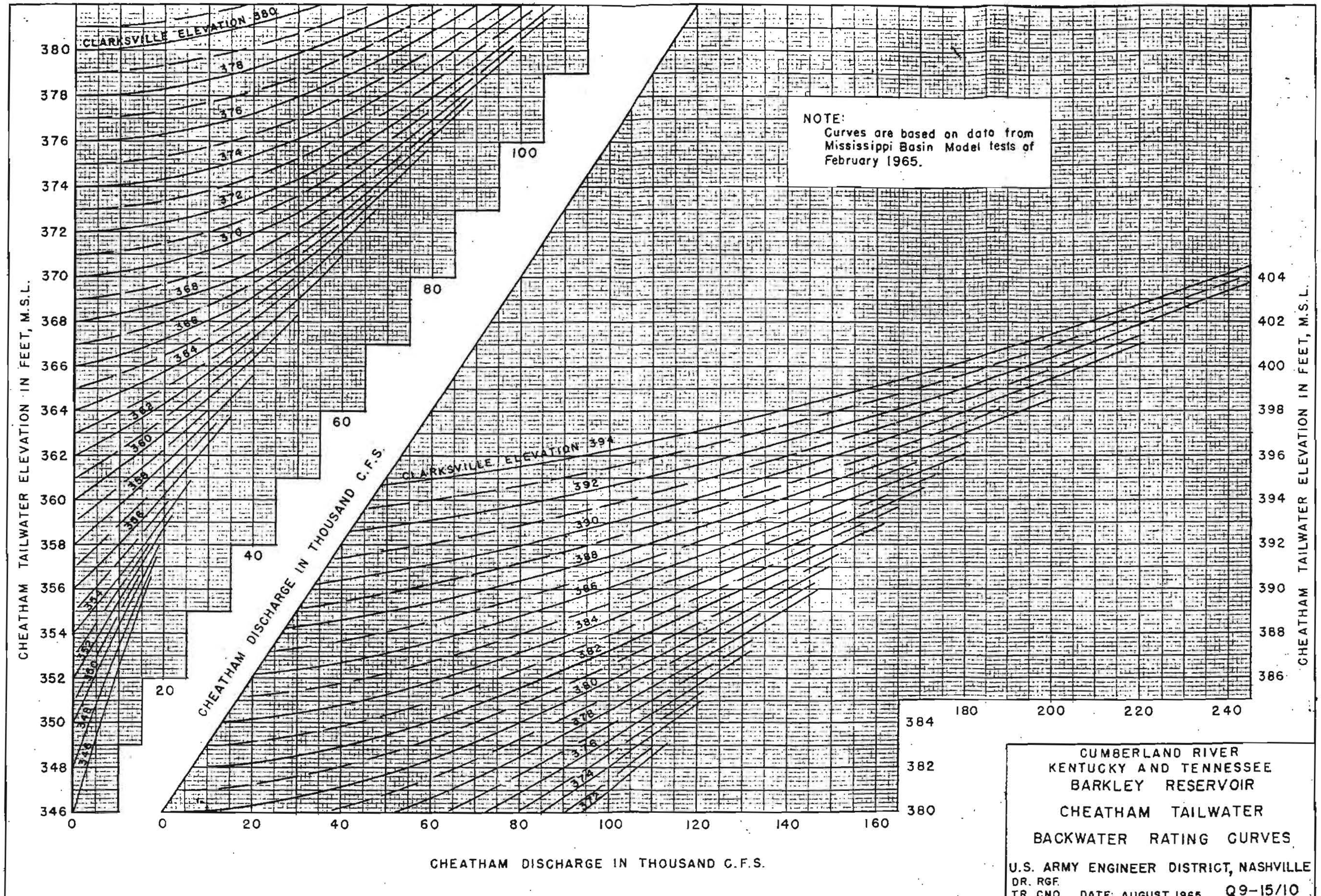
TURBINE DISCHARGE CURVES

NASHVILLE, TENNESSEE, DISTRICT

BY: A.G.S.

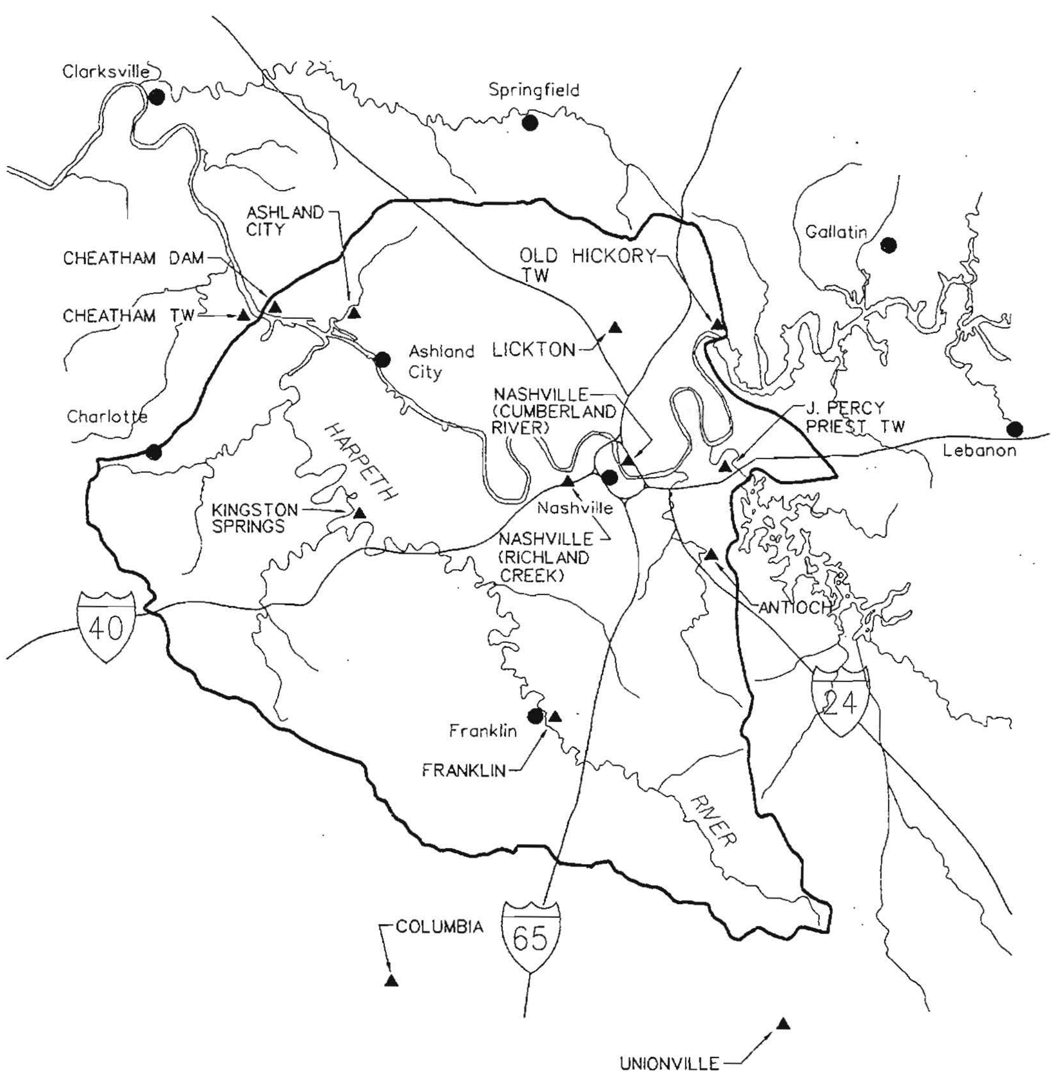
TRACED: W.C.F.

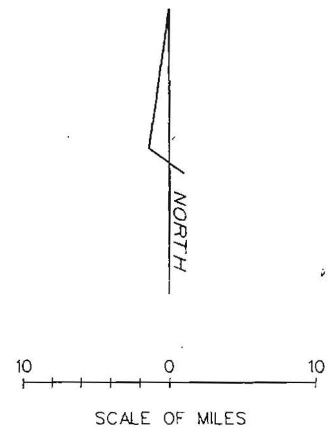
DATED: SEPTEMBER 1959


CLARKSVILLE ELEVATION 380
CLARKSVILLE ELEVATION 394
NOTE:
Curves are based on data from Mississippi Basin Model tests of February 1965.
CHEATHAM TAILWATER ELEVATION IN FEET, M.S.L.
CHEATHAM DISCHARGE IN THOUSAND C.F.S.
CUMBERLAND RIVER
KENTUCKY AND TENNESSEE
BARKLEY RESERVOIR
CHEATHAM TAILWATER
BACKWATER RATING CURVES
U.S. ARMY ENGINEER DISTRICT, NASHVILLE
DR. RGF.
TR. CNO. DATE: AUGUST 1965
Q9-15/10

ORNEP-H

CHEATHAM SUBBASIN MAP





STREAM		LOCATION	PRECIPITATION GAGE	RIVER STAGE GAGE	WATER QUALITY GAGE	GOES GAGE
CUMBERLAND RIVER	BELOW	CHEATHAM TW		▲	▲	
CUMBERLAND RIVER	AT	CHEATHAM DAM	▲	▲		▲
CUMBERLAND RIVER	AT	NASHVILLE	▲	▲		▲
CUMBERLAND RIVER	AT	OLD HICKORY TW		▲	▲	▲
CUMMINGS BRANCH	AT	LICKTON	▲	▲		
HARPETH RIVER	NEAR	KINGSTON SPRINGS	▲	▲		▲
HARPETH RIVER	AT	FRANKLIN	▲	▲		▲
MILL CREEK	NEAR	ANTIOCH	▲	▲		▲
RICHLAND CREEK	AT	NASHVILLE		▲		▲
STONES RIVER	BELOW	J. PERCY PRIEST TW		▲		
SYCAMORE CREEK	NEAR	ASHLAND CITY	▲	▲		▲
		COLUMBIA	▲			
		UNIONVILLE	▲			

Plate B-1

CHEATHAM SUBBASIN
DATA COLLECTION NETWORK

STREAM		LOCATION	DATUM	DRAINAGE AREA sq.mi.	RIVER MILE	COUNTY	HYDROLOGIC UNIT CODE	NORTH LAT[redacted]	WEST LONGITUD[redacted]
Cumberland River	below	Cheatham TW	350.00	14163	[redacted]	Cheatham	05130205	[redacted]	[redacted]
Cumberland River	at	Cheatham Dam	0.00	14159	[redacted]	Cheatham	05130202	[redacted]	[redacted]
Cumberland River	at	Nashville	368.17	12841	[redacted]	Davidson	05130202	[redacted]	[redacted]
Cumberland River	at	Old Hickory TW	0.00	11673	[redacted]	Davidson	05130202	[redacted]	[redacted]
Cummings Branch	at	Lickton	532.25	2.4	[redacted]	Davidson	05130202	[redacted]	[redacted]
Harpeth River	near	Kingston Springs	447.04	681	[redacted]	Cheatham	05130204	[redacted]	[redacted]
Harpeth River	at	Franklin	604.42	191	[redacted]	Williamson	05130204	[redacted]	[redacted]
Mill Creek	near	Antioch	472.57	64	[redacted]	Davidson	05130202	[redacted]	[redacted]
Richland Creek	at	Nashville	409.56	24.3	[redacted]	Davidson	05130202	[redacted]	[redacted]
Stones River	below	J Percy Priest TW	0.00	892	[redacted]	Davidson	05130203	[redacted]	[redacted]
Sycamore Creek	near	Ashland City	400.00	97.2	[redacted]	Cheatham	05130202	[redacted]	[redacted]
		Columbia			[redacted]	Maury	06040003	[redacted]	[redacted]
		Unionville			[redacted]	Bedford	06040002	[redacted]	[redacted]

STREAM		LOCATION		USGS ID	TELEPHONE ACCESS GOES ID		DSS PATHNAME PART B	STAGE	PRECIP	WQ
Cumberland River	below	Cheatham TW	TN	03435000	[redacted]		CHEATHAM DAM	S		4
Cumberland River	at	Cheatham Dam	TN	03434900	[redacted]		CHEATHAM DAM	S	P	
Cumberland River	at	Nashville	TN	03431500	[redacted]	T	NASHVILLE	S	P	
Cumberland River	at	Old Hickory TW	TN	03426310	[redacted]		OLD HICKORY DAM	S		5
Cummings Branch	at	Lickton	TN	03431517	[redacted]			S	P	
Harpeth River	near	Kingston Springs	TN	03434500	[redacted]	T	KINGSTON SPRINGS	S	P	
Harpeth River	at	Franklin	TN	03432350	[redacted]	T	FRANKLIN	S	P	
Mill Creek	near	Antioch	TN	03431000	[redacted]	T	MILL CREEK	S	P	
Richland Creek	at	Nashville	TN	03431700	[redacted]			S		
Stones River	below	J Percy Priest TW	TN	03430100	[redacted]		J PERCY PRIEST DAM	S		
Sycamore Creek	near	Ashland City	TN	03431800	[redacted]		SYCAMORE CREEK	S	P	
		Columbia	TN				COLUMBIA		P	
		Unionville	TN				UNIONVILLE		P	

NORMALS, MEANS, AND EXTREMES FOR 1996

NASHVILLE, TN (BNA)

LATITUDE: 36° 07' 08" N — LONGITUDE: 86° 41' 21" W — ELEVATION (FT): GRND: 590 BARO: 630 — TIME ZONE: CENTRAL (UTC+ 6) — WBAN: 13897

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	45.9	50.8	61.2	70.8	78.8	86.5	89.5	88.4	82.5	72.5	60.4	50.2	69.8
	MEAN DAILY MAXIMUM	49	46.7	51.4	60.3	71.0	79.2	86.8	89.9	88.9	82.6	72.3	59.5	50.4	69.9
	HIGHEST DAILY MAXIMUM	57	78	84	86	91	97	106	107	104	105	94	84	79	107
	YEAR OF OCCURRENCE		1972	1962	1982	1989	1941	1952	1952	1954	1954	1953	1971	1982	JUL 1952
	MEAN OF EXTREME MAXS.	49	67.9	72.0	79.0	85.5	89.6	95.1	97.1	96.3	93.4	85.9	77.1	69.1	84.0
	NORMAL DAILY MINIMUM	30	26.5	29.9	39.1	47.5	56.6	64.7	68.9	67.7	61.1	48.3	39.6	30.9	48.4
	MEAN DAILY MINIMUM	49	28.1	30.9	38.6	47.7	57.0	65.1	69.3	67.8	60.9	48.5	38.6	31.5	48.7
	LOWEST DAILY MINIMUM	57	-17	-13	2	23	34	42	51	47	36	26	-1	-10	-17
	YEAR OF OCCURRENCE		1985	1951	1980	1982	1976	1966	1947	1946	1983	1987	1950	1989	JAN 1985
	MEAN OF EXTREME MINS.	49	7.2	10.4	21.7	31.0	41.9	52.8	59.9	58.0	45.9	32.5	20.6	12.2	32.8
	NORMAL DRY BULB	30	36.2	40.4	50.2	59.2	67.7	75.6	79.3	78.1	71.8	60.4	50.0	40.5	59.1
	MEAN DRY BULB	49	37.4	41.2	49.5	59.4	68.1	76.0	79.7	78.4	71.8	60.4	49.0	41.0	59.3
	MEAN WET BULB	13	34.0	37.8	44.3	52.1	61.5	68.7	71.8	70.7	64.5	54.3	41.9	37.9	53.3
	MEAN DEW POINT	13	28.2	31.0	36.6	44.7	56.7	64.6	68.0	66.9	60.3	49.0	36.6	32.3	47.9
	NORMAL NO. DAYS WITH:														
	MAXIMUM ≥ 90°	30	0.0	0.0	0.0	0.1	1.5	9.2	16.6	13.1	5.8	0.1	0.0	0.0	46.4
	MAXIMUM ≤ 32°	30	5.1	2.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.4	10.1
	MINIMUM ≤ 32°	30	22.2	17.1	9.2	1.8	0.0	0.0	0.0	0.0	0.0	1.2	7.7	17.8	77.0
	MINIMUM ≤ 0°	30	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.4
H/C	NORMAL HEATING DEG. DAYS	30	893	689	469	193	59	0	0	0	21	195	450	760	3729
	NORMAL COOLING DEG. DAYS	30	0	0	10	19	143	318	443	406	225	52	0	0	1616
RH	NORMAL (PERCENT)	30	70	68	65	63	70	70	73	73	74	69	70	71	70
	HOUR 00 LST	30	75	74	71	72	81	83	85	85	85	81	77	76	79
	HOUR 06 LST	30	80	80	79	80	86	87	89	90	90	86	82	80	84
	HOUR 12 LST	30	63	60	54	51	55	55	57	57	58	53	59	63	57
	HOUR 18 LST	30	65	61	55	52	58	59	62	62	64	60	64	67	61
S	PERCENT POSSIBLE SUNSHINE	54	41	47	52	59	60	65	63	63	62	62	50	42	56
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY ≤ 1/4 MI)	56	2.4	1.3	1.0	0.5	0.9	0.9	1.1	1.5	1.8	2.1	1.6	1.8	16.9
	THUNDERSTORMS	56	1.2	1.6	4.0	5.0	7.3	8.3	9.4	7.6	3.5	1.6	1.6	1.0	52.1
CLOUDINESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	56	5.7	5.4	5.3	4.9	4.8	4.5	4.4	4.2	4.2	3.9	4.8	5.3	4.8
	MIDNIGHT-MIDNIGHT (OKTAS)	32	5.3	5.1	5.0	4.6	4.6	4.1	4.0	3.8	4.0	3.6	4.7	5.0	4.5
	MEAN NO. DAYS WITH:														
	CLEAR	55	6.3	6.9	7.5	8.3	8.0	8.0	8.1	9.9	10.5	12.8	8.8	7.1	102.2
	PARTLY CLOUDY	55	6.1	5.9	7.2	8.5	10.1	12.5	13.2	12.2	9.1	8.0	6.8	7.0	106.6
	CLOUDY	55	18.5	15.5	16.3	13.2	13.0	9.5	9.7	8.9	10.4	10.2	14.4	17.0	156.6
PR	MEAN STATION PRESSURE(IN.)	24	29.50	29.47	29.39	29.37	29.35	29.36	29.91	29.41	29.43	29.47	29.48	29.51	29.47
	MEAN SEA-LEVEL PRES. (IN.)	13	30.17	30.12	30.06	29.99	30.01	29.99	30.02	30.03	30.07	30.11	30.13	30.18	30.07
WINDS	MEAN SPEED (MPH)	44	9.0	9.1	9.7	9.0	7.4	6.9	6.5	6.0	6.3	6.7	8.3	8.8	7.8
	PREVAIL.DIR(TENS OF DEGS.)	28	18	18	18	18	18	18	18	18	18	18	18	18	18
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	21	32	35	41	35	41	35	33	40	33	32	39	41	41
	DIR. (TENS OF DEGS.)		34	32	13	18	36	36	34	02	34	36	15	23	23
	YEAR OF OCCURRENCE		1985	1980	1987	1993	1984	1990	1978	1983	1977	1986	1984	1987	DEC 1987
	PEAK GUST :														
	SPEED (MPH)	13	48	47	56	67	55	52	58	70	47	48	60	54	70
	DIR. (TENS OF DEGS.)		SE	SW	SE	W	NW	S	S	NW	N	N	W	SW	NW
	YEAR OF OCCURRENCE		1994	1988	1987	1991	1984	1994	1995	1990	1989	1986	1985	1987	AUG 1990
PRECIPITATION	NORMAL TOTAL (IN.)	30	3.58	3.81	4.85	4.37	4.88	3.57	3.97	3.46	3.46	2.62	4.12	4.61	47.30
	MAXIMUM TOTAL (IN.)	57	13.92	10.31	12.35	8.41	11.04	9.37	7.75	8.31	11.44	6.13	9.04	13.63	13.92
	YEAR OF OCCURRENCE		1950	1956	1975	1984	1983	1960	1950	1942	1979	1959	1945	1978	JAN 1950
	MINIMUM TOTAL (IN.)	57	0.19	0.64	1.18	0.52	0.69	0.45	0.71	0.69	0.28	T	0.54	0.98	T
	YEAR OF OCCURRENCE		1986	1968	1987	1986	1941	1988	1954	1968	1956	1963	1949	1985	OCT 1963
	MAXIMUM IN 24 HOURS (IN.)	57	4.40	4.73	4.66	3.29	4.27	4.91	4.32	5.34	6.68	3.75	3.74	5.12	6.68
	YEAR OF OCCURRENCE		1946	1989	1975	1979	1984	1960	1992	1963	1979	1975	1973	1978	SEP 1979
	NORMAL NO. DAYS WITH:														
	PRECIPITATION ≥ 0.01	30	10.3	10.3	11.6	10.8	10.9	9.3	10.4	8.3	8.2	7.2	10.1	11.0	118.4
	PRECIPITATION ≥ 1.00	30	0.7	0.7	1.1	1.2	1.5	0.9	1.2	1.0	0.7	0.7	1.0	1.5	12.2
SNOWFALL	NORMAL TOTAL (IN.)	30	4.4	3.5	1.1	0.*	0.0	0.0	0.0	0.0	0.0	T	0.3	1.7	11.0
	MAXIMUM TOTAL (IN.)	57	18.8	18.9	16.1	1.1	0.0	T	0.0	T	0.0	0.4	9.2	13.2	18.9
	YEAR OF OCCURRENCE		1948	1979	1960	1971		1994		1989		1993	1950	1963	FEB 1979
	MAXIMUM IN 24 HOURS (IN.)	57	8.1	8.3	8.8	1.1	0.0	T	0.0	T	0.0	0.4	9.2	10.2	10.2
	YEAR OF OCCURRENCE		1988	1979	1951	1971		1994		1989		1993	1950	1963	DEC 1963
	MAXIMUM SNOW DEPTH (IN.)	48	70	8	7	0	0	0	0	0	0	0	5	7	70
	YEAR OF OCCURRENCE		1948	1979	1968								1966	1963	JAN 1948
	NORMAL NO. DAYS WITH:														
	SNOWFALL ≥ 1.0	30	1.2	1.4	0.3	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.*	0.5	3.4

PRECIPITATION (inches) 1996 NASHVILLE, TENNESSEE (BNA)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1967	1.62	1.78	4.44	3.40	6.98	4.23	7.46	2.06	1.93	1.57	3.87	5.88	45.22
1968	3.50	0.64	4.47	3.57	6.28	2.26	6.87	0.69	2.76	3.92	5.39	3.58	43.93
1969	4.96	4.48	2.12	6.03	4.81	3.34	5.33	2.27	2.06	2.01	1.83	8.03	47.27
1970	1.16	4.36	3.87	6.81	5.90	6.73	3.61	2.99	2.76	2.94	2.20	3.60	46.93
1971	2.66	4.70	2.95	3.34	2.93	3.47	5.00	5.87	2.11	1.27	1.18	5.17	40.65
1972	5.15	3.45	4.34	3.58	3.52	2.54	6.40	4.30	3.71	4.06	5.22	8.14	54.41
1973	3.40	3.63	9.88	7.00	5.72	4.80	7.67	1.79	1.56	3.32	7.78	3.23	59.78
1974	9.45	3.01	5.25	3.97	5.04	6.80	2.10	4.13	10.44	1.47	6.23	2.81	60.70
1975	4.67	5.22	12.35	3.55	6.52	2.22	2.96	4.69	5.42	5.86	3.00	4.12	60.58
1976	4.11	2.28	5.32	1.53	6.19	4.72	4.01	8.05	5.08	5.17	1.30	1.81	49.57
1977	2.53	3.27	5.83	7.87	1.65	4.29	1.15	4.65	5.04	4.22	5.96	4.25	50.71
1978	5.95	1.57	4.88	2.42	8.03	1.46	4.03	3.81	1.37	2.28	4.01	13.63	53.44
1979	7.13	4.01	4.92	7.80	8.18	2.79	4.27	4.59	11.44	3.97	5.98	5.04	70.12
1980	2.59	1.38	7.27	3.67	6.14	2.89	3.53	1.24	1.09	1.17	2.55	1.40	34.92
1981	1.60	3.83	3.38	4.78	3.05	8.05	3.49	3.10	1.37	2.82	3.83	2.38	41.68
1982	6.50	4.80	3.00	4.36	4.19	2.28	5.47	3.46	3.23	1.91	3.87	6.36	49.43
1983	2.56	2.93	3.44	6.80	11.04	3.93	1.71	1.36	0.45	2.77	6.98	7.75	51.72
1984	1.79	2.38	5.14	8.41	9.68	4.49	6.63	2.42	0.97	6.00	6.20	2.38	56.49
1985	3.02	3.30	2.70	2.91	2.65	1.53	2.00	3.91	2.52	1.59	3.81	0.98	30.92
1986	0.19	3.59	2.29	0.52	3.36	2.38	0.77	3.38	2.19	2.19	7.43	3.31	31.60
1987	1.61	4.87	1.18	1.03	4.41	2.82	2.56	0.73	1.95	0.21	3.40	5.46	30.23
1988	3.73	2.02	2.18	2.09	1.86	0.45	3.26	2.39	2.45	1.54	5.49	3.95	31.41
1989	4.52	9.36	5.31	2.68	4.61	7.87	3.18	3.67	6.30	3.62	3.94	1.97	57.03
1990	2.76	4.73	3.26	1.60	2.80	2.37	4.86	3.12	2.13	4.41	4.29	10.76	47.09
1991	2.92	5.44	4.25	3.35	5.63	1.25	2.82	1.79	5.47	3.88	2.87	7.27	46.94
1992	2.97	2.60	4.50	0.77	3.12	4.31	5.89	3.25	3.45	1.62	4.48	2.88	39.84
1993	2.76	3.33	5.50	3.33	4.50	5.31	3.64	1.76	2.90	2.20	2.53	6.62	44.38
1994	4.36	6.18	7.56	5.72	3.76	8.08	4.82	5.05	4.20	3.31	4.04	2.69	59.77
1995	5.61	1.81	3.87	3.95	7.66	3.69	1.95	3.40	5.00	5.60	3.98	2.32	48.84
1996	3.82	2.46	5.15	3.68	4.48	3.68	5.45	1.09	4.89	3.16	6.00	4.77	48.63
POR= 126 YRS	4.55	4.11	5.07	4.14	4.10	3.81	3.87	3.28	3.31	2.51	3.62	4.01	46.38

WBAN : 13897

AVERAGE TEMPERATURE (°F) 1996 NASHVILLE, TENNESSEE (BNA)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1967	42.3	37.5	57.0	63.9	66.3	76.3	75.7	72.6	66.8	59.3	44.3	42.6	58.7
1968	34.0	32.4	47.8	58.7	66.3	74.9	77.8	79.5	69.9	59.5	48.7	38.1	57.3
1969	37.2	39.8	42.6	60.9	68.9	77.2	82.7	78.1	70.8	60.6	46.5	37.3	58.5
1970	32.4	38.4	46.8	61.3	68.4	73.6	77.2	79.2	76.9	61.0	47.5	43.2	58.8
1971	35.6	38.7	44.6	57.9	63.3	77.5	76.8	76.4	74.4	66.7	49.9	49.2	59.3
1972	41.8	41.8	50.2	60.5	67.4	73.0	77.3	77.2	75.7	60.2	47.3	42.8	59.6
1973	38.0	39.7	56.8	56.4	64.2	76.1	78.7	78.1	76.2	66.2	54.7	40.5	60.5
1974	45.4	41.8	54.9	58.6	70.0	71.4	78.0	77.6	67.5	59.4	50.0	42.6	59.8
1975	43.4	44.6	47.3	58.5	70.4	76.0	78.5	79.1	67.9	62.4	52.1	42.8	60.2
1976	36.7	50.5	55.9	59.9	64.0	73.3	76.4	74.4	66.8	53.9	40.9	36.6	57.4
1977	24.5	40.6	53.9	63.0	71.9	77.2	82.2	79.5	74.0	57.0	50.8	38.6	59.4
1978	27.6	29.2	46.9	61.0	66.7	76.2	80.5	78.7	75.5	57.4	53.6	42.4	58.0
1979	29.7	33.4	50.7	57.8	66.3	73.7	77.6	77.0	70.5	60.3	48.6	41.5	57.3
1980	39.7	35.7	46.3	57.3	67.8	75.5	82.8	81.7	76.0	57.8	48.5	41.0	59.2
1981	35.5	42.6	47.5	64.0	64.2	77.5	79.8	76.6	68.1	60.4	49.9	38.3	58.7
1982	34.0	39.5	52.5	54.6	71.0	73.3	79.8	76.1	69.6	61.1	51.4	48.2	59.3
1983	38.8	42.7	50.3	54.5	64.8	75.5	80.5	83.2	73.7	62.4	49.9	34.0	59.2
1984	32.2	43.4	46.1	58.2	64.2	77.4	76.1	76.5	68.6	66.7	46.0	49.6	58.8
1985	27.8	36.5	53.2	61.9	68.4	75.7	80.2	77.2	70.8	64.4	56.9	34.2	58.9
1986	37.2	44.7	50.8	60.8	68.6	76.5	82.4	76.7	74.9	61.0	49.9	39.9	60.3
1987	36.1	43.1	51.8	57.7	73.4	77.5	80.2	81.1	72.2	54.6	52.4	44.1	60.3
1988	34.4	38.7	49.3	57.1	67.3	77.3	81.4	81.9	72.8	54.2	51.1	42.4	59.0
1989	44.9	39.0	52.6	59.3	65.7	74.7	79.1	78.0	70.5	61.0	51.4	29.5	58.8
1990	45.8	49.9	53.6	58.4	66.4	78.2	80.4	79.6	74.7	60.1	54.3	43.7	62.1
1991	39.2	43.9	52.5	63.8	74.2	78.2	81.1	78.3	72.3	61.2	47.2	44.5	61.4
1992	40.0	45.9	50.1	59.6	65.8	72.4	79.9	74.9	70.9	59.4	49.5	41.2	59.1
1993	41.6	39.3	47.1	56.7	67.6	75.9	83.3	81.0	71.0	58.6	47.4	40.3	59.1
1994	33.4	44.0	50.7	62.5	64.1	78.1	78.5	77.1	69.1	61.0	54.5	45.3	59.9
1995	38.6	40.4		60.9	68.5	74.7	80.8	83.3	70.7	60.0	44.0	39.5	
1996	36.3	40.6	44.6	55.8	71.5	75.6	77.6	77.5	69.5	60.8	45.7	44.4	58.3
POR= 126 YRS	38.5	41.0	49.6	59.4	68.1	76.2	78.9	78.3	72.1	60.8	49.1	41.0	59.4

published by: NCDC Asheville, NC

WBAN : 13897

CLIMATOGRAPHY OF THE UNITED STATES NO. 20

FRANKLIN, TN

PERIOD: 1951-80
ELEVATION: 670 FT

CLIMATOLOGICAL SUMMARY

	TEMPERATURE (F)														
	MEANS			EXTREMES						MEAN NUMBER OF DAYS				DEGREE DAYS	
										MAX		MIN			
	* DAILY MAXIMUM	* DAILY MINIMUM	* MONTHLY	RECORD HIGHEST	YEAR	DAY	RECORD LOWEST	YEAR	DAY	90 AND ABOVE	32 AND BELOW	32 AND BELOW	0 AND BELOW	* HEATING BASE 65	* COOLING BASE 65
JAN	48.4	27.4	37.9	78+	52	1	-15+	63	24	0	3	21	1	840	0
FEB	53.1	29.2	41.2	82+	62	13	-12+	51	3	0	1	17	0	666	0
MAR	61.9	37.3	49.6	87+	67	13	0+	80	3	0	0	12	0	491	14
APR	73.2	46.8	60.0	94+	65	23	23+	73	11	0	0	3	0	172	22
MAY	80.4	54.1	67.3	95+	62	18	31+	76	4	2	0	0	0	53	124
JUN	87.4	62.0	74.7	106+	52	28	39+	72	1	12	0	0	0	7	298
JUL	90.5	65.5	78.0	107+	52	28	43+	72	7	20	0	0	0	0	403
AUG	89.8	64.1	77.0	103+	54	16	41+	53	23	18	0	0	0	0	372
SEP	84.3	57.7	71.0	105+	54	5	34+	67	30	8	0	0	0	17	197
OCT	74.1	45.3	59.7	94	53	1	21+	76	29	0	0	3	0	200	36
NOV	61.2	36.5	48.9	83+	71	2	7+	76	30	0	0	12	0	483	0
DEC	52.3	30.3	41.3	79+	64	24	-6+	62	13	0	1	19	0	735	0
YEAR	71.4	46.4	58.9	107	JUL 52	28	-15	JAN 63	24	60	5	87	1	3664	1466

	PRECIPITATION TOTALS (INCHES)											
							SNOW			MEAN NUMBER OF DAYS		
	* MEAN	* GREATEST MONTHLY	YEAR	GREATEST DAILY	YEAR	DAY	MEAN	MAXIMUM MONTHLY	YEAR	.10 OR MORE	.50 OR MORE	1.00 OR MORE
JAN	4.91	10.64	54	4.00	74	11	3.0	11.2	66	8	3	1
FEB	4.49	10.42	62	4.48	62	27	2.7	18.9	79	7	3	1
MAR	6.00	15.25	75	5.42	75	13	1.0	9.5	60	9	4	2
APR	4.66	8.35	73	2.74	62	11	.0	.0		7	3	1
MAY	4.64	12.60	79	7.25	79	04	.0	.0		7	3	2
JUN	3.85	9.52	60	6.43	60	17	.0	.0		6	2	1
JUL	4.32	12.71	72	6.83	72	28	.0	.0		7	3	1
AUG	3.90	7.84	59	3.65	52	30	.0	.0		5	3	1
SEP	3.66	10.39	79	5.81	79	14	.0	.0		5	2	1
OCT	3.18	7.31	76	3.01	57	04	.0	.0		5	2	1
NOV	3.83	8.83	73	4.07	73	27	.3	5.5	66	6	3	1
DEC	4.87	11.71	78	5.23	78	04	1.0	6.6	67	6	3	2
YEAR	52.31	15.25	MAR 75	7.25	MAY 79	04	8.0	18.9	FEB 79	78	34	15

*FROM 1951-80 NORMALS

ESTIMATED VALUE BASED ON DATA FROM SURROUNDING STATIONS

+ ALSO ON EARLIER DATES.

DEGREE DAYS TO SELECTED BASE TEMPERATURES (F)

BASE	HEATING DEGREE DAYS												
BELOW	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
65	840	666	491	172	53	7	0	0	17	200	483	735	3664
60	694	536	356	79	13	0	0	0	0	107	339	580	2704
57	606	458	284	40	5	0	0	0	0	64	257	495	2209
55	549	408	242	22	0	0	0	0	0	41	207	437	1906
50	415	293	155	0	0	0	0	0	0	12	110	302	1287

BASE	COOLING DEGREE DAYS												
ABOVE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
55	19	21	75	172	381	591	713	682	480	187	24	12	3357
57	14	15	55	130	325	531	651	620	420	148	14	8	2931
60	9	9	33	79	239	441	558	527	333	98	6	0	2332
65	0	0	14	22	124	298	403	372	197	36	0	0	1466
70	0	0	0	0	48	170	251	222	96	10	0	0	797

DERIVED FROM THE 1951-80 MONTHLY NORMALS

PROBABILITY THAT THE MONTHLY PRECIPITATION WILL BE EQUAL TO OR LESS THAN THE INDICATED PRECIPITATION AMOUNT

MONTHLY PRECIPITATION (INCHES)

PROBABILITY LEVELS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
.05	1.39	1.42	2.26	1.65	1.40	.75	1.32	1.10	.91	.51	1.15	1.35
.10	1.86	1.85	2.82	2.09	1.84	1.09	1.73	1.47	1.26	.93	1.52	1.81
.20	2.56	2.48	3.62	2.73	2.50	1.66	2.34	2.03	1.79	1.48	2.06	2.51
.30	3.18	3.02	4.29	3.26	3.07	2.18	2.87	2.52	2.26	1.91	2.53	3.12
.40	3.77	3.54	4.92	3.77	3.62	2.71	3.38	3.00	2.73	2.35	2.99	3.72
.50	4.40	4.08	5.57	4.30	4.19	3.27	3.91	3.49	3.23	2.80	3.46	4.35
.60	5.09	4.68	6.28	4.87	4.82	3.91	4.49	4.04	3.78	3.31	3.99	5.04
.70	5.90	5.37	7.09	5.53	5.56	4.69	5.17	4.69	4.43	3.90	4.60	5.87
.80	6.96	6.27	8.13	6.38	6.52	5.71	6.05	5.54	5.28	4.68	5.39	6.93
.90	8.62	7.66	9.73	7.69	8.02	7.35	7.43	6.86	6.64	5.92	6.64	8.61
.95	10.16	8.95	11.19	8.90	9.41	8.92	8.70	8.09	7.90	7.07	7.79	10.17

THESE VALUES WERE DETERMINED FROM THE INCOMPLETE GAMMA DISTRIBUTION.

SOURCE: **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**

403280 FRANKLIN, TN — LAT: 35 56N (DEG MIN) LONG: 86 52W (DEG MIN) — PERIOD: 1951-80

FREEZE DATA

PROBABILITY OF LATER DATE IN SPRING (THRU JULY 31) THAN INDICATED(*)

SPRING FREEZE DATES (MO/DAY)

TEMP (F)	.90	.80	.70	.60	.50	.40	.30	.20	.10
36	4/13	4/19	4/23	4/26	4/29	5/02	5/06	5/10	5/15
32	3/29	4/04	4/07	4/11	4/14	4/17	4/20	4/24	4/29
28	3/19	3/23	3/26	3/29	4/01	4/03	4/06	4/09	4/13
24	3/04	3/08	3/12	3/15	3/18	3/21	3/24	3/27	4/01
20	1/27	2/06	2/13	2/19	2/25	3/02	3/09	3/16	3/26
16	1/23	2/01	2/07	2/12	2/17	2/22	2/27	3/05	3/14

PROBABILITY OF EARLIER DATE IN FALL (BEGINNING AUG 1) THAN INDICATED(*)

FALL FREEZE DATES (MO/DAY)

TEMP (F)	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	9/30	10/03	10/06	10/08	10/11	10/13	10/15	10/18	10/21
32	10/07	10/12	10/15	10/18	10/21	10/24	10/27	10/30	11/04
28	10/19	10/24	10/27	10/30	11/02	11/05	11/08	11/12	11/17
24	10/28	11/01	11/05	11/07	11/10	11/13	11/15	11/19	11/23
20	11/06	11/11	11/15	11/18	11/21	11/24	11/28	12/01	12/07
16	11/16	11/24	11/30	12/04	12/09	12/13	12/18	12/24	12/31

PROBABILITY OF LONGER THAN INDICATED FREEZE FREE PERIOD (DAYS)

FREEZE FREE PERIOD

TEMP (F)	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	184	177	172	168	164	160	155	150	143
32	208	202	197	193	189	186	182	177	171
28	232	226	222	218	215	212	208	204	198
24	253	248	243	240	236	233	229	225	219
20	303	291	283	275	269	262	255	247	235
16	326	315	307	300	294	287	281	273	261

(*)PROBABILITY OF OBSERVING A TEMPERATURE AS COLD, OR COLDER, LATER IN THE SPRING OR EARLIER IN THE FALL THAN THE INDICATED DATE.
0/00 INDICATES THAT THE PROBABILITY OF OCCURRENCE OF THRESHOLD TEMPERATURE IS LESS THAN INDICATED PROBABILITY.

GROWING DEGREE UNITS TO SELECTED BASE TEMPERATURES (F)

BASE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
40	M	117	146	332	607	854	1050	1187	1146	940	620	302	150	7451
	S	117	263	595	1202	2056	3106	4293	5439	6379	6999	7301	7451	
45	M	64	80	212	460	699	900	1032	991	790	468	192	80	5968
	S	64	144	356	816	1515	2415	3447	4438	5228	5696	5888	5968	
50	M	31	37	121	320	544	750	877	836	641	323	106	36	4622
	S	31	68	189	509	1053	1803	2680	3516	4157	4480	4586	4622	
55	M	12	13	61	201	393	600	722	681	491	199	49	13	3435
	S	12	25	86	287	680	1280	2002	2683	3174	3373	3422	3435	
60	M	3	3	24	110	252	450	567	526	345	104	18	4	2406
	S	3	6	30	140	392	842	1409	1935	2280	2384	2402	2406	

M = MONTHLY DATA S = SUM OF MONTHLY DATA

GROWING DEGREE UNITS FOR CORN

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
CORN	M	74	98	218	398	562	706	799	767	622	415	200	93	4952
	S	74	172	390	788	1350	2056	2855	3622	4244	4659	4859	4952	

NOTE: FOR CORN THE BASE IS 50, AND THE DEGREE UNITS ARE ADJUSTED FOR TEMPERATURES BELOW 50 AND ABOVE 86

OTHER CLIMATOLOGICAL DATA ARE AVAILABLE IN A VARIETY OF SUMMARIES AND FORMATS, SUCH AS THE CLIMATOGRAPHY OF THE UNITED STATES: NO. 60 - CLIMATE OF STATES; NO. 81 - MONTHLY NORMALS (AND SUPPLEMENTS: ANNUAL DEGREE DAYS TO SELECTED BASES DERIVED FROM THE 1951-80 NORMALS; AND MONTHLY PRECIPITATION PROBABILITIES, SELECTED PROBABILITY LEVELS DERIVED FROM THE 1951-80 NORMALS); NO. 84 - DAILY NORMALS; NO. 85 - DIVISIONAL NORMALS. A VARIETY OF DATA IS AVAILABLE EITHER ON MAGNETIC TAPE, MICROFICHE, OR PAPER COPY.

TO OBTAIN INFORMATION ABOUT CLIMATOLOGICAL DATA AND RELATED PUBLICATIONS, CONTACT:

DIRECTOR
NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NC 28801-2696
(OR TELEPHONE: (704) 259-0682)

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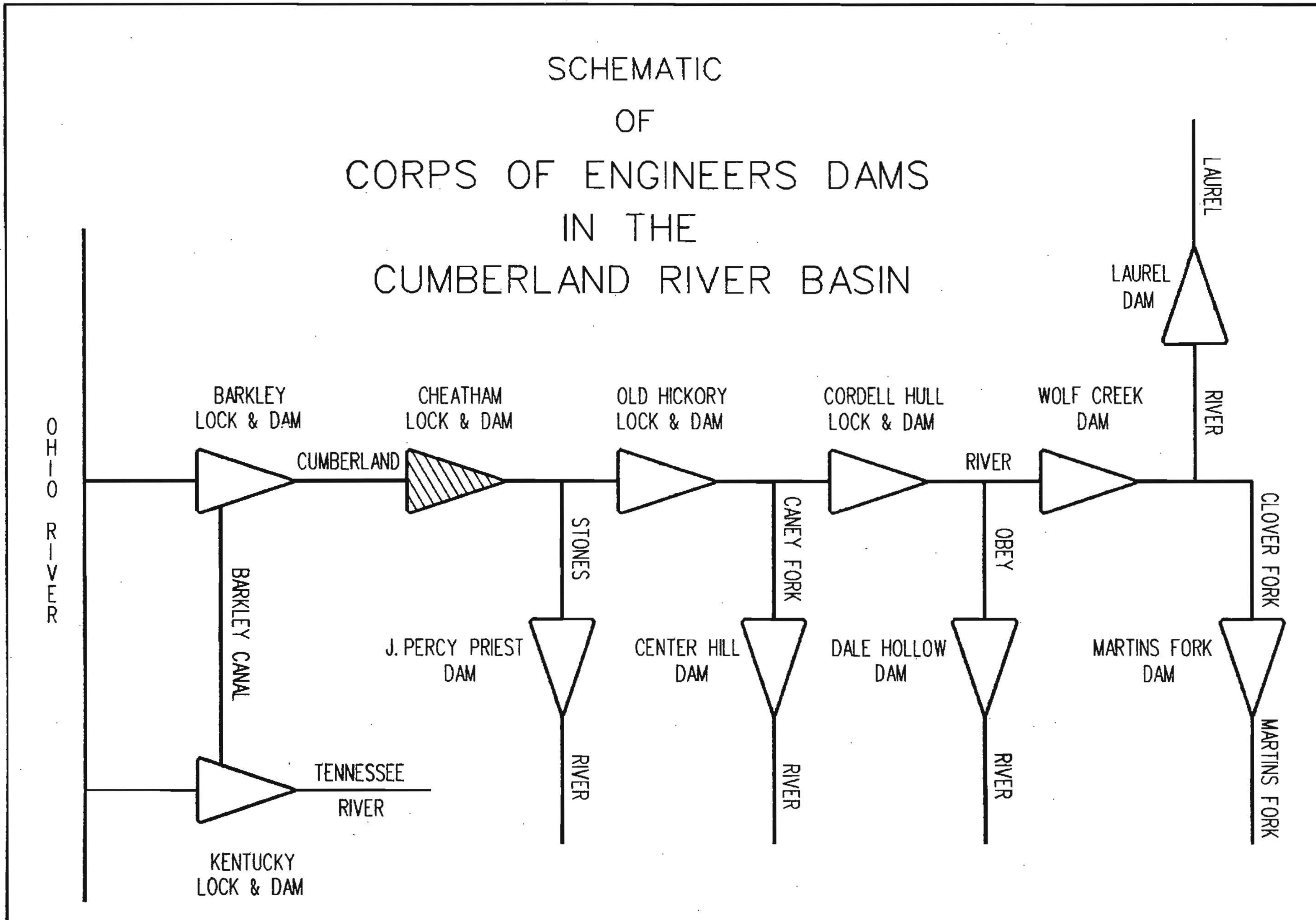
SCHEMATIC
OF
CORPS OF ENGINEERS DAMS
IN THE
CUMBERLAND RIVER BASIN
OHIO RIVER
BARKLEY LOCK & DAM
CHEATHAM LOCK & DAM
OLD HICKORY LOCK & DAM
CORDELL HULL LOCK & DAM
WOLF CREEK DAM
LAUREL DAM
LAUREL
RIVER
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RIVER
DALE HOLLOW DAM
CLOVER FORK
MARTINS FORK DAM
MARTINS FORK
BARKLEY CANAL
TENNESSEE
RIVER
KENTUCKY LOCK & DAM

Plate C-1

CUMBERLAND RIVER BASIN MAP

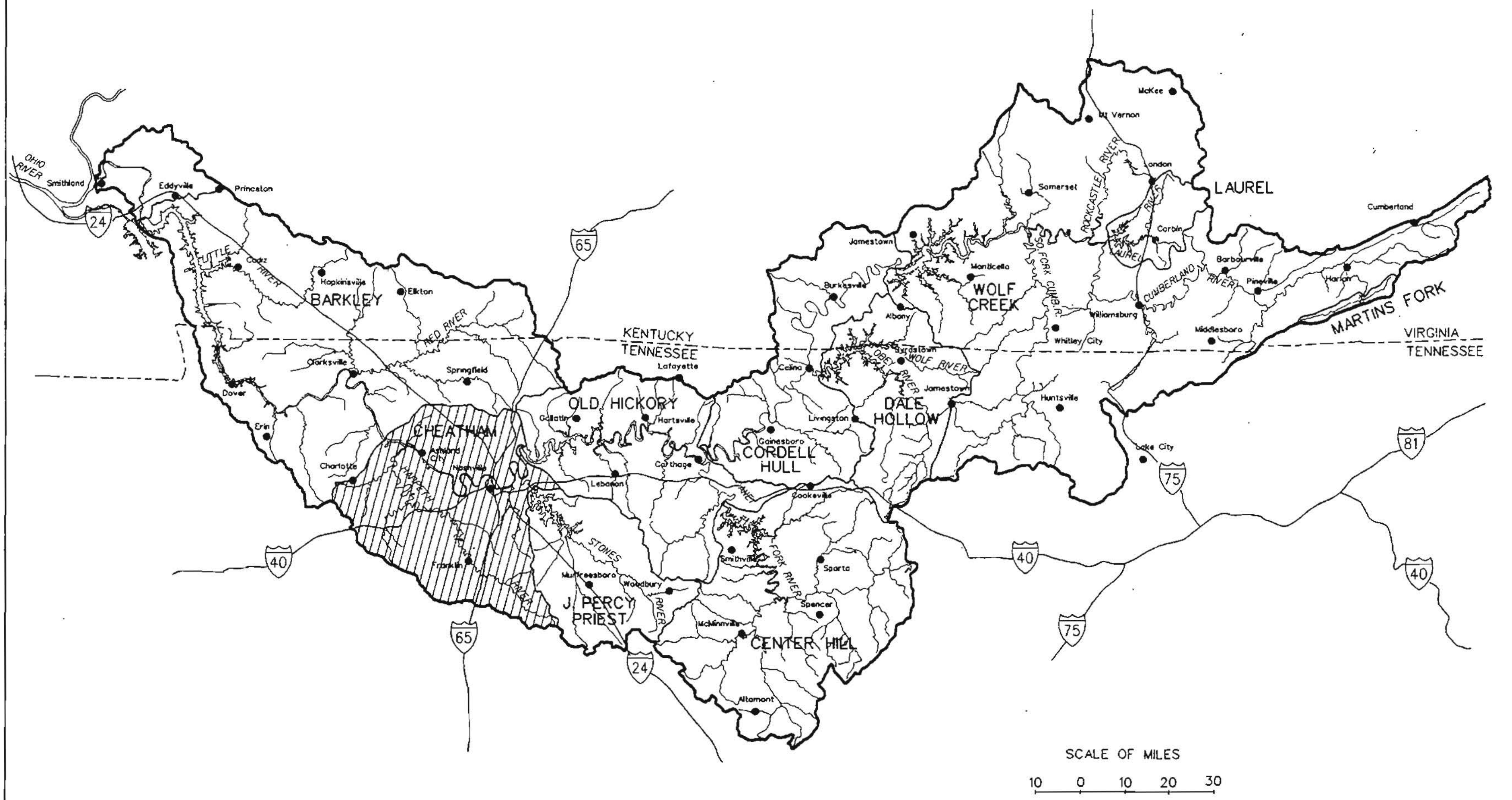
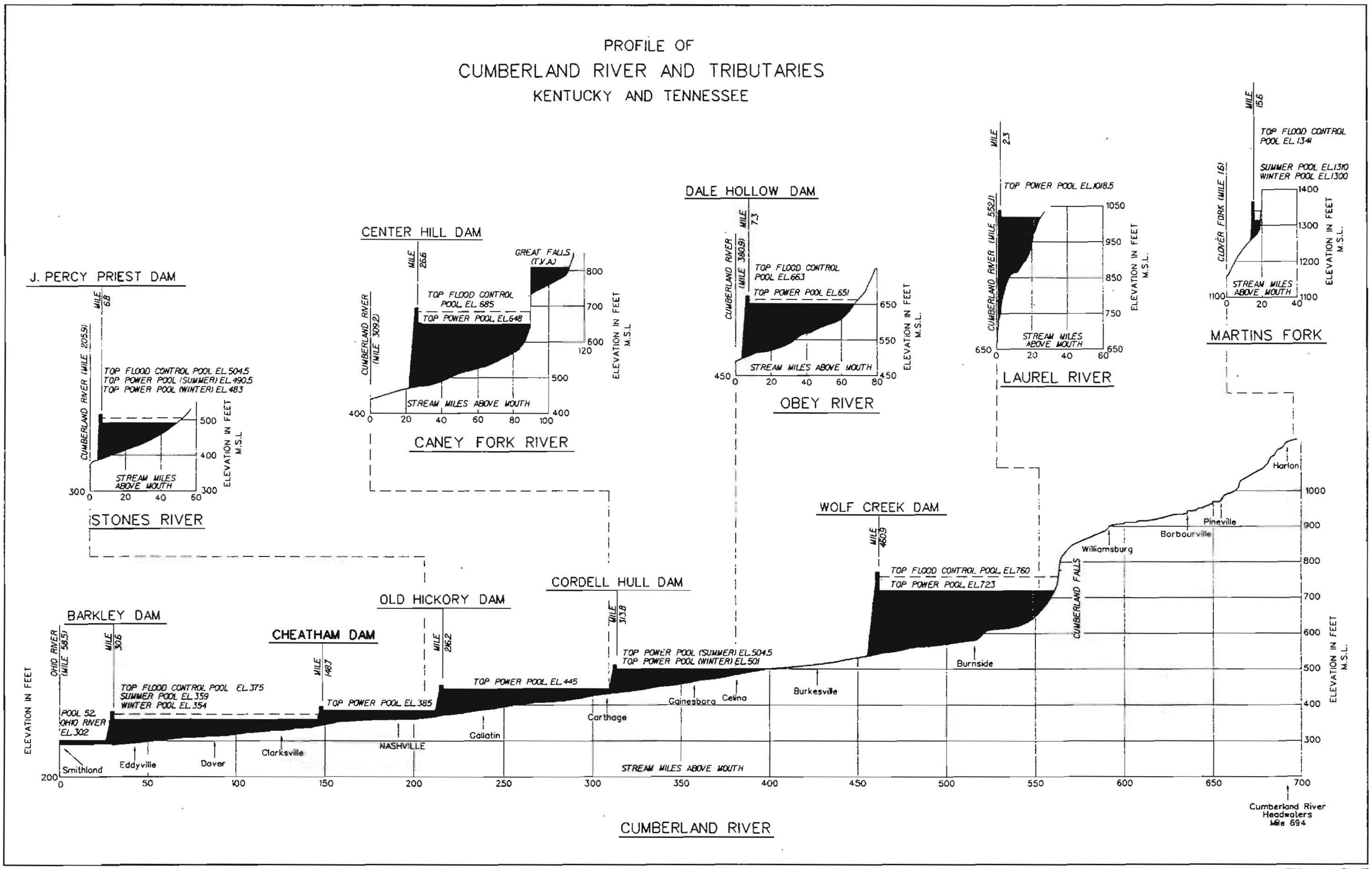


Plate C-2



PROFILE OF
CUMBERLAND RIVER AND TRIBUTARIES
KENTUCKY AND TENNESSEE
J. PERCY PRIEST DAM
STONES RIVER
CENTER HILL DAM
CANEY FORK RIVER
DALE HOLLOW DAM
OBEY RIVER
LAUREL RIVER
MARTINS FORK
WOLF CREEK DAM
CORDELL HULL DAM
OLD HICKORY DAM
CHEATHAM DAM
BARKLEY DAM
TOP FLOOD CONTROL POOL EL.760
TOP POWER POOL EL.723
TOP POWER POOL EL.445
TOP POWER POOL EL.385
STREAM MILES ABOVE MOUTH
ELEVATION IN FEET M.S.L.
Smithland
Eddyville
Dover
Clarksville
NASHVILLE
Gallatin
Carthage
Gainesboro
Celina
Burkesville
Burnside
Williamsburg
Barbourville
Pineville
Harlan
CUMBERLAND FALLS
Cumberland River Headwaters Mile 694
CUMBERLAND RIVER

Redacted
Ex. 7

Revision	Date	Description	By
4	6-17-57	Revised as constructed	B.C.
3	6-3-52	Deleted Note No. 3	[illegible]
2	12-27-51	Revised in accordance with Addendum No. 1	[illegible]
1	12-5-51	General coordination check	[illegible]

10 0 20 40

GRAPHIC SCALE

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
NASHVILLE, TENNESSEE, DISTRICT

DRAWN C.W.D.
CHECKED M.J.M.

CUMBERLAND RIVER
CHEATHAM LOCK AND DAM
DAM

PLAN AND ELEVATIONS

SCALE 1" = 20'

DATED NOVEMBER 1951

Q12-40/L 4

Plate C - 4

Redacted
Ex. 7

Revision	Date	Description	By	Chkd
.3	5 Nov 52	Revised upper approach		
.2	30 Jan 50	Riprap note added (Addendum No. 2) Rock line at discharge culvert revised (Addendum No. 1)		
.1	4 Jan 50	General revisions; Detail of Outlet added.		

200' 100' 0 200'
GRAPHIC SCALE

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
NASHVILLE, TENNESSEE, DISTRICT

CUMBERLAND RIVER
CHEATHAM LOCK AND DAM
PLANS, ELEVATIONS AND SECTIONS

DATED SEPTEMBER 1949

012-34

Revision	Date	Description	By	Chkd
.4	7-5-57	Revised as constructed		

Redacted
Ex. 7

CUMBERLAND RIVER
TENNESSEE AND KENTUCKY
CHEATHAM
LOCK AND DAM

U. S. ARMY ENGINEER DISTRICT, NASHVILLE
30 JUNE 1966

PLATE C-6

U. S. ARMY

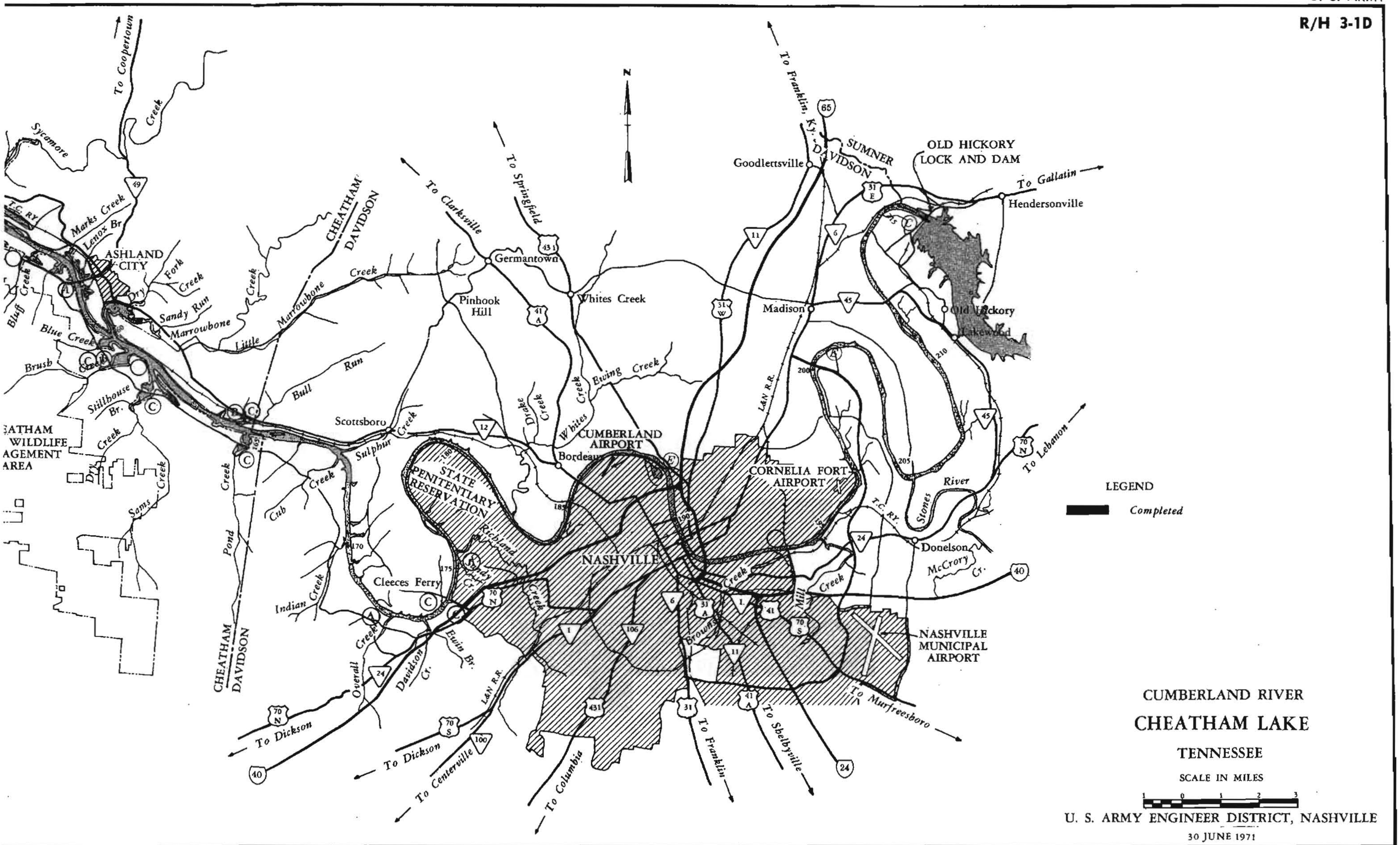
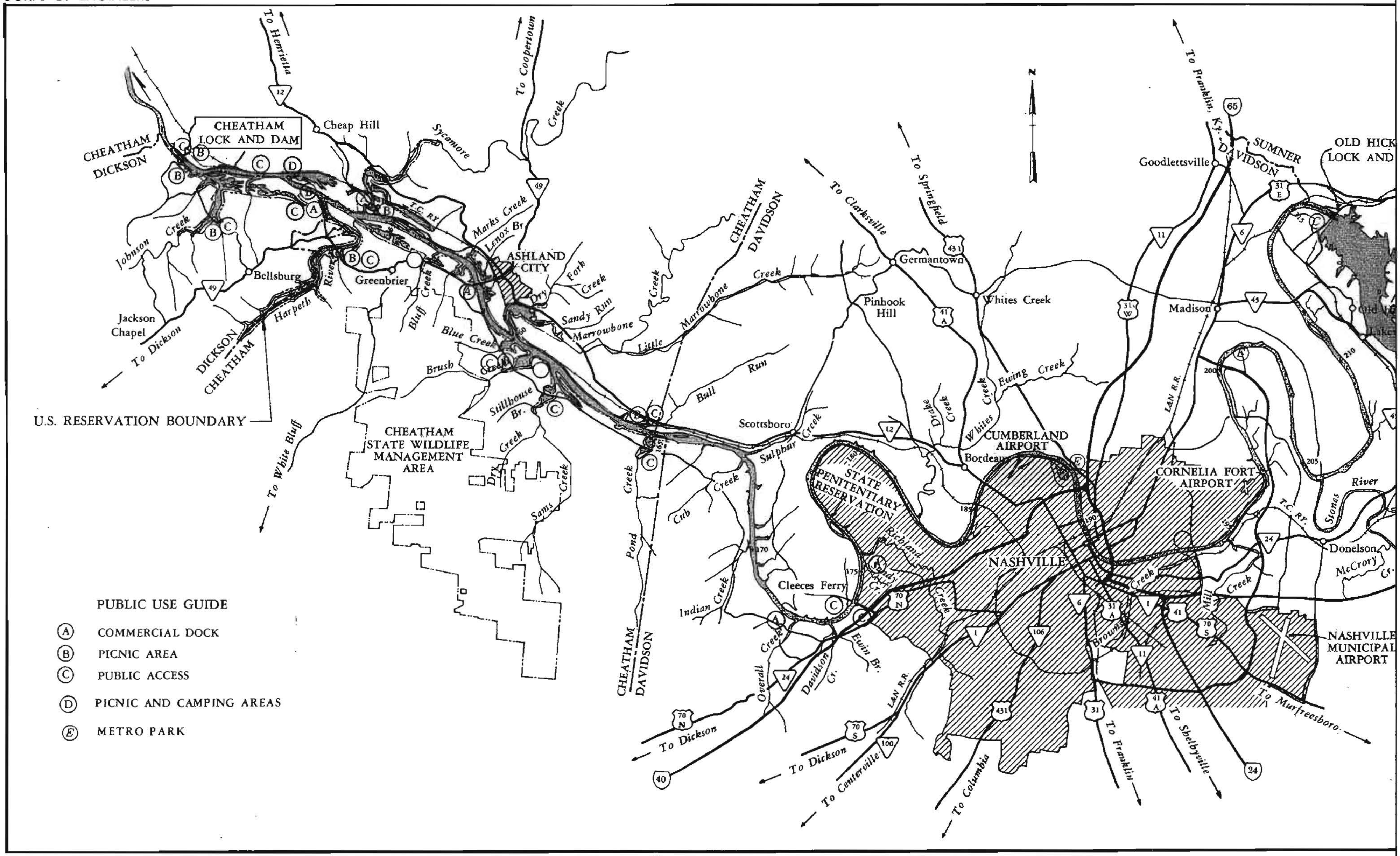
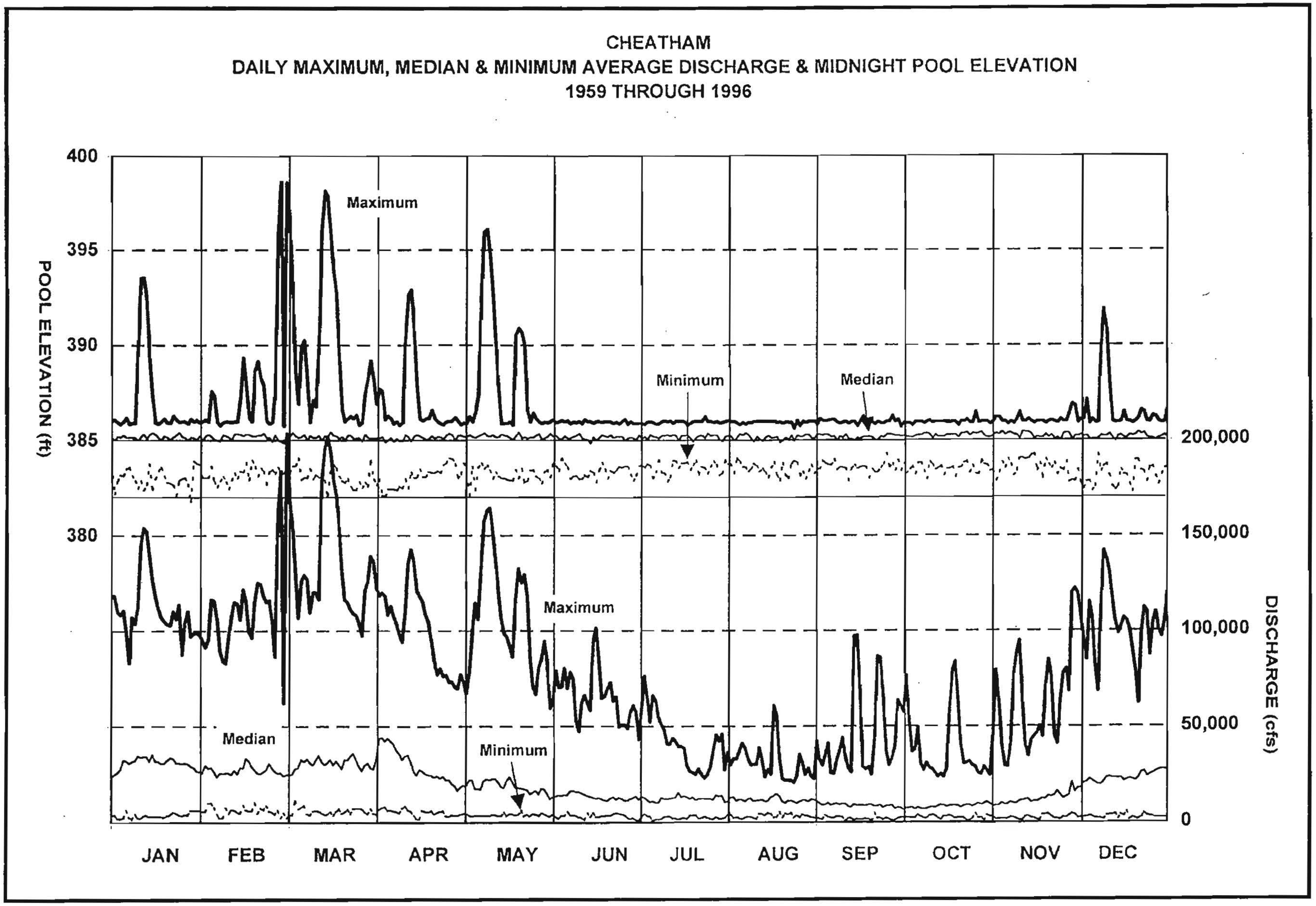


PLATE C-7


CHEATHAM LOCK AND DAM
CHEATHAM
DICKSON
To Henrietta
To Coopertown
Cheap Hill
Sycamore
Johnson Creek
Bellsburg
Greenbrier
Harpeth River
Jackson Chapel
To Dickson
DICKSON
CHEATHAM
U.S. RESERVATION BOUNDARY
To White Bluff
Marks Creek
Lenox Br
ASHLAND CITY
Dry Fork Creek
Sandy Run
Marrowbone
Little Marrowbone Creek
Bluff Creek
Blue Creek
Brush Creek
Stillhouse Br.
Dry Creek
Sams Creek
CHEATHAM STATE WILDLIFE MANAGEMENT AREA
Pond Creek
CHEATHAM
DAVIDSON
Bull Run
Scottsboro
Sulphur Creek
Cub Creek
Indian Creek
Overall Creek
Davidson Cr.
Ewin Br.
Cleeces Ferry
To Clarksville
To Springfield
Germantown
Whites Creek
Pinhook Hill
Ewing Creek
Drake Creek
Whites Creek
CUMBERLAND AIRPORT
Bordeaux
STATE PENITENTIARY RESERVATION
Richland Creek
NASHVILLE
Browns Creek
Mill Creek
To Franklin, Ky.
Goodlettsville
SUMNER
DAVIDSON
OLD HICK
LOCK AND
Madison
L&N R.R.
T.C. RY.
CORNELIA FORT AIRPORT
Stones River
Donelson
McCrory Cr.
NASHVILLE MUNICIPAL AIRPORT
To Dickson
To Dickson
To Centerville
To Columbia
To Franklin
To Shelbyville
To Murfreesboro
PUBLIC USE GUIDE
A COMMERCIAL DOCK
B PICNIC AREA
C PUBLIC ACCESS
D PICNIC AND CAMPING AREAS
E METRO PARK



9/26/97
Cdd-1a.xlc

PLATE D-1a

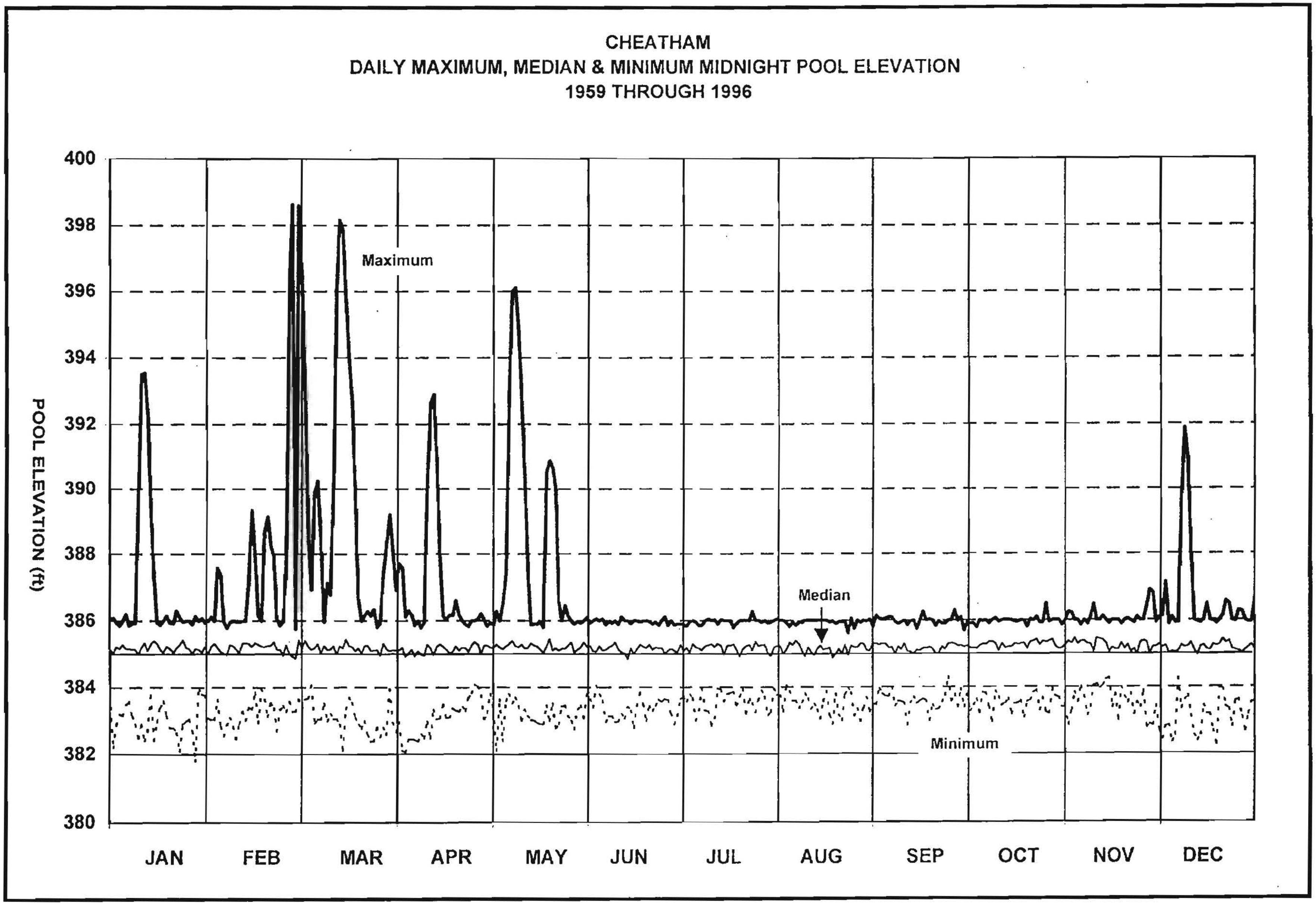


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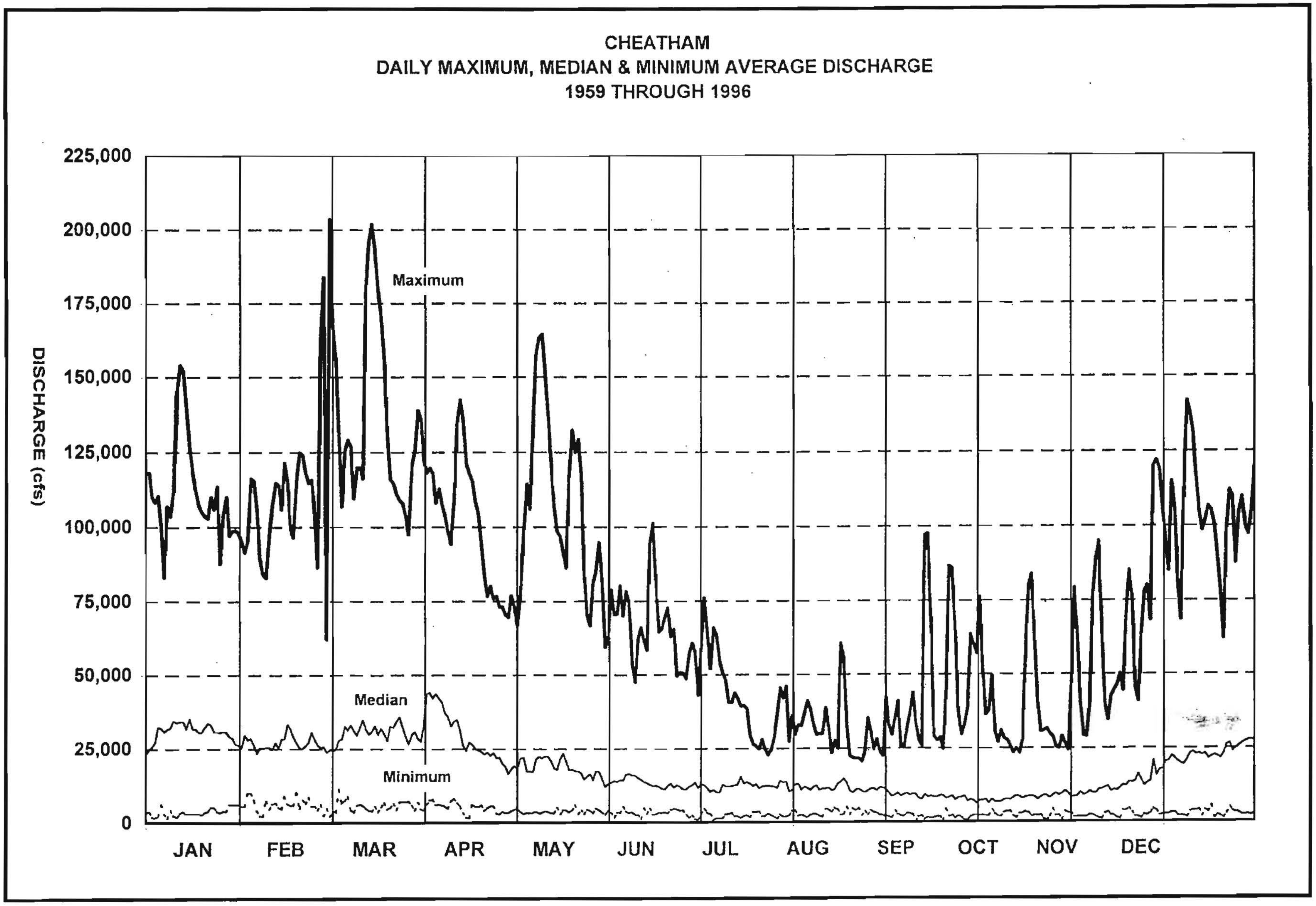
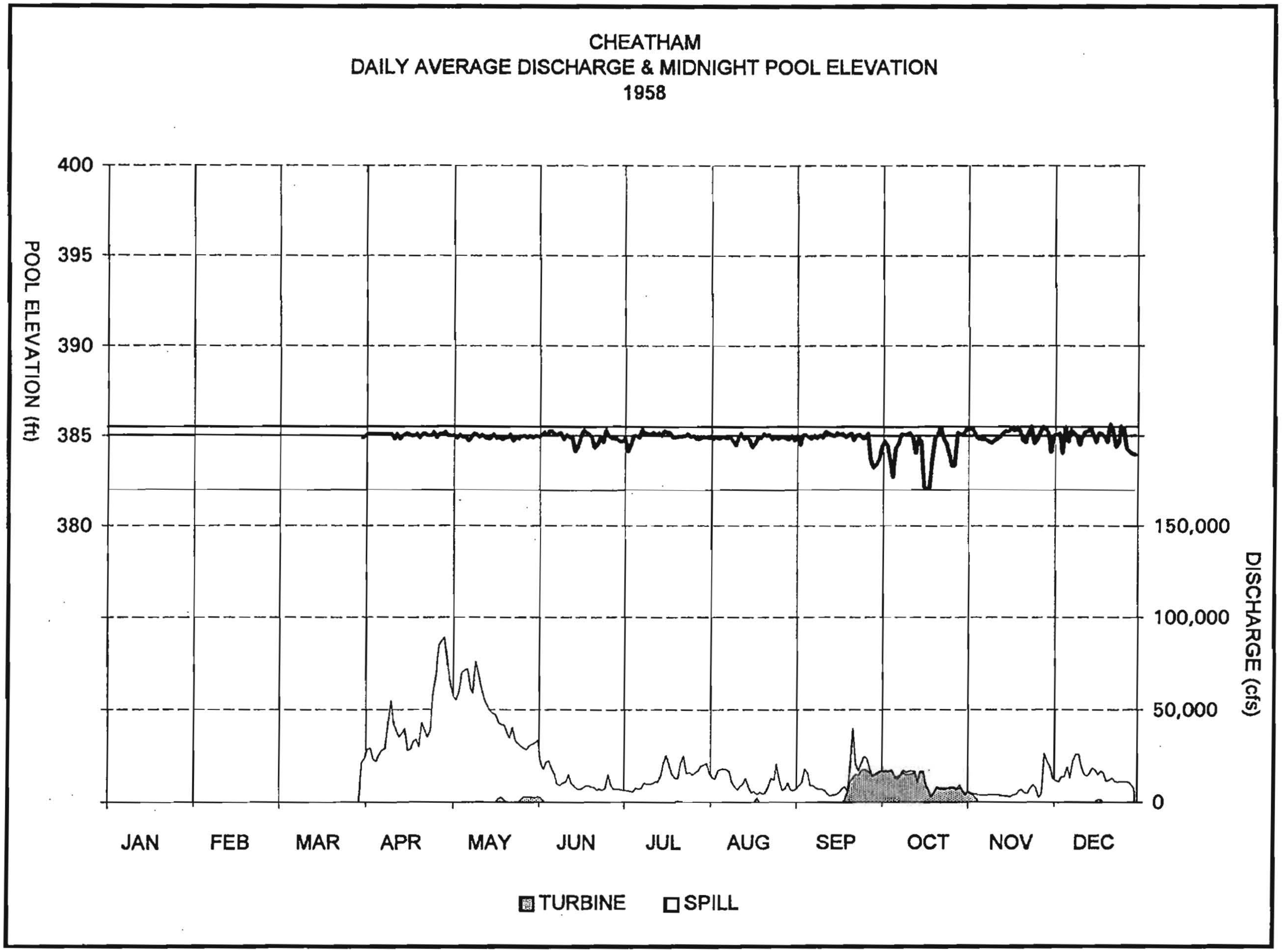
PLATE D-1b



9/26/97
Cdd-1c.xlc



CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1958
400
395
390
385
380
POOL ELEVATION (ft)
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

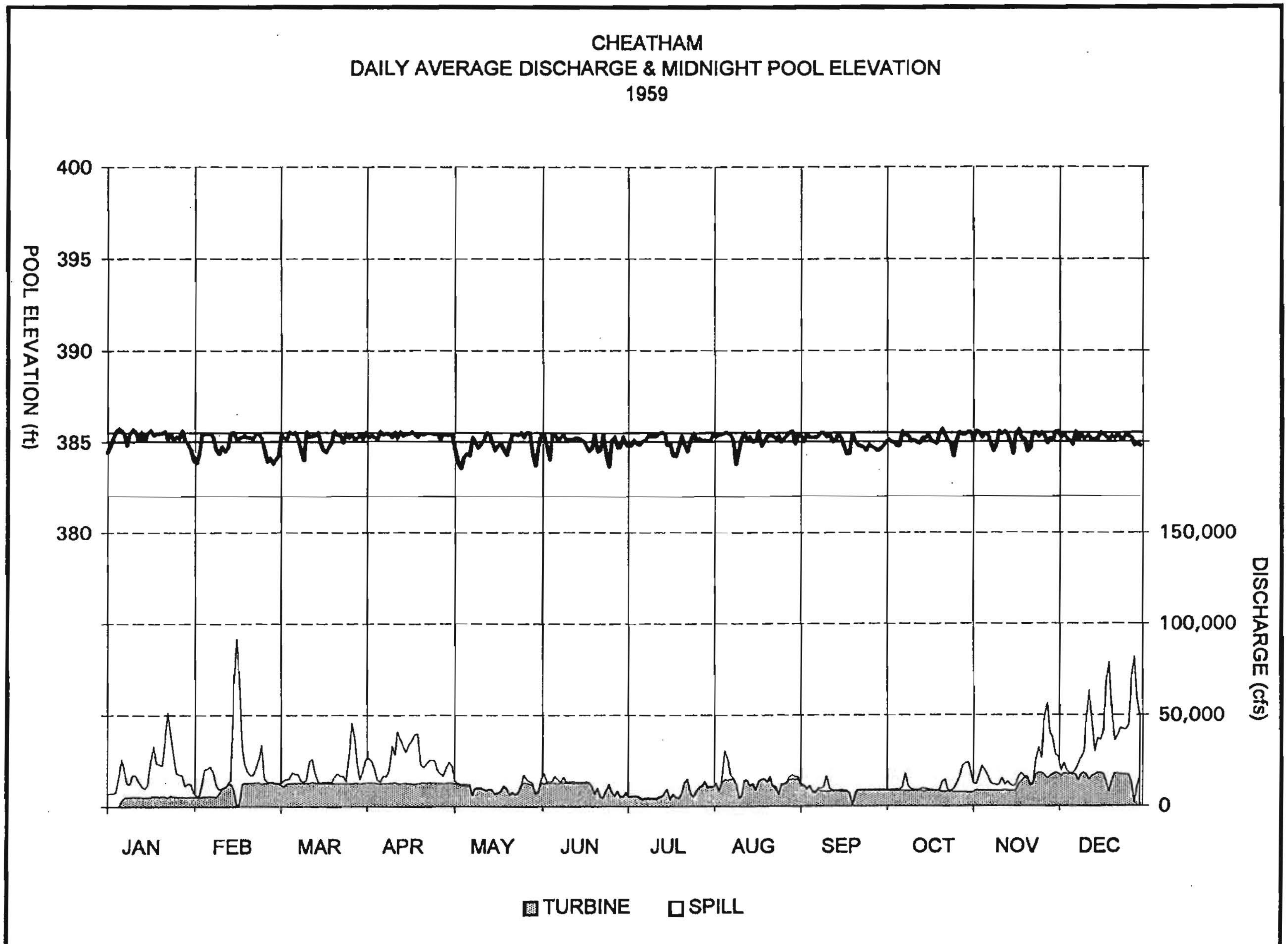
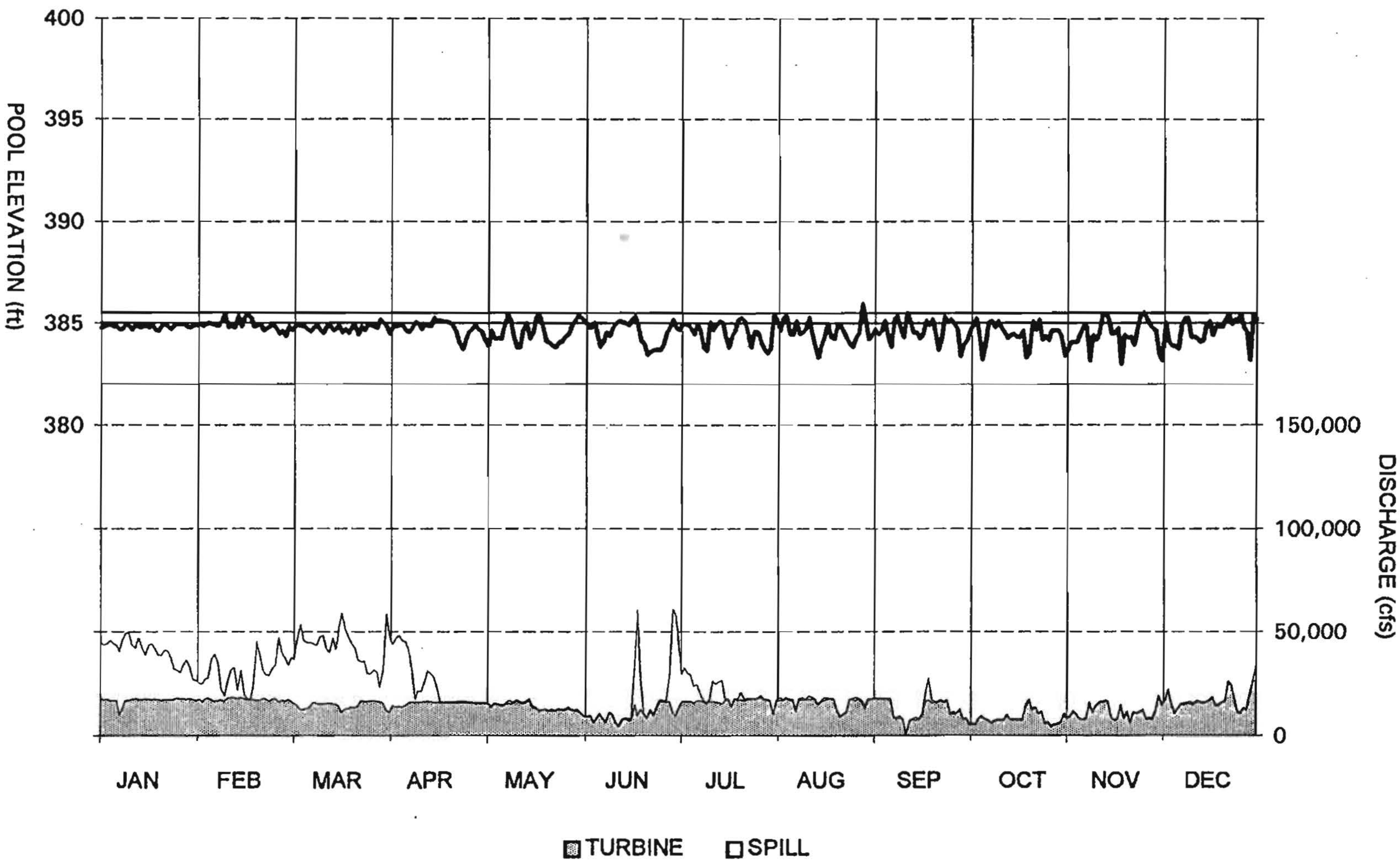
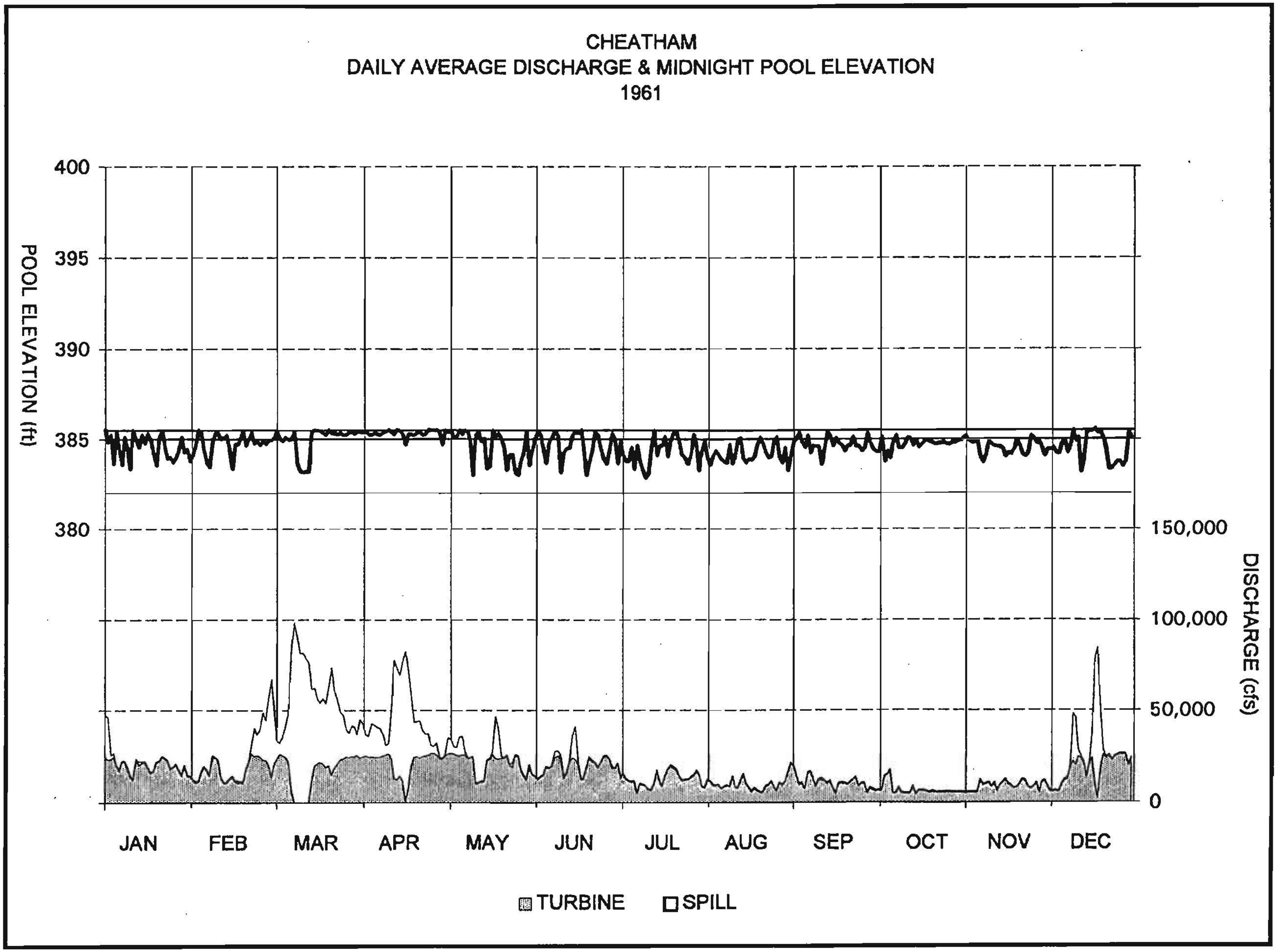

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1959
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

PLATE D-3

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1960





CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1961
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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JAN
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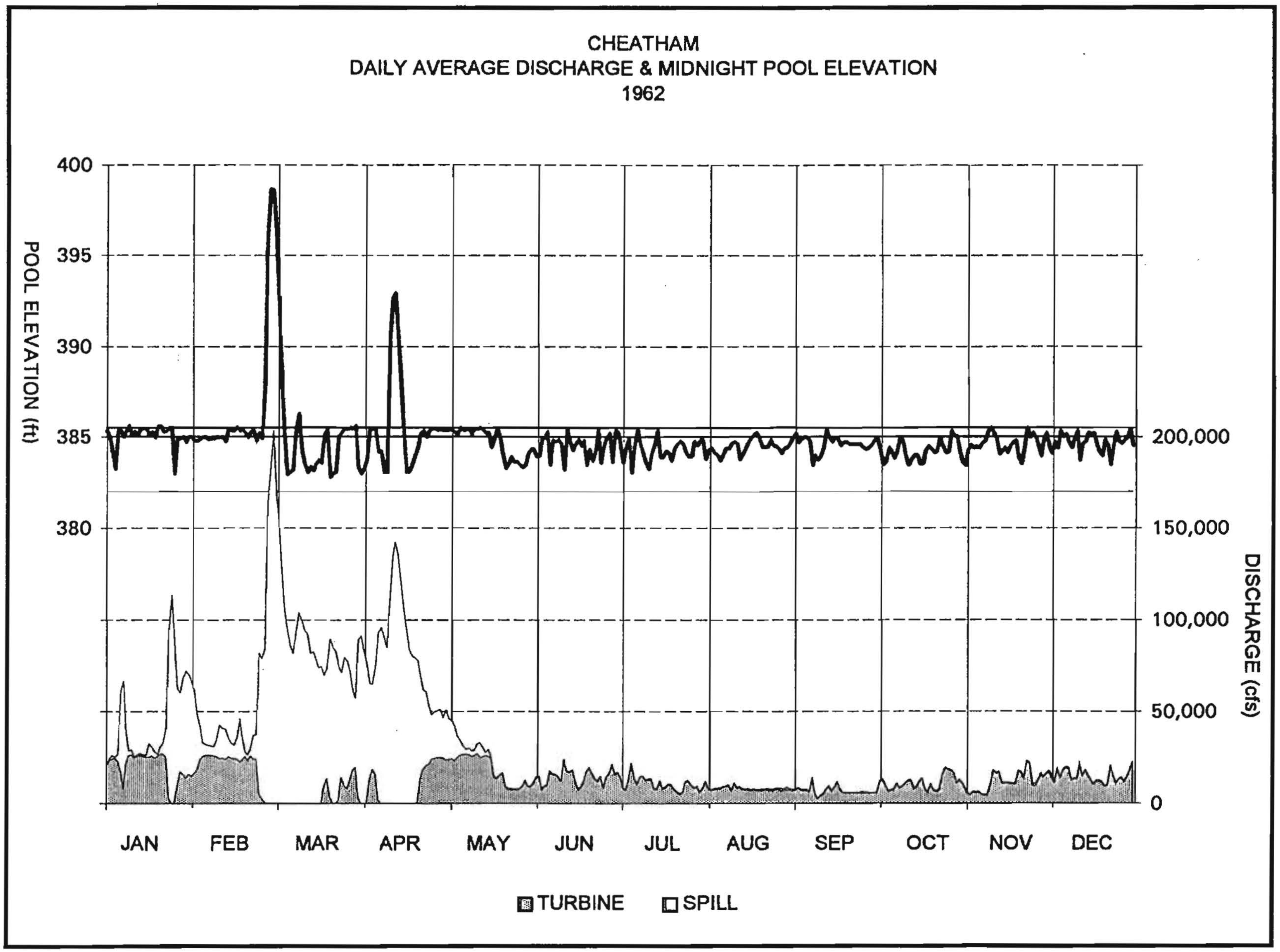
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1962
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
200,000
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
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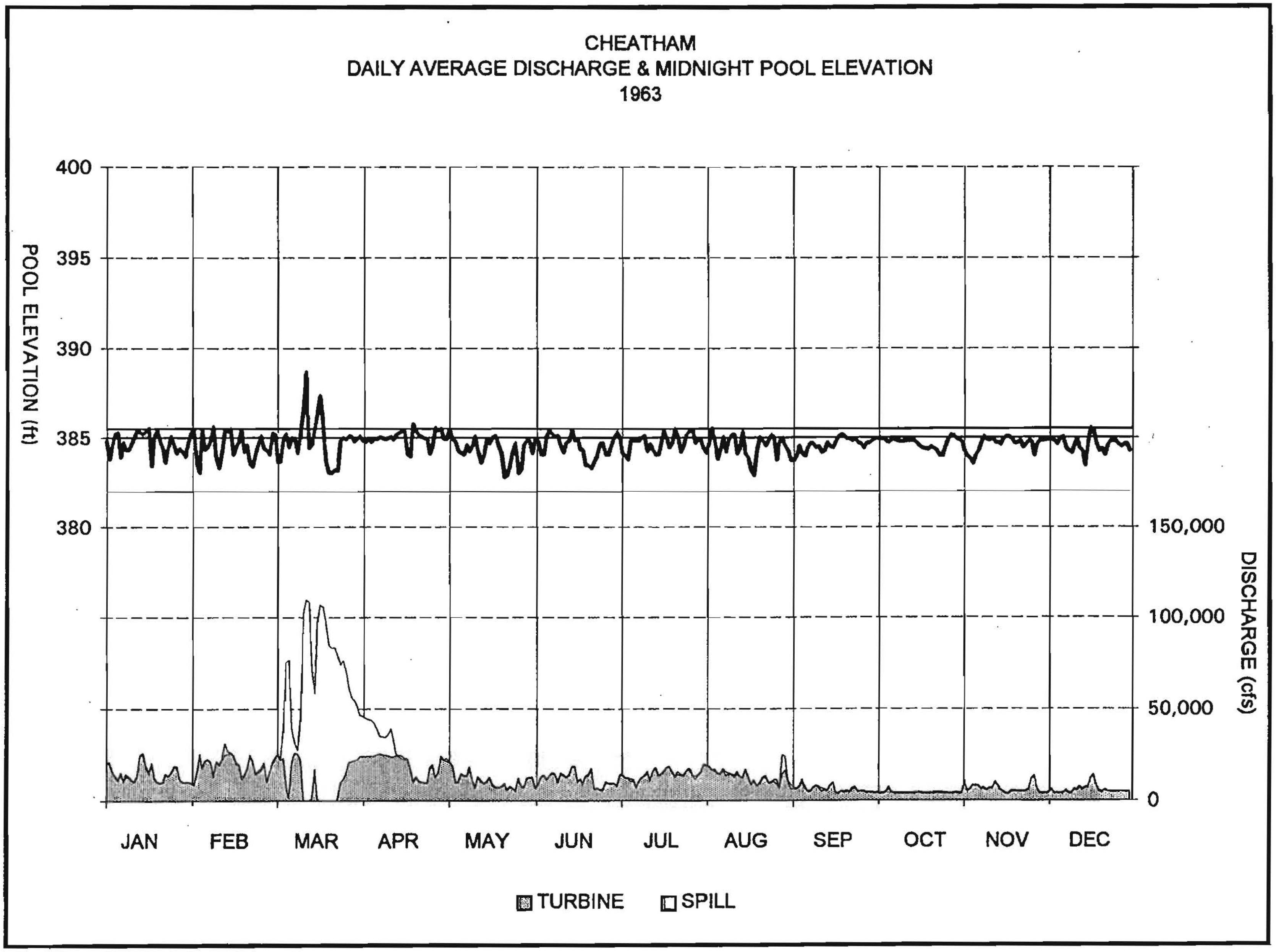
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1963
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
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AUG
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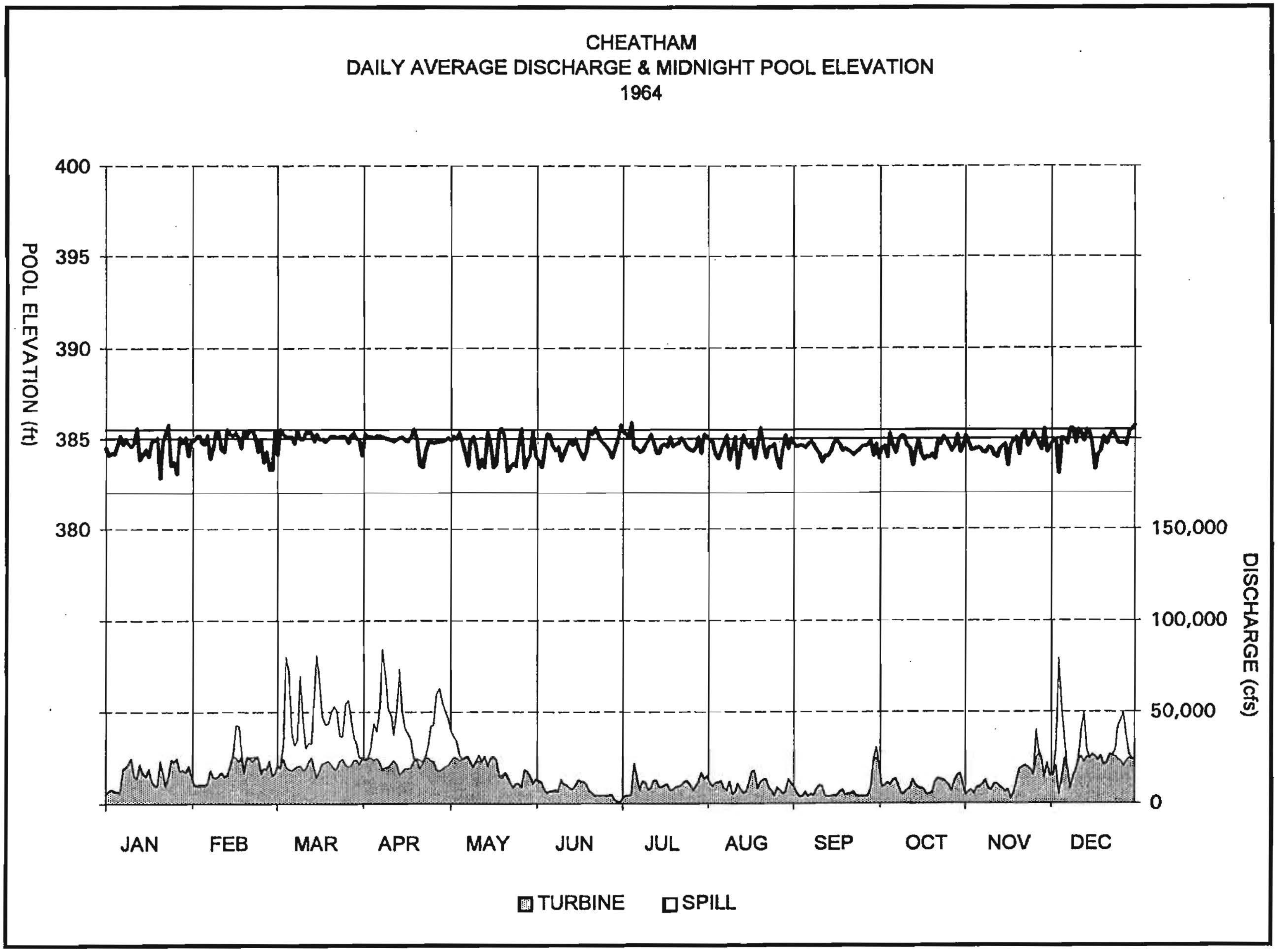
NOV
DEC
TURBINE
SPILL

PLATE D-7


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1964
400
395
390
385
380
POOL ELEVATION (ft)
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
MAR
APR
MAY
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JUL
AUG
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OCT
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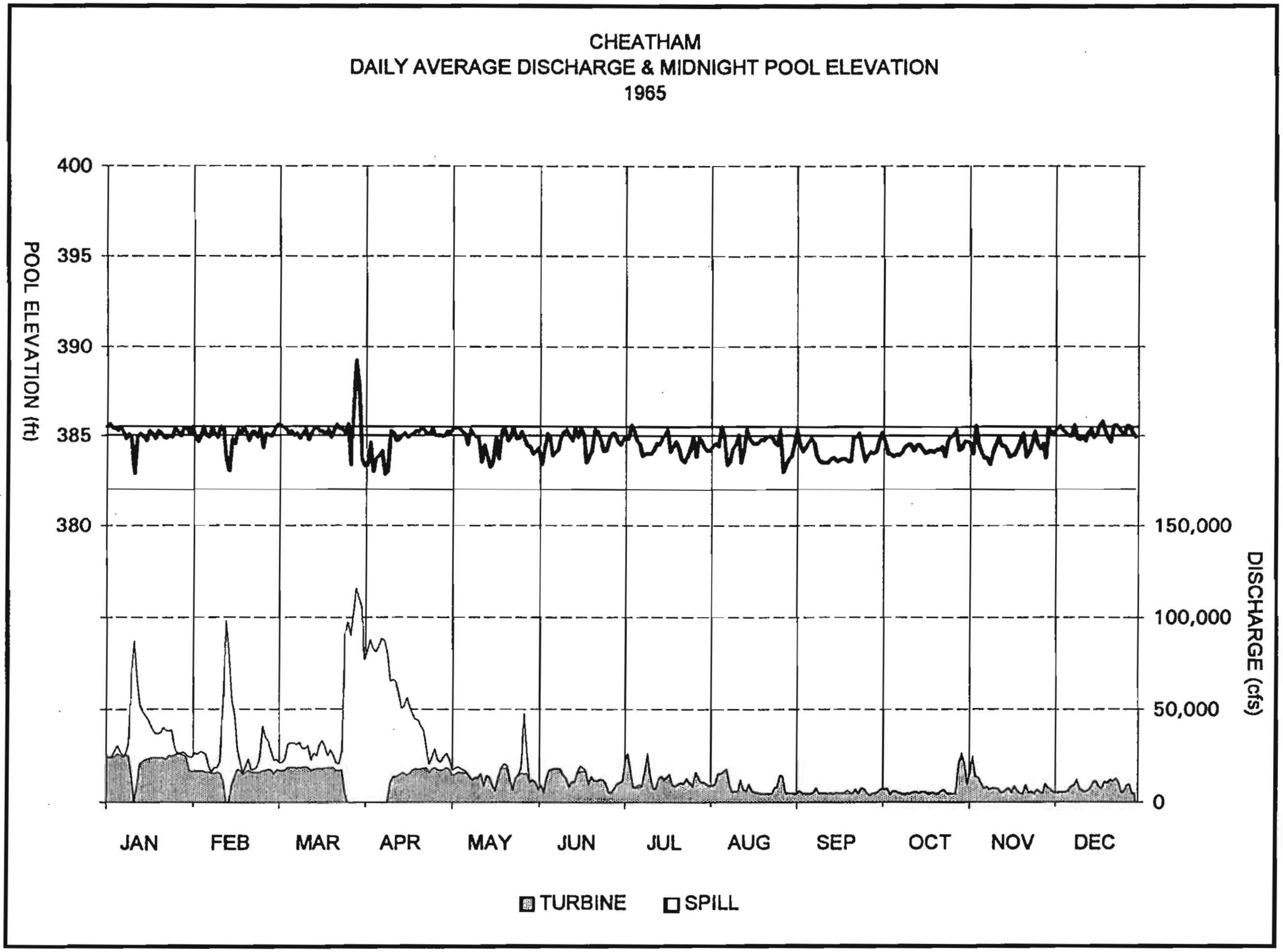
DEC
TURBINE
SPILL



CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1965
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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JAN
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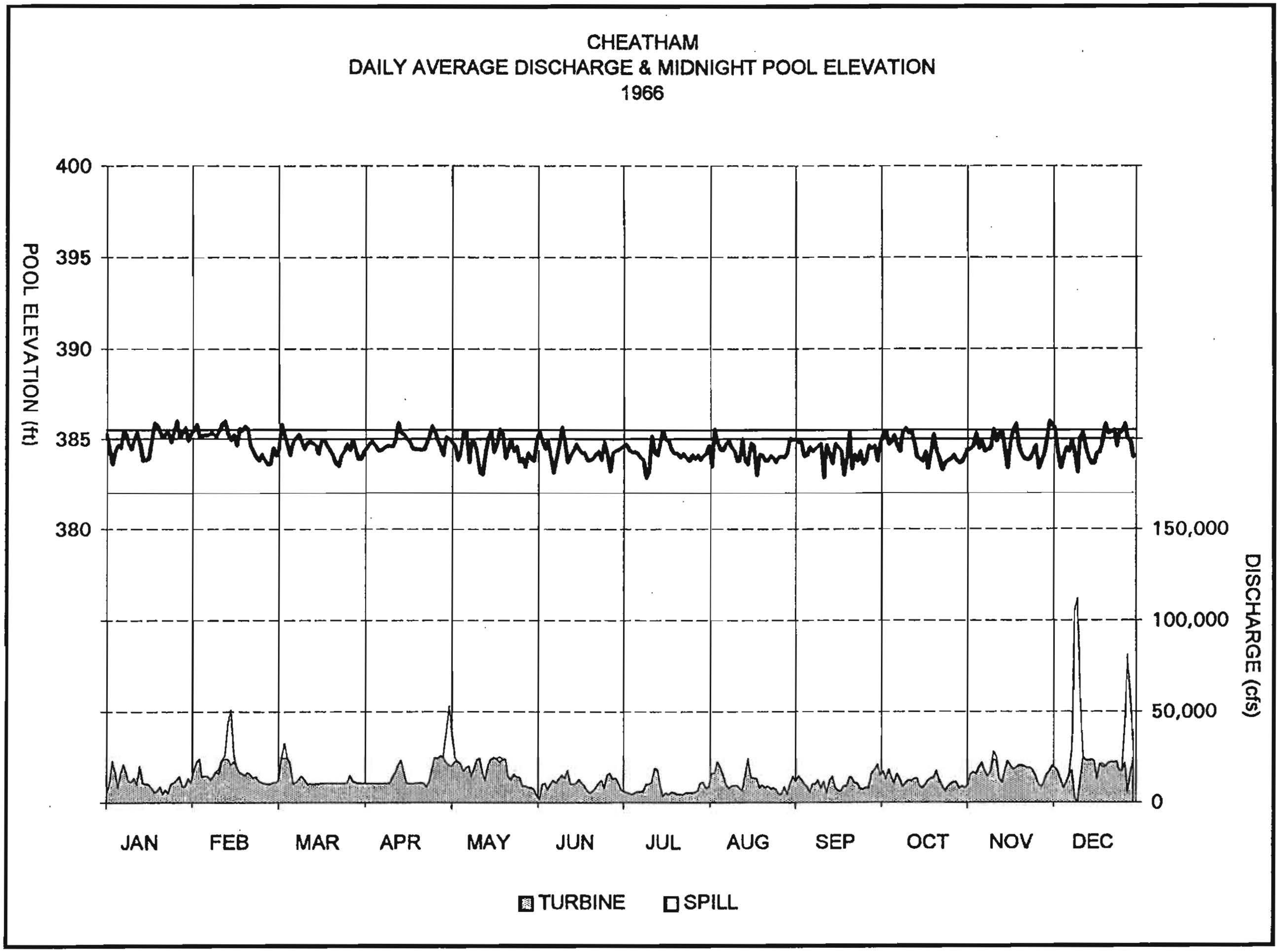
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1966
POOL ELEVATION (ft)
400
395
390
385
380
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
MAR
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JUL
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SEP
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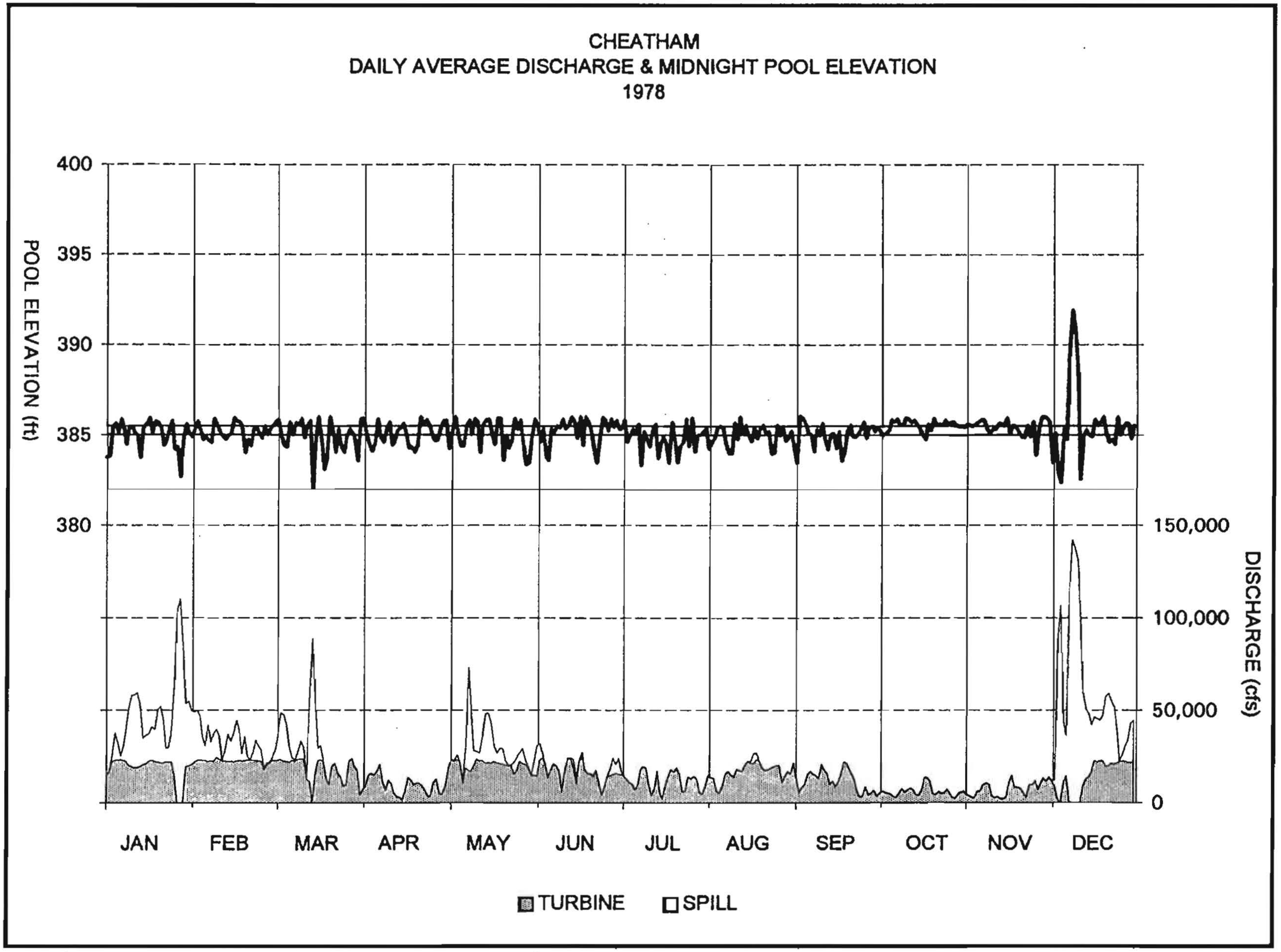
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1978
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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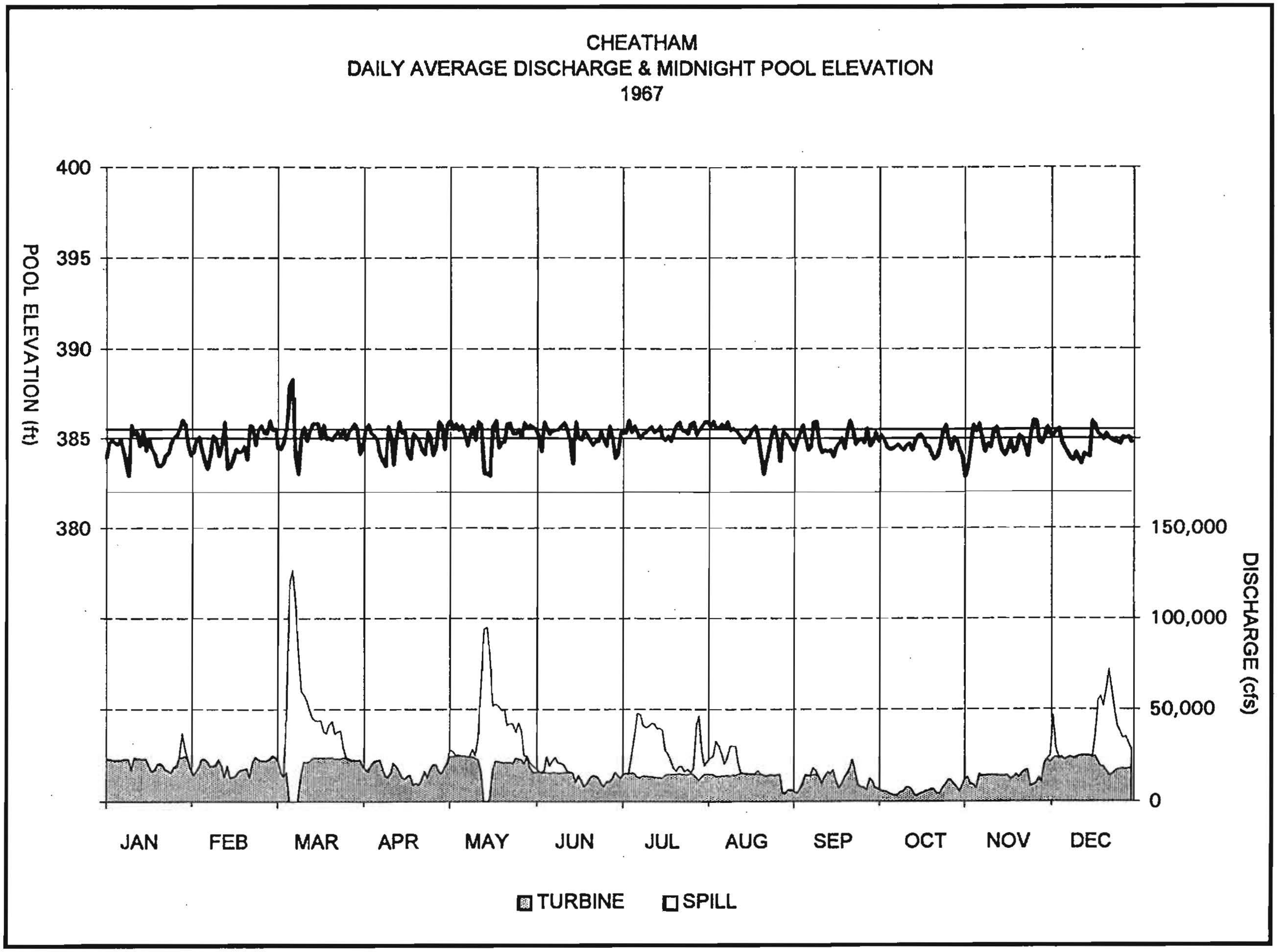

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1967
POOL ELEVATION (ft)
400
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390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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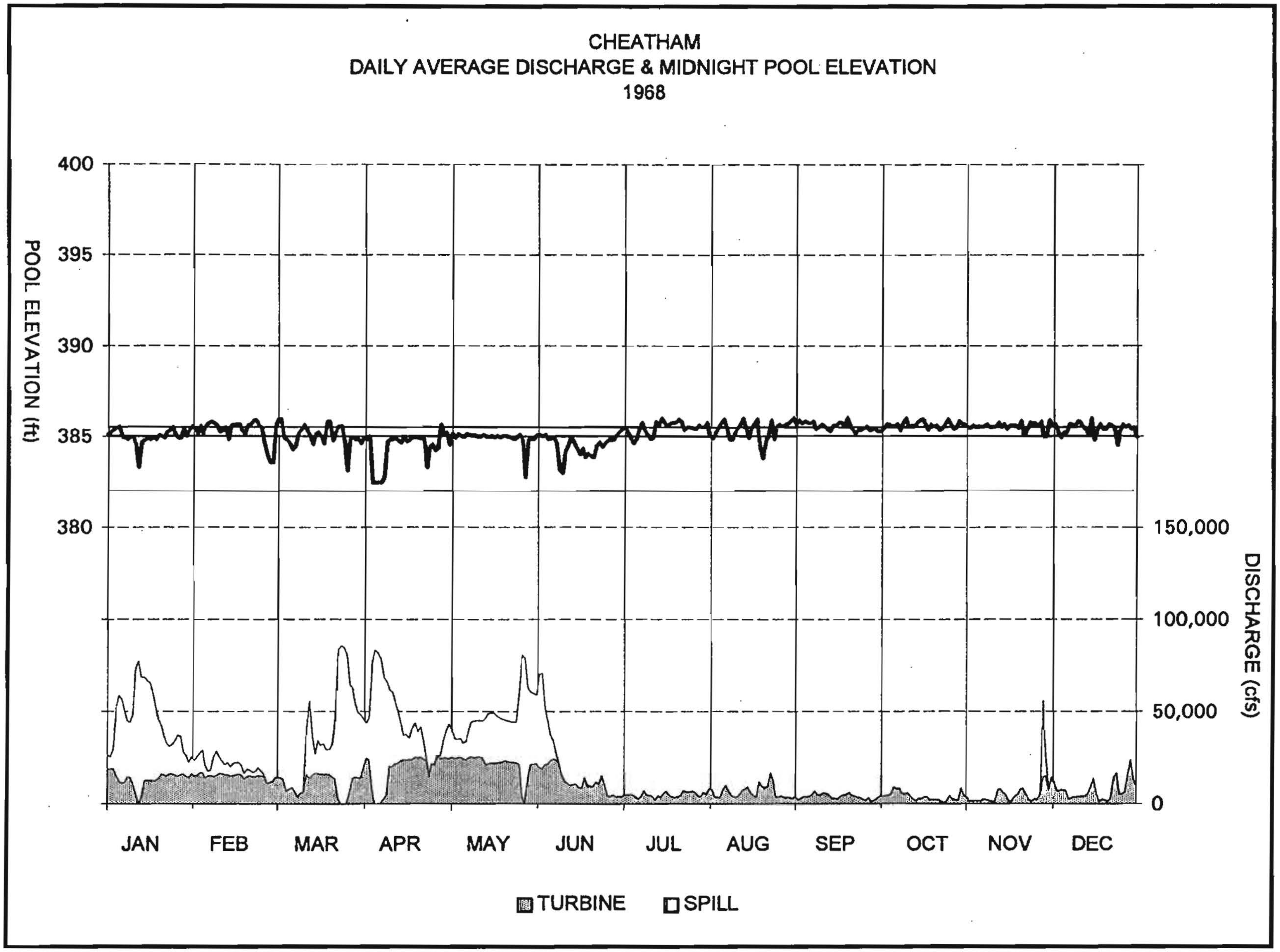
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1968
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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DEC
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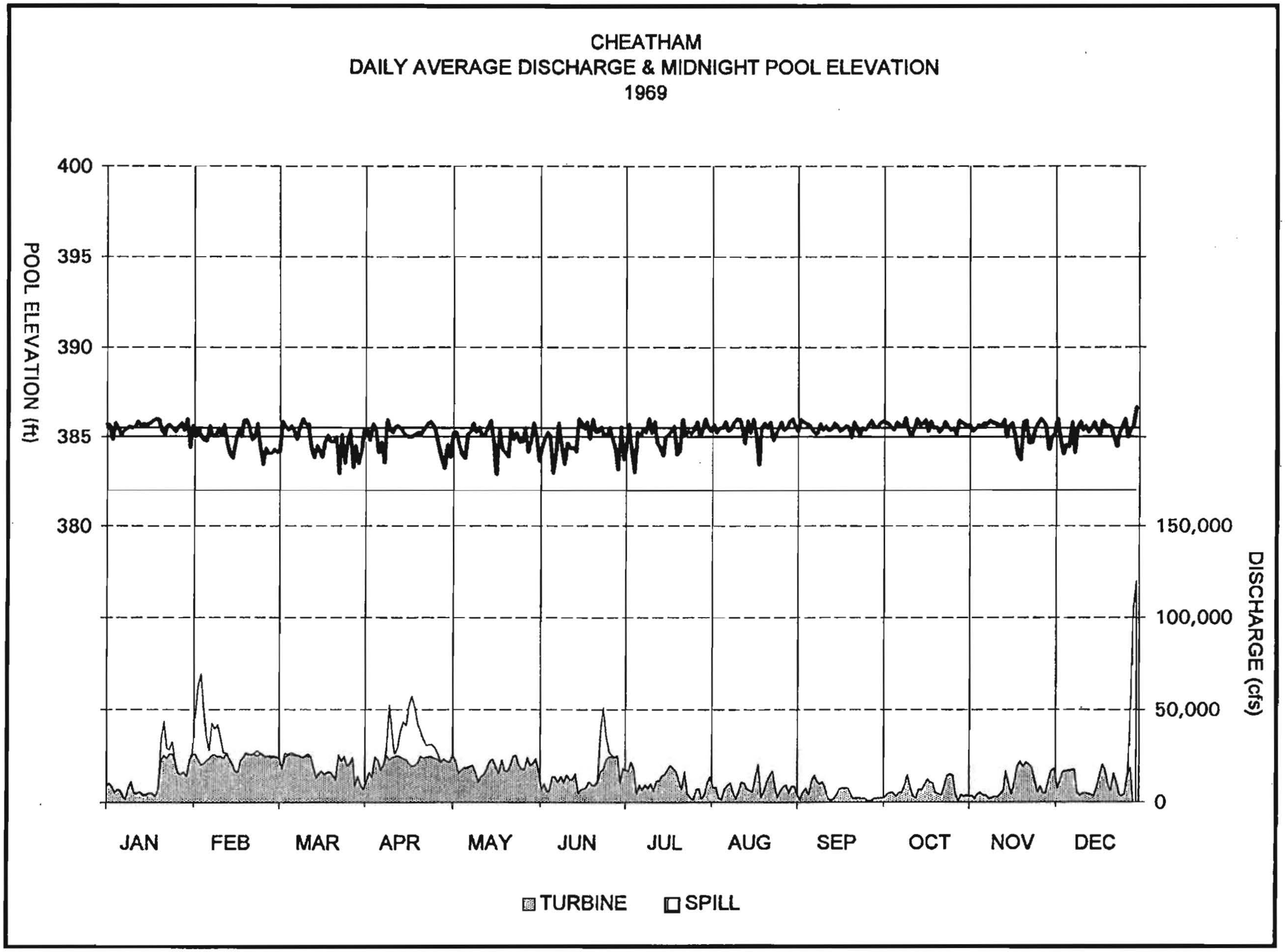
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1969
POOL ELEVATION (ft)
400
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390
385
380
DISCHARGE (cfs)
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100,000
50,000
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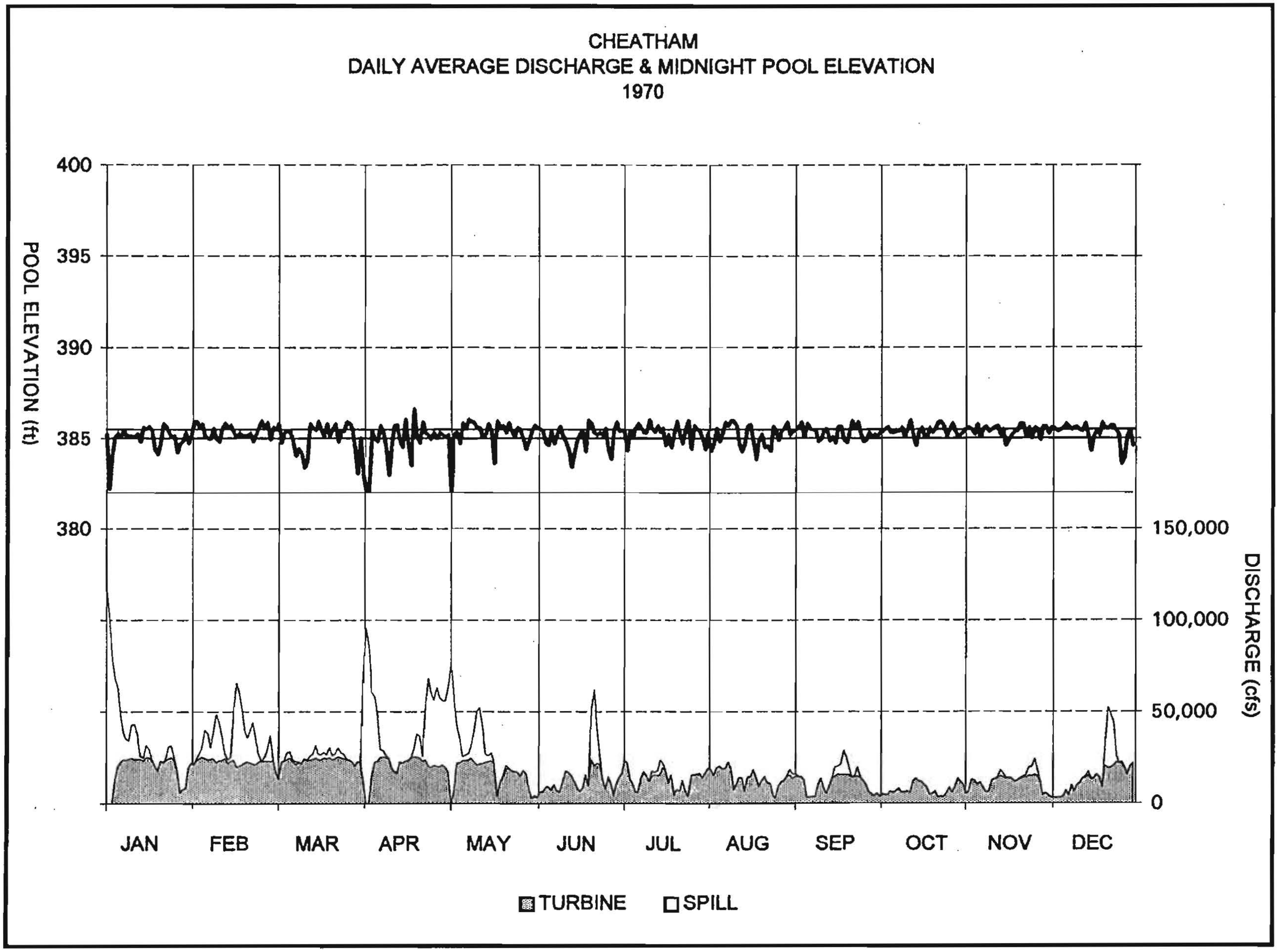
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1970
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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MAR
APR
MAY
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JUL
AUG
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OCT
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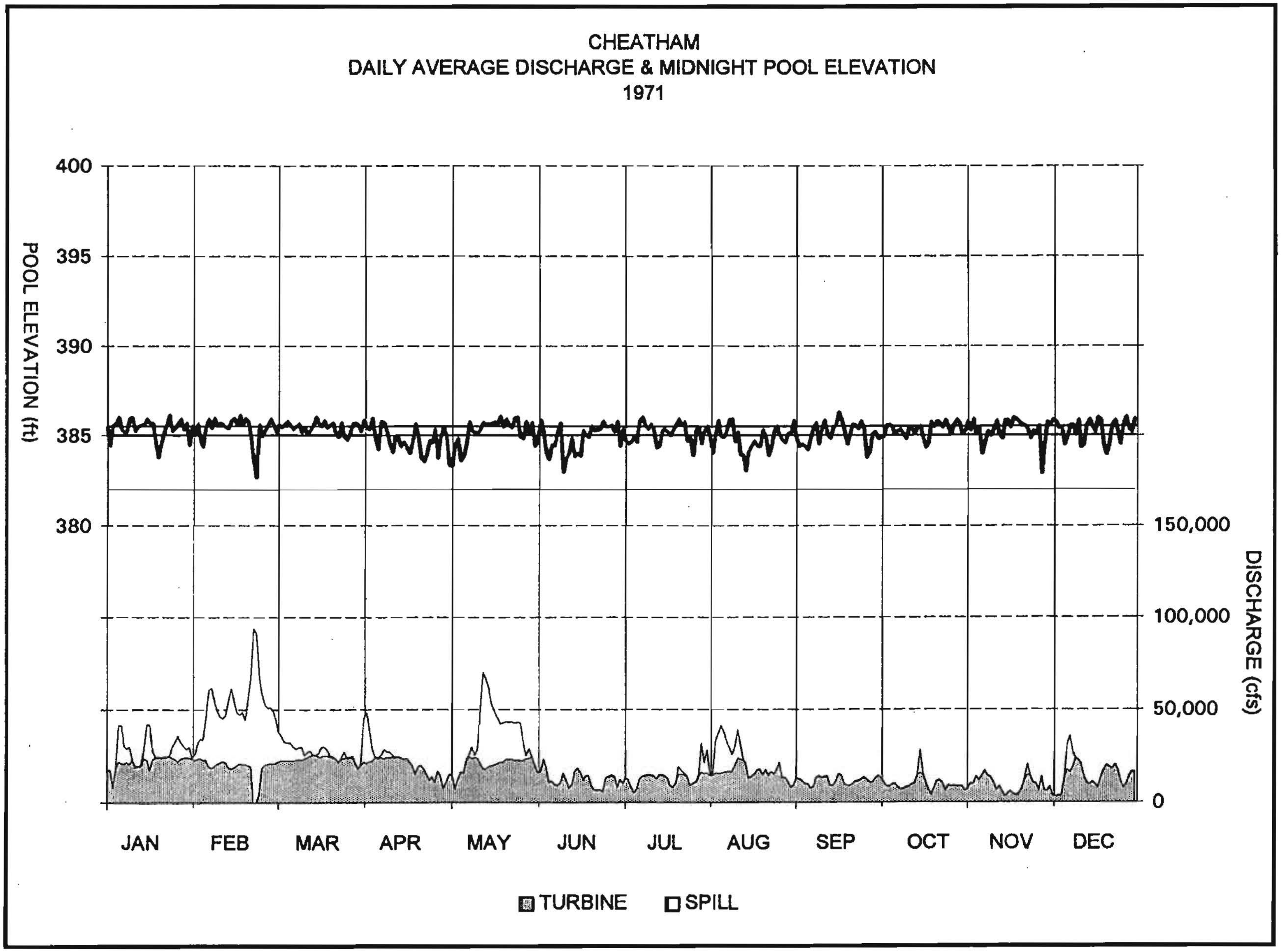
DEC
TURBINE
SPILL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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1971
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
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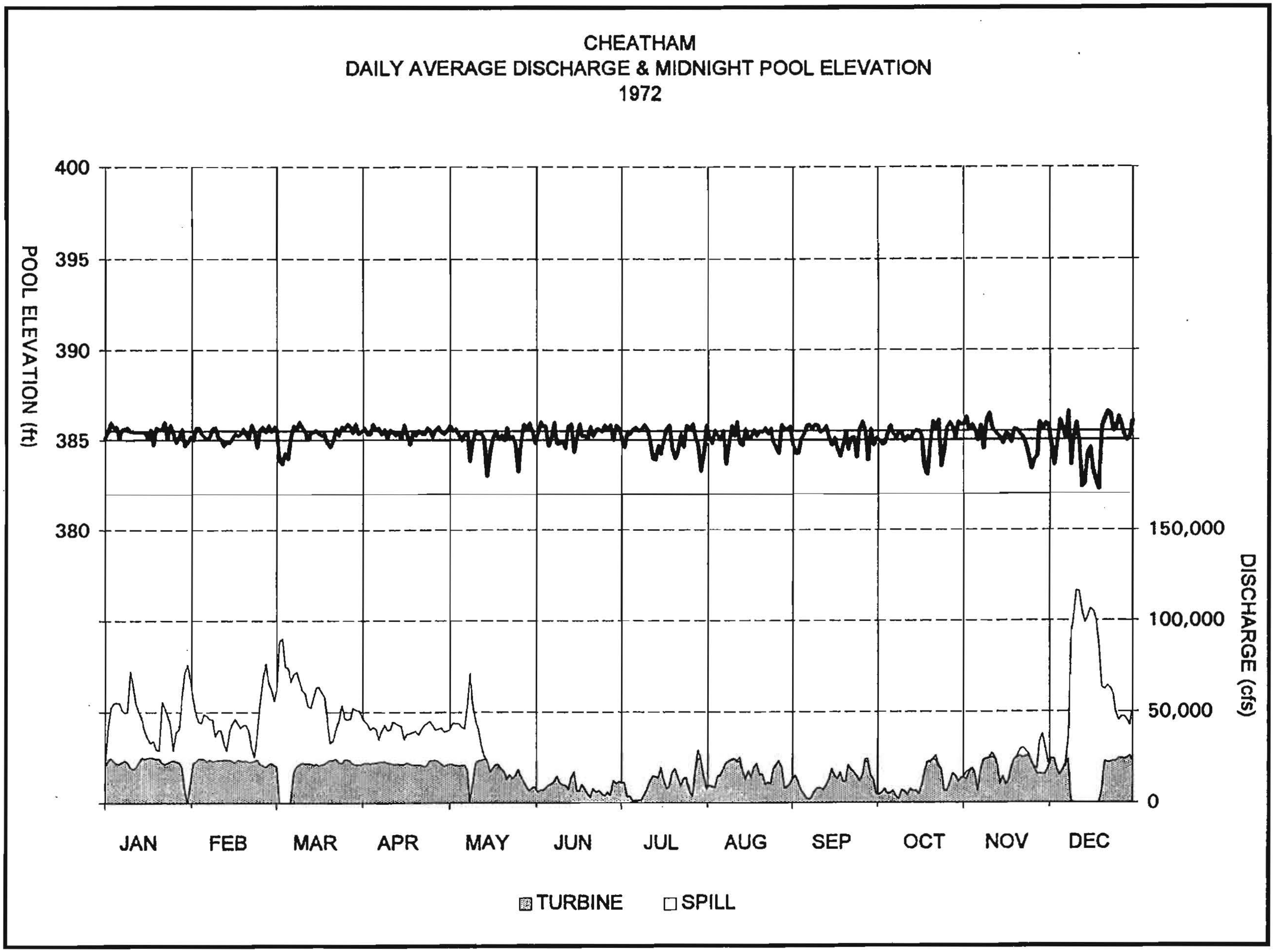
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1972
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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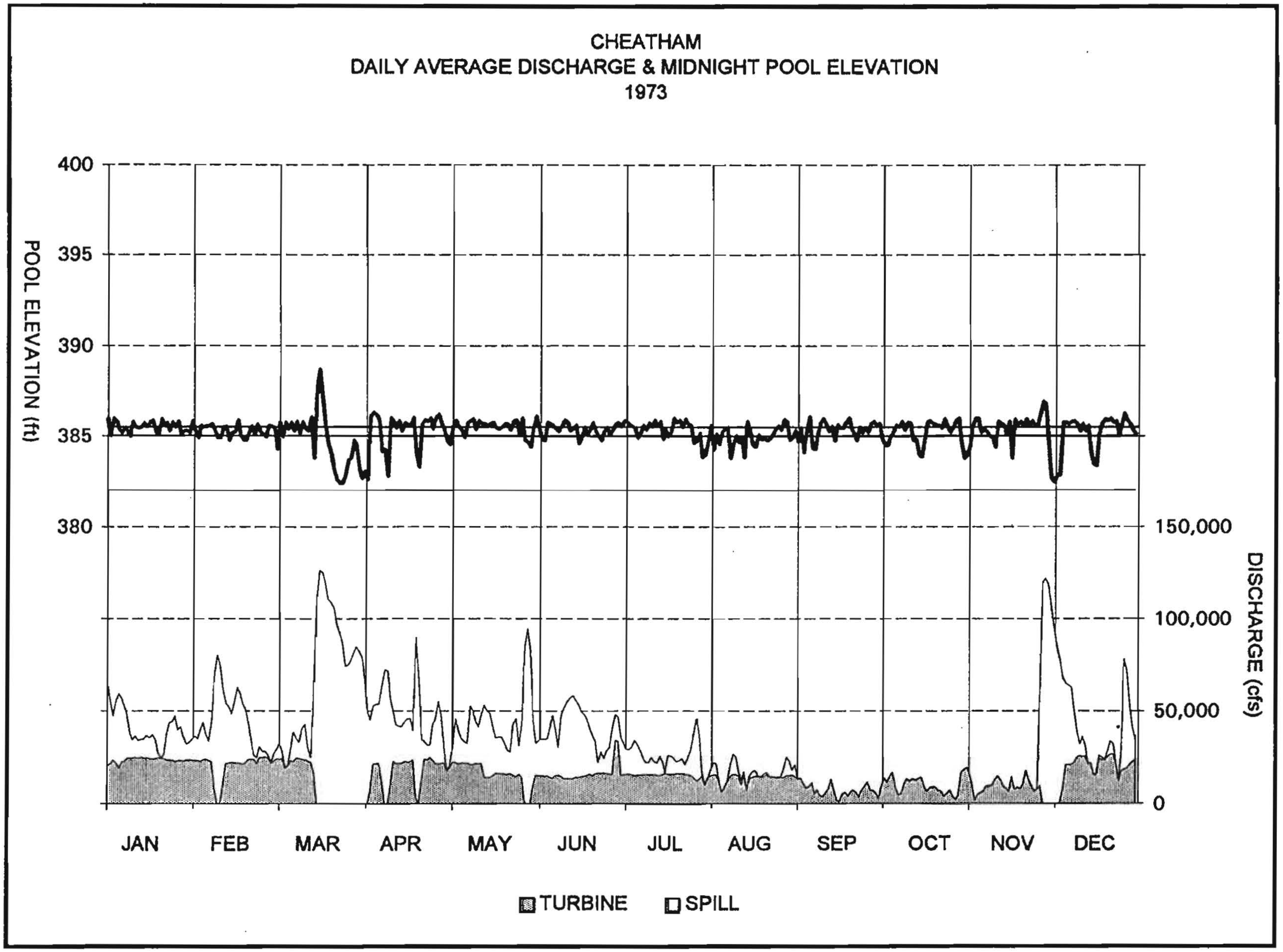
CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1973
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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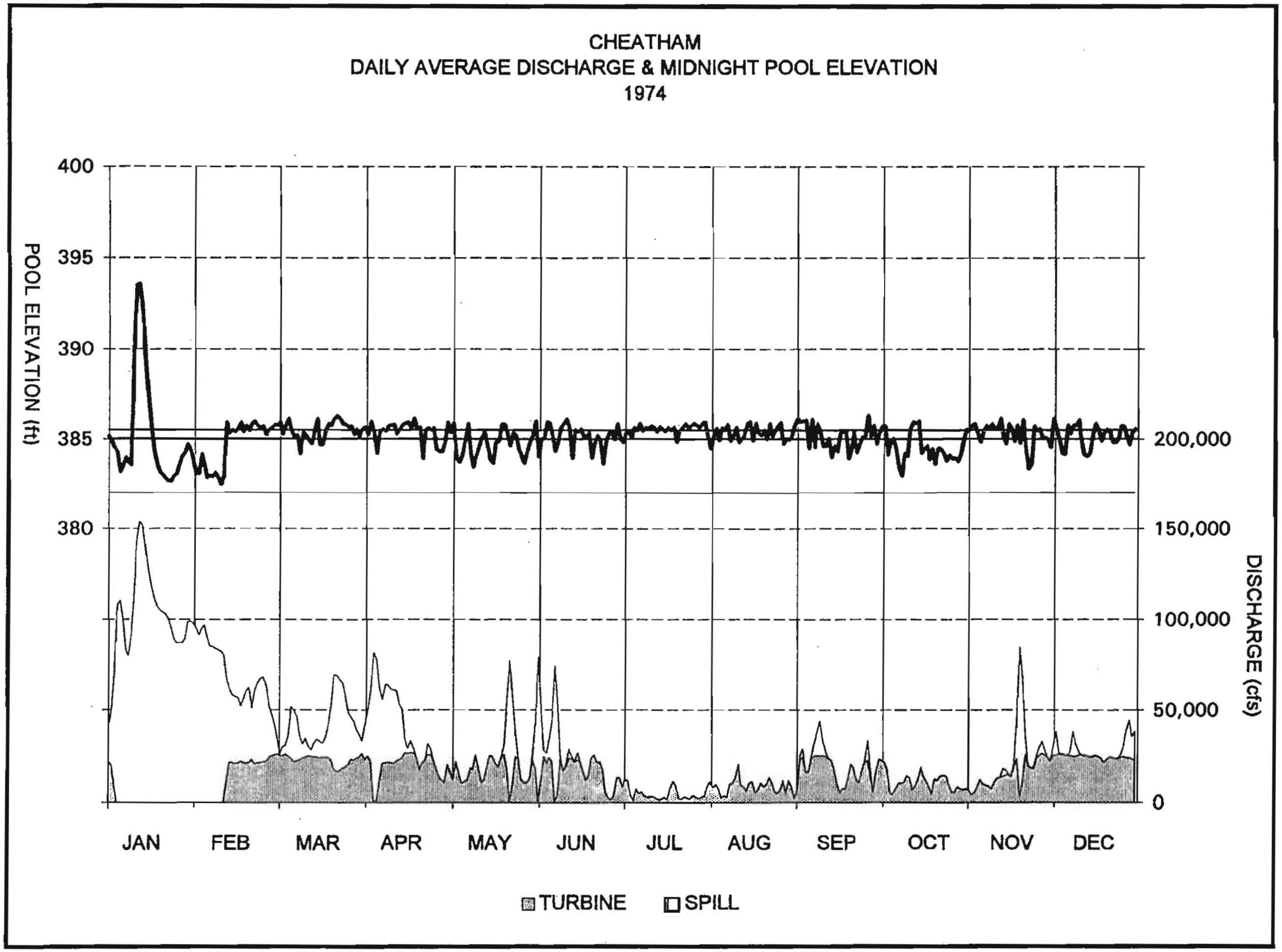
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1974
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
200,000
150,000
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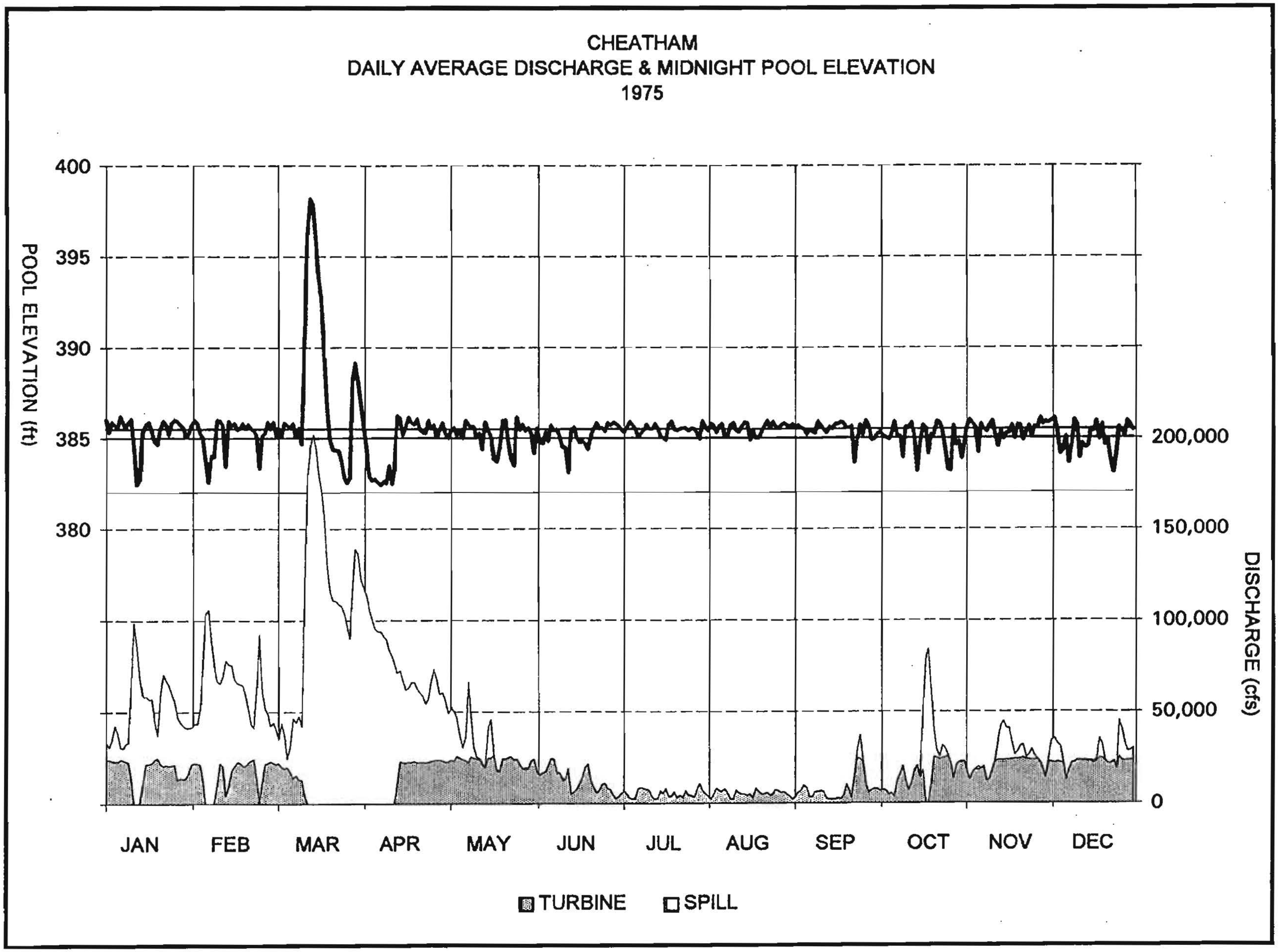
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DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1975
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
200,000
150,000
100,000
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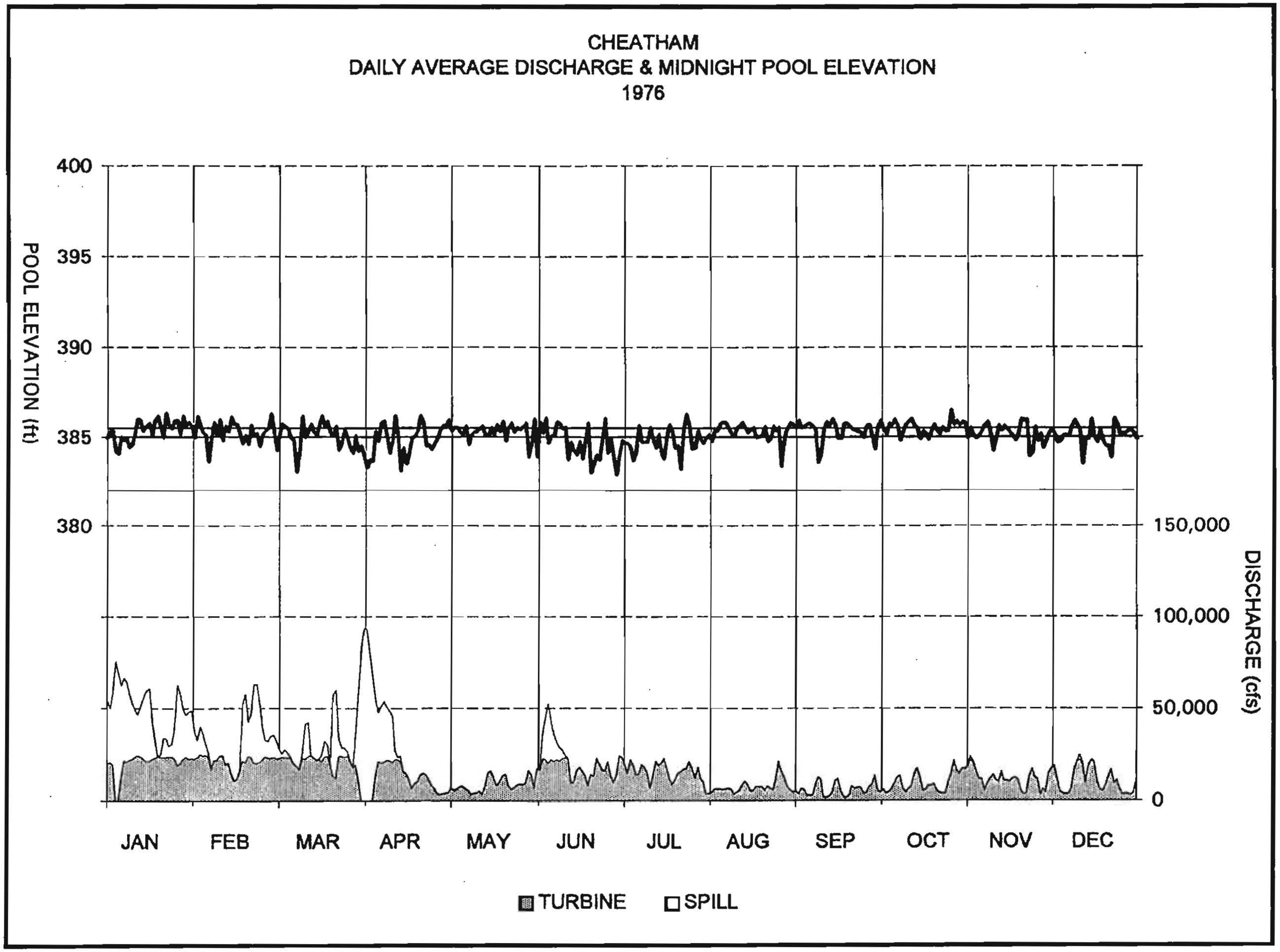
CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1976
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
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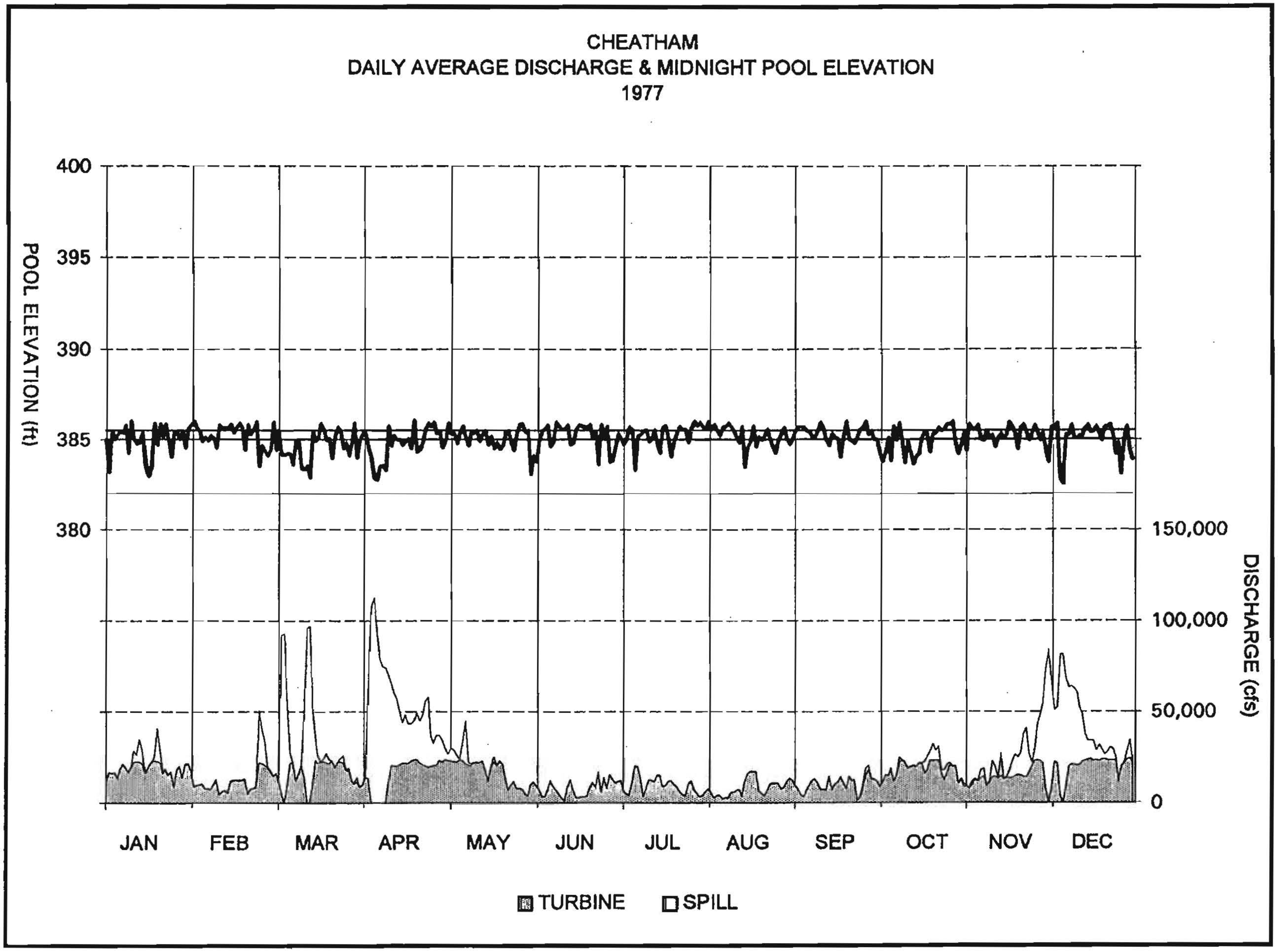

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1977
POOL ELEVATION (ft)
400
395
390
385
380
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
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APR
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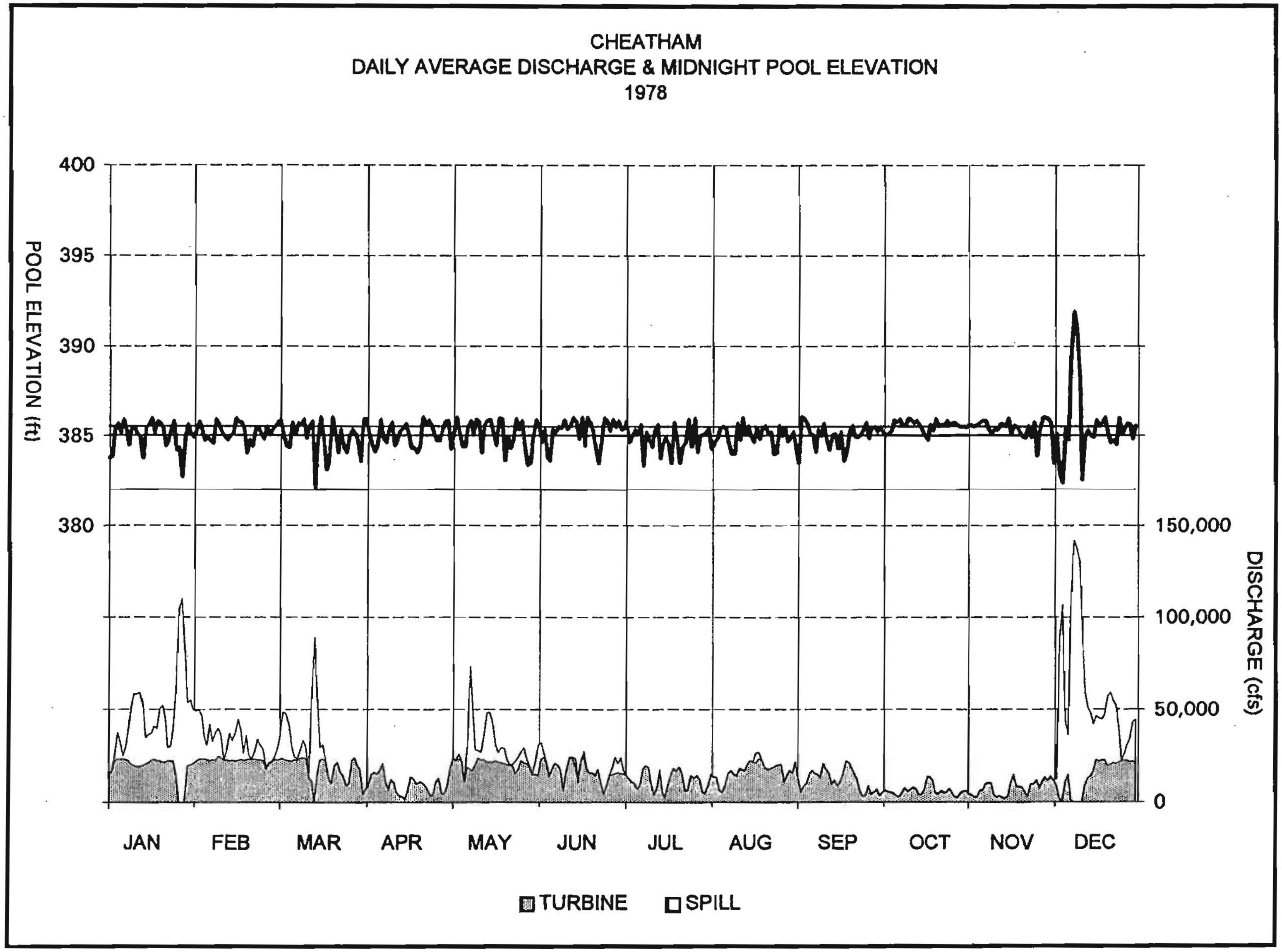
CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1978
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
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APR
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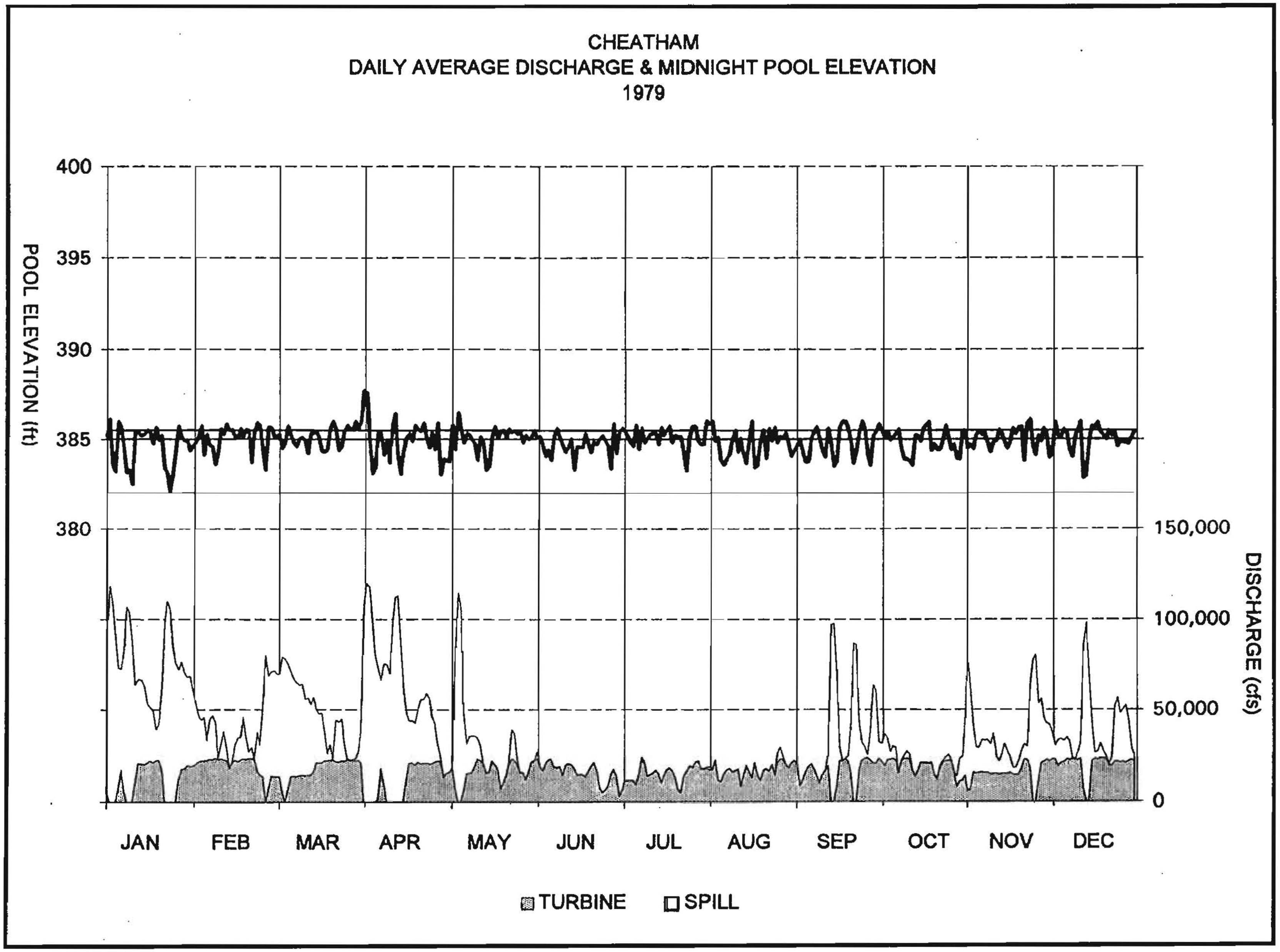
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1979
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
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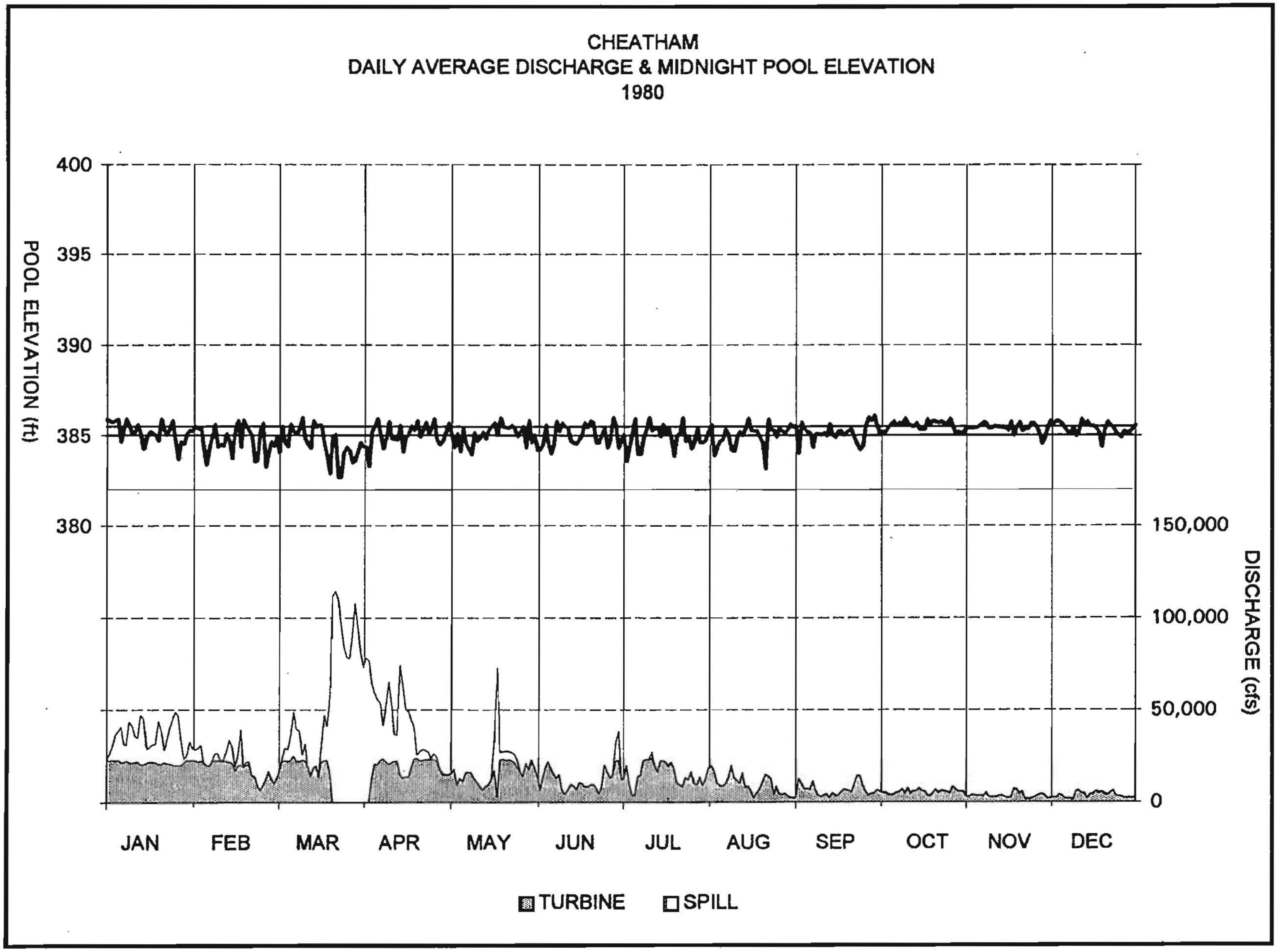
TURBINE
SPILL



CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1980
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
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APR
MAY
JUN
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AUG
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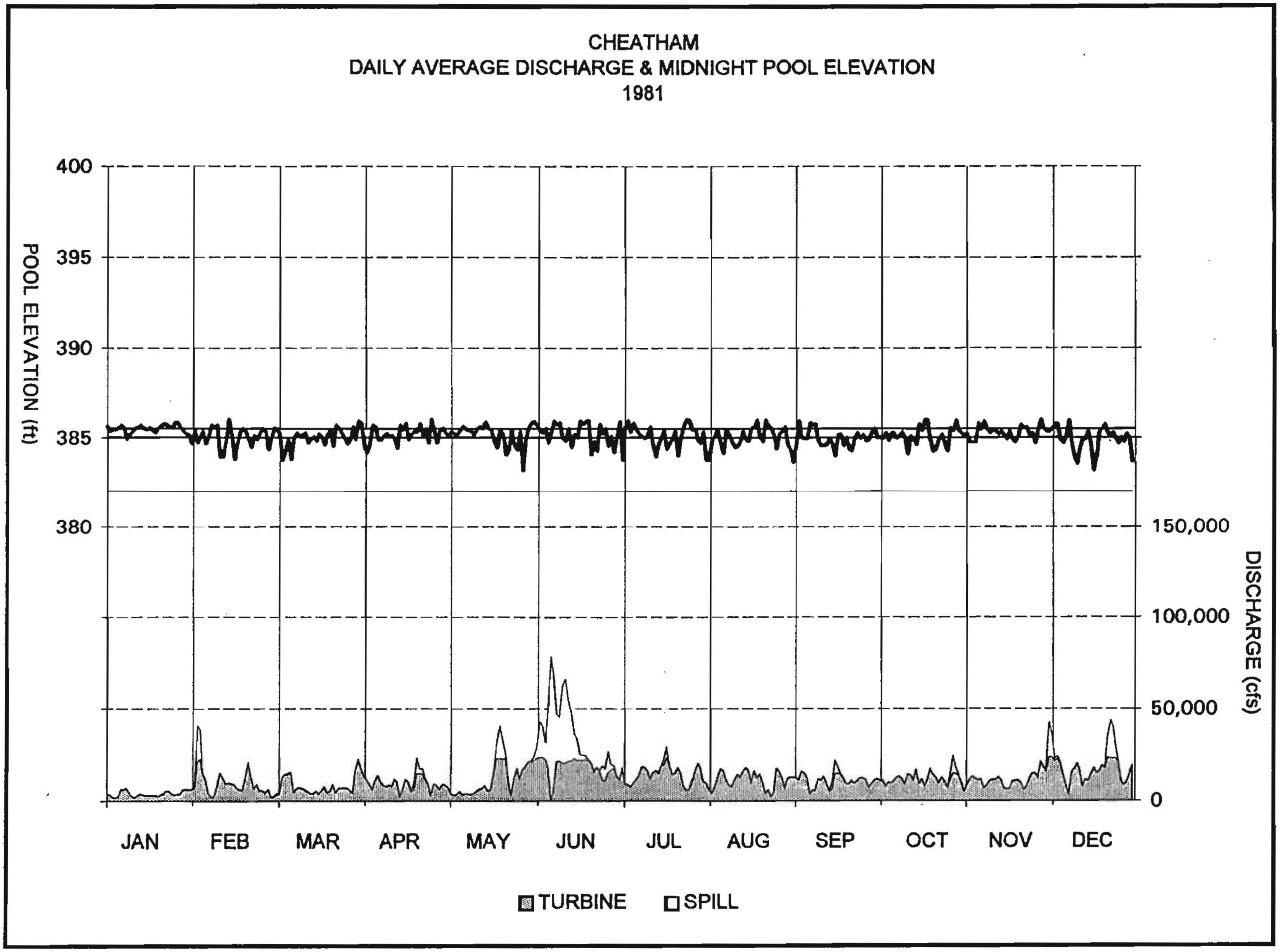
NOV
DEC
TURBINE
SPILL

PLATE D-24


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1981
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
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TURBINE
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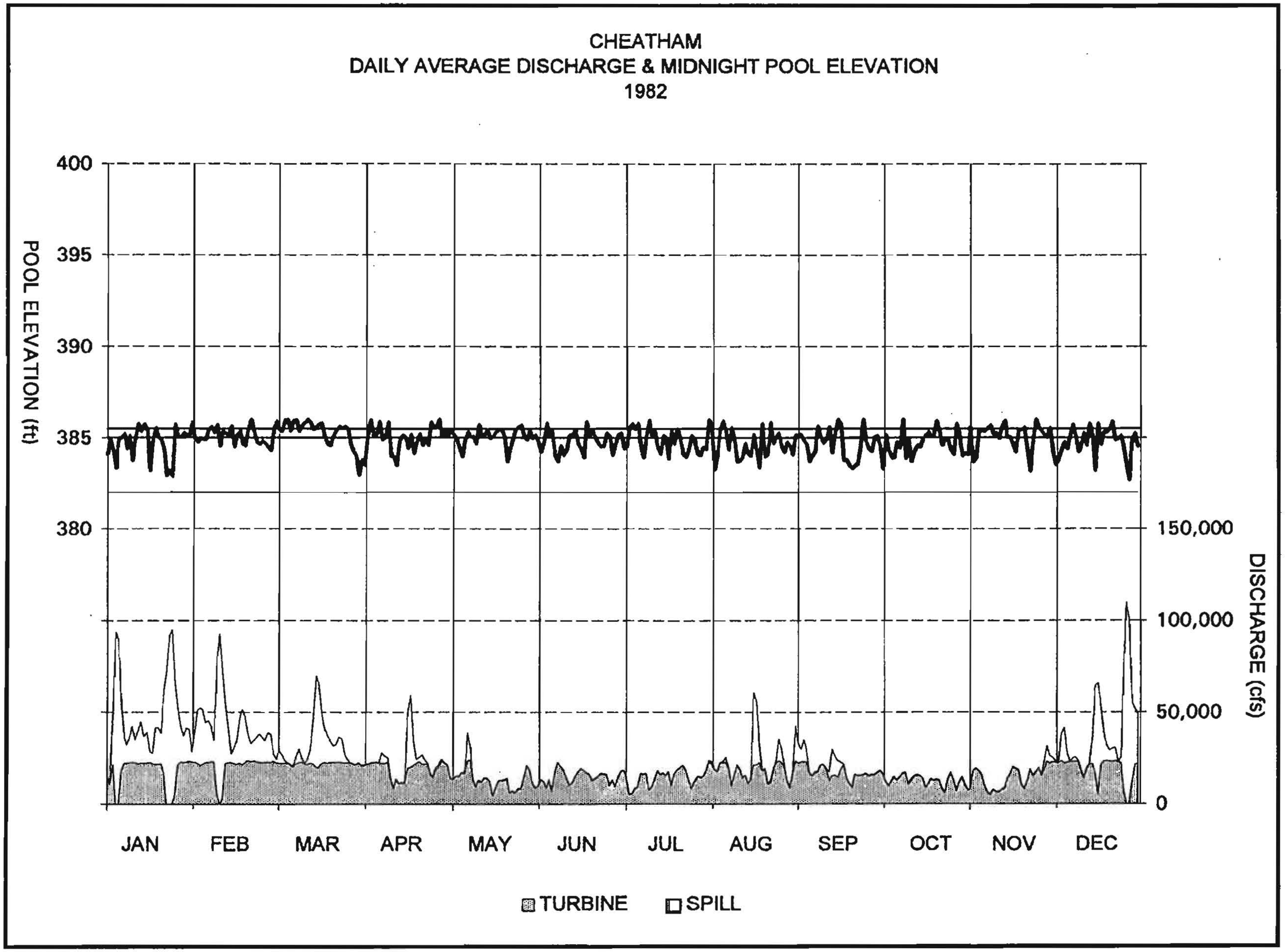
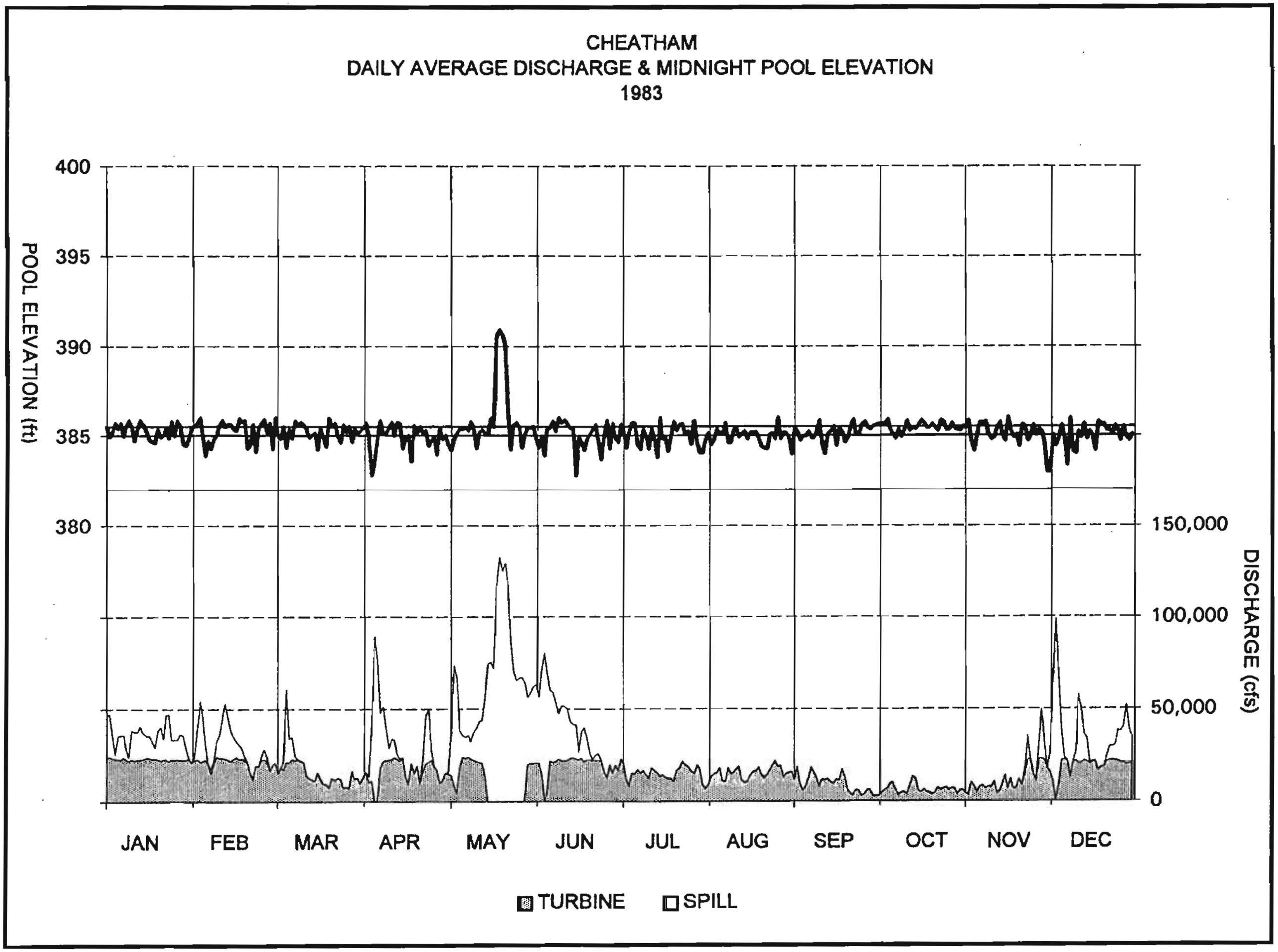


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1982
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1983
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

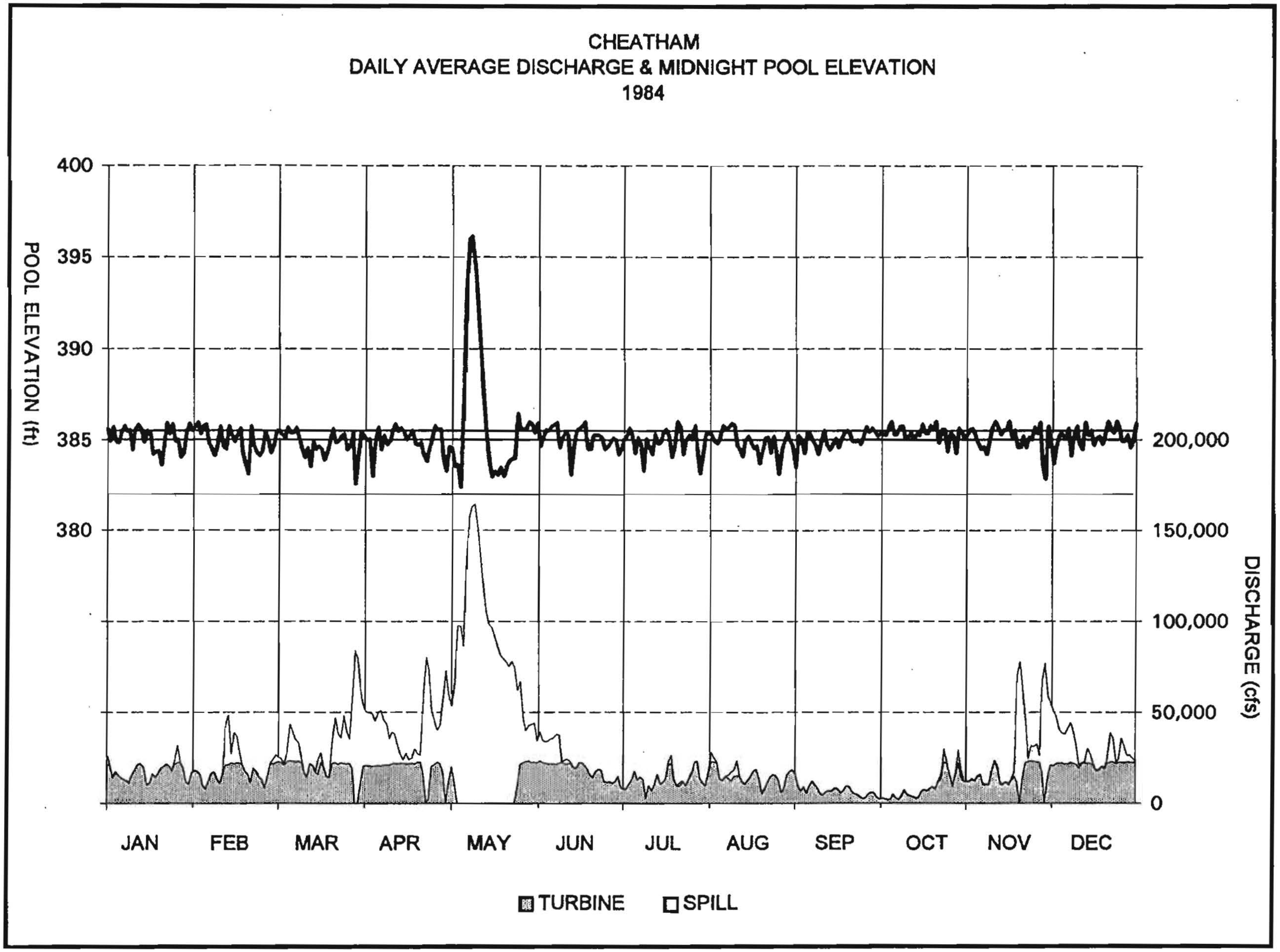
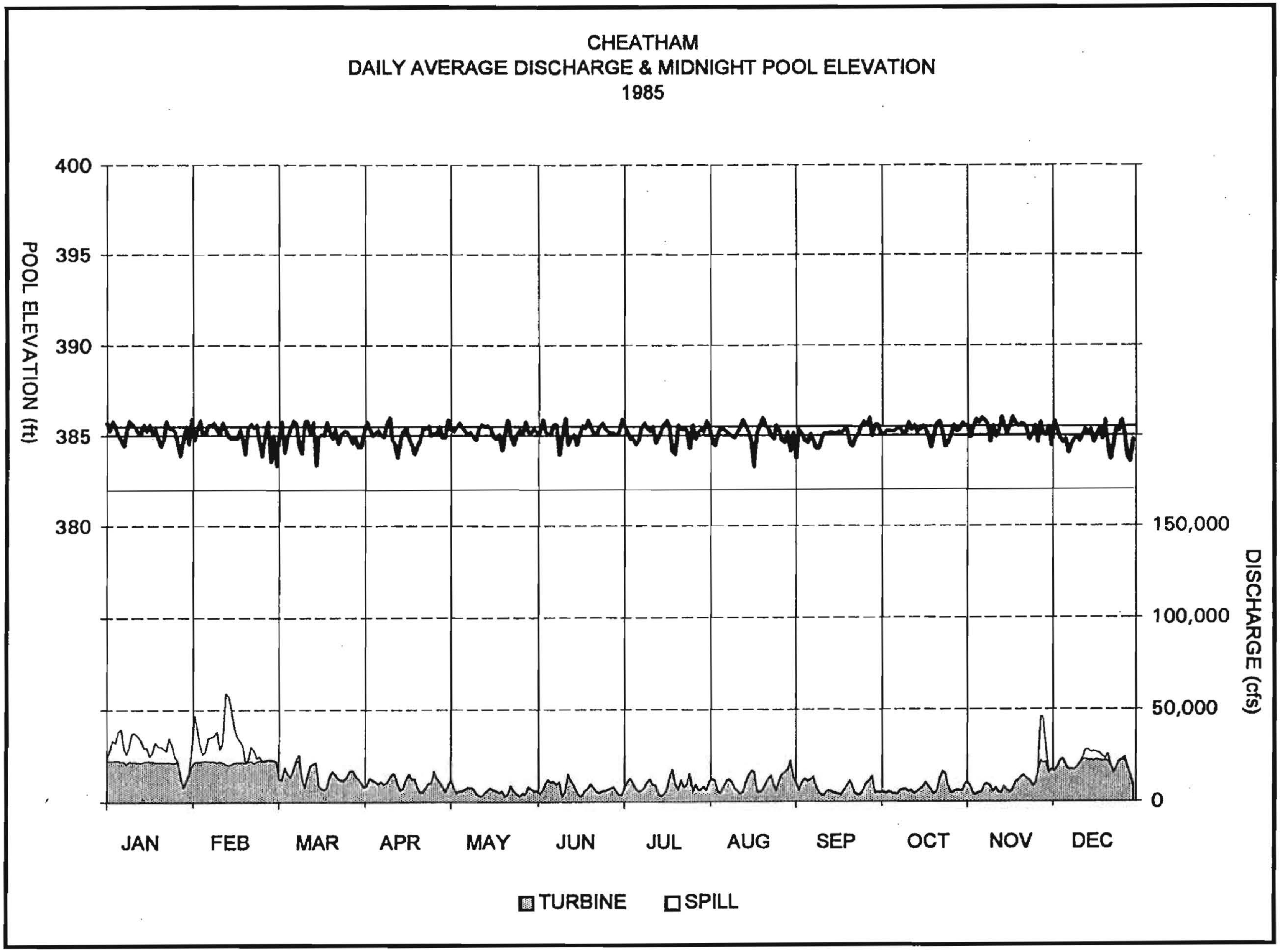
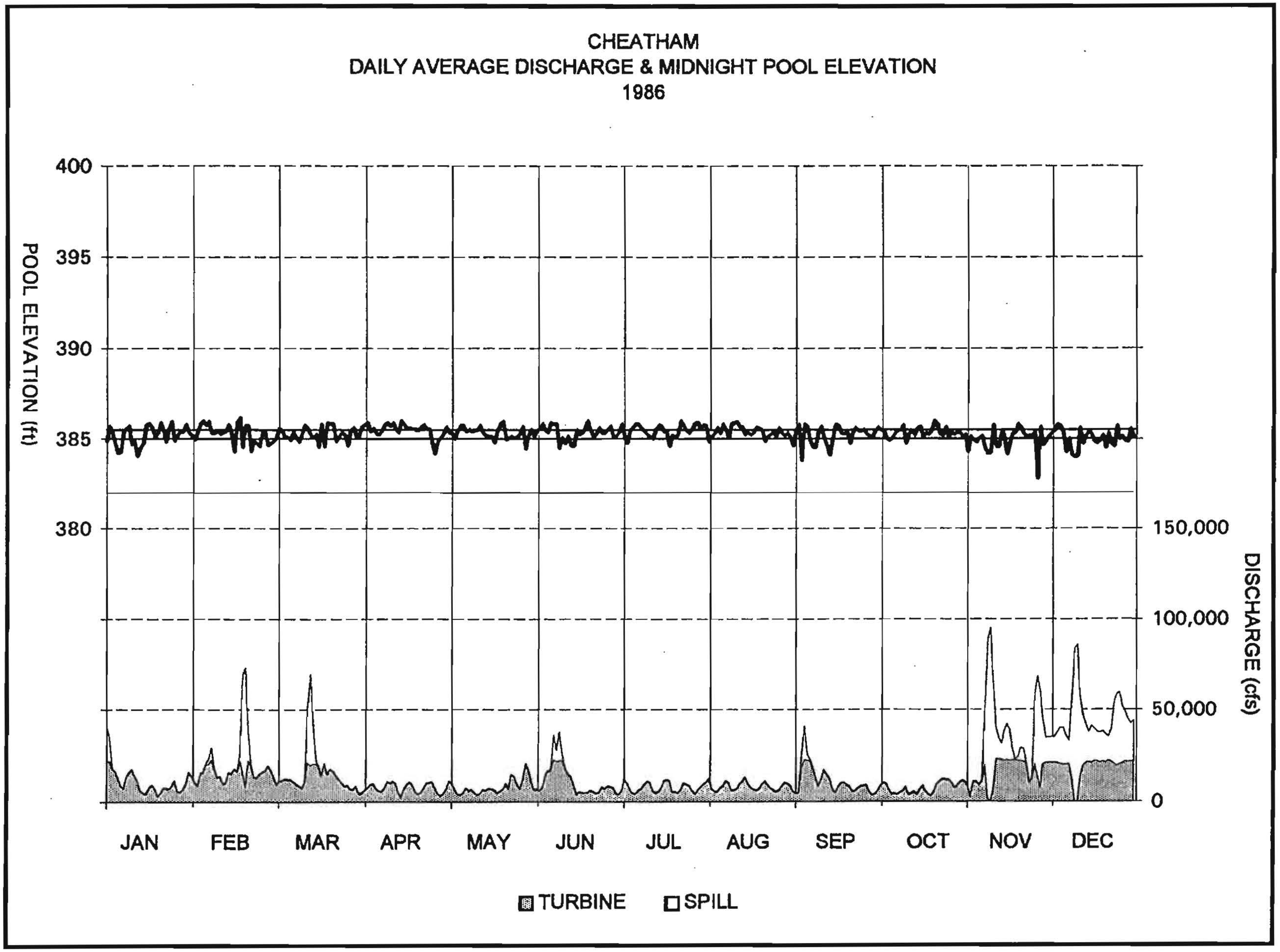
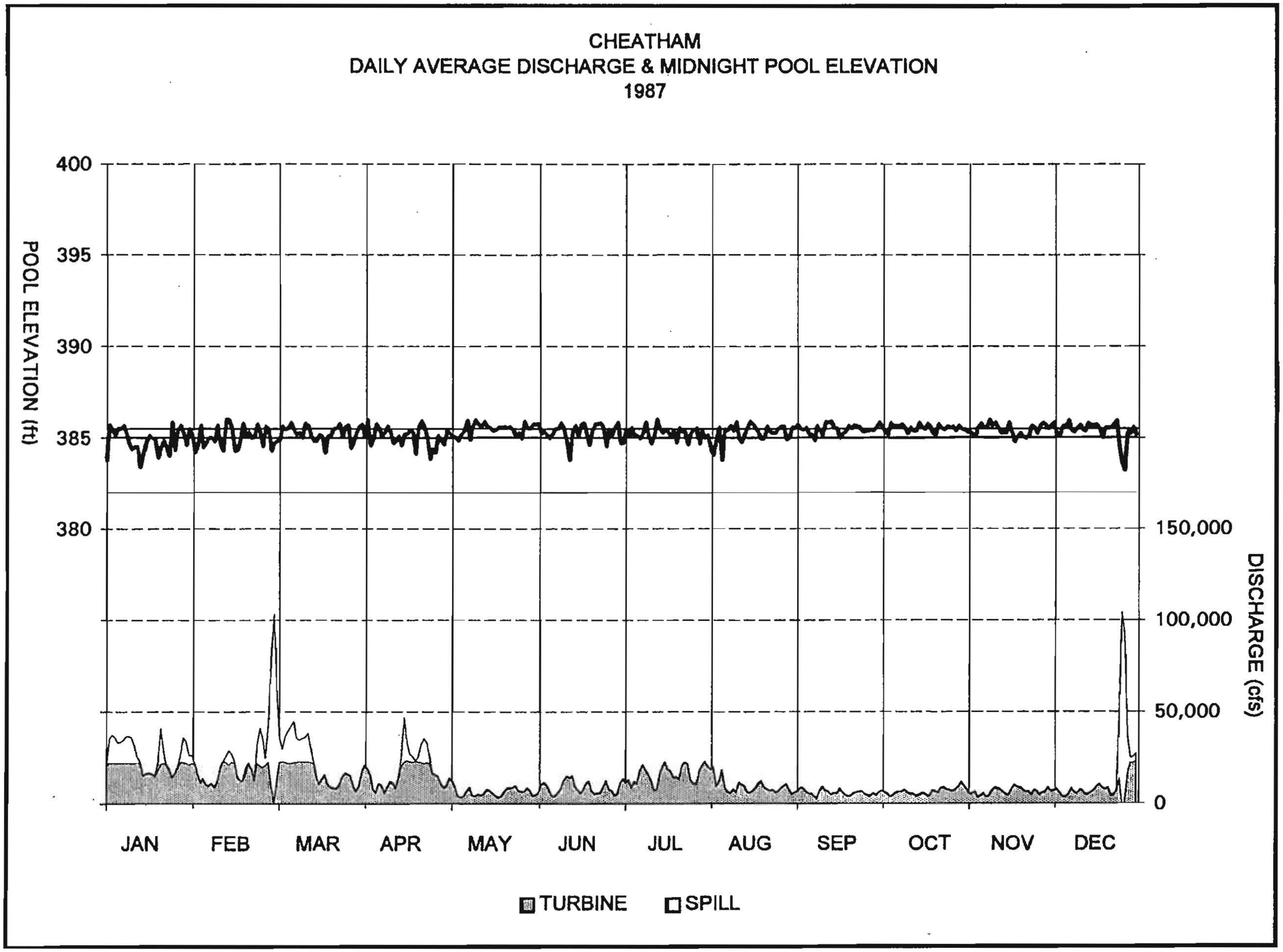

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1984
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
200,000
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

PLATE D-28

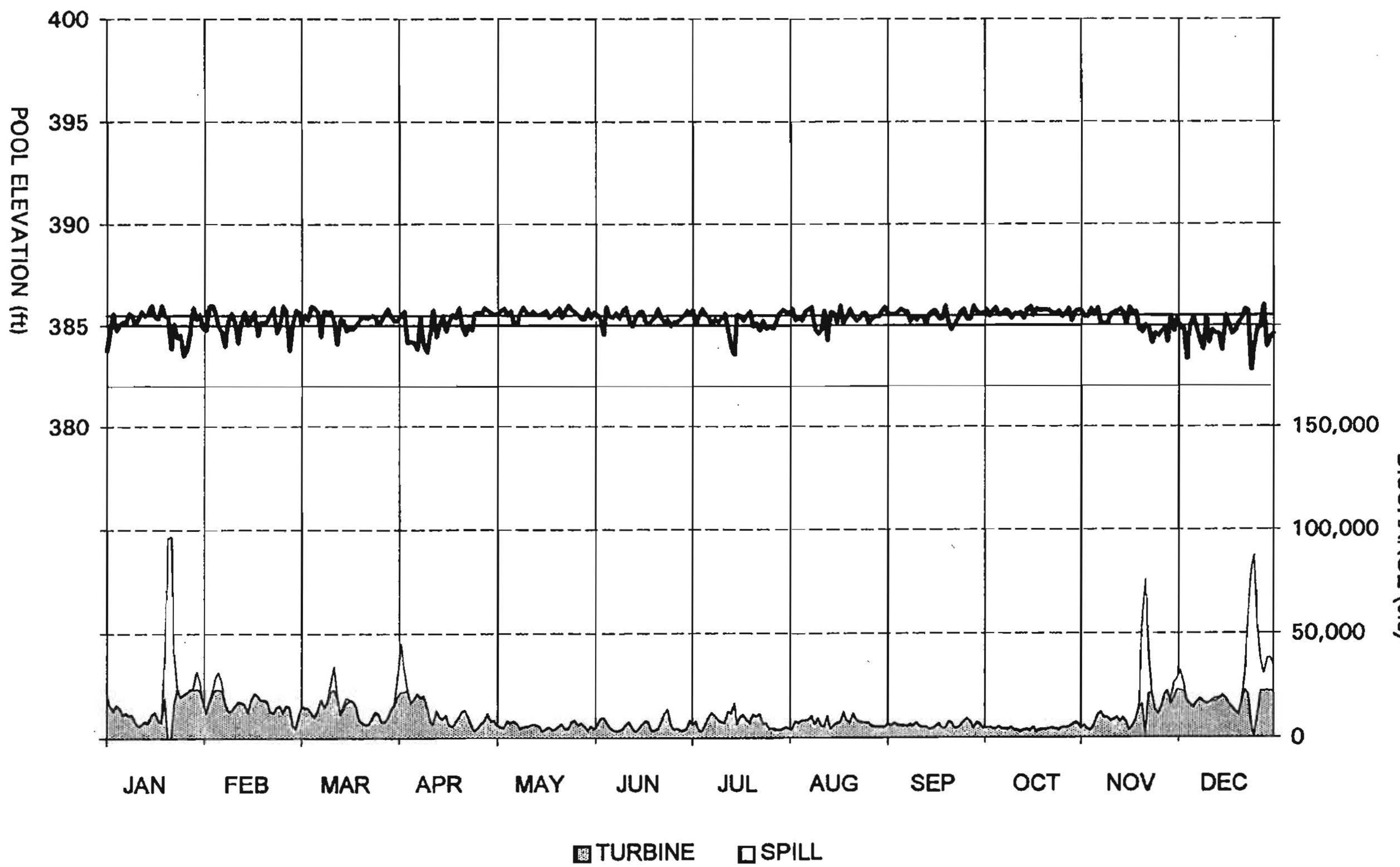


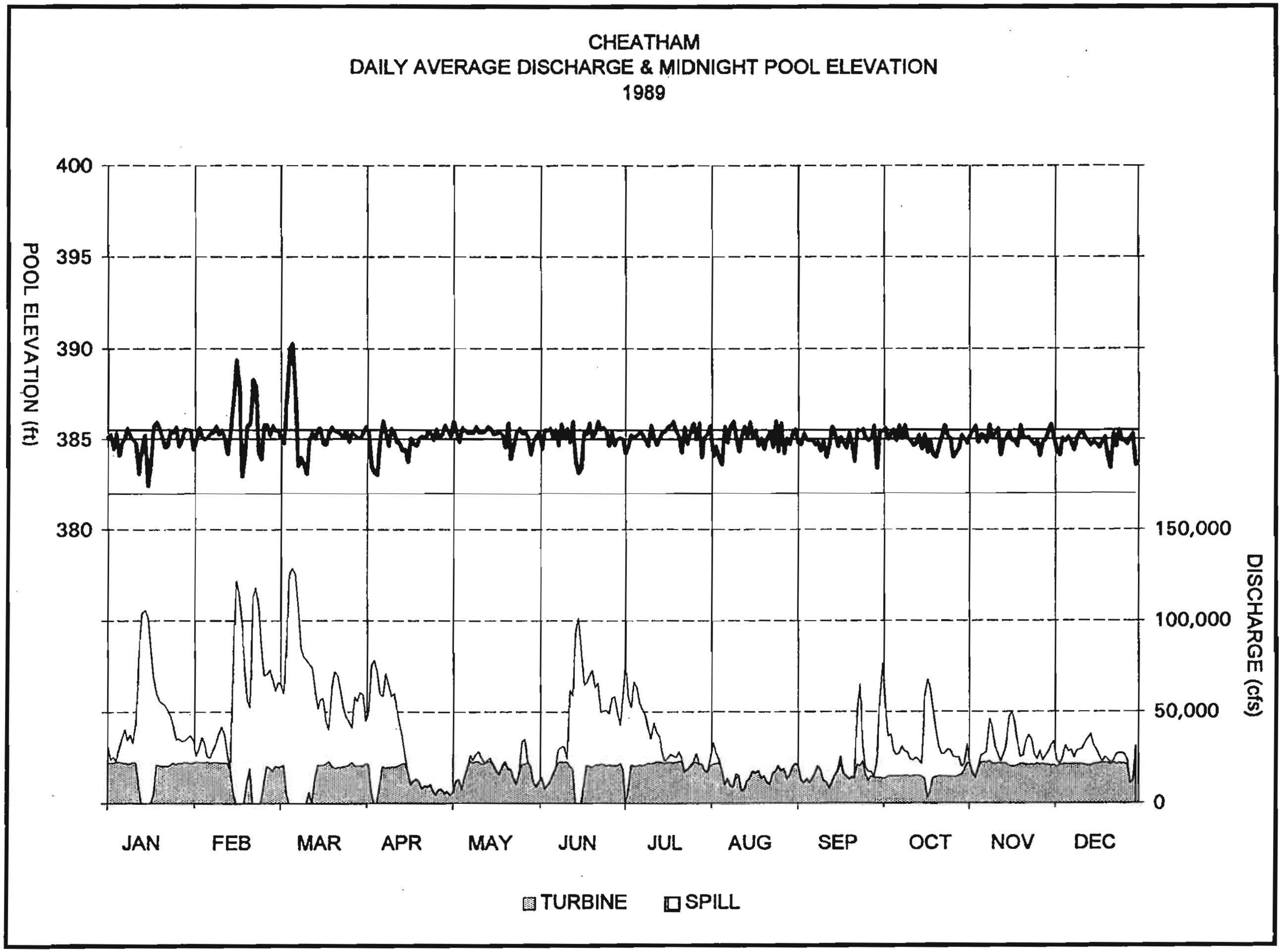
CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1985
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1986
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

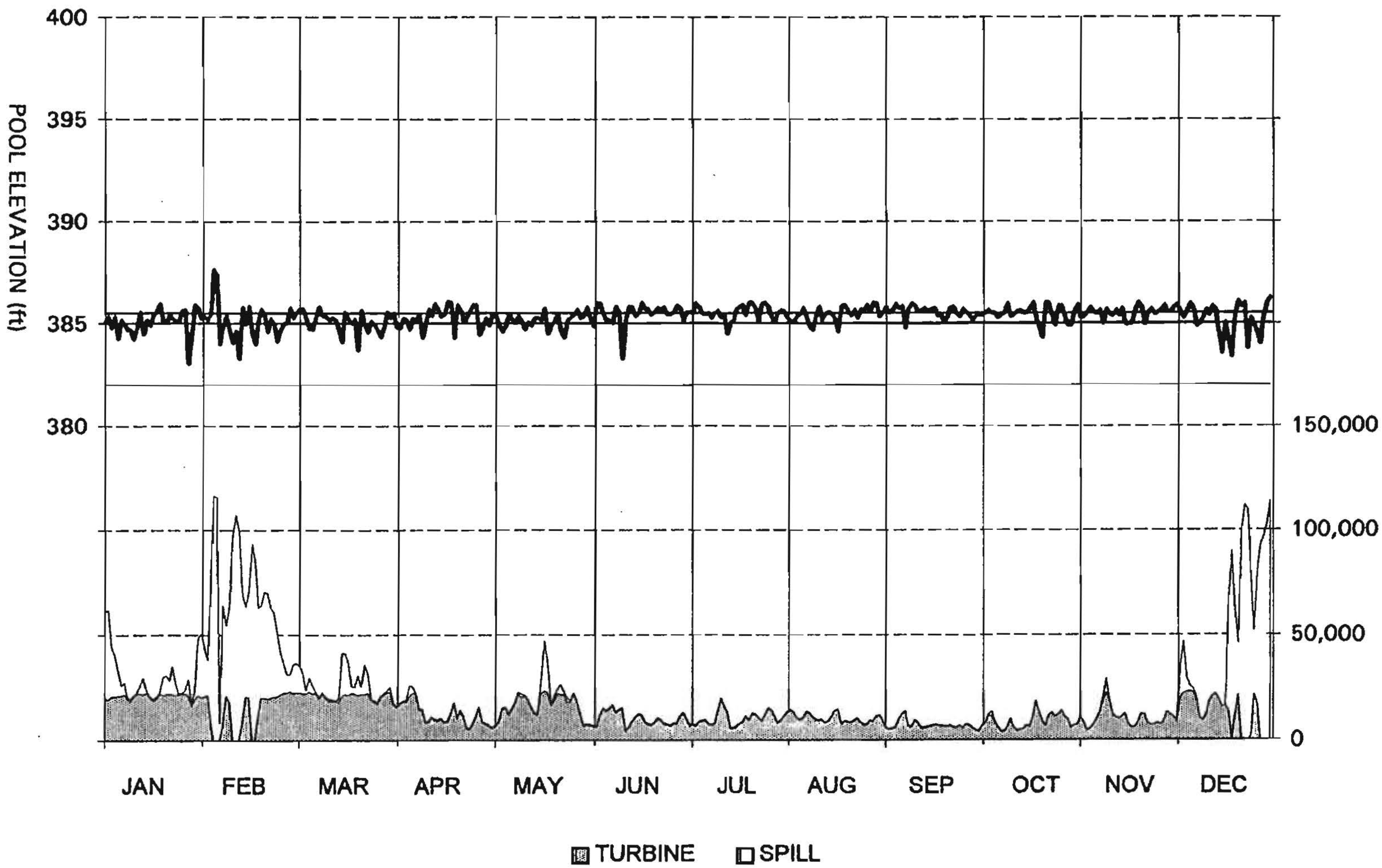

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1987
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

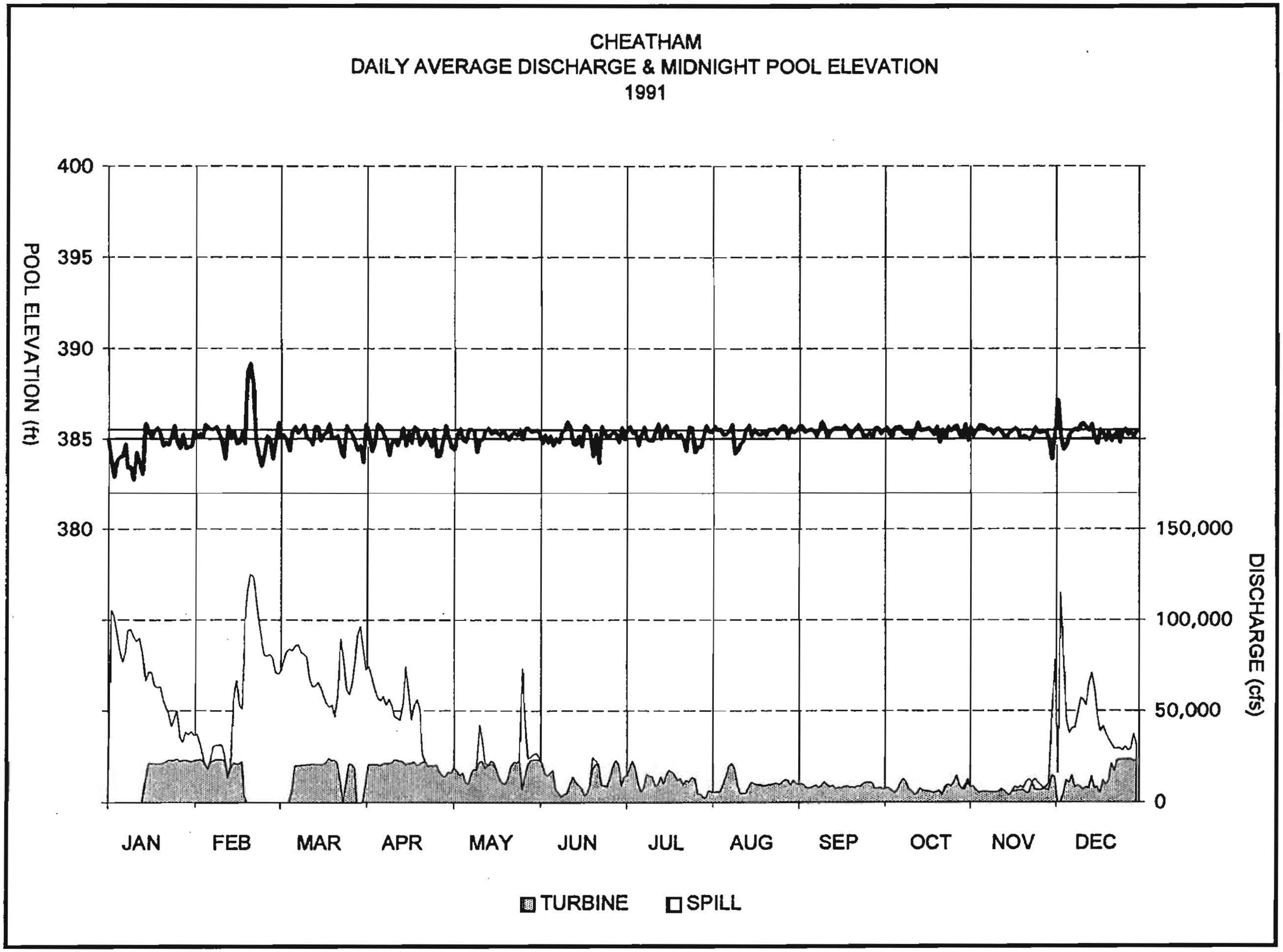
CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1988

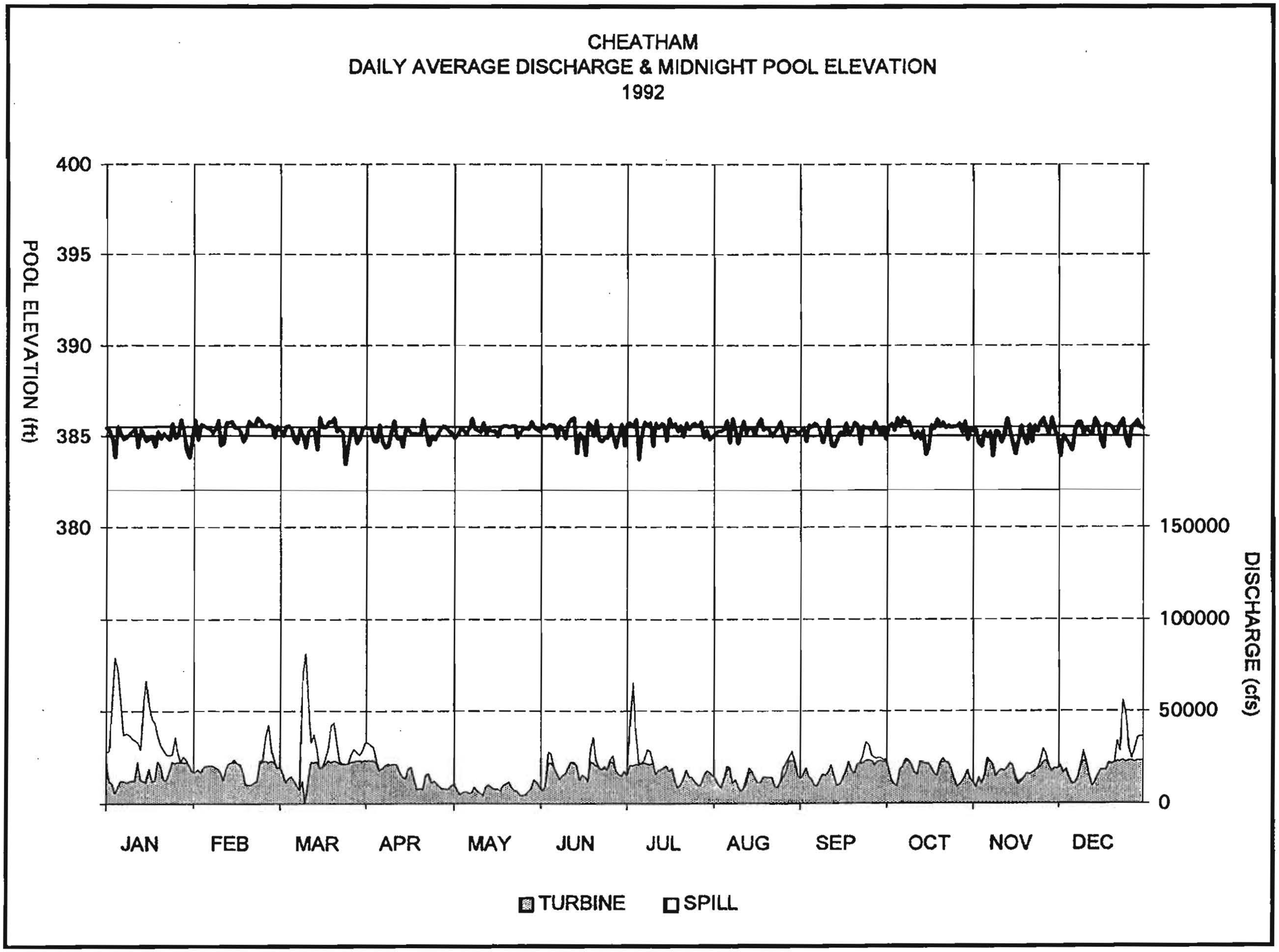


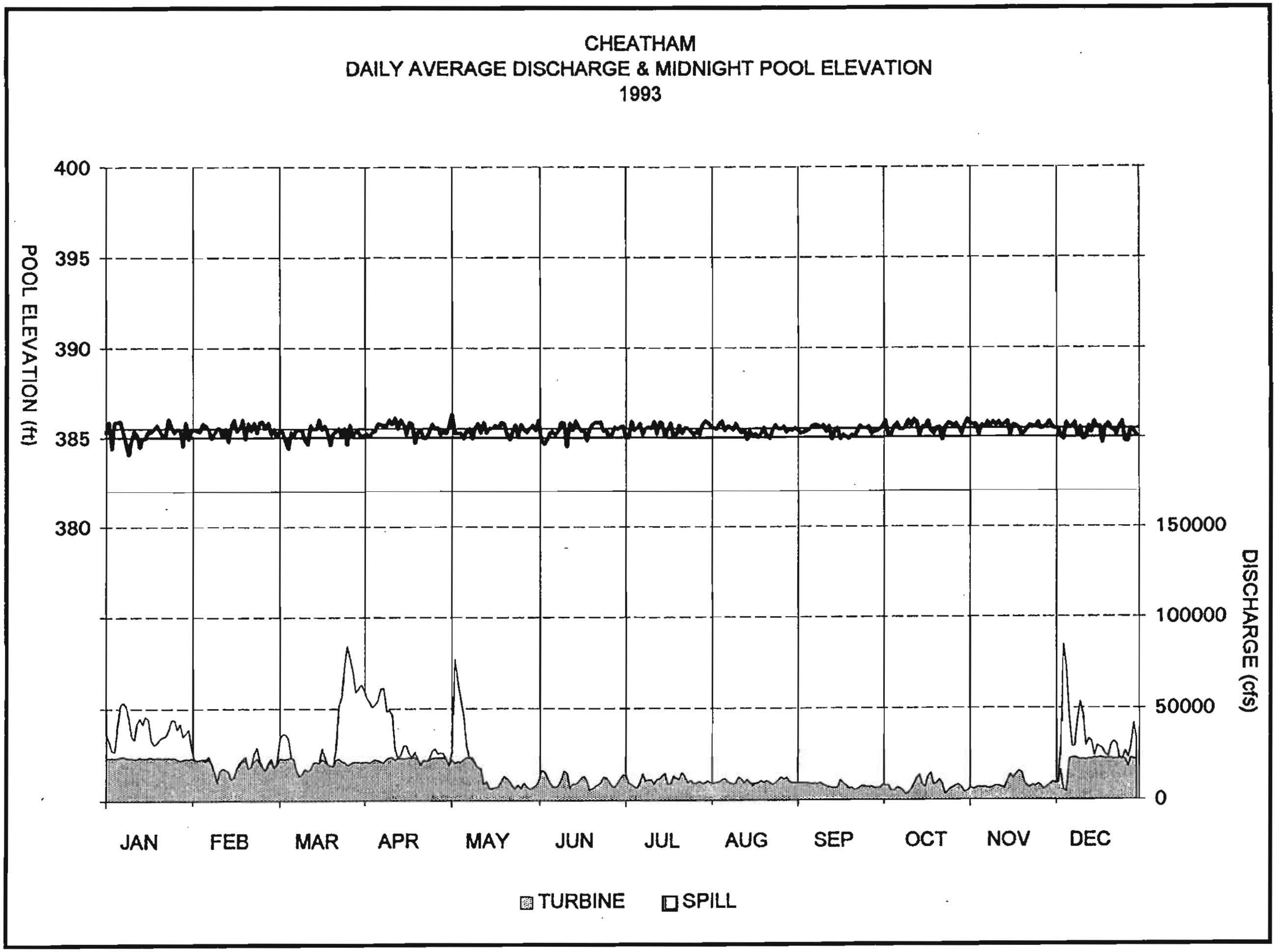

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1989
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL

CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1990




CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1991
400
395
390
385
380
POOL ELEVATION (ft)
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1992
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150000
100000
50000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1993
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150000
100000
50000
0
JAN
FEB
MAR
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SEP
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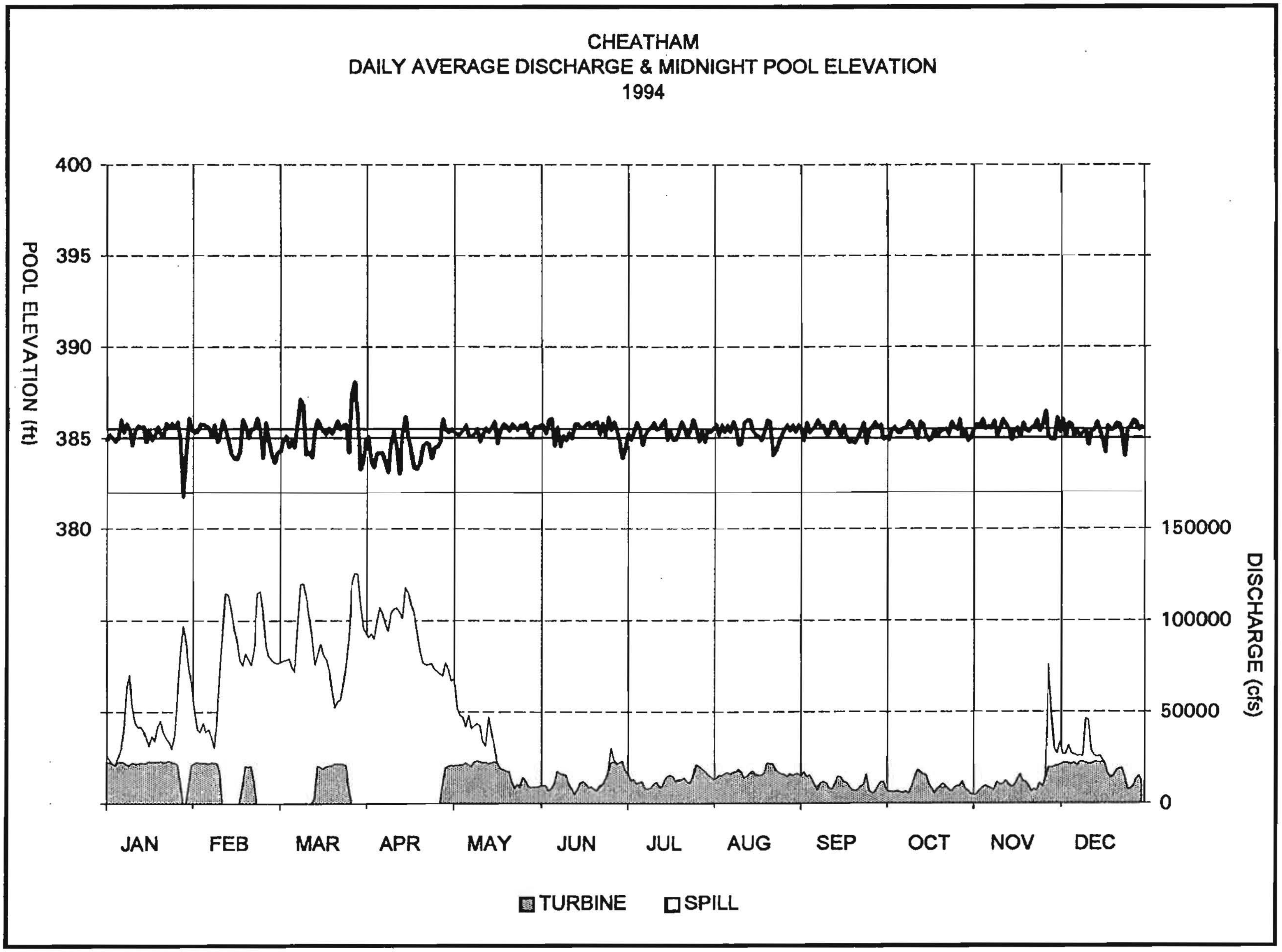
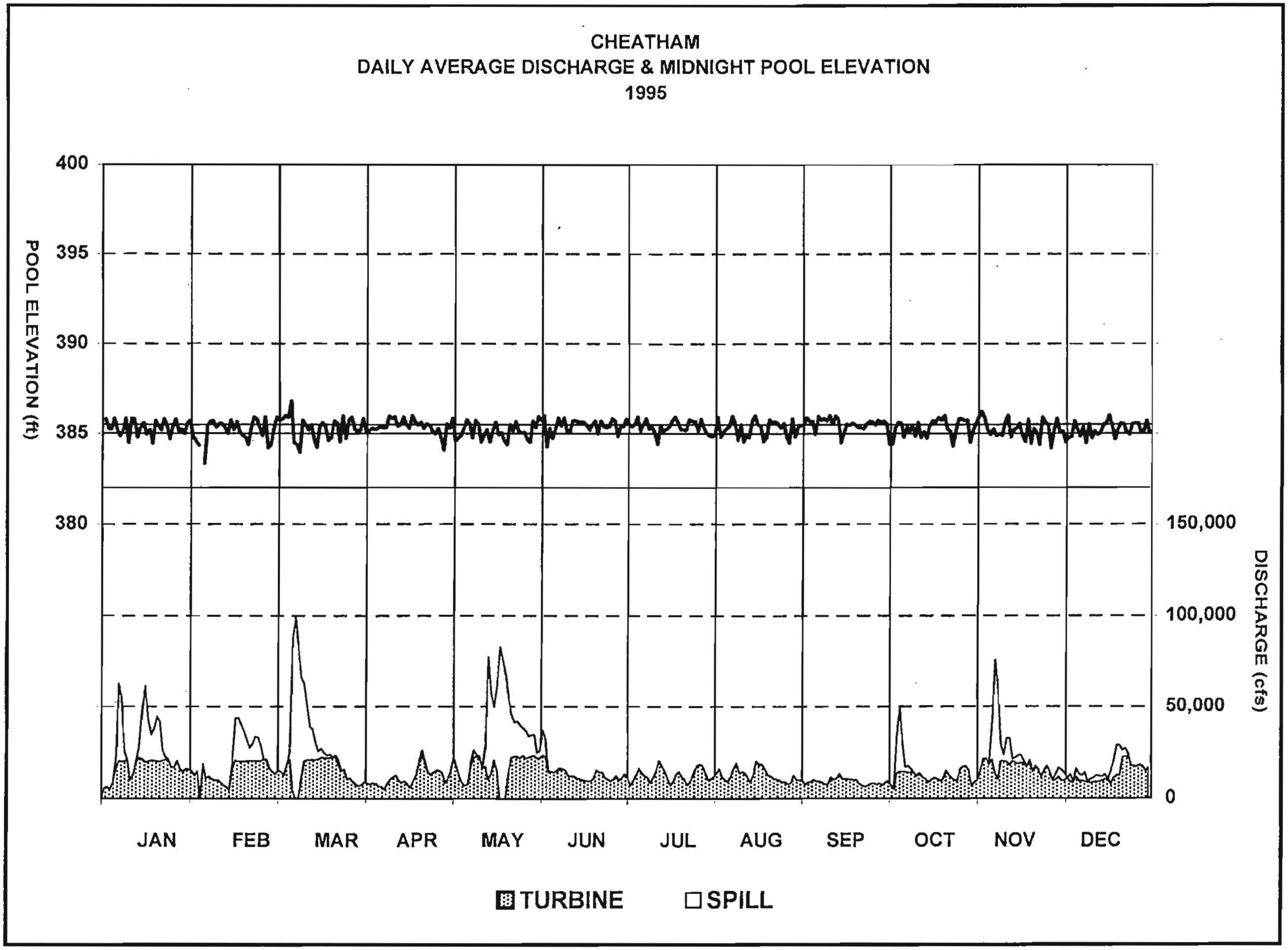
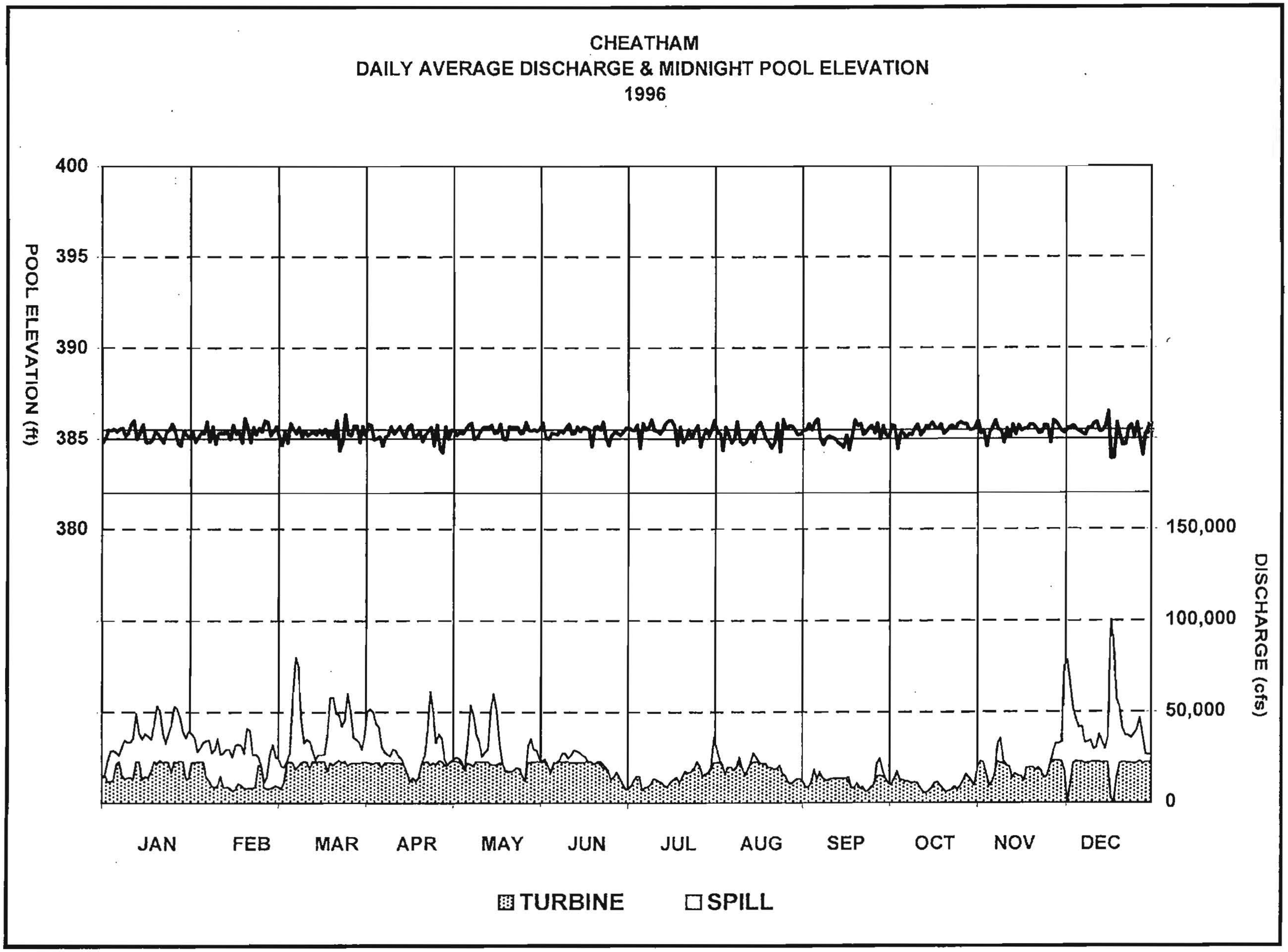
NOV
DEC
TURBINE
SPILL

PLATE D-37



CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1994
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150000
100000
50000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1995
POOL ELEVATION (ft)
400
395
390
385
380
DISCHARGE (cfs)
150,000
100,000
50,000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
TURBINE
SPILL


CHEATHAM
DAILY AVERAGE DISCHARGE & MIDNIGHT POOL ELEVATION
1996
400
395
390
385
380
POOL ELEVATION (ft)
150,000
100,000
50,000
0
DISCHARGE (cfs)
JAN
FEB
MAR
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DEC
TURBINE
SPILL

PLATE D-40

KEY CONTACT TELEPHONE LIST

CONTACT	TELEPHONE Office	Home	Restricted
■ **CORPS OF ENGINEERS**			
ENGINEERING - PLANNING DIVISION			
Chief, [redacted]	[redacted]		
Hydrology and Hydraulics Branch			
Chief, [redacted]	[redacted]		
Water Management Section			
Chief, [redacted]	[redacted]		
CONSTRUCTION - OPERATIONS DIVISION			
Chie[redacted]	[redacted]		
Readiness Branch			
Chief, [redacted]	[redacted]		
Al Du[redacted]			
Technical Support Branch			
Chie[redacted]	[redacted]		
Hydropower Section			
Chief, [redacted]	[redacted]		
Locks Section			
Chief, [redacted]	[redacted]		
Natural Resource Section			
Chi[redacted]	[redacted]		
Hydropower Plants			
Barkley	[redacted]		
Center Hill			
Cheatham			
Cordell Hull			
Dale Hollow			
J. Percy Priest			
Laurel			
Old Hickory			
Wolf Creek			

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

CONTACT	TELEPHONE Office	Home	Restricted
Locks			
Barkley	[redacted]		
Cheatham	[redacted]		
Old Hickory	[redacted]		
Cordell Hull	[redacted]		
Resource Managers			
Center Hill	[redacted]		
Cheatham	[redacted]		
Cordell Hull	[redacted]		
Dale Hollow	[redacted]		
J. Percy Priest	[redacted]		
Lake Barkley	[redacted]		
Lake Cumberland (Wolf Creek)	[redacted]		
Laurel	[redacted]		
Martins Fork	[redacted]		
Old Hickory	[redacted]		
Public Affairs Office (PAO)			
Chief, E.M. Evans	615/736-7161	615/399-1342	
FM Radio Call Letters			
Emergency Operations Center (Base)		[redacted]	
Center Hill		[redacted]	
Cheatham		[redacted]	
Cordell Hull		[redacted]	
Dale Hollow		[redacted]	
J. Percy Priest		[redacted]	
Barkley		[redacted]	
Wolf Creek (Lake Cumberland)		[redacted]	
Laurel		[redacted]	
Martins Fork		[redacted]	
Old Hickory		[redacted]	

■ GREAT LAKES AND OHIO RIVER DIVISION (LRD)

Water Management Branch			
Chief [redacted]	[redacted]	[redacted]	
River and Reservoir Control Section			
Chief [redacted]	[redacted]		

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

CONTACT	TELEPHONE Office	Home	Restricted
■ TENNESSEE VALLEY AUTHORITY (TVA)_			
Reservoir Operations (Knoxville)			
Manage[redacted]	[redacted]		
Power Supply Operations (Chattanooga)			
Load Coordinator	[redacted]		
Manage[redacted]	[redacted]	[redacted]	
Data Collection			
Supervis[redacted]	[redacted]		
Daily Operations (Chattanooga)			
Mana[redacted]	[redacted]		
■ SOUTHEASTERN POWER ADMINISTRATION (SEPA)			
Systems Engineering			
Manager[redacted]	[redacted]		
Power Operations			
Specialist[redacted]	[redacted]		
■ NATIONAL WEATHER SERVICE (NWS)			
Nashville Office	[redacted]		
Chief,[redacted]			
Nashvile Radar Site			
Weather Forecast Office			
Memphis			
Service Hydrologist,[redacted]			
Louisville			
River Forecast Center			
Cincinnati (Wilmington, OH)			[redacted]
Kansas City			
Slidell			

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

CONTACT	TELEPHONE Office	Home	Restricted
■ **UNITED STATES GEOLOGIC SERVICE (USGS)**			
Tennessee Office	[redacted]		
District Chi[redacted]			
Assist. Dist. Ch[redacted]			
Supervisor of Field Operations			
[redacted]			
Kentucky Office	[redacted]		
District Chi[redacted]			
Assist. Dist. Chi[redacted]			
Supervisor of Field Operations			
Upper Cumberland			
[redacted]	[redacted]		
West Kentucky			
[redacted]	[redacted]		
■ **NATIONAL RESPONSE CENTER**	800/424-8802 N.R.C. will call Coast Guard if it is determined to be the Coast Guard's responsibility or jurisdiction.		
■ **TENNESSEE EMERGENCY MANAGEMENT AGENCY** [redacted]	615/741-0001 Note: T.E.M.A. will notify the Tennessee Department of Water Pollution Control in case of a spill.		
■ **KENTUCKY DISASTER EMERGENCY RESPONSE**	502/564-7815 800/255-2587		
■ **TENNESSEE DEPARTMENT OF WATER POLLUTION CONTROL** [redacted]	615/226-6918 [redacted] 615/532-0654		
■ **KENTUCKY ENVIRONMENTAL RESPONSE EMERGENCY** **Spill Notification**	502/564-2380 800/928-2380		

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.

■ PERTINENT GAGES IN THE CUMBERLAND BASIN WITH TELEPHONE ACCESS

Stream	Subbasin	Location	Restricted No.	Goes Station ID
Cumberland River	Barkley	Clarksville		[redacted]
Cumberland River	Barkley	Dover		
Red River	Barkley	Port Royal		
Cumberland River	Cheatham	Nashville		
Harpeth River	Cheatham	Kingston Springs		
Harpeth River	Cheatham	Franklin		
Mill Creek	Cheatham	Antioch		
Cumberland River	Old Hickory	Carthage		
W Fork Stones River	J. Percy Priest	Smyrna		
Cumberland River	Cordell Hull	Penitentary Branch		
Cumberland River	Cordell Hull	Celina		
Roaring River	Cordell Hull	Gainsboro		
Cumberland River	Wolf Creek	Pineville Pine St		

Note: A space has been provided for Restricted telephone numbers for use by employees with access to such.