LOWER HUDSON RIVER BASIN

LAKE CARMEL DAM
PUTNAM COUNTY, NEW YORK
INVENTORY NO. N.Y. 100

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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NEW YORK DISTRICT CORPS OF ENGINEERS
SEPTEMBER 1981

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NEW YORK DISTRICT CORPS OF ENGINEERS
SEPTEMBER 1981
Phase I Inspection Report
Lake Carmel Dam
Lower Hudson River Basin, Putnam County, NY
Inventory No. 100

EUGENE O'Brien

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National Dam Safety Program
Lake Carmel Dam (Inventory No. 100), Lower Hudson River Basin, Putnam County, New York.
Phase I Inspection Report

Approved for public release; Distribution unlimited.

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to human
life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the service spillway, it has been determined that the structure is inadequate for all floods in excess of 17.5 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching the embankment section of the dam; this would significantly increase the hazard of loss of life and property. The spillway section is therefore judged to be "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be an inadequacy in the service spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.
This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE CARMEL DAM
I.D. NO. N.Y. 100
D.E.C. NO. 231 - 867
LOWER HUDSON RIVER BASIN
PUTNAM COUNTY, N.Y.

CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>OVERVIEW PHOTOGRAPH</td>
<td></td>
</tr>
<tr>
<td>1 PROJECT INFORMATION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 GENERAL</td>
<td></td>
</tr>
<tr>
<td>a. Authority</td>
<td>1</td>
</tr>
<tr>
<td>b. Purpose of Inspection</td>
<td>1</td>
</tr>
<tr>
<td>1.2 DESCRIPTION OF PROJECT</td>
<td>1</td>
</tr>
<tr>
<td>a. Description of the Dam and Appurtenant</td>
<td>1</td>
</tr>
<tr>
<td>Structures</td>
<td></td>
</tr>
<tr>
<td>b. Location</td>
<td>2</td>
</tr>
<tr>
<td>c. Size Classification</td>
<td>2</td>
</tr>
<tr>
<td>d. Hazard Classification</td>
<td>2</td>
</tr>
<tr>
<td>e. Ownership</td>
<td>2</td>
</tr>
<tr>
<td>f. Purpose</td>
<td>2</td>
</tr>
<tr>
<td>g. Design and Construction History</td>
<td>2</td>
</tr>
<tr>
<td>h. Normal Operation Procedure</td>
<td>2</td>
</tr>
<tr>
<td>1.3 PERTINENT DATA</td>
<td>3</td>
</tr>
<tr>
<td>a. Drainage Area,</td>
<td>3</td>
</tr>
<tr>
<td>b. Discharge at Dam Site</td>
<td>3</td>
</tr>
<tr>
<td>c. Elevations</td>
<td>3</td>
</tr>
<tr>
<td>d. Reservoir</td>
<td>3</td>
</tr>
<tr>
<td>e. Storage</td>
<td>3</td>
</tr>
<tr>
<td>f. Dam</td>
<td>3</td>
</tr>
<tr>
<td>g. Spillway</td>
<td>3</td>
</tr>
<tr>
<td>h. Reservoir Drain</td>
<td>4</td>
</tr>
<tr>
<td>2 ENGINEERING DATA</td>
<td>5</td>
</tr>
<tr>
<td>2.1 GEOLOGY</td>
<td>5</td>
</tr>
<tr>
<td>2.2 SUBSURFACE INVESTIGATIONS</td>
<td>5</td>
</tr>
</tbody>
</table>

-i-
2.3 DESIGN RECORDS 5
2.4 CONSTRUCTION RECORDS 5
2.5 OPERATION RECORD 5
2.6 EVALUATION OF DATA 5
3 VISUAL INSPECTION 6
3.1 FINDINGS 6
   a. General 6
   b. Embankment Structures 6
   c. Spillway 6
d. Downstream Spillway Channel 7
e. Reservoir Drain Channel 7
f. Abutments 7
g. Reservoir Area 7
3.2 EVALUATION OF OBSERVATIONS 7
4 OPERATION AND MAINTENANCE PROCEDURES 9
4.1 PROCEDURES 9
4.2 MAINTENANCE OF DAM 9
4.3 WARNING SYSTEM IN EFFECT 9
4.4 EVALUATION 9
5 HYDROLOGIC/HYDRAULIC 10
5.1 DRAINAGE BASIN CHARACTERISTICS 10
5.2 ANALYSIS CRITERIA 10
5.3 SPILLWAY CAPACITY 10
5.4 RESERVOIR CAPACITY 11
5.5 FLOODS OF RECORD 11
5.6 OVERTOPPING POTENTIAL 11
5.7 EVALUATION 12
6 STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY
   a. Visual Observations 13
   b. Design and Construction Drawings 13
   c. Operating Records 13
   d. Post Construction Changes 13
   e. Stability Analysis 13
   f. Seismicity Stability 13

7 ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT
   a. Safety 14
   b. Adequacy of Information 14
   c. Need for Additional Investigations 14
   d. Urgency 15

7.2 RECOMMENDED MEASURES 15

APPENDICIES

A. DRAWINGS
B. PHOTOGRAPHS
C. VISUAL INSPECTION CHECKLIST
D. HYDROLOGIC DATA AND COMPUTATIONS
E. REFERENCES
F. OTHER DATA
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM: LAKE CARMEL DAM (N.Y. 00100)
STATE LOCATED: NEW YORK
COUNTY LOCATED: PUTNAM
STREAM: MIDDLE BRANCH OF CROTON RIVER
BASIN: LOWER HUDSON RIVER
DATE OF INSPECTION: 26 MAY 1981

ASSESSMENT

The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to human life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the service spillway, it has been determined that the structure is inadequate for all floods in excess of 17.5 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching the embankment section of the dam; this would significantly increase the hazard of loss of life and property. The spillway section is therefore judged to be "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be an inadequacy in the service spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.

It is therefore recommended that within 3 months from the date of notification to the owner, detailed hydrological/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to
obtain more information regarding the upstream and downstream control facilities and their affect upon the overtopping potential of the dam. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation and snow melt. At the same time a dam break analysis should be conducted to ascertain flood plain boundaries downstream of the dam and its impact on nearby homes that may be contained within.

The dam has a number of additional deficiencies which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 12 months.

1) The active erosional gullies on both the upstream and downstream embankment slopes including the longitudinally traversing drainage near the north abutment on the downstream face should not be permitted to further erode. Existing damage should be repaired.

2) Small trees, shrubs and bushes on both upstream and downstream slopes should be removed with resulting holes and depression properly backfilled and seeded.

3) The gate valve controlling the reservoir drain should be repaired to a good working condition or replaced.

4) Concrete on the spillway training wall should be repaired. Debris and vegetation from the downstream channel should be removed.

5) Foundation for gatehouse should be repaired.

6. Sandbar upstream of spillway channel entrance should be removed.

7. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of moving parts in the reservoir drain system. This program should be documented for future reference. An emergency action plan, described in section 7.1d should be developed and updated periodically during the life of the structure.

Eugene O'Brien, P.E.
New York No. 29822

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer

Date: 13 Aug 1984
1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers Contract No. DACW 51-81-C-0008 in a letter dated 14 December 1980 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367 dated 8 August 1972.

b. Purpose of Inspection

This inspection was conducted to evaluate the existing condition of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam and Appurtenant Structures

Lake Carmel Dam consists of a 475 ft long earth embankment having a maximum crest height of 25 feet and a 30 foot crest width. The compacted earthfill embankment according to the existing design records shows a full length (see photograph 1) reinforced concrete core wall located at the upstream crest and extending 2.5 feet into a hard clay foundation stratum. The upstream face is protected by riprap extending from the embankment crest partway down the slope to El 615+. The upstream slope above El 618+ ranges between 1V:1.5H and 1V:2.0H; it flattens to 1V:2.5H below El 618+. Downstream slopes are uniform and range between 1V:1.5H and 1V:2.0H. The crest serves to support an asphalt paved town road.

The service spillway (see photograph 2) located at the south abutment, is a reinforced concrete rectangular open channel section 70 feet in width. Crest elevation of the apron is 5 feet below the crest of the dam. A reinforced concrete curvilinear chute feeds a reinforced concrete apron directing water to the discharge channel (Middle Branch of the Croton) at
the toe of the dam.

The dam is equipped with a reservoir drain system in the form of a 4x4 ft reinforced concrete pipe section passing through the base of the structure. Flow in this drain is controlled by means of a sliding gate valve operated from a gate house located near the upstream embankment crest.

b. Location

The dam is located approximately 2 miles north east of Carmel, in the City of Lake Carmel, Putnam County, New York.

c. Size Classification

The dam is 25 feet high and has a reservoir at this height with a storage capacity of 1620 acre-feet and, therefore, is classified as an Intermediate Dam.

d. Hazard Classification

The dam is in the "high" hazard potential category due to the location of occupied residences located downstream and within the flood plain.

e. Ownership

Present ownership of the dam is unclear. Its original ownership reported in the Application for Construction is the Town of Kent Park District. Past records regarding maintenance of the dam indicate continued involvement on behalf of the Town of Kent Park District thru 1958.

f. Purpose

The dam was constructed to form Lake Carmel for recreational use. No other use of the Lake is permitted.

g. Design and Construction History

The dam was designed by Messrs. W. J. Kaufman, W. Wickstrom, and P. H. Brown, address unknown, in February 1930 as indicated on the original design drawings presented in Appendix A. The exact construction date of the structure is unknown. Construction of the structure appears to generally conform with the original design with the exception of a concrete parapet wall which apparently was never built.

h. Normal Operation Procedure

Discharge is uncontrolled through the service spillway. There appears to be no normal operating procedure established.
for the reservoir drain.

1.3 **PERTINENT DATA**

a. **Drainage Area, square miles**
   13.0

b. **Discharge at Dam Site, cfs**
   - Uncontrolled Service Spillway at Max. Pool 2830 cfs
   - Reservoir Drain at Max. Pool (El. 623.37) Unknown
   - Total Discharge at Max. Pool (El. 623.37) 2830+cfs

c. **Elevations, USGS Datum MSL**
   - Crest of Dam 623.37 *
   - Maximum Design Pool 622.37 *
   - Spillway Crest 618.37 *
   - Invert Reservoir Drain 599.24 *

d. **Reservoir**
   - Length of Maximum Pool, feet 8400
   - Surface Area @ Maximum Pool, Acres 240

e. **Storage, Acre-feet**
   - Reservoir at Spillway Crest 1620
   - Reservoir at Maximum Pool 2790

f. **Dam**
   - Type Earthfill with Reinforced Concrete core wall cut off
   - Height, feet 25
   - Length, feet 475
   - Upstream Slope 1V:1.5H to 1V:2.0H above El. 618+
   - Downstream Slope 1V:1.5H to 1V:2.0H
   - Crest Elevation, feet 623.37 *
   - Crest Width, feet 30
   - Cut off type Reinforced concrete wall
   - Grout Curtain None

  * Based on original design drawings

* Based on original design drawings

-3-
<table>
<thead>
<tr>
<th>h. Reservoir Drain</th>
<th>Concrete Box Culvert</th>
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<tr>
<td>Type</td>
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</tr>
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<td></td>
</tr>
</tbody>
</table>
SECTION 2 - ENGINEERING DATA

2.1 GEOLOGY

The Lake Carmel Dam is located in the Hudson Highlands Section of the New England Maritime Physiographic Province. The bedrock in the area consists of metamorphic, igneous and sedimentary rocks which have undergone a complex sequence of position, folding, faulting and erosion. In the vicinity of the damsite, bedrock consists of biotite-quartz-plagioclase paragneiss.

2.2 SUBSURFACE INVESTIGATIONS

There is no record of subsurface investigation for the dam. Shallow surficial soils along the dam alignment are presumed to be alluvial deposits associated with the Middle Branch of the Croton River whereas underlying soils projected as hard clays or hardpan would be of glacial origin.

2.3 DAM AND APPURTEANNT STRUCTURES

The original design drawings for the Lake Carmel Dam are presented in Appendix A.

2.4 CONSTRUCTION RECORDS

No information regarding the construction of the dam and its appurtenant structures is available. The dam was reportedly built circa 1930.

2.5 OPERATION RECORDS

The dam is for the sole purpose of containing Lake Carmel. Limited records of operation or maintenance (primarily a series of 1958 correspondence) exist. Reportedly both the Town of Kent and Putnam County Highway Departments have provided some maintenance to the dam, primarily associated with the road located at the crest. Discussions with representatives of both the Town of Kent and Putnam County did not provide sufficient information to establish present ownership or maintenance responsibility for the dam.

No systematic monitoring of the dam's performance is in effect at this time.

2.6 EVALUATION OF DATA

The information obtained from the available documents and a visual inspection are sufficient to support a Phase I evaluation of the dam.
SECTION 3 VISUAL INSPECTION

3.1 FINDINGS

a. General

The visual inspection of Lake Carmel Dam was made on May 26, 1981. The skies were clear with temperatures ranging from 75 to 85°F. The reservoir level was estimated to be at El. 618.5 based on a water depth of about 2 inches at the spillway crest.

b. Embankment Structures

The embankment structure is generally in good condition showing no signs of horizontal or vertical movement, general instability or seepage. Of major concern, however, are several well developed erosional gulleys both on the downstream and upstream embankment faces. These gulleys appear to be developed along pedestrian access routes down the slope (see photographs 3 & 4).

Additionally the following adverse conditions were noted:
1) Moderately heavy vegetation, including deciduous trees, shrubs and bushes, is present on both the upstream and downstream slopes (see photographs 1 & 5).
2) The gate valve controlling the reservoir drain is not in good working condition and leaks in its closed position.
3) A minor drainage channel longitudinally traversing the downstream slope near the North Abutment exists (see photograph 6).
4) Rip rap is disturbed or absent in isolated areas along the upstream slope (see photographs 7 & 8).
5) The Gatehouse masonry foundation is severely cracked with stones missing (see photographs 8 & 9).
6) There is no emergency action plan for the project.

c. Spillway

Training walls both upstream and downstream are cracked with some spalling. A major crack on the southern downstream wall (see photograph 10) was reportedly repaired but needs further attention. At present the wall appears stable, showing no signs
of recent movement either rotational or translational. Apron slabs are cracked most notably at the junction with the north training wall where water is flowing beneath the slab causing erosion at the slab toe (see photograph 11).

d. Downstream Spillway Channel

The spillway apron discharges into a short natural channel emptying into the Middle Branch of the Croton River. The channel contains moderately heavy vegetation near the center. In addition, there is some debris in the spillway channel.

e. Reservoir Drain Channel

Discharges from reservoir drain are directly into the course of the Middle Branch of the Croton River. Fill extending into the river has resulted in constricting its flow forming a pool in the general vicinity of the outlet.

f. Abutments

The dam abutment areas are in good condition. There does not appear to be either instability or seepage problems in these areas.

g. Reservoir Area

No slides or general instability were observed along the reservoir shoreline in the general vicinity of the dam. No significant sedimentation was observed along the dam; however, a sandbar was building near the entrance of the service spillway.

3.2 EVALUATION OF OBSERVATIONS

Although deficiencies were observed, there is no indication that the dam is in imminent danger. Some of the deficiencies noted previously are minor and should be corrected in conjunction with routine maintenance. Other conditions described, however, represent conditions which may present potential for further deterioration and consequently need further investigation and correction.

The following is a summary of the problem areas encountered and recommended corrective measures requiring immediate attention:

1) The reservoir drain gate valve should be repaired to good working condition or suitably replaced.

2) Major cracks in the service spillway should be filled and monitored. Training walls should be properly backfilled.
3) Repair erosional gulleys by filling with properly compacted earthfill following by seeding.

4) Control of surface water drainage longitudinally traversing the downstream slope from the north abutment by construction of a positive drainage system.

5) Vegetative growth in the spillway discharge channel as well as all debris should be removed.

6) Fill constricting flow from the pool at the reservoir drain discharge should be removed.

7) Foundation walls for the gate house should be reconstructed.

8) Removal of small trees (less than 8" diameter), brush and shrubs from embankment slopes and proper backfilling of resulting depressions or holes with subsequent seeding should be performed. Removal of larger trees may be difficult because of the more extensive root networks and therefore is not recommended, however, these trees should be inventoried and monitored for seepage near the root ball.

9) A program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and maintenance of the reservoir drain and its control facilities should be developed and implemented. Inspections should be documented for future reference. Also, an emergency action plan should be developed.
SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

No written operation and maintenance procedures exist for the project. The normal operation is to allow flow through the service spillway.

4.2 MAINTENANCE OF DAM

It is reported that no routine maintenance of the dam is performed.

4.3 WARNING SYSTEM IN EFFECT

No warning system is in effect or in preparation.

4.4 EVALUATION

The overall condition of the dam and appurtenant structures appears to be good. Recommendations in connection with regular maintenance are discussed in Section 7.
SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE BASIN CHARACTERISTICS

The Lake Carmel Dam is located on the upstream reaches of the Middle Branch of the Croton River in the City of Lake Carmel, southeast of Kent Township, Putnam County, New York (Hydrologic Unit Code 02030101). The drainage basin extends north into Dutchess County with an area of 13 sq. miles. The upper drainage basin is rural with a combination of steep hills and low lying marsh lands. The major tributary drainage in this area is Stump Pond Stream passing through a series of small ponds among which Stump Pond is the largest. The lake occupies approximately 3 percent of the total drainage area. In the vicinity of Lake Carmel, about 1.4 sq. miles of area is thickly populated.

5.2 ANALYSIS CRITERIA

The analysis of the service spillway capacity was performed by developing a design flood using the unit hydrograph method and the Probable Maximum Precipitation (PMP). The all season PMP for 200 square miles in 24 hours for the Lake Carmel area is 22 inches as reported in the Weather Bureau's Hydrometological Report No. 33 and distributed over 48 hours. Inflow hydrograph from the entire basin is computed by using the U. S. Army Corps of Engineers HEC-1DB computer program. For unit hydrograph computations, the Snyder coefficients $C_L$ and $C_P$ are assigned as 2 and 0.625 respectively. An initial loss of 1.0 inch and constant loss of 0.1 inch/hour were estimated as representative of the basin for the design storm.

In accordance with the recommended guidelines for Safety Inspection of Dams, the adequacy of the spillway is analysed using the PMF. A multi-plan analysis was performed for the full, 0.75, 0.50 and 0.25 PMF.

In order to evaluate the tailwater elevation at the dam, the outflow from the reservoir was routed to a cross-section downstream of the dam. This cross-section was obtained from field observation and the USGS topographic map, Lake Carmel quadrangle.

5.3 SPILLWAY CAPACITY

The ungated concrete spillway, crest elevation at 618.37 ft (MSL), is 70 ft in width with the sidewalls being used to support a bridge deck completing the roadway atop the dam. A 1.5 ft wide pier used as a center support for the bridge deck is located at the center of the spillway. Therefore, the effective width of the spillway is 68.5 ft. The opening between the crest and the
bridge, partially restricted by the bridge deck support, is 3.5 ft. As the water surface elevation rises from the spillway crest to the bottom of bridge substructure, the spillway was assumed to act as a broad crested weir. When the water surface elevation exceeded the level of bridge bottom, flow through the opening was computed by using an orifice flow formula. The computed maximum discharge with the water surface elevation 623.37 ft (top of dam/bridge) is 2,830 cfs.

5.4 RESERVOIR CAPACITY

The normal reservoir capacity is listed as 1620 acre feet. This capacity is assumed to be equal to the storage when water surface elevation is at the spillway crest. The surcharge storage of 1170 acre feet computed for a water surface elevation at 623.37 ft (top of dam/bridge) is equivalent to approximately 1.69 inches of runoff over the entire basin.

5.5 FLOODS OF RECORD

No record of flood or maximum lake elevation is available; however, the dam has reportedly never been overtopped.

5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated based on the spillway discharge capacity and the available surcharge storage to meet the selected design flood inflows. The computed PMF, routed through the lake resulted in a maximum lake level at elevation 627.43 feet, 4.06 feet above the dam crest, and a maximum peak outflow of 16,198 cfs. Lake elevation was assumed to be at 618.37 (spillway crest elevation) at the beginning of the flood event. Table 1 is the summary of the multi-ratio analysis.

<table>
<thead>
<tr>
<th>Ratio of PMF(%)</th>
<th>Inflow Peak (cfs)</th>
<th>Outflow Peak (cfs)</th>
<th>Overtopping (Ft.)</th>
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<tr>
<td>100</td>
<td>16,718</td>
<td>16,198</td>
<td>4.06</td>
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<td>75</td>
<td>12,538</td>
<td>12,086</td>
<td>3.14</td>
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<td>50</td>
<td>8,359</td>
<td>7,802</td>
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<td>25</td>
<td>4,179</td>
<td>3,170</td>
<td>0.29</td>
</tr>
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</table>

The analysis indicates that the spillway is capable of passing only 17.5 percent of the PMF before overtopping occurs.
5.7 EVALUATION

The Lake Carmel Dam spillway is capable of discharging only 17.5 percent of the PMF without the dam being overtopped. Overtopping could result in the failure of the dam thus significantly increasing the hazard to the loss of life downsteam. Therefore the spillway is assessed as "seriously inadequate."
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual inspection of the dam did not indicate instability of the embankment from either seepage or a general slope type failure. Although not posing an immediate threat to the structural integrity of the embankment at its present operating level, several adverse conditions were observed that if allowed to further deteriorate and/or if subjected to flood stage loading may seriously jeopardize stability of the dam. As detailed in Section 3, erosion of both the upstream and downstream embankment slopes, if allowed to continue, could develop into an eventual breaching of the dam. Similarly, continued undermining of the spillway apron will undercut the slope and may progressively develop into a general slope failure.

b. Design and Construction Drawings

A review of original design drawings does not reveal any structural stability problems or sources for potential problems.

c. Operating Records

There are no operating records for the dam.

d. Post Construction Changes

There are no reported post-construction changes to the dam. Some repair work to fill a cracked training wall in the spillway was reportedly performed in 1958.

e. Stability Analysis

Stability analysis of the open channel spillway section were not performed to evaluate either sliding or overturning. With consideration for the minimal loads applied to the uncontrolled spillway structure when compared to its relative size and mass it can be intuitively concluded that the stability criteria set forth by the COE will be met under the severest of loading conditions.

f. Seismicity Stability

The dam is located in Seismic Zone 1 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.
SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Examination of the available documents and a visual inspection of the dam and the appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers' screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 17.5 percent of the Probable Maximum Flood (PMF). The overtopping of the dam could result in a failure of the embankment and abutments thus increasing the hazard to loss of life downstream. The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

The structural stability based on a review of available information and visual inspection indicates that the embankment and spillway structures are adequate in this regard.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation. However, prior to the initiation of the following recommended additional investigations and corrective measures, the establishment of present ownership and maintenance responsibility is of paramount importance.

c. Need for Additional Investigations

A detailed hydrological/hydraulic investigation of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to obtain more information regarding the
upstream and downstream control facilities and their effect upon the overtopping potential and stability of the dam.

d. **Urgency**

The additional hydrologic/hydraulic investigations which are required must be initiated within 3 months from the date of notification. Within 12 months of notification, remedial measures as a result of these investigations must be initiated, with completion of these measures during the following year. In the interim, an emergency action plan for the notification of downstream residents and proper around-the-clock surveillance of the dam during periods of extreme runoff should be developed. The other problem areas listed below must be corrected within one year from notification.

### 7.2 RECOMMENDED MEASURES

1. The results of the aforementioned investigation will determine the appropriate remedial measures required regarding spillway modifications.

2. Repair erosional gullies on embankment slopes.

3. Repair the concrete apron at the toe of the embankment and clean out downstream channel.

4. Excavate constricting fill downstream of the reservoir drain outlet structure.

5. Repair or replace reservoir drain outlet gate valve to a good working condition.


7. Remove developing sandbar at entrance to spillway.

8. Provide a program of periodic inspection and maintenance of the dam and appurtenance including yearly operation and lubrication of the reservoir drain and its control facilities. Document this information for future reference. Establish an emergency action plan and maintain and update it periodically during the life of the structure.
PLAN OF
PROPOSED DAM
across the
MIDDLE BRANCH OF CROTON RIVER
near Carmel
PUTNAM CO. N.Y.
PLAN OF PROPOSED DAM
across the
MIDDLE BRANCH OF CROTON RIVER
near Carmel
PUTNAM CO. N.Y.

SECTION 'A-A'
Scale: 1 inch = 6 ft

DETAIL OF SPILLWAY
Scale: 1 inch = 6 ft

PROFILE OF COREWALL
and
SECTION THROUGH SPILLWAY CREST
Scale: 1 inch = 10 ft
PLAN OF
PROPOSED DAM
across the
MIDDLE BRANCH OF CROTON RIVER
near Carmel
PUTNAM CO. N.Y.
PLAN OF
PROPOSED DAM
across the
MIDDLE BRANCH OF CROTON RIVER
near Carmel
PUTNAM CO. N.Y.
2. VIEW OF SPILLWAY CHUTE AND APRON.

3. EROSION GULLY ON DOWNSLOPEN SLOPE.
4. EROSION GULLEY ON UPSTREAM EMBANKMENT SLOPE
   (NOTE: Crack in North Training Wall)

5. VIEW OF VEGETATION PRESENT ON DOWNSTREAM SLOPE.
6. LONGITUDINALLY TRANSVERSING PROLIFIC CHANNEL LOOKING DOWN-SLOPE FROM NORTH ALONG TENT.

7. DISPLACED SLIDE ON WESTERN SLOPE.
8. DETERIORATING GATEHOUSE FOUNDATION.
   (NOTE: Absence of Riprap on Slope)

9. LOSS OF GATEHOUSE FOUNDATION ON SOUTHERN SIDE OF STRUCTURE.
10. CRACKED FIREFALL ALONG SOUTH END OF SPILLWAY AFRON.

11. REAR STEEP TOE OF SPILLWAY AFRON.
VISUAL INSPECTION CHECKLIST

APPENDIX C
VISUAL INSPECTION CHECKLIST

Basic Data

a. General

Name of Dam: Lake Carmel Dam
Fed. I.D. #: NY 00100  DEC Dam No.: 231-867
River Basin: Lower Hudson
Location: Town: Kent  County: Putnam
Stream Name: Middle Branch of Croton River
Tributary of: Middle Branch, Reservoir
Latitude (N): 41°27.3'  Longitude (W): 073°39.8'
Type of Dam: Embankment
Hazard Category: High (1)
Date(s) of Inspection: May 26, 1981
Weather Conditions: Clear and Wind 80°F
Reservoir Level at Time of Inspection: EL: 618.50

b. Inspection Personnel

Harvey Feineran - Principal Geotechnical Engineer
John E. Iwall - Geotechnical Engineer

c. Persons Contacted (Including Address & Phone No.)

Mr. George Hanbury - Town Engineer  (914) 225-9353
Route 52, Carmel, N.Y. 10512


d. History:

Date Constructed: Circa 1930  Date(s) Reconstructed: ___________

Designer: W.J. Kaufman, Chief Engineer; W. Wickstrom, Paul A. Brown
Constructed By: Unknown
Owner: Town of Kent Park District

Sheet 1
Embankment

a. Characteristics

(1) Embankment Material: Compact Earth Fill

(2) Cutoff Type: Reinforced Concrete Core Wall

(3) Impervious Core: Reinforced Concrete Wall

(4) Internal Drainage System: None

(5) Miscellaneous: Uptown face partially covered by EPDM

b. Crest

(1) Vertical Alignment: 900

(2) Horizontal Alignment: 900

(3) Surface Cracks: Crest is asphalt paved county road

(4) Miscellaneous: None

c. Upstream Slope

(1) Slope (Estimate) (V:II) 1:1.5-2.0H:7.0V above EL 618 ft; 1:2.5H below EL 618 ft

(2) Undesirable Growth or Debris, Animal Burrows: Concrete growth of brush and shrubs along entire length

(3) Sloughing, Subsidence or Depressions: Few erosional gullies particularly along north approach wall of spillway and near gate house - appear to be associated with pedestrian access points to lake

Sheet 2
d. Downstream Slope

(1) Slope (Estimate - V:II) 11:15H & 11:20H

(2) Undesirable Growth or Debris, Animal Burrows heavily overgrown with deciduous trees 10-24" in diameter 30-40' at numerous smaller trees and occasional debris

(3) Sloughing, Subsidence or Depressions some gullying present among pedestrian access route down slope - toe section none outlets upstream from channelized surface runoff, more sloughing apparent by level in old street - gully trench show no evidence

(4) Surface Cracks or Movement at Toe none

(5) Seepage none

(6) External Drainage System (Ditches, Trenches; Blanket) sloping gully draining surface water traverses downstream face of slope near north abutment

(7) Condition Around Outlet Structure appears to be good structurally some sediment buildup at mouth

(8) Seepage Beyond Toe none visible

e. Abutments - Embankment Contact

good
(1) Erosion at Contact  

(2) Seepage Along Contact  

Drainage System  

a. Description of System  

b. Condition of System  

c. Discharge from Drainage System  

Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)  

Sheet 4
Reservoir

a. Slopes

b. Sedimentation

Sediment appears to be building up

entrance to spillway

c. Unusual Conditions Which Affect Dam

More

Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.)

Several houses may be in flood plain for embankment breach

b. Seepage, Unusual Growth

Unusual vegetation consisting of moderately large trees, brush, shrubs

c. Evidence of Movement Beyond Toe of Dam

None

d. Condition of Downstream Channel

Pool immediately downstream of low level outlet - flow restricted by unconcrete to main channel

Spillway(s) (Including Discharge Conveyance Channel)

Single rectangular concrete apron channel section on south abutment 3 ft deep 70 ft wide at center span pier for support of highway bridge

a. General Spillway Channel is 50 ft in length on the upstream section

cut at El. 616.57 and downstream crest at 618.17 entering into a concrete curvilinear chute and open structure

b. Condition of Service Spillway

Approach wall have minor cracks with minor heave and displacement of less than 6 inches observed on the north wall. South wall along the downstream chute is considered serious such that a 2-3 ft separation is present at the top reportedly filled with grouted concrete, cracking along apron bottom and wall on north side

permitting water to partially undermine toe of chutes on north side

Concrete on walls spalled in places

Sheet 5
### d. Condition of Discharge Conveyance Channel

- **Prevalent Condition:** Blocked with heavy mud and debris.

<table>
<thead>
<tr>
<th>Reservoir Drain/Outlet</th>
<th>As per original drawings.</th>
</tr>
</thead>
</table>

- **Type:** Pipe
- **Material:** Concrete
- **Size:** 4.0' x 4.0'
- **Length:** 100.4'
- **Invert Elevations:**
  - Entrance: EL. 599.74
  - Exit: EL. 588.74

**Physical Condition (Describe):** Unobservable

- **Material:**
- **Joints:**
- **Alignment:**
- **Structural Integrity:**
- **Hydraulic Capability:**

**Means of Control:**
- **Gate:**
- **Valve:**
- **Uncontrolled:**

**Operation:**
- Operable
- Inoperable
- Other

**Present Condition (Describe):**
- Reported difficulty to operate.
- Easy to open.
- Difficulty in closing.
- Stem seem worn.
- Well greased.
- Leaks along gate sides observed while gate was closed.

Sheet 6
Structural

a. Concrete Surfaces  
   Spillway and associated walls, chute and 
   appurtenant structure are generally in good condition.
   Box culvert for Reservoir drain could not be observed 
   except at the outlet.

b. Structural Cracking  
  也有 cracks on apron slab and 
   in upstream divisional retaining walls - Old Warren 
   crack is present in southern downstream wall along Feeder.

c. Movement - Horizontal & Vertical Alignment (Settlement)  
   Minor horizontal 
   displacement observed in trashwall at crest (North Vermont) 
   Rotation of southern downstream wall has occurred but appears to be stable.

d. Junctions with Abutments or Embankments  
   Generally good some weathering 
   along North upstream and South downstream retaining walls.

e. Drains - Foundation, Joint, Face  
   None visible.

f. Water Passages, Conduits, Sluices  
   Channel section appears in 
   good condition.

g. Seepage or Leakage  
   Leaking of appurtenant to downstream 
   spigot by North trench wall resulting in ground 
   erosion and undercutting of slab concrete.

Sheet 7
h. Joints - Construction, etc. *appreciably good capacity for leakage

i. Joints in wall joint on north side of approach

j. Foundation *more visible

k. Control Gates *more

l. Approach & Outlet Channels *problem in approach

m. Energy Dissipators (Plunge Pool, etc.) *none

n. Intake Structures *more visible

o. Stability *good

p. Miscellaneous
10) **Appurtenant Structures** (Powerhouse, Lock, Gatehouse, Other)

a. **Description and Condition**

*Gatehouse - located near the crest on the upstream slope approximately halfway of the dam. Construction is granite block over a stone wall foundation. Foundation stone are missing, replacing resulting in missing stones (cracking) of the blockwork.*
### AREA-CAPACITY DATA:

<table>
<thead>
<tr>
<th>Description</th>
<th>Elevation (ft.)</th>
<th>Surface Area (acres)</th>
<th>Storage Capacity (acre-ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Dam</td>
<td>623.37</td>
<td>234</td>
<td>1170</td>
</tr>
<tr>
<td>Design High Water (Max. Design Pool)</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Auxiliary Spillway Crest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool Level with Flashboards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Spillway Crest</td>
<td>618.37</td>
<td>230x.</td>
<td>1519</td>
</tr>
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</table>

### DISCHARGES

<table>
<thead>
<tr>
<th>Description</th>
<th>Volume (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily</td>
<td>Unknown</td>
</tr>
<tr>
<td>Spillway @ Maximum High Water</td>
<td>2830</td>
</tr>
<tr>
<td>Spillway @ Design High Water</td>
<td>Unknown</td>
</tr>
<tr>
<td>Spillway @ Auxiliary Spillway Crest Elevation</td>
<td>4014</td>
</tr>
<tr>
<td>Low Level Outlet</td>
<td>Unknown</td>
</tr>
<tr>
<td>Total (of all facilities) @ Maximum High Water</td>
<td>2830+</td>
</tr>
<tr>
<td>Maximum Known Flood</td>
<td>Unknown</td>
</tr>
<tr>
<td>At Time of Inspection</td>
<td>200+ cfs</td>
</tr>
<tr>
<td>CREST:</td>
<td>DAM:</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>Type:</td>
<td>Earth Fill</td>
</tr>
<tr>
<td>Width:</td>
<td>30 ft</td>
</tr>
<tr>
<td>Spillover:</td>
<td>Open Channel Penstock Channel</td>
</tr>
<tr>
<td>Location:</td>
<td>South Approach</td>
</tr>
</tbody>
</table>

**SPILLWAY:**

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>AUXILIARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>618.37</td>
</tr>
<tr>
<td>Type</td>
<td>Rectangular Concrete Channel</td>
</tr>
<tr>
<td>Width</td>
<td>70 ft</td>
</tr>
<tr>
<td>Type of Control</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>Concrete Sill</td>
</tr>
<tr>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Size/Length</td>
<td></td>
</tr>
<tr>
<td>Anticipated Length of operating service</td>
<td></td>
</tr>
<tr>
<td>Chute Length</td>
<td>20 ft</td>
</tr>
<tr>
<td>Height Between Spillway Crest &amp; Approach Channel Invert (Weir Flow)</td>
<td>1.88 ft</td>
</tr>
<tr>
<td>HYDROMETEROLOGICAL GAGES:</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Type:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Records:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Max. Reading:</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOOD WATER CONTROL SYSTEM:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warning System:</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method of Controlled Releases (mechanisms):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low level gate valve (post dam breaching area)</td>
</tr>
</tbody>
</table>
DRAINAGE AREA: 13 Sq miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Varies from urban areas to wooded slopes.

Terrain - Relief: Rolling with some steep slopes.

Surface - Soil: Unknown

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

None observed in the vicinity of the Dam & Reservoir.

Potential Sedimentation problem areas (natural or man-made; present or future)

None.

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None observed.

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: None

Elevation:

Reservoir:

Length & Maximum Pool: 0.3 (Miles)

Length of Shoreline (at Spillway Crest): 4.9 (Miles)
**Project:** LAKE CARMEL DAM  
**Job No.:** 1579-03  
**Sheet:** 1 of 25  
**Date:** Jan 21, 1981  
**By:** D.L.C.  

<table>
<thead>
<tr>
<th>Subject</th>
<th>Ch’k. by</th>
</tr>
</thead>
</table>

| **Lake El.** | 11.25° | C/19 (61.83°) |
| **Lake Perimeter** | 22.500 / 4.24 | (3800) / 0.60 |
| **Fetch** | 1600’ | |

| **Lake Area** | 6890 | 0687 | 0484 | 2.03 | 2.03 | 0.75 |
| **A - LAKE AREA** | 2.185 | 200.64 ac |

| **Drainage Area** | 7934 | 4657 | 1374 | 70.55m² | 6814.77 ac |
| **(Lou Lick)** | 32.77 | 32.80 m² |  |
| **(Cook)** | 32.83 |  |

| **(Faughragg)** | 1341 | 0164 | 0188 | 51.7 | 57.75m² | 12.99 58 m² |

| **620’ Contour** | 8096 | 2842 | 2687 | 2.54 | 2.545 | 233.7 ac |
| **2100’ Contour** |  |  |  |  |  |  |
| **540’ Contour** |  |  |  |  |  |  |
630' Contour

3786
3435  \(3.51 \times 3.62\text{in}^2\)
3082

Developed Area adjacent
to lake

4976
11.65 - 2.19 = 9.46\text{in}^2 = 887.0\text{acre}
of 1.4 sq. miles.
### Elevation vs Surchage Storage

<table>
<thead>
<tr>
<th>EL</th>
<th>ΔH</th>
<th>AREA (Ac.)</th>
<th>MEAN AREA (Ac.)</th>
<th>A VOL (Ac.Ft.)</th>
<th>SURCHAGE AREA (Ac.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>612.37</td>
<td>0</td>
<td>200.64</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>620</td>
<td>1.63</td>
<td>233.7</td>
<td>217.17</td>
<td>354</td>
<td>354</td>
</tr>
<tr>
<td>623.37</td>
<td>3.37</td>
<td>250.5</td>
<td>242.4</td>
<td>816</td>
<td>1170</td>
</tr>
<tr>
<td>625</td>
<td>1.63</td>
<td>270.2</td>
<td>260.35</td>
<td>424</td>
<td>1594</td>
</tr>
<tr>
<td>629</td>
<td>2</td>
<td>290.25</td>
<td>280.23</td>
<td>560</td>
<td>2155</td>
</tr>
<tr>
<td>630</td>
<td>3</td>
<td>323.23</td>
<td>306.74</td>
<td>920</td>
<td>3075</td>
</tr>
</tbody>
</table>

% Impervious = \( \frac{\text{LARGE AREA}}{\text{Basin Area}} = \frac{431,497}{831,497} = 0.024 \)

### Stillway Discharges

Let us assume the stillway on a broad crested weir. From the crest level 618.27 ft to the top of opening at \((618.27 + 3.5) = 621.87 \text{ ft} \)

the formula \( Q = C L H^{3/2} \) is used with \( C = 2.63 \).

\[
L = 70 - 1.5 = 68.5 \text{ ft}.
\]
FLOW AT LEVEL 620 ft.

\[ H = (620 - 618.37) = 1.63 \text{ ft} \]

\[ Q = 2.63 \times 68.5 \times (1.63)^{1.5} \text{ cfs} \]

\[ = 3.75 \text{ cfs} \]

FLOW AT LEVEL 621.87 ft. (Top of Opening)

\[ H = (621.87 - 618.37) = 3.5 \text{ ft} \]

\[ Q = 2.63 \times 68.5 \times (3.5)^{1.5} \text{ cfs} \]

\[ = 41.80 \text{ cfs} \]

Above level 621.87, flow is considered to be orifice flow using formula

\[ Q = C \frac{A \sqrt{2gh}}{K} \]

where \( C \) is computed from \( Q = a \frac{\sqrt{2g'h}}{K} \), \( K = 1.5 \)

\[ C = \frac{1}{K} = 0.816 \]

FLOW AT LEVEL 623.37 ft. (Top of Dam/Bridge)

\[ h = 623.37 - (618.37 + \frac{3.5}{2}) \]

\[ = 3.25 \text{ ft} \]

\[ Q = 0.816 \times 68.5 \times 3.5 \times 2 \times 3.25 \times 3.25 \]

\[ = 2,830 \text{ cfs} \]
Flow at Level \[625\] ft

\[h = 625 - (618.37 + \frac{3.5}{2})\]

\[= 4.88 \text{ ft}\]

\[Q = 0.816 \times 3.5 \times 68.5 \times \sqrt{2 \times 32.2 \times 4.88}\]

\[= 3,468 \text{ cfs}\]

Flow at Level \[630\] ft

\[h = 630 - (618.37 + \frac{3.5}{2})\]

\[= 9.28\]

\[Q = 0.816 \times 3.5 \times 68.5 \times \sqrt{2 \times 32.2 \times 9.28}\]

\[= 4,935 \text{ cfs}\]

Weir flow over the bridge from EL. 623.27 ft. will be computed by using HEC-1DB.
\[ L = 21'' = 42,000 \text{ ft} = 7.95 \text{ miles} \]
\[ L_{CA} = 10.4'' = 20,800 \text{ ft} = 3.94 \text{ miles} \]
\[ \text{Unc} \ C_P = 0.625 \quad 640 C_P = 400 \]
\[ C_T = 2.0 \]
\[ T_P = 2.0 \left( 7.95 \times 3.94 \right)^{0.3} \text{ hours} \]
\[ = 5.62 \text{ hours} \]
\[ T_P = 1 \text{ hr} \]
\[ T_{PR} = 5.62 + 0.25 \left( 1.0 - \frac{5.62}{5.5} \right) \]
\[ = 5.61 \]
**TAMS**

**Job No.** 1579-03  
**Project** LAKE CARTEL DAM INC.  
**Subject** HYDRAULIC COMPUTATIONS ON THE DIS CHANNEL

**Date:** June 3, 1981  
**By:** D. K. Bokah  
**Chk. by:**

\[ \text{Length} = \frac{7}{8} \times 2000 = 1750 \text{ ft} \]

\[ \text{Slope} = \frac{10}{(3.5/8 \times 2000)} = 0.0144 \]

**Co-ordinates of the eight points:**

\[ (0, 610) \quad (125, 600) \quad (225, 590) \quad (228, 585) \]

\[ (272, 585) \quad (275, 590) \quad (340, 600) \quad (390, 610) \]
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basin Inflow Hydrograph</td>
<td>T: 22, 112, 123, 133, 141</td>
</tr>
<tr>
<td>NO. DA</td>
<td>HR. MN</td>
<td>PERIOD</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>1.01</td>
<td>1.00</td>
<td>1</td>
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<tr>
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<td>2</td>
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<td>3.00</td>
<td>3</td>
</tr>
<tr>
<td>1.01</td>
<td>4.00</td>
<td>4</td>
</tr>
</tbody>
</table>

**Sun:** 25.10 21.51 3.59 2056.40
(637.34 546.34 91.13 3823.00)

---

**Chart 12 of 25**
<table>
<thead>
<tr>
<th>Station</th>
<th>CFS</th>
<th>24-Hour</th>
<th>72-Hour</th>
<th>Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>3511.1</td>
<td>2924.5</td>
<td>2179.4</td>
<td>1442.7</td>
<td>10797.6</td>
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**Hydrograph at STA 1**

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<th>72-Hour</th>
<th>Total Volume</th>
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**Volume**

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**Hydrograph Routing**

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**Sheet 14 of 22**
### Station 2, Plan 1, Ratio 2

#### End-Of-Period Hydrograph Ordinates

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#### Storage

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#### Stage

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#### Peak Outflow is 1206. At Time 44:00 Hours

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#### Station 2, Plan 1, Ratio 3

#### End-Of-Period Hydrograph Ordinates

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Sheet 10 of 25
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Maximum Stage is 595.4

Maximum Storage = 30.

Maximum Stage is 593.5

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Peak 6-hour | 24-hour | 72-hour | Total Volume
---|---|---|---
7235 | 9711 | 3350 | 135 | 9047
220 | 961 | 92 | 2872
4.84 | 9.59 | 11.07 | 11.77
383.99 | 243.59 | 301.97 | 32.48
533 | 6695 | 8295 | 0252
4156 | 10149 | 10170 |

Sheet 12 of 25
**MAXIMUM STAGE IS** 593.5

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**STAGE**

| 593.0   | 595.0   |
| 593.0   | 595.0   |
| 593.0   | 595.0   |
| 593.0   | 595.0   |
| 593.0   | 595.0   |
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| 593.0   | 595.0   |

**TOTAL VOLUME**

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**MAXIMUM STORAGE =** 27.

**MAXIMUM STAGE IS** 590.4

Sheet 22 of 25
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Summary of Dam Safety Analysis

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### SUMMARY OF DAM SAFETY ANALYSIS

#### PLAN 1

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<th>MAXIMUM RESERVOIR W.S.ELEV.</th>
<th>MAXIMUM DEPTH OVER DAM</th>
<th>MAXIMUM STORAGE AC-FT</th>
<th>MAXIMUM CFS</th>
<th>DURATION (HOURS)</th>
<th>TIME OF TOP OUTFLOW (HOURS)</th>
<th>TIME OF FAILURE (HOURS)</th>
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#### MAXIMUM STATION 3

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<th>TIME (HOURS)</th>
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<td>0.25</td>
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REFERENCES


2. "Seasonal Variation of the Probable Maximum Precipitation, East of the 105th Meridian for Areas from 10 to 1,000 Square Miles, and Durations of 6, 12, 24 and 48 Hours", Hydrometeorological Report No. 33. Weather Bureau, U.S. Department of Commerce, April 1956.

3. "Recommended Guidelines for Safety Inspection of Dams", Department of the Army, Office of the Chief of Engineers, Appendix B.

OTHER DATA

APPENDIX F
Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N.Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked herewith submitted for the construction of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about

1. The dam will be on the South Branch of the Hudson River in the town of [Town], County of [County].

2. Location of dam is shown on the [Quadrangle] quadrangle of the United States Geological Survey.

3. The name of the owner is [Name].

4. The address of the owner is [Address].

5. The dam will be used for [Use].

6. Will any part of the dam be built upon or its pond flood any State lands? [Yes/No]

7. The watershed above the proposed dam is [Area] square miles.

8. The proposed dam will create a pond area at the spillway elevation of [Area] acres and will impound [Volume] cubic feet of water.
9. The maximum height of the proposed dam above the bed of the stream is 24 feet 6 inches.

10. The lowest part of the natural shore of the pond is 25 feet vertically above the spillcrest, and everywhere else the shore will be at least 40 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam. **Conditions favorable.**

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.). **A mixture of clay, sand, and gravel.**

13. Facing down stream, what is the nature of material composing the right bank? **Clay.**

14. Facing down stream, what is the nature of the material composing the left bank? **Clay.**

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. **Bed and gravel are very impervious, and thin clay. Bank is impervious clay.**

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? **No.**

17. **Wastes.** The spillway of the above proposed dam will be 70 feet long in the clear; the waters will be held at the right end by an earth embankment at the top of which will be 5 feet above the spillcrest, and have a top width of 33 feet; and at the left end by the natural ground the top of which will be 1 foot above the spillcrest, and have a top width of 1 foot.

18. The spillway is designed to safely discharge 2000 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

   *4 x 4 H Sluice Gate will be fit."

20. What is the maximum height of flash boards which will be used on this dam? __

21. **APRON.** Below the proposed dam there will be an apron built of __feet of __feet across the stream, __feet wide and __feet thick.

22. Does this dam constitute any part of a public water supply? **Yes.**
INSTRUCTIONS

Read carefully on the last page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Chief Engineer, Division of Engineering, Department of Public Works, Albany, N.Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.
SECTION 948 OF THE CONSERVATION LAW

§ 948. Structures for impounding water: inspection of docks; penalties. No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, remove, repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or who hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this state a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order herefore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works of plans and specifications theretofore approved by such commission or commissioner under this section.

The foregoing information and accompanying plans and specifications are correct to the best of my knowledge and belief.

[Signature]

By....................................................., authorized agent of owner.

Address of signer 221 W. 57 St. New York, N.Y. Date March 31st, 1930.
Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N.Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked... 

...herewith submitted for the (construction or reconstruction) of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about DEC. 31, 1955... 

1. The dam will be on...C Estem Brook...flowing into...Middle Branch...in the town of...South East...County of...Putnam...and...1/2 mile from intersection of Route 27 - Route 31... 

2. Location of dam is shown on...Lang Cardell...quadrangle of the United States Geological Survey. ...Longi tude 73° 34' 16" west...Latitude 40° 23' 20" north...District...Town...Eccent...Park...Department... 

3. The name of the owner is...Carmel...N.Y. ... 

4. The address of the owner is...Carmel...N.Y... 

5. The dam will be used for...Carmel...Lake...Carmel...in creation...purposes... 

6. Will any part of the dam be built upon or its pond flood any State lands?...No... 

7. The watershed above the proposed dam is...13.5...square miles... 

8. The proposed dam will create a pond area at the spill crest elevation of...23...acres...and will impound...65.7...cubic feet of water...
9. The maximum height of the proposed dam above the bed of the stream is_____ feet______ inches.

10. The lowest part of the natural shore of the pond is_________________ feet vertically above the spillcrest, and everywhere else the shore will be at least_________________ feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam.

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.)

13. Facing downstream, what is the nature of material composing the right bank?

14. Facing downstream, what is the nature of the material composing the left bank?

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc.

16. Are there any porous seams or fissures beneath the foundation of the proposed dam?

17. Wastes. The spillway of the above proposed dam will be____ feet long in the clear; the waters will be held at the right end by a CONCRETE TRAINING WALL of______ feet above the spillcrest, and have a top width of______ feet; and at the left end by a CONCRETE TRAINING WALL the top of which will be______ feet above the spillcrest, and have a top width of______ feet.

18. The spillway is designed to safely discharge______________________ cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

20. What is the maximum height of flash boards which will be used on this dam? ______ none

Arrow. Below the proposed dam there will be an apron built of REINFORCED CONCRETE across the stream_______ feet wide and_______ feet thick.

This dam constitute any part of a public water supply? ______ no
who shall thereupon pay the same into the treasury. Any amount so levied shall thereupon become a lien upon the real property affected thereby, to the same extent as any tax levy becomes and is a lien thereon.

Any person in interest may, within thirty days from the service of any such order, appeal to the supreme court to determine the reasonableness of such order. At any time during such appeal to the supreme court upon at least three days' notice, the party appealing may apply for an order directing any question of fact to be tried and determined by a jury, and the court shall thereupon cause such question to be stated for trial accordingly and the findings of the jury upon such question shall be conclusive. Appeals may be taken from the supreme court to the appellate division of the supreme court and to the court of appeals in such cases, subject to the limitations provided in the civil practice act.

This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works, of plans and specifications theretofore approved by such commission or commissioner under this section.

The foregoing information is correct to the best of my knowledge and belief, and the construction will be carried out in accordance with the approved plans and specifications.

Town of Kent Water District, Owner

By [Signature] Nicholas [Name], Supervisor, Authorized agent of owner.

Address of signer [Address] Date [Date]
March 28, 1958

Mr. Henry Ten Haren
Deputy Chief Engineer
New York State Department of Public Works
Albany, N. Y.

Attention: Mr. D. C. Ogsbury, Associate Civil Engineer

Dear Mr. Ogsbury,

Regarding repairing the sluice gate in the Lake Carmel dam at Carmel, N. Y. (Putnam County)

The present sluice gate is in need of repair. We have had it inspected by an engineer of the Ludlow Valve Company, New York City and he suggests we remove the present lift. x lift. gate and replace it with a 36in. circular valve. The dam has a spill-way and the sluice gate is used in times of emergency and lowering the lake level for beach and peer maintenance.

I understand your office has to be notified and permission granted before we can go ahead with this project, because we are replacing the gate with a valve which is different than the original.

Enclosed please find a copy of the gate chamber of the dam, and the circled portions on the copy are the proposed changes.

The reason the engineer suggested the change is primarily the cost. He told us the circular valve is a production item and the gate is a fabricated item making a big difference in the cost. Also the chamber lends its self well to the installation of such a valve.

I would appreciate hearing from you regarding the above matter.

Yours truly,

William C. Nichols
Supervisor Town of Kent
March 31, 1958

Ro: Dam No. 231-367
Town of Kent
County of Putnam

Mr. William C. Nichols
Supervisor Town of Kent
Carpel, New York

Dear Sir:

This is to acknowledge receipt of your letter of March 28, 1958 together with an enclosed photostat of a drawing showing the proposed changes to the sluice gate of the above noted dam.

We wish to advise you that whenever alterations are to be made to any section of an existing dam, a new form of application and three sets of plans and specifications for the proposed alterations must be submitted to this Department for approval.

Enclosed herewith are two forms of "Application for the Construction or Reconstruction of a Dam". One form is to be properly filled in and returned to the Department with the required number of plans and specifications. The other form is for your records.

Very truly yours,

Henry TenHagen
Deputy Chief Engineer

By: D. C. Oglesby
Assoc. Civil Engineer

JFP's
Encl.
May 8, 1958

Re: Dam Lake Carmel
Town Of Kent
County Of Putnam

Mr. Henry Ten Hagen
Deputy Chief Engineer
New York State Department of Public Works
Almday, New York

Dear Mr. Ogsbury,

Thank you for your letter of March 31, 1958 advising us as to procedure to follow regarding repair to sluice gate in the Lake Carmel dam.

Enclosed find three sets of complete blue prints of dam, also application for repair of dam. I am also enclosing two photostats of proposed repair work to be done. These sketches were prepared by the Ludlow Valve Company 11 West 42nd St. New York City.

The circular valve will be mounted on a rectangular steel plate which in turn will be anchored on the down-stream side of the gate chamber. The original gate will be left in place in open position if possible.

Details: 36" Ludlow Valve "List #3, L'RH, Flange & Spiral, (FxD 125 ASA) Sliding Rising Double Disc Parallel Seat Gate Valve with Cast Iron Coupling.---------5'6"x6'1" Steel plate with 3'6" diam. hole in center, 32 holes to hold valve to steel plate size 15/16". All 32 holes to be chamfered on one side of plate 3/32"x15 degree angle to hold bimylene Ring (Water Seal). Holes of steel plate to be drilled to take approx. 50 1" bolts long enough to pass thru 1" steel plate to 1" compound threaded anchor in masonry.

Above valve will be operated from floor stand with connecting steel rod.

We propose to have our park maintenance crew install above units.

Please contact me on any question or point of information you may need.

Yours truly,

William C. Nichols, Supervisor
May 26, 1958

Ro: Dam No. 231-367
  Town of Kent
  County of Putnam

Mr. William C. Nicholas
Supervisor Town of Kent
Cornel, New York

Dear Sirs:

The application and plans filed by you with this Department under the provisions of Section 548 of the Conservation Law, for the dam, Town of Kent Park District, Cornwall, New York, for repairs and installation of new sluice gate valves at the above named dam, are approved to the extent of the authority of the Superintendent of Public Works under the above mentioned statute.

The new designation for the dam is #231A-367 of the Lower Hudson River Watershed.

One set of plans formally stamped approved is being returned to you herewith.

Very truly yours,

Henry T. Telesco
Deputy Chief Engineer

BY:

D. C. O'Grady
Assoc. Civil Engineer

JEP:fs
Encl.
May 26, 1958

Re: Dam No. 231-367
Town of Kent
County of Putnam

Mr. William C. Nicholas
Supervisor, Town of Kent
Carmel, New York

Dear Sir:

The application and plans filed by you with this Department under the provisions of Section 948 of the Conservation Law, for the owner, Town of Kent Park District, Carmel, New York, for repairs and installation of new sluice gate valve at the above named dam, are approved to the extent of the authority of the Superintendent of Public Works under the above mentioned statute.

The new designation for the dam is #231A-367 of the Lower Hudson River Watershed.

One set of plans formally stamped approved is being returned to you herewith.

Very truly yours,

Henry Tonilagon
Deputy Chief Engineer

BY:________________________________
D. C. Quinley
Assoc. Civil Engineer

JEP:
Encl.
August 25, 1958

Mr. William Nichols, Supervisor
Town of Kent, Carmel, N. Y.

Dear Mr. Nichols:

Our office made an inspection and report to the Town of Kent, addressed to Mr. Emil Frank, of Lake Carmel Park Department, on December 23, 1957, relative to our opinions as to the condition of the Outlet Gate at the dam at Lake Carmel. We also made certain preliminary recommendations pending a more thorough study. At that time it was necessary to make certain assumptions due to the inability to observe very clearly the functioning within the chamber.

It was our opinion that the present gate was so damaged that it would be necessary to install a new gate. On July 28, 1958, Mr. Walter Filner inspected the chamber and gate with Mr. William Nichols, Supervisor, and was able to make a much more thorough examination. He reported his findings to me, and on the basis of the facts presented, I would like to revise my opinion as to the necessity or replacing the gate at present.

Mr. Filner made a flow test in the chamber by the weir method and since the gate is located on the intake side, the amount of water flowing through the chamber represented the actual leakage of the gate. This was calculated to be 75 gallons per minute. Water was spouting over the gate top about 6 ft.

Mr. Filner succeeded in sealing the gate an additional amount and reduced the leakage to approximately 35 gallons per minute. Due to the difficulty in accomplishing this, apparently it has not been done in recent years, in the belief that the safe limit of operation had been reached and increased pressure would cause the valve stem. It was this assumption that resulted in the conclusion that the effective leakage of 75 gallons per minute could not be avoided.
Apparantly the opening for the gate through the chamber had been reduced at one time, and there was some leakage in two places through the walls of the chamber. The gate itself showed two points of corrosion, one on top and the other on one side, and some pitting on the underside. These items were not considered to be of a serious concern although they were responsible for the leakage of about 26 gallons per minute.

In considering the fact that it is not advisable to completely stop the flow through the chamber due to the possibility of complaint of others using the stream below the dam, the present leakage serves to supply about the desired amount to be allowed to escape.

On the basis of this additional information, I feel that any work on the gate or chamber could be eliminated from consideration at present.

Very truly yours,

Roy Burgess
RS:er
Re: Dam #231-867  
Town of Kent  
Putnam County

Department of Public Works  
Mr. Henry TenHagen  
Deputy Chief Engineer  
Albany, New York

Attn. Mr. Ogsbury  
Assoc. Civil Engineer

Dear Mr. Ogsbury,

I think the enclosed letter is self-explanatory regarding the situation at the Lake Carmel dam. The first professional investigations of the sluice gate were made in the middle of the winter when the water temperature was too low for a man to get wet. Before actual replacement of the sluice gate was to be made a detailed examination of the gate was made, and by a cleaning of the tracks in which the gate slides, it was found the gate would close satisfactorily. The gate has been partially open for a period of years, causing the track to clog.

I wish to thank you for your help and interest in this matter, and hope the above action meets with approval of your office. If there is anymore information you wish on the subject, please contact this office.

Very truly yours,

William C. Nichols  
Supervisor Town of Kent
Re: Dam # 231-867
Town of Kent
County of Putnam

Mr. William G. Nichols
Supervisor, Town of Kent
Carmel, New York

Dear Sir;

Receipt of your letter dated September 2, 1958 and of the report by Mr. Roy Burgess, Land Surveyor and Professional Engineer, are hereby acknowledged.

The report by Mr. Roy Burgess relative to the present sluice gate of the above named dam stating that the said gate, after some minor adjustments, has been sealed properly thereby reducing the leakage around the gate and needs not to be replaced at present is acceptable to us.

We will hold our approval of the alterations to the above named dam, as granted to you in our letter of notification of May 26, 1958, in abeyance until such a time that the sluice gate needs to be replaced and about which we request your notification.

Very truly yours,

Henry Tabberson
Deputy Chief Engineer

By: ___________________________
D. C. Coehly
Assoc. Civil Engineer

SEP 11 1958
Concrete spillway apron cracked - no leakage observed at this time. Should be checked again next year.
Downstream winnows cracked.