LOWER HUDSON RIVER BASIN

JOHN D. ROCKEFELLER JR. DAM

WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 665

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1981
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Phase I Inspection Report
John D. Rockefeller Jr. Dam
Lower Hudson River Basin, Westchester County, N.Y.
Inventory No. 665

PERIOD OF REPORT
Phase I Inspection Report
National Dam Safety Program

PERFORMING ORG. REPORT NUMBER

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16. KEYWORDS (Descriptive keywords to identify and classify the subject matter of the report)
Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability

17. ABSTRACT (Limit to 200 words)
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 of the dam 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. (continued)

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The earth embankment is considered to be stable under present conditions; however, the configuration and type of the present spillway are considered unacceptable. This presents a potentially hazardous condition under higher than observed flood discharge levels, when water flowing over the unlined channel, which is cut in overburden, at high rates could erode the adjacent earth embankment resulting in the breaching of the dam.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would not be overtopped for the PMF. The spillway capacity is therefore adequate although the type and configuration are not acceptable.

It is therefore recommended that within 3 months of notification to the owner, an investigation be conducted to determine the exact dimensions, capacity of and to appraise the stability of the existing spillway. Following this study, an acceptable engineering solution should be developed to correct the spillway safety problem.
LOWER HUDSON RIVER BASIN

JOHN D. ROCKEFELLER JR. DAM

WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 665

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1981
PREFACE

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
JOHN D. ROCKEFELLER JR. DAM
I.D. NO. N.Y. 665
D.E.C. NO. 922
LOWER HUDSON RIVER BASIN
WESTCHESTER COUNTY, N.Y.

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PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM  John D. Rockefeller Jr. Dam, NY 665
STATE LOCATED  New York
COUNTY LOCATED  Westchester
STREAM  Pocantico River
BASIN  Lower Hudson
DATE OF INSPECTION  April 2, 1981

ASSESSMENT

The examination of documents and the visual inspection of John D. Rockefeller Jr. Dam 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.

The earth embankment is considered to be stable under present conditions; however, the configuration and type of the present spillway are considered unacceptable. This presents a potentially hazardous condition under higher than observed flood discharge levels, when water flowing over the unlined channel, which is cut in overburden, at high rates could erode the adjacent earth embankment resulting in the breaching of the dam.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would not be overtopped for the PMF. The spillway capacity is therefore adequate although the type and configuration are not acceptable.

It is therefore recommended that within 3 months of notification to the owner, an investigation be conducted to determine the exact dimensions, capacity of and to appraise the stability of the existing spillway. Following this study, an acceptable engineering solution should be developed to correct the spillway safety problem.
In addition, the dam and its appurtenant facilities have a number of problem areas, which if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within one year. These areas are:

1. Local erosion and sloughing on the upstream face should be corrected by regrading the slope and protecting with riprap.

2. Repair operating mechanism for the low level outlets and clear stone and debris from downstream outlet channel. Provide access to outlet works control tower.

3. Remove vegetation and trees as detailed in Section 3.2 and provide a program of periodic mowing and cutting.

4. A program of periodic inspection and maintenance of the dam and appurtenances should be provided including yearly operation of the outlet system and lubrication of its moving parts. This information should be documented for future reference. The 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. 29823

Approved by:

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

Date:
SECTION 1 - PROJECT INFORMATION

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 by Contract No. DACW 51-81-C-0008 dated 14 December 1980 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection
   The inspection was conducted to evaluate the existing conditions 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 THE PROJECT

a. Description of Dam and Appurtenant Structures
   The John D. Rockefeller Jr. Dam is an approximately 325 foot long earth embankment with a concrete core wall. The crest of the dam is 21 feet wide and the dam has a maximum height of 39 feet, (34 feet without core wall extension). The upstream face of the dam has a slope of 1V to 3H below El 302 and 1V to 2H above this elevation to the top of the dam at El 305. The downstream face of the dam has a uniform slope of 1V to 2H.

   An intake tower is located 51.5 feet upstream of the centerline of the dam near the dam's center. The tower has two intakes, a 12-inch sluice gate with an invert elevation of 289.5 and a 24-inch sluice gate fed by a 24-inch I.D. cast iron intake pipe with an invert elevation of 276.0. Outlet from the tower is provided through a 24-inch gate valve which discharges into a 24-inch cast iron pipe which exists at the toe of the dam with an invert elevation of 276.0.

   An unlined ditch of irregular shape located near the right abutment with a low point at El 299 serves as an uncontrolled overflow spillway.
b. Location
John D. Rockefeller Jr. Dam is located on an unnamed tributary of the Pocantico River just north of the Village of Pocantico Hills, New York. The dam is located on the John D. Rockefeller Jr. estate about 1/4 mile south of Route 117.

c. Size Classification
The dam is 34 feet high and has a reservoir with a maximum storage capacity of 289 acre-feet and therefore is classified as a small dam.

d. Hazard Classification
The dam is in the "high" hazard potential category because of its close downstream proximity to a number of residences and N.Y. State Route 117.

e. Ownership
John D. Rockefeller Jr. Dam is owned by the Estate of John D. Rockefeller Jr. and is administered and maintained by the Greenrock Corporation. The person to contact is Mr. John Sundholm, V. P. of Operations, Greenrock Corporation, Pocantico Hills, New York, 10591, Telephone No. (914) 631-4560.

f. Purpose of Dam
The dam impounds water for recreational use.

g. Design and Construction History
The dam was designed and the construction supervised by Walter Kidde Construction Company between 1931 and 1933. Construction was done by employees of the owner.

1.3 PERTINENT DATA

a. Drainage Area, Square Miles 0.16

b. Discharge at Damsite, cfs
Uncontrolled Overflow Spillway 1570.0
24-Inch Low Level Outlet 150.0
Total Discharge at Maximum Pool 1720.0

c. Elevation, Feet Above MSL,
USGS Datum
Maximum Pool, Top of Dam 305.5
Spillway Crest 299.0
Invert Low Level Intake 1 289.5
Invert Low Level Intake 2 276.0
Invert Low Level Outlet 275.0

d. Reservoir
Length of Normal Pool(miles) 0.4
Surface Area of Maximum Pool(-acres) 19.3
Surface Area of Normal Pool (acres) 18.4
e. Storage, Acre-Feet
   Reservoir at Spillway Crest 173
   Reservoir at Maximum Pool 289

f. Dam
   Type Earth Embankment with Concrete Core
   Length (Feet) 325
   Upstream Slope
     Surface: Riprap
     Inclination:
       Above El 302 ft: 1V:2H
       Below El 302 ft: 1V:3H
   Downstream Slope 1V:2H
   Crest Elevation (MSL) 305.5 feet
   Crest Width 21.0 feet
   Grout Curtain None
   Cutoff Concrete Core Wall to Rock

g. Spillway
   Type Uncontrolled Ditch Cut into Dam/Overburden
   Size Irregular; approximately 3 feet deep, 10 feet wide
   Crest Elevation (Feet) 299
   Upstream Channel Varies
   Downstream Channel Unlined Ditch, about 3 feet deep

h. Reservoir Drain
   Intake tower with two inlets (12-inch at El 289.5 feet and 24-inch at El 276 feet); one outlet (24-inch I.D. cast iron pipe at El 275.5 feet) controlled by gate valve.
SECTION 2 - ENGINEERING DATA

2.1 GEOLOGY

The records of the owner contain no data on site geology. However, there is data available in the literature on the general geology of the area. The John D. Rockefeller Jr. Dam is located in the Manhattan Prong of the New England Upland physiographic province. This area is characterized by complex mountains and hills of igneous and highly metamorphosed rock. The rock underlying the site of the dam is the Fordham Gneiss.

2.2 SUBSURFACE INVESTIGATIONS

Subsurface investigations were carried out by test-pitting prior to the construction of the dam. These are summarized on a Longitudinal Section. Eleven test pits were done ranging from 5 to 12 feet in depth. The test pits identified the overburden in the area as topsoil (loam) overlying hardpan and clay, and clay with gravel or clay with sand.

2.3 DESIGN RECORDS

Design records consist of four contract drawings, one as-built drawing and construction specifications. Copies of these are included in Appendices A and F.

2.4 CONSTRUCTION RECORDS

There are no construction records available for the project. The contractor was Walter Kidde Constructors, Inc.

2.5 OPERATION RECORDS

There is no regular operation of the reservoir and there are no operation or maintenance manuals for the dam.

2.6 EVALUATION OF DATA

The information obtained from the drawings, records and personal interviews is considered adequate for a Phase I evaluation.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General
The visual inspection of the John D. Rockefeller Jr. Dam was made on 2 April 1981. The weather was overcast and the temperature was in the fifties. At the time of the inspection, the lake level was at about El 300 with approximately one foot or water flowing through the spillway.

b. Dam
The horizontal and vertical alignment of the crest of the dam show no signs of stress, deformation or cracking. The upstream and downstream slopes are covered by moderate amounts of brush with the downstream face additionally covered by substantial amounts of tree growth. There is no evidence of sliding, sloughing or other distress on the downstream slope and there is no seepage evident.

The upstream slope of the dam shows a continuous line of local sloughing near the current water level. This appears to be the result of a lack of or damage to riprap at this elevation.

There is no emergency action plan for the project.

c. Spillway
The spillway which is located near the contact of the dam with the right abutment is an uncontrolled open ditch with no guide walls, control structure or well defined channel. Water as it flows over the spillway is allowed to find its own channel until after it crosses the dam/abutment contact where it is carried by a small unpaved channel. The drawings (see Appendix A) confirm the field observations, that is, that the spillway is cut into overburden.

d. Outlet and Pipes
The inlets to the intake tower could not be observed at the time of the inspection since they were below the water level. The top portions of the rods which control the gates and valves were visible from the tower; it could be seen that their diameters were reduced by rusting and therefore they would probably be inoperable. The owner's representative has no recollection of these being operated. The wheels and stems required for the operation of the gates were not at the site. The access bridge to the tower is missing resulting in a boat being the only access to the tower.

The discharge end of the reservoir outlet pipe was buried under a pile of rocks about 50 feet downstream of the toe of the dam and was therefore unobservable. There was a small amount of rusty water seeping from under the rocks.
e. **Abutments**
The abutment/dam contacts and abutments are in good condition; there does not appear to be any unstable conditions on the abutments.

f. **Reservoir Area**
The reservoir is located within a park-like area surrounded by gently sloping open fields and more heavily wooded steeper sloping areas. There are neither slides, rock falls or sloughing around the reservoir. There is no visible sedimentation accumulation in the reservoir.

3.2 **EVALUATION OF OBSERVATIONS**

Although deficiencies were observed, there is no indication that the dam is in imminent danger. Most of the deficiencies observed in the previous paragraphs are minor and should be corrected by the owner's maintenance forces. Other conditions described above may have a potential for further deterioration and for this reason, they need to be further investigated and corrected to ensure the stability of the dam and appurtenances. The following is a summary of the problem areas encountered, with the appropriate recommended action:

1. The existing spillway type and location is not of an acceptable type. The possibility for erosion and breaching of the dam presents a potentially dangerous situation and therefore requires immediate attention. The spillway channel should be reshaped, paved and lined or some other suitable structure of adequate size should be built to protect the dam and abutment from possible erosion.

2. The erosion and local sloughing near the water level on the upstream face could increase and if not corrected could lead to an unsafe condition. The upstream slope therefore should be reestablished to its original condition and protected by riprap to prevent further erosion.

3. Currently there are no operating controls for the reservoir outlets due to rusted valve stems and missing wheels and wheel stands. These controls should be repaired or replaced and the intakes should be cleaned. Readily available access should be provided for the control structure.

4. All brush and saplings from the upstream and downstream slopes should be cleaned. All coniferous trees should be removed while larger hardwood trees should not be removed but should be inventoried and their condition monitored. If a
tree dies, the area around the tree should then be monitored for possible seepage.

5. A program of periodic inspection and maintenance of the dam and appurtenances should be provided, including yearly operation of the outlet works and lubrication of its moving parts. Instructions and programs for periodic inspection and operation, together with records of the inspection, should be filed for future reference. The emergency action plan described in Section 7.1d should be maintained and updated periodically during the life of the structure.
SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no operating procedures for the John D. Rockefeller Jr. Dam. Water flows over the spillway ditch in the wet seasons of the year and there is reportedly no flow in the dry summer months. The low level outlets are inoperable.

4.2 MAINTENANCE OF THE DAM

There is no regular maintenance schedule for the dam. The dam is checked occasionally and the road along the crest is regraded periodically by the staff of the owner. Brush and saplings are reportedly cut down about every two years. There is no other maintenance performed.

The low level outlet controls and downstream exit facilities are not cleaned, checked, maintained or lubricated.

4.3 WARNING SYSTEM IN EFFECT

There are no warning systems in effect or in preparation.

4.4 EVALUATION

The overall maintenance of the John D. Rockefeller Jr. Dam is considered inadequate in the following areas:

a. Controls for low level outlets are not operable.

b. The downstream outlet for the low level outlet pipe is covered by rocks and debris.

c. There is brush and tree growth on both the upstream and downstream faces of the dam.

d. There is local erosion and sloughing on the upstream slope.

e. No formal operation and maintenance procedures and manuals exist for the project.
SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The John D. Rockefeller Jr. Dam is located at the headwaters of an unnamed tributary of the Pocantico River, about two miles northeast of Tarrytown and 1-1/2 miles west of the junction of the Taconic State Parkway and Sawmill River Parkway (Hydrologic Unit Code No. 02030101). The drainage basin (0.16 square miles) consists of relatively steep wooded slopes with no defined river channels or surface storage and with little development.

5.2 ANALYSIS CRITERIA

The analysis of the adequacy of the spillway was performed by developing a design flood, using the unit hydrograph method and the Probable Maximum Precipitation (PMP). The all season, 200 square mile 24 hours, PMP for the Westchester area (Zone 1) taken from Weather Bureau sources, was 22 inches. The unit hydrograph was developed for the drainage basin, by using the average Snyder coefficients of 640 \(C_p = 400\) and \(C_T = 2.0\). Rainfall losses of 2.0 inches (initial loss) and 0.1 inch per hour (constant loss) were used. In accordance with the "Recommended Guidelines for Safety Inspection of Dams", the adequacy of the spillway was analyzed using the Probable Maximum Flood (PMF). A multi-plan analysis was performed to test the spillway under the full, 0.75, 0.50 and 0.25 PMF.

5.3 SPILLWAY CAPACITY

The spillway of the John D. Rockefeller Jr. Dam is an irregular earth channel situated near the contact of the dam with the right abutment. The dimensions of the channel vary from point to point and the discharge capacity was computed across the roadway, which was assumed to be the control of the channel, using the Mannings equation. The computed discharge at a depth of 5.0 feet is 780 cfs.

5.4 RESERVOIR CAPACITY

The normal reservoir capacity is listed as 290 acre-feet (see Appendix F) but this is believed to be incorrect. It is estimated that the normal capacity is closer to 180 acre-feet. The computed surcharge storage between the spillway crest El 299 and top of dam El 305.5 is 108 acre-feet which is equivalent to 12.8 inches of run-off.

5.5 FLOODS OF RECORD

There are no records available of floods or maximum lake elevations.
5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated on the basis of the spillway discharge capacity and the available surcharge storage to meet the selected design flood inflows.

The analysis was performed assuming that the lake level was at spillway crest elevation (299.0 feet) at the start of the flood event, and the reservoir drain was assumed closed. The computed inflow peak (PMF) is 561 cfs. The HEC-1DB analysis indicated that the spillway is capable of passing the PMF without the dam being overtopped:

<table>
<thead>
<tr>
<th>RATIO OF PMF</th>
<th>INFLOW PEAK</th>
<th>OUTFLOW PEAK</th>
<th>OVERTOPPING</th>
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<tr>
<td>1.00</td>
<td>561 cfs</td>
<td>421 cfs</td>
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<td>0.75</td>
<td>421 cfs</td>
<td>280 cfs</td>
<td>0 ft.</td>
</tr>
<tr>
<td>0.50</td>
<td>280 cfs</td>
<td>150 cfs</td>
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</tr>
<tr>
<td>0.25</td>
<td>140 cfs</td>
<td>73 cfs</td>
<td>0 ft.</td>
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</table>

5.7 FINDINGS

The John D. Rockefeller Jr. Dam spillway has sufficient capacity to pass the outflow from the PMF routed through the reservoir. Therefore, spillway capacity is adequate.
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
Visual observations did not indicate any structural problems with the embankment or appurtenant structures with the reservoir at its present level. There are no adverse conditions which would affect the stability of the dam at its present level. As detailed in Section 3, however, a potential exists for erosion at the contact of the dam with the right abutment during flood conditions due to the spillway arrangement.

b. Design and Construction Data
The four contract drawings, one as-built drawing and the brief set of specifications have been located. A review of these does not reveal any structural stability problems except as noted above for the spillway.

c. Operating Records
There are no operating records presently kept or available. There are no records or reports of any operational problems which would affect the stability of the dam.

d. Post-Construction Changes
There are no reported post-construction changes other than the maintenance of the road along the crest. This has no effect on the stability of the dam.

e. Seismic Stability
The dam is located in Seismic Zone 1 and in accordance with recommended Phase I guidelines, it does not warrant a seismic analysis.
7.1 ASSESSMENT

a. Safety

Examination of 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.

The earth embankment is considered to be stable under present conditions; however, the location, configuration and type of the present spillway is unacceptable. This presents a potentially hazardous condition under higher than observed flood discharge levels when water flowing over the unlined earth channel at high rates could erode the embankment resulting in the breaking of the dam.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would not be overtopped for the PMF. The spillway capacity is adequate although the configuration and type are not acceptable.

b. Adequacy of Information

This report and its conclusions are based on a visual inspection, interview data, contract drawings, and office hydrologic and hydraulic studies. This information and data are adequate for a Phase I inspection.

c. Need for Additional Investigations

Investigations are required to determine the exact dimensions, capacity or and to appraise the stability of the existing spillway. Following this study, an acceptable engineering solution should be developed to correct this spillway safety problem.

d. Urgency

The investigation of the spillway which are required must be initiated within 3 months from the date of notification. Within 12 months of notification, remedial measures developed as a result of this investigation must be initiated, with completion of this measure during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper around-the-clock surveillance of the dam during periods of extreme runoff. The other problem areas listed below must be corrected within one year of notification.
7.2 RECOMMENDED MEASURES

Following the engineering studies of the spillway other recommended measures are as follows:

1. The local erosion and sloughing on the upstream face near the current water level should be corrected by re-grading and protecting with riprap.

2. Operating mechanisms for the low level outlets should be repaired or replaced. The outlet near the toe of the dam for the low level outlet should be cleared or stones, debris and brush.

3. All brush and saplings from the upstream and downstream slopes should be cleaned. All coniferous trees should be removed while larger hardwood trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should then be monitored for possible seepage. A program of periodic mowing and cutting should also be provided.

4. A program of periodic inspection and maintenance of the dam and appurtenances should be established, including yearly operation of the outlet system and lubrication of its moving parts. This information should be documented for future reference. The emergency action plan detailed in Section 7.1d should be maintained and updated periodically during the life of the structure.
Scale 1" = 2.2 miles

JOHN D. ROCKEFELLER JR.
DAM
VICINITY MAP
PROPOSED DAM FOR LAKE
at the Estate of
MR. JOHN D. ROCKEFELLER JR.
of Prairito Hills, N.Y.

water works contractors inc.
120 Custer St.
M. N. Qty
PROPOSED DAM FOR LAKE
on the Estate of
MR. JOHN D. ROCKEFELLER JR.
at Poquott Hills N.Y.

Water Mills Contractors Inc.
100 Center St.
N.Y. 047
PROPOSED DAM FOR LAKE
on the Estate of
MR. JOHN D. ROCKEFELLER JR.
at Perkins Hill, N.Y.
July 1932

Water, Valley Contractors Inc.
200 Cedar St.
NY, NY
PROPOSED DAM FOR LAKE
ON THE ESTATE OF
MR. JOHN D. ROCKEFELLER JR.
AT POGANTICO HILLS N.Y.

Walter Middlebrooke Constructors Inc.
100 Center St.
10 Y City
PLAN

Revised Core Wall and Spillway

scale 1" = 20'

Proposed Dam for Lake

on the Estate of

Mr. John D. Rockefeller Jr.

at Pocantico Hills, N.Y.

July 6 [illegible]

Hollis Brothers
Walter Rids Construction Inc.
160 Cedar St.
N.Y.C.
PHOTOGRAPHS

APPENDIX B
2. UPSTREAM VIEW OF DAM

3. VIEW ACROSS CREST OF DAM TO RIGHT ABUTMENT
4. OUTLET WORKS TOWER

5. VALVE CONTROL ROD FOR UPSTREAM GATE (NOTE: CORROSION BELOW WATER LEVEL)
6. VIEW OF SPILLWAY LOOKING DOWNSTREAM

7. VIEW OF SPILLWAY LOOKING UPSTREAM
8. CLOSE-UP VIEW OF UPSTREAM FACE OF DAM.
(NOTE: IRREGULAR SLOPE AND LOCAL EROSION)

9. LOW LEVEL OUTLET DOWNSTREAM OF TOE
VISUAL INSPECTION CHECKLIST

APPENDIX C
VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam John D. Rockefeller Jr.
Fed. I.D. # NY 665 DEC Dam No. 922
River Basin Lower Hudson
Location: Town Pocantico Hills County Westchester
Stream Name Pocantico River
Tributary of Hudson River
Latitude (N) 41-06.9 Longitude (W) 73-50.3
Type of Dam EARTH
Hazard Category 1
Date(s) of Inspection April 2, 1981
Weather Conditions Cloudy 50-53°F

b. Inspection Personnel Kalman Sealy, Joe Fiteni Jr.

c. Persons Contacted (Including Address & Phone No.) Mr. John Sandhein:
V.P. Operations, Greenrock Corp., Pocantico Hills, N.Y. 10540 (914). Also at same address contacted:
Pete Vanhelden, P. Fernholz, Mike Berger and John Shroba.

d. History:
Date Constructed 1931-1932 Date(s) Reconstructed
Designer Walter Kidde Constructors Inc
Constructed By As above with Staff of Owner
Owner Estate of John D. Rockefeller-Greenrock Corp.
2) Embankment

a. Characteristics

(1) Embankment Material  EARTH Fill

(2) Cutoff Type  Concrete Core Wall Socketed into Rock Foundation

(3) Impervious Core  Concrete Core Wall

(4) Internal Drainage System  None

(5) Miscellaneous  Limited riprap section on upstream slope shown on drawings - not evident in field.

b. Crest

(1) Vertical Alignment  Good - Except where spillway cut crosses - intentionally sloped in this area

(2) Horizontal Alignment  Good

(3) Surface Cracks  None Visible

(4) Miscellaneous


c. Upstream Slope

(1) Slope (Estimate) (V:H)  1\!:\!2 to 3\!:\!1

(2) Undesirable Growth or Debris, Animal Burrows  None present

(3) Sloughing, Subsidence or Depressions  Local slope erosion and irregularity due to lack of riprap at waterline.

Sheet 2
(4) Slope Protection: Riprap shown on drawings for limited area of slope not presently visible on dam; local erosion present in this area.

(5) Surface Cracks or Movement at Toe: None

---

d. Downstream Slope

(1) Slope (Estimate - V:II) 1V to 2H

(2) Undesirable Growth or Debris, Animal Burrows: Some brush, small tree growth.

(3) Sloughing, Subsidence or Depressions: None Visible

---

(4) Surface Cracks or Movement at Toe: None Visible

(5) Seepage: None Visible

---

(6) External Drainage System (Ditches, Trenches; Blanket): None Present

(7) Condition Around Outlet Structure: Outlet covered by stones, not visible. Surrounding area overgrown, some rusty seepage...

(8) Seepage Beyond Toe: None Visible

---

e. Abutments - Embankment Contact

Left Abutment Contact - Good, Right Abutment Contact

Spillway flows in open cut at contact.

Sheet 3
1) Erosion at Contact  None Visible

2) Seepage Along Contact  None Visible

3) Drainage System
   a. Description of System  None Shown on drawings or evident in field

   b. Condition of System  NA

   c. Discharge from Drainage System  NA

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)  No instruments present
5) Reservoir
   a. Slopes Vary - rolling hills to steep rock outcrops
   b. Sedimentation None visible
   c. Unusual Conditions Which Affect Dam None

6) Area Downstream of Dam
   a. Downstream Hazard (No. of Homes, highways, etc.) High
   b. Seepage, Unusual Growth No visible seepage, Brush and tree covered slope and toe area
   c. Evidence of Movement Beyond Toe of Dam None
   d. Condition of Downstream Channel generally full of brush outlet covered by stones

7) Spillway(s) (Including Discharge Conveyance Channel)
   Spillway consists of unlined ditch cut through overburden near contact of dam with the rock abutment No cts.
   a. General Spillway type is considered unacceptable. Large flows over spillway could erode a deep channel before reaching underlying rock. This would create an unstable condition at right abutmentcontact.
   b. Condition of Service Spillway See note under "a"
      No erosion problem present currently.

Sheet 5
c. Condition of Auxiliary Spillway

None present

---

d. Condition of Discharge Conveyance Channel

Channel is very small, not as shown on drawings. Capacity is very limited before flow would occur over surrounding road and field.

---

3) Reservoir Drain/Outlet

Type: Pipe [ ] Conduit [ ] Other [ ]

Material: Concrete [ ] Metal [ ] Other [ ]

Size: 24 inch ID [ ] Length 164.5

Invert Elevations: Entrance 276.0 Exit 275.0

Physical Condition (Describe): Unobservable [ ]

Material: NA [ ]

Joints: NA [ ] Alignment [ ]

Structural Integrity: NA [ ]

Hydraulic Capability: NA [ ]

Means of Control: Upstream [ ] Gates Side [ ] Downstream [ ] Valve Side [ ] Uncontrolled [ ]

Operation: Operable [ ] Inoperable [ ] Other [ ]

Present Condition (Describe): Rods to gates are bad/rusted. Wheels and stand required to operate gate not present at outlet works.
9) Structural

a. Concrete Surfaces  See Item B

b. Structural Cracking  See Item B

c. Movement - Horizontal & Vertical Alignment (Settlement)  NA

d. Junctions with Abutments or Embankments  NA

e. Drains - Foundation, Joint, Face  NA

f. Water Passages, Conduits, Sluices  Item B

g. Seepage or Leakage  NA
h. Joints - Construction, etc. ______ NA

i. Foundation ______ NA

j. Abutments ______ NA

k. Control Gates ______ See item B

l. Approach & Outlet Channels ______ See item B

m. Energy Dissipators (Plunge Pool, etc.) ______ NA

n. Intake Structures ______ See item B

o. Stability ______ NA

p. Miscellaneous ______ NA
10) **Appurtenant Structures** (Powerhouse, Lock, Gatehouse, Other)
a. Description and Condition  **No Appurtenant Structures present.**
HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D
### Check List for Dams
**Hydrologic and Hydraulic Engineering Data**

**Area-Capacity Data:**

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Surface Area</th>
<th>Storage Capacity</th>
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<tbody>
<tr>
<td>ft.</td>
<td>acres</td>
<td>acre-ft.</td>
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</tbody>
</table>

1) Top of Dam  
2) Design High Water (Max. Design Pool)  
3) Auxiliary Spillway Crest  
4) Pool Level with Flashboards  
5) Service Spillway Crest

### Discharges

<table>
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<th>Volume (cfs)</th>
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<tbody>
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<tr>
<td>1570</td>
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<td>1720</td>
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<tr>
<td>unknown</td>
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<td>unknown</td>
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<tr>
<td>CREST: DAM</td>
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<tr>
<td>------------</td>
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<tr>
<td>Type: Earth</td>
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<tr>
<td>Spillover: Uncontrolled Ditch - natural</td>
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### Spillway:

<table>
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<tr>
<th>Service</th>
<th>Auxiliary</th>
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<tr>
<td>299.0</td>
<td>Elevation</td>
</tr>
<tr>
<td>Open Cut</td>
<td>Type</td>
</tr>
<tr>
<td>Varies</td>
<td>Width</td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>Type of Control</td>
</tr>
<tr>
<td>Controlled: (Flashboards; gate)</td>
<td>Number</td>
</tr>
<tr>
<td>Size/Length</td>
<td>Invert Material</td>
</tr>
<tr>
<td>Anticipated Length of operating service</td>
<td>Chute Length</td>
</tr>
<tr>
<td>Height Between Spillway Crest &amp; Approach Channel Invert (Weir Flow)</td>
<td>7</td>
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</table>
HYDROMETEOROLOGICAL GAGES: None used

Type: __________________________
Location: _______________________
Records:
   Date: ________________________
   Max. Reading: _______________

FLOOD WATER CONTROL SYSTEM: None

Warning System: _______________________

Method of Controlled Releases (mechanisms): None

______________________________
______________________________
______________________________
DRAINAGE AREA: 0.16 Sq. Miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Woodlands and Meadows

Terrain - Relief: Gently Sloping

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

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:

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

Location: None

Elevation:

Reservoir:

Length & Maximum Pool 0.4 (Miles)

Length of Shoreline (at Spillway Crest) 1t (Miles)
<table>
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<th>Duration (Hrs)</th>
<th>%</th>
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<td>6</td>
<td>11</td>
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<tr>
<td>12</td>
<td>123</td>
</tr>
<tr>
<td>2.4</td>
<td>132</td>
</tr>
<tr>
<td>4.8</td>
<td>142</td>
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</tbody>
</table>

| L = 1.3" = 2600' = 0.49 miles |
| L_CH = 0.6" = 1200' = 0.23 miles |

Using average Scurer Coef C_T = 2

640 C_p = 400

\[ T_p = 2 (0.49 \times 0.23)^{0.3} = 1.04 \text{ hours} \]

\[ T_\text{fr} = 1.5^{0.5} = 0.159, \text{ h/s} = 11.34 \text{ mil} \text{ for } T_\text{fr} = 0.159 \text{ hrs} \]

\[ T_{pr} = T_p + 0.25 (T_r - T_\text{fr}) = 1.04 + 0.25 (0.5 - 0.159) = 1.04 + 0.0775 \]

\[ T_{pr} = 1.12 \text{ (2 decimal places)} \]
Spillway is Iregular Earth Channel at NE corner of Dam

Spillway Discharge Computed using:

\[ Q = \frac{1.49}{n} AR^{\frac{3}{2}} \]

**Set S = 0.001** \( S^{\frac{3}{2}} = 0.032 \)

**Set n = 0.035** \( 1.49/n = 42.6 \)

Invert of channel at approx. elevation 299.

<table>
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<tr>
<th>EL</th>
<th>Width</th>
<th>Area</th>
<th>Q</th>
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<tr>
<td>300</td>
<td>14</td>
<td>11</td>
<td>12.5</td>
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<tr>
<td>302</td>
<td>80</td>
<td>110</td>
<td>180</td>
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<td>304</td>
<td>115</td>
<td>810</td>
<td>816</td>
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<tr>
<td>305.5</td>
<td>150</td>
<td>510</td>
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Width approximated from design drawing at July 31.
**TAMS**

**Job No.** 1519-12  
**Project** J.D. Rockefeller Dam Inspection  
**Subject** Hydraulic/Hydrologic Computations  
**Date** April 1961  
**By** D.L.C.

### Surcharge Storage Computations

<table>
<thead>
<tr>
<th>EL (Ft)</th>
<th>ΔH (Ft)</th>
<th>Area (Ac)</th>
<th>Mean Area (Ac)</th>
<th>ΔVolume (AcFt)</th>
<th>Storage Capacity (AcFt)</th>
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<td>19.8</td>
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<tr>
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<td>21.1</td>
<td>378</td>
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<tr>
<td>320</td>
<td>10</td>
<td>21.2</td>
<td>21.2</td>
<td>21.2</td>
<td>640</td>
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**Lake Area** 18.37

**Drainage Area** 105.64

% impervious 17.472

### Cross Section D/S of Dam Span 6450

<table>
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<th>Dist.</th>
<th>Diff.</th>
<th>Dist.</th>
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<tr>
<td>270</td>
<td>100</td>
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**Notes:**

4. **CRS 6.24:** Dam width = 400 ft [325' + Length of right abutment (75 ft)] which is at same level as dam - see DWS.
**JOB SPECIFICATION**

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<th>MB</th>
<th>WHR</th>
<th>MN</th>
<th>1ST</th>
<th>2ND</th>
<th>WT</th>
<th>HRC</th>
<th>SPLT</th>
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**MULTI-PLAN ANALYSES TO BE PERFORMED**

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<th>NRTY</th>
<th>NRTZ</th>
<th>NRTA</th>
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**SUB-AREA RUNOFF COMPUTATION**

**1 BASIN RUNOFF**

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<th>ICON</th>
<th>ICON</th>
<th>ITAPE</th>
<th>JOLT</th>
<th>JPRT</th>
<th>INAME</th>
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**HYDROGRAPH DATA**

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<th>IH30A</th>
<th>IH30C</th>
<th>CTAB</th>
<th>RATIO</th>
<th>ISNOW</th>
<th>ISAME</th>
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**PRECIP DATA**

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<th>R440</th>
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<th>R96</th>
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**TAPC COMPUTED BY THE PROGRAM IS**

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**LOSS DATA**

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**UNIT HYDROGRAPH DATA**

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**RECESSION DATA**

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**APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SWR HYD**

| UNIT HYDROGRAPH IN END-OFF-TIME ORDINATES, LAG = 1.01 HOURS, CP = 0.63 VOL = 1.00 |
|-------|-------|-------|-------|-------|
| 18    | 57    | 63    | 33    | 19    |
| 10    | 5     | 2     | 1     | 1     |

Sheet 7 of 20
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**END-OF-PERIOD HYDROGRAPHS**

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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


7. "National Program of Inspection of Dams", Vol. 3, Department of the Army, Office of the Chief of Engineers, 1975


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


11. "Geologic Map of New York, Lower Hudson Sheet", The University of the State of New York, the State Education Department State Museum and Science Service, Geological Survey, Map and Chart Series No. 5, 1961

OTHER DATA

APPENDIX F
GREENROCK CORPORATION
POCANTIC HILLS
TARRYTOWN, NEW YORK 10591

Area Code 914
631-4560

February 10, 1981

J. Patel
Tippetts-Abbet-McCarthy-Stratton
The Tams Building
655 Third Avenue
New York, New York 10017

J. Patel:

In regards to your letter of January 14, 1981 I have copied a set of drawings we had on file for the JDR Lake. In addition to the prints I have enclosed photographs of the subject dam.

The questionnaire is probably not applicable to the Rockefeller Dam, in fact, I found it difficult to answer the questions.

In recent years the lake formed by the dam has become known as Swan Lake.

If I can be of further assistance please do not hesitate to call or write.

Sincerely,

[Signature]

John C. Sundholm
Vice President of Operations
BRIDGE AT 

...
September 10th, 1931.

T. F. Farrell, Chief Engineer,
Division of Engineering,
Albany, N.Y.

Dear Sir:

As directed in your letter dated September 4th, an inspection
was made of the foundations of the dam being constructed for Mr. John
D. Rockefeller, Jr., at a point about two miles north of Pocantico Hills
Village and about three hundred (300) feet west of the old railroad
right of way.

This inspection was made on September 8th in company with
Messrs. A.B. Miller, H.G. Test, W.M. Renwick and O. Blake, all of whom
are employees of the Walter Kidde Constructors, Inc.

This project has the following characteristics:

Location:  quad. 214, Sect. 6, Letter A, No. 22
Maximum Height:  21 feet
Drainage Area:  .04 square miles
Storage Capacity:  Over one million gallons
Type:  Concrete core wall with earth embankment on
       both sides.
Length:  Over three hundred feet.
Spillway:  Rectangular, twenty-four feet wide, eleven
          feet high.
Blow-off:  24" C.I.P.
Purpose:  Recreational
Owner:  John D. Rockefeller, Jr.
Date Completed:  --------
Designed by:  Walter Kidde Constructors, Inc.
Constructed by:  Rockefeller Employees.

At the time of our visit, the lowest point to which excavation
for core wall had been carried was elevation 275.0 (R.R. datum), whereas
the plans called for elevation 271.0. Material at bottom of trench was
a quite compact strata of sand containing no gravel but some boulders.
Ledge rock had been reached over a forty foot interval on the west end
and a twenty foot interval on the east end of the core wall foundation.
One spring has been encountered at approximately the middle of
the dam site.

Mr. Miller advised that when the remainder of the founda-
tion had been uncovered at a lower depth and in a more substantial
material, he will advise us for the purpose of further inspection.

You will note that this dam is located a few hundred feet
north of the headwaters of a stream which flows to the south as
indicated on U.S.G.S. sheet.

This dam will have a drainage area of only nineteen acres
and is located in a swamp which has no springs with appreciable
discharge and therefore we believe there will be some difficulty
in maintaining the proposed lake of fresh water.

Very truly yours,

J. S. BIXBY

District Engineer

CAH/BHI

Copy to Co. Asst. Brady and Mr. C. A. Huhne
Incorporated
Engineers and Constructors

140 Cedar Street, New York

September 2, 1931

State of New York,
Dept. of Public Works,
Div. of Engineering.

Attn. Mr. H.O. Schermerhorn, Asst. Chief Engr.

Re: DAM NO. 214-922 LOWER HUDSON WATERSHED.

Dear Sirs:

Your letter of August 5th requested notification when
the foundation of the dam was ready for inspection.

The trench for the core wall is nearly completed and
the site of the dam has been cleared and grubbed and loam
and top soil removed.

It appears to us that the inspection could now be made
any time at your convenience.

If arriving in Tarrytown by train, please call at the
Westchester Road Construction Co., 38 White Street, who will
locate our Engineer and have him come down with his auto.
If arriving by automobile, the nearest point would be at the
job office of the new bridge now under construction about a
mile north of Pocantico Hills Village on Bedford Road, where
the Engineer can be found, or be reached by 'phone.

Yours very truly,

WALTER KIDDE CONSTRUCTORS, INC.

Arthur B. Miller.
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 Proposed Dam for Lake on the Estate of Mr. John D. Rockefeller, 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 July 1932.

1. The dam will be on a brook flowing into Pocantico River in the town of Mount Pleasant, County of Westchester and 3,000 feet South from the former R.R. Bridge on Old Sleepy Hollow Road.

2. Location of dam is shown on the Carytown quadrangle of the United States Geological Survey.

3. The name of the owner is Mr. John D. Rockefeller, Jr.

4. The address of the owner is Pocantico Hills, New York.

5. The dam will be used for Pleasure Lake.

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 approximately one-third of a square mile.

8. The proposed dam will create a pond area at the spillcrest elevation of six feet and will impound seven million cubic feet of water.
9. The maximum height of the proposed dam above the bed of the stream is 21 feet 0 inches.

10. The lowest part of the natural shore of the pond is five feet vertically above the spillcrest, and everywhere else the shore will be at least fifteen 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 down stream, what is the nature of material composing the right bank? Sand, gravel, clay and rock.

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

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 24 feet long in the clear; the waters will be held at the right end by a masonry wall, the top of which will be five feet above the spillcrest, and have a top width of two feet; and at the left end by a masonry wall, the top of which will be five feet above the spillcrest, and have a top width of two feet.

18. The spillway is designed to safely discharge 180 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows: twenty-four inch cast iron draw off pipe loads under the dam, and is controlled by a 24" cast iron gate valve in a masonry gate tower. A twenty-four inch sluice gate and a twelve inch sluice gate admit water to the gate tower.

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 twenty-four inch Spillway and channel used.

22. Does this dam constitute any part of a public water supply?
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 hereofore made by the conservation 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 heretofore 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.

_________________________     _________________
John P. Rockefeller, Jr.    Owner.

By. _________________________
Arthur B. Miller, authorized agent of owner.

Address of signer. 140 Cedar Street, New York City. Date. August 3, 175.
SPECIFICATIONS

for

PROPOSED DAM FOR LAKE

on the Estate of

MR. JOHN D. ROCKEFELLER, JR.

PACIFIC HILLS, N.Y.

July 1931.

Walter Elks Constructors, Inc.,
120 Cedar Street,
New York City.
ENAVATION

EXCAVATION

All brush, grass, roots and scrap must shall be cleared from the area to be covered by the dam embankments down to clean soil, hardpan or rock and in any event to a depth of not less than two (2) feet.

DITCH WALL

Trench for the core wall shall be excavated in clay or hardpan to a depth of three (3) foot below the surface thereof, or eight (8) feet below the present ground surface. If ledge rock is encountered at least depth all rotten or weathered rock shall be removed and the sound rock shall be thoroughly worked and broken to receive the concrete. No boulders shall be left within or projecting into the trench.

MISCELLANEOUS

All other excavation required for the blow-off pipe, spillway or other appurtenances shall be made as shown on the drawings or directed by the Engineer.

EQUIPMENT

Material for making the embankments of the dam shall be obtained from the pool bottom and banks where directed by the Engineer. Material shall be free from all brush, grass and roots and free stones larger than six (6) inches in greatest dimension. If stones of any size are placed in the upstream embankment they shall be carefully separated and not be permitted to lie in nooks.

The material forming the dam embankments shall be spread in layers not over eight (8) inches in thickness and each layer shall be thoroughly compacted by tamping or treading over the loose material. Against the core wall or other walls and in places where the embankments are not be compacted by tamping, they shall be thoroughly tamped with heavy hand tampers.

If ordered by the Engineer each layer of embankment shall be sprinkled with water to insure proper consolidation.

No frozen material will be permitted in embankments or back fill.
EXHIBIT

Upon completion of the downstream embankment and the top of the dam, those surfaces shall be well raked and seeded in rye and then be sprinkled. If a good stand of rye is not obtained by the first seeding it shall be repeated.

CONCRETE

PROPORTIONS

All reinforced concrete shall be mixed in the proportions of one part by volume of cement to two parts of sand to four parts of broken stone.

All plain concrete shall be mixed in the proportions of one part by volume of cement to two and one-half parts of sand to five parts of broken stone.

In plain concrete structures more than one (1) foot in thickness, one ton stone or piers may be used. Each pier shall be well washed, and packed into place and no pier shall be narrower than two (2) inches in a form.

MIXING

All concrete shall be mixed in a power-driven batch mixer satisfactory to the Engineer and the mixing of each batch shall be sufficient to produce a uniform plastic mass with no segregation of the ingredients.

WATER

Only so much water shall be used as will give a plastic workable concrete mixture "not" nor "dry". All water shall be provided by the contractor at his own expense.

PLACING

Concrete shall be carried from the mixer to the forms and placed in the forms in such manner that there will be no separation of the ingredients.

VIBRATION

As concrete is placed in the forms it shall be thoroughly tamped and spread against the forms as to avoid stone pockets and to produce a surface on the concrete which will require no finishing.

FORMS

All forms shall be made from clean and dressed lumber either chip lap or tongue and groove. Forms shall be duly strong to maintain line and grade during the placing and tamping of the concrete and shall be built truly to the shapes and dimensions shown on the drawings. Forms shall be thoroughly water-tight and satisfactory to the Engineer.
FINAL OR FORMS

Forms shall not be removed from any portion of the work until permitted by the Engineer.

REINFORCEMENT

Steel reinforcing bars of the size and spacing shown on the drawings shall be fastened securely to their proper position in the forms. Thereafter, bars shall overlap fifty (50) diameters and shall be securely wired. All intersecting bars shall be securely wired together.

CONSTRUCTION JOINTS

Construction joints having the detail shown on the drawings shall be placed so that the section of work between the joints can be poured at one continuous operation. All concrete shall be monolithic between construction joints.

RIP RAP AND PAVER

RIP RAP

Upon the upstream slope of the dam embankment stone rip rap shall be placed by hand to line and grade. Stones for rip rap shall be the size of a man's head and shall be chinked with similar stone.

PAVER

The ordinary paving shall be laid by hand of stones similar to those used for rip rap. After paving is laid it shall be thoroughly grouted by pouring on three parts of cement and sand mixed with water to the consistency of cream and well broomed in.

BLOW-OFF

The contractor shall furnish and lay cost iron pipe blow-off as shown on the drawings. Joints shall be poured from molten lead and thoroughly swelled. Lead in the finished joints shall have a depth of at least two (2) inches. Second hand pipe may be used if approved by the Engineer.

VALVE

The contractor shall furnish and set a gate valve in the blow-off pipe where it passes through the gate tower. This valve shall be a twenty-four inch flanged and iron body bronze mounted double disk water works gate valve, with four (4) inch bypass valve, with hand wheel, and shall be a Jamesbury Valve Company Standard Weight Gate Valve or equal and satisfactory to the Engineer.
Flume Gate:

The Contractor shall furnish and set the cast iron sluice gates shown in the gate tower. These sluice gates shall be "shrink" or expressed steel, and bronze mounted turn-hunt. The joint between the front of the sluice gates and the masonry wall shall be made with expoxy saturated sealing wood as a gasket.

Sluice Gate:

The Contractor shall furnish and set a steel plate cover for the masonry. This cover shall be provided with hinges, latch and lock and shall be painted with the costs of red lead and oil. Hinges and latch shall be neatly and securely fastened to the concrete of the masonry.

Ladder Steps:

The Contractor shall furnish and set wrought iron ladder steps in the gate tower as shown on the drawings.

Bridge:

Bridge from the dam to the Gate Tower shall be made with two (2) leg I beams with bolts and pipe separators, and shall be filled with 2" rough oak planks, and fastened with 2" track spikes driven from underneath to clip the inside flanges of the beams. Leading shall be of wood as per details, the wood posts being bolted through the web of the I beam.

AUS H11 - PIPE PILER

If order by the Engineer, the Contractor shall furnish material and drive a steel sheet pile cut-off wall beneath the core wall. Piling shall have 3/8 inch web and shall weigh not less than 25 pounds per square foot of wall. Price for this work will be agreed upon when work is ordered and will be in addition to the lump sum bids.

Materials:

Concrete shall be a standard brand of Portland cement and shall meet the requirements of the Standard Specifications and Tests for Portland Cement of the American Society for Testing Materials, Serial Publication C-90-08 and any subsequent revisions thereof.

Sand:

Sand for concrete shall be coarse, clean and sharp and shall contain no vegetable matter and not over three (3) percent of clay or loam.
BROKEN STONE

Broken stone for concrete shall be sound trap rock free from shale, limestone or dust. It shall be of size such that it will be passed by a two (2) inch screen but retained on a one (1) inch screen.

WATER

Water for concrete and grout shall be clean and free from oil, acid, clay or other deleterious matter.

CAST IRON PIPE

Cast iron pipe shall be Class B hub and spigot and flange and spigot pipe in accordance with the American Water Works Association Specifications.

REINFORCING STEEL

All steel reinforcing bars shall be square deformed or square twisted bars meeting all the requirements of the Standard Specifications and Tests of the American Society for Testing Materials, Serial Designation A-15-16 and any subsequent revisions thereof.