DAM SAFETY INSPECTION REPORT
FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ENERGY PROJECTS
DIVISION OF DAM SAFETY AND INSPECTIONS
NEW YORK REGIONAL OFFICE

For the period September 28, 2007 to July 29, 2010

Licensee Indian River Hydro LLC Project No. 2631-MA

Project Name Woronoco (NATDAM No. MA00737)

Location Westfield River Hampden MA
(Waterway or reservation) (County) (State)

License issued April 30, 2002 Expires March 31, 2042 Type Case Specific

Date of last amendment None

Inspected by C Y Hsu & Noel Aglubat Date July 29, 2010

Parts of project inspected Dams, gatehouse, intake and stoplog structures, penstock, and powerhouse

Weather Partly sunny, temperatures in the low 80s°F

Accompanied by Messrs Wayne Bailey, Davis Hobbis & Wayne Robbers, and Bill Fey – Indian River Hydro Operations

Summary

Based on a file review of all available information and field observations, the Licensee was in compliance with all license requirements during this report period.

Overall, the North and South Dams, project structures and equipment were inspected and found to be in generally good condition.

The Licensee filed construction drawings and design calculations for the installation of the Downstream Fish Passage Facilities (**DFPF**). After review, NYRO sent an authorization letter to proceed the DFPF construction on May 21, 2010.

Project security was discussed during the current Dam Safety Inspection and any follow-up was provided as needed.

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There are no other matters of immediate interest to the Commission.

Submitted February 28, 2011

C Y Hsu, Civil Engineer

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Pertinent Data Sheet

09/10/2010

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ENERGY PROJECTS
Division of Dam Safety and Inspections

NYRO

General Data

Dam Number	02631-01-01
Dam Name	Woronoco - South Dam
Project Name	Woronoco
Reservoir Name	Woronoco
Secondary Reservoir Name	
Licensee/Exemptee	Woronoco Hydro, LLC
Owner	Woronoco Hydro, LLC
County, State	Hampden, Massachusetts
USGS Quad Map	Blandford
Latitude	42.1650
Longitude	-72.8294

Hazard Potential Classification	L
Year Dam Completed	1938
River	Westfield River
Drainage Area (sq mi)	346
Downstream City	Westfield
Distance (mi)	8.00
Last Periodic Inspection Date	07/29/2010

Hydrologic Data

Hundred-Year Flood (cfs)	58,650
Flood of Record (cfs)	70,300
Date of Flood of Record	08/19/1955

Reservoir Data

Normal Maximum Surface Area (ac)	43.0
Reservoir Elevation (ft)	
Maximum	229.0
Normal Maximum	229.0
Minimum	229.0
Reservoir Storage (ac-ft)	
Maximum	1,830
Normal Maximum	1,830

Project Works

Dam Height (ft)	25.0
Nominal Dam Crest Elevation (ft)	229.0
Elevation of Lowest Point of Embankment (ft)	
Elevation of Lowest Point of Parapet (ft)	
Normal Freeboard (ft)	0.0
Length of Dam (ft)	351.0
Flashboards Installed	No
Elevation of Top of Flashboards (ft)	Not Applicable
Uncontrolled Spillway Width (ft)	311.0
Uncontrolled Spillway Crest Elevation (ft)	229.0
PMF Inflow (cfs)	
PMF Outflow (cfs)	
PMF Reservoir Elevation (ft)	
IDF Inflow (cfs)	
IDF Outflow (cfs)	
IDF Reservoir Elevation (ft)	
IDF Freeboard (ft)	
Number of Penstocks	1
Number of Tunnels	0
Number of Canals	0
Number of Locks	0
Number of Powerhouses	1
Number of Generating Units	3
Authorized Generation Capacity (kW)	2,700

Dam Type 1: Concrete
Dam Type 2: Gravity

Safety Requirements

Part 12D Report Required	No
Latest Part 12D Report Received	Not Applicable
Emergency Action Plan Status	Exempt
Latest EAP Plan/ Modification Received	Not Applicable
Boat Restraining Barrier Required	Yes
Date In (Month/Day)	04/15
Date Out (Month/Day)	10/15

Gate Details

Gate Category/Number of Gates:

Total Number of Spillway Gates	0

Types, # of Spillway Gates

CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION
DO NOT RELEASE

Pertinent Data Sheet

09/10/2010

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ENERGY PROJECTS
Division of Dam Safety and Inspections

NYRO

General Data

Dam Number	02631-01-02
Dam Name	Woronoco - North Dam
Project Name	Woronoco
Reservoir Name	Woronoco
Secondary Reservoir Name	
Licensee/Exemptee	Woronoco Hydro, LLC
Owner	Woronoco Hydro, LLC
County, State	Hampden, Massachusetts
USGS Quad Map	Blandford
Latitude	42.1665
Longitude	-72.8297

Hazard Potential Classification	L
Year Dam Completed	1938
River	Westfield River
Drainage Area (sq mi)	346
Downstream City	Westfield
Distance (mi)	8.00
Last Periodic Inspection Date	07/29/2010

Hydrologic Data

Hundred-Year Flood (cfs)	58,650
Flood of Record (cfs)	70,300
Date of Flood of Record	08/19/1955

Reservoir Data

Normal Maximum Surface Area (ac)	43.0
Reservoir Elevation (ft)	
Maximum	229.0
Normal Maximum	229.0
Minimum	229.0
Reservoir Storage (ac-ft)	
Maximum	1,830
Normal Maximum	1,830

Project Works

Dam Height (ft)	25.0
Nominal Dam Crest Elevation (ft)	229.0
Elevation of Lowest Point of Embankment (ft)	
Elevation of Lowest Point of Parapet (ft)	
Normal Freeboard (ft)	0.0
Length of Dam (ft)	962.0
Flashboards Installed	No
Elevation of Top of Flashboards (ft)	Not Applicable
Uncontrolled Spillway Width (ft)	307.0
Uncontrolled Spillway Crest Elevation (ft)	229.0
PMF Inflow (cfs)	
PMF Outflow (cfs)	
PMF Reservoir Elevation (ft)	
IDF Inflow (cfs)	
IDF Outflow (cfs)	
IDF Reservoir Elevation (ft)	
IDF Freeboard (ft)	
Number of Penstocks	0
Number of Tunnels	0
Number of Canals	0
Number of Locks	0
Number of Powerhouses	
Number of Generating Units	
Authorized Generation Capacity (kW)	

Dam Type 1: Concrete
Dam Type 2: Gravity
Dam Type 3: Earth

Safety Requirements

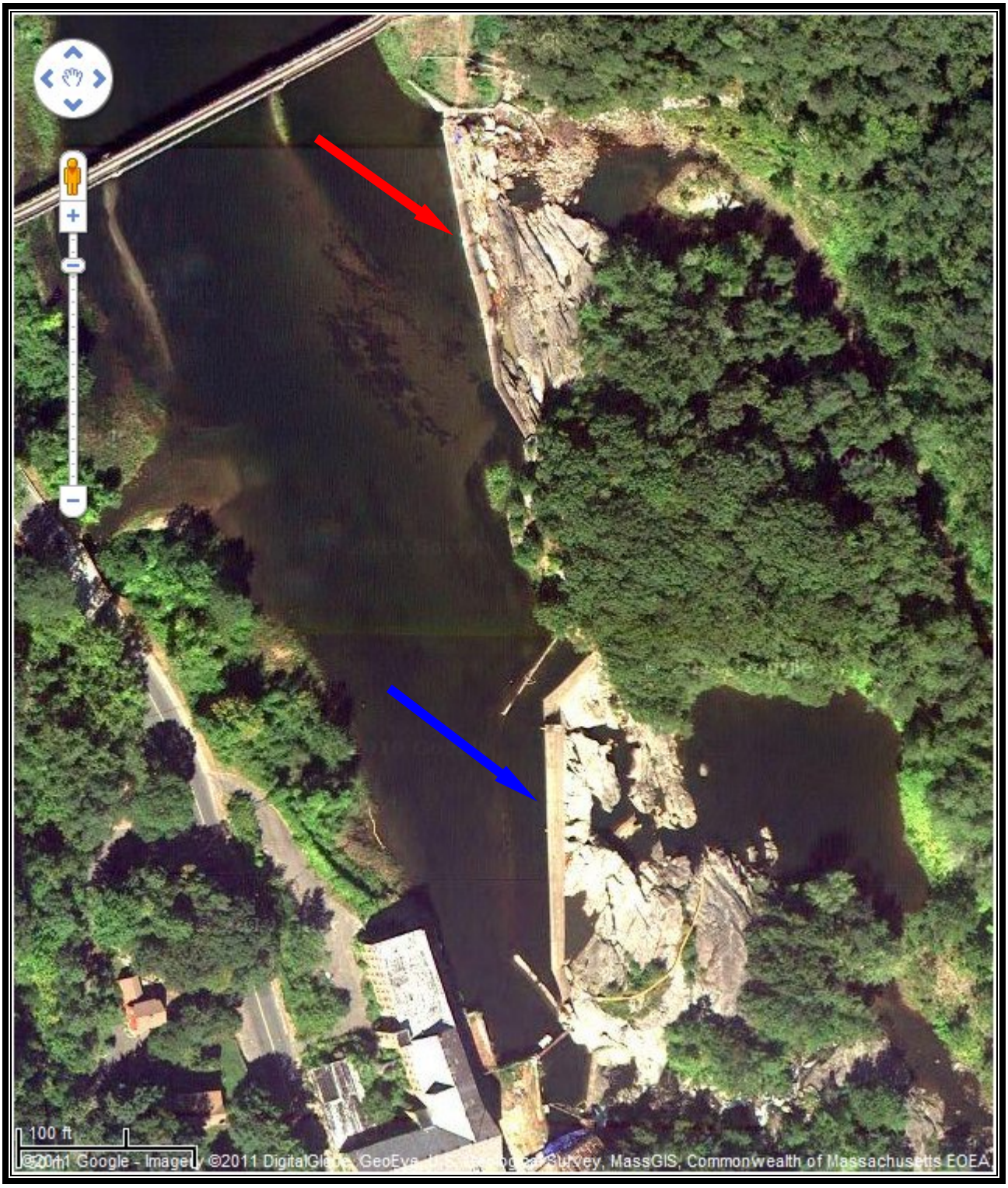
Part 12D Report Required	No
Latest Part 12D Report Received	Not Applicable
Emergency Action Plan Status	Exempt
Latest EAP Plan/ Modification Received	Not Applicable
Boat Restraining Barrier Required	Yes
Date In (Month/Day)	04/15
Date Out (Month/Day)	10/15

Gate Details

Gate Category/Number of Gates:

Total Number of Spillway Gates	0

Types, # of Spillway Gates



Aerial Photo – View of the Woronoco project. The red arrow indicates the location of the north dam. The blue arrow indicates the location of the south dam.

CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION
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A. Downstream Hazard Potential

The Woronoco Project is located within the boundaries of the former Strathmore Paper Company Mill on the Westfield River in the Town of Russell, Hampden County, Massachusetts, about 18.5 miles upstream of the confluence with the Connecticut River. The area downstream of Woronoco Dam is predominantly rural, with several small residential areas and industrial sites situated along both river banks. A commercial rail line and major highways are also located along the Westfield River immediately downstream of the project site.

Dambreak analyses submitted by the former Licensee, International Paper Company, on January 18, 1991, as a supplement to the second consultant's safety inspection report, revealed that failure of Woronoco Dam under sunny day or various flood flow events would not significantly impact downstream life or damage improved property and related structures.

Both dams have the same height so the dambreak analysis was for a concrete dam with a height of 25 feet. The breach parameters were a 60-foot wide, full height breach occurring within 10 minutes. The embankment section was also evaluated using a 15 foot full height breach, 45 feet wide, 0.5H: 1V side slopes and a failure time of 0.1 hours. The embankment failure was less critical than the failure of the concrete section due to its smaller breach size.

The reservoir storage was also modified to account for silt assuming part of the silt would be released by a dam breach. This revised the reservoir storage from 1,830 acre-feet to 600 acre-feet. Dam breaks were evaluated for sunny day, 10-yr flood, 50-yr flood and 100-yr flood. The dam break study showed that the increments under sunny day were about 10 feet immediately below the dam and quickly dropped. No structures were impacted by a sunny day dam failure. For the 10-yr flood, the incremental flooding below the dam was about 4 feet and also dropped to less than two feet about 3.5 miles downstream from the dam. For the 50-yr and 100-yr flood dam breaks, the increments were about two feet or less below the dam and became insignificant further downstream.

Therefore, the dam break analysis showed dam failure would have no impacts on downstream life or property. The Director, Division of Dam Safety and Inspections (D2SI) subsequently reclassified Woronoco Dam as a low hazard potential structure by letter dated March 18, 1991.

Field observations during the inspection revealed no significant changes in downstream conditions **(Photo Nos. 1 & 2)** to warrant a revision in the present hazard potential classification.

B. Project Safety and Maintenance

1. Dams and Other Water Retaining or Conveyance Structures

The Woronoco Project consists of Woronoco Dam, which is comprised of two concrete gravity spillway sections separated by a rock outcropping. The spillway section north of the outcropping is known as the North dam and the spillway section south of the outcropping is known as the South dam **(Aerial Photo)**. The project also consists of an earth dike with a steel sheetpile core; a gatehouse and intake structure; a sluice gate for interim downstream fish passage; a canal stoplog structure; a steel penstock; and a powerhouse.

The north dam was found to be in satisfactory conditions. At the time of the inspection the Licensee was performing concrete maintenance on the downstream face of the dam **(Photo No.3)**. The south dam was found to be in satisfactory condition with the exception of some deteriorated concrete on the down stream face **(Photo No. 4)**. The Licensee proposed to perform concrete maintenance work once the work was completed on the north dam. The work will be verified during the next dam safety inspection.

The project intake structure is located adjacent to the south dam, and includes trash racks with 1.25-inch-clear bar spacing and a downstream fish passage facility. The gatehouse and intake structure **(Photo No. 5)** were found to be in good to fair condition. During the previous report period the Licensee installed a new steel roller safety gate in place of the dilapidated wooded bulkhead gate. The new gate can close under its own weight if there is a plant trip and the turbine wicket gate fails to close. The gate can also be manually closed.

The fish passage facility consists of a fish collection chamber, a 30 inch bypass schedule 40 pipe, an open-topped metal chute, a timber gate, and a plunge pool. The pool has been modified to enhance safe fish passage. The passage facilities installation is required by Article 404 of Woronoco Project License dated April 30, 2002 and Order Approving Downstream Atlantic Salmon Smolt Passage Effectiveness Report and requiring further Action Pursuant to License Article 404 dated July 21, 2009. The facility operates using a flow of 20 cubic feet per second. In its March 1, 2010 Order Approving Plans and Schedules for Trashrack Installation and Testing, and a Revised Schedule for Downstream Atlantic Salmon Smolt Passage Effectiveness Study, the Commission approved the licensee's plan to begin using 13 full-depth, removable trashrack overlay panels that would reduce the trashrack clear spacing to 3/4 inch, to protect out-migrating salmon smolts and adult eel.

The drawings and design calculations for the DFPF installation were filed by the Licensee on April 5, 2010. NYRO approved the DFPF designs and authorized DFPF construction on May 21, 2010. During the site visit, it was observed that the construction

was completed up to the Elevation of 239.59. The new deck and its support beams had not been constructed yet.

The sluice gate **(Photo No. 6)** located next to the gatehouse is in good condition. According to the Licensee, a gate efficiency test was conducted during this report period. Due to the gate mechanism failure, the gate could not be closed. In order to restore the gate operating condition, the reservoir was drawn down and an emergency repair performed. The Licensee had informed all resource agencies of the reservoir draw down. A new stoplog closure structure was installed immediately upstream, in the previous report period, to dewater the forebay area without draining the entire impoundment.

The penstock which runs partially underground and partially above ground appeared to be in good condition with no leakage or any significant deterioration of the concrete saddles **(Photo Nos. 7 & 8)**. The concrete piers supporting the penstock leading to the powerhouse were under repair during this reporting period **(Photo No. 9)**. The V-shape expansion joint **(Photo No. 10)** was observed during this inspection and was found to have slightly expanded compared to the previous inspection. The Licensee was asked to monitor this condition and report on any changes.

Both the interior and exterior of the powerhouse was observed to be in good condition, **(Photo Nos. 11 & 12)**. The structure appears to be well maintained. The Licensee reported that no significant changes have occurred in the previous found cracks located along the top of the tailrace portal **(Photo No. 13)**.

No settlement or depression was noted along the crest of the earth embankment **(Photo No. 14)**; during the previous inspection, the Licensee was requested to cut and remove the vegetation overgrowth. The Licensee indicated that overgrown vegetation had been cut and removed, but it has grown back. During this site visit, the Licensee was requested to conduct a vegetation control program to remove the overgrowth as part of their regular maintenance and to make a thorough inspection on the earth dike after clearing the vegetation.

2. Spillway Gates and Control structures

There are no spillway or crest control gates at the Woronoco Project.

3. Power Generation and Transmission

During the inspection, the pond elevation was at 229.00’ and the tailrace water elevation was at 173.32’. The units were generating at the following rates: both Unit Nos. 1 and 2 were generating at 400kW and Unit 3 was generating at 1950kW.

According to the Licensee, the most recent maintenance overhaul to the units was

conducted during the April, 2010 shut down. The work includes: inspection of the pressure case and cleaning of debris, inspection of the wicket gates and gate links, inspection and adjustment of the wet bearings, checking the torque on the wicket gate shaft nose bolts, lubrication of the control shaft bushings and adjustment of the main shaft and gate control shaft packing glands.

The most recent turbine draft tubes inspections were conducted by the Licensee in September 2010. Except for minor deficiencies such as the small holes in draft tube Nos. 1 & 2 all draft tubes are in good condition.

A new transformer which would bring the voltage up from 600KV to 2300KV was installed during this report period **(Photo No. 15)**.

4. Reservoir Condition

No debris was observed in the project impoundment or on the crest of the North and South dams during the inspection. No evidence of shoreline erosion or slope instability was visible in the immediately upstream of the project site **(Photo No. 16)**.

5. Licensee's Performance Monitoring Program

There is no dam safety instrumentation at the Woronoco Project and none is necessary at this time.

Indian River Hydro Operations Company, Inc. of Thorndike, Massachusetts operates and maintains the Woronoco Project for the Licensee. A local plant operator inspects project structures and equipment every day and performs minor maintenance, as required. In addition, the penstock and forebay area immediately upstream of the gatehouse dewatered periodically, usually every two years, for a detailed inspection. The most recent penstock inspections were conducted on August 27 (exterior), and September 8 (interior), 2009. Except for minor leakages, the penstock is in good condition. The Licensee reported that they removed approximately 400 pounds of loose concrete from inside of the penstock during their penstock inspection. The Licensee's inspection program is adequate.

6. Emergency Action Plan

The Director, Division of Dam Safety and Inspections (D2SI) granted the former Licensee an exemption from filing an Emergency Action Plan (EAP) for the Woronoco Project on March 18, 1991 based on the dambreak analyses previously mentioned in Section A of this report.

7. Status CSIRs and Consultant's Recommendations

The March 18, 1991 letter from the Director, D2SI also exempted the Woronoco Project from the requirements of Part 12, Subpart D of the Commission's regulations requiring an independent consultant's safety inspection report based on the assessment that failure of Woronoco Dam would not significantly impact downstream life and property.

8. Status of Previous Dam Safety Inspection Recommendations

The Licensee has begun repairs to the South Dam as shown in **(Photo No. 4)** as per last year's inspection recommendation The Licensee has also established a vegetation control program and the Licensee have maintained control of brush growth throughout the project.

9. Records

Project records are maintained in the powerhouse and at the office of Indian River Hydro Operations located in Wilbraham, Massachusetts.

C. Environmental Conditions

The last Environmental and Public Use Inspection (EPUI) of the Woronoco Project was conducted by D2SI-NYRO on May 18, 2000. The inspection revealed no significant public safety or environmental problems that required follow-up action.

D. Public Safety

The Licensee maintains warning signs, fence, gates and a boat barrier immediately upstream of the North Dam and earth dike to enhance public safety within the project boundaries. At the present time, there are no formal recreational facilities at the Woronoco Project, although International Paper Company partially funded and developed a municipal park upstream of the project site.

International Paper Company also filed a public safety plan with D2SI-NYRO on October 30, 1992 to satisfy Section 12.4 of the Commission's regulations. The plan includes a drawing showing the safety devices at the project site and their approximate location. D2SI-NYRO informed the former Licensee on December 16, 1992 that the plan met the submittal requirements of Section 12.4.

Woronoco Hydro LLC has implemented the approved public safety plan. All safety devices such as safety barriers**,** fencing and gates **(Photo Nos. 16 & 17)** and warning signs shown on the existing safety plan were in place during the inspection and

at the locations indicated on the plan drawing.

E. Project Security

Project security was discussed during the current Dam Safety Inspection and any follow-up was provided as needed.

F. Project Compliance

1. Article 402 of the license requires the Licensee to discharge 57cfs, or inflow to the reservoir, whichever is less, in the two bypass channels downstream of Woronoco Dam as follows:

a. 35cfs in the south channel (20cfs through the existing fish passage facility located adjacent to the gatehouse **(Photo Nos. 18 & 19)** and 15cfs through the mud gate located in the northern section of the South Dam);

b. 22cfs through the mud gate **(Photo No. 20)** located at the left abutment of the North Dam.

Compliance was verified by direct observation during the inspection.

2. To satisfy Article 404 of the license, the Licensee filed a draft Comprehensive Fish Passage Plan on April 12, 2004 and a Modifying Comprehensive Fish Passage Plan on September 1, 2005. These Plans were approved by the Commission Order on April 26, 2006. The same Order set out specific requirements and times frames for installation of upstream eel fishways, completion of downstream salmon smolt passage studies and developing plan to evaluate upstream eel ways, downstream eel passage and downstream adult salmon passage. Subsequent to that order, the Commission issued and Order Granting Extension of Time to file the revised plan on August 1, 2007 that extended the deadlines for completing final filings to August 31, 2007. The revised plan filing has included the eel ways effectiveness monitoring studies which the Licensee installed three eel ways **(Photo No. 21)** on the dam for these studies.

3. On December 23, 2009, the Licensee consultants filed construction drawings and a design calculations for the installation of the modified Downstream Fish Passage Facilities (**DFPF**) at the Woronoco Project, FERC No. 2631-MA. The installation is required by Article 404 of Woronoco Project License dated April 30, 2002 and Order Approving Downstream Atlantic Salmon Smolt Passage Effectiveness Report and Requiring further Action Pursuant to License Article 404 issued by the Commission on July 21, 2009.

The **DFPF** will be constructed in the project intake area. The new trashrack was approved by NYRO letter dated March 2, 2010. Besides of the trashrack, a new 10'- 9" x 5'- 6" and 6'-0" deep fish collection chamber and its supporting structures will be constructed at the left side of the intake behind the trashracks.

The construction will include demolition of the existing wood gate house, removal of the existing fixed trash rack system, operator deck, and rack cleaner. The installation of the new system will include fixed-in-place vertical panel guides; a timber planked upper rack section, new operator deck and new cleaner machine.

The Temporary Construction Emergency Action Plan and the Quality Control and Inspection Program for the Trashrack Construction was approved by Commission Letter dated March 2, 2010.

After review these submitted documents. On May 21, 2010, the Licensee was authorized to proceed with the Downstream Fish Passage construction.

3. Based on a file review of all available information and field observations, the Licensee was in compliance with all license requirements during this report period.

G. Findings and Follow-up Action

Overall, the North and South Dams, related project structures and equipment are in generally good condition. The Licensee has periodically monitored these structures and documents and compares the conditions. The Licensee will conduct vegetation control as a normal project maintenance program.

The Licensee filed construction drawings and design calculations for the installation of the Downstream Fsih Passage Facilities. After review, an authorization letter for the **DFPF** construction was issued by NYRO on May 21, 2010.

There are no other operation and maintenance items that require immediate follow-up action at this time.

Attachments: Pertinent Sheets
Photo Location Map
Set of 21 Photographs

cc:FERC-NYRO
CY Hsu

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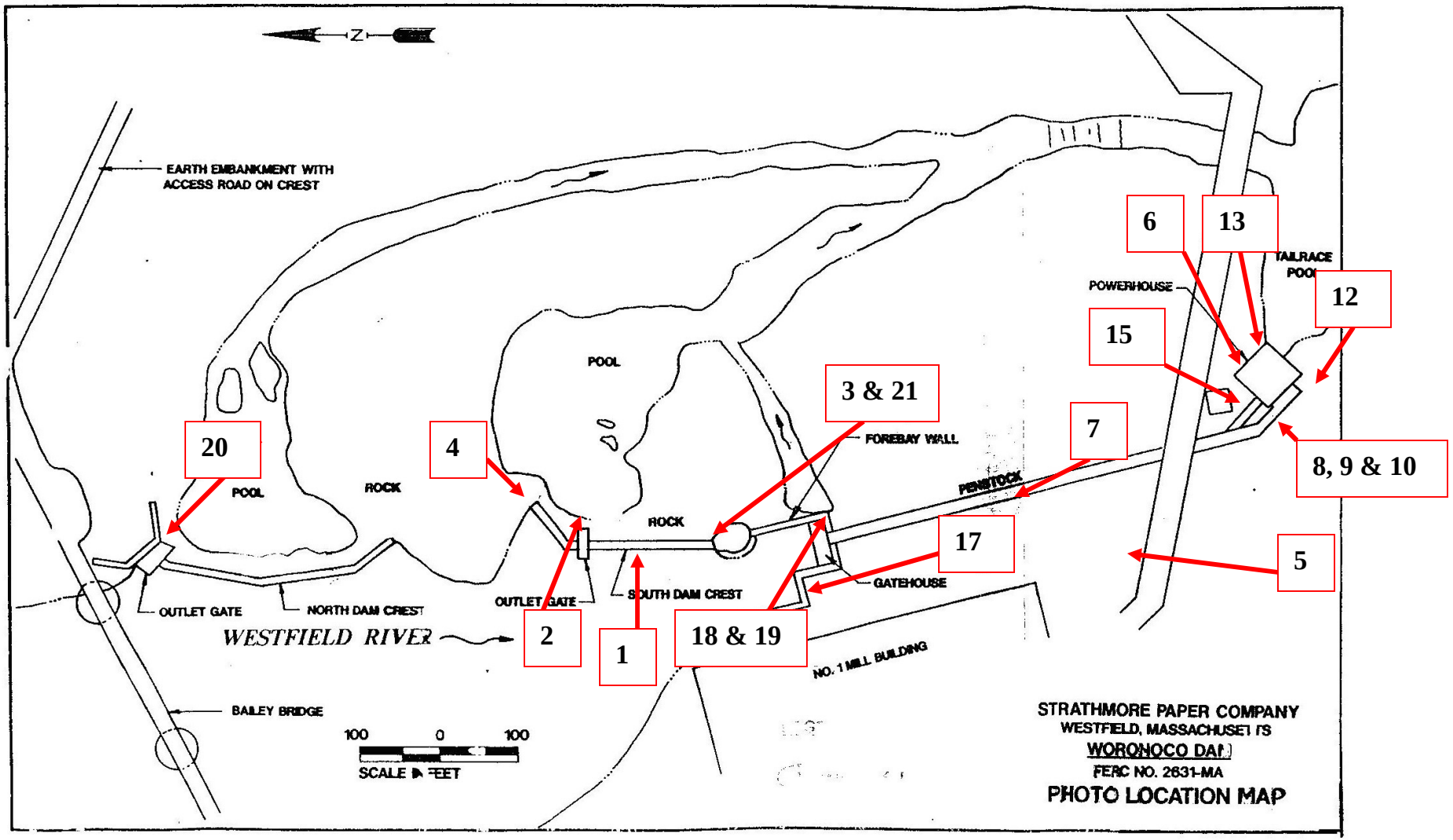

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Photo No. 1 - View of the downstream channel on the project south side. Note the lower left water is fish drop pool.

Photo No. 2 - View of the north side project downstream channel.

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Photo No. 3 – North Dam looking toward south from the left abutment gate structure. Note the repairs being made to the dam surface.

Photo No. 4 – South Dam looking north toward south from the rock outcropping in the Westfield River. Note the gouges at the dam surface, the Licensee proposed to repair the remaining gouges at a later date.

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Photo No. 5 – Gatehouse and intake structure looking upstream from the project security fence. Note the project sign.

Photo No. 6 – View of the sluice gate adjacent to the intake Structure.

Photo No. 7 – View of the above ground steel penstock looking upstream from the powerhouse.

Photo No. 8 – View of project penstock at access road.

Photo No. 9 – Close view of repairs made to concrete piers supporting penstock.

Photo No. 10 – View of V shape of the penstock expansion joint which is in very good condition. Some movement was observed from the previous inspection.

Photo No. 11 – View of the interior of powerhouse (not on photo location map).

Photo No. 12 – View of the powerhouse.

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Photo No. 13 – View from the back of the powerhouse tailrace chute.

Photo No. 14 - Crest of the earth dike looking longitude toward the south. Note the overgrown vegetation (not on photo location map). Note the licensee was requested to remove the vegetation.

Photo No. 15 – View of the new transforms at the project substation.

Photo No. 16 – Downstream view of the project reservoir. Note the installed safety boom (not on photo location map).

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Photo No. 17 – View of the entrance at the project headwork. Note the installed fenced gates.

Photo No. 18 – View of the fish passage chute. Note fish passage was not in operation. However, the flow releases (at red arrow) was satisfying the project minimum requirements.

CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION
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Photo No. 19 – View of the fishway plunge pool.

Photo No. 20 - View of the flow releases (at red arrow) from opening of the north side mud gate to satisfy the project minimum requirements.

Photo No. 21 – View of one of the three eelways that was constructed for monitoring of the eelway effectiveness studies.

Document Content(s)