Report to the Governor by the Hinckley Reservoir Working Group

Working Group Member Agencies

Herkimer County

Mohawk Valley Water Authority

NY Power Authority

NYS Department of Environmental Conservation

NYS Department of Health

NYS Emergency Management Office

NYS Office of Parks, Recreation and Historic Preservation

NYS Thruway Authority and Canal Corporation

Oneida County

April 30, 2008

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ACRONYMS

BWSP	Bureau of Water Supply Protection
CEH	Center for Environmental Health
CEMP	Comprehensive Emergency Management Plan
DAM	New York State Department of Agriculture and Markets
DEHP	Division of Environmental Health Protection
DLA	Division of Legal Affairs
DMTF	Drought Management Task Force
DOT	New York State Department of Transportation
DPC	Disaster Preparedness Commission
ECL	Environmental Conservation Law
Erie	Erie Boulevard Hydropower, LP
ERP	Emergency Response Plan
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FWPCAA	Federal Water Pollution Control Act Amendments
FFN	Fall Fish Nests
GIS	Geographic Information System
HWG	Hinckley Working Group
ICAP	Installed Capacity
MVWA	Mohawk Valley Water Authority
NGVD	National Geodetic Vertical Datum
NERFC	Northeast Rivers Forecasting Center
NMPC	Niagara Mohawk Power Corporation
NOAA	National Ocean and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NTU	Nephelometric Turbidity Unit
NWS	National Weather Service
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NYSDAM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYSTA	New York State Thruway Authority
NYSWRPC	New York State Water Resources Planning Council
OCHD	Oneida County Health Department
OPRHP	Office of Parks, Recreation and Historic Preservation
PHL	Public Health Law
PRISM	Parameter-elevation Regressions on Independent Slopes Model
PWS	Public Water System
SEMO	New York State Emergency Management Office
TOC	Total Organic Carbon
TTHM	Total Trihalomethane

UMVRWB	Upper Mohawk Valley Regional Water Board
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WCC	West Canada Creek
WQC	Water Quality Certification
WSA	Water Supply Application
WSP	Water Supply Permit
WTP	Water Treatment Plant

ABBREVIATIONS

ac-ft	acre-feet (measure of a large volume of water)
cfs	cubic feet per second (measure of water flow rate)
ft	feet
gpd	gallons per day (measure of water flow rate)
gpm	gallons per minute (measure of water flow rate)
kW	kilowatt (measure of electrical capacity)
mg/l	milligrams per liter (concentration)
mgd	million gallons per day (measure of water flow rate)
mW or MW	megawatts (measure of electrical capacity)

EXECUTIVE SUMMARY

In October 2007, Governor Spitzer created the Hinckley Reservoir Working Group and charged it to examine ways to facilitate communication and water allocation among competing interests and to develop a plan to help the Hinckley Reservoir meet the future needs of the Oneida County community. Included in the charge for the Working Group were to make recommendations regarding:

- The water levels needed at Hinckley Reservoir to service drinking water needs, fisheries, power generation, and canal operations;
- The capability of other canal reservoirs to help meet those needs;
- An early warning system to communicate drought situations to stakeholders and facilitate their communication regarding all competing needs; and
- A report of the water usage and meteorological data for 2006 and 2007 to better understand the factors that contributed to low reservoir conditions in the fall of 2007.

The Working Group was chaired by the New York State Department of Health with members from:

- Herkimer County;
- Mohawk Valley Water Authority;
- NY Power Authority;
- NYS Department of Environmental Conservation;
- NYS Emergency Management Office;
- NYS Office of Parks, Recreation and Historic Preservation;
- NYS Thruway Authority and Canal Corporation; and
- Oneida County.

The group set forth a strategy and a schedule to accomplish the Governor's charge and has completed its work. The group held eight open meetings. Members of the public and elected officials also attended these meetings and provided valuable input to the process.

To complete its charge, the Working Group collected much information related to the Hinckley Reservoir. Some of the information was used to describe, evaluate and understand the Hinckley Reservoir, the Delta Reservoir and other canal water resources and to understand the water use and meteorological data. Other information such as permits and licenses was collected so that this report would serve as a repository for information about the area that might be needed in the future.

To help meet its charge, the Working Group created three committees to focus on specific issues: hydrology, communications and operations. Each of the members of the Working Group contributed additional staff to complete the committee charges. The committee reports are included as annexes to the report and provide valuable support to the report itself.

Water Levels Needed at Hinckley Reservoir to Service Drinking Water Needs, Fisheries, Power Generation and Canal Operations

The water levels that are needed for various uses depend on two factors: the amount of water released from the reservoir (generally measured in cubic feet per second) and the elevation of the reservoir. Table 6 (Section 3) details the needs for the four uses; some of those needs listed as reservoir elevations are:

- NYPA hydropower generation goes off line at an elevation of about 1195 feet;
- Drinking water withdrawal is affected at about 1185 feet;
- Canal navigation releases are affected at about 1173.5 feet; and
- Fisheries release rates are affected at about 1173.5 feet.

The elevations listed above are present needs. MVWA estimates that by 2050, the water supply may need to provide 66.2 cfs or 43 mgd per day. The values listed above for drinking water withdrawal will change if these future needs occur.

The Capability of Other Canal Reservoirs to Help Meet Those Needs

The canal system in the Hinckley area includes the Rome summit section, the highest point in the eastern section of the Erie Canal (see Figure 5, Section 3). Lake Erie supplies ample water to the western section of the canal. Twenty-two reservoirs are in the eastern section of the Erie Canal (see Tables 2 and 3, Section 3). Hinckley and Delta Reservoirs normally have abundant water and have been the primary sources of water for the eastern section of the canal. Many of the remainder of the northern and southern reservoirs serve as backup sources. However, a few of these reservoirs are controlled for power generation, have infrastructure limitations or cannot supply water to the Rome summit section. Because the southern reservoir supply is infrequently used, some infrastructure problems such as silted-in channels and inoperable valves exist.

An Early Warning System to Communicate Drought Situations to Stakeholders and Facilitate Communication Regarding All Competing Needs

The Communications Committee report (see Annex III) provides a strategy for routine and enhanced communications. The strategy calls for regular communication and information sharing between core agencies during routine, non-emergency reservoir conditions. It also recommends a strategy for providing information to the general public. The strategy calls for enhanced communication when the elevation of the Hinckley Reservoir drops below the 10%

historical low level and the 30 day running average inflow is below 300 cubic feet per second (see Annex I, Communication Triggers). With SEMO coordination during enhanced communications, the agencies are to discuss options for protecting water in the Hinckley Reservoir.

A Report of the Water Usage and Meteorological Data for 2006 and 2007 to Better Understand the Factors that Contributed to the Current Situation

Section 4 of this report provides details of the effects of the 2006 and 2007 weather patterns, the management of the Hinckley Reservoir and the actions that agencies took to mitigate the high and low water levels. In 2006, the entire canal was not opened until August because of severe damage from flooding. In 2007, as result of low water conditions, drinking water use was restricted, some fisheries were closed, hydropower generation was discontinued, water releases from the Hinckley Reservoir were reduced and water conservation measures were undertaken in the Canal System.

The meteorological data for 2006 and 2007 were evaluated. In general, both 2006 and 2007 exceeded long term annual precipitation averages. Flooding in the spring and summer of 2006 was a concern in the Mohawk Valley with record flooding occurring at some locations. Severe flooding occurred in the West Canada Creek watershed and the Hinckley Reservoir was filled to a near record elevation. In 2007, precipitation in the West Canada Creek watershed was well below average for five months from May through September, with May 2007 being the driest of these months. The extended dry period led to unusually low reservoir inflows which in turn contributed to record low water levels in Hinckley for 40 contiguous days. In the late fall, the precipitation pattern changed, bringing moderate to heavy amounts of precipitation for the end of 2007 and early 2008.

The timing and rates at which water is released from the Hinckley Reservoir into West Canada Creek have a major effect on reservoir conditions. These managed releases are essential for Canal Navigation, the production of hydropower, fishery maintenance, flood protection and public recreation. Drinking water is drawn directly from the reservoir and is not dependent on reservoir releases, but adequate reservoir water levels are necessary to obtain enough drinking water to meet demands. Since 1921, normal reservoir release rates have been determined by a contract between the State of New York and downstream hydropower interests. This contract requires the releases to the downstream hydropower producers at rates set forth in a 1920 Operating Diagram.

In both 2006 and 2007, the managed releases from the Hinckley Reservoir for power generation and canal needs were generally normal and followed the 1920 Operating Diagram, with a few exceptions. In 2006, the Canal Corporation requested deviations of an extra 500 to 700 cfs above the normal releases rates for about 21 days. In summer 2007, the Canal Corporation requested deviations of an extra 160 to 200 cfs above the normal release rates, also for about 21 days. In late 2007, the Canal Corporation requested deviations below the Operating Diagram from September 24 to October 22, with the amount of decrease ranging from about 130 to 260 cfs over a period of about 29 days.

From May through September 2007, precipitation in the West Canada Creek watershed was very low. During roughly this same period, inflow to the Hinckley Reservoir was the second lowest rate of inflow calculated for a 150 day time period during the 60 year period of historic data that was reviewed by the Hydrology Committee. The record low water levels that occurred in the Hinckley Reservoir from September 1 to October 10, 2007, were a result of the low precipitation, low inflows and continued releases to West Canada Creek.

The Working Group also evaluated precipitation and other watershed data that were used to form the 1920 Operating Diagram and compared these data to long term trends. The conclusion of these analyses was that conditions during the period when the Operating Diagram was developed are similar to the long term averages for both precipitation and inflow (see Annex I).

Recommendations

The Working Group developed a series of recommendations to address its findings. "Section 6: Conclusions and Recommendations of the Working Group" includes 10 recommendations that range from short term, no cost administrative actions to long term, capital intensive projects. Some of the recommendations can be in place for the 2008 canal navigation season. Other recommendations need further evaluation of the benefits, costs and feasibility of the recommended actions.

One recommendation is a strategy to improve communications among the core agencies involved with the day to day operation of the Hinckley Reservoir and among responding agencies when reservoir conditions warrant. Another recommendation identifies data gaps related to the Hinckley Reservoir. Closing these data gaps would help the core agencies better assess reservoir conditions and could improve their ability to forecast near term reservoir conditions. Some of the recommendations involve capital expenditures, and not all of these are likely to be implemented. One of the capital recommendations expected to move forward is for the Mohawk Valley Water Authority to make improvements to its drinking water intake and raw water mains. It is also recommended that the Canal Corporation should move forward with an assessment of capital improvements that may help to improve its ability to transfer water from other resources to the canal.

A few recommendations call for feasibility assessments of long term, capital intensive projects that may be difficult to implement. As example, one recommendation calls for evaluating ways to create additional water storage within the Hinckley Reservoir. The Working group did not develop this recommendation to the point where the feasibility of the action is known, and recognizes that a full evaluation may identify issues that could make this unfeasible.

All of the Working Group's members provided valuable input to the group's deliberations and to preparation of the information in this report. Many comments were provided by member agencies during the development of the report and its annexes and most were addressed in full. Consensus among the member agencies was attained on nearly all of the technical evaluations and issues that the Working Group addressed. However, member agencies

have expressed concern with some aspects of the Working Group's efforts and have submitted dissenting opinions. These dissenting opinions are presented verbatim in Section 7. The dissenting opinions have not been evaluated by the Working Group and should not be construed as official findings, conclusions or recommendations of the Working Group.

The recommendations made by the Hinckley Reservoir Working Group are:

Recommendation 1 – Communications
Recommendation 2 – Drinking Water Conveyance
Recommendation 3 – Use of Other Canal Sources
Recommendation 4 – Data Gaps
Recommendation 5 – Working Group Data Archive
Recommendation 6 – Low Water Pumping
Recommendation 7 – Canal Resource Infrastructure Limitations
Recommendation 8 – Drought Region IV
Recommendation 9 – Planning and Advisory Group
Recommendation 10 – Additional Storage Upstream of Hinckley Reservoir

Perhaps the most important understanding that came from all of the evaluations considered by the Working Group is how valuable these water resources are to the region, and how many different users depend on and can be impacted by the operation of the Hinckley Reservoir and other canal water resources. During normal conditions, the Hinckley Reservoir and other canal resources have ample water to meet the needs of all users. Management of these resources requires constant attention and difficult decisions must be made on a regular basis concerning the resources and how best to meet competing demands, especially during low reservoir conditions.

Section 1: INTRODUCTION

2007 Overview

The West Canada Creek watershed experienced an extended period of abnormally low precipitation beginning in May 2007. Consequently, during the period from May 21 to October 17, 2007, the inflow to the Hinckley Reservoir was at one of the lowest rates of calculated inflows included in the 60 year period of historic data reviewed by the Working Group. During this period, the reservoir level fell approximately 30 feet, from 1224.7 feet to 1194.8 feet. From May through most of September releases from the reservoir continued generally in accordance with the 1920 Operating Diagram, with two exceptions: the Canal Corporation requested two deviations to increase the rate of discharge from the reservoir to maintain navigation levels along the downstream Mohawk River portion of the canal. These are among the factors that contributed to Hinckley Reservoir water levels that were below normal from June through late October. Beginning on September 1, 2007 and continuing through October 10, daily reservoir water levels reached new record lows due to lack of precipitation, low reservoir inflows, and continued reservoir releases. At the lowest point on September 26, 2007, the reservoir stood at elevation 1188.60 feet. This level was 21.9 feet below the historic mean elevation and 11.2 feet below the previous low level recorded for that date. The volume of water in the reservoir on September 26 was estimated to be about 15% of full capacity.

Concerns with low water levels were raised by the Mohawk Valley Water Authority (MVWA) and the New York Power Authority (NYPA) in late August 2007. In September 2007, Oneida County and the NYSDOH raised concerns about the continued operation of the drinking water supply, and in early September, NYPA power production went offline as a result of hydraulic limitations when the reservoir fell below 1195 feet. These concerns led to a number of responses by involved parties. State agencies held a series of conference calls beginning on September 12, 2007, to review and assess the situation. On September 17, 2007, the Canal Corporation initiated an hourly locking schedule to conserve water. On September 24 and 25, 2007, releases from the Hinckley Reservoir were reduced to flows below levels specified by the 1920 Operating Diagram to help stabilize Hinckley Reservoir levels. On September 26, 2007, Oneida County Executive Anthony J. Picente, Jr., issued a County drinking water conservation emergency, and the public served by the MVWA was directed to initiate mandatory water conservation measures. In the following weeks, a number of conference calls and meetings were held and subsequent steps were taken by the involved State and County agencies to help stabilize the reservoir, including:

- The New York State Department of Environmental Conservation (NYSDEC) agreed to a temporary reduction in the minimum discharges to West Canada Creek required by the Federal Energy Regulatory Commission (FERC) license for Jarvis and initiated continuous monitoring of stream conditions below Hinckley because of fishery concerns;
- Canal Corporation temporarily suspended water diversions from West Canada Creek to the Canal summit, normally used to maintain Canal water levels for navigation. In

addition, the Canal Corporation began to draw additional water from other sources, including from Delta Reservoir, continued the previously initiated hourly locking schedule, and announced that the New York State Canal System would be closing early due to a lack of water in the Mohawk Valley;

- MVWA issued a water conservation notice to its customers to reduce drinking water demand; and
- Reservoir releases were reduced as a result of requests by State agencies to further stabilize the reservoir levels.

Several significant rain events occurred in October 2007 that enabled the reservoir to recover. The County declaration was carried through until October 16, 2007, when drinking water users were allowed to resume normal water usage. By October 23, 2007, releases from the Hinckley Reservoir reverted back to those specified by the 1920 Operating Diagram. By late October, the reservoir water elevations had returned to levels typically seen during that time of the year.

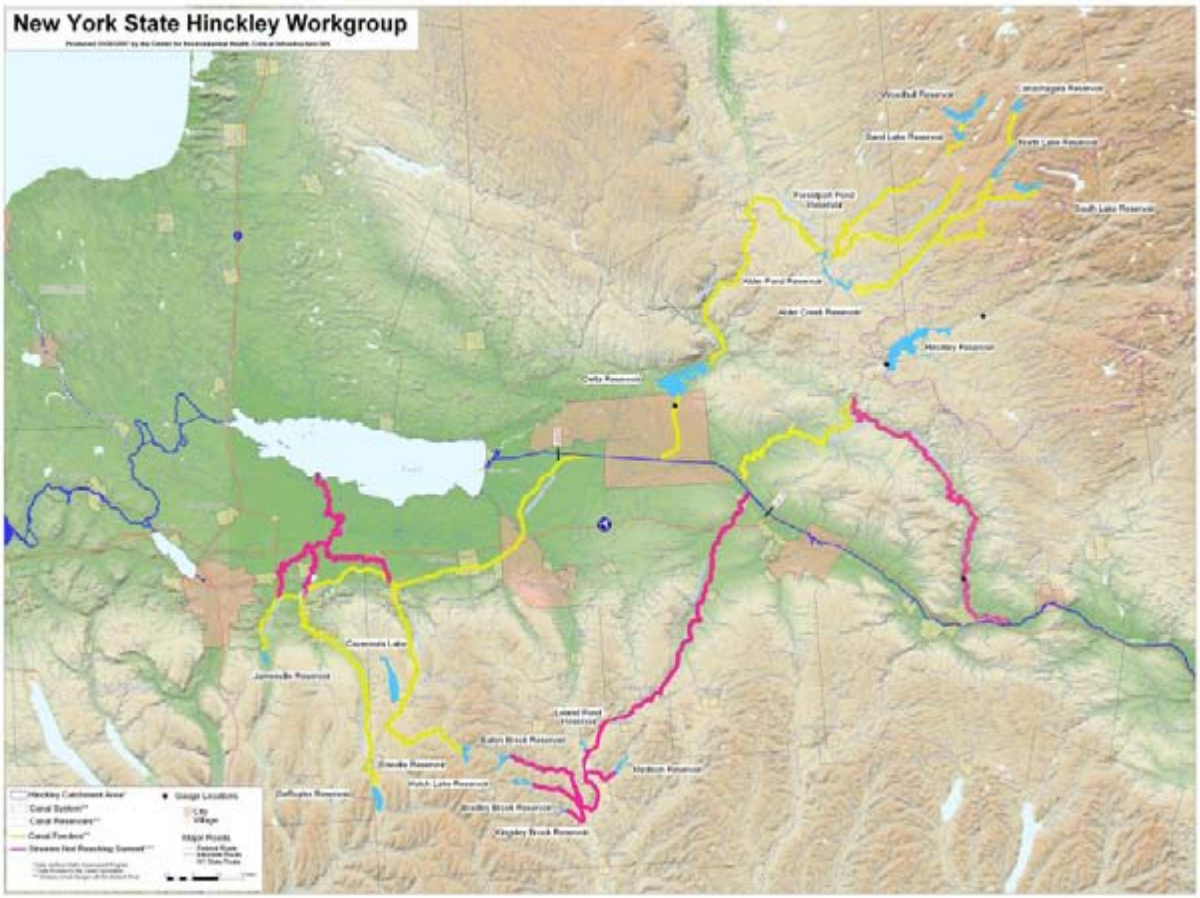

Figure 1: Canal Sources and Feeders in the Rome Summit Section

Hinckley Reservoir Working Group

On October 19, 2007, Governor Eliot Spitzer directed the formation of the Hinckley Reservoir Working Group. The Working Group was charged by the Governor to examine specific issues surrounding the uses of water from the Hinckley Reservoir and to make recommendations regarding:

- the water levels needed at the Hinckley Reservoir to service drinking water needs, fisheries, power generation and canal operations;
- the capability of other canal reservoirs to help meet canal operational needs;
- an early warning system to communicate drought situations to stakeholders and facilitate their communication regarding all competing needs; and
- a report of the water usage and meteorological data for 2006 and 2007 to better understand the factors that contributed to low reservoir conditions in the fall of 2007.

The Working Group is chaired by the New York State Department of Health (NYSDOH) and includes the following members:

- Herkimer County;
- Mohawk Valley Water Authority (MVWA);
- New York Power Authority (NYPA);
- New York State Department of Environmental Conservation (NYSDEC);
- New York State Emergency Management Office (SEMO);
- New York State Office of Parks, Recreation and Historic Preservation (OPRHP);
- New York State Thruway Authority (NYSTA) and Canal Corporation (Canal Corporation); and
- Oneida County.

The Working Group collected a significant amount of information in the form of documents, data files, letters, public comments, presentations, contracts, statutory provisions, regulations, agendas and meeting minutes. To facilitate access to this information by members of the group, the NYSDOH set up a secure electronic “group space” that was available by invitation to Working Group members only. The group space was also used to provide draft files for review and comment and a common calendar of Working Group activities.

Information collected by the Working Group was obtained from many sources. The group compiled information into usable formats and developed additional information during its evaluations. This information may be useful for readers of the Working Group report, for

agencies involved with West Canada Creek, the Hinckley Reservoir and other Canal resources, and for future planning efforts related to the resources. For this reason, detailed information is provided on compact disks in a format that can be readily accessed through interactive links embedded in the report and its appendices. Upon completion of the Working Group's charges, the NYSDOH, as the Working Group chair agency, will also identify a means to archive the information for future accessibility.

This report summarizes water resource management issues related to the interests at Hinckley Reservoir, the historic condition of the reservoir and surrounding area and the meteorological and operational conditions that led to the low water levels in the fall of 2007. This report was a collaborative effort by the Hinckley Reservoir Working Group member agencies and technical subcommittees. Conclusions and recommendations are based on information provided by the Mohawk Valley Water Authority, New York State Canal Corporation, New York Power Authority, New York State Department of Environmental Conservation and other sources.

Legal Limitations

The Working Group has attempted to meet its charges by, in part, analyzing and discussing the practical aspects of operating Hinckley Reservoir and its outflow, as well as identifying and discussing uncontrollable issues such as weather and water flows. This is reflected in the report itself. The Working Group has compiled information related to, but was not charged with analyzing the legal issues, including (but not limited to):

- An analysis of potentially inconsistent statutory direction (specifically Canal Law §80 and the Environmental Conservation Law §15-0105(5));
- Existing contracts from 1917 and 1921 among some of the parties or their predecessors;
- FERC licenses for all facilities located on the Hinckley Reservoir and West Canada Creek; and
- The applicable Water Supply Permit.

The Working Group Recognizes that:

- Statutes can only be changed by the legislature;
- Contracts can be changed by the parties and their successors and any necessary contractual revisions will involve negotiations between the parties;
- Litigation is pending with regard to operation of Hinckley, and additional litigation is possible;
- Some of the parties in the Working Group, such as governmental entities including agencies and public authorities, are not able to make commitments or even recommendations that would potentially bind their agencies without significant additional review and approval by their respective agency or managing body; and

- Some parties to the relevant contracts and litigation are not members of the Working Group.

Given these limitations, the Hinckley Working Group is not making recommendations concerning these matters. Instead, the Working Group's recommendations focus on the technical or scientific issues that arise from its charge. However, the Working Group recognizes that any long term change to the operation of the reservoir itself may require changes to the relationships among the involved parties.

Section 2: HINCKLEY and DELTA RESERVOIRS

Physical Description

The Hinckley Reservoir, located in Herkimer and Oneida Counties, and the Delta Reservoir, located about 15 miles west in Oneida County, were constructed by the State when the old Erie Canal was converted into the modern day Barge Canal in the early 1900s. These reservoirs were constructed to serve as the primary water sources for the Barge Canal between Rome and Herkimer with water from Hinckley Reservoir "diverted from West Canada Creek as is necessary to augment the Delta water to the amount required" (Landreth & Gibson, 1921).

The Hinckley Reservoir was constructed in the valley formed by West Canada Creek, which flows south out of the Adirondack Mountains and through the reservoir on its route to the Mohawk River at Herkimer. The reservoir was commissioned in 1915. The reservoir covers about 4.46 square miles (2,854 acres) when full and is fed by a total drainage area of approximately 372 square miles, most of which is within the Adirondack State Park (Whitford, 1921). Black Creek is a tributary to West Canada Creek and drains approximately 25% of the Hinckley watershed into the eastern side of the reservoir.

The Hinckley Reservoir is formed by a dam 3,700 feet in length built across the West Canada Creek valley, with two earthen sections and a 400 foot long concrete section that forms the spillway and houses a hydropower facility. Within the concrete section are structures used for controlling and measuring reservoir release rates and water surface elevation, as well as intakes for raw water that is then transmitted to the water treatment plant that serves the greater Utica area and is operated by the Mohawk Valley Water Authority. The reservoir was constructed to have an average water depth of about 28 feet and a maximum depth of approximately 75 feet from the spillway crest. When full to the spillway crest at an elevation of 1225, the reservoir was designed to have a usable capacity of approximately 3.4 billion cubic feet (25.8 billion gallons or 79,080 acre-feet) of water when it was completed in 1915 (Whitford, 1921).

The Delta Reservoir was constructed in the valley formed by the upper Mohawk River, at the site of an ancient glacial lake. Construction began in 1912 and the reservoir was commissioned in 1914. The reservoir covers about 4.33 square miles (2,771 acres) when full and is fed by a drainage area of approximately 137 square miles, most of which is within

the Tug Hill Plateau (Whitford, 1921). It is formed by a dam 1,100 feet in length across the Mohawk River valley. The reservoir was designed to have an average water depth of approximately 23 feet and a maximum depth of 70 feet from the spillway crest. When full to the spillway crest, the reservoir had a usable capacity of approximately 2.7 billion cubic feet (20.6 billion gallons or 63,127 acre-feet) of water when it was completed in 1915 (Whitford, 1921).

Delta Reservoir and Hinckley Reservoir are owned by the State of New York, presently under the jurisdiction of the Canal Corporation. The Delta Reservoir was designed to serve as the primary source of water (Landreth & Gibson, 1921) for the highest elevation of the canal, referred to as the Rome summit, located between canal locks E-20 and E-21 near Rome. Water supplied to the Rome summit section is essential for canal navigation westward to Oneida Lake and eastward towards the Hudson River.

The Hinckley Dam is operated by NYPA pursuant to a 1982 FERC license and a 1984 Hydropower Easement and 1983 Operations and Maintenance Agreement between the Canal Corporation and NYPA. These agreements require NYPA to operate the Hinckley Reservoir in accordance with the 1920 Hinckley Reservoir Operating Diagram. NYPA performs daily operations associated with the Hinckley Dam under the oversight of the Canal Corporation. NYPA's role includes controlling releases made from Hinckley Reservoir into West Canada Creek and coordinating reservoir management activities with downstream hydropower producers, such as Erie Boulevard Hydropower, LP (Erie).

The Hinckley Reservoir also serves as the sole source of drinking water for about 130,000 people in the greater Utica area. The Mohawk Valley Water Authority (MVWA) and its predecessors constructed an intake structure on the West Canada Creek in 1906, which was relocated to Hinckley Dam when it was constructed in 1915 .

Both the Hinckley and Delta Reservoirs support other uses. Waters released from the Hinckley Reservoir maintain the prime trout waters of West Canada Creek. The Delta Reservoir does not serve as a public drinking water supply and is not presently used for hydropower production. Both the Hinckley and Delta Reservoirs provide flood protection benefits for downstream areas, but neither was built for the primary purpose of flood management. Water released from Delta helps to maintain the fishery in a portion of the upper Mohawk River and to provide water necessary for the daily operation of the State's Rome Fish Hatchery located just below the reservoir.

History of Hinckley Reservoir

Prior to the construction of the Hinckley Reservoir, West Canada Creek was used as the source of drinking water for the Utica area and to produce hydropower by the predecessor companies of the current independent hydropower producers. West Canada Creek provided water to the old Erie Canal below the summit through its natural channel to the Mohawk River near Herkimer. At that time, there were four incorporated users of the water that flowed through West Canada Creek:

- Consolidated Water Company of Utica (now Mohawk Valley Water Authority) maintained an intake located in West Canada Creek at Hinckley;
- Utica Gas and Electric Company (later Niagara Mohawk Power Company, now Erie Boulevard Hydropower, L.P. [FERC License 2701] at Prospect and Trenton Falls) used water for hydropower production at Trenton Falls;
- International Paper Company used water for hydropower to run a pulp and paper facility in the Village of Herkimer; (Presently, Trafalgar Power, Inc. [FERC License 9709] generates power from West Canada Creek near this location in a facility operated by Algonquin Power Systems, NY) and
- Newport Electric Light and Power (now Newport Hydro Associates [FERC License 5196]) used water for hydropower production at the Village of Newport.

In 1899, Governor Theodore Roosevelt appointed a commission to study the future of the Erie Canal. Based on recommendations from this commission, the State of New York elected to build a "Barge Canal". In 1903, the Barge Canal Act passed with the support of Governor Odell and this act was ratified by the voters of New York State in November of the same year. Construction of the Barge Canal began in 1905 and was completed by 1918. Hinckley Reservoir was constructed by the State of New York and completed in 1915 for the purpose of supplying water to the enlarged canal. Hinckley Reservoir was located at its present site primarily because of its proximity to the canal and its elevation above the canal.

The Barge Canal System was originally under the jurisdiction of the New York State Department of Public Works. In 1967, the jurisdiction of the Barge Canal was transferred to the New York State Department of Transportation (NYSDOT) through the Transportation Capital Facilities Development Act. In 1992, legislation known as "Thruway 2000" was enacted into law which transferred jurisdiction over the Barge Canal system from the NYSDOT to the New York State Thruway Authority (NYSTA). Thruway 2000 also created a subsidiary public benefit corporation within the Authority, the New York State Canal Corporation.

The Consolidated Water Company of Utica, predecessor to the Mohawk Valley Water Authority, was party to several agreements during the early 1900s. These contracts established a basis for water rights and management in the West Canada Creek:

- 1905 - Utica Gas and Electric Company;
- 1906 - International Paper Company; and
- 1909 - Newport Electric Light and Power Company.

When Hinckley Reservoir was constructed, the Consolidated Water Company of Utica filed a claim against the State in the amount of ten million dollars due to the extinction of its rights to water in the West Canada Creek. A 1917 agreement between the State of New York and the

Consolidated Water Company of Utica, N.Y., settled this litigation.

Descriptions of the intent of the 1917 agreement have been provided by the Canal Corporation and MVWA. These descriptions are provided verbatim in Appendix B.

When Hinckley Reservoir was constructed in 1915, its operation for canal purposes was alleged to injure downstream hydropower interests and claims were brought against the State by Utica Gas & Electric Company, of Utica, N.Y. In December 1920, the State developed an operating diagram that established the release of water from Hinckley Reservoir based upon varying reservoir levels throughout the year. The 1920 Operating Diagram established the rates (in cubic feet per second) at which water is to be discharged from Hinckley Reservoir during each third of the month period based upon the observed reservoir elevation at the beginning of each period. The Operating Diagram is in Appendix B.

The 1920 Operating Diagram became part of the June 14, 1921, Agreement between the State of New York and the Utica Gas & Electric Company, of Utica, N.Y., that settled the Utica Gas and Electric Claim. The 1921 Agreement states:

> "*to operate the Hinckley State Reservoir, that, after serving the canal uses and purposes, of the State, it may, so far as practicable, be fully used for the storage of water and the regulation of the flow of West Canada Creek below the same for the benefit of the power property and riparian lands of the party of the second part (Erie) on West Canada Creek below the Hinckley State Reservoir."*

The intent of the 1920 Operating Diagram was to allow reservoir levels to vary by about 51 feet between a full reservoir level of 1225 feet, to a low level of 1173.5 feet. The prescribed downstream discharge reduces as the reservoir levels fall in order to maintain sufficient water in Hinckley Reservoir for canal navigation. The Operating Diagram also provides for increased reservoir releases during the winter so that reservoir capacity can be available to help mitigate spring floods.

For practical purposes, the flows associated with the 1921 Agreement form the basis for the FERC licenses for the Erie's facilities at Prospect and Trenton Falls. The Canal Corporation and NYPA are required to honor the flow requirements set forth in the 1921 Agreement and the corresponding 1920 Operating Diagram, unless an extreme conditions arises which permits a deviation below the rates set out in the Operating Diagram.

Hydrographics and Water Resources

The water surface level of Hinckley Reservoir is impacted by a number of factors including the shape and volume of the reservoir, inputs into the system and losses from the system.

Meteorological Factors

Stream inflow is the primary source of water in the Hinckley Reservoir. Precipitation contributes to inflow and is affected by factors such as evaporation rates, rainfall intensity, vegetative cover, soil conditions and season. Direct precipitation measurements in the West

Canada Creek Watershed above the dam are limited; however, indirect measurements and data obtained outside of the basin can be used to estimate precipitation amounts within the basin.

Groundwater Impacts

No detailed hydrogeological evaluations on groundwater flow have been conducted in the Hinckley area; therefore, it is not known to what extent groundwater is a significant input into the reservoir. The nearest groundwater monitoring station to Hinckley is in Forestport, outside of the West Canada drainage basin.

Stream Inputs

It is estimated that approximately 95 percent of the surface water inflows into Hinckley enter from two streams: West Canada Creek and Black Creek. The West Canada has a United States Geological Survey (USGS) gaging station at Wilmurt, approximately 3 miles upstream of the reservoir, which has been in operation since 2001. Black Creek currently has no gaging station.

Reservoir Volume

To accurately calculate the volume of water in the reservoir, detailed contours of the reservoir bottom must be known. Contours of the Hinckley Reservoir were determined by the State Engineer and Surveyor's office before the reservoir was constructed beginning in 1912 and no additional bottom contour surveys have been completed since. In 1919 and 1921 the State Engineer used the bottom contour information to prepare area-volume curves that help define the volume of water stored in the reservoir for any given water elevation. The elevation-volume relationship has been re-evaluated several times; however bottom contours, on which the elevation-volume relationships are based, have not been surveyed since construction.

It is likely that there has been infilling of soil, rock and debris during the nearly 100 years of Hinckley Reservoir operation. Infilling reduces the volume of water stored in the reservoir at any given water level. This raises concern with the accuracy of reservoir storage estimates that are based on pre-construction bottom contours. At high reservoir water levels this inaccuracy would be expected to be a relatively small percentage of the total reservoir volume, and not likely a concern for water users. However, at low reservoir elevations when the viability of the water resource is of most concern for drinking water and other users, the volume of water available may be significantly less than what the available elevation-storage information would indicate. Updated bottom contour information would be needed to determine how significant this overestimate may be and to provide accurate reservoir volumes for use in water resource management decisions.

Reservoir Releases

There are three primary methods by which water is released from the reservoir:

- uncontrolled releases over the spillway when water levels are high;
- controlled releases through the Hinckley Dam; and
- withdrawals by Mohawk Valley Water Authority.

The highest releases from the Hinckley Reservoir are uncontrolled flows that occur over the spillway during high water and flooding events. Uncontrolled releases are intermittent and most common in the spring because of snow melt and precipitation; however, flood conditions can produce uncontrolled releases at any time of the year. During the June 2006 flood, uncontrolled releases over the Hinckley Dam were estimated to be about 17,350 cfs (Annex I: Report of the Hydrology Committee).

Controlled releases pass through valves and turbines within the Hinckley Dam. These releases are governed by the 1920 Operating Diagram, which requires releases that vary from 200 cfs to 1100 cfs, depending on reservoir elevation and time of the year . The 1920 Operating Diagram release is determined by finding the intersection between the date and the reservoir elevation, and reading the release from the family of curves. For example, consider a reservoir elevation of 1219 feet on July 21. In this situation, the Operating Diagram release would be 500 cfs. This is determined by finding the intersection on the Operating Diagram between the horizontal line at 1219 feet and the vertical line at July 21. Many times the intersection of the reservoir elevation and the date do not fall on one of the curves of constant release. In this situation, interpolation is used to estimate the Operating Diagram release. For example, consider an elevation of 1216 feet on August 16. An examination of the Operating Diagram for this date indicates a release halfway between 400 and 500 cfs. The Operating Diagram release is 450 cfs. The Operating Diagram is in Appendix B. Controlled release rates above the specified value given by the 1920 Operating Diagram are occasionally made to meet Canal navigation needs pursuant to the terms of the 1921 agreement. There are long term flow records available for controlled releases through the Hinckley Dam. The Working Group reviewed approximately 60 years of controlled release data covering the years 1938-1957, 1960-1978 and 1987-2007.

The withdrawals by MVWA for the public drinking water supply are the smallest draw on the Hinckley Reservoir. The public drinking water withdrawal requirement varies slightly through the year and is usually in the range of 32 to 37 cfs (average daily flow).

Section 3: BACKGROUND - WATER USE and MANAGEMENT

Introduction

The West Canada Creek has been a commercially important watercourse since the 1800s, and is currently being used for canal navigation, drinking water, hydropower, fishing and recreation. The water resource management issues are complex. The uses and allocation of water within the reservoir are described below.

Drinking Water

The MVWA owns and operates the water supply, treatment, transmission and distribution system (the "Regional System") that currently serves a population of approximately 130,000 people in the eastern portions of Oneida County and the western portions of Herkimer County. Hinckley Reservoir is the sole source of water for the MVWA service area. The water, once treated, supports domestic potable uses, industrial and commercial uses, fire fighting and other municipal uses.

The service area includes parts of the Towns of Trenton, Marcy, Deerfield, Whitestown, New Hartford, Kirkland, Westmoreland, Schuyler, Frankfort, the City of Utica and six villages. Primary water system components include the water intake tower at Hinckley Reservoir, a water treatment plant (WTP) in Prospect, numerous pump stations, water storage facilities and approximately 700 miles of transmission and distribution mains.

The City of Utica used the West Canada Creek as its drinking water source since 1906. The Hinckley location was selected in the 1890s as the new source to meet the growing community's water needs. Water rights were acquired and the original intake was constructed on the West Canada Creek several thousand feet upstream of the current Hinckley Dam. The intake consisted of a small wood crib dam and 30" wood stave conduit which connected to a single 24" cast iron water main. The intake was relocated to an intake tower at the south end the Hinckley Dam spillway in 1915 by the State of New York as part of the Hinckley Reservoir construction project.

Water rights on West Canada Creek were the subject of litigation that was settled in 1917 by an agreement that was filed as a deed protecting both the State and the Water Company's rights, entitled "Memorandum of Amended and Supplemental Agreement made and entered into on December 27, 1917 by and between the Consolidated Water Company and the State of New York" (See Appendix B). These water rights are currently the subject of litigation between MVWA, the State of New York, Erie Boulevard Hydropower, L.P. and the New York State Canal Corporation.

The intake tower, which originally consisted of ten screened openings, was renovated in 1988 by the MVWA. As part of that project, the two lower screened openings were plated over. This work occurred prior to the water treatment plant (WTP) construction in 1992 and would protect the consumers from potentially high color and high turbidity water typically

experienced at lower water levels (American Water Works Association, 1990). The raw water mains that convey water from the reservoir intake to the new WTP begin as two 42" mains at the dam, and change in configuration several times before entering the WTP at Prospect.

Raw water is conveyed by gravity to the WTP, located just outside the Village of Prospect. The WTP was placed in service in 1992, and has a current capacity of 32 mgd (49.3 cfs). According to records from MVWA, WTP production for the years 2002 though 2007 averaged approximately 19 mgd (29 cfs). The peak daily production at the WTP is approximately 22 mgd (34 cfs). A large leak could add potentially 4 ± mgd (6 cfs) of demand until located and repaired or by-passed.

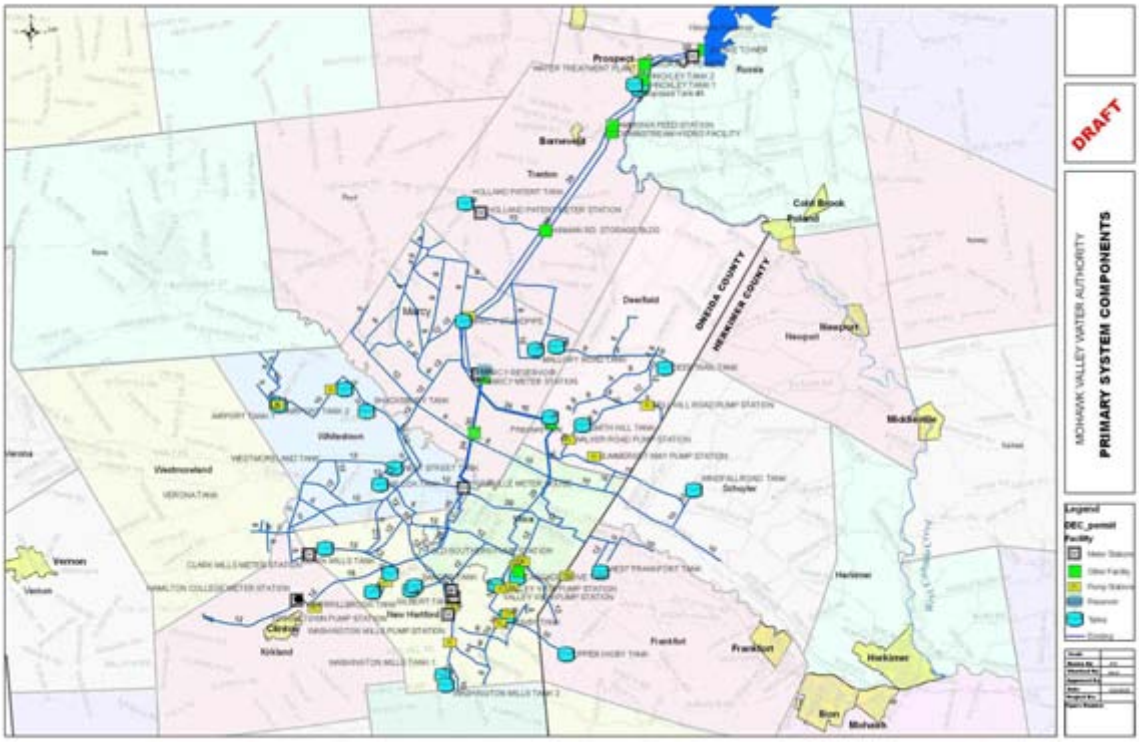

Figure 2: Mohawk Valley Water Authority primary system components

The public drinking water withdrawal from Hinckley Reservoir varies slightly through the year and usually averages from of 32 to 37 cfs (average daily flow). The MVWA's withdrawals from Hinckley Reservoir are typically 2.0 mgd (3 cfs) greater than the WTP production numbers.

Depending on water quality conditions, approximately 1.0 mgd (1.5 cfs) is used for backwashing (cleaning) the clarifiers and filters. This water is returned to the nearby West Canada Creek after settling in the sludge lagoons. The balance of the difference may be

attributable to meter performance combined with leaks on the raw water mains. Leaks are not unusual as water transmission and distribution mains age. MVWA has made several unsuccessful attempts to leak survey both raw water mains and is planning another attempt in summer 2008 using new technologies, as part of a leak reduction program condition in the water supply permit (WSA #9435, See Appendix B).

In 1992, the water company's water treatment plant was constructed in Prospect. The presence and operation of the plant has increased the requirements for hydraulic pressure from Hinckley Reservoir to convey water throughout the distribution system. MVWA expects to complete the installation of a new raw water transmission main within the next five years. When the new transmission main is completed, MVWA will be able to draw a greater volume of water from Hinckley Reservoir at lower reservoir levels.

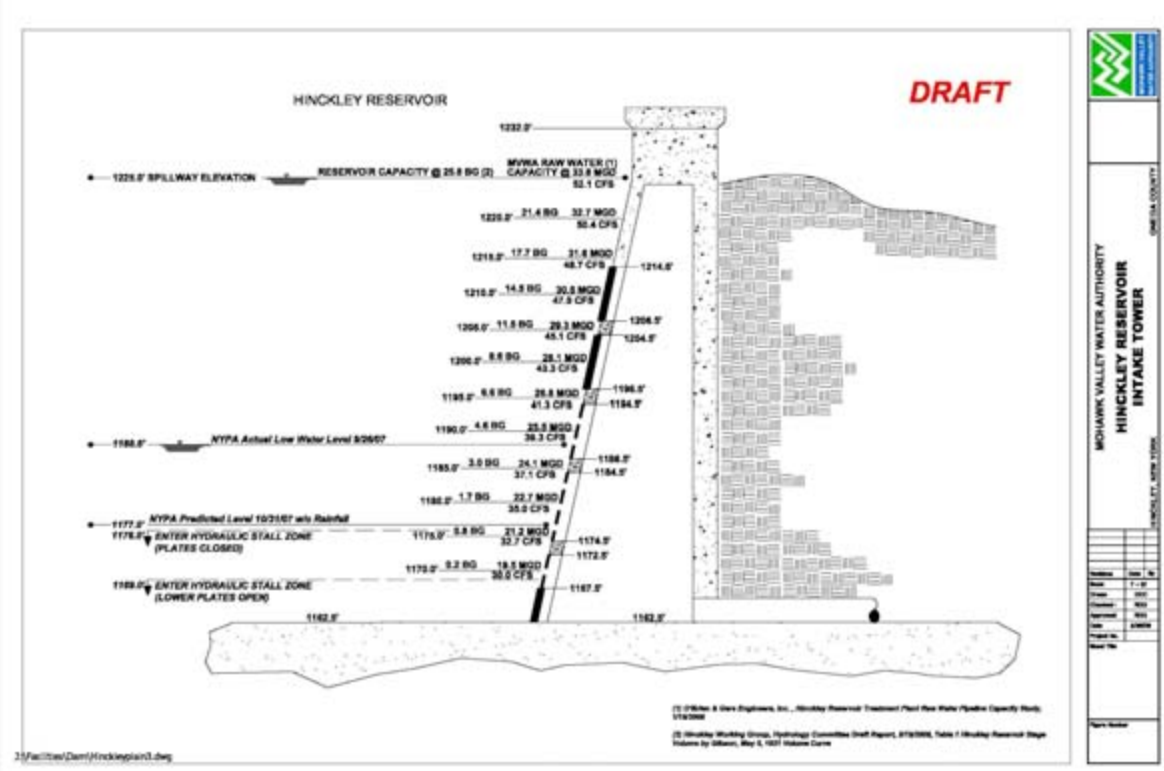

Figure 3: Mohawk Valley Water Authority critical elevations at intake tower

The MVWA references a reservoir elevation of 1185 feet as a level historically used for protecting the drinking water supply. The 1185 foot level is noted in MVWA's emergency response plan and a number of FERC, NYPA, MVWA and NYSDOT documents as a historically critical level. This elevation is acknowledged in the FERC license (#3211) for the Jarvis Project (at Hinckley Dam) but it is not cited in the FERC license as an operational requirement nor a level at which emergency actions should be taken. The Hinckley Reservoir Working Group did not find historic analysis on which the 1185 foot elevation was based.

A hydraulic analysis of the drinking water intakes that accounts for the current WTP and intake conditions was undertaken in 2007 by MVWA and the results were made available to the Hinckley Reservoir Working Group. These results are illustrated in Figure 3. Critical reservoir levels, where the drinking water withdrawal may be impacted, range from 1185 feet to 1169 feet, depending on withdrawal rate and configuration of the drinking water intake plates. Because these critical levels vary by as much as 16 feet, improvements to the raw water intake and transmission mains may help to ensure that full demand can be met without pumping even when the reservoir is at lower levels.

The 1920 Operating Diagram has a self-correcting characteristic that stabilizes Hinckley Reservoir levels during low inflow periods by reducing the required release rates as reservoir levels decline. In 1964, Hinckley Reservoir was below elevation 1188.6 feet for six consecutive weeks in October and November, and during this time, releases continued pursuant to the 1920 Operating Diagram. The lowest reservoir elevation in the record is 1174.9 feet observed on November 17, 1964. This low level was less problematic for the drinking water supply because the WTP did not exist at that time.

Since the construction of Hinckley Reservoir, sufficient water has been available for the MVWA and its predecessors to meet the needs of the regional drinking water system. There have been years when declining reservoir levels were of sufficient concern to the MVWA that it sought to have reservoir levels stabilized. Prior to 2007, the Canal Corporation (and its predecessors) and the hydropower interests have cooperated to stabilize Hinckley Reservoir levels through a temporary reduction of the release specified in the 1920 Operating Diagram. In general, releases below the Operating Diagram were agreed to when there was no negative impact to canal navigation, due to the availability of water from other sources.

There are two other factors that help to ensure that MVWA will always have an adequate supply of water available from the Hinckley Reservoir:

- The MVWA has the lowest intake at the Hinckley Dam (invert elevation 1162.5 feet). This is 4.5 feet lower than the invert of the control valve openings (1167.0 feet) that allow water to be released to West Canada Creek and 11 feet below the lowest elevation addressed by the 1920 Operating Diagram (1173.5 feet). Water level 1173.5 feet is the elevation below which NYPA or Canals cannot ensure a release rate of 230 cfs to meet downstream needs. (Landreth & Gibson, 1921)
- Hinckley Reservoir inflows typically exceed the amount of water withdrawn by MVWA for public water supply purposes.

The MVWA intake is the lowest withdrawal point in the reservoir. It is clear that releases for hydropower production, Canal navigation and the downstream West Canada Creek fishery would end before MVWA is unable to draw water for drinking water purposes; however, at these low reservoir levels, both the quantity and quality of water drawn for drinking water use may become problematic until MVWA completes their proposed new water transmission line.

Direct daily comparisons of MVWA withdrawals to calculated total reservoir inflow can not be made for all days due to imprecision in historical reservoir elevation data and the method used to calculate total reservoir inflows. However it is possible to overcome this data issue by comparing running averages to the MVWA withdrawal. Thirty day running averages of total reservoir inflows were calculated as part of the Hydrology Committee's evaluation of reservoir trigger criteria (Annex I: Report of the Hydrology Committee). This evaluation showed that the lowest 30 day average inflow for the years in the record with sufficient data for this analysis was 66 cfs during September 1999. The evaluation does not show with certainty that the daily MVWA withdrawals have always been exceeded by total reservoir inflows, but it does show that if reservoir inflow has been below the MVWA withdrawal rates, it was on an infrequent, short term basis.

MVWA has projected demand for the regional water systems for the year 2050 as 66.2 cfs (43 mgd). This includes potential expansion in western Oneida County and the Herkimer County communities along the West Canada Creek, including those near the confluence with the Mohawk River, that the NYSDEC has indicated should be served by the MVWA. The 2050 demand also includes 9cfs (6 mgd) for a "Chip Fab" type user.

Pursuant to the Water Resources Management Strategy Act of 1984, NYSDEC with the participation of NYSDOH, developed and published a series of "Water Resources Management Studies" in 1989 and associated "Water Resources Management Strategies" to inventory and analyze the capacity of existing water supply sources and facilities and to make recommendations for future modifications, expansion or development of new sources or facilities. One objective of the reports was "to encourage and recommend, where appropriate, the development, restoration, conjunctive management, interconnection and/or expansion of water supply sources or systems on a regional basis. To accomplish these goals, the state was divided into thirteen substate regions. Herkimer County was grouped with several other counties into the "Mohawk Region" and similarly, Oneida County was grouped into the "Oswego Region." (NYSWRPC, 1989a; NYSWRPC 1989b)

The reports for the Mohawk and Oswego Regions contain recommendations for future water supply development in Herkimer and Oneida Counties, and should be consulted when new water supply projects are contemplated. However, the reports were meant to evolve as needed in response to changing policies and circumstances. Specific recommendations in the reports include:

- *C. A regional water system could be established in Herkimer County which would utilize excess water from the Utica Water Board to alleviate water shortages in Towns of Herkimer and Frankfort and the Village of Ilion.*
- *D. The excess capacity of the Utica Water Board should be utilized to satisfy additional water demand requirements and economic development within its existing service area and with communities adjacent to or interconnected with it that exceed their own source yields (p. 12). (NYSWRPC, 1989a)*
- *F. Excess capacity of the Utica Water Board should be utilized to alleviate water shortages in the Towns of Herkimer and Frankfort and the Village of Ilion in Herkimer*

County (p. 12). (NYSWRPC, 1989b).

Copies of the Mohawk Region and Oneida Region Water Resources Management Strategy are located in Appendix E.

Fisheries

The West Canada Creek watershed is located in the south western Adirondacks and extends to the mouth of the West Canada Creek at Herkimer. The NYSDEC Bureau of Fisheries evaluates the watershed in four parts:

- upper watershed above Hinckley Reservoir;
- Hinckley Reservoir;
- Prospect Pond and West Canada Creek from Prospect to Trenton Falls; and
- the thirty mile stretch of the creek from Trenton Falls to Herkimer.

The upper watershed above Hinckley Reservoir, which is located entirely within the Adirondack Park, is used mostly for recreation such as camping, snowmobiling, hiking, hunting and fishing. The fishery in this area is managed for its trout fishing with most of the water bodies classified as wild trout streams, ponds and lakes. Only a few streams and ponds are stocked by the NYSDEC, private organizations or individuals. NYSDEC stocks approximately 3,400 brown trout and 11,000 brook trout into West Canada Creek in this area. Timber management is a major economic component of this portion of the watershed. In the past, this industry relied heavily on flows of the West Canada Creek to move the logs to market; however, this is no longer the case.

Hinckley Reservoir is in the second part of the West Canada Creek watershed. This section of the watershed is used for hydropower generation, water supply for the canal system, municipal drinking water supply, flood control, boating, swimming and fishing. Fluctuating water levels, water chemistry issues, including low nutrient levels, hardness and conductivity, as well as the roughly 80% sand substrate of the reservoir, have made it difficult to produce a good fishery. A good fishery has several components. Catching fish is obviously important but catch rates, growth rates and the condition factor of the fish species must be considered. Compared to similar water bodies in the Northeast and northern tier states, Hinckley fish (except for rock bass) are smaller and weigh less for a given age (Hasse, 1977). There are times and locations at Hinckley that occasionally produce a good fishery but not with any consistency. Hinckley Reservoir was stocked with walleye, lake trout, brown trout, brook trout, rainbow trout and tiger muskellunge in the past but none of the stockings ever produced a fishery in the reservoir. The reservoir is occasionally stocked by the NYSDEC when surplus fish are available in the hatchery system, but as with the earlier stockings, only a small percentage of the fish are caught.

The third part of the watershed consists of Prospect Pond and West Canada Creek from Prospect to Trenton Falls. Prospect Pond, created in 1959 when the dam at Prospect was constructed, is immediately downstream of Hinckley Reservoir. Prospect Pond is managed by Erie for power generation under FERC License #2701. Prospect Pond is stocked with brown trout to meet NYSDEC's objective as a trout fishery. Approximately 3,400 brown trout are stocked annually. Prospect Pond was the only water body from Hinckley Reservoir downstream that was not negatively impacted by the water situation during the summer and fall of 2007 from a fisheries perspective.

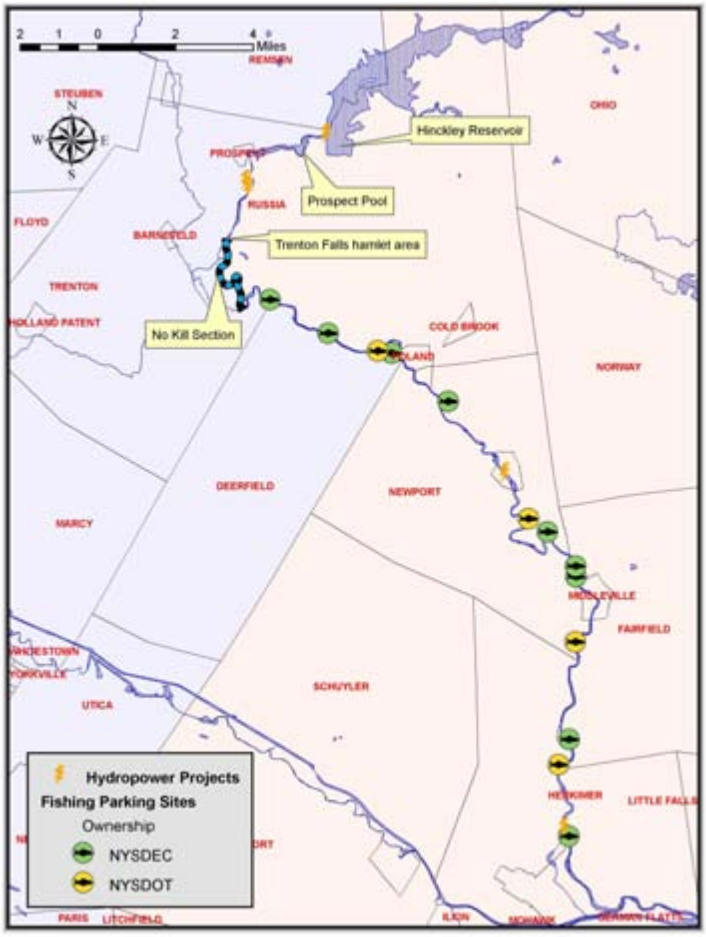

Figure 4: Fishing sites from Hinckley Reservoir to Herkimer

The thirty mile stretch of the river from Trenton Falls to Herkimer is the fourth part of the watershed. This part is intensely managed by the NYSDEC as a high quality trout fishery. The operation of the hydropower facilities at Hinckley, Prospect and Trenton and the Nine Mile Feeder Canal have the potential to significantly affect the fishery in this portion of the West Canada Creek. The FERC licenses issued to these facilities and the associated 401 Water Quality Certifications require close coordination between the hydropower facilities and the Canal Corporation to ensure that a minimum flow rate of 160 cfs is maintained in the creek at all times at a location downstream of the Morgan Dam at Trenton (See Figure 6).

The NYSDEC has conducted four statewide angler surveys since 1973 (Connelly, Brown & Knuth, 1997). This stream segment has always ranked as one of the top ten most popular fishing streams in the state, reaching as high as third on several occasions. The entire segment is covered by special regulations which enhance its importance to fishermen. From Herkimer upstream to the mouth of Cincinnati Creek, the fishing season is extended from mid-October to the end of November. From the mouth of Cincinnati Creek upstream to the dam at Trenton Falls a no

kill, artificial lures only, year round fishery exists.

Anglers have access to 21% of the stream bank through the public fishing rights program. Nine parking areas managed by NYSDEC, four managed by NYSDOT and several private or municipal parking areas provide additional access to the river. These access points are also used by canoeists and kayakers.

NYSDEC spends about $75,000 annually to stock 50,520 brown trout in this section of the stream, as illustrated in Table 1. These fish were pursued by approximately 52,000 anglers. Most of the anglers, about 67%, were local fisherman, 33% were not from the immediate area, and about 10% were from out of state. These fishermen spent an estimated $1.3 million per year fishing the West Canada Creek (Connelly et al., 1997).

From the Hinckley Dam to Herkimer there are five hydropower plants. Minimum releases required for each of these facilities are set in their Federal Energy Regulatory Commission (FERC) licenses. In order to supply the proper flows below Trenton Falls, the hydroelectric projects at Hinckley Dam and Prospect must pass a minimum 160 cfs plus the quantity that is diverted for canal operations. The facilities at Newport and Herkimer must pass a minimum of 160 cfs.

Table 1: Brown trout stocking by NYSDEC into the West Canada Creek from Herkimer upstream to Trenton Falls in 2007

Section	Number of Trout	Number of Big Trout
Herkimer to Middleville	17,700	680
Middleville to Poland	15,900	680
Poland to Cincinnati Creek	12,300	680
Cincinnati Creek to Trenton Falls	2,200	380
Totals	**48,100**	**2,420**

Note: A total of 50,520 hatchery raised brown trout were stocked. Included in this number were 2,420 fish 12-15 inches long.

In the early 1980's, environmental studies completed for the FERC license application at Jarvis, Prospect and Trenton Falls showed that flows below 160 cfs had a major impact on the resource by dewatering large areas of the stream (Culp, Homa, & Platt, 1981). The bypass reaches of the Prospect and Trenton Falls generation facilities are watered only when the hydraulic capacity of the generation units is exceeded or when the generation units are offline. Observations by NYSDEC staff since the 160 cfs minimum flows were instituted showed anchor ice and frazil ice formation during the winter, and warm water during the summer have negative affects on the stream. According to NYSDEC field observations, the ice froze out food sources and eliminated habitat while the warm water reduced the oxygen carrying capacity of the stream and produced thermal shock to the fish. The extent of the impact is not known.

The Delta Reservoir is located near Rome, and also provides ample fishing opportunities. Delta Reservoir has water quality that is conducive to growing fish and provides a better habitat. This results in an excellent fishery for bass, walleye, northern pike, and pan fish. The NYSDEC stocks 5.2 million walleye fry into Delta. The Rome Fish Hatchery produces 1.2 million fish annually and uses 5,000 gpm (11 cfs) from Delta.

Five southwestern Adirondack lakes have been modified to provide flows to the canal system if needed. These lakes, located north of the canal, normally flow into Lake Ontario via the Black River but can be diverted at Forestport into Delta Reservoir via the Forestport feeder canal and the Lansing Kill. North Lake, South Lake, Sand Lake, Woodhull Lake and Canachagala Lake are managed by DEC as trout fisheries. The NYSDEC annually stocks North Lake with 3,000 splake and 1,000 tiger muskellunge. South Lake is stocked with 3,500 hybrid brook trout. The Adirondack League Club stocks Canachagala Lake with 3,290 brook trout. Sand and Woodhull Lakes are wild trout fisheries. A major drawdown in the fall or early winter could create noticeable impact on the fish resource by dewatering spawning sites since these trout species spawn in the fall.

Water Supply Permit Program

The Public Water Supply Permit (WSP) Program has a long history dating back to 1905. The program was first administered by the State Water Supply Commission. Presently, it is administered by the Department of Environmental Conservation (NYSDEC). The current statutory authority is found in Article 15, Title 15, of Environmental Conservation Law. The implementing regulations are found at 6 NYCRR, Part 601.

The WSP program regulates activities that involve permanently installed systems providing piped water to the public for drinking water and other potable purposes. Anyone planning to operate or operating such a system, with at least five service connections used year-round, must obtain a WSP from NYSDEC before undertaking any of a long list of activities specified in law and regulation (see Appendix A). Examples of regulated activities include: installation of a new water supply system; acquisition or development of new or additional source(s) of water supply; taking or condemning lands associated with water supply sources; and extension into new service areas not specifically authorized by a previous NYSDEC permit.

When the program was first initiated in 1905, three statutory determinations had to be met for an application to be approved. Other statutory requirements have been added since that time, most recently in 1989 with the addition of the water conservation requirement.

Presently there are eight statutory requirements for which NYSDEC must be able to make an affirmative finding prior to issuing a WSP. In summary these are:

- Is the proposed project justified by public necessity? (Original 1905)
- Have other sources of supply, which are available or may become available, been adequately considered? (Added 1973)
- Will all work and construction in connection with the project be done in a proper and safe

manner? (Added 1911)

- Will the water supply be adequate to meet the needs of the proposed service area? (Added 1973)
- Will there be proper protection of the water supply and watershed or proper treatment of the water supply? (Added 1911)
- Will the proposed project be just and equitable to all the affected municipalities, particularly with regard to their present and future needs for water supplies? (Original - 1905)
- Is there provision for fair and equitable determinations of and payments of any direct and indirect legal damages to persons or property resulting from the acquisition of any lands for the proposed project or the construction and continuing operation of the project? (Original - 1905)
- Has the applicant developed and implemented a water conservation program in accordance with local water resource needs and conditions? (Added 1989)

NYSDEC, upon receipt of an application, evaluates whether the proposed supply, based on the information developed at the time of the application, will be adequate for a reasonable period into the future. Neither the applicant nor NYSDEC can guarantee that the proposed sources will remain adequate indefinitely. NYSDEC's WSP program does not presently include routine (e.g., daily or monthly) reporting or tracking of water source production or yield. The decision as to when to develop new source capacity, due to either declining existing source yield or increased demand, rests with the applicant.

In the case of a surface water source, the standard a proposed source must meet for quantity is:

The quantity of water at the source shall:

- Be adequate to meet the maximum projected water demand of the service area as shown by calculation based on a one in fifty year drought or the extreme drought of record, and should include consideration of multiple year droughts. Requirements for flows downstream of the intake shall comply with requirements of the appropriate reviewing authority;
- Provide a reasonable surplus for anticipated growth;
- Be adequate to compensate for all losses such as silting, evaporation, seepage, etc.; and
- Be adequate to provide ample water for other legal users of the source (Great Lakes – Upper Mississippi Board of State and Provincial Public Health and Environmental Managers, 2003)

Mohawk Valley Water Authority Water Supply

The drinking water supply system which would ultimately become the current Mohawk Valley Water Authority (MVWA) had its origins with private water supply companies. These companies were in existence before the creation of NYSDEC's WSP program and thus had no water supply permits. The first permit/decision issued by NYSDEC (or its predecessors) directly related to the future MVWA system was Water Supply Application (WSA) No. 1272, approved on September 14, 1937 (see Appendix B for a copy of the decision). WSA (permit) No. 1272 approved the purchase by the City of Utica of the water supply system of the Consolidated Water Company of Utica. The next major relevant WSA was WSA No. 9435, approved on November 15, 1996 (see Appendix B for a copy of the permit). WSA No. 9435 approved the acquisition and future operation by the Upper Mohawk Valley Regional Water Board (now MVWA) of the existing water supply and distribution system then owned by the City of Utica.

WSA (permit) No. 9435 is the only NYSDEC water supply permit under which MVWA currently operates. The permit authorizes MVWA, as successor to the City of Utica Board of Water Supply and the former Consolidated Water Company of Utica, to obtain a supply of water for use in its system from Hinckley Reservoir on West Canada Creek, under the provisions of the Memorandum of Amended and Supplemental Agreement made and entered into on December 27, 1917, by and between the Consolidated Water Company and the State of New York (see Special Condition #2 of WSA No. 9435). The permit, among other conditions, specifies MVWA's service area; preserves the rights of communities within the West Canada Creek watershed below Hinckley Reservoir to obtain a water supply from MVWA; and specifies water conservation measures. The permit does not address drought response measures.

Other Public Water Supplies in the West Canada Creek Watershed Below Hinckley Reservoir

Other NYSDEC permitted water supplies exist in the West Canada Creek watershed below Hinckley Reservoir. None of these systems draw from West Canada Creek.

- Village of Herkimer (WSP #226, upland reservoir and WSP #9020, surficial aquifer wells);
- Village of Poland (WSP #9138, surficial aquifer wells);
- Village of Middleville (WSP #7673, surficial aquifer wells);
- Village of Newport (WSP #1660, springs);
- Village of Remsen (WSP #9826, bedrock aquifer wells);
- Village of Prospect (WSP #8553, surficial aquifer wells); and
- Village of Barneveld (WSP #4163, springs).

During the summer of 2007, NYSDEC had no reports from any of these systems regarding water resource yield problems.

Canal Navigation

Canal System Water Supply

The water supply for the canal system is provided by runoff from the drainage areas tributary to the canal and, in dry periods, by withdrawal from storage in natural and artificial reservoirs. Lake Erie provides ample supply to the western section of the Erie Canal. There are 22 reservoirs under the jurisdiction of the Canal Corporation that serve as sources for the eastern section of the Erie Canal, extending from Three Rivers east to Waterford. Twelve of these reservoirs are north of the canal and ten are south of the canal. All of the reservoirs were either constructed or appropriated by the State of New York for canal use and they remain in state ownership. The reservoirs are listed in Table 2 below.

Table 2: Canal sources available in the Rome summit area

Northern Reservoirs	Southern Reservoirs (West)
Alder Creek Reservoir[6]	Cazenovia Lake[4,7]
Alder Pond Reservoir[3,6]	DeRuyter Reservoir[4,7]
Canachagala Reservoir[3]	Erieville Reservoir[4,7]
Chub Pond Reservoir[3]	Jamesville Reservoir[4,7]
Delta Reservoir[7]	Southern Reservoirs (East)
Forestport Pond Reservoir[2,6]	Bradley Brook Reservoir[1,7]
Hinckley Reservoir[5]	Eaton Brook Reservoir[4,7,8]
North Lake Reservoir[7]	Hatch Lake Reservoir[1,7]
Sand Lake Reservoir[7]	Kingsley Brook Reservoir[1,7]
South Lake Reservoir[7]	Leland Pond Reservoir[4,7,8]
Twin Lakes Reservoir[3]	Madison Reservoir[4,7,8]
Woodhull Reservoir[7]	

Note: Maps depicting canal sources in the Rome summit area can be found by clicking on the hyperlinks in the table heading below (Northern Reservoirs, East and West) and by referring to Figure 1.

1 These reservoirs can no longer supply water to the canal system due to major infrastructure limitations.

2 This reservoir cannot be drawn down by agreement with Algonquin Power Systems, Inc., due to Section 401 Water Quality concerns.

3 These reservoirs no longer impound water, or impounded water is not releasable, but water used to supply the canal system passes through them.

4 These reservoirs can currently supply a minimal amount of water to the Rome summit, but there are infrastructure issues that restrict volume and flow.

5 NYPA staff actively performs water control functions on these reservoirs.

6 Algonquin Power Systems staff actively performs water control functions on these reservoirs. Alder Pond Reservoir is required for maintaining flow in the Black River and is not used for Canal Navigation.

7 Canal staff actively performs water control functions on these reservoirs.

8 The eastern group of southern reservoirs cannot supply the Rome summit section. When diverted for canal use, water flows to the natural Mohawk River channel and enters the Erie Canal near Frankfort, downstream of Lock E-19.

Through a series of interconnected water courses, all of the northern reservoirs except Hinckley Reservoir can be diverted to supply water through Delta Reservoir and into the Rome summit section. These reservoirs discharge into the Black River that naturally flows into Lake Ontario near Watertown. A portion of the Black River can be diverted at Forestport into Delta Reservoir through the Forestport Feeder Canal. Presently, there are no natural or artificial reservoirs that contribute water to Hinckley Reservoir.

The southern reservoirs (west) supply water to the old Erie Canal, which can feed the Rome summit level or Oneida Lake. The southern reservoirs (east) can be diverted to Oriskany Creek and subsequently the Mohawk River. These reservoirs cannot supply water to the Rome summit section, but can provide water to the Canal below Lock E-19. The water from the southern reservoirs naturally flows into the Chenango River and south, away from the Canal System.

Table 3: Full reservoir capacity of the Northern and Southern reservoirs

Reservoir	Full Reservoir Capacity	
	Million Cubic Feet	Billion Gallons
Northern Reservoirs		
Alder Creek Reservoir	213	1.6
Alder Pond Reservoir	3	0.02
Delta Reservoir	2736	20.6
Forestport Pond Reservoir	13.8	0.1
Hinckley Reservoir	3449	25.8
North Lake Reservoir	300	2.2
Sand Lake Reservoir	240	1.8
South Lake Reservoir	300	2.2
Woodhull Lake Reservoir	879	6.6
Southern Reservoirs		
Bradley Brook Reservoir	146	1.1
Cazenovia Lake	207	1.5
DeRuyter Reservoir	504	3.8
Eaton Brook Reservoir	553	4.1

Reservoir	Full Reservoir Capacity	
	Million Cubic Feet	Billion Gallons
Erieville Reservoir	318	2.4
Hatch Lake Reservoir	58	0.4
Jamesville Reservoir	170	1.3
Kingsley Brook Reservoir	98	0.7
Leland Pond Reservoir	60	0.5
Madison Reservoir	409	3.1

The Rome summit level is 18.2 miles long, extending from Lock E-20, near Whitesboro on the east, to Lock E-21, near New London, on the west. The normal pool level in this area is 420 feet above sea level. The City of Rome is located on the north bank of the summit level, approximately at its mid-point. The Mohawk River, flowing southerly from Delta Reservoir, enters the canal in Rome. The natural Mohawk River channel still exists south of the canal and is used to receive overflow from the Rome summit section when the water level in the canal is high. This portion of the river is located between 200 feet and 3,000 feet south of the canal and at Lock E-20, the river surface is nearly 20 feet below the canal. Two additional sources of water for the summit level are the old Erie Canal and Nine Mile Creek. The old Erie Canal enters the Barge Canal from the south, approximately one mile east of Lock E-21. Nine Mile Creek enters the canal from the north, approximately four miles west of Lock E-20. Water supplied by Hinckley Reservoir can be diverted from West Canada Creek into the Nine Mile Feeder Canal and then into Nine Mile Creek, to supply the Rome summit level. Oriskany Creek enters the Mohawk River from the south, as the river meanders around Lock E-20. Water from the Oriskany Creek can be used for canal navigation to the east of the summit level; however it does not enter the canal until the confluence with the Mohawk River near Frankfort. Therefore, it cannot be used as a source of water to the Rome summit.

According to the Canal Corporation, the hydraulic capacity of the Nine Mile Feeder Canal is 630 cfs, and the historic maximum diversion has been measured at 188 cfs. The average diversion, when it occurs during the navigation season, has been estimated at approximately 100 cfs. The United States Geological Survey (USGS) monitored discharge in the Nine Mile Feeder Canal (Nine Mile Feeder Near Holland Patent, NY, Station Number 01344500) during the navigation season from 1919 through 1968; however, use of the gage was discontinued following the 1968 navigation season. The Canal Corporation computes the rate of water diverted into the Nine Mile Feeder Canal using theoretical hydraulic calculations based upon field measurements when gate changes are made; however, Erie estimates the rate of water diverted on a daily basis by monitoring a staff gage at the Canal Diversion at Morgan Dam.

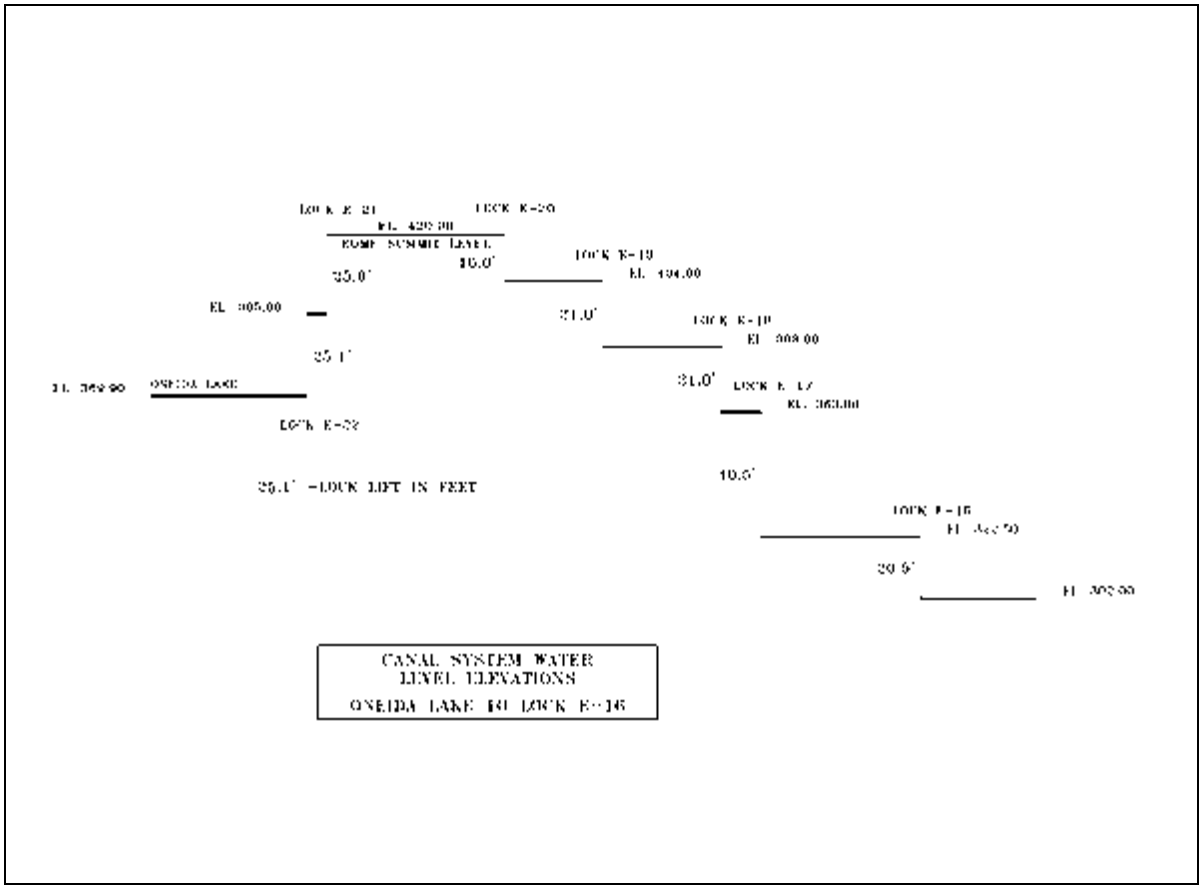

Figure 5: Rome summit level and lock elevations

Canal System Water Demand

A lockage is defined as the act of emptying the water in the lock chamber. The water required for lockages depends upon the size of the locks and the number of lockages. The quantity of water available for lockages is particularly important at the Rome summit level (Lock E-20 to Lock E-21) because locks at both ends draw out of the summit, and there are no locks that bring water into the section. Locks downstream of the summit level are supplied by the water from the locks at either terminus of the summit level, and by tributary streams entering the canal downstream of the summit level.

Each lockage at Lock E-20 requires approximately 1.8 million gallons while each lockage at Lock E-21 requires approximately 2.8 million gallons. While these volumes are relatively simple to calculate, the canal water need is not simply a function of the number of lockages and the volume for each lockage. The Mohawk River and the Canal are dynamic systems with a constant flow of water. Some is natural and some is artificial.

There is additional water demand on the summit section when the lift of the locks downstream of the summit level exceeds the lift of the summit level locks. On the western end of the summit level this is not a problem because the lifts of Locks E-21 and E-22 are

roughly equal and then the canal flows into Oneida Lake, a vast reservoir with an area of 80 square miles. On the eastern end of the summit level, the lift of Lock E-20 is 16 feet, far short of the four adjacent locks (E-19 – 21 feet; E-18 – 20 feet; E-17 – 40.5 feet; and E-16 – 20.5 feet). Therefore, the water supplied from Hinckley Reservoir, via West Canada Creek and then the Mohawk River, which enters the canal below Lock E-18, is very critical to canal operations east of the summit level. More water is supplied down the West Canada Creek below the Canal diversion than is supplied through the Nine Mile Feeder to the summit level. This water is used for canal navigation need downstream of Lock E-18 where this flow enters the canal.

Historically, Delta and Hinckley Reservoirs, due to their abundant water supply, have been held as the primary sources of water for the eastern section of the Canal. The remainder of the northern and southern reservoirs have been retained as a backup sources. Because the southern reservoir supply is infrequently used, there are infrastructure problems such as silted-in channels and inoperable valves in several different areas. Funding for capital improvements and maintenance has been directed to areas in the canal system where it would be most effective, thus deferring maintenance on infrastructure that is less critical to canal navigation.

Hydropower Generation

Hinckley Reservoir supports the hydropower production at several locations along West Canada Creek. NYPA, Erie Boulevard Hydropower, L.P., (a wholly owned subsidiary of Brookfield Power), Newport Hydro Associates and Algonquin Power Systems NY, operate facilities along the West Canada Creek. NYPA operates the Jarvis Project at Hinckley Reservoir and controls the flow of water through the dam. Nearly 52 mW of power can be generated on the WCC between Hinckley Reservoir and the Mohawk River. The Jarvis Project is dependent on the Hinckley Reservoir elevation and outflow, where the other downstream producers are dependent only on flow rates from the reservoir. The water elevation differences, known as head, that are needed for the downstream projects are created by downstream impoundments.

1920 Operating Diagram and Hydropower Development

Shortly after the Hinckley Reservoir was built, the operation of the reservoir for canal purposes was alleged to injure existing downstream hydropower interests and claims were brought against the State by Utica Gas & Electric Company. In December 1920, the State developed an Operating Diagram that established the minimum rate for release of water from Hinckley Reservoir based upon varying reservoir levels throughout the year. The Operating Diagram has a self correcting characteristic that provides for reducing release rates as reservoir levels decline.

The 1920 Operating Diagram became part of the June 14, 1921 Agreement between the State of New York and the Utica Gas & Electric Company that settled earlier claims. The 1921 Agreement and Operating Diagram now govern operations at the Hinckley Dam. The 1921 Agreement includes an exemption to the 1920 Operating Diagram for either a drought or flood on the downstream Canal:

> "*…during periods of extraordinary or unusual drought, flood, or emergency caused by the temporary failure of other sources of water supply for canal use …* [Canal Corporation] *may temporarily vary or entirely suspend the operation of the said dam and reservoir as described and laid down in the operating diagram aforesaid, during the periods of such extraordinary or unusual drought, flood or emergency caused by the temporary failure of other sources of supply for the canal use."*

The Canal Corporation and New York State Power Authority are required to honor the flow requirements set forth in the 1921 agreement, unless one of the extreme conditions arises which permits a deviation for canal purposes. Normal releases are coordinated with Erie. Canal Corporation and Mohawk Valley Water Authority are contacted as needed.

FERC Licensing and Section 401 Certification

Hydropower projects are subject to licensing by the Federal Energy Regulatory Commission (FERC). Prior to FERC's issuance of a hydropower license, the State of New York must certify that the project complies with Section 401 of the Clean Water Act. A Water Quality Certification is required for placing fill or undertaking activities resulting in a discharge to waters of the United States where a permit or license from a federal agency is required. Applicants for a federal license or permit for activities (including but not limited to the construction or operation of facilities that may result in any discharge into waters of the United States) are required to apply for and obtain a Water Quality Certification from NYSDEC demonstrating that the proposed activity will not violate water quality standards.

The 401 certification for the Jarvis Project requires that NYPA, in cooperation with the Niagara Mohawk Power Corporation (now Erie), the New York State Department of Transportation (now Canal Corporation) and the New York State Department of Environmental Conservation, operate the Jarvis project in such a manner as to provide a continuous minimum flow of 160 cubic feet per second in West Canada Creek downstream of the Barge Canal diversion (Nine Mile Feeder Canal) that is located at the Morgan Dam, about 4.6 miles below Hinckley Reservoir (See Figure 6).

Article 20 of the FERC license for the Jarvis project provides that: "Licensee, in cooperation with the Niagara Mohawk Power Corporation, the New York State Department of Transportation, and the New York State Department of Environmental Conservation, shall operate the Hinckley Hydroelectric Project in such a manner as to provide a continuous minimum flow of 160 cubic feet per second in West Canada Creek downstream of the DOT barge canal diversion weir."

On August 12, 1982, the FERC issued a license with a 40 year term for the Power Authority's Jarvis Project at Hinckley Reservoir. Prior to obtaining a license for Jarvis, NYPA was required to consult and coordinate with Niagara Mohawk, the operator of the Prospect and Trenton Falls projects located on West Canada Creek immediately downstream from Jarvis. At the time, licensing was commenced for Jarvis, Niagara Mohawk was also in the process of applying for a new license for their downstream facilities.

As part of the FERC pre-license consultation process, NYPA responded to comments from the City of Utica regarding past cooperation "setting aside the Operating Diagram" to maintain a minimum elevation of 1185 feet in Hinckley Reservoir. NYPA stated that its "development of hydroelectric power at Hinckley ….. will not interfere with this historical cooperation to preserve the Utica water supply …." The FERC license, however, does not require maintenance of reservoir elevation 1,185 feet, but requires releases to be made in accordance with the 1920 Operating Diagram.

The Section 401 Water Quality Certification for the Jarvis Project at Hinckley Dam, issued by NYSDEC in November 1981, noted that Hinckley Reservoir is a water supply for the City of Utica and recognized the application of ECL §15-0105 "if need is established."

Jarvis Project at Hinckley (FERC #3211)

NYPA operates the Jarvis project pursuant to an Operation and Maintenance Agreement dated August 31, 1983, and a hydropower Easement dated March 7, 1984, with the State of New York. That agreement requires NYPA to "operate the dams and discharge all flows in accordance with existing or modified rule curves, or where such rule curves do not exist, the rule curves developed jointly by the Authority and NYSDOT (Canal Corporation)." NYPA is further required to "adjust flows as requested by NYSDOT where such adjustment is necessary due to navigational needs or canal maintenance."

Electric generation at Jarvis is dependent on the reservoir release rates set by the 1920 Operating Diagram and the elevation of Hinckley Reservoir. Jarvis has two generating units, with a nominal generating capacity of 9 mW. The project can operate over a flow range of 250 cfs to 1800 cfs. The spillway crest elevation of the Hinckley Reservoir Dam is 1225 feet; Jarvis cannot generate power when the reservoir elevation falls below 1195 feet. Below 1195 feet, water is discharged to West Canada Creek through either a penstock valve or at an outlet valve, based on the Operating Diagram requirements. These valves are unable to provide an adequate quantity of water to meet downstream discharges when the reservoir elevation is below 1173.5 feet. In effect, sufficient releases can no longer be made to the West Canada Creek when water levels in the Hinckley Reservoir fall below this critical level. The inverts of these valve openings are at 1167.0 feet, and below this level no releases can be made from Hinckley Reservoir to West Canada Creek.

The Jarvis application proposed to utilize the existing diagram developed in 1920 as the basis for its operation**,** with "target elevations" in the non-navigation season intended to minimize reservoir spillage.

NYPA generally operates Jarvis at a constant generating level, and not with the sole intention to generate more power during electric system daily peak periods, with few exceptions. Such an exception occurs when generation from the specified Operating Diagram discharge is below Jarvis' installed capacity (ICAP) commitment to the New York Independent System Operator (NYISO). The NYISO is the manager of New York's transmission and wholesale electricity marketplace. Under such conditions, Jarvis releases sufficient flow, up to 900 cfs, to generate at the ICAP (3 MW) for four hours during the day. Flow during the other 20 hours is adjusted downward so that the average daily flow equals

the Operating Diagram discharge.

Prospect and Trenton (FERC #2701)

On March 18, 1983, the FERC issued license #2701 to Niagara Mohawk Power Company's (now Erie Boulevard Hydropower) Prospect and Trenton facilities on West Canada Creek. The license was for a 50 year term, commencing March 1, 1973. The Prospect facility is located approximately 2.5 miles downstream from Hinckley Reservoir; the Trenton Falls facility is approximately 4.25 miles downstream.

Niagara Mohawk Power Corporation (NMPC) applied to NYSDEC for a 401 Water Quality Certification on June 9, 1980. NYSDEC requested a habitat flow assessment of West Canada Creek on July 22, 1980, and NMPC submitted the requested report on June 18, 1981. At the time the FERC license was issued, FERC observed "On the basis of a lack of action for over a year by the State of New York upon NMPC's request for a water quality certificate pursuant to Section 401 of the Federal Water Pollution Control Act Amendments (FWPCAA), supra, it is concluded that the certification requirements of that section have been waived."

The licensed capacity of Prospect is 17.325 megawatt (MW) with a "best gate" discharge of 1525 cfs and 135 feet of head. The best gate is the turbine capacity setting at which maximum efficiency is achieved. At flows beyond best gate, additional power is generated, but at lower efficiencies.

The downstream plant operations are based on the 1920 Operating Diagram releases. The Prospect and Trenton facilities, however, both have the capacity to operate at 1525 cfs, and routinely do so by storing water released from Hinckley in their own reservoirs. By using these reservoirs, they can generate power with releases up to 1525 cfs "on peak." Power is generated at a single turbine generator unit that is operated as a peaking facility. A peaking facility attempts to maximize generation during periods of high electricity demand. A hydropower peaking facility is generally operated at or near its maximum allowable capacity for part of the day, and is either shut down or operated at a minimum capacity level for the remainder of the day. Prospect Pond stores water released from Hinckley, and has a storage capacity of 3,250 acre-feet at normal pool elevation (1,161.5 feet, USGS) and operates with 5 feet (approximately 806 acre-feet) of active storage.

The Trenton Falls plant is operated in a similar manner to Prospect, but its reservoir is small in comparison to Prospect's. Trenton Falls has a total FERC licensed capacity of 22.45 MW, with three units in operation. These units may operate at a minimum gate setting of approximately 120 cfs and a maximum combined flow of 1450 cfs at 255 feet of head. Maximum generation efficiency is achieved at 1450 cfs. Trenton Falls reservoir has 264 acre-feet gross storage at normal pool elevation of 1023.9 feet (USGS).

Article 20 of the FERC license # 3211 provides that:

> *"Licensee, in cooperations with the Niagara Mohawk Power Corporation, the New York State Department of Transportation and the new York State Department of Environmental Conservation, shall operate the Hinckley Hydroelectric Project in such a manner as to provide a continuous minimum flow of 160 cubic feet per second in West Canada Creek downstream of the DOT barge canal diversion weir."*

Article 33 of FERC license #2701 states:

> *"The licensee shall provide a continuous minimum flow of 160 cubic feet per second or the inflow to the project whichever is less, as measured immediately downstream of the New York State Department of Transportation Barge Canal diversion weir, for the purpose of protecting and enhancing aquatic resources in West Canada Creek. These flow may be temporarily modified if required by operating emergencies beyond the control of the licensee and for short periods for fishery management purposes upon mutual agreement between the licensee and the New York State Department of Environmental Conservation."*

Minimum flow releases for fishery protection and diversion for Canal Corporation purposes occur below the Trenton Falls powerhouse and are part of the normal generation flows through the powerhouse. Normal procedure is to provide total flows equal to the sum of: the FERC required minimum flow of 160 cfs (or inflow) below the Morgan Dam diversion structure, plus the Canal Corporation diversion amount (during canal season), as part of and along with, the daily Hinckley release through the generating units at Trenton and Prospect. If the generating units are not available for use, or the flow is too low for these units to use, then the minimum and diversion flows would be provided through the gates at Trenton Dam or Prospect Dam. These flows are directly dependent upon the release from Hinckley. Such releases must be coordinated with NYPA and the Canal Corporation more carefully when outflow is low (approximately 300 cfs or less). This is currently accomplished through normal operational communications between these agencies.

Minimum flow releases for fishery and canal purposes occur at Trenton Falls. There are no direct measurements of the flow rate in West Canada Creek for fishery protection purposes. Erie Boulevard Hydropower takes manual readings from a gage that shows the depth of water diverted into Nine Mile Feeder Canal at Morgan Dam. This gage reading is used to estimate canal diversion rates which allows Erie to adjust releases to meet the 160 cfs minimum flow in West Canada Creek.

Other West Canada Creek Generation Facilities

There are two additional hydro projects on West Canada Creek below Trenton Falls.

- Newport Hydro Associates operates the Newport Project (FERC # 5196), approximately 15.2 miles below Hinckley. Newport has a licensed capacity of 1960 kW.

- On behalf of Trafalgar Power, Algonquin Power Systems NY operates the Herkimer Project (FERC # 9709), approximately 26 miles downstream of Hinckley. Herkimer has a licensed capacity of 1680 kW.

Recreation

Both Hinckley Reservoir and Delta Reservoir provide recreational opportunities within the greater Utica-Rome area. Recreation on both reservoirs support local businesses that provide services to residents and visitors. Delta Lake State Park and the Hinckley Day Use Area are two facilities operated by the State that provide recreational opportunities to the public. There are many privately owned businesses whose viability depends on continued recreational opportunities at Hinckley and Delta Reservoirs.

Hinckley Reservoir

Hinckley Reservoir is a very popular recreation area for residents of the Utica area. Because there are no formal state campgrounds on the reservoir, most recreational activity is in the form of day use. Day uses include boating, swimming and fishing. The two largest public use areas are the NYPA boat launch site and the Hinckley Day Use Area operated by NYSDEC.

Camping
There are no publicly owned campgrounds on Hinckley Reservoir; however, there are several privately owned campgrounds that can accommodate a variety of campers with tents to recreational vehicles. Camp Northwood is a private camp for children with special needs located in the Town of Remsen and has 260 campers for seven weeks each summer (Pertz, 2008).

Boating and Fishing
Motorized boats and personal watercraft are permitted on the Hinckley Reservoir. The NYPA boat launch site is operated as a concession with the operator charging a launch fee of $5 per boat. Boats can be launched at the NYPA Boat Launch and Hinckley Day Use Area. The Trail's End Campground has hosted two fishing tournaments on Hinckley Reservoir sponsored by the Hangar's Bass Club (Pertz, 2008).

Swimming
Swimming is available at the NYSDEC operated Hinckley Day Use Area. In addition, swimmers enjoy the Island, Pierce's Beach, Camp Northwood, Trail's End Campground, Kuyahoora Yacht Club and Brady Beach, and privately owned camps and residences. Some of these facilities are permitted by the New York State Department of Health and Oneida County Health Department as bathing beach facilities, as illustrated in Table 4.

Table 4: Recreational facilities on Hinckley Reservoir

Name	Facilities
Adirondack Lakeside Rentals Mobile Home Park	Lakeside Rentals, no beach.
Camp Northwood	Children's camp with beach
Trail's End Mobile Home Park	Mobile home park with beach
Grant Hotel	Food service
NYS Hinckley Day Use Area	Non community water only

Source: Oneida County Health Department and New York State Department of Health, Herkimer District Office. Only facilities permitted by NYSDOH and OCHD are listed.

Passive Recreation - Picnicking/Bird Watching/Wildlife Viewing
The Hinckley Reservoir and surrounding area has many passive recreational opportunities. NYSDEC staff have reported sightings of ospreys and eagles around the West Canada Creek.

Hiking/Walking/Bicycling
Hiking and walking trails exist along Hinckley Reservoir and the West Canada Creek. Many of the fishing access sites provide opportunities for hiking along the West Canada Creek.

Delta Reservoir

The Delta Reservoir is a popular local attraction for outdoor enthusiasts. Along with the many residents that live, work and play on the reservoir, several privately owned facilities draw hundreds of thousands of visitors annually. The largest single attraction at the Delta Reservoir is the Office of Parks, Recreation and Historic Preservation (OPRHP) operated Delta Lake State Park, a multi use recreational facility that attracts approximately 160,000 visitors annually.

Camping
There are two popular camping locations along the Delta Reservoir: Delta Lake State Park and the A-OK Campgrounds & Marina. Delta Lake State Park draws well over 25,000 campers to the reservoir annually.

Boating & Fishing
Between Delta Lake State Park, the Lake Delta Yacht Club and the A-OK Campgrounds & Marina, tens of thousands of boaters enjoy the Delta Reservoir annually. Sailing, canoeing, kayaking, personal water crafts, water-skiing, tubing and wake-boarding are just some of the many activities that visitors and residents can enjoy all summer long.

A nutrient-rich lake bottom plus clean cool water make the Delta Reservoir one of the most popular fisheries in the Mohawk Valley. The reservoir boasts smallmouth bass, northern pike, pickerel, yellow perch, rock bass, crappie and bullheads and walleyed pike.

Table 5: Recreational facilities on Delta Reservoir

Name	Facilities
A-OK Campground & Marina	Campground / Marina
Camp Crooked Arrow	Children's camp with beach
Delta Lake Bible Camp and Conference Center	Children's camp with beach
Delta Lake State Park	Campground, beach and boat launch
Lake Delta Yacht Club	-
Teugega Country Club	Country Club

Source: Oneida County Health Department, OPRHP.

Swimming
Swimming is one of the more popular summer activities on the reservoir. In addition to the many people swimming from their boats and docks, the beaches at Delta Lake State Park and at the A-OK Campground and Marina attract tens of thousands of visitors to the reservoir annually.

Passive Recreation – Picnicking/Bird Watching/Wildlife Viewing
The Delta Reservoir is an excellent place for more passive recreation like wildlife viewing. It is home to many animal species including raccoons, white-tail deer, red foxes, groundhogs, turtles and beavers. It is also the seasonal home to an amazing variety of birds including ducks, geese, crows, ravens, herons, red-tailed hawks, osprey, owls, bald eagles and many song birds.

Hiking/Walking/Bicycling
The Delta Reservoir is a very scenic place for hiking, walking and bicycling. There is a bicycle trail that joins the reservoir to Rome via Route 46. Additionally, the proposed Mohawk River Trail is expected to join Bellamy Harbor Park, on the Erie Canal in Rome, to Delta Lake State Park, on the Delta Reservoir. This will undoubtedly draw even more visitors in years to come.

Summary – Water Use and Management

West Canada Creek and the Hinckley Reservoir are regional resources that provide water needed for many interests. During normal meteorological conditions the Hinckley Reservoir has ample water available to meet the full needs of all users. This is demonstrated by the long history of the reservoir and the infrequent problems with low water levels. However, an extended dry period, as occurred in 2007, can create problems in meeting the needs of all users and difficult, competing demands can arise.

Table 6 provides a summary of Hinckley Reservoir elevations, rates for reservoir releases and withdrawals and identifiable critical levels at which water resource users may be impacted. Figure 6 illustrates the facilities and critical locations related to water use along Hinckley Reservoir and West Canada Creek. During conditions of a declining reservoir, the

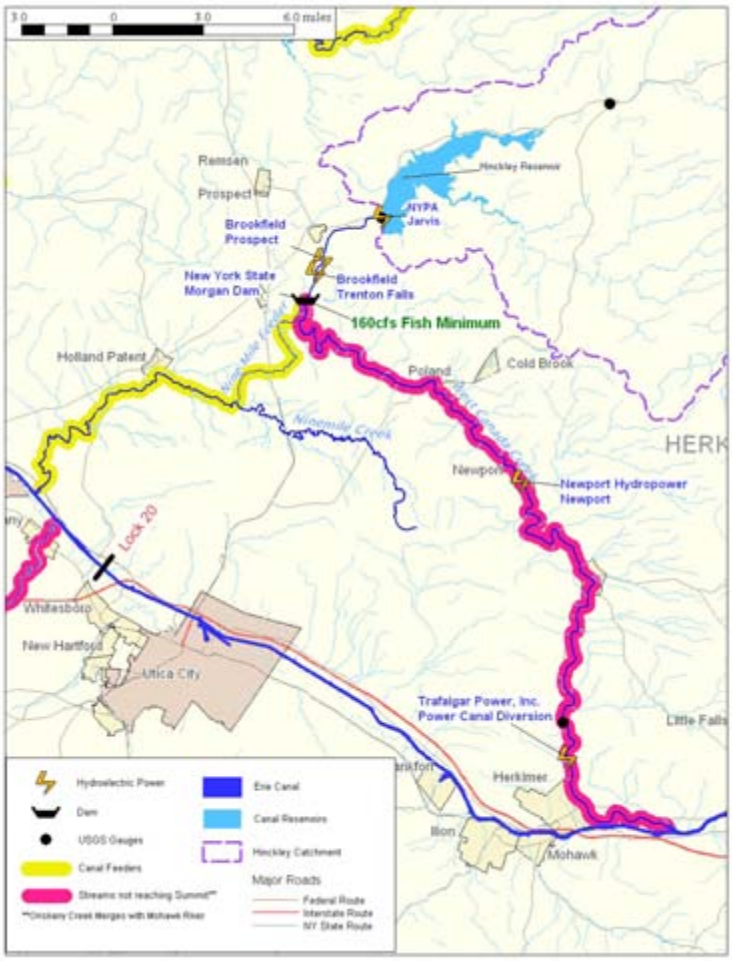

Figure 6: Water uses along the West Canada Creek

users that can be impacted, in order of occurrence, are:

- Recreation in Hinckley Reservoir - boaters lose launch access at about elevation 1213.5 feet;
- NYPA Hydropower Generation - production goes off line at about elevation 1195 feet;
- Drinking Water Supply - impacts to water withdrawal begin at an elevation of 1185 feet, reduced daily demands cannot be met below 1169 feet and water withdrawals by gravity end at elevation 1162.5 feet;
- Canal Corporation/ HydropowerGeneration - Operating Diagram releases for canal navigation purposes, which are concurrently used for power production, are impacted at elevation 1173.5 feet;
- West Canada Creek Fishery - release rates to meet minimum flows impacted at 1173.5 feet; and
- All releases for downstream users end at elevation 1167.0 feet.

For perspective, the lowest water level recorded in the Hinckley Reservoir since it was commissioned in 1915 was 1174.9 feet on November 17, 1964.

Users can also be impacted by reservoir release rates, independent of the water level in the Hinckley Reservoir. During low release conditions users that can be impacted are:

- Canal Navigation - Needed release rates vary widely based on canal needs. If sufficient release rates are not made when needed, canal navigation can be impacted and/or terminated;

- Hydropower Generation - lower release rates can reduce generation capacity at all five generation facilities;
- West Canada Creek Fishery - reduced flow rates, especially during warm months, can significantly impact the trout fishery. Minimum rates have been established at 160 cfs; and
- Drinking Water Supply - drinking water supply is taken directly from the Hinckley Reservoir and is independent of the reservoir release rates.

The largest demand on the Hinckley Reservoir is the release required by the 1921 contract and associated 1920 Operating Diagram. Depending on reservoir conditions and time of year, this release can vary from 200 cfs to 1100 cfs. Under normal conditions this release is used to meet the water needs of five hydropower facilities, for canal navigation and for maintaining the prime trout fishery in the downstream section of West Canada Creek. Releases made under the Operating Diagram are used first by NYPA to generate power at Hinckley, and then by hydropower producers that re-use the water at four other hydropower facilities located downstream. All of the water that is used by the hydropower producers enters the canal and is available to support navigation needs. Reservoir releases can enter the canal systems at two locations, through West Canada Creek to the canal near Herkimer and when needed, by diversion westward to the Rome summit section.

Many water sources are available to help meet the water demand for canal navigation and the Rome summit section. Many of these are small reservoirs with limited capacity and limitations on the ability to transfer water to the canal system. The two largest reservoirs, Hinckley and Delta, are also the most readily available for canal use. These reservoirs were constructed to provide water for the summit section of the canal. The Hinckley Reservoir is the only one of the canal reservoirs that also serves as a public drinking water source. The Canal Corporation has relied on Hinckley Reservoir because it has a larger watershed and the highest sustainable water yield. In addition, the water demand for canal navigation east of the summit section can often be met with water already being released from Hinckley to satisfy hydropower obligations under the 1921 contract.

Hydraulic limitations at the drinking water intake structure increase the reservoir water level needed to meet the drinking water demand for the greater Utica area. MVWA has indicated that they are considering improvements to the intake, including installation of larger raw water mains and modifications to the intake structure. These improvements may benefit MVWA and its customers by lowering the reservoir level where hydraulic capacity limitations arise.

The Nine Mile Feeder Canal that diverts water from West Canada Creek to the Rome summit section has a reported capacity of up to 630 cfs, and an estimated average flow diversion of about 100 cfs. This water use can be a significant part of total reservoir releases, and can also impact the minimum flow regime for West Canada Creek, but is not directly measured by the Canal Corporation.

Table 6: Present use and allocation of water in the Hinckley Reservoir

Water Use	Reservoir Release/ Withdrawal (cubic feet per second - cfs)	Reservoir Elevation (feet above Canal Datum - ft)
Fishery		
	160 cfs minimum for West Canada Creek base flow (measured below Nine Mile Feeder diversion canal at Morgan Dam)	**1173.5 ft.** - release diminishes, may impact downstream fishery **1167 ft.** - releases end. Low water level impact to in-reservoir fishing, season dependent, boat launch access impacted at about 1213.5 ft.
Drinking Water Demand Scenarios (MVWA)[1]		
▪ Peak Day Demand with 3 cfs leak, with conservation	**40.2 cfs** (26.1 mgd)	**1192 ft.** - Min Elevation[2]
▪ Peak Day Demand with conservation	**37.1 cfs** (24.1 mgd)	**1185 ft.** - Min Elevation[2]
▪ Average Day Demand with 3 cfs leak, with conservation	**36.0 cfs** (23.4 mgd)	**1182 ft.** - Min Elevation[2]
	0 cfs	**1174.5 ft.** - No flow with lower plates closed
	29.4 cfs (19.1 mgd)	**1169 ft.** - Hydraulic stall begins with lower plates open
	0 cfs	**1167.5 ft.** - No flow with lower plates open
Canal Navigation		
▪ summit lockage	N/A[3]	**1173.5 ft.** - release diminishes, may impact Canal needs
▪ Nine Mile Feeder (diversion canal at Trenton)	**0-630 cfs**, 100 cfs "typical"	**1167.0 ft.** - releases end
▪ direct to Canal at Herkimer	Per 1920 Operating Diagram	
NYPA Hydropower Production		
	250-1800 cfs	**1195 ft.** - suspended production
Downstream Hydropower Production		
	200-1100 cfs per 1920 Operating Diagram, varies with reservoir level and season[4]	**1173.5 ft.** - release diminishes, impacts downstream hydropower **1167.0 ft.** - releases end

1. Reservoir release rates include about 2 mgd water used for treatment and raw water leak.
2. Minimum required elevation to hydraulically convey the release rate from Hinckley Reservoir to MVWA WTP in Prospect. New raw water main would reduce required level for these flows.
3. N/A means Not Applicable; this parameter (release rate or elevation) does not govern.
4. Discharges from Hinckley Reservoir to West Canada Creek determine how much water is available for hydropower production at downstream facilities.

Table 6 summarizes the answers to the first charge question, water levels needed at Hinckley Reservoir to service drinking water needs, fisheries, power generation and canal operations. These are present water needs. Mohawk Valley Water Authority has projected demand for the regional water systems for the year 2050 will be 66.2 cfs or 43 mgd and the elevations and release rates in this table would be affected. Several studies have been completed in the past to identify and address future regional water needs (Malcolm Pirnie, 1968; Herkimer-Oneida Counties, 1989; NYSWRPC 1989a; NYSWRPC, 1989b). These water resources management studies could be consulted for additional suggestions on future water supply development.

The information in this section also answers the second charge question: the capability of other canal reservoirs to help meet those needs. Tables 2 and 3 list other canal sources and their ability to aid in providing water to the canal system. The ability of other reservoirs (besides Hinckley and Delta) to provide water to the Rome summit section is somewhat limited. The other northern reservoirs can supply water to this section, but some are managed for power generation or no longer impound water. About half of the southern reservoirs (those in the western section) can supply some water to the Rome summit section, but they have infrastructure problems that restrict volume and flow. The southern reservoirs in the eastern section can not supply water to the Rome summit section, but can to the Erie Canal, downstream of Lock E-19.

Section 4: WATER USE AND MANAGEMENT DURING 2006-2007

Introduction

The Working Group was tasked to evaluate water usage and management during the 2006-2007 navigation season and compare it to historical data and modern day usage prior to 2006. The Working Group evaluated data from the Canal Corporation, NYPA, MVWA and other sources. In addition, meteorological data and precipitation records were evaluated to compare the conditions in 2006 and 2007 with those in previous years.

Weather Patterns

Precipitation data from eight stations surrounding the Hinckley watershed was evaluated by the Hydrology Committee (Annex I: Report of the Hydrology Committee). In general, both 2006 and 2007 exceeded long term precipitation averages. The eight stations evaluated recorded an average of 10.2 inches above normal precipitation for 2006 and 5.0 inches above normal precipitation for 2007. However, precipitation for the five months from May through September 2007 was well below average. Between May and September 2007,

precipitation was as much as 11.9 inches below normal at the Piseco precipitation gage. Combined, the eight stations recorded an average of 4.8 inches below normal precipitation for the five months.

On the State level, the Drought Management Task Force (DMTF) was convened at the beginning of October 2007 to assess statewide conditions related to drought. The DMTF continued to assess statewide conditions through November 2007. There was no declaration of a drought warning or watch for any of the State's drought regions; however, the task force did note through the assessment of its data significant precipitation deficits in several portions of the State, most notably, Herkimer, Oneida and Lewis Counties.

Figure 7: New York State Drought Regions

Drought Region IV, which covers the mid-Hudson Counties from Columbia to Washington, and Mohawk River Valley Counties from Oneida to Schenectady, did not collectively enter a drought status in 2007. Much of Drought Region IV did not experience drought, however the two western counties, Oneida and Herkimer, did experience significant precipitation deficits from May to October 2007 that contributed to the unusually low Hinckley Reservoir conditions.

An analysis of surface weather features for the period May through September 2007 showed a relatively high frequency of high pressure ridging in the eastern third of the United States. At times there were fairly weak cold fronts passing through the ridge, bringing areas of rain showers to the state. There were no large scale precipitation makers, i.e. stalled low pressure systems or hurricane activity to bring excessive amounts of rainfall to the state. Overall, the driest month for the Hinckley Watershed was May 2007. During this month, high pressure ridging extending from eastern Canada southward into the mid Atlantic states, was fairly common. This pattern generally results in below normal precipitation under the ridging.

In late fall of 2007, the precipitation pattern changed. According to NYSDEC meteorologists and the National Weather Service, the winter weather pattern of 2007 - 2008 for the Northeast, including New York State, has been under the influence of a moderate strength La Nina. A La Nina episode occurs when the ocean surface temperatures in the equatorial Pacific are colder than normal. This effect has a worldwide influence on weather patterns. For North America, there is a tendency for cold air to penetrate into the northern Great Plains

and the western United States. The southeastern US, on the other hand, becomes warmer and drier than normal (NOAA, 2008).

For the Northeast, including New York State, La Nina provides a higher tendency for surface storms to track into and through the Great Lakes, passing west of the state. This storm track brings warmer/milder air on the eastern side of storms into New York, resulting in more liquid precipitation occurring during winter storms than would normally be expected. This pattern also tends to push developing Atlantic coastal storms farther to the east, resulting in heavier precipitation for New England and lighter amounts for New York (NOAA, 2008).

The Hinckley Reservoir Watershed has benefited from the La Nina induced westward storm track by receiving moderate to heavy amounts of liquid precipitation in late 2007 and early 2008. The Lake Ontario lake effect snow machine has also brought heavy amounts of snowfall to the far northern and western sections of the watershed. As this accumulating snowpack melts during the spring, it will flow into the watershed.

Water Resource Conditions

Drinking Water

Drinking Water Treatment

The water quality in the Hinckley Reservoir during the years 2006 and 2007 presented some operational challenges to MVWA WTP staff although the WTP was designed to respond to shifts such as this in water quality. The spring rains of 2006 caused some spikes of turbidity but the plant was able to easily adjust to remove particulates. Color indicative of organic carbon was also elevated during 2006 and Total Organic Carbon (TOC) removal rates ranged from 62.5 - 70.0 %, well above the required removal levels of 35-45%.

The low water levels of August and September 2007 also did not pose treatment problems at the WTP. Alkalinity and pH levels of the reservoir were measured at higher than average levels as the reservoir level fell and possibly facilitated the chemical coagulation process. The water treatment plant continued to operate and produce water, meeting treatment standards throughout August, September and October of 2007.

Hinckley Reservoir levels recovered due to rains in October and November 2007. As a result, higher than normal turbidities (6 nephelemetric turbidity units [NTU]) were experienced and the TOC content of the raw water rose to a record high of 10 mg/l in November 2007. According to the Mohawk Valley Water Authority Director of Water Quality, typical raw water turbidities range from 0.8 to 3 NTU and TOC is between 2.8 and 6.5 mg/l. TOC removal rates averaged 60% during this time and again, the WTP produced water meeting all treatment standards.

Drinking Water Access and Conveyance

The high Hinckley Reservoir levels of 2006 posed no significant challenges to the operation of the intake or raw water transmission mains. Water withdrawals averaged 20.1 mgd

(31 cfs) from May 2006 through September 2006.

Water withdrawals averaged 21.7 mgd (31cfs) from May 2007 through September 2007. The historically low reservoir levels in 2007 caused concerns about the ability of MVWA to obtain a sufficient raw water supply. Prior to 2007, the lowest observed water level at Hinckley Reservoir since the opening of the water treatment plant in 1992, was 1190.42 feet on March 25, 1993. A level of 1188.60 feet was reached on September 26, 2007.

In response to concern with low reservoir levels, MVWA began work in September 2007 on source improvement initiatives to ensure continued delivery of raw water to the WTP. Several procedures and physical modifications were implemented to maintain raw water transmission into the WTP if necessary. These precautionary steps were commenced in early to mid-September with all construction work completed by mid-October.

- Divers confirmed conditions of the intake tower's lower plates, and cut seventeen (17) slots approximately 3 inches wide by 60 inches long in the two (2) lower plates. This action provided access to water down to an elevation of approximately 1167.5 feet from the previous low of 1174.5 feet although sufficient water cannot be conveyed at these elevations. This work was undertaken on September 25, 26 and October 1, 2007.
- WTP staff prepared for possible 24 hour operations.
- A 36 inch supplemental raw water pumping connection to the 48 inch raw water main into the treatment plant was designed and installed. Up to 12 mgd (19 cfs) could be pumped from the West Canada Creek adjacent to the WTP using portable pumps and generators. MVWA did not pursue permits for this connection, and noted that such use of the West Canada Creek would be subject to a number of approvals.
- Regional system tanks and reservoirs were filled to their practical maximums to maximize emergency storage.
- Water use restrictions were issued on September 26, 2007.

Fisheries

Water levels in Hinckley Reservoir were dropping rapidly by mid-August 2007, causing the fish to be concentrated in pools. Several residents living around the reservoir reported to the Utica NYSDEC fisheries staff that there was an increase in fishing pressure at a few sites that ceased as the water continued to drop. Two factors appeared to cause the stoppage. First, as the water level dropped it became increasingly more difficult for anglers to reach the water because extensive mud flats developed. Second, the remaining water had concentrated the numbers of prey fish for the game fish, making them less likely to strike a lure or other bait. Because of difficulties associated with launching and retrieving boats, coupled with the hazards encountered while running the boats, boat fishing stopped on Hinckley Reservoir by early September, according to Environmental Conservation Officers patrolling the area.

NYSDEC fish and wildlife staff biologists who live near the Hinckley Reservoir and West Canada Creek noted an increase in fish-eating birds in early September. Eagles and osprey were more frequently seen feeding on the exposed fish. After the flows were reduced to 120 cfs on September 26, 2007, mergansers (a fish-eating duck) appeared more frequently on West Canada Creek and were seen feeding on the fish trapped in the pools by the low water. Crows were also seen foraging on a daily basis in the areas of the stream that became de-watered.

Dried sunfish and bass nests at Hinckley Reservoir were observed on September 26, 2007, by the Region 6 NYSDEC fish biologist where the substrate consisted of a gravel/cobble mix. The sunfish/bass nests, which are normally utilized in June and July and are constructed in a few feet of water, were dried out by the drop in water elevation of 13 feet that occurred from June 1 to August 1, 2007. The loss of these nests and the fish they should have produced will be noticed for the next several years as poor fishing.

Field observations of West Canada Creek made by NYSDEC fisheries staff on October 1, 2007, at 13 locations between Trenton Falls and Kast Bridge, revealed the exposure of fall fish nests. The exposure of the fall fish nests in the West Canada Creek probably did not impact this species since the flow reductions in West Canada Creek occurred after the spawning period.

The most dramatic impact to aquatic life was first noted on September 26, 2007, when NYSDEC biologists found thousands of stranded and dehydrated snails that had died in Hinckley Reservoir. This has the potential to impact the Hinckley Reservoir ecosystem in two ways. First, since snails are grazers, there may be an increase in algae and other organisms that grow on solid substrates. Second, snails serve as prey species for fish, crayfish, birds, etc. (Jokinen, 1992); therefore, the food chain could be altered. No dead snails were found in West Canada Creek.

Based on comments from 1100 fishermen interviewed by NYSDEC fisheries staff conducting the 2007 West Canada Creek creel census, the summer and fall of 2006 was one of the best years for fishing on the West Canada Creek below Trenton Falls. The summer and fall of 2007 was one of the worst years for fishing in recent memory according to many of the same anglers. Anglers blamed the low flows for poor fishing in 2007 (NYSDEC, 2007).

Fisherman interviewed during the 2007 West Canada Creek creel survey reported the flow regime on the creek below Trenton Falls appeared normal for the first part of the summer. By late July, fishermen and and other recreational users of the creek were beginning to question the long periods of low flows compared to previous years. This phenomenon was more noticeable from Trenton Falls to Newport, a stretch of creek with few tributaries. The USGS stream flow gage at Kast Bridge recorded values below normal for this time frame.

NYSDEC records from 1992 documented water temperatures in West Canada Creek at Newport reached 83 ºF during the heat wave. There was a fish kill of hundreds of brown trout at that time from Newport to Herkimer. At Middleville, temperatures on July 31, 2007 were 82 ºF, based on a spot check by NYSDEC staff preparing for a training session. Cooler

Figure 8: West Canada Creek on October 1, 2007 above West Canada Creek School.
Flows at 120 cfs. Dark band at water's edge on gravel bar illustrates dewatered area.

weather arrived, resulting in a drop in stream temperatures of a few degrees. No fish kills were noticed by NYSDEC.

To monitor the temporary flow reduction to 120 cfs in the West Canada Creek below Trenton Falls, NYSDEC biologists began monitoring the stream temperatures on September 28, 2007, by taking grab samples at Trenton Falls and Middleville. The data showed the water temperatures were fluctuating four to nine degrees on a daily basis which was about twice the rate when flows were higher, according to NYSDEC field data.

If this lower flow had occurred in August with the water temperature at nearly 80 ºF, there would have been a fish kill from thermal shock and low oxygen levels to the trout population from Trenton Falls to the mouth at Herkimer. From mid-September to mid-October, water temperatures ranged from 55 to 68 ºF. Although the stream temperatures were lower in September compared to August, the fish were no longer acclimated to warmer temperatures. Brown trout acclimated to cooler water temperatures have a lethal temperature of 78 ºF (Carlander, 1969), not the mid-1980s as was experienced during the 1992 fish kill. It can be concluded that if the warm spell that took place October 3-6, 2007, with a daytime high of 84 ºF, and a nighttime low of 65 ºF (www.weatherpages.com, 2007) had lasted more than four days, a fish kill from thermal shock would likely have occurred.

Table 7: Water temperature of the West Canada Creek

Date	Time	Trenton Falls		Middleville	
		Temp. (ºF)	Daily Change	Temp (ºF)	Daily Change
September 28		63		67	
September 29	a.m.	55		59	
	p.m.	61	6	65	6
September 30	a.m.	54		55	
	p.m.	62	8	64	9
October 1	a.m.	64		63	
	p.m.	66	2	67	4

Date	Time	Trenton Falls		Middleville	
		Temp. (ºF)	Daily Change	Temp (ºF)	Daily Change
October 2	a.m.	63		68	
	p.m.	-		-	
October 3	a.m.	63		63	
	p.m.	-		68	5
October 4	a.m.	62		62	
October 4	p.m.	-		-	
October 5	a.m.	60		59	
October 5	p.m.	-		-	

Note: Water temperature of the West Canada Creek at Trenton Falls and Middleville during 120 cfs flows occurring from September 28 to October 5, 2007. Morning temperatures were taken between 7:30 and 8:30 a.m. Afternoon temperatures were taken between 4:00 and 5:00 p.m.

In addition to monitoring the stream temperatures, the NYSDEC measured the creek on October 1, 2007, at 13 locations to determine the amount of substrate that had been dewatered by the reduced flows. The dewatered zone was measured from the edge of the water to the noticeable line formed on the stream bottom by the dried algae, mud and other bottom-dwelling organisms that were stranded by the receding water. A reduction of 10.8% of wetted substrate was found. Based on the locations sampled, the average stream width of West Canada Creek below Trenton Falls was 177 feet with a range of 105 to 255 feet. Dewatered substrate averaged 19.2 feet with a range of 0 to 111 feet. The significance of this reduction is unknown at this time. Lower water elevations also trapped many fish in pools, stopping the normal movement of fish through the riffles in addition to making them more vulnerable to predators. An increase of predators was noted by NYSDEC staff monitoring the reduced flows.

Concern over the increased vulnerability of the fish resource prompted the NYSDEC to issue an emergency fishing order on October 5, 2007, closing the entire creek to fishing from Trenton Falls to Herkimer. The ban prohibited fishing from that date until December 1, 2007, in the catch and release special regulations area and until April 1, 2008, for the remainder of the stream below Trenton Falls. This was the first and only time in the history of fish management on the West Canada Creek that it has been closed to fishing.

Table 8: Dewatered substrate in West Canada Creek

Location	Stream Width	Dewatered Area		
		Right Bank	Left Bank	Total
Trenton Falls Bridge	105	11	11	22
Blue Bend (FFN)	240	111	9	120
Comstock Bridge	219	14	9	23

Location	Stream Width	Dewatered Area		
		Right Bank	Left Bank	Total
Trenton Falls Bridge	105	11	11	22
Yellow Gate (FFN)	189	0	12	12
Schermerhorn Bridge	156	12	27	39
Poland Bridge	165	18	5	23
Old State Road Bridge	129	4	5	9
Above West Canada School (FFN)	129	24	10	34
Above Middleville	237	0	14	14
KOA Middleville	189	22	30	52
Above Kast Bridge	165	17	27	44
Kast Bridge	123	0	16	16
Michel Bridge Herkimer	255	21	5	26

Note: Determination of dewatered substrate resulting from a flow reduction of 160 cfs to 120 cfs in West Canada Creek from Trenton Falls to Herkimer. Right and left bank measurements were taken looking downstream. All measurements are in feet. Areas where exposed fall fish nests were found are identified with the FFN notation.

Canal Operations

2006 Water Use and Management – Hinckley Reservoir

During the 2006 canal navigation season, the operation of Hinckley Reservoir was generally in accordance with the 1920 Operating Diagram. Rainfall in the spring was below average; however, a major precipitation event in the Mohawk Valley in late June resulted in considerable flooding on Hinckley Reservoir and throughout the Mohawk Valley. Hinckley Reservoir reached elevation 1229.85 ft on June 29, 2006, and the corresponding peak discharge from Hinckley Reservoir was measured at 15,700 cfs. The result of this event was the second highest observed Hinckley Reservoir elevation and discharge. The historic peak reservoir elevation occurred on October 2, 1945, when the reservoir reached elevation 1230.2 feet with a corresponding peak discharge of 17,100 cfs.

The 2006 event exceeded the flood of record in the Mohawk River between Lock E-12 (Tribes Hill) and Lock E-17 (Little Falls). At Locks E-14 (Canajoharie), E-15 (Fort Plain) and Lock E-17 (Little Falls), the flood waters exceeded the 500-year return frequency.

The Federal Emergency Management Agency (FEMA) made a federal disaster declaration, 1650-DR-NY, on July 1, 2006, for twelve counties in New York State from this event. FEMA-1650-DR-NY included Individual Assistance (assistance to individuals and households) declarations in Broome, Chenango, Delaware, Herkimer, Montgomery, Oneida, Orange, Otsego, Schoharie, Sullivan, Tioga and Ulster Counties while Public Assistance

(assistance to State and local governments and certain private nonprofit organizations for emergency work and the repair or replacement of disaster-damaged facilities) declarations were made in Broome, Chenango, Delaware, Herkimer, Montgomery, Otsego, Sullivan and Ulster Counties. More than $227 million was approved or obligated for assistance to families and individuals as well as public entities that suffered damage from the severe storms and flooding.

At its peak, a total of 275 miles of interstate highways, including portions of the New York State Thruway, were closed to traffic as a result of this event. The flooding also forced the closure of 45 of the canal system's 57 locks along 297 miles of the 524-mile waterway and the entire canal system was not open to navigation until August 19, 2006.

During the year, the Canal Corporation requested NYPA to make deviations above the 1920 Operating Diagram on three occasions. From April 19, 2006 through April 24, 2006, the rate of discharge from Hinckley Reservoir was increased from 900 cfs specified by the 1920 Operating Diagram to 1,400 cfs. This deviation was necessary to provide sufficient water to refill the downstream Mohawk River portion of the canal in order to open the canal system for the 2006 navigation season. Deviations above the operating diagram are made for this purpose during some years, but do not occur every year.

From July 9, 2006, through July 12, 2006, and from August 9, 2006, through August 19, 2006, the rate of discharge from Hinckley Reservoir was increased from the 700 cfs specified by the 1920 Operating Diagram to 1,400 cfs to provide sufficient water to refill the downstream Mohawk River portion of the canal to permit navigation. Water levels in this area were low immediately following the flooding due to measures taken to pass the high flows of the event and while repairs to canal infrastructure damaged during the June 2006 event were made.

In general, the 1920 Operating Diagram was followed for the remainder of the year.

2007 Water Use and Management – Hinckley Reservoir

During the 2007 canal navigation season, the operation of Hinckley Reservoir was generally in accordance with the 1920 Operating Diagram. Spring runoff was sufficient to fill the reservoir in 2007. The reservoir was full (elevation 1225 feet) as late as May 4, 2007. Beginning later in May and continuing until October, the reservoir was declining. This period of decline led to several weeks of new low levels for the time of year.

During this year, the Canal Corporation requested NYPA to make deviations above the 1920 Operating Diagram on two occasions. From June 27, 2007, through July 10, 2007, the rate of discharge from Hinckley Reservoir was increased from 440 cfs specified by the 1920 Operating Diagram, to 600 cfs to maintain navigation levels along the downstream Mohawk River portion of the canal. From August 3, 2007, through August 8, 2007, the rate of discharge from Hinckley Reservoir was increased from 400 cfs specified by the 1920 Operating Diagram, to 600 cfs in order to maintain navigation levels along the downstream Mohawk River portion of the canal. Data subsequently evaluated by the Working Group showed that the trigger recommended in the Communications Strategy (Annex III) would

have been invoked from June 6 through October 19, 2007. Reservoir inflows during this period were below 300 cfs and the reservoir elevation was below the 10th percentile of recorded historic elevations. During the second deviation, the reservoir elevation fell from 1208.01 to 1205.32.

On August 28, 2007, and again on September 10 and 12, 2007, NYPA contacted the Canal Corporation requesting permission to reduce release rates and stabilize water levels. The Canal Corporation replied to NYPA on August 28 and September 20, 2007, denying NYPA's request to reduce releases in order to maintain canal navigation. Between August 28 and September 24, the reservoir declined 9.59 feet from 1198.54 to 1188.95. No operational changes occurred pursuant to these communications. Initial 2007 communications on reservoir release reductions are provided in Appendix E.

On September 18, 2007, the Canal Corporation implemented water conservation measures including scheduled hourly lockings for recreational vessels between Locks E-7 (Niskayuna, Schenectady County) and E-20 (Marcy, Oneida County) on the Erie Canal.

On September 24, 2007, Hinckley Reservoir reached elevation 1,190 feet and the rate of discharge from Hinckley Reservoir was reduced from the 380 cfs specified by the 1920 Operating Diagram to 250 cfs at the direction of the Canal Corporation in order to conserve Hinckley Reservoir levels.

On September 25, 2007, the rate of discharge from Hinckley Reservoir was further reduced from 250 cfs to 200 cfs to further slow the reduction in Hinckley Reservoir levels based upon a call between the Canal Corporation and the State Emergency Management Office (SEMO).

On September 25, 2007, Oneida County staff requested that the Canal Corporation reduce the release of water from Hinckley Reservoir to 45 cfs and then to 25 cfs based upon their assessment of hydrologic conditions. This request was made by the Oneida County Health Department (OCHD) because available calculations, data and observations were inconsistent. Oneida County estimated that Hinckley Reservoir inflow was 65 cfs. This request was denied by the Canal Corporation based on an assessment of hydrologic conditions that estimated the reservoir inflow to be approximately 190 cfs based on a 10-day running average of inflow estimates made at that time using the residual method. Subsequent estimates of daily reservoir inflow rates by the Hinckley Reservoir Working Group's Hydrology Committee showed total reservoir inflow rates of approximately 123 cfs on September 23, 2007, and 101 cfs on September 24, 2007.

On September 26, 2007, Hinckley Reservoir reached elevation 1,188.6 feet and Oneida County Executive Anthony J. Picente, Jr. declared a water emergency in Oneida County. Following this declaration, SEMO and the state agency partners, including NYSDEC, NYSDOH, New York State Department of Agriculture and Markets (NYSDAM), and the Canal Corporation, further evaluated issues surrounding Hinckley Reservoir and the Oneida County water emergency declaration. This group requested Canal Corporation to further reduce the release rate from Hinckley Reservoir to 120 cfs as an interim measure to allow Hinckley Reservoir to stabilize while an assessment of Hinckley Reservoir inflow was done.

On October 17, 2007, the release of water from Hinckley Reservoir was increased from 120 cfs to 200 cfs pursuant to further joint discussions between SEMO, NYSDEC, NYSDOH, NYPA and the Canal Corporation since Hinckley Reservoir levels had increased to elevation 1,195 feet. This reservoir rise was a result of appreciable precipitation between October 7, 2007, and October 12, 2007.

On October 22, 2007, the release of water from Hinckley Reservoir reverted back to the release rates associated with the 1920 Operating Diagram. By this time, the Oneida County Water Emergency had expired and Hinckley Reservoir water levels had reached 1,199.6 feet. This latest reservoir rise was a result of appreciable precipitation on October 20, 2007.

Within the next week, the water levels in Hinckley Reservoir rose an additional 20 feet and the reservoir was nearly full. This reservoir rise was a result of a precipitation event that occurred on October 23, 2007, and October 24, 2007.

In general, the 1920 Operating Diagram was followed for the remainder of the year.

2006 Water Use and Management – Delta Reservoir

In 2006, Delta Reservoir was drawn down to elevation 545 feet from January 1, 2006, through mid-March. The normal winter drawdown for Delta Reservoir is between elevation 535 feet and 540 feet; however, based on unusually warm winter temperatures, the associated rainfall during the winter and the lack of snowpack in the watershed, Delta Reservoir was maintained at a higher level than normal during the winter.

On March 28, 2006, the gates at Delta Reservoir were set to the minimum opening of one gate open 11 inches. The resulting release from Delta Reservoir at this time was approximately 190 cfs. The minimum gate setting was maintained until June 28, 2006, when Delta Reservoir levels rose above the spillway crest following the June 2006 storm event and all the gates were closed. Standard Operating Practice is to close all gates when Delta Reservoir reaches the spillway crest elevation of 550 feet. Delta Reservoir levels remained above the spillway crest elevation of 550 feet until August 11, 2006. At this time, the gates were set at the minimum gate setting and remained at that level until October 1, 2006. The minimum Delta Reservoir level was observed on September 24, 2006, at elevation 548.05 feet.

On October 1, 2006, Delta Reservoir levels were at elevation 550 feet and in general, remained above the spillway crest elevation until December 1, 2006. For most of this period the gates were fully closed. On December 1, 2006, the gates were opened to release approximately 1,350 cfs to draw down Delta Reservoir to its winter level. Delta Reservoir receded to elevation 536.1 feet on December 22, 2006, and the level were maintained within the normal winter drawdown.

2007 Water Use and Management – Delta Reservoir

In 2007, Delta Reservoir was maintained at a target winter draw down elevation of approximately 537.5 feet from January 1, 2007, through mid-March based on an assessment of the snowpack in the watershed. As the spring melt began in mid-March, reservoir levels rose above the spillway crest of 550 feet by March 28, 2007, and remained above that level until May 4, 2007, when the reservoir reached the spillway crest elevation. On May 4, 2007, the gates at Delta Reservoir were set to the minimum gate setting of one gate open 11 inches. The resulting release from Delta Reservoir at this time was approximately 250 cfs. The minimum gate setting was maintained throughout the navigation season until September 27, 2007. The release rate reduced from 250 cfs in early May to approximately 180 cfs as the reservoir elevation dropped from a full reservoir level of 550 feet in early May to a low reservoir level of 537.85 feet on September 27, 2007. On September 27, 2007, the release was increased to 300 cfs to maintain navigable canal levels when the downstream release of water from Hinckley Reservoir was reduced to 120 cfs and the flow of water from the West Canada Creek into the Nine Mile Feeder was terminated.

The discharge from Delta Reservoir was reduced to approximately 250 cfs on September 28, 2007, and over the next five weeks, reservoir discharge varied between 200 and 300 cfs until November 8, 2007, when the release was increased to 510 cfs as the Delta Reservoir reached a spillway crest elevation of 550 feet. The following day the release was increased to approximately 1,000 cfs until November 24, 2007, when the release was reduced to approximately 230 cfs as the reservoir level dropped to elevation 544.2 feet. On November 30, 2007, the release was increased to approximately 1150 cfs to draw down Delta Reservoir to a winter drawdown target for December to 540 feet. Reservoir levels were maintained near this level for the remainder of the year.

2006/2007 Water Use and Management – Southern Reservoirs

Water stored in the canal's southern reservoirs was not diverted to the canal during 2006 and 2007 due to infrastructure and hydraulic capacity limitations of the feeder canals that convey this stored water to the Erie Canal. The water control gates at these reservoirs were set at their normal navigation season settings throughout each of the navigation seasons.

2006/2007 Water Use and Management - Northern Reservoirs

2006 Water Use and Management

North Lake Reservoir has a spillway crest elevation of 1823.5 feet. The reservoir was drawn down to a winter target levels of 1817 feet throughout the winter of 2005-2006. Spring runoff increased North Lake Reservoir levels to near the spillway crest in late April. North Lake Reservoir was maintained near this level throughout the navigation season until it was drawn down beginning in October to the winter target level where it was maintained for the remainder of 2006.

South Lake, Woodhull and Sand Lake Reservoirs were operated at their minimum gate setting throughout 2006. In general, the water levels at these reservoirs were near their reservoir spillway crest elevations throughout the year.

Alder Creek and Forestport Pond Reservoirs are not drawn down below their respective spillway elevations in order to maintain run-of-river flow in the Black River. Further, Alder Pond Reservoir cannot be drawn down while providing flow in the Forestport Feeder Canal.

The Forestport Feeder Canal was used to convey water from the Black River between April 14, 2006, and October 11, 2006. Water is conveyed into the Forestport Feeder Canal while maintaining Forestport Pond Reservoir at elevation 1126.5 feet to provide a minimum discharge of 83 cfs for reservoir inflow for the protection of aquatic resources in the Black River as required in the FERC License (FERC 4900-001). Flows in excess of the minimum Black River flows are conveyed into the Forestport Feeder Canal at the capacity of the feeder canal at standard gate settings or returned to the Black River through hydropower generation.

2007 Water Use and Management

North Lake Reservoir was drawn down to a winter target level of 1817 feet throughout the winter of 2006-2007. Spring runoff increased North Lake Reservoir levels to near the spillway crest in late April. North Lake Reservoir was operated at a minimum gate setting of one gate open two inches throughout the summer. The level of North Lake Reservoir continued to drop through the summer to elevation 1816 feet by mid-September with the gates at their minimum setting since mid-May. North Lake Reservoir water level rose to a full level in late October as a result of substantial rain events.

South Lake, Woodhull and Sand Lake Reservoirs were operated at their minimum gate setting throughout 2007. In general, the water levels at these reservoirs were near or just below their reservoir spillway crest elevations throughout the year.

The Forestport Feeder Canal was used to convey water from the Black River between May 11, 2007, and October 31, 2007. On September 14, 2007, the rate of discharge into the Forestport Feeder Canal was increased above the discharge associated with the standard gate settings up to the hydraulic capacity of the feeder without overtopping the feeder canal banks. This was done in coordination with Algonquin Power Systems, NY, the Canal Corporation and NYSDEC. The NYSDEC agreed to temporarily suspend the minimum downstream discharge from Forestport Pond Reservoir in order to maximize flow in the Forestport Feeder for canal purposes while drought conditions persisted. The increase in flow associated with this adjustment is unknown.

Hydropower Generation

Hydropower operations in 2006 were routine. Releases from Hinckley were based on Operating Diagram release levels and specific deviations above Operating Diagram flows requested by the Canal Corporation.

NYPA operation of the Jarvis Project was routine until September 6, 2007, when generation was suspended due to insufficient water level in the reservoir (elevation 1194.4 feet). Operating Diagram releases from Hinckley to West Canada Creek continued, using the outlet valve that bypasses the Jarvis turbines, until specific deviations below Operating Diagram

flows were requested by the Canal Corporation.

On September 21, NYPA requested guidance from FERC, indicating the reduced levels of Hinckley Reservoir may cause a conflict in certain license provision addressing minimum releases downstream. Jarvis returned to service on October 23, 2007.

Recreational Uses

Summer Recreation at Hinckley Reservoir

One of the most popular recreational areas on the Hinckley Reservoir is the NYSDEC Hinckley Day Use Area, which has facilities for picnicking and swimming. The use of this area was affected by low reservoir conditions in 2007. The number of registered users declined from 10,230 in 2006 to 9,183 in 2007 according to NYSDEC records. The swimming area was closed in mid-August due to low water levels.

Residents surrounding the reservoir reported that the NYPA launch ramp became unusable by early July, 2007. This resulted in a significant reduction in boating activity for the remainder of the summer and a complete stoppage of boating activity by early September. Since much of the fishing that occurs on Hinckley Reservoir is boat-based, this activity was also greatly curtailed.

The owners of Trails End Campground reported the low water levels in the reservoir "greatly impacted our business." They launched about 100 boats per weekend until the July Fourth weekend when the water levels made their ramp unusable. The reservoir elevation was about 1213.5 feet on July 4, 2007.

There were no formal estimates of bird or wildlife watching activities in the Hinckley Reservoir area. However, observations by NYSDEC staff and comments from the public suggested that the low water levels in the reservoir may have enhanced opportunities to view bald eagles and osprey. The low water levels concentrated fish into smaller areas. These birds were observed foraging in the Hinckley Reservoir area earlier than in previous years.

Summer Recreation at Delta Reservoir

The low water levels experienced in the summer of 2007 did not have a large impact on camping activities at either of the campgrounds located on Delta Reservoir. However, the low water levels did threaten the non-potable water system that feeds the State Park's restroom facilities. The lowest water level in 2007 (537.85 feet) was approximately 3 feet from jeopardizing the non-potable water intake for the Park. If this level had been reached, Delta Lake State Park most likely would have had to close.

In the summer of 2007, low water levels on the reservoir shortened the boating season for many of the residents and visitors. Residents were forced to remove their boats and docks to winter storage about a month earlier than normal. The dock at the boat launch in Delta Lake State Park was also removed about a month earlier than normal although boating was never officially closed on the reservoir.

The low water level at Delta Reservoir created a continually growing beach at Delta Lake State Park, reducing the size of the swim area as the water levels continued to decline throughout the summer. By the end of the swim season, the deep water lifeguard stations (which had to be relocated throughout the summer to account for the reduced swim area) were abutting the old Black River canal, limiting the park's ability to adjust for the reduced swim area and further impacting the recreational experience

Agriculture

Commercial farming in the West Canada Creek watershed is located almost entirely below the Hinckley Reservoir and is primarily animal-based agriculture. The use of Hinckley Reservoir or West Canada Creek as a water supply for agricultural use is infrequent, and there is no reported regular use of these water resources for irrigation. (Jackson, 2008)

During the late summer and fall of 2007, farms in the counties near the Hinckley Reservoir and West Canada Creek watershed experienced drought. There were no reports of any agricultural impacts due to low water levels in the Hinckley Reservoir or low flow rates in West Canada Creek. The reported impacts involved farm water sources such as ponds, small streams and wells that were unable to meet the needs of herd operations. In Herkimer County, tanker trucks hauled water necessary for dairy herds. SEMO trucks (5,500 gallon tankers) were used in Herkimer County from early September, 2007, to early November 2007, and provided water for a total of 28 farms. Two farm operations near Newport were reported to have pulled water directly from West Canada Creek for a short time to supplement failing farm sources, but this ended when the SEMO tankers became available.

2007 Water Conservation Emergency

The period of unusually dry weather that occurred over the West Canada Creek watershed beginning in May of 2007, created an extended period of below normal inflow into the Hinckley Reservoir. By late August 2007 staff from the MVWA and agencies involved in the operation and monitoring of the Hinckley Reservoir began to have concerns with declining reservoir levels.

In early September staff from the Oneida County Health Department (OCHD) began evaluating reservoir conditions related to the public drinking water source. On September 6, 2007 the New York Power Authority's (NYPA) Jarvis hydropower facility at the Hinckley Dam stopped production as a result of hydraulic limitations caused by low reservoir levels. Beginning on September 1, 2007, reservoir water levels reached historic lows for that time of year and were declining due to lack of precipitation and continued reservoir releases.

On September 26, 2007, with support of the OCHD, NYSDOH, SEMO and MVWA, Oneida County Executive Anthony J. Picente, Jr. declared a drinking water conservation emergency. The security of the water supply for the 130,000 customers of the MVWA was the primary reason that Oneida County declared a State of Emergency. With the emergency declaration, the public served by the MVWA was directed to initiate mandatory water conservation measures.

The County emergency declaration was made under Article IIB of New York State Executive Law, which provides authorization for local emergency declarations of duration up to five days. The County declaration with mandatory water conservation was extended on three separate occasions, including October 1, 2007, and October 5, 2007. An extension on October 11, 2007, kept water conservation measures in place, but eased these restrictions by making some water restrictions voluntary.

Several significant rain events occurred in October and November 2007 that enabled the reservoir to recover. The County emergency declaration was kept in place until October 16, 2007. At that time, drinking water users were permitted to resume normal water usage. By October 23, 2007, normal releases from the Hinckley Reservoir needed for downstream users were resumed and NYPA returned to producing power at the Hinckley Reservoir. By late October, the reservoir water elevations had returned to levels typically seen for that time of the year. Hinckley Reservoir levels exceeded the historic mean level on October 25, 2007.

Discussions between MVWA, NYPA and the Canal Corporation regarding declining water levels in the Hinckley Reservoir began as early as August, 2008. In mid-September, State and County response agencies became involved in evaluating reservoir conditions. Communications between the involved agencies were at times difficult, in part because the complex nature of canal system operations defies easy understanding, and in part because information needed by the agencies was not always readily available. The Hinckley Reservoir Working Group's Operations Committee has evaluated operations during 2006 - 2007, including the communications that occurred during the response of fall 2007. The Committee's findings are presented in Annex II, Report of the Operations Committee.

Summary – Water Use and Management During 2006 and 2007

Precipitation data obtained from meteorological stations surrounding the Hinckley Reservoir watershed indicated that annual precipitation exceeded long term averages in both 2006 and 2007. Intense precipitation in June 2006 led to serious flooding in the Mohawk Valley; however, precipitation deficits recorded at meteorological stations in the region for the five months from May to September 2007 averaged 4.8 inches below normal and reached as high as 11.9 inches below normal. The New York State Drought Management Task Force assessed precipitation statewide through November, 2007. Drought Region IV, which includes Oneida and Herkimer Counties, did not enter a drought status during 2007.

Flooding in the spring and summer of 2006 was a concern in the Mohawk Valley. The 2006 flood event exceeded the flood of record at some Mohawk River locations and exceeded the 500 year return frequency at other locations. Working Group members experienced the following impacts from the 2006 flooding event:

- Heavy rainfall caused spikes in turbidity within Hinckley Reservoir; however these spikes were within the capabilities of the MVWA WTP;

- Forty-five of the canal system's fifty seven locks were closed, and the entire canal system was not open to navigation until August 19, 2006; and
- Water stored in the canal's southern reservoirs was not diverted to the canal during 2006 or 2007 due to infrastructure and hydraulic capacity limitations of the feeder canals that convey this stored water to the Erie Canal.

In contrast to 2006, dry weather and low reservoir levels in 2007 led to the following conditions and impacts to users of the Hinckley Reservoir, Delta Reservoir and West Canada Creek.

- MVWA was able to meet treatment standards throughout August, September and October of 2007. Reservoir levels did not cause treatment problems;
- MVWA cut seventeen slots in the plates that covered the lower intakes on September 25, 26 and October 1, 2007;
- A 36 inch supplemental raw water pumping connection to the 48 inch raw water main was designed and installed by MVWA;
- NYSDEC wildlife biologists monitored stresses on the ecosystem resulting from reduced reservoir outflows;
- The Canal Corporation implemented water conservation measures and hourly lockings for recreational vessels;
- The Canal Corporation directed NYPA to reduce the release from Hinckley Reservoir from the 380 cfs specified in the 1920 Operating Diagram to 250 cfs on September 24 and to 200 cfs on September 25 to conserve Hinckley Reservoir levels;
- A water emergency was declared by Oneida County Executive Anthony J. Picente, Jr., on September 26, 2007;
- Hydropower operations were suspended on September 6 at NYPA's Jarvis facility due to insufficient levels in the Hinckley Reservoir;
- The NYPA boat launch ramp became unusable in early July 2007;
- Privately owned businesses surrounding Hinckley Reservoir reported operating losses due to the low reservoir levels;
- Information submitted to the Working Group by residents and business owners near Hinckley Reservoir indicated fishing activity in 2007 was also curtailed;
- The dock at the boat launch in Delta Lake State Park was removed about a month earlier than normal, although boating was never officially closed on the reservoir. The receding shoreline also impacted swimming;
- Releases were further reduced to 120 cfs on September 26 at the request of SEMO, NYSDEC, NYSDOH, NYPA and the Canal Corporation; and

- The Canal Corporation announced an early closure of the New York State Canal System on October 8, 2007.

Information in this section provides answers to the fourth charge question: a report of the water usage and meteorological data for 2006 and 2007 to better understand the factors that contribute to the low reservoir conditions in the fall of 2007. The Report of the Hydrology Committee in Annex I and the Report of the Operations Committee in Annex II provide additional information and analyses, supporting this section.

In both 2006 and 2007 precipitation amounts exceeded long term annual averages. However, in 2007, precipitation for the five months from May through September was well below average, with May being the driest of these months. The extended dry period contributed to unusually low reservoir conditions that set record low water levels for 40 contiguous days, from September 1 to October 10, 2007. In the late fall, the precipitation pattern changed, bringing moderate to heavy amounts of precipitation in late 2007 and early 2008.

In 2006, the Canal Corporation requested releases that deviated above the normal rates specified by the 1920 Operating Diagram three times:

- April 19 to April 24 900 cfs to 1400 cfs
- July 9 to July 12 700 cfs to 1400 cfs
- August 9 to August 19 700 cfs to 1400 cfs.

In 2007, the Canal Corporation requested releases that deviated above the Operating Diagram two times:

- June 27 to July 10 440 cfs to 600 cfs
- August 3 to August 8 400 cfs to 600 cfs

Subsequent analysis completed by the Working Group showed that the deviations in reservoir release rates above normal in 2007 occurred at a time when the Hinckley Reservoir elevation was below the 10th percentile historic elevation and calculated reservoir inflows were below 300 cfs. The trigger recommended in the Communications Strategy (Annex III) would have been invoked from June 6 through October 19, 2007.

In 2007, the Canal Corporation also requested releases that deviated below the Operating Diagram on:

- September 24 380 cfs to 250 cfs
- September 25 380 (250) to 200 cfs
- September 26 380 (200) to 120 cfs
- October 17 to October 22 400 (120) to 200 cfs

On October 22, water releases reverted back to the normal release rates specified by the Operating Diagram.

The deviations above the 1920 Operating Diagram in both years were requested because of navigation needs in the Canal System. In late August through mid-September 2007, discussions about reducing reservoir release rates because of low water levels in Hinckley took place. Canal Corporation implemented conservation measures in mid-September; releases below the Operating Diagram were not begun until September 24.

From May through September 2007, precipitation in the West Canada Creek watershed was very low, leading to low inflows and low water levels in the Hinckley Reservoir. Reducing releases from the reservoir earlier could have helped to mitigate or stabilize, but probably not eliminate, the unusually low levels experienced in late 2007.

Section 5: PUBLIC INVOLVEMENT

The Hinckley Working Group did not hold formal public meetings or hearings. However, all of the full Working Group meetings were held in open forum and were attended by elected officials, members of the public and the media. The meetings were held in Utica, New York where interested parties would have ready access to attend. This gave the public opportunities to follow the progress of the Working Group and to provide input. Each of the full working group meetings included time on the agenda for the public to make presentations, comments and suggestions.

At each meeting, members of the public took advantage of this opportunity to speak, and some provided written submittal of their comments. The Working Group's member agencies received several letters from the public and interested parties. A collection of affidavits, brochures and videos displaying recreational facilities and use near and on the Hinckley Reservoir was also provided to the working group by interested citizens (Pertz, 2008). These letters and affidavits were made available to all the member agencies for their consideration, and are included within the appendices of this report.

Issues raised by the public were varied, and ranged from specific suggestions regarding operation of the Barge Canal system to requests for economic and planning assessments. Issues and suggestions raised by the public generally included the following:

- Public desire to have potable water as first priority water use;
- Impact of reservoir operations on private water wells around the Hinckley Reservoir;

- Potential impacts to property owners along the Hinckley shoreline;
- Need for comprehensive watershed study and water management plan;
- Property values in West Canada Creek watershed;
- Economic development and planning for the Herkimer / Oneida County area;
- Importance of maintaining the West Canada Creek fisheries;
- Economic value of recreational use of the Hinckley and Delta Reservoirs;
- Impacts of water resource management on local recreational economy;
- Need for public information and input on water resource management;
- Need for adequate drinking water supply for residents and the economy; and
- Value of hydroelectric power to lessen reliance on oil and minimize greenhouse gases.

Issues raised by the public demonstrated interest in water resource management in the West Canada Creek and Mohawk River watersheds and that these issues are very important to the community. Some of the issues and suggestions raised by the public were considered and addressed to varying degrees by the Working Group's activities. Other issues and suggestions were outside of the Governor's charge to the Hinckley Reservoir Working Group and could not be addressed, but may warrant further consideration by long term community planning efforts.

Section 6: CONCLUSIONS and RECOMMENDATIONS of the WORKING GROUP

The Hinckley Reservoir Working Group has identified issues associated with the use and management of the Hinckley Reservoir for which improvements may be possible. Presented in this section are a series of findings and recommendations intended to address these issues. Some recommendations were considered by the Working Group, such as creating additional storage within the Hinckley Reservoir, that were not included in the final recommendations. The listed recommendations are not presented in a particular order and the Working Group did not intend that priority for the recommendations be inferred from the order of presentation.

Most of the findings and recommendations were developed in direct response to the Governor's charge to the Working Group. Many issues were raised during the Working Group's open meetings that are related to the water resources of the Hinckley Reservoir and West Canada Creek, but that did not fall under the Governor's charge. Generally, these non-charge issues involve the economic, environmental and recreational interests of local communities. These non-charge issues have not been addressed with specific findings and recommendations, however a recommendation was made for a planning and advisory body that could consider these issues.

The Working Group was not provided with authority to "assign" responsibility for implementing its recommendations to any agency or person, and most of the recommendations are not accompanied by designation of a responsible party. However, a few of the recommendations are sufficiently specific to infrastructure owned or managed by an identified agency that the Working Group has included that agency in the writeup for that recommendation.

To help develop, evaluate and characterize its recommendations, the Working Group adopted a definition for short term and long term recommendations. Recommendations presented herein can be categorized as follows:

"Short term" applies to issues, action items and recommendations of the Working Group that can be addressed or implemented immediately or in a matter of one to two years; and

"Long term" applies to issues, action items and recommendations that would take longer to address or implement, may involve additional and possibly extensive study, may involve resolution of long standing legal issues, or may require substantial infrastructure modification and/or capital improvements.

Many of the recommendations involve capital expenditures. The Working Group has attempted to provide relative costs associated with these recommendations, but for most no detailed estimates were completed and the costs presented should be used for comparative purposes only. Before implementing recommendations involving capital expenditures, further evaluation is needed to better identify the costs and benefits. Implementing agencies would

need to identify funding sources and evaluate constraints that may exist with, and authority for, use of those sources. Identification of outside funding sources may be appropriate or necessary for some of the listed recommendations.

The Working Group did not examine specific legal issues or constraints that may be associated with implementing the listed recommendations. Implementation of any of the recommendations included in this report must be legally permissible, in compliance with regulatory requirements and within the framework of contractual obligations. Recommendations 2, 3, 6, 7 and 10 have been identified as activities likely to have legal requirements or constraints associated with them.

Findings and Recommendation 1 - Communications

Findings:
During the response to low reservoir conditions in 2007, a large amount of information on reservoir conditions, infrastructure, operating procedures, critical water levels, flow rates, etc. was exchanged. Understanding all of this information within the time frame of a response action was difficult. Some of the difficulty was due to the complex nature of the canal system and reservoir operations. But some difficulty also resulted from a lack of readily available or consistent information. To help improve future communications and information sharing, the Working Group has identified the following issues related to communications:

Responding agencies did not always have immediate access to data - Operating data for the Hinckley Reservoir, West Canada Creek and other canal resources is maintained by the respective agencies responsible for the operation and management of the resource. Since there is no centralized data collection nor an established data sharing protocol, information must be collected, distributed, analyzed and conveyed to decision makers before an emergency condition can be established and action taken.

Responding agencies sometimes received incomplete and conflicting information - The responding agencies included organizations that are not involved in the daily management of the resource and may not have a complete understanding of the operational requirements and constraints that apply to the resource. The core agencies may not fully understand the operations and operational constraints of the other core agencies and may not have access to the same data. In some instances, up to date information on infrastructure needs and capacities did not exist. As examples: changes to drinking water intake hydraulics resulting from the construction of a new drinking water treatment plant had not previously been assessed to determine critical reservoir water levels needed to meet drinking water demand and the capacities of alternate canal sources and water diversion rates were not well understood. As a result, conflicting information may be conveyed, complicating the decision making process.

The public needs access to reservoir information - The Hinckley Reservoir and West Canada Creek are major recreational resources for the surrounding communities and local businesses that depend on it for their livelihood. Access to information such as current reservoir levels, average seasonal levels and reservoir release rates, would assist the public

in making decisions regarding their use of the resources.

Recommendations:
1a) The core agencies should consider adopting the communications strategy developed by the Hinckley Reservoir Working Group's Communications Committee and included as Annex III: Report of the Communications Committee. This strategy was developed to improve information sharing between the core agencies. Included within the strategy are suggestions that:

- Continuous, transparent assessment of reservoir conditions be incorporated as part of routine reservoir operations;
- Information consisting of daily conditions related to the Hinckley Reservoir be shared among agencies on a weekly basis;
- Communications be enhanced during periods of unusually low and declining reservoir levels; and
- Information be made available on a public website to help the public make decisions regarding their use of the Hinckley Reservoir and West Canada Creek.

1b) The core agencies involved in operating the Hinckley Reservoir should convene on a periodic basis to assess the effectiveness of their communications procedures and make revisions as appropriate. For the 2008 canal navigation season, these agencies should consider making an assessment midway through the season to ensure that communications procedures are in place and again at the end of the season to revise them, if needed, to ensure that they are effective.

1c) The core agencies should continue their efforts to develop and maintain up to date assessments of the conditions and hydraulic capacities of the infrastructure.

1d) The core agencies should perform an analysis of historical deviations from the 1920 Operating Diagram, from 2007 back at least to the time that the MVWA water treatment plant was constructed in 1992 (within the bounds of available data). The analysis should be considered by the core agencies in future refinements to the communications strategy, and should also be made available to future planning and advisory groups.

Discussion:

The communications strategy was developed for use by the core agencies and the Working Group recommends that it be piloted during the 2008 canal navigation season. To implement this strategy, the core agencies will need to make regular assessments of daily reservoir conditions and develop data sharing protocols.

Improved communications between the core agencies can and should occur for the 2008 canal navigation season. There are no capital planning or other costs associated with this effort, though some human resources will be needed to implement the strategy on a routine

basis. Integral to the communications strategy is the continual assessment of reservoir conditions and comparison to pre-defined trigger conditions that would invoke enhanced communications under the strategy. This trigger evaluation strategy is implementable immediately using information that is already being collected during normal reservoir operations.

Implementing the public information sharing component of the communications strategy will require development of a public internet site where information useful to the public can be posted and maintained. Involving members of the public or their representatives would be appropriate during the creation of this site. A public website could be readily created without significant capital expenditure, using existing personnel and computer resources, but the Working Group did not identify the most appropriate agency to implement this task.

Finding and Recommendation 2 - Drinking Water Conveyance

Finding:
The drinking water intake structure at the Hinckley Dam and the raw water mains that convey reservoir water from the intake structure to MVWA's Water Treatment Plant (WTP) are aged and have hydraulic limitations due to pipe sizes. During response activities in 2007, MVWA obtained commercial diving services to assess and modify the lower intake openings to improve water intake conditions. A hydraulic analysis completed by MVWA in 2008 shows that reservoir water levels required to meet drinking water needs vary by as much as 16 feet based on intake configuration and relatively small changes in the drinking water demand. Improvements to the intake structure and raw water mains could improve drinking water conveyance and reduce the critical reservoir levels at which drinking water supply may be affected.

Recommendations:
2a) MVWA should install new raw water main(s) to improve the conveyance of water from Hinckley Reservoir to the WTP.

2b) MVWA should make improvements to the intake structure at the Hinckley Dam so that the intake openings can be opened or closed as needed to maximize water quality and intake hydraulics.

Discussion:
Both of these recommendations will require significant capital planning and expenditures. MVWA has reported that they are already considering these improvements in their capital planning. A preliminary cost for installing new raw water mains has been estimated at roughly $8 to $10 million and MVWA reported that construction for the improved raw water mains may begin as early as 2010. No preliminary cost estimates or schedule projections are available for improvements to the intake structure itself.

Approval of designs for drinking water infrastructure improvements will need to be to be obtained, and there may be other substantive regulatory approvals needed, depending on the details of the improvements that are yet to be determined.

Finding and Recommendation 3 - Use of Other Canal Sources

Finding:

The Canal Corporation has jurisdiction over 22 state-owned reservoirs which can provide water to the eastern portion of the canal systems for navigation purposes. The Hinckley Reservoir is used extensively by the Canal Corporation to meet the needs of canal navigation for the eastern portion, especially the Rome summit section and east of Lock 18 at Herkimer. Other reservoirs can also provide water for these sections, and can help to alleviate the demand on the Hinckley Reservoir, which is the only one of the 22 reservoirs that is also used as a public drinking water supply.

Both the Delta and Hinckley Reservoirs were built for the express purpose of providing water to meet canal navigation needs. Originally, diversion of water from the Hinckley Reservoir to the summit section was intended for use when other water sources, especially the Delta Reservoir, became inadequate for the purpose (Landreth and Gibson, 1921). But under current operational practices, diversion from Hinckley to the summit section is a normal activity. The current practice of using Hinckley to augment the summit has several advantages: Hinckley Reservoir has larger capacity and higher watershed yield than Delta and is able to refill faster during precipitation events; minimizing releases from Delta will help to maintain water levels for the users of that resource; and frequent use of the Nine Mile Feeder Canal helps to maintain it's hydraulic capacity. However, during conditions of declining reservoir, reliance on Hinckley to augment the summit section may impact the users of that reservoir, including the drinking water supply for the greater Utica area.

Recommendation:
The Canal Corporation should consider using other sources, including Delta Reservoir, for water needed in the Rome summit section when Hinckley Reservoir water levels are below normal and declining.

Discussion:
The 22 reservoirs have varying capacities and most cannot, by themselves, serve as the principal water supply to the canal. Only the Hinckley and Delta Reservoirs have such capacity. For some of the smaller reservoirs, infrastructure problems exist that make drawing water from them difficult. The southern reservoirs, because of their relative low capacities, lengthy travel times and infrastructure problems, are seldom used to augment canal flows in the eastern section. The northern reservoirs (excluding Delta and Hinckley) can augment the summit section, but their capacities are limited, and issues can arise when diversion for canal purposes draws water needed to meet other needs. All of the reservoirs have recreation and/ or residential uses that can be impacted by diversion of water for canal purposes.

Regulatory, contractual, environmental and social issues can all have bearing on, and be impacted by, the use of the canal resources and must be considered each time that decisions are made regarding the use of these resources to augment the canal. The use of these resources is a balance of competing demands that the Canal Corporation must make with every decision regarding deployment of its water resources.

Finding and Recommendation 4 - Data Gaps

Finding:
Data gaps exist that affect the ability to make accurate assessments and forecasts of reservoir conditions, and to fully quantify the use of Hinckley Reservoir water resources. Some of these same data gaps (c, d and e below) limit the ability of the State Drought Management Task Force to assess the West Canada Creek watershed when it makes statewide and regional drought declarations.

Recommendations:

Recommendations to fill identified data gaps include:

4a) Completing a bathymetric survey of the reservoir to assess current size, shape and volume of the reservoir. This survey should be used to recalculate volumes contained by the reservoir for each foot of elevation above 1162.5 (canal datum), and the new volumes should be incorporated into the routine operational calculations of total reservoir inflow.

4b) Installing and operating a stream gage for the continuous measurement of water diverted from West Canada Creek into the Nine Mile Feeder Canal.

4c) Installing and operating a stream gage for the continuous measurement of flow from Black Creek into the Hinckley Reservoir to help to assess reservoir water balance and improve the ability to understand and forecast reservoir conditions and the impacts of daily reservoir releases. This stream gage should be installed and maintained in coordination with the USGS so that data can be incorporated into their existing network of over 7,000 stream gages throughout the United States.

4d) Installing two or more meteorological stations to measure precipitation within the West Canada Creek watershed above the Hinckley Dam to help to improve the ability to understand and forecast reservoir conditions and the impacts of daily reservoir releases. Restoring the meteorological station at Hoffmeister, NY, should be included so that the data from this station could be immediately comparable to the historical record available for that location. These meteorological stations should be installed and maintained in coordination with NOAA so that data can be incorporated into the national data base.

4e) Assessing the movement of groundwater as a component of reservoir mass balance to help to provide a fuller understanding of reservoir water balance and to potentially help to improve forecasting, especially during low reservoir conditions. Installing at least one long term monitoring well to develop and assess long term groundwater conditions near the reservoir should be considered.

Discussion:
The identified data gaps can be addressed over the short term, but for new data gathering stations, the full benefit of the data collection will not be available until a sufficient record has been created to allow evaluation of long term conditions. There will be costs associated with

closing these data gaps. In one instance, only initial costs associated with survey activities would be needed. In most instances, initial installation and annual operating costs would be involved.

A bathymetric survey of the reservoir to accurately determine its volume may cost as much as $500,000, depending on scope, and would be a one-time-only cost. Adding a new stream gage to monitor Black Creek was estimated to cost about $32,000 for the initial installation and $15,300 annually for operation. The costs to construct a stream gage on the Nine Mile Feeder Canal would be expected to be similar to the Black Creek gage. No costs were estimated for installing and operating meteorological stations in the West Canada Creek watershed, but each of these are expected to exceed the cost of the Black Creek stream gage. A quantitative assessment of groundwater would be a lengthy and expensive study; no estimates were obtained but a study of this magnitude could readily exceed $250,000.

The value and need to close each of these data gaps has been debated by the Working Group and divergent opinions remain. One stated concern is that the data items identified in this recommendation are not required to operate the reservoir under the 1920 Operating Diagram and the contracts and licenses that incorporate the Operating Diagram as the determinant of reservoir release rates. Another question raised is who would be responsible to implement activities needed to close the data gaps and whether funding could be identified and available.

Finding and Recommendation 5 - Working Group Data Archive

Finding:
The Hinckley Reservoir Working Group has compiled a great deal of information on the Hinckley Reservoir and other canal resources, including historical data, operational data, and the licenses, permits and contracts that govern the use of these resources. This information should be archived in a way that will make it readily available for future management and planning related to these resources.

Recommendation:
The New York State Department of Health, as Working Group chair, should identify and implement a means to archive the information compiled by the Working Group so that it will be available to help support future water resource management efforts.

Discussion:
This is a low cost activity that should be completed shortly after the Working Group final report is completed. The final report of the Working Group was prepared with companion files that contain much of this information. This report and attendant information will be written on compact disks and widely distributed after the final report is presented to the Governor's Office. In addition, the Department of Health will also explore means to get the collected information into the State archive system.

Finding and Recommendation 6 – Low Water Pumping

Finding:
The drinking water intake at the Hinckley Dam relies solely on gravity flow to get sufficient water to the water treatment plant. This is a low cost, energy efficient way to draw water for municipal use. However, at low reservoir water levels, the ability to draw sufficient water to meet drinking water demand can be impacted. Pumping directly from the reservoir can overcome this limitation and can provide access to water in the lowest part of the reservoir that may otherwise be unavailable.

Recommendation:
MVWA should consider installing a standby pumping system to pull drinking water directly from the reservoir during extremely low reservoir elevations.

Discussion:
Based on the evaluations completed by the Hydrology Committee, the occurrence of reservoir levels low enough to impact gravity driven inflows would be infrequent. No cost estimates have been prepared for this recommendation, but the capital expenses would be expected to be high for a permanent pumping station. Considering the likely high capital costs and infrequent occurrence of water levels that may require pumping, a permanent station may be cost prohibitive. However, developing the ability to utilize temporary pumping equipment may be worth exploring in sufficient detail to identify the capital costs and any regulatory issues associated with it.

Finding and Recommendation 7 - Canal Resource Infrastructure Limitations

Finding:
The Canal Corporation has jurisdiction over 22 state owned reservoirs which can provide water to the eastern portion of the canal systems for navigation purposes. For some of these reservoirs, infrastructure limitations and maintenance problems exist that make drawing water for canal use difficult.

Recommendation:
The Canal Corporation should consider assessing and upgrading infrastructure to assist other canal system reservoirs in augmenting flow to the Rome summit section. Assessment should include a long term study to identify capital improvements and funding mechanisms for modernizing canal capital facilities and related operational systems.

Discussion:
Infrastructure limitations of the canal's resources were not fully identified by the Hinckley Reservoir Working Group. These may vary from relatively minor equipment problems to silted diversion canals that were constructed decades ago. The costs of improvements to address these limitations have not been developed, but it is expected that costs will vary greatly. Some relatively minor problems may be correctable by Canal Corporation forces; others may require contracting and significant capital expenditure.

At this time, the engineering and economic feasibility of upgrading existing canal infrastructure to provide for increased use of other reservoirs is unknown. Before an infrastructure improvement program is undertaken, it would be appropriate to complete an inventory of the infrastructure limitations, develop options for improvements and assess the costs and benefits associated with potential corrective actions. For some infrastructure problems, the cost of improvements may be high for small gains in water transfer capabilities.

Finding and Recommendation 8 - Drought Region IV

Finding:
During 2007, West Canada Creek (WCC) watershed and Hinckley Reservoir experienced precipitation deficits that were distinctly different from the near normal precipitation experienced in other parts of the State, including the other counties that form Drought Region IV. Despite precipitation deficits that contributed to unusually low Hinckley Reservoir levels and activation of State and County response, the drought region as a whole did not enter drought status in 2007. This may be due in part to the lack of meteorological stations within the watershed to support drought evaluation and in part to including Oneida and Herkimer Counties in a drought region that stretches to the Hudson Valley and the Vermont and Massachusetts borders.

Recommendation:
The State Drought Management Task Force (DMTF) should consider creating a new drought region to place Oneida and Herkimer Counties, possibly with parts of Hamilton County, into a separate drought region.

Discussion:
The recommendation to consider revising the State drought regions is administrative in nature and could be implemented over the short term. Separating Oneida and Herkimer Counties, possibly with parts of Hamilton County, into a separate drought region would allow the Hinckley Reservoir and West Canada Creek, the region's major water resources, to be assessed independently from counties in the eastern Mohawk River Valley and mid-Hudson region. This may be appropriate in light of the very different weather patterns seen in 2007 in the West Canada Creek area when compared to the rest of Drought Region IV. Additionally, the WCC watershed is highly influenced by lake effect snow patterns, far more so than the other counties in Drought Region IV.

A formal declaration of drought status by the State Drought Management Task Force may help the core agencies that operate the reservoir with their deliberations for appropriate responses to low and declining reservoir conditions.

A possible drawback to creating a separate drought region is that this may encourage partitioning other areas of the State into smaller drought regions to address other regional concerns. As the number of drought regions increase, so does the need for monitoring locations and data to assess conditions within the regions. A precedent for smaller, separate

drought regions was set when Drought Region IIA was created to allow for assessment of the New York City water supply separately from the rest of Drought Region II.

Finding and Recommendation 9 - Planning and Advisory Group

Finding:
It became apparent through the public comments received, and through historical knowledge of the area, that people are also very concerned about the larger issues of the interplay among the various users of Hinckley Reservoir and the West Canada Creek. In addition to hydropower and water supply, recreational uses that significantly impact the cultural and economic well-being of the area have not been fully assessed or quantified, nor has there been an area-wide plan developed to ensure proper development.

Recommendation:
A working group or commission should be created that includes representatives of citizens, businesses and state and local government. Citizen and local business representatives could be appointed in some combination by the governor, state legislature and county executives for Herkimer and Oneida County. Funds should be obtained and the working group should hire a consultant well-versed in such issues. The consultant's charge would be to expand upon the findings of the Hinckley Reservoir Working Group by undertaking a study of the area to characterize economic, recreational and development issues associated with the water resources. Acknowledging the strictures of the FERC licenses and contracts already in place, the study should include input on how operation of the reservoir affects recreational users, as well as economic development, including property values. As part of that study, the public and involved agencies should be canvassed to determine what residents and users of the resources would like to see for the area, and when all information is obtained and documented, public forums should be held to obtain additional input. Plans and conclusions should be developed by the commission for consideration by the impacted communities. Results of that undertaking should be pursued as determined appropriate and for which funds are available.

Discussion:
It has been clear for many years that the West Canada Valley and Hinckley Reservoir receive heavy use, particularly in the summer, by residents and visitors alike. It is also becoming clear that no effort has been made to ensure that all interests in the resources are listened to and taken into account. As use increases, competition for the resources, and over-use will cause a decline in the value of the area. This could easily result in damages to the resources, which in turn could have permanent environmental impacts, and concomitantly, a loss of revenue for residents and businesses. Creation of a commission and development of a study would serve as the bases for long term planning for the area to ensure that such negative impacts do not occur.

Finding and Recommendation 10 – Additional Storage Upstream of Hinckley Reservoir

Finding:
During most years, West Canada Creek and the Hinckley Reservoir provide ample water to meet the needs of all users. During unusually dry periods, such as occurred from May through October 2007, operation of the reservoir to fully meet the needs of all users may become difficult. Additional water storage within the watershed above the Hinckley Reservoir could provide water during extended dry periods to help Hinckley meet the needs for all users.

Recommendation:
Consider the feasibility, effects, costs and potential benefits of constructing additional storage reservoirs on the West Canada Creek watershed, upstream of the Hinckley Reservoir, to create storage for augmenting inflow to the Hinckley Reservoir during extended low inflow conditions.

Discussion:
Previous studies (Malcolm Pirnie, 1968; Herkimer-Oneida Counties, 1989) looked at the possibility of such reservoirs. Re-evaluation of this option could be based on the earlier studies, updated for current environmental, economic and regulatory impacts. It is clear that major regulatory issues and environmental impacts would be created with implementation of this option, including the potential for impacts to private properties that comprise or abut locations considered for reservoir construction.

Section 7: DISSENTING OPINIONS

All of the Working Group's members provided valuable input to the group's deliberations and to preparation of the information in this report. Many comments were provided by member agencies during the development of the report and its annexes and most were addressed in full. Consensus among the member agencies was attained on nearly all of the technical evaluations and issues that the Working Group addressed. However, member agencies have expressed concern with some aspects of the Working Group's effort and have submitted dissenting opinions. These dissenting opinions are presented in this section verbatim. The dissenting opinions have not been evaluated by the Working Group and should not be construed as official findings, conclusions or recommendations of the Working Group.

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ANTHONY J. PICENTE, JR.
County Executive
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April 23, 2008

Nancy Kim
Interim Director, Center for Environmental Health
New York State Department of Health
547 River Street
Troy, NY 12180

Dear Dr. Kim:

On September 26, 2007, I issued a "State of Emergency Declaration" pursuant to Article IIB of State Executive Law to protect the water supply for residents of Oneida County. Then Governor, Elliot Spitzer, formed the Hinckley Reservoir Working Group on October 17, 2007 the day after my State of Emergency Declaration expired. I and my staff have participated in the 8 working group and numerous committee meetings that have taken place since that time. I am writing to express my disappointment in the final Report to the Governor by the Hinckley Reservoir Working Group that was submitted to you on April 30, 2008.

On December 10, 2007 during the second meeting of the Hinckley Reservoir Working Group, I clearly articulated the concerns of Oneida County. First and foremost, a secure and safe water supply for the 135,000 customers being served by the Mohawk Valley Water Authority must be assured. Second, the Hinckley Resource must be managed to assure that electrical power generation facilities can operate in an efficient manner. Third, an adequate supply of water is critical for assuring the community infrastructure to retain and attract businesses that are so important to the economic vitality of the region. Fourth, but certainly not the least import is the vitality of the recreational resources that include fishing, boating, canoing, swimming which are impacted by the Hinckley Resource. It is disappointing that the Working Group has not explicitly stated that the water supply to customers being served by the Mohawk Valley Water Authority does not have the greatest level of importance.

In addition, I raised a question during this meeting that I expected to be addressed by the conclusion of the Working Group's deliberations. I and the residents of Oneida County observed that the Barge Canal was filled to capacity and overflowing at the same time the Hinckley Reservoir was at its lowest levels when I made my State of Emergency Declaration. What were

the specific needs of the canal during the periods of over release? My question has never been addressed.

During the course of the working group and committee meetings, concerns raised by staff from the Oneida County Health Department were either not addressed or the appropriate answer has been relegated to an inconspicuous section of the report or an appendix. I provide the following bulleted listing of the concerns raised by my staff and how the issue was addressed by the Working Group:

- An accurate chronology of the events was prepared that included events preceding and during the Hinckley Crisis from August 28, 2007 through October 16, 2007. Expectations were that this chronology would be included in the section of the report entitled, "2007 Water Conservation Emergency". The chronology has been scattered throughout different sections of the report with key portions omitted. My staff raised this point during the eighth Working Group meeting on April 21, 2008. The decision was made during this meeting to include this chronology in the form of actual e-mail correspondence that will be relegated in an appendix to the report. The e-mails are only of a portion of the events that led to my Emergency Declaration, therefore an accurate chronology of events is lacking.

- Currently there is a written protocol for addressing deviations from a "rule curve" that is used as a tool to regulate the flows out of the Hinckley Reservoir. This "rule curve" was developed during the 1917-1921 time period and was written into legislation and contracts that pertain to the Canal Corporation's access to water and the generation of electrical power. The written protocol to deviate from this "rule curve", in the context of under releases, while never enacted into legislation, has been followed for decades and there has never been a situation where the water supply has been threatened – even during periods of drought. In 2007, the same procedures were followed as in previous years with requests for reduced flow deviations being made prior to our direct communications with the Canal Corporation in September 2007. These requests were denied by the Canal Corporation. This led directly to the water crisis and my Emergency Declaration. My staff has repeatedly attempted to have this "unofficial" yet routine protocol of reduced flow deviations from the rule cure adopted at the working group and committee level. Their effort has been ignored.

- I and my staff have attempted repeatedly to have included information comparing similar precipitation years and respective reservoir levels that the Oneida County Health Department produced in collaboration with the Mohawk Valley Water Authority. This information that includes a chart is instructive in that it illustrates how management decisions throughout the spring and summer season affect reservoir levels in the fall. The Governor's charge asked for a comparison of water usage and meteorological data between 2006 and 2007 to better understand the factors that contributed to low reservoir conditions in the fall of 2007. However, meteorological conditions between the two years were vastly different. Similar, but not identical meteorological conditions were experienced during the years 1999 and

- 2007. The year 1999 was a drier year than 2007 (45.1 inches of rain compared to 54.5 inches) and a drought was declared in 1999. Precipitation and reservoir were similar throughout the spring and early-summer. In late-June, however, [June 23rd in 1999, reservoir elevation 1217.5 ft; and June 25th in 2007, reservoir elevation 1217.1 ft] water management decisions were made that affected reservoir elevations for the remainder of each respective year. In 1999, the decision was made to reduce flows to approximately 25% below the rule curve (from 400 cfs to 300 cfs). These flows were reduced for the most part until October 1st. Reservoir levels never declined below 1205.3 feet and the water supply was never at risk. In 2007, however, in late-June and again in early August, release rates were increased approximately 50% above the "rule curve" flows (from 400 cfs to 600 cfs) which resulted in a release of more than 2 billion gallons of water. These decisions resulted in the reservoir dropping to a record low level for that time of year (1192.2 feet). This put the water supply at, risk and resulted in my Emergency Declaration on September 26, 2007. During the last working group meeting, it became clear to me that this comparison will not be included in the working group report.

- In collaboration with Herkimer County, my staff developed a table that summarized the value of property adjacent to the Hinckley Reservoir and West Canada Creek. My representative made the suggestion that a section be included in the working group report for this information. This information was relegated to Appendix D.

- Society has changed. The canal system is no longer used for commerce. Comments regarding the vintage of the laws pertaining to the water rights to the Hinckley Reservoir and their regulation have been raised by me, my staff, and others during the course of working group and committee meetings. Suggestions for amending these laws and regulations have been made repeatedly. Oneida County recognizes that water flow is "managed" by contracts that are nearly a century old. However, none of the points raised of discussion and suggestions on this "ancient legislation" has been included in a prominent location in the final report.

The Mohawk Valley Region in Oneida and Herkimer Counties depends upon a secure and stable supply of fresh, clean water for its residents and industrial base. It must be recognized that the Environmental Protection Agency (USEPA) rules for water quality are continually changing making compliance much more difficult for smaller communities served by their own water systems. In the next few years, compliance with these new federal regulations may be fiscally impossible for some water systems. While the decision to connect with the Mohawk Valley Water Authority would rest with the local municipality, it would be in the best interests for many residents for the Water Authority to expand into these areas to provide high-quality drinking water. Currently, there are several projects that are in a state of uncertainty due to concerns over Hinckley Reservoir and the waters available to the MVWA. Several of these projects have been

developed to serve residential populations that are currently living with poor quality and quantity and in some situations contaminated and unsafe drinking water. The projects would eliminate these significant health concerns for several communities in Oneida County.

Indeed, the economic vitality and stability of the region is dependent on the expansion of the Mohawk Valley Water Authority. The proposed microchip plant in Marcy will require an additional 6 million gallons of water per day. This usage coupled with even moderate residential expansion will maximize the capabilities of the current water treatment plant to supply water to the region. However, it requires an assurance that water will be available from the Hinckley Reservoir.

I am cognizant and appreciative of the effort contributed by the Chair of the Hinckley Working Group, Dr. Nancy Kim, and her staff in the preparation of this report. However, if this report is read by an individual who is not familiar with Hinckley Crisis of 2007, the reader would not have a clear understanding of what transpired. This report clearly articulates that there was a near water shortage and that it was corrected. The report falls short in that it does not explain how and why the near water shortage occurred. A reader of this report will not be able to determine if the events that transpired in 2007 that led to the Hinckley Crisis would be preventable in the future.

In conclusion, even with the shortcomings outlined above, Oneida County is supportive of the final report and recommendations developed by the Hinckley Reservoir Working Group. I support some recommendations more than others. For example, Recommendation 10 to continue to study the upstream water storage capacity of the Hinckley Resource was included largely to appease the Canal Corporation and has little bearing on the modern day usage of the canal system and other users of the Hinckley Resource. However, I fully support the recommendation to create a Hinckley Commission. This appears to be the only remaining avenue available to amend archaic legislation that affects the water resource that is so important the health and safety of residents and to the economic vitality of the region.

Sincerely,

Anthony J. Picente Jr.
Oneida County Executive

Cc: Hinckley Reservoir Working Group

TO: Dr. Nancy Kim – Working Group Chair
Craig Jackson – NYS Department of Health

FROM: Patrick J. Becher – MVWA

DATE: April 28, 2008

RE: Working Group Final Report

The Mohawk Valley Water Authority respectfully requests that the following information be included in the report and identified as a separate section.

MVWA Dissenting Opinions

1. 2007 Canal Withdrawals from Hinckley Reservoir

It is the opinion of the MVWA that the report as written falls short of fulfilling the Governor's charge "to better understand the factors that contributed to low reservoir conditions in the fall of 2007." We believe the abnormally high drawdown of Hinckley Reservoir for Canal use during the summer of 2007 has not been adequately explained. The communities of the Mohawk Valley region need a clearer understanding of the specific reasons why so much water was needed and whether or not we should expect that in the future. Responsible planning and water management decisions cannot be made confidently without this information.

The sheer magnitude of the departure from past practices requires a detailed analysis in order to fully understand the implications for all users moving forward. There were multiple periods during the summer months in which releases exceeded the Operating Diagram by as much as fifty percent. According to daily release records, the total over-releases drew the reservoir down by an extra 2.85 billion gallons, or roughly seven feet in elevation.

Repeated requests beginning at the end of August to reduce the releases below the Operating Diagram were likewise denied. These requests and Canals' denials of allowing reduced releases were a direct contributing factor to the water emergency, yet this information is buried on page 49 and in Appendix E (correspondence) of the Working Group report.

It was suggested that the Canal Corporation had been having difficulty maintaining the proper navigation depth due to dry weather conditions. However, it was widely noted that the water level was exceedingly high. There is documentation that the canal was overflowing spillways east of the Rome summit pool. This has not been questioned or explained, and the amount of water lost to spillage has not been quantified.

The Nine Mile feeder channel was also observed overflowing its banks for several weeks. As noted in the local newspaper, residents at adjacent properties could not recall ever seeing the feeder that full. The flow on the Nine Mile feeder was estimated to exceed 160 cfs for at least several weeks in late summer. In contrast, diversions at Morgan Dam into the feeder have averaged only 30-40 cfs during navigation season most of the past decade.

The only explanation offered thus far by the Canal Corporation is that the water was needed for "navigation purposes." There has been no detailed justification based on the amount of boat

traffic or number of lockings. In fact, the Canal Corporation eliminated locking fees in 2006 in an effort to encourage more recreational boating.

2. Relevance and Importance of Deviations from the Operating Diagram

The MVWA believes the existing practice of deviations during periods of reduced inflows should be thoroughly reviewed and refined, and continued when deemed appropriate and agreeable to all parties. We believe that deviating from the Operating Diagram when warranted remains the single most effective way to protect water availability for all purposes. Therefore, it warrants inclusion as a separate recommended practice, rather than as a component of the communications protocol. Without a more thorough consideration of this point, the report offers the communities of the Mohawk Valley region very little insight or assurance regarding what specific steps can be quickly undertaken should their drinking water supply be threatened again in the near future.

Based on 2007 data, adherence to the Operating Diagram during the summer months coupled with reductions in late summer (if necessary), would have maintained the reservoir within normal ranges. In late June and early August, over-releases were conducted while the reservoir was nearing historic lows for those times of the year. Consequently, reductions were requested by NYPA on August 28 and were denied by the Canal Corporation. The denial for reductions in outflows was the major contributing factor as the reservoir level declined nearly ten feet during the month of September. Based on information obtained as a result of litigation, this was the first time a request to reduce the outflows during dry weather was ever denied.

The MVWA, the Oneida County Executive, and the Oneida County Health Department have attempted to highlight the procedures used over many years that reduce the recommended release rate during dry periods. For example, in 1999, the rainfall total from June through October was similar to 2007. However, the reservoir outflows were reduced from 400 cfs to 300 cfs in late June of 1999, and remained at that level most of the summer. The outflow was further reduced in September. The resulting lowest recorded water level during that season was elevation 1205’ - seventeen feet higher than what was experienced in 2007.

Minor and temporary reductions in release rates are the most effective approach to maintaining a reservoir level adequate for water supply, power production, and ample uninterrupted flows for downstream habitat. It requires no expenditures to implement. Accordingly, the MVWA is greatly concerned over the views expressed by some agencies within the Working Group that this resource management practice does not warrant careful study or consideration.

3. Additional Water Storage within the Hinckley Watershed

The MVWA believes that the two recommendations to study additional water storage are beyond the scope of the Working Group and should be removed from the report. A consensus had seemingly emerged supporting a DEC suggestion to eliminate both recommendations based on their costs and complexities. However, the second proposal was reinstated at the insistence of the Canal Corporation only.

Both proposals were deemed to have significant environmental impacts, complicated permitting processes, and would require extensive studies to determine their feasibility and operational

implications. It should be further noted that upstream storage has never been used, and that adequate reservoir levels have been maintained during dry years (1995 and 1999 most recently) without additional water storage by simply managing the releases more carefully.

The first proposal was to study the installation of flash boards to marginally increase the height of Hinckley Dam. It was estimated by a member of the Health Department that a one-foot increase in height would store an additional 0.9 billion gallons. This proposal could create federal licensing issues associated with the Jarvis power production plant.

The second recommendation was to study the feasibility of creating a separate water storage facility elsewhere in the watershed upstream from Hinckley Reservoir. This proposal would have exorbitant capital construction costs without necessarily providing any clearly quantified or consistent benefits. The 1921 Agreement that adopted the use of the Operating Diagram placed severe restrictions on the ability of Utica Gas & Electric to store water upstream of Hinckley Reservoir, and they could not store water at all during the summer months. The reasons for these restrictions must be thoroughly understood before any determinations can be made to hold back water that would naturally flow to the reservoir.

The reasons cited to eliminate the flash board proposal apply equally to both recommendations. More importantly, we view the second water storage proposal as even less worthy of consideration because other canal storage reservoirs already exist further north that are used on a minimal basis only. Moreover, the Canal Corporation abandoned and drained two of its northern reservoirs in 2006. By eliminating the Twin Lakes and Chub Pond Reservoirs, the Canal Corporation now has fewer alternative water sources and is likely more dependent on Hinckley Reservoir than was originally intended. Infrastructure improvements should be made to better utilize the remaining northern reservoirs before any consideration is given to creating new impoundments.

NEW YORK STATE CANAL CORPORATION
Memorandum

TO: Dr. Nancy Kim
New York State Department of Health

DATE: April 28, 2008

FROM: New York State Canal Corporation

SUBJECT: Hinckley Reservoir Working Group
Dissenting Opinion

The Canal Corporation and Thruway Authority (The Corporation) would like to commend all of the members of the Hinckley Reservoir Working Group for their diligent efforts to bring this important project to fruition. The Corporation would especially like to recognize the staff from the Department of Health, led by Dr. Kim, for their leadership and countless hours of coordination and editing.

The importance of the work accomplished by the Working Group cannot be overstated. Hinckley Reservoir is a resource used by many different entities for many different purposes. Perhaps the most important accomplishment of the Working Group was to bring these entities together for discussion about their individual uses and constraints. It was integral, not only to the Report, but for moving into the future, that everyone understand the view points of all members of the Working Group. The Corporation believes, as a result of this effort, a strong partnership has been developed among the parties that will help us address any challenges in the future. The Corporation recognizes the importance of the other competing interests for the water supply provided by Hinckley Reservoir, especially drinking water, however, the Corporation's legal obligation is the water supply for the Canal System.

It was evident that the members of the Working Group could not come away with all of the issues resolved to their sole benefit. With this understanding, the Corporation approached the project with the objective of a compromise solution that would be best for all involved. As a result, the Corporation supports the Working Group's Findings and Recommendations. It was never the Corporation's intention to assemble a dissenting opinion; however, since other parties have chosen to do so, it was imperative that the Corporation document certain concerns.

The Report does not include the Corporation's analysis of how Hinckley Reservoir could be operated in the absence of compensating flows as a result of MVWA's demolition of the Gray Reservoir Dam upstream of Hinckley Reservoir. The absence of Gray Dam will not endanger the drinking water supply at current withdrawal rates, but will continue to have a detrimental impact on reservoir levels, canal navigation, hydropower generation and fisheries in the time of drought. The Operating Diagram created in 1920 has withstood the test of time, including the drought of record, which occurred in 1964 (although Gray Reservoir was in operation during

1964). It is through the use of this 1920 Operating Diagram and its associated legal and contractual constraints that the Corporation and its predecessors have operated the reservoir for the benefit of all users, and must continue doing so. Improved communications recommended by the Working Group will be very helpful in that regard.

The Corporation fully supports the following Findings and Recommendations:

1. Communications
4. Data Gaps
5. Working Group Data Archive
8. Drought Region IV
9. Planning and Advisory Group

The Corporation supports the following Findings and Recommendations; however, the legal foundation from which MVWA is permitted to withdraw Hinckley Reservoir water is not adequately addressed:

2. Drinking Water Conveyance
6. Low Water Pumping
10. Upstream Storage

Hinckley Reservoir was built in 1915 to provide sufficient water to this highest point of the eastern section of the new Barge Canal and the Corporation is required by law to use it for that purpose. MVWA and the Corporation inherited the obligations contained in the 1917 agreement which settled litigation over rights to the water for the city of Utica and other users. Under that agreement MVWA, has a right to pass water through the reservoir, but its right is contingent on it maintaining sufficient water storage reservoirs upstream of Hinckley reservoir to make up for any adverse impact on Hinckley Reservoir water levels. The agreement is not ambiguous concerning this obligation, and in fact states that without this upstream storage, MVWA has no right to draw Hinckley Reservoir water. Furthermore, MVWA's FERC license and water supply permit require compliance with the 1917 Agreement.

In 2002, MVWA dismantled its only upstream reservoir, Gray, and now expects to use the State reservoir for its sole water supply, and also wants to increase the amount of water it can take to the detriment of other purposes (e.g. canal navigation, hydropower generation, and fisheries). The legal and contractual ramifications of this course of action are the subject of pending litigation.

The absence of any upstream compensating reservoir means the impact on Hinckley Reservoir water levels during either drought or flood will be exaggerated. The back-to-back 2006 flood and 2007 drought experienced in the Mohawk Valley coincidentally, represented the extremes in weather conditions experienced at the location since the drought of record, in 1964.

The Report does not fully consider the hydrology of the reservoir. Among the facts not fully explained in the final Report are:

- MVWA has the lowest intakes from the Hinckley Dam, which means that they may still draw water when others cannot. Historically, there has been sufficient water for MVWA's current level of use. At current demand, the Canal System, hydropower companies, and fisheries will be jeopardized before MVWA's customers are affected;

- When the Corporation reduced its withdrawals at the request of the State Emergency Management Office (SEMO) and the Oneida County Department of Health, the discharges from Hinckley Reservoir fell below those required by the 1920 Operating Diagram, and this has resulted in the State and the Corporation being served with a Notice of Intention to File a Claim to pay damages to the downstream hydropower generators for loss of revenues;

- The 1921 Agreement with the hydropower companies also resulted from the settlement of litigation over the water rights, and required that the discharges from Hinckley Reservoir be maintained at the rates set forth in the 1920 Operating Diagram.

While the Report recommendations task the MVWA with correcting some of these issues, the Report does not necessarily recognize the implications surrounding the remedies. The legal, regulatory and contractual issues involved in the low level pumping and drinking water conveyance recommendations are very significant. The Report does not directly consider the key questions of (1) how much water can be provided in the absence of an upstream compensating reservoir, and (2) should the State subsidize a single local water authority, MVWA, that dismantled its own reservoir above Hinckley Reservoir and now wants to take more water to expand its service area.

The Working Group did not address the legal basis from which MVWA is permitted to withdraw Hinckley Reservoir water for MVWA customers, as well as the impacts on Hinckley Reservoir levels from MVWA withdrawals on the rights of other users of that resource. The 1917 Agreement, between the State and (now) the Canal Corporation and the predecessor to MVWA forms the sole basis for MVWA to take water from Hinckley Reservoir. The permission to withdraw water, however, came with obligations to which it agreed. One was that it construct and maintain "a compensating storage reservoir" or reservoirs, the first being at Gray, NY, on the Black Creek, a tributary of the West Canada Creek above Hinckley Reservoir. Issues surrounding the 1917 Agreement are presently being litigated, but there are explicit provisions in the Agreement that establish its intent and are essential for understanding Hinckley Reservoir operations. The 1917 Agreement states:

> "*The [Water Company] covenants and agrees that it and its successors, grantees and assigns will at all times maintain, or cause to be maintained, a storage reservoir or reservoirs above the State dam at Hinckley, on West Canada Creek or its tributaries; fill the same from time to time from the flood, freshet or excess of the flow of water in said creek or its tributaries over and above the amount of water sufficient to comply with the contracts hereinafter mentioned, and from said reservoir or reservoirs, discharge into, contribute and supply to the natural flow of West Canada Creek, above the aforesaid State dam from time to time, quantities of water sufficient to comply fully with such of the*

provisions of the several contracts of the [Water Company] with the [Hydropower Companies]."

MVWA becomes obligated to release water from its upstream compensating reservoir(s) when the flow into Hinckley Reservoir is below 335 cfs. When this low-flow point is reached, the MVWA is required to replace all the water it takes from Hinckley in order to ensure that its withdrawals will not impact the water in the reservoir needed for other users. Without Gray Reservoir, MVWA is unable to meet its contractual obligations and is prohibited from taking water from Hinckley Reservoir. The 1917 Agreement states:

> *"...And it is further understood and agreed that in the event of the failure of the [Water Company], its successors, grantees or assigns to provide and operate or cause to be provided and operated the storage reservoir or reservoirs as and in the manner in this paragraph provided, it shall have no right or authority or be permitted to take or draw water from the said State reservoir or said creek above Trenton Falls while such failure continues ..."*

During the 122 days between June 1, 2007 and September 30, 2007, the calculated Hinckley Reservoir inflow was less than the required 335 cfs for 101 days, or 83 percent of the time. Following its demolition of the Gray Reservoir Dam in 2002, MWVA cannot provide the required low-flow compensation as its agreement required. The consequence of this was dramatically lower Hinckley Reservoir levels throughout the summer of 2007. MVWA's consultant, Barton and Loguidice indicated in documents supporting their Safe Yield Analysis for Hinckley Reservoir in 2004 that MVWA's failure to maintain compensating reservoir(s) and the requisite low-flow compensation "demonstrates how detrimental MVWA taking is to reservoir level".

The Corporation seeks to clarify the following Finding and Recommendation:

3. Use of Other Canal Sources

The Report does not fully explain that most of the Canal System's 20 other reservoirs are not a realistic supply-alternative to Hinckley and Delta Reservoirs because they are small, remote, and mechanically unusable and/or present their own environmental or contractual limitations. This means that the water contained in them could be very difficult to bring to the needed location at the summit-level of the canal in a timely manner. The local communities at those locations, not consulted for this Report, may very well oppose these drawdowns.

In addition, even those reservoirs which can provide some water could never supply the volume of water that would be needed during drought periods. The only other reservoir that offers any significant relief to help alleviate problems during a drought is Delta Reservoir. In each navigation season, including 2007, Delta Reservoir has been used extensively. The finding on page 63 makes it appear as if the Corporation does not use Delta, but rather exclusively relies on Hinckley. The recommendation on this same page suggests that the Corporation "should consider using … Delta Reservoir for water needed in the Rome Summit section when the Hinckley Reservoir water levels are below normal or declining." This is already standard operating procedure, yet it may lead a reader to believe this option has not been used in the past, or worse, that the Corporation had not considered or utilized this resource.

The Corporation would like to comment on the funding issues surrounding the following Finding and Recommendation:

7. Canal Resource Infrastructure Limitations

In general, the Report makes a number of costly recommendations, but does not say how they will be funded. The Corporation's Capital Program is primarily funded using toll revenues from the Thruway Authority. The use of toll revenue to support the Canal System was recently a subject of public debate over the increase in tolls. The Corporation is concerned that Thruway toll payers will now be called upon not only to fund the Canal System, but also to subsidize infrastructure costs of a single local water authority.

The Report suggests that the Corporation should assess and upgrade its infrastructure in Recommendation 7. The recommendation goes on to say that the "long term study should identify capital improvements and funding mechanism for modernizing canal capital facilities and related operational systems." However, the Corporation notes that no funding source for this recommendation is specified in the Report. Furthermore, many of the possible infrastructure improvements may have little or no benefit to the users of Hinckley Reservoir.

Much more work remains to be done. The Corporation is committed to working with all parties in a collaborative fashion.

Section 8: APPENDICES

Documents can be accessed by clicking on the links.

Appendix A: Statutory Considerations

Canal Law and Regulations

- New York State Canal Law §10 - General powers and duties of the corporation relating to canals (Appendix A_CAL Article 2 SS10.pdf) (PDF, 34 KB, 2 pg.)
- New York State Canal Law §80 - Supplying deficiencies of water (Appendix A_CAL Article 2 SS80.pdf) (PDF, 16 KB, 1 pg.)
- Constitution of the State of New York, Article 15 – Canals (Appendix A_Article XV NYS Constitution.pdf) (PDF, 226 KB, 1 pg.)

Environmental Conservation Law and Regulations

- Environmental Conservation Law (ECL) §15-0105 - Declaration of policy. (Appendix A_ECL Article 15 SS 0105.pdf) (PDF, 24 KB, 1 pg)
- ECL §15-1501 - New or additional sources of water supply; permit. (Appendix A_ECL Article 15 SS 1501.pdf) (PDF, 22 KB, 1 pg.)
- ECL §15-0503 - Permits (Appendix A_ECL Article 15 SS 0503.pdf) (PDF, 35 KB, 2 pg.)
- ECL §15-0103 - Legislative Findings (Appendix A_ECL Article 15 SS 0103.pdf) (PDF, 35 KB, 2 pg.)
- ECL §15-1701 - Water Power (Appendix A_ECL Article 15 SS 1701.pdf) (PDF, 16 KB, 1 pg.
- 6 NYCRR Part 10.3 (b) (22) (d) - Additional special fishing regulations for certain inland waters (Appendix A_6NYCRR Part 10.pdf) (PDF, 901 KB, 82 pg.)
- 6 NYCRR Part 601 - Water Supply Applications (Exclusive Of Long Island Wells) (Appendix A_6NYCRR Part 601.pdf) (PDF, 104 KB, 10 pg.)

Public Health Law and Regulations

- Public Health Law §1125 - Water Supply Emergency Plans (Appendix A_PHL 1125.pdf) (PDF, 28 KB, 2pg.)
- 10 NYCRR Subpart 5-1 - drinking water supplies (Appendix A_10 NYCRR Subpart 5-1.pdf) (PDF, 685 KB, 170 pg.)
    - Section 5-1.1 - Definitions
    - Section 5-1.33 - Water supply emergency plans

- Section 5-1.71 - Protection and supervision of public water systems

Other Local, State or Federal Laws

- Public Authorities Law - Article 5 Title 10-A §1126-bb - Upper Mohawk Valley Regional Water Board (Appendix A_PBA Article 5 Title 10-A SS1126-bb.pdf) (PDF, 14 KB, 1 pg.)
- Executive Law - Article 2-B
- §20 - Natural and man-made disasters; policy; definitions (Appendix A_EXC Article 2B SS20.pdf) (PDF, 23 KB, 1 pg.)
- §24 - Local state of emergency; local emergency orders by chief executive (Appendix A_EXC Article 2B SS24.pdf) (PDF, 31 KB, 1 pg.)
- §25 - Use of local government resources in a disaster (Appendix A_EXC Article 2B SS25.pdf) (PDF, 21 KB, 1 pg.)
- §26 - Coordination of local disaster preparedness forces and local civil defense forces in disasters (Appendix A_EXC Article 2B SS26.pdf) (PDF, 15 KB, 1 pg.)
- Federal Energy Regulatory Commission, "Terms and Conditions of License for Constructed Major Projects Affecting Navigable Waters and Lands of the United States. October 1975, Article 12 and Article 13. (Appendix A_FERC Terms and Conditions October 1975.pdf) (PDF, 46 KB, 10 pg.)

Appendix B: Contracts, Licenses, Permits

Pre-Hinckley Contracts - 1905-1909

- 1905 - Agreement between the Consolidated Water Company of Utica, NY and Utica Gas and Electric (Appendix B_1905 Agreement between Consolidated WC of Utica and Utica Gas and Electric.pdf) (PDF, 1.78 MB, 7 pg.)
- 1906 - Agreement between the Consolidated Water Company of Utica, NY and the International Paper Company (Appendix B_1906 Agreement between Consolidated WC of Utica and International Paper.pdf) (PDF, 2.89 MB, 10 pg.)
- 1909 - Agreement between the Consolidated Water Company of Utica, NY and the Newport Electric Light and Power Co. (Appendix B_1909 Agreement between Consolidated WC of Utica and Newport Electric.pdf) (PDF, 2.32 MB, 8 pg.)

Hinckley Contracts and Documents

- 1917 - Agreement between the State of New York and the Consolidated Water Company of Utica, NY (Appendix B_1917 Agreement between State of NY and Consolidated WC of Utica.pdf) (PDF, 17.67 MB, 103 pg.)
- 1917 - Agreement Descriptions from the Canal Corporation and MVWA (Appendix B_1917 Agreement Descriptions.pdf) (PDF, 45 KB, 2 pg.)

- 1921 - Agreement between the State of New York and Utica Gas and Electric (Appendix B_1921 Agreement between State of New York and Utica Gas and Electric.pdf) (PDF, 2.96 MB, 15 pg.)
- 1958 - Agreement between Utica Water Board and Niagara Mohawk Power Corporation (Appendix B_1958 Agreement between Utica Board of Water Supply and Niagara Mohawk.pdf) (PDF, 1.60 MB, 6 pg.)
- Report on the Practical Operation of the Hinckley Reservoir (Appendix B_Report on the Practical Operation of Hinckley Reservoir.pdf) (PDF, 14.41 MB, 45 pg.)
- 1920 Hinckley Reservoir Operating Diagram (Appendix B_Operating Diagram.pdf) (PDF, 400 KB, 1 pg.)

State Water Supply Permit

- Water Supply Permit No. 9435 (Appendix B_WSP 9435.pdf) (PDF, 689 KB, 6 pg.)
- Water Supply Permit No. 1272 (Appendix B_WSP 1272.pdf) (PDF, 518 KB, 11 pg.)

FERC License and Current Hydropower Contracts

- Hinckley Hydroelectric Project Application for License (FERC #3211) (Appendix B_Hinckley Hydro Project Application for License.pdf) (PDF, 5.28 MB, 112)
- Hinckley Hydroelectric Project Issuing License (FERC #3211) (Appendix B_Hinckley Hydro Project Issuing License.pdf) (PDF, 1.09 MB, 22 pg.)
- Hinckley Hydropower Easement (Appendix B_Hinckley Easement.pdf) (PDF, 1.80 MB, 6 pg.)

Appendix C: Drought Management

- Drought Management Coordination Annex (Appendix C_Drought Management Coordination Annex.pdf) (PDF, 12 KB, 1 pg.)

Appendix D: Public Comments Received

- Public Statement by Mr. Pertz at November 16 meeting (Appendix D_Nov 16 Pertz Public Statement.pdf) (PDF, 15 KB, 2 pg.)
- Public Statement by Ms. Kellogg at December 10 meeting (Appendix D_Dec 10 Kellogg Public Statement.pdf) (PDF, 47 KB, 1 pg.)
- Public Statement by Ms. Kellogg at January 8 meeting (Appendix D_Jan 8 Kellogg Public Statement.pdf) (PDF, 89 KB, 2 pg.)
- Letter: Felt Evans to New York State Department of Health. January 31, 2008 (Appendix D_Letter Felt Evans to DOH.pdf) (PDF, 51 KB, 2 pg.)

- Letter: DeTraglia to Destito. November 15, 2008 (Appendix D_Letter DeTraglia to Destito.pdf) (PDF, 58 KB, 2 pg.)
- Letter: Zuccotti (Brookfield) to Spitzer. November 20, 2008 (Appendix D_Letter Zuccotti to Spitzer.pdf) (PDF, 1.12 MB, 27 pg.)
- Letter: Snyder to New York State Department of Health. November 19, 2008 (Appendix D_Letter Snyder to DOH re Recommendations Nov 19 2007.pdf) (PDF, 96 KB, 2 pg.)
- Affidavits on Hinckley Reservoir recreation, submitted by Richard Pertz on March 2008. (Appendix D_Hinckley Resident Affidavits March 5 2008.pdf) (PDF, 72 KB, 68 pg.)
- Total Market Values of Lands within 500 feet of Hinckley Reservoir and the West Canada Creek (Appendix D_Total Market Values of Lands Within 500 feet of the West Canada Creek.pdf) (PDF, 51 KB, 1 pg.)
- Affidavit on deeded riparian rights, submitted by Katrina Hanna. April 24, 2008. (Appendix D_Hanna Affidavits April 24 2008.pdf) (PDF, 303 KB, 11 pg.)
- Letter: Destito to Working Group Chair, forwarding e-mail from DeLaire. March 27, 2008. (Appendix D_Letter Destito for DeLaire to Kim Mar 27 2008.pdf) (PDF, 136 KB, 4 pg.)
- Letter: Destito to Governor, April 21, 2008. (Appendix D_Letter Destito to Governor April 21.pdf) (PDF, 50 KB, 2 pg.)
- Letter: Pertz to New York State Department of Health, April 21, 2008. (Appendix D_Letter Pertz to NYSDOH April 21.pdf) (PDF, 29 KB, 1 pg.)
- Public Statement by Ms. Kellogg at April 21 Meeting. (Appendix D_April 21 Kellogg Public Statement.pdf) (PDF, 49 KB, 1 pg.)

Appendix E: Miscellaneous

- Press Release: October 19, 2007. Governor forms Working Group. (Appendix E_Governors Press Release.pdf) (PDF, 29 KB, 2 pg.)
- Press Release: March 31, 2008. Working Group Deadline Extended. (Appendix E_Final Report Deadline Extended Press Release.pdf) (PDF, 70 KB, 1 pg.)
- Oneida County Emergency Declaration (Appendix E_Emergency Declaration.pdf) (PDF, 53 KB, 1 pg.)
- Water Conservation Emergency Declaration (Appendix E_Water Emergency Press Release.pdf) (PDF, 116 KB, 2 pg.)
- 2007 Communications on Release Reductions (Appendix E_Release Rate Communications 2007.pdf) (PDF, 137 KB, 7 pg.)
- September 17, 2007 Letter from the Canal Corporation to NYPA (Appendix E_Sept 17 Letter Canal Corp to NYPA.pdf) (PDF, 115 KB, 2 pg.)

- September 29, 2004 memo from Howard Goebel to Michael Fleischer regarding MVWA withdrawal (Appendix E_Memo from Goebel to Fleischer re Hinckley Reservoir.pdf) (PDF, 65 KB, 1 pg.)
- Letter from Northeast Rivers Forecasting Center to DEC. February 1, 2008. (Appendix E_NERFC Letter to DEC.pdf) (PDF, 1.5 MB, 1 pg.)
- 2006 Flood Crest Elevations Report (Appendix E_2006 Flood Crest Elevations Report.pdf) (PDF, 4.6 MB, 74 pg.)
- 1650 DR-NY Riverine High Water Mark Collection Report (Appendix E_1650 DR-NY Riverine High Water Mark Collection Report.pdf) (PDF, 170 KB, 1 pg)
- MVWA Gray Reservoir Project Report, November 2000 (Appendix E_Gray Reservoir Project.pdf) (PDF, 1.91 MB, 28 pg.)
- Oswego Region Water Resources Management Strategy (NYSWRPC, 1989a) (Appendix E_Oswego Water Resource Strategy.pdf) (PDF, 7.65 MB, 72 pg.)
- Mohawk Region Water Resources Management Strategy (NYSWRPC, 1989b) (Appendix E_Mohawk Region Water Resources Strategy.pdf) (PDF, 7.54 MB, 76 pg.)

Appendix F: Background Calculations and Data

- Monthly Precipitation Totals at Selected Monitoring Stations (Appendix F_Master Hinckley Precipitation Review.pdf) (PDF, 18.23 KB, 1 pg.)
- USGS Real Time Groundwater Monitoring Network, Oe-151 (Appendix F_USGS Real Time Ground Water Level Network Oe-151.pdf) (PDF, 37 KB, 1 pg.)
- USGS Hinckley Reservoir Capacity Table (Appendix F_USGS Hinckley Reservoir Capacity Table.pdf) (PDF, 70 KB, 2 pg.)
- Hinckley Reservoir Elevation Graph – 1924-1937 (Appendix F_Hinckley Reservoir Elevations 1924-1937.pdf) (PDF, 4.42 MB, 1 pg.)
- Hinckley Reservoir Elevation Graph – 1938-1949 (Appendix F_Hinckley Reservoir Elevations1938-1949.pdf) (PDF, 5.07 MB, 1 pg.)
- Hydrology Committee Trigger Analysis DRAFT Worksheet (Appendix F_Trigger Evaluation of Alternatives DRAFT 3-22-2008.xls) (Excel, 26.9 MB)

Appendix G: Hinckley Working Group Meeting Information

- November 2, 2007 Agenda (Appendix G_Nov 2 Meeting Agenda.pdf) (PDF, 27 KB, 1 pg.)
- November 2, 2007 Meeting Minutes (Appendix G_Nov 2 FINAL Minutes.pdf) (PDF, 55 KB, 6 pg.)

- November 16, 2007 Agenda (Appendix G_Nov 16 Meeting Agenda.pdf) (PDF, 29 KB, 1 pg)
- November 16, 2007 Meeting Minutes (Appendix G_Nov 16 FINAL Minutes.pdf) (PDF, 55 KB, 3 pg)
- November 19, 2007 Technical Committees, Members and Charges (Appendix G_Technical Committees Nov 19.pdf) (PDF, 20 KB, 2 pg.)
- December 10, 2007 Agenda (Appendix G_Dec 10 Meeting Agenda.pdf) (PDF, 27 KB, 1 pg)
- December 10, 2007 Meeting Minutes (Appendix G_Dec 10 FINAL Minutes.pdf) (PDF, 40 KB, 3 pg)
- January 8, 2008 Agenda (Appendix G_Jan 8 Meeting Agenda.pdf) (PDF, 28 KB, 1 pg.)
- January 8, 2008 Meeting Minutes (Appendix G_Jan 8 FINAL Minutes.pdf) (PDF, 49 KB, 2 pg.)
- January 31, 2008 Agenda (Appendix G_Jan 31 Meeting Agenda.pdf) (PDF, 29 KB, 1 pg)
- January 31, 2008 Meeting Minutes (Appendix G_Jan 31 FINAL Minutes.pdf) (PDF, 46 KB, 2 pg.)
- February 21, 2008 Agenda DRAFT (Appendix G_Feb 21 Meeting Agenda DRAFT.pdf) (PDF, 37 KB, 1 pg.)
- February 21, 2008 Meeting Minutes (Appendix G_Feb 21 FINAL Minutes.pdf) (PDF, 46 KB, 2 pg.)
- March 18, 2008 Agenda (Appendix G_Mar 18 Meeting Agenda.pdf) (PDF, 32 KB, 1 pg.)
- March 18, 2008 Meeting Minutes (Appendix G_Mar 18 FINAL Minutes.pdf) (PDF, 48.2 KB, 2 pg.)
- April 21, 2008 Agenda (Appendix G_Apr 21 Meeting Agenda.pdf) (PDF, 29 KB, 1 pg.)
- April 21, 2008 Meeting Minutes (Appendix G_April 21 Minutes.pdf) (PDF, 28 KB, 2pg.)

Appendix H: References

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Report to the Governor
By the
Hinckley Reservoir Working Group

ANNEX I

REPORT OF THE

HYDROLOGY COMMITTEE

Hinckley Reservoir Working Group

April 2008

INTRODUCTION

Annex I was prepared as a Report of the Hydrology Committee. This committee was comprised of representatives from the following member agencies:

- Mohawk Valley Water Authority - Elisabetta DeGironimo
- New York Power Authority- Rich Mueller
- New York State Canal Corporation - Howard Goebel
- New York State Department of Health - Craig Jackson, Kristine Wheeler
- New York State Department of Environmental Conservation - Al Ash, Mike Holt, Skip Shoemaker (chair)

The Hydrology Committee had 5 face to face meetings along with several conference calls and numerous e-mail communications. The Committee gathered and analyzed extensive data from numerous sources in an effort to detail the hydrologic characteristics of the watershed. The findings of the Committee were utilized by the working group in supporting the final report recommendations.

The Hydrology Committee was established by the Hinckley Reservoir Working Group to characterize the hydrological and meteorological data related to water resources available to water users of Hinckley Reservoir, West Canada Creek and other Canal summit sources. The charge of the Hydrology Committee was established by the Working Group, and included:

- Locating and evaluating available hydrologic information, including reservoir levels, stream flows, groundwater data, precipitation information and other watershed data;
- Evaluating hydrologic and meteorological conditions during the years 2006-2007 and comparing those years to long term conditions;
- Comparing the conditions used in the development of the 1920 Operating Diagram to long term conditions;
- Developing options and recommendations for hydrologic conditions that could serve as mitigating factors or triggers for actions and decisions related to low reservoir conditions; and
- Identifying information gaps and the importance of filling those gaps.

The charge of the Hydrology Committee is Located in Appendix G.

ASSESSMENT OF HYDROLOGICAL INFORMATION

Meteorological Data

The New York State Drought Forecasting Plan directs the New York State Department of Environmental Conservation (NYSDEC) to evaluate drought conditions throughout the state. This evaluation includes analyzing data from a network of weather observing stations supervised by the National Oceanic and Atmospheric Administration (NOAA). The NOAA National Climatic Data Center is the world's largest active archive of weather data and has long served the nation as a national resource for climate information. Although none of the NOAA stations are currently located directly within the watershed of Hinckley Reservoir, several are located within 20 miles.

Figure 1: Drought management regions

Eight stations surround the Hinckley Reservoir watershed. These stations are are located at Boonville, Highmarket, Indian Lake, New London Lock 22, Northville, Piseco, Trenton Falls and Tribes Hill. Monthly precipitation data (in inches) for each of these stations was analyzed for calendar years 2005, 2006 and 2007. Actual amounts were compared to 30 year mean values to determine monthly departures from normal. Seven of the eight sites recorded precipitation that was above normal in 2005, 2006 and 2007. The station at Piseco was the only station that recorded below normal precipitation for this time period.

A period of below normal precipitation was observed during the summer of 2007. For the 5 month period from May to September 2007, the cumulative precipitation departure from normal ranged from 1.7 inches above normal at the Northville station to 11.9 inches below normal at the Piseco station. Monthly precipitation departures are calculated by subtracting the 30 year mean from the actual measured amounts.

Precipitation can also be evaluated as a percent of normal for a given period of time. The NYS Drought Forecasting Plan establishes the criteria for defining a drought condition. According to the Drought Forecasting Plan:

- Precipitation amounts of 80% or more are normal;
- Precipitation amounts between 70 and 80% of normal equates to a Drought Watch condition;
- Precipitation amounts between 60 and 70% of normal equates to a Drought Warning condition; and
- Precipitation amounts 60% or less of normal equates to a Drought Emergency condition.

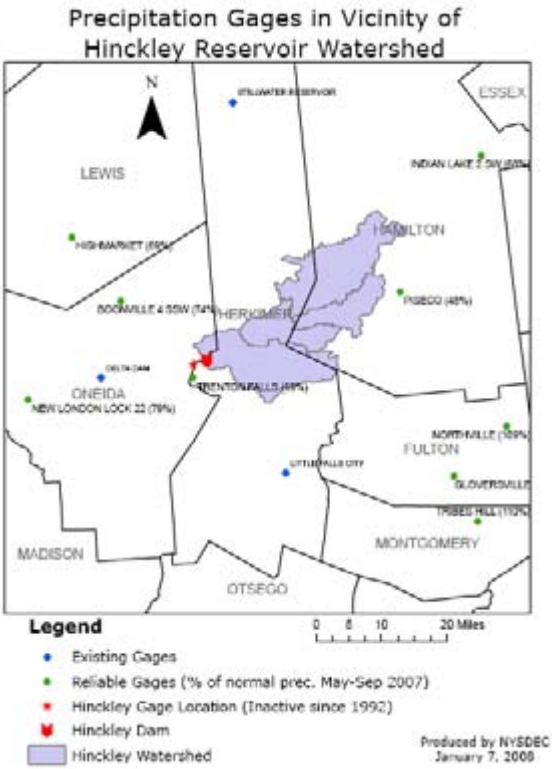

Figure 2: Precipitation gages in the vicinity of the Hinckley Reservoir Watershed

Precipitation is analyzed for a five month period before the drought status is changed. For the five month period between May and September 2007, precipitation for the eight stations surrounding the Hinckley watershed was approximately 76% of normal. This is equivalent to a Drought Watch condition; however, a Drought Watch condition was not declared because the dry conditions observed at some of the gaging stations was not consistent with conditions observed throughout Drought Region IV. For example, the Northville and Tribes Hill stations located to the southeast of the Hinckley watershed both experienced above normal precipitation for the five month period between May and September 2007.

Precipitation totals were also ranked for the five month period from May to September in 2006 and 2007. These rankings can be found in Appendix F entitled, "Monthly Precipitation Total at Selected Monitoring Stations." Both 2006 and 2007 exceeded annual long term precipitation averages; however, precipitation measured at several of the stations between May and September 2007 was below average. May to September 2007 was the driest on record at the Highmarket and Piseco stations. The Highmarket and Piseco stations had 77 years and 58 years of historical precipitation data, respectively. The Tribes Hill station was the 49th driest out of 89 years of precipitation data.

Inflow to Hinckley Reservoir in 2006 and 2007

Inflow to Hinckley Reservoir can be used to determine the historical severity of the wet conditions in 2006 and the dry conditions in 2007. The calculated inflow provides a more direct explanation of high or low water levels in Hinckley Reservoir than precipitation.

For this report, daily inflows into Hinckley Reservoir were calculated for 60 years (1938-1957, 1960-1978, 1987-2007) using the residual method. Inflows were calculated using recorded water levels in the reservoir and release records at the Hinckley Dam. The 60 years of inflows were analyzed to determine how extreme the hydrologic conditions in Hinckley Reservoir were in 2006 and 2007.

2006 Inflow - Hinckley Reservoir

The year 2006 is characterized as very wet and included the largest single day inflow during the 60 years of available data. The 120 day period between July 1 and October 28, and the 150 day period between May 21 and October 17, 2006, had the largest rates of inflow for both the 120 day and 150 day time periods during the 60 years. These prolonged periods of large inflows contributed to high reservoir levels for much of the year.

The second largest flood on record at the Hinckley Reservoir occurred in 2006. The water level in Hinckley reservoir reached a peak of 1229.85 feet on June 28, 2006. The record height of 1230.2 feet was observed on October 2, 1945.

2007 Inflow - Hinckley Reservoir

The 120 day period between June 10 and October 7, 2007, had the third lowest calculated rate of inflow for a 120 day time period during the 60 years. The water level fell from 1219.94 feet to 1190.00 feet (about 30 feet) during this time.

The 150 day period from May 21 to October 17 had the second lowest rate of calculated inflow for a 150 day time period during those 60 years. The water level fell from 1224.74 feet to 1194.80 feet (about 30 feet) during this time. The lowest rate of inflow for 120 day and 150 day periods in the 60 year period of record occurred in 1964.

Groundwater Information

Approximately 75 to 80% of the Hinckley Reservoir watershed is underlain by Adirondack metamorphic rock. The NYS bedrock geology maps (1:250,000 scale) identify an area of approximately 50 square miles under and extending from the northern half of the reservoir generally eastward, as glacial and alluvial deposits. An inspection of available well reports near the perimeter of the reservoir suggests the following:

- The western shore of the reservoir exhibits a thin layer of sand (up to 25 feet thick) overlying clay or silt and clay layers or directly overlying bedrock;
- The eastern shore exhibits slightly thicker initial sand layers (up to 32 feet thick). Bedrock is found at greater depth (with one exception at the southern end of the shoreline) with interbedded layers of clay, sand and gravel above; and
- In the northern inlet area of the reservoir, an initial layer of sand may be absent with a thick occurrence of till found above bedrock.

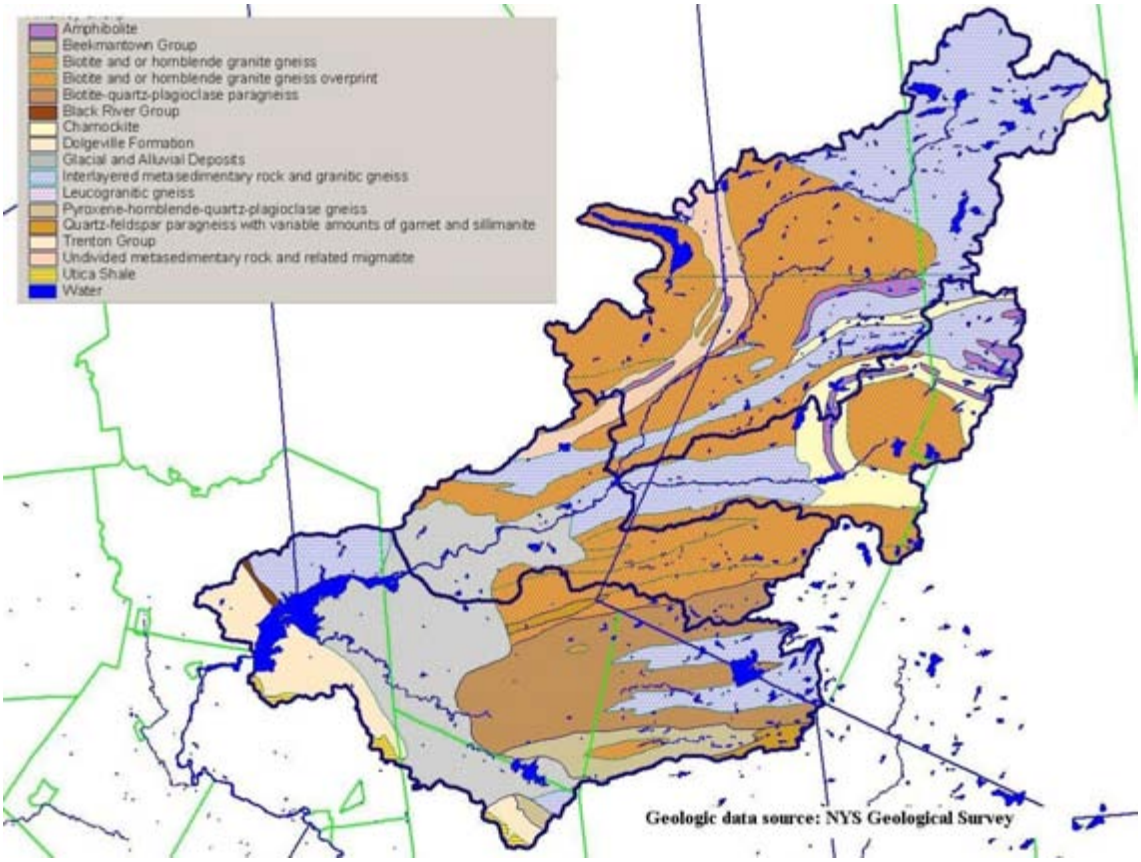

Figure 3: Hinckley Reservoir watershed geology

No comprehensive studies evaluating the direct impacts of groundwater on Hinckley Reservoir were discovered by the Hydrology Committee. The lack of detailed information makes it impossible to determine with any degree of certainty how groundwater movement impacts Hinckley Reservoir water levels.

The New York State Drought Forecasting Plan directs NYSDEC to evaluate drought conditions statewide. This evaluation involves analyzing data from a network of 70 plus unconsolidated and bedrock observation wells that have long periods of historical record. None of these wells are located in the Hinckley Reservoir watershed, therefore direct measurements of groundwater levels are not available; however one is located approximately 15 miles west of the watershed near Woodgate, NY. This well is designated by USGS as Oe-151 (Oneida County). Available data dates back to July of 1926. It is approximately 31 feet in depth and installed in unconsolidated (sand and gravel) material.

A review of the 2007 records for this well, obtained from the US Geological Survey, shows that water levels were above the historical median for the first half of the year and then began to decline until they approached historic minimum levels in September. The well then proceeded to quickly recover, to above median levels by the end of 2007. Oe-151 has an 81

year period of historical record. Data associated with this monitoring well is located in Appendix F.

As part of its drought monitoring responsibilities, NYSDEC evaluates statistical groundwater data provided by the USGS on a monthly basis. Water levels are reported as "percent exceedance." For example, 90% exceedance means that higher water levels have been observed for that month 90% of the time. For groundwater wells,

- Reported levels of greater than 75% are considered normal;
- Levels between 75 and 89% are considered a Drought Watch condition;
- Levels between 90 to 94% are considered a Drought Warning condition; and
- Levels 95% or greater are considered a Drought Emergency groundwater condition.

The highest reported exceedance for Oe-151 in 2007 was 96% for the month of September. This emergency condition correlates with observed conditions, and supports the low calculated inflows into Hinckley Reservoir. This well can be monitored in the future to determine if a correlation between well Oe-151 and Hinckley Reservoir levels exist.

Stream Inputs

The Hinckley Reservoir watershed is 372 square miles and lies almost entirely within the Adirondack Park in Herkimer and Hamilton Counties. Approximately 95% of this area is drained by the West Canada Creek and Black Creek. The flow from the northern 258 square miles (approximately 70%) drained by the West Canada is currently measured by a USGS stream gaging station (# 01343060) located near Wilmurt. This gage, located in Herkimer County, is downstream of the bridge on State Highway 8, 2.6 miles southwest of Wilmurt and about 3 miles upstream of the Hinckley Reservoir. This gage has been in service since June of 2001, and records real time stage (ft) and discharge (cfs). This data is currently available on the USGS Real-Time Water Data for New York website at http://waterdata.usgs.gov. The Black Creek drains the majority of the southern portion of the watershed, but it is not gaged at this time.

Accurate stream gaging data is important when estimating inflow into a surface water body. Since 70% of the watershed area is gaged, it would seem appropriate that inflow from the remainder of the watershed would be proportional. This technique is often used to estimate inflow into a surface water body; however, USGS field measurements taken during the September - October 2007 period indicated that the Black Creek was yielding approximately twice the inflow per square mile as West Canada Creek. Additional information is needed to determine if this is typical of the Black Creek basin or a result of hydrologic conditions at the time of the measurements. An additional USGS gage along Black Creek would represent a majority (approximately 93 square miles) of the remaining drainage area of Hinckley Reservoir. The addition of a new gage on Black Creek combined with the existing gage at Wilmurt would provide for direct measurement approximately 95% of the Hinckley Reservoir watershed.

USGS estimates that the initial capital cost to install a USGS streamflow gage along the Black Creek near Grant that is similar to the Wilmurt gage is $32,000. Annual operation and maintenance costs would be approximately $15,300. The addition of this gage would lead to

more accurate stream flow information, since the technique used during the fall of 2007 resulted in an underestimation of inflow into Hinckley Reservoir.

Estimating Inflow into Hinckley Reservoir

Effective water management in Hinckley Reservoir when reservoir levels are low requires an estimate of inflow into the reservoir. Accurate inflow measurements would be a useful decision making tool for determining if adjustments in the amount of water to be released is appropriate.

As noted above, the two largest streams flowing into Hinckley Reservoir are West Canada Creek and Black Creek. Without reliable gages on both streams, it is not possible to determine the amount of water flowing into Hinckley reservoir based on stream gage data. Alternatively, the inflow into Hinckley Reservoir can be estimated by the residual in a water balance calculation. If all other sources of water into or out of the reservoir can be estimated, and the reservoir volume curve can be approximated, then the inflow can be calculated as the residual. The Hinckley Reservoir inflow used in this report is calculated by this approach.

The water balance equation, using Hinckley Reservoir as the control volume, is:

- The water balance equation, using Hinckley Reservoir as the control volume is: *ΔStorage = Inflow – Outflow;*
- This equation can be expanded by specifying the hydrologic variables: *ΔStorage = (DirectPrecip + Streamflow) – (Jarvis + MVWA + LakeEvap) ± GW;*
- *Inflow* can be calculated if this equation is rearranged, as follows: *Streamflow = Δstorage – DirectPrecip + (Jarvis + MVWA + LakeEvap) ± GW;*
- *Inflow* represents the flow from West Canada Creek, Black Creek and other small tributaries into Hinckley Reservoir. *Inflow* also represents the contribution, either positive or negative, from groundwater. Average annual inflow has been calculated to be approximately 976 cfs;
- ∆ *Storage* is the change in storage volume over a 24-hour period. Storage is determined from water level measurements and converted to storage based on the 1921 Gibson data. The annual change in storage is considered 0 cfs, because there is no carryover of storage from year to year;
- *DirectPrecip* is water that falls directly on the reservoir water surface. *DirectPrecip* is estimated as the average monthly precipitation from the Hoffmeister gage for the years 1920 to 1965. The annual direct precipitation is about 14 cfs;
- *LakeEvap* is lake evaporation from the reservoir water surface. This is estimated as the average monthly potential evapotranspiration for the lower Hinckley watershed (NOAA, 2004). The annual lake evaporation is about 8 cfs;
- *Jarvis* is the sum of the releases through the Jarvis powerhouse turbines, over the spillway, outlet valve(s) and the bypass valve. NYPA applies the Operating Diagram to determine the Jarvis release. The average Jarvis release is 966 cfs; and

- *GW* is the groundwater flow through the contact area between the water body and the ground. Under various hydrologic conditions, this may be flow into the reservoir or flow out of the reservoir. The groundwater contribution is unknown, as it is in many lake water balance studies, and is considered small or negligible compared to the other hydrologic quantities. The inflow estimate for Hinckley Reservoir includes the contribution from groundwater.

Accuracy of the Inflow Estimate

The daily inflow estimate is as accurate as the least accurate hydrologic component of the calculation. The calculation for the standard deviation of the error in each of the hydrologic components is below. These estimates are assumed to be unbiased, so that the inflow estimate is unbiased.

- Assuming the components are independent, the variance of the daily inflow estimate, V(Inflow), is: *V(Streamflow) = V(ΔStorage) + V(DirectPrecip) + V(Jarvis) + V(MVWA) +V(LakeEvap) + V(GW);*
- *V(Δ Storage)* is dependent on the accuracy of the measurement of reservoir elevation. In the early 20th century, the elevation was measured manually and was recorded to the nearest 0.10 foot. In later years, this measurement was recorded to the nearest 0.01 foot. The error associated with a daily change in elevation of 0.02 feet at elevation 1214 feet translates to a daily storage error of about 22 cfs. Therefore, the estimate of the standard error is 22 cfs;
- *DirectPrecip* used in the inflow calculation is the long term average monthly estimate derived from the Hoffmeister rainfall gage from 1920 to 1965. While this is likely to be an unbiased estimate, the accuracy is poor on a daily basis, but acceptable. The standard deviation of the daily precipitation, as recorded by the NYPA precipitation gage at Hinckley Reservoir for the five year period from 1990 to 1994, is 0.40 inches. At an average level of 1214 feet, the estimated standard error for the daily precipitation is 40 cfs;
- The *Jarvis* release is most often comprised of turbine flow. The standard error of flow measurement is about 35 cfs, based on experience at other similar hydropower facilities;
- The actual monthly *MVWA* withdrawal is used to estimate the daily withdrawal. The monthly *MVWA* withdrawals averaged 32 cfs; however, there is more uncertainty on a daily basis. A conservative estimate of the standard deviation for the daily *MVWA* withdrawals is 10 cfs;
- *LakeEvap* used in the inflow calculation is the long term average monthly estimate, derived from the NOAA Task Completion Report, Task 4-0008b, Calibration for the Hudson River Basin, November 2004. While this is likely to be an unbiased estimate, the accuracy is poor on a daily basis, but is acceptable. The maximum monthly evaporation is 17 cfs, therefore a conservative estimate of the standard error in the *LakeEvap* estimate is 10 cfs;
- *GW* is typically a very small contribution to the water balance of a reservoir, and is often considered to be 0. In this case, the inflow estimate includes an adjustment for any *GW*

contribution; however, the error introduced by the day to day variability in the groundwater contribution remains. This error is likely small and is ignored in this error analysis;

- The relative contribution of each source of error on the inflow estimate is: *V(Streamflow) = V(ΔStorage) + V(DirectPrecip) + V(Jarvis) + V(MVWA) + V(LakeEvap) + V(GW);*
- *V(Streamflow)=(22x22) + (40x40) + (35x35)+(10x10) +(0x0) =3509cfs.*

The standard deviation of the in*flow* estimate is 59 cfs. This means that the actual daily inflow will be within a range of plus or minus 59 cfs 66% of the time.

Conclusions

- The average daily inflow is 976 cfs and the daily calculated inflow has a standard deviation of the error of 59 cfs. The error is a conservative estimate;
- The daily inflow estimate is sufficiently accurate to manage the water in Hinckley reservoir on a daily basis; and
- The 30 day, 60 day and 90 day running average inflows will have better accuracy than the daily inflow estimate.

HINCKLEY ELEVATION LEVELS

Approximately sixty years of daily reservoir elevation data (1938-1957; 1960-1978; and 1987-2007) were analyzed by the Hydrology Committee. A spreadsheet was created that grouped the data by the 366 calendar days of the year, including February 29. For each day of the year, the minimum, maximum and average reservoir elevation was calculated.

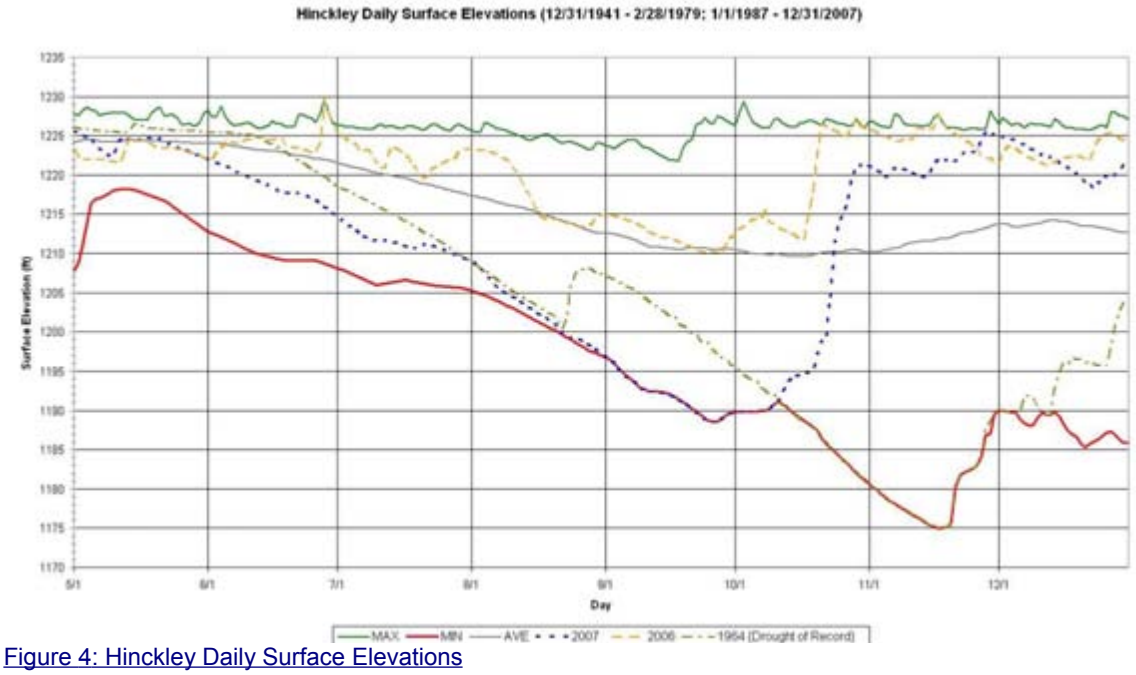

Figure 4: Hinckley Daily Surface Elevations

When the elevations in 2006 and 2007 were compared to the elevations in the dataset, it was evident that each year represented an extreme. In 2006, the highest recorded elevations in the dataset occurred on twenty-three (23) days, and elevations were above average on 319 days in 2006. The lowest elevation in the dataset did not occur at any time during 2006. In

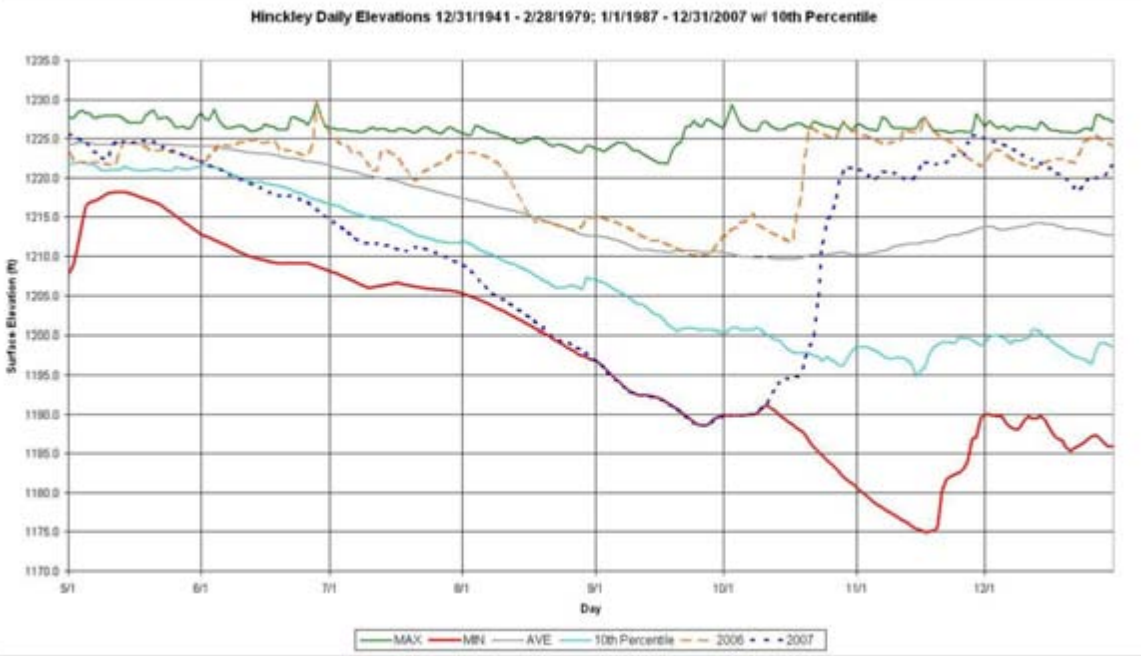

Figure 5: Hinckley Reservoir Daily Elevations, 10th Percentile

contrast, the maximum recorded elevations in the dataset occurred on three days in 2007 (January 6 through January 8). The lowest recorded elevation in the dataset occurred on 40 days (September 1 through October 10). In 2007, elevations were above average on 188 days.

The lowest observed Hinckley Reservoir elevation in 2007 was 1188.6 feet. Since Hinckley Reservoir was constructed in 1915, there have been 32 years when the minimum annual reservoir level was less than 1188.6 feet. Table 1 illustrates the years when Hinckley Reservoir levels were less than 1188.6 feet and the lowest level observed that year. During October and November of 1964, Hinckley Reservoir was below elevation 1188.6 feet for six consecutive weeks. The lowest elevation ever recorded was 1174.9 feet, observed on November 17, 1964.

Table 1 – Hinckley Reservoir levels less than 1188.6 ft.

Year	Day	Minimum Reservoir Elevation (ft)	Year	Day	Minimum Reservoir Elevation (ft)
1924	3/23	1186.4*	1960	3/29	1182.0
1930	12/31	1187.0*	1961	2/17	1177.7

Table 1 – Hinckley Reservoir levels less than 1188.6 ft.

Year	Day	Minimum Reservoir Elevation (ft)	Year	Day	Minimum Reservoir Elevation (ft)
1931	3/23	1177.1*	1963	3/27	1179.9
1934	3/3	1184.6*	1964	11/17	1174.9
1935	3/20	1184.1*	1965	4/7	1182.5
1936	2/27	1176.3*	1967	3/27	1179.8
1937	4/5	1176.3*	1969	3/19	1183.4
1940	3/30	1177.6	1970	3/26	1181.3
1941	4/4	1177.8	1971	3/23	1182.0
1944	4/9	1183.2	1972	4/14	1185.4
1948	3/16	1184.2	1974	4/4	1187.9
1950	3/28	1186.1	1975	4/14	1185.1
1952	11/18	1186.8	1976	3/19	1188.1
1956	4/2	1177.4	1987	12/30	1185.9
1958	3/6	1181.8	1988	12/21	1188.3
1959	3/21	1186.0	1989	1/1	1181.0

* Hinckley Reservoir Elevation data from 1924 to 1937 and 1928 to 1948 is located in Appendix F.

Hinckley Reservoir Elevation-Capacity Curves

Note: All elevations listed in this section are based on Barge Canal Datum which, at Hinckley, NY, is approximately one foot lower than 1929 National Geodetic Vertical Datum (NGVD).

Summary

The Hydrology Committee evaluated four sets of data that list volumes for specific water elevations in Hinckley Reservoir. The four data sets are named:

- 1919 Gibson;
- 1921 Gibson;
- USGS data; and
- NYPA data

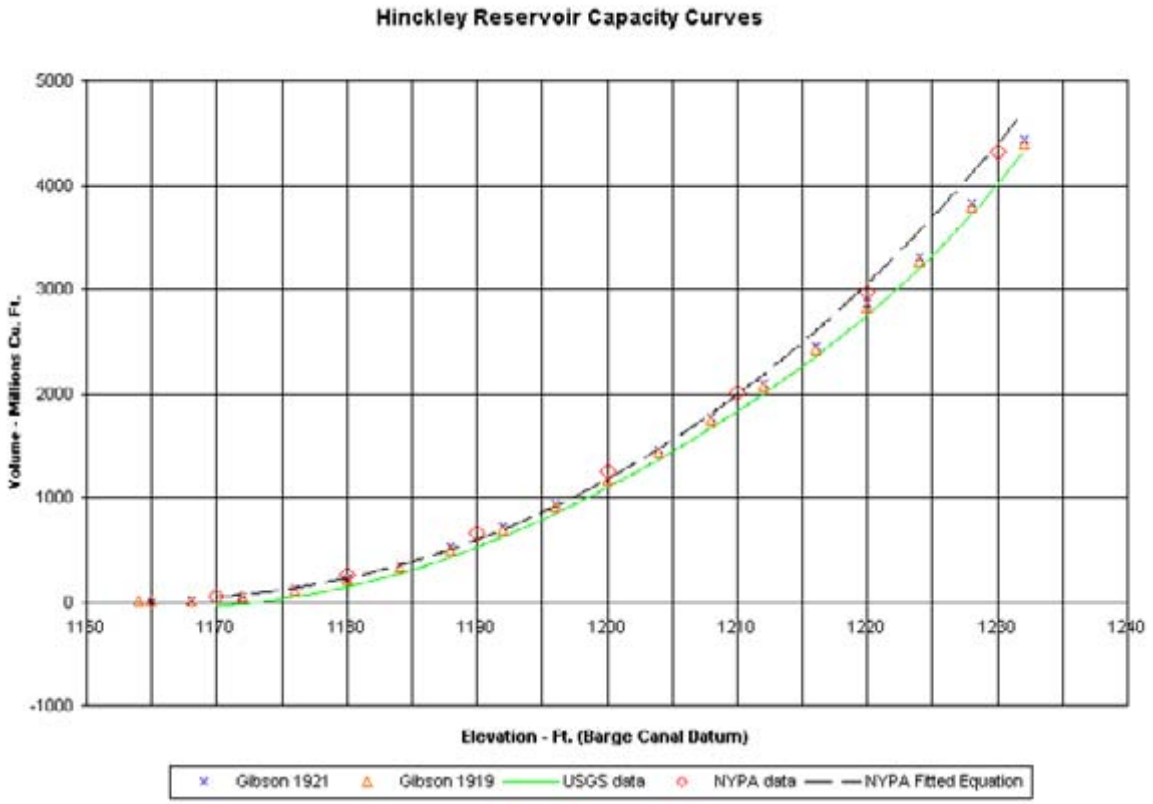

Figure 6: Hinckley Reservoir Capacity Curves

Figure 6 illustrates each data set. Upon review of each data set, the Hydrology Committee determined that the 1921 Gibson data provides the best currently available information for the capacity of Hinckley Reservoir at any given elevation. The committee further recommends, based on the unknown accuracy of the original survey and subsequent sedimentation in the Reservoir, that the bathymetry of the reservoir be re-surveyed.

Discussion

The Hinckley Reservoir Dam spillway has two outlet control structures. One control structure is on the north side for hydropower and discharge to the West Canada Creek streambed; and the other is on the south side for municipal water supply.

G. Edward Gibson, New York State Department of State Engineer and Surveyor, developed the 1919 and 1921 data, illustrated in Table 2 below. The data is based upon a 4-foot contour interval with a starting elevation of 1164 ft; however, the 1921 volume curve uses a zero storage value at elevation 1165 feet. The 1919 and the 1921 volume data is similar. The first draft of the Operating Diagram, completed in 1919, was developed to include a reserve supply in Hinckley Reservoir as backup in the event Delta Reservoir had to be taken off line. In 1921, the Operating Diagram was modified to eliminate this reserve and to incorporate other modifications (Landreth & Gibson, 1921).

Table 2 – Hinckley Reservoir Storage Volume by Gibson

Elevation (ft)	March 7, 1919[1]		May 5, 1921 Volume Curve[2]	
	Million Cubic Feet	Billion Gallons	Million Cubic Feet	Billion Gallons
1164	0.22	0.00		
1165	1.24	0.01	0	0.00
1168	10.20	0.08	11.8	0.09
1172	46.54	0.35	51	0.38
1176	114.44	0.86	122	0.91
1180	211.11	1.58	223	1.67
1184	337.56	2.53	351	2.63
1188	499.08	3.73	525	3.93
1192	692.60	5.18	713	5.33
1196	914.28	6.84	939	7.02
1200	1162.66	8.70	1185	8.86
1204	1436.48	10.75	1465	10.96
1208	1735.24	12.98	1768	13.23
1212	2061.48	15.42	2098	15.70
1216	2419.10	18.10	2456	18.37
1220	2819.32	21.09	2861	21.40
1224	3271.34	24.47	3316	24.81
1228	3788.32	28.34	3834	28.68
1232	4387.48	32.82	4436	3319

1. Data from G. Edward Gibson, March 7, 1919
2. Data from G. Edward Gibson, May 5, 1921

The USGS reservoir capacity reference table, located in Appendix F, was developed on October 14, 1934. The USGS data starts with zero storage volume at elevation 1173.5 ft. Elevation 1173.5 ft. falls within the range of the original 60-inch outlet pipes present when the dam was first constructed.

Table 3: Hinckley Reservoir Storage Volume by NYPA

Elevation (ft)	Area (ft)	Storage (ft)	Equation Storage (acre-ft)
1160	0	0	0
1170	240	1200	1027
1180	680	5800	5264

Table 3: Hinckley Reservoir Storage Volume by NYPA

Elevation (ft)	Area (ft)	Storage (ft)	Equation Storage (acre-ft)
1190	1190	15150	13695
1200	1550	28850	26987
1210	1910	46150	45674
1220	2530	68350	70207
1230	3610	99050	100982
1240	4640	140300	138353

Source: New York Power Authority, c. 1988

The USGS curve represents usable storage volume above the outlet and does not consider the volume below that point. The lower limit of storage is at elevation 1173.5, the elevation required to pass 230 cfs, or the minimum estimated draft for canal supply (Landreth & Gibson, 1921).

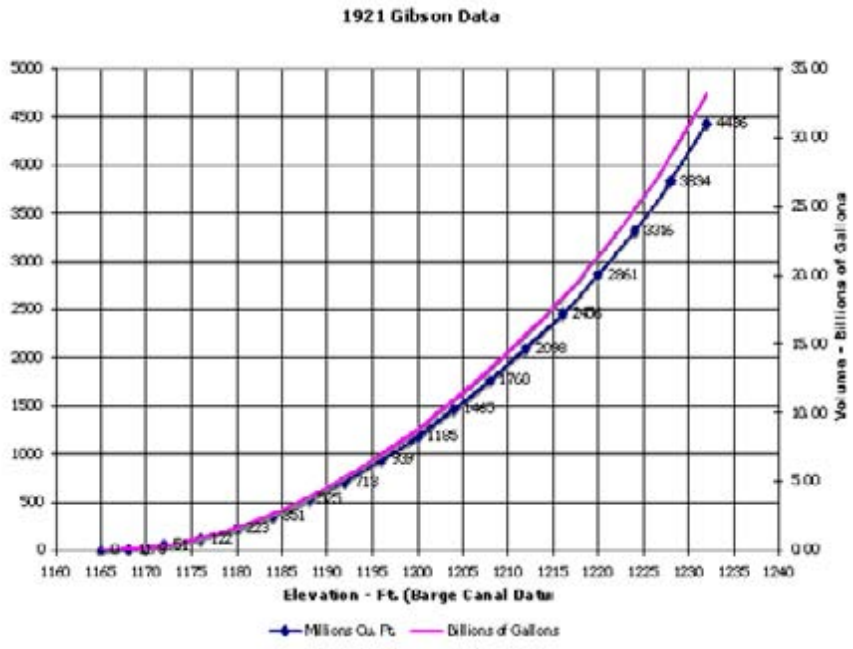

Figure 7: 1921 Gibson data for full reservoir elevation

Much later, NYPA developed their own elevation-storage data based on a NYSDOT pre-Hinckley Reservoir, 1" = 1200', 10-foot contour topographic map, since they did not have access to the Gibson data. This data was subsequently used by NYPA and MVWA, and is illustrated in Table 3.

The Hydrology Committee elected to use Gibson's data since it is original work based on four foot contours. The bottom of the Reservoir is considered to be 1165' (Gibson, 1921). This decision was made since it is unlikely that Gibson would have repeated the exercise later without cause. Figure 7 illustrates the 1921 Gibson data.

Neither the accuracy of the original work nor the method used is known. In addition, it is unknown if the perimeter of the reservoir was surveyed, or if islands within the reservoir bounds were subtracted from the reservoir volume. In addition, the effect on reservoir volume of almost 100 years of sedimentation is unknown. These uncertainties become more significant at lower elevations. Figure 8 is an expanded graph of the 1921 Gibson data below elevation 1200 ft.

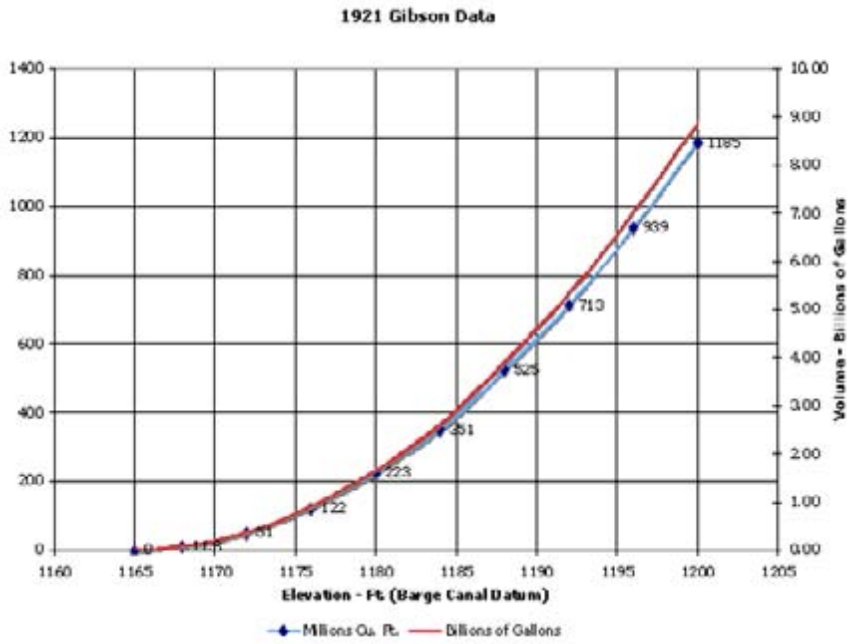

Figure 8: 1921 Gibson data for reservoir elevations below 1200

Recommendations

The Hydrology Committee recommends that the 1921 Gibson Data be used to determine the capacity of Hinckley Reservoir at any given elevation. The committee further recommends, based on the unknown accuracy of the original survey and subsequent sedimentation in the reservoir, that consideration be given to conducting a survey to re-establish the bathymetry of the reservoir .

RESERVOIR RELEASES

1920 Operating Diagram

In December 1920, the state developed the “Operating Diagram for Hinckley Reservoir” and in June of 1921 an agreement that included the 1920 Operating Diagram was signed between the State of New York and Utica Gas & Electric Company of Utica, NY (predecessor to Erie Boulevard Hydropower, L.P.) concerning how to control the flow of Hinckley water during a wide variety of conditions to settle legal claims regarding Hinckley Reservoir operation. The 1920 Operating Diagram established the rates (in cubic feet per second) at which the water is to be discharged from Hinckley Reservoir during each third of the month period, based upon the observed reservoir elevation at the beginning of each such period.

The 1920 Operating Diagram was developed to control the discharge of water from Hinckley Reservoir to secure the maximum practical use of the water first and primarily for canal purposes, and second for power purposes. This concept was incorporated in the 1921

agreement as follows:

> *"The intent and purpose of the agreement being so to operate the Hinckley State Reservoir, that, after serving the canal uses and purposes, of the State, it may, so far as practicable, be fully used for the storage of water and the regulation of the flow of West Canada Creek below the same for the benefit of the power property and riparian lands of the party of the second part (Utica Gas & Electric) on West Canada Creek below the Hinckley State Reservoir."*

The period from 1907 through 1914 was used as the basis for the creation of the Operating Diagram since a continuous record existed for that period. Streamflow data from Trenton Falls and Poland were used in the study along with the storage volume available within Hinckley Reservoir to calculate reservoir inflow. A theoretical perfect operation of Hinckley Reservoir was developed for the period from 1907 through 1914, based upon the variable inflow into Hinckley Reservoir, reservoir storage and required downstream releases.

The years 1915 through 1918 were used as a test period to study the impact of operating Hinckley Reservoir in accordance with the Operating Diagram without using reservoir inflow as a variable in the decision making process.

The final Operating Diagram was modified from the theoretically perfect Operating Diagram to account for several factors including:

- The maximum release was set at 1,100 cfs, the hydraulic capacity of the Trenton Falls power plant, rather than the 1,530 cfs associated with perfect operation;
- The 520 million cubic feet reserve included originally was removed;
- The minimum desired release during the canal navigation season was established at 400 cfs; and
- Increases to the releases during June and July were found to be desirable.

The Operating Diagram is located in Appendix B.

New York Power Authority

New York Power Authority controls the releases to Prospect Pond via the power project at Hinckley. The 1920 Operating Diagram established the rates (in cubic feet per second) at which the water is to be discharged from Hinckley Reservoir during each third of the month period based upon the observed reservoir elevation at the beginning of each such period. Since 1920, Hinckley has been operated using this diagram.

Uncontrolled discharges occur when the reservoir elevation exceeds the spillway crest elevation of 1225 feet. The reservoir has been observed to rise as much as 10 feet per day during periods of heavy precipitation and runoff. Uncontrolled discharges typically occur in April and May, as the result of snow melt and heavy spring rainfall events. They also occur in the late fall as a result of heavy rainfall and runoff.

Reservoir releases for 78 years of available data have averaged 967 cfs. The largest monthly discharges occur in April. The average April discharge is 2,061 cfs. The smallest monthly discharges occur in the months of July, August and September. The average discharges in those months are 611, 540 and 571 cfs, respectively.

Mohawk Valley Water Authority

The MVWA has utilized the West Canada Creek (WCC) as its drinking water source since 1906. The Hinckley watershed was selected in the 1890s as the new source to meet water needs. Water rights were acquired and the original intake was constructed on the WCC upstream of the current Hinckley Dam. The intake consisted of a small wood crib dam and 30" wood stave conduit which connected to a single 24" cast iron water main. The intake was relocated to an intake tower at the south end the Hinckley Dam spillway in 1915 by the State of New York as part of the Hinckley Reservoir construction project.

Drinking water withdrawals in the early 1900s were approximately 15 cfs (9.7 mgd). The water system experienced steady growth from the 1920's until the early 1970s, when the drinking water withdrawal averaged about 34 cfs (22 mgd). During the eleven-year period that followed, usage decreased to a low of about 30 cfs (19.4 mgd) in 1978, then increased to about 33.5 cfs (21.7 mgd) five years later. From 1983 though 2007, withdrawals averaged between 32 and 34 cfs (21.7 - 22 mgd), with a monthly average range of 27 to 41 cfs (17.4 – 26.5 mgd).

1920 Operating Diagram Evaluation

One of the Hydrology Committee's charges was to evaluate precipitation and other watershed data that were used to form the 1920 Hinckley Operating Diagram, and compare this to long term trends. Much of the data and analysis that was used to develop the 1920 Operating Diagram is no longer available and cannot be evaluated. For example, Gray Reservoir was in existence during the period in which the 1920 Operating Diagram was being developed. A review of the 1921 Agreement indicates that releases from Gray were considered in the development of the Operating Diagram; however, the Hydrology Committee was unable to locate documentation that would detail precisely how Gray Reservoir's operation was incorporated into that diagram. As such, while it is expected that the removal of Gray Dam impacted the system hydrology, it is not possible to determine if this removal significantly impacted releases which followed the Operating Diagram. Two separate evaluations were completed that take advantage of data that is available, one based upon precipitation, the other based on calculated inflows. Both of these evaluations concluded that hydrometeorological conditions during the period when the Operating Diagram was developed are similar to the long term averages for both precipitation and inflow.

The 1920 Operating Diagram, along with a description of the development of the diagram and summary precipitation data are provided in Landreth and Gibson, 1921. The diagram was developed using inflow data as the primary basis. Precipitation data was used during testing of the Operating Diagram. The eight year period from 1907 to 1914 was taken as the basis for the study and a mass curve was constructed, using the mean net inflow for each third of a month for the basic period 1907 to 1914, inclusive (Landreth & Gibson, 1921).

Inflow Evaluation

A comparison of reservoir inflow during the twelve year period that was used to develop the 1920 Operating Diagram (1907 through 1918) and the sixty year period from 1938 and 2007 (excluding the years of 1958, 1959 and the period from 1979 through 1986, where insufficient data exists for such comparison) was completed. This analysis demonstrates that the monthly inflows used to develop the 1920 Operating Diagram are statistically the same as the sixty year period from 1938 through 2007 at a 95 percent confidence level. This finding is based upon statistical analyses of monthly inflows from each period using two methods.

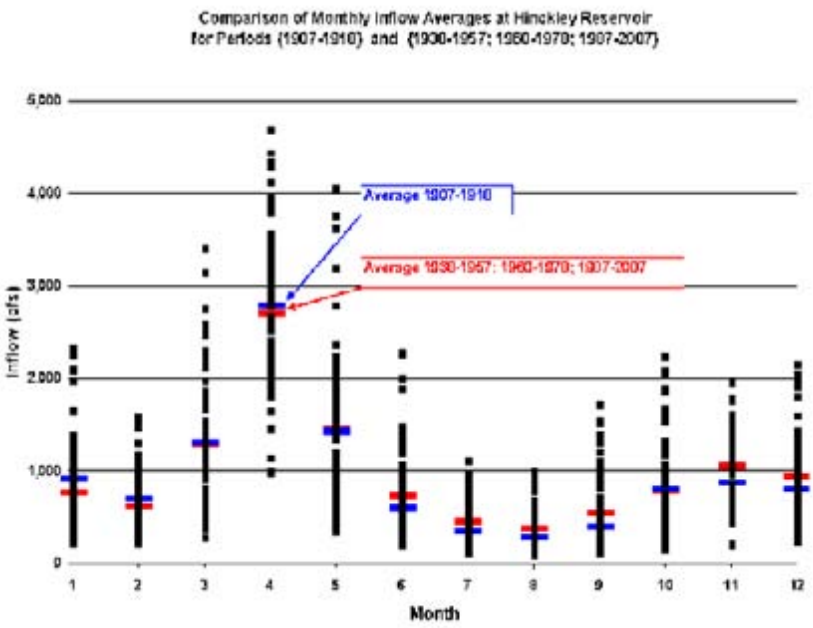

Figure 9: Comparison of Monthly Inflow Averages at Hinckley Reservoir

Method 1 includes a comparison of the two population means using the Student's t distribution and hypothesis testing. This analysis found that the means from the two periods are the same, at a 95% confidence level.

Method 2 included a comparison of the two population medians using the Mann-Whitney hypothesis test. The Mann-Whitney hypothesis test is a non-parametric test based on ranks. This analysis found that the medians from the two periods are the same, at a 95% confidence level.

The details associated with these statistical analyses of Hinckley Reservoir inflow are provided in Appendix F.

Precipitation Evaluation

Landreth and Gibson, 1921, provides as Diagram I, a graph of average total monthly precipitation (in inches) and the range of total monthly precipitation (maximum and minimum) for the years 1909 to 1918 for a single precipitation gaging station located within the Hinckley reservoir watershed at Hoffmeister. Monthly averages for 1909 to 1918 were taken from this diagram. The Hoffmeister gage is no longer in existence, but the National Oceanographic and Atmospheric Administration (NOAA) does provide a nearly continuous 45 year precipitation record for this gage that extends from 1920 to 1965 (NOAA, 2007). Monthly averages for 1920 to 1965 were calculated from the daily precipitation data taken from NOAA.

Table 4 – Monthly Average Precipitation (in inches) for Hoffmeister, NY

Month	1909-1918	1920-1965
January	4.60	3.83
February	4.10	3.37
March	3.70	4.30
April	3.10	4.27
May	4.70	4.37
June	3.90	4.37
July	3.80	4.90
August	4.40	4.31
September	4.90	4.69
October	5.10	4.48
November	3.90	4.61
December	3.20	4.24
Total	**49.4**	**51.74**

The monthly averages for the period 1909 through 1918 and the sum of the monthly averages were compared to the monthly averages and the sum of monthly averages for the 45 year period from 1920 through 1965. This comparison shows that overall, the total annual precipitation that occurred during the diagram development and verification period was similar to, but slightly less than, that calculated for the period 1920 through 1965.

Precipitation Evaluation - PRISM

To supplement the precipitation base evaluation based on the single gage station at Hoffmeister, a second precipitation based evaluation was completed using modern methods and tools that allows the results of multiple gaging stations located in the vicinity of the Hinckley Reservoir watershed to be considered. This evaluation uses the PRISM (Parameter-elevation Regressions on Independent Slopes Model) method. (PRISM, 2008).

The PRISM method, developed by the University of Oregon, was used to create a spatial precipitation dataset that contains monthly precipitation totals beginning in 1895 for the coterminous U.S. Precipitation data is interpolated between weather stations (including over 8000 NOAA and 600 NRCS stations) using the PRISM method, resulting in a continuous GIS (Geographic Information System) raster dataset (4km x 4km grid cells). The PRISM dataset is the USDA's official climatological database and is used extensively by NOAA's River Forecasting Centers.

There are sixty-one (61), 4 x 4km grid cells that have their centroid fall within the Hinckley Reservoir watershed. To compare the PRISM data with precipitation from the Hoffmeister gage, watershed precipitation was calculated for each month of analysis for the years 1909-1918. The table below shows that precipitation data from both sources are within 5% of each other.

Table 5 – Comparison of PRISM Hinckley Watershed Precipitation to Hoffmester Gage for Years 1909-1918

Month	PRISM	Hoffmeister
January	4.6	4.6
February	4.1	4.1
March	4.0	3.7
April	3.6	3.1
May	4.7	4.7
June	4.7	3.9
July	4.2	3.8
August	4.4	4.4
September	4.8	4.9
October	4.7	5.1
November	4.0	3.9
December	4.0	3.2
Total	**51.9**	**49.4**

FLOOD REDUCTION BENEFIT AT HINCKLEY RESERVOIR

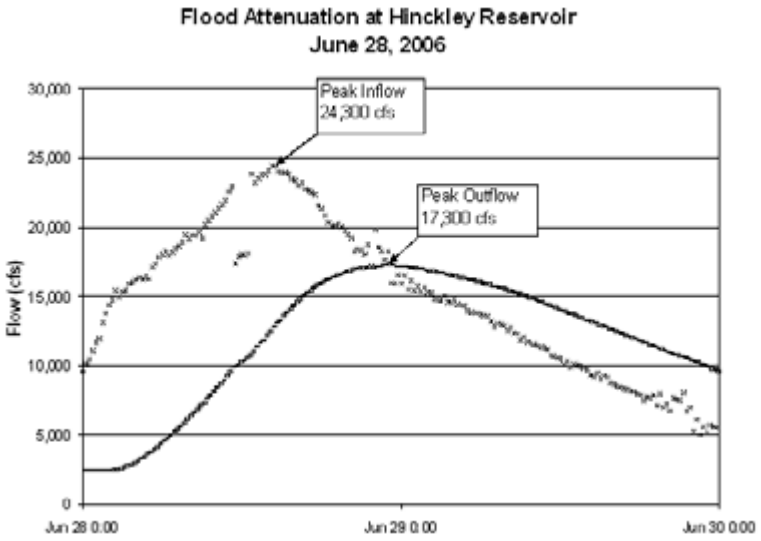

Figure 10: Flood attenuation at Hinckley Reservoir during June 2006 rain event

The existence of a dam on West Canada Creek causes a reduction in the peak flow downstream of the dam during flood events. The flood reduction benefit of Hinckley Reservoir Dam was acknowledged, but not quantified, in the *Report on Practical Operation of the Hinckley Reservoir*, by Landreth and Gibson, 1921.

Inflows and outflows from a long historical record were analyzed to determine the flood reduction potential of Hinckley Reservoir. Daily inflows into Hinckley Reservoir and outflows from the reservoir for 60 years (1938-1957, 1960-1978, 1987-2007) were analyzed. Based on daily data, the average daily flood reduction is approximately 2,000 cfsas demonstrated in Figure 10.

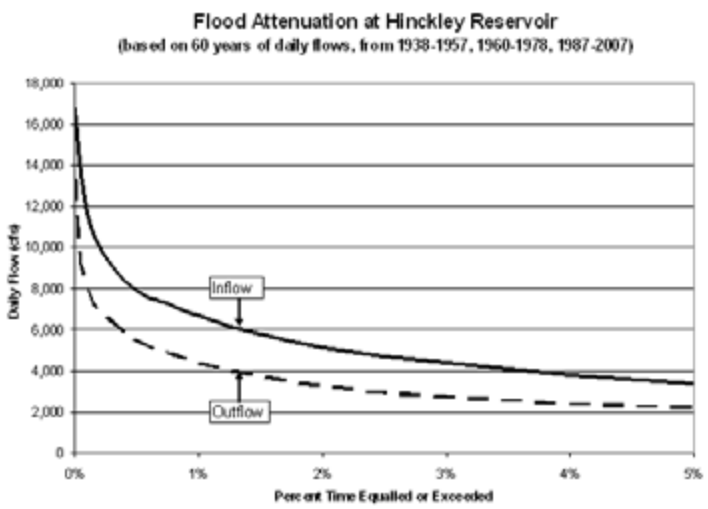

Figure 11: Flood attenuation at Hinckley Reservoir

A daily time scale is too large to capture peak flows and peak water levels resulting from floods in the Hinckley watershed. In fact, water levels can rise as much as 10 feet in a day, as shown in Figure 11. NYPA began keeping electronic hourly records since 2000 and 15 minute water levels can be captured at the USGS website. The smaller timescale records were used to determine the peak flow reduction of the June 28, 2006, flood.

The water level in Hinckley Reservoir reached a peak of 1229.85 feet on June 28, 2006 and is likely the second highest water level on record. USGS states that the record height of 1230.2 feet occurred on October 2, 1945.

The water level of Hinckley Reservoir prior to the flood on June 28, 2006, was 1223.5 feet, or 2.5 feet below the spillway crest. Even with this small storage volume available to contain the flood above elevation 1223.5 feet, the flood peak downstream was reduced from 24,300 cfs to 17,300 cfs.

FORECASTING HINCKLEY WATER LEVELS

The Northeast Rivers Forecast Center (NERFC) has a dedicated web address (www.erh.noaa.gov/er/nerfc) where the level of Hinckley Reservoir at the dam is reported in real time. Included in the Hinckley site (HIKN6) are charts which express the likely level of Hinckley up to three weeks in the future. These forecasts are provided by the National Weather Ser-vice's Advanced Hydro-logic Prediction Service.

The forecast makes use of a complex predictive model outlined in the Task Completion Report, Calibration for the Hudson River Basin, dated November 2004, and published by NOAA, November 2004. This model takes into account extensive data including historic stream flows, rainfall data, evaporation rates, snowfall, reservoir releases, MVWA water withdrawals, soil moisture content and other available data. Although the primary purpose of this forecast is to provide early warning for flooding events, it may also serve as a decision making tool in the event of extreme low water levels.

As with any model, the accuracy of the outputs is only as good as the data inputs. Some of the information used in the model (particularly stream flow and precipitation data) was extrapolated from out-of-basin or downstream measurements and not from direct in-basin measurements. The Hydrology Committee contacted NERFC to determine if enhanced monitoring might improve forecast accuracy. NERFC responded by letter dated February 1,

2008, indicating a need for improved stream gaging, precipitation and temperature measurements, as well as updated bathymetry on Hinckley Reservoir. A copy of this letter is located in Appendix D.

COMMUNICATION TRIGGERS

One of the tasks asked of the Hydrology Committee was to identify conditions in which the available data suggests it would be prudent for the interests involved with the reservoir to initiate enhanced communications and information exchange during low water events. The committee focused on conditions that would give advanced warning of possible extreme low conditions but would also avoid a trigger that produced excessive false alarms.

The committee evaluated a number of conditions. The committee recommends a communications trigger that is based on a combination of reservoir elevation related to seasonally adjusted low reservoir levels, and total reservoir inflow conditions.

Elevation Trigger

The elevation trigger is invoked when the actual reservoir elevation drops below a predefined water level that occurs at low frequency for a given date, based on the historical record. The 5, 10 and 15% non-exceedence levels were evaluated. A non-exceedance level is the probability that the reservoir will fall below a certain level. The reservoir levels evaluated to determine the elevation trigger are expected to occur 5, 10 and 15% of the time.

Inflow Trigger

The inflow trigger is invoked when the actual reservoir inflow is less than the trigger inflow. The Hydrology Committee evaluated inflows of 120,160, 200, 250, 300 and 400 cfs. These minimum inflows were further evaluated based on a 30, 60 and 90 day running averages.

The Hydrology Committee recommends that enhanced communication occur from May to December when:

- The Hinckley water level drops below the 10% historical low level; and
- The 30 day running average inflow is below 300 cfs.

Enhanced communication will occur before critical assets are affected and with ample time to make water management decisions.

The Hydrology Committee's goal was to develop a trigger that is an indicator of emerging low reservoir conditions, ensures sufficient time to protect critical assets and minimizes false positive results. To achieve this goal, various combinations of elevations and inflows were considered. Low elevations with non-exceedence probabilities of 5, 10 and 15% were considered. Running average inflows of duration 30, 60 and 90 days were compared to low inflows 120, 160, 200, 250, 300 and 400 cfs. The committee analyzed 108 triggers as part of this analysis. Each trigger combination was evaluated over approximately 60 years (1938-1957, 1960-1978, 1987-2007) of historical daily data, to determine the frequency and

duration with which enhanced communication would have occurred. These results are summarized in Figure 12, along with the Hydrology Committee's recommendation for triggers to invoke Enhanced communication (highlighted).

Many of the 108 trigger combinations could be easily eliminated from consideration. The 60 and 90 day running average inflow were eliminated because it was felt that early summer dry conditions were not addressed, whereas the 30 day running average inflow invoked some Enhanced communication from May to December. In addition, Operating Diagram releases of 400 cfs are a common occurrence. As a result, the 400 cfs trigger was removed from consideration.

Trigger 2 (Inflow)	30d						60d						90d					
Trigger 1 (Elevation)	120	160	200	250	300	400	120	160	200	250	300	400	120	160	200	250	300	400
Average Number of "YEARS" Between Enhanced Communication																		
5%	60	7	5	5	4	3	60	20	7	5	5	4	>60	12	5	5	4	
10%	20	5	4	3	3	2	30	12	5	3	3	3		10	4	3	3	
15%	9	3	2	2	2	2	20	7	4	2	2	2		7	3	2	2	
Average Number of "DAYS" of Enhanced Communication per Year																		
5%	42	20	25	32	34	35	10	20	22	30	40	42	90 day running average inflow was always greater than 160 cfs	11	26	34	36	
10%	25	22	30	36	38	41	11	19	23	32	42	48		10	27	35	45	
15%	19	20	25	38	44	46	12	15	24	32	42	46		10	26	34	41	

Figure 12: Trigger evaluation results

Flow reductions to 120, 160 or 200 cfs will reduce the decline of the reservoir levels in many cases, but may not stop the decline in all cases. In addition, flow reductions below 160 cfs may have severe consequences to the West Canada Creek fishery. For these reasons, the 120, 160 and 200 cfs trigger levels were removed from consideration.

After careful consideration, the 30 day running average inflow rate of 300 cfs was determined to be the inflow trigger necessary to provide an adequate level of assurance that reservoir uses could be maintained while Hinckley Reservoir levels decline. **Therefore, the Hydrology Committee recommends that the inflow trigger for enhanced communications occur when the 30-day running average inflow is less than 300 cfs.**

For a 30 day running average inflow less than 300 cfs, the choice of a 5, 10 or 15% low water level trigger remains. Therefore, at these three elevation triggers, the critical assets of the core agencies (Canal Corporation, MVWA and NYPA) are not yet affected. The choice becomes based largely on the frequency with which enhanced communications would occur. Enhanced communication would occur about every 4 years at the 5% level, every 3 years at the 10% level and every 2 years at the 15% level. Figure 13 shows the three elevation triggers under consideration.

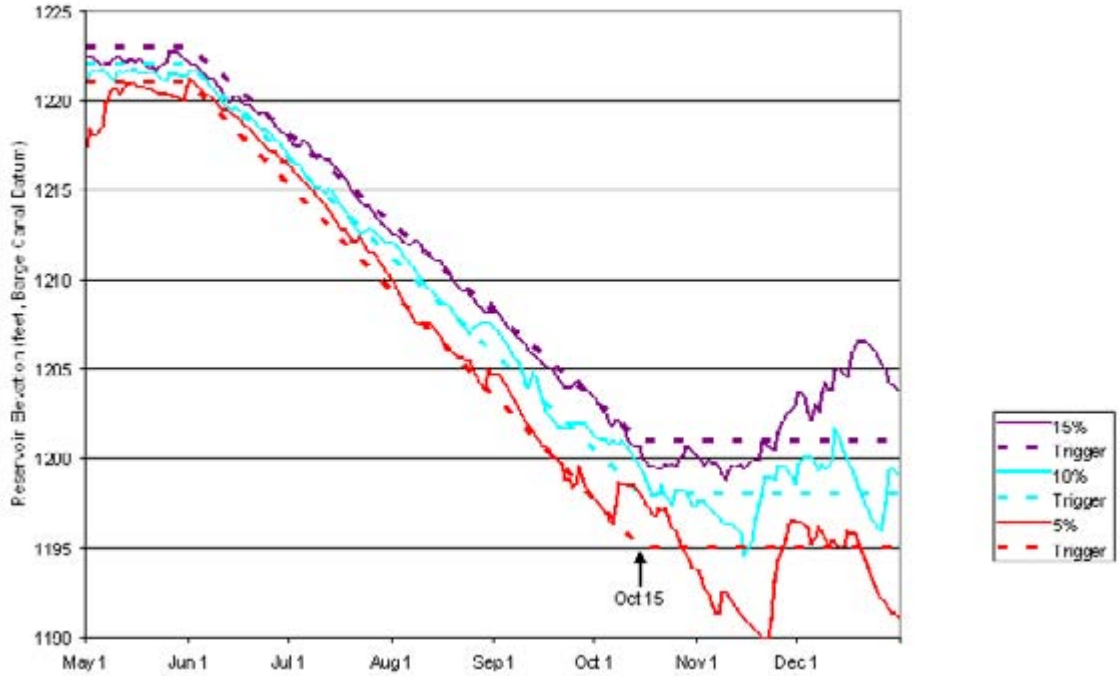

Figure 13: Proposed 5%, 10% and 15% non-exceedence elevation triggers

Therefore, the Hydrology Committee recommends that the elevation trigger for enhanced communication occurs when the elevation falls below the 10% non-exceedence level. This trigger is 1222 feet in May, 1198 feet October 15 to December 31 and linearly interpolated from 1222 feet on May 31 to 1198 feet on October 15.

Figure 12 shows that on average, enhanced communication will occur every 3 years for a duration of 38 days when the 30 day running average is less than 300 cfs and the reservoir elevation falls below the 10% non-exceedance level. The 10 lowest annual water levels, from May through December, and the earliest date enhanced communication would have begun are listed in Table 5.

Table 5: Trigger point evaluation

Year	Enhanced communication would have been triggered on	Lowest water level (May – December) ft.
1964	July 19 for 37 days September 23 for 65 days	1174.9 on November 17
1988	June 26 for 28 days August 20 for 8 days (Hinckley Dam rehabilitation)	1185.30 on December 21

Table 5: Trigger point evaluation

Year	Enhanced communication would have been triggered on	Lowest water level (May – December) ft.
1987	"No communication" (Hinckley Dam rehabilitation)	1185.88 on November 23
1952	October 23 for 8 days November 4 for 16 days	1186.80 on November 18
2007	June 26 for 116 days	1188.60 on September 26
1963	October 17 for 35 days	1189.00 on November 8
1953	October 21 for 34 days	1189.80 on November 22
1948	October 17 for 23 days	1190.10 on November 6
1944	"No communication"	1190.40 on December 31
1948	October 17 for 23 days	1190.10 on November 6

DATA GAPS

The following data gaps, which impair reservoir forecasting capabilities, have been identified. The importance of filling these gaps is dependent upon the specific data needs for a forecasting plan specifically designed for Hinckley Reservoir (see forecasting below):

- Establishment of a stream gage on Black Creek (25% of watershed) would greatly enhance the ability to forecast reservoir levels;
- Bathymetry measurements need to be undertaken to confirm the reservoir volume (See reservoir volume discussion above);
- In-basin precipitation measurements would improve the reliability of reservoir level forecast; and
- Local groundwater hydrology needs to be evaluated. Little is known relative to the local groundwater impacts on reservoir levels. The significance of these impacts should be determined.

FINDINGS AND RECOMMENDATIONS

Forecasting

The ability to predict water levels days or weeks in the future would be an important decision making tool if, as a result of low water levels in the future, deviations from the Operating Diagram are necessary. Currently, the ability to forecast Hinckley water levels is limited due to the lack of critical data such as the reservoir volume at a given depth, groundwater impact, and accurate short term influent flow measurements.

Recommendation: A forecasting plan work group consisting of stakeholders could be established to identify and prioritize specific information needs that would enhance reservoir

forecasting capability within one year. The work group should include governmental forecasting experts (NOAA, USGS) as well as major users of the reservoir (NYS Canals, MVWA, and hydroelectric interests). Certain data needs may require years of collection until they become useful for forecasting purposes. As such, it would be important to initiate collection of these data elements as soon as reasonably possible. It is, therefore, recommended that the development of the forecasting plan be give a high priority. The time table for implementing the forecasting plan should be proposed by the plan formulation team.

Specific information that a plan formulation team might consider obtaining could include, but not be limited to the following:

Hinckley Bathymetry

Knowing how much water is remaining in the reservoir at any given surface elevation is essential if the reservoir is to be utilized to the fullest extent. While reservoir volume estimates have been made in the past, the accuracy of those estimates are unknown. The unknown accuracy is of particular concern at lower reservoir levels. If sediment deposition has occurred over the years, it would have had the greatest impact on the bottom of the reservoir. A bathymetry survey of the reservoir should be considered and from this survey an up-to-date stage volume curve could be developed. This curve would enable decision makers to determine the volume of water remaining in the reservoir at any given surface water elevation. (Further discussion of Bathymetry can be found on page I-10).

Stream Inflows and Precipitation

There is currently incomplete information available on stream inflows into the reservoir and meteorological data within the basin. The lack of complete data impairs the ability to forecast reservoir levels. Establishing a monitoring system to obtain stream flow and precipitation data may enhance the reliability and accuracy of reservoir forecasting capabilities. (Further discussion of stream flows can be found on page I-6).

Groundwater Hydrology

Little is known about how groundwater impacts reservoir levels. A local hydrological evaluation should be considered to assess these impacts. (Further discussion on groundwater can be found on page I-5).

1920 Operating Diagram

The environmental conditions used in the development of the 1920 Operating Diagram are consistent with the conditions observed since its development. The removal of Gray Dam changed the physical character of the drainage basin above Hinckley Dam, however, the extent to which this removal impacted the system hydrology could not be ascertained, and should be considered as part of any future hydrological evaluation of the system. (For further discussion on the operating diagram see page I-15)

Communication Trigger

The Hydrology Committee has evaluated historic reservoir levels and is proposing that a seasonally adjusted reservoir level in combination with low influent stream flows be utilized

as a trigger to initiate discussions (i.e., enhanced communications) among involved interests to determine if reactive measures are appropriate. The committee is also recommending that these triggers be re-evaluated within 5 years. (For further discussion on communication triggers see page I-21).

Report to the Governor
By the
Hinckley Reservoir Working Group

ANNEX II

REPORT OF THE

OPERATIONS COMMITTEE

Hinckley Reservoir Working Group

April 2008

INTRODUCTION

Annex II was prepared as a Report of the Operations Committee. This committee was comprised of representatives from the following member agencies:

- Herkimer County - Dr. Gregory O'Keefe
- Mohawk Valley Water Authority - Patrick Becher, Richard Goodney
- New York Power Authority - John Osinski (chair), Richard Mueller.
- New York State Department of Environmental Conservation - Al Ash
- New York State Department of Health - John Dunn
- New York State Thruway Authority and Canal Corporation - Lawrence Frame, Steven Eidt
- Oneida County - Dan Gilmore, Joseph Robertaccio

Beginning in November, 2007, the Operations Committee communicated as necessary by conference call and meetings (in conjunction with Working Group meetings). There were frequent communications via e-mail during the development of the committee report.

OPERATIONS COMMITTEE CHARGE

The operations committee was charged by the Hinckley Reservoir Working Group to formulate recommendations for short term water resource management actions that will maintain the viability of the resource for water users of the Hinckley Reservoir. The charge of the Operations Committee is located in Appendix G.

The Committee addressed eight (8) tasks, Tasks 1-5 addressed the water uses and needs of MVWA, hydropower, fisheries, navigation, and recreation. Data prepared in response to these tasks was incorporated directly into the Working Group report.

The Operations Committee findings in response to, Task 6 (2006-7 Operations and Water Uses), Task 7 (Conclusions and Recommendations), and Task 8 (Data Gaps) are incorporated into Annex II.

Specifically, the Working Group requested that the committee complete the following tasks:

TASK 1: MVWA Water Uses and Needs
Identify water levels and reservoir storage volumes that may be considered critical for the operation of the drinking water treatment plant;

TASK 2: Hydropower Water Uses and Needs
Identify water levels and/or discharge volumes that may be considered critical for the operation of the hydropower facilities on the West Canada Creek;

TASK 3: Fishery Water Uses and Needs
Identify water levels that may be considered critical for fish maintenance;

TASK 4: Navigation Water Uses and Needs
Identify water levels and capacities that may be considered critical for canal operations;

TASK 5: Recreation Water Uses and Needs
Identify water levels that may be considered critical for recreational purposes;

TASK 6: 2006-2007 Operations and Water Uses
Review the actual operations and water uses during 2006 and 2007;

TASK 7: Conclusions and Recommendations
Develop options and recommendations for reservoir conditions that can be implemented in the short term to trigger early warning communications and consideration for operational changes; and

TASK 8: Data Gaps
Identify data or information gaps and the importance of filling those gaps.

The Operations Committee analyzed operating data from MVWA, NYPA and the New York State Canal Corporation to develop a series of recommendations geared towards short term water resource management, with a focus on sustainable reservoir management practices.

TASKS 1 through 5: Water Uses and Needs

The Operations Committee provided information to the Working Group that addresses its assigned tasks for the collection and evaluation of data related to water uses and needs under Tasks 1 through 5. The factual information obtained by the committee for these five tasks has been incorporated into Sections 3 and 4 of the Working Group's report to the Governor.

TASK 6: 2006-2007 Operations and Water Uses

2006 Operations

Rainfall in the spring was below average, followed by a major precipitation event in the Mohawk Valley in late June that resulted in considerable flooding on Hinckley Reservoir and throughout the Mohawk Valley. Hinckley Reservoir reached elevation 1229.85 ft on June 29, 2006, and the corresponding peak discharge from Hinckley Reservoir was measured at 15,700 cfs. The 2006 event exceeded the flood of record in the Mohawk River between Lock E-12 (Tribes Hill) and Lock E-17 (Little Falls). At Locks E-14 (Canajoharie), E-15 (Fort Plain) and Lock E-17 (Little Falls), the flood waters exceeded the 500-year return frequency.

FEMA made a federal disaster declaration, 1650-DR-NY, on July 1, 2006, for twelve designated counties in New York State associated with this event. More than $227 million was approved or obligated for assistance to families and individuals as well as

public entities that suffered damage from the severe storms and flooding associated with this event. This included $22 million to $25 million in damage to canal infrastructure.

At its peak, flooding forced the closure of 45 of the canal system's 57 locks along 297 miles of the 524-mile waterway and the entire canal system was not open to navigation until August 19, 2006.

Canal Corporation: During the 2006 canal navigation season, the operation of Hinckley Reservoir was generally in accordance with the 1920 Operating Diagram.

The Canal Corporation requested the following deviations from the Hinckley 1920 Operating Diagram, pursuant to the 1921 Agreement:

- April 19-24. Release increased from 900 cfs to 1400 cfs to refill the downstream Mohawk River portion of the canal in order to open the canal system for the 2006 navigation season;
- July 9-12. Release increased from 700 cfs to 1400 cfs to refill portions of the canal after repairing flood damage. Water levels in this area were low immediately following the flooding due to measures taken to pass the high flows of the event; and
- August 9-19. Release increased from 700 cfs to 1400 cfs to refill portions of the canal after repairing flood damage.

MVWA: The high water levels of 2006 posed no significant challenges to the operation of the MVWA intake or raw water transmission mains.

Water withdrawals averaged 20.1 mgd from May 2006 through September 2006.
The spring rains of 2006 caused some spikes of turbidity but the plant was able to easily adjust to the removal of particulates. Color indicative of organic carbon was also elevated during 2006 and TOC removal rates ranged from 62.5- 70.0 %, well above the required removal levels of 35-45%.

2007 Operations

The spring runoff was sufficient to fill the reservoir in 2007. The reservoir was completely full (elevation 1225 feet) as late as May 4.

Beginning in late August, there were a series of communications between NYPA, Canal Corporation, and MVWA regarding conditions in Hinckley Reservoir and application of the Operating Diagram (initial 2007 communications are provided in Appendix E). No operational changes occurred pursuant to these communications.

Canal Operations

During the 2007 canal navigation season, the operation of Hinckley Reservoir was generally in accordance with the 1920 Operating Diagram until late September.

The Canal Corporation made two requests for deviations from the 1920 Operating Diagram, pursuant to the 1921 Agreement :

- June 27-July 10: Release increased from 440 cfs to 600 cfs to maintain navigation levels along the downstream Mohawk River portion of the canal;
- August 3-August 8: Release increased from 400 cfs to 600 cfs in order to maintain navigation levels along the downstream Mohawk River portion of the canal;
- On September 18, 2007, the Canal Corporation implemented water conservation measures including scheduled hourly lockings for recreational vessels between Locks E-7 and E-20 on the Erie Canal;
- On September 24, 2007, Hinckley Reservoir reached elevation 1190 feet and the rate of discharge from Hinckley Reservoir was reduced from the 380 cfs to 250 cfs in order to conserve Hinckley Reservoir levels;
- On September 25, 2007, the rate of discharge from Hinckley Reservoir was further reduced from 250 cfs to 200 cfs to further slow the reduction in Hinckley Reservoir levels based upon coordination with SEMO;
- On September 26, 2007, Hinckley Reservoir reached elevation 1189 feet and Oneida County Executive Anthony J. Picente, Jr. declared a water emergency in Oneida County due to the extremely low water levels at Hinckley Reservoir (Appendix E of the Hinckley Reservoir Working Group Report to the Governor). Following this declaration, SEMO empanelled the state agency partners, including NYSDEC, NYSDOH, NYSDAM, the Canal Corporation and NYPA to discuss issues surrounding Hinckley Reservoir and the Oneida County water emergency declaration. It was the consensus of the group that the release of water from Hinckley Reservoir should be reduced to 120 cfs as an interim measure while Hinckley Reservoir inflow could be verified;
- On October 8, 2007, the Canal Corporation announced the closing of the New York State Canal System to recreational traffic on November 1, 2007, and to commercial traffic November 7, 2007, a week ahead of the originally scheduled closing date of November 15, 2007;
- On October 17, 2007, the release of water from Hinckley Reservoir was increased from 120 cfs to 200 cfs pursuant to further joint discussions between SEMO, NYSDEC, NYSDOH, NYPA and the Canal Corporation, since Hinckley Reservoir levels had increased to elevation 1195 feet;
- On October 22, 2007, the release of water from Hinckley Reservoir reverted back to the releases associated with the 1920 Operating Diagram since the Oneida County Water Emergency had expired and Hinckley Reservoir water levels had reached 1200 feet; and
- Within the next week, Hinckley Reservoir water levels rose an additional 20 feet and the reservoir was nearly full. This reservoir rise was a result of significant precipitation that occurred on October 23, 2007, and October 24, 2007.

MVWA Operations

MVWA water withdrawals averaged 21.7 mgd from May 2007 through September 2007. Also, the low water levels of August and September 2007 did not pose any particular treatment problems at the WTP.

Hinckley levels recovered due to rains in October and November. As a result, higher than normal turbidities (6 Nephelometric Turbidity Units [NTU]) were experienced and the TOC content of the raw water rose to a record high of 10 mg/l in November 2007. TOC removal rates averaged 60% during this time and again, the WTP produced water meeting all treatment standards.

Following the declaration of a water emergency in Oneida County by County Executive Anthony J. Picente, Jr., the following steps were taken by MVWA:

- Seventeen (17) slots approximately 3" wide by 60" long were cut in the two (2) lower plates of the MVWA intake structure at Hinckley. This action provided access to water down to an elevation of approximately 1167.5 feet from the previous low of 1174.5 feet;
- WTP staff was advised to prepare for possible 24 hr operations if necessary;
- Design, authorization and installation of a 36" supplemental raw water pumping connection to the WTP 48" raw water main was completed. Up to 12 million gallons per day (MGD) could be pumped from the West Canada Creek adjacent to the WTP using portable pumps and generators;
- Regional system tanks and reservoirs were filled to their practical maximums to maximize emergency storage;
- Water use restrictions were issued on September 26, 2007.
- State Emergency Management Office (SEMO): Hinckley elevation issues were first raised to SEMO by the Canal Corporation on September 12, 2007. A conference call to review drought conditions was conducted by SEMO on September 17, 2007. Participating agencies included the New York State Department of Agriculture and Markets (NYSDAM), the New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), New York State Canal Corporation (Canal Corporation), New York State Thruway Authority (NYSTA) and SEMO Regions 3 and 4;
- Following the September 26 emergency declaration, SEMO continued this coordination role, conducting additional calls on September 26, September 27, October 5, October 7, October 10, October 15 and October 22, 2007. Participation was expanded to include NYPA and the Office of Parks, Recreation and Historic Preservation (OPRHP). Coordination calls ended on October 22, 2007, when Hinckley operations pursuant to the 1920 Operating Diagram resumed.

Department of Environmental Conservation (NYSDEC)

On September 26, 2007, based on the apparent water crisis, the early fall season, and meteorological conditions at the time, NYSDEC judged that, with appropriate monitoring,

a temporary reduction in the release rate from Hinckley Reservoir to 120 cfs would probably not be catastrophic to the West Canada Creek fishery. After the flows were reduced to 120 cfs on September 28, 2007, NYSDEC staff continued to monitor conditions on West Canada Creek and within Hinckley Reservoir. Staff activities and findings included:

- Stream temperatures were monitored by taking grab samples at Trenton Falls and Middleville. The data immediately showed the water temperatures were fluctuating four to nine °F on a daily basis, which was about twice the rate when flows were higher (NYSDEC field data, 1996, Utica NY);
- From mid-September to mid-October, water temperatures ranged from 55 to 68°F depending on the weather;
- On October 1, 2007, the NYSDEC measured the creek at 13 locations to determine the amount of substrate that had been dewatered by the reduced flows. The dewatered zone was measured from the water's edge to the noticeable line formed on the stream bottom by the dried algae, mud and other bottom-dwelling organisms that were stranded by the receding water. A reduction of 10.8% of wetted substrate was found. Based on locations sampled, the average stream width of West Canada Creek below Trenton Falls was 177 feet, with a range of 105 to 255 feet. Dewatered substrate averaged 19.2 feet with a range of 0 to 111 feet (Table 8, Section 4 of the Hinckley Reservoir Working Group Report to the Governor). The significance of this reduction is unknown at this time. Lower water elevations also “trapped” many fish in pools stopping the normal movement of fish through the riffles in addition to making them more vulnerable to predators. As mentioned elsewhere in this report, an increase of predators was noticed by NYSDEC staff monitoring the reduced flows;
- On October 5, 2007, NYSDEC issued an emergency fishing order closing the entire creek to fishing from Trenton Falls to Herkimer. The ban prohibited fishing from that date until December 1, 2007, in the catch and release special regulations area and until April 1, 2008, for the remainder of the stream below Trenton Falls. This was the first and only time in the history of fish management on the West Canada Creek that it has been closed to fishing.

New York Power Authority

NYPA operation of the Jarvis Project was routine until September 6, when generation was suspended due to an insufficient water level in the reservoir (elevation 1195 feet). Operating diagram releases from Hinckley Reservoir to West Canada Creek continued, using the outlet valve that bypasses the Jarvis turbines.

- On September 21, 2007, NYPA contacted FERC, noting that without precipitation an elevation of 1185 ft would be reached by October 2, 2007, and 1177 ft would be reached by October 13, 2007. NYPA further stated that Operating Diagram releases below 1177 ft may be insufficient to meet their 401 Certification requiring a minimum of 160 cfs in addition to the canal requirements of 83 cfs.
- On October 23, 2007, NYPA’s Jarvis hydropower plant returned to service.

TASK 7: Conclusions and Recommendations

Legal constraints to changes in Hinckley Reservoir operations have not been addressed by the Working Group. Any change in proposed operations would have to be reviewed against these constraints.

Recommendation: A thorough review of statutory, regulatory and case law considerations affecting the operation of Hinckley Reservoir should be undertaken.

Recommendation: The criteria should be clarified for establishing "need" in the context of ECL Sections 15-0105 and 15-1503 and the NYSDEC issued 401 Water Quality Certification for the Jarvis project, which states that 'the acquisition, storage, diversion and use of water for domestic and municipal purposes shall have priority over all other uses."

Communications between various stakeholders has been constrained, and there is ongoing litigation between several stakeholders. Communications concerning basic resource information and the operational requirements of the stakeholders are essential to planning and response to water supply concerns.

Recommendation: Routine and emergency communication protocols between the involved agencies should be developed and implemented.

Recommendation: Consistent with statutory, regulatory and legal constraints, upon initiation of emergency communications, the operating agencies should discuss options for conserving and protecting Hinckley Reservoir and West Canada Creek resources, including but not limited to:

- Water conservation restrictions for the customers of MVWA;
- Suspending non-emergency water demanding maintenance and flushing (MVWA);
- Increased leak detection and repair (MVWA);
- Suspending non-emergency water demanding maintenance (Canal Corporation);
- Supplementing the Rome summit section with other canal resources; and
- Temporary departure from 1920 Operating Diagram releases.

TASK 8: Data Gaps

The following new or improved Hinckley Reservoir information or data would improve stakeholder planning, but are not critical to application of the 1920 Operating Diagram:

- Updated reservoir elevation - storage information;
- Ground water impact/contribution to reservoir elevation, including possible groundwater monitoring;
- Better inflow information; and

- The FERC licensees for both the Jarvis (#3211) and the Prospect-Trenton (#2701) projects are structured to provide a continuous minimum flow of 160 cfs in West Canada Creek downstream of the Morgan Dam canal diversion weir. Presently, there is no accurate measure of the flow diverted at Morgan Dam for canal purposes; consequently, the remaining flow in West Canada Creek is not known with precision and the required minimum flow of 160 cfs cannot be directly verified.

  Recommendation: The Operations Committee recommends that a flow measuring station be established at the Morgan Dam canal diversion to measure and document canal diversions in the feeder canal. Downstream flows in West Canada Creek could then be accurately determined as the difference between the turbine discharge at the Trenton Project minus the measured Nine Mile Feeder Canal diversion. The diversion into the Nine Mile Feeder Canal is monitored on a daily basis (on weekdays) by Erie Boulevard Hydropower through staff gage readings using theoretical discharge calculations. From 1927 through 1968 the USGS maintained a streamflow gage for the Nine Mile Feeder Canal. This gage could be put back into operation.

Report to the Governor
By the
Hinckley Reservoir Working Group

ANNEX III

REPORT OF THE

COMMUNICATIONS COMMITTEE

Hinckley Reservoir Working Group

April 2008

INTRODUCTION

Annex III was prepared as a Report of the Communications Committee. This committee was comprised of representatives from the following member agencies:

- Herkimer County, Robert Vandawalker
- Mohawk Valley Water Authority, Dick Goodney
- Mohawk Valley Water Authority, Pat Becher
- New York State Department of Health, Kristine Wheeler, NYSDOH
- New York State Department of Health, Ron Heerkens
- New York State Emergency Management Office, Thomas Fargione (Chair)
- New York State Thruway Authority, Canal Corporation, Ray Engel
- Oneida County, Dan Gilmore
- Oneida County, Sean Clive

The information in this annex provides the answers to the third charge question: an early warning system to communicate drought situations to stakeholders and facilitate communication regarding all competing needs. It outlines a process for routine information exchange between the core agencies that manage the Hinckley Reservoir and a process for providing information to all stakeholders. It also outlines a process for enhancing communications when reservoir levels and inflow volumes are low. The charge of the Communications Committee is included in Appendix G.

Beginning in November of 2007, the Communications Committee met as needed by conference call and in person (in conjunction with Working Group meetings). There were frequent communications via e-mail during the development of the committee report. An initial draft of the Communications Committees report was developed by the committee in late November, 2007.

BACKGROUND

Management of the Hinckley Reservoir and associated canal water resources is a complex and difficult task. Effective and timely communication between the agencies that operate the Hinckley Reservoir and utilize its water resources is essential for proper reservoir management. During the response to declining Hinckley Reservoir levels in the fall of 2007, communications were problematic, in part due to the complexity of the Canal systems and associated water resources, and in part because information needed by the response agencies was not always readily available and was sometimes conflicting.

To help assure effective communications, the Communications Committee prepared a strategy for consideration by the agencies that operate the Hinckley Reservoir and Dam and/or that draw water directly from the reservoir. This report presents this strategy and recommends that agencies adopt it and develop procedures necessary to incorporate the strategy into their regular operating procedures.

The core agencies that operate the reservoir, and other agencies that may be called upon to perform response functions in the event of emergency conditions, have a need for ready access to information on reservoir conditions and management. Members of the general public also have a need for reservoir related information. The following agencies, public authorities, private entities, and their customers have been identified as stakeholders with interest in the management of the Hinckley Reservoir:

- Residents and businesses of Herkimer and Oneida County;
- Downstream hydropower producers (Brookfield/Erie, Newport, Alqonquin, Trafalgar);
- Herkimer County Office of Emergency Services;
- Oneida County Department of Health;
- Oneida County Emergency Management;
- Mohawk Valley Water Authority (MVWA);
- New York Power Authority (NYPA);
- New York State Canal Corporation (Canal Corporation);
- New York State Department of Environmental Conservation (NYSDEC);
- New York State Department of Health (NYSDOH);
- New York State Emergency Management Office (SEMO); and
- New York State Office of Parks, Recreation and Historic Preservation (OPRHP).

For the purposes of this communications strategy, the core agencies involved with the daily management of the Hinckley Reservoir are:

- New York State Canal Corporation (Canal Corporation);
- New York Power Authority (NYPA); and
- Mohawk Valley Water Authority (MVWA).

The following communications strategy recognizes the needs of these many stakeholders and provides for appropriate levels of communication among stakeholders. Beyond routine communications, the strategy uses a “trigger point” to monitor reservoir conditions and invoke appropriate communications in response to changing reservoir conditions. This trigger point was developed and evaluated by the Hinckley Reservoir Working Group’s Hydrology Committee, and is adopted herein as part of the communications strategy.

The recommended communications strategy does not address nor supplant the required, regular communications between NYPA, the Canal Corporation, and the downstream hydropower producers. Communications with hydropower interests to coordinate water management and power production should continue using procedures already in place for that purpose.

COMMUNICATIONS STRATEGY

The basic communications strategy set forth and recommended herein is two tiered:

- Routine communications; and
- Enhanced communications.

The key to this strategy is the trigger point which takes into consideration reservoir inflow and water level elevation. The progression of communication protocols to be followed would be as follows:

Routine Communications → Trigger Activation → Enhanced Communications

The trigger involves an assessment of overall reservoir conditions, is based upon a combination of reservoir water level and total inflow rates, and can be calculated on a daily basis using existing information. The trigger would be activated when the following two conditions exist:

- Reservoir elevation is lower than the historical level experienced for that date 90% of the time; and
- Total inflow into the reservoir is less than 300 cubic feet per second (cfs) as calculated on a 30 day running average.

Trigger activation invokes enhanced communications and is intended to provide early notification of deteriorating reservoir conditions so that management decisions can be made that maintain the needs of all resource users to the fullest extent practical. When enhanced communication protocols are invoked, response agencies are notified and become involved.

If reservoir conditions continue to deteriorate, the enhanced communications and response agency involvement may in turn lead to adjustments to reservoir operations and release rates. It is the intent that enhanced communication protocols, once activated, would not be deactivated until normal reservoir operations are restored.

ROUTINE COMMUNICATION PROTOCOLS

The communications strategy calls for regular communication and information sharing between core agencies and with other stakeholders during routine, non-emergency reservoir conditions.

1. Communication and information sharing between the core agencies

Each core agency has information that is important to the operation of the Hinckley Reservoir and Dam. As a minimum, the following information should be shared between the core agencies at least weekly.

Mohawk Valley Water Authority

- Daily raw water demand;
- Anticipated water demands (based on season and/or weather patterns); and
- Projects or changes to operating conditions that may affect water demand.

New York Power Authority

- Daily Hinckley Reservoir conditions and calculations for trigger point assessment (daily reservoir inflow, 30 day average inflow, daily elevation with comparison to normal and 10 percentile levels);
- Daily Hinckley Reservoir release (excluding MVWA withdrawal);
- Required Operating Diagram release rates for the period;
- Daily West Canada Creek stream flow (Wilmurt gage); and
- Projects or changes to operating conditions that may affect Hinckley water level or release rates.

New York State Canal Corporation

- Rate of water diversion from the West Canada Creek at Morgan Dam to the Rome summit section;
- Conditions of Delta Reservoir (water elevations, volumes available for canal augmentation, release rates); and
- Projects or changes to operating conditions that may affect Hinckley water level or release rates.

Anticipated projects and changes to operating conditions that may impact water use or management of the reservoir should be disclosed during weekly communications so that water resource allocations are properly coordinated. These conditions include, but are not limited to, planned activities that can affect release rates or drawdown of the Hinckley Reservoir and other canal sources, such as:

- Infrastructure improvements;
- Dam and reservoir maintenance; or
- Canal maintenance.

Other operating changes and emergencies should be disclosed within 24 hours of occurrence. These changes include, but are not limited to:

- Modifications to reservoir releases for flood control;
- Infrastructure problems, such as major water main breaks, control valve failures, etc.; and
- Deviation from the Operating Diagram requirements for canal navigation purposes.

2. Information for the general public and other stakeholders

Timely information on the Hinckley Reservoir is important for the general public and other stakeholders. This communications strategy recommends that the core agencies coordinate the development of a public website where information related to the Hinckley Reservoir is posted on a regular basis; involving members of the public or their representatives may be appropriate during the development of this website. Information posted, if available, should include, but not necessarily be limited to, current reservoir elevation, normal seasonal reservoir elevations, reservoir release rates, reservoir elevation advisory information, and public contact information.

ENHANCED COMMUNICATION PROTOCOLS

When enhanced communications are invoked by the trigger, this is early indication that conditions on the Hinckley Reservoir are deteriorating and involvement by State and County response agencies may be warranted. Under enhanced communication protocols the core agencies will continue to provide the information set forth for routine communications and augment routine information exchange with additional information as follows:

Mohawk Valley Water Authority

- Status and results of water conservation measures;
- Changes affecting water demand, storage, treatment or ability to draw sufficient supply of raw water (as they occur);
- Metered finished water system demand;
- Estimates of unmetered water demand due to treatment plant operations, water main breaks, hydrant flushing, street cleaning, etc.;
- Status of leak detection and repair efforts; and
- Description of intake conditions (plate configuration, raw mains used, etc.).

New York Power Authority

- Changes to reservoir release rates (as they occur);
- Problems controlling reservoir releases (as they occur); and
- Problems meeting requirements of the Operating Diagram or Jarvis FERC license.

New York State Canal Corporation

- Releases planned that would deviate from the Operating Diagram requirements, and the basis for departure from the diagram (prior to deviation);
- Status of infrastructure readiness and use of all other canal summit sources; and
- Summary of Hinckley Reservoir conditions and canal system actions taken in response.

Within 24 hours of trigger activation and initiation of enhanced communication protocols, the Canal Corporation should notify SEMO by telephone and e-mail that trigger activation has occurred. Following the notification by the Canal Corporation, SEMO will be responsible for initiating communications with the appropriate State and County response agencies. At this time, the core agencies, in coordination with SEMO and the response agencies, should take steps to further evaluate reservoir conditions and discuss options and consequences for protecting the Hinckley Reservoir resource. This may include, but is not limited to:

- Obtaining precipitation data representing the West Canada Creek watershed;
- Obtaining long range forecast information for weather and reservoir conditions;
- Issuing water conservation restrictions for the customers of MVWA;
- Suspending non-emergency water demanding maintenance and flushing (MVWA);
- Increasing leak detection and repair (MVWA);
- Suspending non-emergency water demanding maintenance (Canal Corporation);
- Supplementing the Rome summit section with other canal resources (Canal Corporation); and
- Temporarily reducing releases below Operating Diagram requirements by consensus among the applicable parties or absent consensus, by consideration of applicable law and/or emergency declaration.

Contact Information for Notification under Enhanced communication protocols	
SEMO Response Section Current as of April 2008: Thomas Fargione (518) 292-2464 thomas.fargione@semo.state.ny.us alternate: Brian Head (Director of Operations) (518) 292-2465 brian.head@semo.state.ny.us	Deputy Director for Response Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (518) 292-2200 (24 hr)
Canal Corporation Current as of April 2008: Larry Frame (518) 436-2747 lawrence_frame@canals.state.ny.us alternate: Howard Goebel (Canal Hydrologist) (518) 471-5888 howard.goebel@canals.state.ny.us	Deputy Director for Operations and Maintenance Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (518) 436-2888 (24 hr statewide dispatch)
NY Power Authority Current as of April 2008: John Osinski (518) 433-6742 / Cell # (518) 527-6622 osinski.j@nypa.gov alternate: Rich Mueller (Senior Engineer) (315) 792-8206 rich.mueller@nypa.gov	Executive Director for Regulatory Affairs Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (315) 792-8228 (24 hr control room)
Mohawk Valley Water Authority Current as of April 2008: Pat Becher (315) 792-0310 pbecher@mvwa.us alternate: Don Weimer (Principle Engineer) (315) 792-0327 / Cell (315) 534-3766 dweimer@mvwa.us.	Executive Director Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (315) 792-0302 (24 hr)

Additional Contact Information for Enhanced Communications	
Oneida County Health Department Current as of April 2008: Nicholas DeRosa (315) 798-5064 nderosa@ocgov.net alternate: Dan Gilmore (Director, Environmental Health) (315) 798-5064 dgilmore@ocgov.net	Public Health Director Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (315) 798-5064 (24 hr answer service)
Herkimer County Emergency Services Current as of April 2008: Robert Vandawalker (315) 867-1212 rvandawalker@herkimercounty.org alternate: James Wallace (County Administrator) (315) 867-1112 jwallace@herkimercounty.org	Director, Emergency Services Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (315) 867-1212 (24 hr answer service)
NYSDOH Central Region (Syracuse) Current as of April 2008: Ron Heerkens (315) 477 - 8484 rhh01@health.state.ny.us alternate: John Strepelis (Water Supply Field Coord) (315) 477 - 8150 jxs06@health.state.ny.us	Regional Director off Environmental Health Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (315) 477-8500 (24 hr)
NYSDEC Region 6 Current as of April 2008: Judy Drabicki (315) 785-2239 jxdrabic@gw.dec.state.ny.us alternate: Skip Shoemaker (Regional Engineer) (315) 785-2513 or (315) 793-2554 ceshoema@gw.dec.state.ny.us	Director, Region 6 Name: _____ e-mail: _____ Tel 1: _____ Tel 2: (877) 457-8228 (24 hr statewide dispatch)