

CHAPTER FIVE--EMERGENCY ACTION PLAN, INSPECTIONS AND KIMBALL'S GULLY

CHAPTER FIVE

EMERGENCY ACTION PLAN AND INSPECTIONS

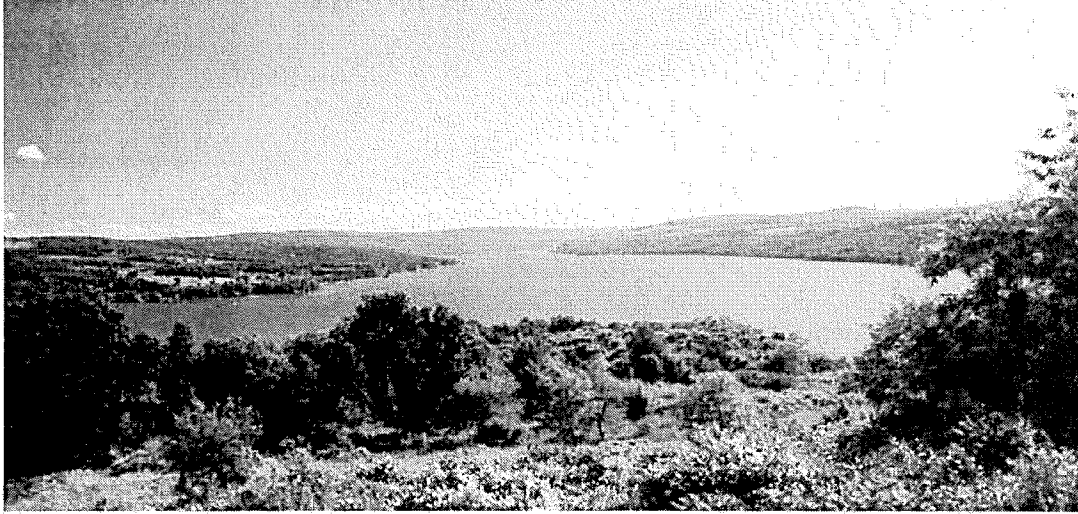
1996 NOTICE BY NYS EMERGENCY
MANAGEMENT OFFICE OF PLAN REQUIREMENTS FOR
HAZARD MITIGATION

2001-2002 NEED FOR PLAN AND
INSURANCE REQUIREMENTS

2006 THE DAM ID IS 053-0610 AND
CLASSIFIED AS HIGH HAZARD

2007 SELECTION OF ENGINEERING
COMPANY FOR INNUNDATION STUDY

2009 NYS INSPECTION OF GATES



EMERGENCY ACTION PLAN

KEUKA LAKE OUTLET DAM

Prepared for:

KEUKA LAKE OUTLET COMPACT
PENN YAN, NEW YORK

Prepared by:

Kleinschmidt Associates, PA, PC
Energy & Water Resource Consultants

APRIL 2012

DAM location 42.6558 N
77.0540 W



EMERGENCY ACTION PLAN

CONTROL COPY NUMBER _____

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KEUKA LAKE OUTLET DAM

**KEUKA LAKE OUTLET COMPACT
PENN YAN, NEW YORK**

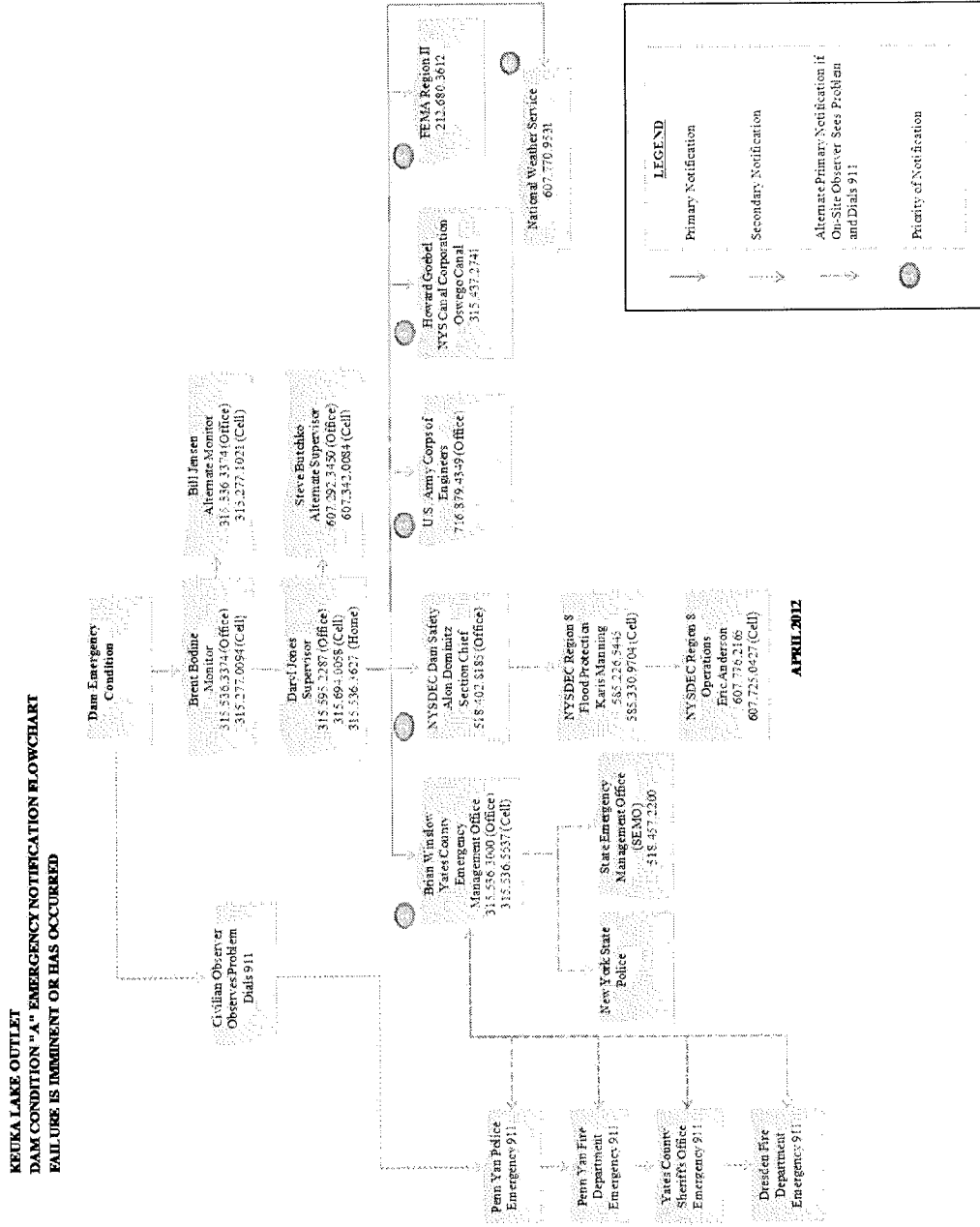
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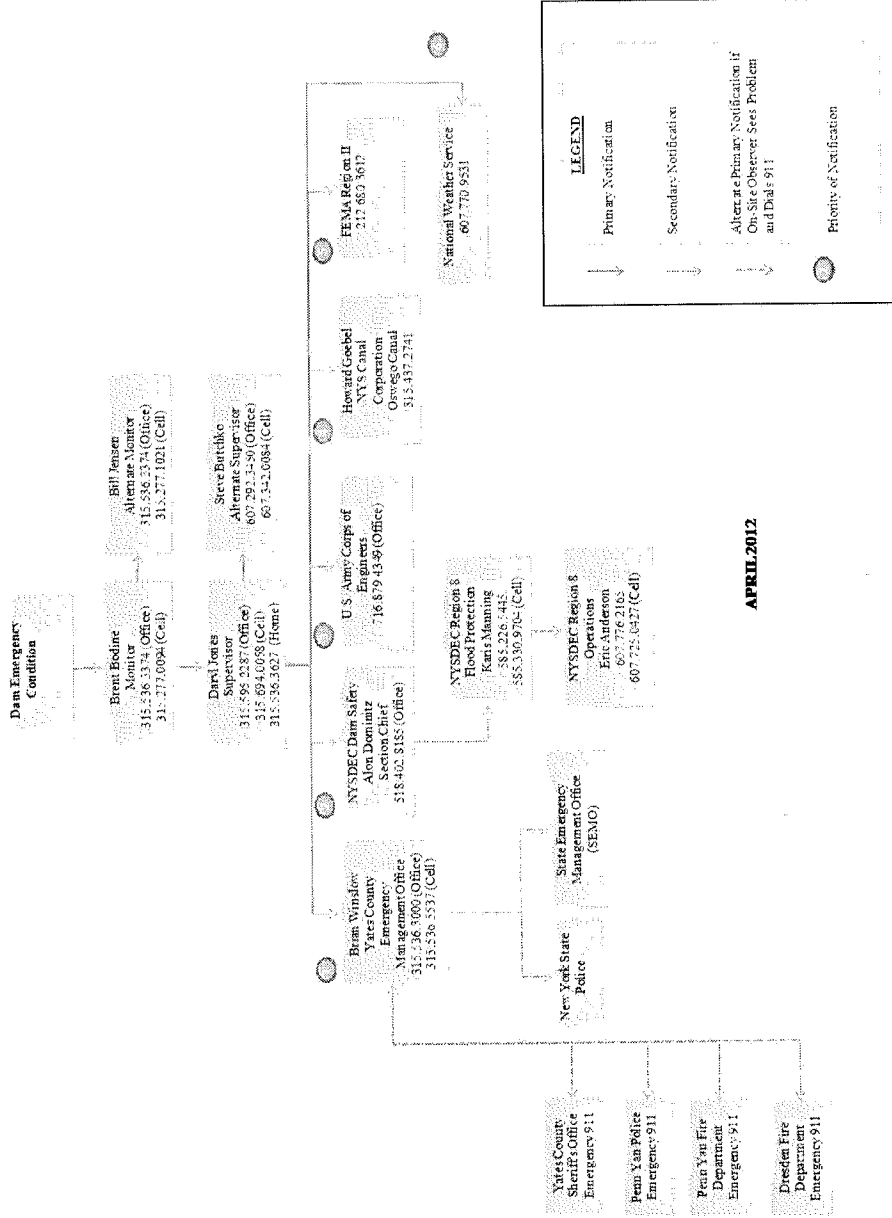
EVACUATION/NOTIFICATION FLOW CHARTS¹



¹ Placed here for quick reference -- This flowchart is also shown in Appendix C located in the back of this document.

EVACUATION/NOTIFICATION FLOW CHARTS²

**KEUKA LAKE OUTLET
 DAM CONDITION "B" EMERGENCY NOTIFICATION FLOWCHART
 POTENTIAL FAILURE SITUATION DEVELOPING/ONEMINUTE EMERGENCY
 (IF FAILURE BECOMES IMMINENT, GO TO CONDITION "A" NOTIFICATION)**



² Placed here for quick reference – This flowchart is also shown in Appendix C located in the back of this document.

1.0 NOTIFICATION FLOWCHARTS

Notification Flowcharts for Condition A and Condition B emergencies as described further in this EAP are shown in the preceding pages and in Appendix C. These flowcharts prescribe the sequence of contacts and notification to occur when implementing the respective Condition A or Condition B emergency response. These flowcharts are very similar. The primary difference is that a public entity may trigger a Condition A emergency notification by dialing 911 as will be described further below.

2.0 STATEMENT OF PURPOSE

The purpose of this Emergency Action Plan (EAP) is to safeguard the lives and reduce damage to the property of residents of Yates County living along the Keuka Lake Outlet, in the event of a breach or impending breach of the dam. The EAP should also be employed during periods of unusually high storm flows that are not expected to result in a dam failure. The inundation maps incorporated into this plan (Appendix B) are based on a dam break hazard analysis prepared by Kleinschmidt Associates for the following flooding scenarios: 1) “sunny day” dam break; and 2) dam break during flood induced condition (50% PMF).

3.0 DESCRIPTION OF PROJECT

3.1 BACKGROUND

The Keuka Lake Outlet Dam is located on Keuka Lake Outlet in the Village of Penn Yan immediately upstream from the Main Street (Route 54) Bridge. This dam controls lake levels and discharge from Keuka Lake, third largest New York Finger Lake having a gross surface area of 11,584 acres at elevation 714.0 NGDV. The dam is one mile downstream from Keuka Lake. Keuka Lake Outlet downstream of the dam flows 6.7 miles where it drains into Seneca Lake.

Keuka Lake Outlet Dam is operated as a flood control structure as a federal flood control project authorized by Section 205 of the 1948 Flood Control Act (Public Law 80-845 June 30 1948). In conjunction with the referenced federal flood control program, Keuka Lake Outlet Dam was reconstructed and upgraded in 1993 under contract with the U.S. Army Corps of Engineers (USACE). This federal flood control project was transferred to the State of New York where it comes under the jurisdiction of the New York State Department of Environmental Conservation (NYSDEC).

Accordingly, the regulation of Keuka Lake and the operation and maintenance of Keuka Lake Outlet Dam are subject to the “Keuka Lake Outlet Reservoir Regulation Manual – April 1997” and the “Operation and Maintenance Manual Keuka Lake Flood Protection Project – January 1998” issued by the USACE in April 1997 and January 1998, respectively. These comprehensive manuals set forth the operational procedures and organizational framework for ensuring flood protection around Keuka Lake. In light of this unique circumstance, this Emergency Action Plan has been tailored to adopt and integrate the already established monitoring, operations and communications procedures in the existing Reservoir Regulation Manual pertaining to the dam.

Pursuant to the “Keuka Lake Outlet Reservoir Regulation Manual – April 1997”, the Keuka Lake Outlet Structure is operated by the Village of Penn Yan. In 1990 the towns and villages that border Keuka Lake formed the “Keuka Lake Outlet Compact” (KLOC). The Towns include Penn Yan, Jerusalem, Pultney, Barrington, Hammondsport, Milo, Wayne, and Urbana. KLOC is

responsible for controlling lake level, channel maintenance (from the Outlet control Structure to Keuka Lake), and maintaining and managing the control structure. KLOC is governed by a Board of Directors, composed of eight members who represent the six towns and two villages.

The KLOC appointed the Village of Penn Yan as the control structure manager. The Village of Penn Yan in turn appointed the Penn Yan Municipal Utilities Operations Supervisor as the Manager. The Manager oversees the day-to-day operation and maintenance of the outlet control structure.

3.2 GENERAL DESCRIPTION OF DAM COMPONENTS

The following general descriptions apply to the dam structure:

The 100 foot long dam includes a 59-foot long, 10-foot high steel spillway with six gates. There is a gate on the left side of the spillway, three gates in the middle of the spillway and two gates on the right side of the spillway. The main purpose of the dam is to control the water level of Keuka Lake. The gates are operated to prevent flooding around the perimeter of the Lake, and to keep the water level up during low flow times. The lake has a drainage area of approximately 172 square miles and an approximate storage capacity of 1.2 million acre-ft.

3.3 DOWNSTREAM REACH

Maps of the downstream area (aerial photographs) are included in Appendix B. These maps show the estimated dam break inundation limits.

4.0 EMERGENCY DETECTION EVALUATION AND CLASSIFICATION

This EAP is a critical document and multiple copies should be kept readily accessible at all times.

As can be seen from the notification flowcharts, the "primary" **MONITOR**, herein referred to as the **MONITOR**, is the first line of defense in assessing a potential, impending or imminent emergency at the dam. The **MONITOR** should understand that he/she is charged with the responsibility of maintaining a general awareness of the conditions of the dam and weather conditions which may affect the conditions and water levels at the dam. In the event that the **MONITOR** is unavailable or unable to discharge his/her duties and responsibilities, then an "alternate" **MONITOR** will be required. An "alternate" **MONITOR** should be recommended by the "primary" **MONITOR** and approved by the **SUPERVISOR** upon acceptance of this EAP and so designated on the flowcharts. Throughout this EAP, reference to **MONITOR** and alternate **MONITOR** are interchangeable. If high water conditions or any deterioration in the area of the dam are observed, including seepage or bypassing at the spillway, training walls, fuse plugs or the embankment, he is responsible for the timely assessment of the severity of the situation, reporting his findings and recommendations regarding the level of EAP activation (*i.e.*, Classification A or B) directly to the **SUPERVISOR**. The **SUPERVISOR** will make the decision regarding the activation of the EAP procedures, determining the Classification of the situation and resulting implementation of the appropriate notification procedures as outlined in this EAP.

In an emergency or pre-emergency situation, the **MONITOR** will maintain the operation of the low level outlet gate making every possible effort to control the lake water level and minimize excess spillage over the dam.

During periods of non-critical weather (*i.e.*, no precipitation or significant snowmelt forecasted) the dam shall be monitored on a weekly basis. When significant rain (*i.e.*, 1/2 inch or more) or rapid snow melt is forecast, the monitoring frequency should be increased such that evaluation of rising water situations which may result in an action level pond elevation (as discussed below)

can be performed as early as possible. The **MONITOR** shall be responsible for tracking local weather forecasts, determining when potentially critical weather is likely and increasing the frequency of his dam observations accordingly.

Keuka Lake elevations are monitored pursuant to procedures described in the Keuka Lake Outlet Reservoir Regulation Manual – Section 7 – Water Control Plan (See Appendix D). As indicated in this Water Control Plan water levels are taken on a daily basis, and more frequently during times of heavy runoff, by the “damtender³” (**MONITOR**) at the Village of Penn Yan water treatment plant intake. In addition lake levels are publically viewable in real time at the website www.keukalakeassoc.org/keuka_lake_level.php.

There are three conditions considered by this EAP that define the state of emergency or potential emergency situations which could occur at the dam. The determination as to the classification of the situation at the dam and to initiate the necessary notifications accordingly shall be in accordance with the guidelines outlined below.

Declaration of an emergency can be a very controversial decision. The issue should not be debated too long. An early decision and declaration is critical to maximize available response time.

4.1 ASSUMED FAILURE SCENARIOS AND EMERGENCY CLASSIFICATIONS

Two dam failure scenarios have been assumed for this EAP: 1) “Sunny Day” failure; and 2) Flood induced (50% PMF) dam failure. The “Sunny Day” dam failure scenario assumes that an average inflow condition based on 2 cubic feet per second (cfs) per square mile of drainage area, or 364 cfs, exists just prior to failure. The Keuka Lake Outlet dam is not constructed of earth embankment materials that would support the assumption that incipient dam failure to be a flood elevation associated with earthen structure overtopping. As mentioned previously, the dam was redesigned and reconstructed by the U.S. Army Corps of Engineers in 1994 so the assumption in

³ The “damtender” originally referred to in Appendix D is currently referred to as the “gatekeeper” or the Director of Public Works, village of Penn Yan.

preparing this EAP is that the stability of the dam meets with the USACE high standards that would render a flood induced failure to be highly improbable.

There is no exact criterion for predicting or remotely detecting a “Sunny Day” dam failure at Keuka Lake Outlet dam. Given the expansive volume of Keuka Lake monitored lake level drop from a “Sunny Day” failure would not be perceptible until many hours or days after a breach has occurred. Only direct visual observation will confirm a “Sunny Day” failure.

The Keuka Lake Outlet dam is periodically inspected by the USACE and the NYSDEC Dam Safety personnel and any conditions affecting the safety of the dam would be flagged by these agencies and remedial measures or stepped up monitoring of a condition causing concern would be required. The observed progression of a deteriorating condition of a flood gate or dam structure or the occurrence of an earth quake in the vicinity of the dam or unusually high ice build-up upstream of the dam should be cause for the **MONITOR** to implement frequent daily visual inspection of the dam in order to ensure timely observation of an actual dam failure condition.

For the development of the dam failure inundation maps shown in Appendix B the flood induced dam failure scenario modeled by Kleinschmidt Associates, assumes that a flood equating to one-half the Probable Maximum Flood (PMF) is occurring at the time of dam failure. 50% PMF is the criteria set forth in the New York State Department of Environmental Conservation dam safety guidelines defining the “Spillway Design Flood” (SDF) for Class “C” high hazard dams. No PMF appeared to have been previously developed for the Keuka Lake Outlet Dam. Therefore, in order to simulate the one-half PMF dam failure scenario, Kleinschmidt Associates adopted PMF hydrographic data for the Keuka Lake sub-basin derived from a PMF analysis Kleinschmidt Associates previously analyzed for the Seneca Falls dam.

4.2 DAM FAILURE INUNDATION AREAS

The dam failure inundation areas for the above described “Sunny Day” and 50% PMF scenarios are shown in maps included in [Appendix B](#). The peak non-breach stage versus the peak breach stage flood levels are tabulated along with the incremental difference in breach related incremental inundation are tabulated for various cross sections shown on the maps. The maximum inundation caused by the “Sunny Day” breach is 2.1 feet; however, the peak breach flow and inundation levels are below flood stage well within the channel capacity of the stream (USACE assumed a channel capacity of 1,000 cfs in the Regulation Manual).

The maximum incremental inundation pertaining to the 50% PMF dam failure scenario is 0.8 feet shown at several cross sections in the [Appendix B](#) inundation maps. This incremental dam failure impact is not significant nor is the dam failure impact from a “Sunny Day” breach that would be within the channel capacity of the Keuka Lake Outlet stream. Therefore, this EAP has been tailored to adopt a two condition approach that will function around monitoring and flood control procedures set forth in the aforementioned “Keuka Lake Outlet Reservoir Regulation Manual – April 1997” and the “Operation and Maintenance Manual Keuka Lake Flood Protection Project – January 1998” as pertains to natural flood scenarios.

For the purpose of this EAP, three emergency classifications have been considered for the long-term operation of the dam taking into consideration the inundation hazard areas pertaining to the foregoing dam failure scenarios. The two classifications are:

- Condition A: Failure has occurred
- Condition B: Non-Failure Emergency Condition warranting stepped up monitoring and stand-by alerts
- Non-Flood Emergency

The definition of these conditions follows.

4.3 CONDITION A: FAILURE IS IMMINENT OR HAS OCCURRED

This condition applies to an actual structural failure of the dam. For the purpose of the EAP, “failure” shall mean physical failure of one of the control gates or impounding structures at the dam has been visually confirmed by direct observation by the MONITOR or his alternate. Because the dam is constructed with concrete and steel materials failure by erosion due to overtopping of earth embankment structures is not an appropriate imminent failure condition pertaining to the Keuka Outlet Dam. For the purpose of this EAP, imminent failure will be assumed when a water surface elevation at the dam of 718.9 feet (estimated for 50% PMF flood level) has been observed.

Generally, Condition A should convey the impression that "time has run out" with respect to the failure of the dam. This is a situation where a failure either has occurred, is occurring, or the assumed imminent failure elevation of 718.9 has been monitored. Once the **MONITOR** determines that either of these conditions exist, the "failure is imminent" or “failure has occurred" warning should be issued. Emergency management agencies, for evacuation purposes, should conservatively interpret the phrase "failure is imminent" to mean that the dam is failing. It should not be assumed that there is any time lag between “failure is imminent” and a “failure has occurred." Therefore, "failure is imminent" and “failure has occurred" should conservatively be interpreted as essentially the same condition for evacuation purposes.

4.4 CONDITION B: NON-FAILURE EMERGENCY CONDITION WARRANTING STEPPED UP MONITORING AND STAND-BY ALERTS

As described earlier, the Keuka Lake Outlet Dam is operated as a flood control structure regulated and maintained in accordance with respective procedures set forth in the “Keuka Lake Outlet Reservoir Regulation Manual – April 1997” and the “Operation and Maintenance Manual Keuka Lake Flood Protection Project – January 1998”, respectively. Therefore, pursuant to these current manuals as will be described below, Condition B non-failure flood emergency condition monitoring is already integrated into procedures currently practiced by the Penn Yan Municipal Utilities Operations Supervisor (KLOC appointed Manager or the **MONITOR** designated in this EAP).

Appendix D is an excerpt from the above referenced Regulation Manual that describes the general flood regulation control plan for the operation of the Keuka Lake Outlet Dam. As indicated in Appendix D, flood control operations revolve around the target lake elevation 714.2 feet NGVD which is the trigger for “Flood Control Operation”. The primary focus of “Flood Control Operation” in the Regulation Manual is flood level control around Keuka Lake shoreline. The target seasonal lake elevations plotted in guide curves in the original 1997 Regulation Manual have been updated with revised curves that can be viewed at the website www.keukalakeassoc.org/keuka_lake_level.php. Therefore, the Appendix D excerpt from the Regulation Manual does not include a series of tables reflecting prescribed gate openings pertaining to maintaining lake levels relative to the original seasonally adjusted target rule curve. These details are not within the scope of this EAP and only the excerpted details that do pertain are included in Appendix D.

Although downstream flooding considerations in the Regulation Manual are secondary to lake flood protection objectives, procedures in the Regulation Manual also address potential downstream flooding scenarios. As stated in Appendix D *“There is a small tributary which may impact downstream flooding during significant rainfall events located about ¼ of a mile downstream of Cascade Mill, the tributary is located approximately at river mile 2.45 (this is just below Cross Section 8 in the Appendix B inundation maps Sheet 2 of 3). The dam operator should check this tributary during heavy precipitation. If flow in the tributary is heavy, the operator should commence further checking for downstream flooding. After topping the conservation zone (elevation 714.2) the policy will be to make releases up to channel capacity (about 1,000 cfs) or the outlet control structure’s capacity, whichever is less.”* For the purpose of this EAP, Condition B is to be implemented by the **MONITOR** whenever flows monitored pursuant to the above quoted existing Regulation Manual procedure indicate a discharge exceeding 1,000 cfs or the outlet control structure’s capacity in accordance with the existing flood control monitoring procedure just quoted. 1,000 cfs would be approximately equivalent to a 20 year flood.

Based on the above described factors triggering Condition B, Condition B warrants issuing a standby alert notice to emergency response officials noted in [the Appendix B Condition B

Notification Flow Chart. This is a situation where a failure may never occur, but emergency response officials may need to implement surveillance measures in accordance with their current emergency procedures for natural occurring flood emergencies and to maintain communications with the SUPERVISOR to track the progression of ascending flood discharge levels at the Keuka Lake Outlet Dam. Should an actual dam failure occur or an assumed imminent dam failure condition (water levels at the dam reach elevation 718.9 feet) occur triggering a Condition A alert, the Yates County Emergency Management Office and respective village and town police and fire department personnel will be instantly ready to mobilize for evacuation in the flood zone areas shown in the Appendix B inundation maps. The SUPERVISOR in evoking Condition B notification must clearly communicate that Condition B is a non-failure flood emergency so as to not prematurely implement Condition A unnecessarily triggering evacuations.

If the water continues to rise to El. 718.9, the **MONITOR** shall again contact the **SUPERVISOR**, declare a Condition A situation exists, and subsequently increase his physical observations of the dam to a minimum of every 4 hours (or more frequently, as may be deemed necessary based on the **MONITOR**'s observations). Appropriate notifications should be initiated by the **SUPERVISOR** in accordance with the outline below and the Condition B notification flowchart.

Activation of the EAP will provide an early warning to downstream areas during flood conditions or large spillway releases. Therefore, an important application of the EAP is when there is a flood occurring on the watershed system, but there may be no apparent threat to the integrity of the dam (Condition B). In this situation, natural flooding is expected or is in progress upstream from the dam site and an impending or actual release of water to downstream areas will result from unusually large spillway flows. The dam owner can provide an important public service by notifying the appropriate agencies of the expected release or passage of flood waters below the dam. While the amount of flooding may be beyond the control the dam owner, information on the amount of releases from the dam will be very helpful to the authorities in reaching decisions on the need for evacuation.

For the Keuka Lake Outlet Dam, when a non-failure emergency notification is issued, communications shall follow the Notification Flow Chart for Condition B.