

# Emergency Action Plan (EAP)

## Lake Delhi Dam

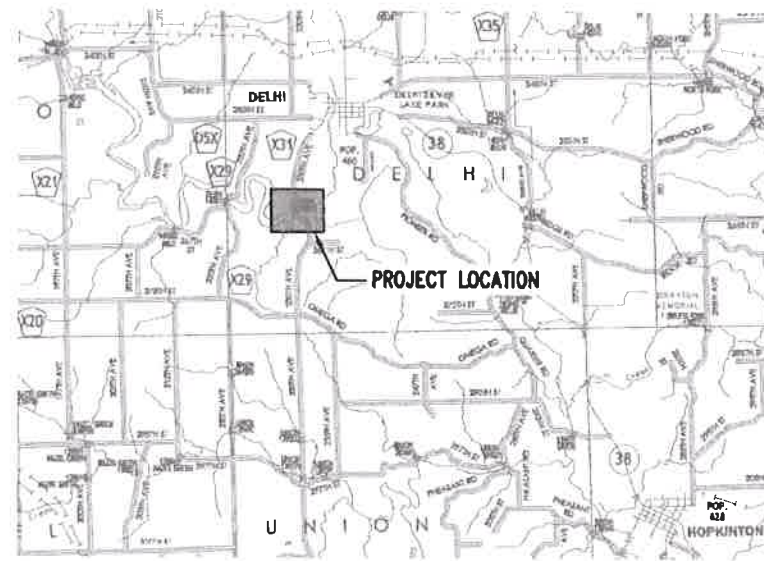
National Inventory of Dams (NID) NID-IA01297

Delaware County, Iowa

With assistance from the  
Iowa Department of Natural Resources



State Map



Location Map

Reviewed and Updated:

Owner

John A. Feltner  
Sheriff, Delaware County, Iowa

Date

6/21/2017  
Date

Copy 7 of 7

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# Basic EAP Data

**Purpose**

The purpose of this EAP is to reduce the risk of human life loss and injury and minimize property damage during an unusual or emergency event at Lake Delhi Dam.

**Potential Impacted Area**

See *Evacuation Map* tab (Appendix B–3) and *People at Risk* tab (Appendix B–4) for the locations and contact information of the following residents and businesses that may be flooded if the dam should fail and the estimated time for the flood wave to travel from the dam to these locations:

*Half of the Probable Maximum flood (resulting in a breach of the dam) would affect approximately 29 residential properties, 8 agriculture properties, 3 bridges, and 8 roads.*

**Dam Description**

Height: 49 ft	Drainage Area: 349 sq. mi
Built: 1922	Hazard Classification: Moderate
Legal Description: NE,S30,T88N,R4W	Dam Operator: Lake Delhi Combined Recreational Facility and Water Quality District
Latitude: 42°24’35.11” N	Major Property Owner: District
Longitude: 91°20’33.42” W	Dam Designer: Stanley Consultants
National Inventory of Dams No.: IA01297	
See detailed design data in <i>Appendix B</i> tab.	

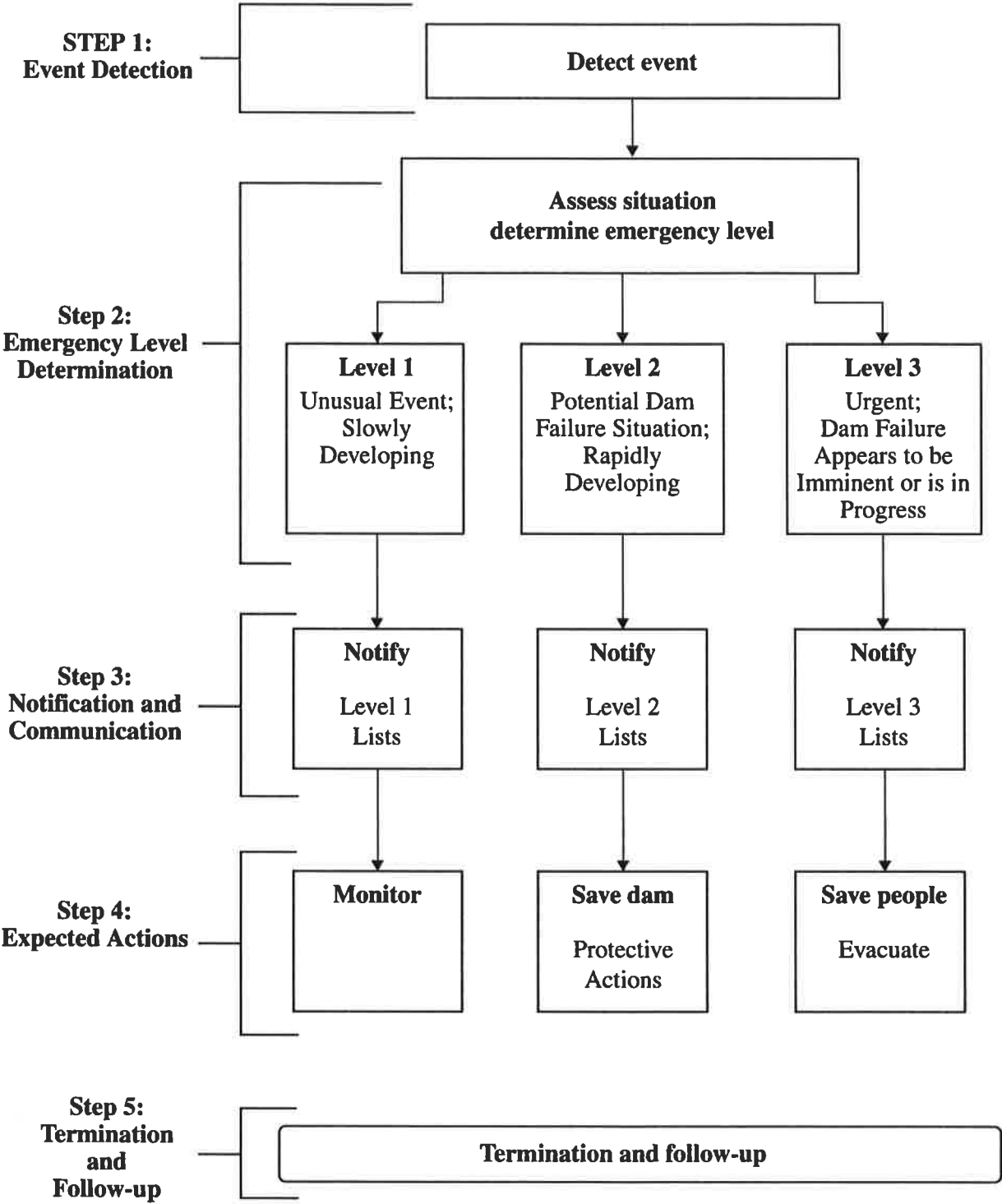
**Pre-existing conditions on this dam:** Lake Delhi Dam is located on the Maquoketa River in Delaware County, Iowa. The dam is owned, operated and maintained by the Lake Delhi Combined Recreational Facility and Water Quality District (District). During the flood event of July 23–24, 2010, the dam’s southern earthen embankment was overtopped and fully eroded and the concrete spillway gates were damaged. Floodwaters also infiltrated and seeped through a section of the northern embankment. This dam was rehabilitated in 2014-2015 which included construction of a labyrinth weir spillway on the southern embankment.

**Directions to dam** (See *Location and Vicinity Map*; Appendix B–2.)

Located on the Maquoketa River in the NE Section 30, T88N, R4W; Delaware County, Iowa.

- From (North) Delaware, IA – Head South on IA-38(3.3 miles)>Turn Right onto Franklin St/County Hwy-X31 (0.2 miles)>Turn Left onto 6<sup>th</sup> St/County Hwy X31 (1.7 miles until the Lake Delhi Dam).
- From (East) Dubuque, IA – Head West on US-20 (37.1 miles) to Delaware, IA and follow the direction from (North) Delaware, IA
- From (West) Waterloo, IA – Head East on US-20 (50.4 miles) to Delaware, IA and follow the directions from (North) Delaware, IA
- From (South) Cedar Rapids, IA – Head North on I-380 (8.8 miles)>take Exit 28 towards Toddville/Robins>Turn Right onto County Home Road/County Hwy-E34 (7.8 miles)>Turn Left onto Hwy 13/IA-13(22.7 miles)>Turn Right onto 275 St/County Hwy-D42 (7 miles)>Turn Left onto 230<sup>th</sup> Ave/County Hwy-X31 (1.6 miles until the Lake Delhi Dam)

# EAP Overview



# Roles and Responsibilities

## Dam Owner

- As soon as an emergency event is observed or reported, immediately determine the emergency level (see *Emergency Levels* tab).
  - Level 1: unusual event, slowly developing
  - Level 2: potential dam failure situation, rapidly developing
  - Level 3: dam failure appears imminent or is in progress
- Immediately notify the personnel in the order shown on the notification chart for the appropriate level (see *Notification Charts* tab).
- Provide updates of the situation to the County Emergency Management Communication Center to assist them in making timely and accurate decisions regarding warnings and evacuations.
- Provide leadership to assure the EAP is reviewed and updated annually and copies of the revised EAP are distributed to all who received copies of the original EAP.

## Incident Commander (County Sheriff)

- Serve as the primary contact person responsible for coordination of all emergency actions.
- When a Level 2 situation occurs: Prepare emergency management personnel for possible evacuations that may be needed if a Level 3 situation occurs.
- When a Level 3 situation occurs:
  - Initiate warnings and order evacuation of people at risk downstream of the dam.
  - Notify local emergency management services to carry out the evacuation of people and close roads within the evacuation area (see *Evacuation Map* tab).
- Decide when to terminate the emergency.
- Participate in an annual review and update of the EAP.

## Emergency Management Services

- Maintain communication with media.
- When a Level 2 situation occurs:
  - Prepare emergency management personnel for possible evacuations that may be needed if a Level 3 situation occurs.
  - Alert the public as appropriate.
- When a Level 3 situation occurs:
  - Alert the public.
  - Immediately close roads and evacuate people within the evacuation area (see *Evacuation Map* tab).
- Participate in an annual review and update of the EAP.

## State Dam Safety Agency (Iowa Department of Natural Resources)

- Advise the dam operator of the emergency level determination, if time permits.
- Advise the dam operator of remedial actions to take if Level 2 event occurs, if time permits.

# The Five-step EAP Process

## Step 1 Event Detection

This step describes the detection of an unusual or emergency event and provides information to assist the dam operator in determining the appropriate emergency level for the event.

Unusual or emergency events may be detected by:

- Observations at or near the dam by government personnel (local, state, or Federal), landowners, visitors to the dam, the public, or dam operations staff.
- Evaluation of instrumentation data
- Earthquakes felt or reported in the vicinity of the dam
- Forewarning of conditions that may cause an unusual event or emergency event at the dam (for example, a severe weather or flash flood forecast)

See *Guidance for Determining the Emergency Level* table for assistance in evaluating specific events to determine if they are unusual or potential emergency situations.

## Step 2 Emergency Level Determination

After an unusual or emergency event is detected or reported, the Owner or his representative is responsible for classifying the event into one of the following three emergency levels:

**Emergency Level 1—Nonemergency, unusual event, slowly developing:**

This situation is not normal but has not yet threatened the operation or structural integrity of the dam, but possibly could if it continues to develop. Iowa DNR Dam Safety staff should be contacted to investigate the situation and recommend actions to take. The condition of the dam should be closely monitored, especially during storm events, to detect any development of a potential or imminent dam failure situation. 911 should be informed if it is determined that the conditions may possibly develop into a worse condition that may require emergency actions.

**Emergency Level 2—Potential dam failure situation, rapidly developing:**

This situation may eventually lead to dam failure and flash flooding downstream, but there is not an immediate threat of dam failure. 911 should be notified of this emergency situation and placed on alert. The dam operator should closely monitor the condition of the dam and periodically report the status of the situation to the Sheriff. If the dam condition worsens and failure becomes imminent, 911 must be notified immediately of the change in the emergency level to evacuate the people at risk downstream.

If time permits, Iowa DNR Dam Safety staff should be contacted to evaluate the situation and recommend remedial actions to prevent failure of the dam. The dam operator should initiate remedial repairs (note local resources that may be available—see Appendix B–1). Time available to employ remedial actions may be hours or days.

This emergency level is also applicable when flow over the spillway has or is expected to result in flooding of downstream areas and people near the channel could be endangered. Emergency services should be on alert to initiate evacuations or road closures if the flooding increases.

**Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

This is an extremely urgent situation when a dam failure is occurring or obviously is about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. This situation is also applicable when flow through the earth spillway is causing downstream flooding of people and roads. 911 should be contacted immediately so emergency services can begin evacuations of all at-risk people and close roads as needed (see *Evacuation Map* tab).

See the following page for guidance in determining the proper emergency level for various situations.

Guidance for Determining the Emergency Level

Event	Situation	Emergency level*
High Flow Event	Spillway flow increasing and river flows forecasted to exceed 10,000 cfs	1
	Spillway flow with active downstream erosion	2
	Spillway flow that could result in flooding of people downstream if flows increase	2
	Spillway flowing with an advancing headcut that is threatening dam structure	3
	Spillway flow that is flooding people downstream	3
Embankment overtopping	Reservoir level is 2 feet below the top of the dam	2
	Water from the reservoir is near top of the dam	3
Concrete Spillway	Cracks in concrete are forming	1
	Cracks are becoming larger in a short period of time	2
	Cracks are significantly larger and are rapidly changing. Large portions of concrete are being removed.	3
Seepage	New seepage areas in or near the dam	1
	New seepage areas with cloudy discharge or increasing flow rate	2
	Seepage with discharge greater than 10 gallons per minute	3
Sinkholes	Observation of new sinkhole in reservoir area or on embankment	2
	Rapidly enlarging sinkhole	3
Embankment cracking	New cracks in the embankment greater than 1/4-inch wide without seepage	1
	Cracks in the embankment with seepage	2
	Sudden cracking of the embankment crest, slopes, abutments. and/or foundation.	3
Embankment movement	Visual movement/slippage of the embankment slope	1
	Settlement of the crest, slopes, abutment, and/or foundation that may result in breaching of the dam.	2
	Sudden or rapidly proceeding slides of the embankment slopes	3
Instruments	Instrumentation readings beyond predetermined values	1
Earthquake	Measurable earthquake felt or reported on or within 50 miles of the dam	1
	Earthquake resulting in visible damage to the dam or appurtenances	2
	Earthquake resulting in uncontrolled release of water from the dam	3
Security threat	Verified bomb threat that, if carried out, could result in damage to the dam	2
	Detonated bomb that has resulted in damage to the dam or appurtenances	3
Sabotage/ vandalism	Damage to dam or appurtenance with no impacts to the functioning of the dam	1
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam	1
	Damage to dam or appurtenances that has resulted in seepage flow	2
	Damage to dam or appurtenances that has resulted in uncontrolled water release	3

\* Emergency Level 1: Nonemergency unusual event, slowly developing

\* Emergency Level 2: Potential dam failure situation, rapidly developing

\* Emergency Level 3: Urgent; dam failure appears imminent or is in progress



### Step 3 Notification and Communication

## Notification

After the emergency level has been determined, the people on the following notification charts for the appropriate emergency level shall be notified immediately.

## Communication

**Emergency Level 1—Nonemergency, unusual event; slowly developing:**

The dam owner should contact the Iowa Department of Natural Resources Dam Safety staff. Describe the situation, and request technical assistance on next steps to take.

**Emergency Level 2—Emergency event, potential dam failure situation; rapidly developing:**

The following message may be used to help describe the emergency situation to the 911 operator or Delaware County emergency management personnel:

"This is Identify yourself; name, position.

*We have an emergency condition at Lake Delhi Dam, located 1.5 miles south of Delhi, IA.*

*We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 2.*

*We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.*

*Please prepare to evacuate the area along low-lying portions of river*

*Reference the evacuation map in your copy of the Emergency Action Plan.*

*We will advise you when the situation is resolved or if the situation gets worse.*

*I can be contacted at the following number \_\_\_\_\_ . If you cannot reach me, please call the following alternative number \_\_\_\_\_ ."*

**Emergency Level 3—Urgent event; dam failure appears imminent or is in progress:**

911 should be contacted immediately and the area evacuated (see *Evacuation Map* tab). The following actions should be taken:

1. Call 911. Be sure to say, “This is an emergency.” They will call other authorities and the media and begin the evacuation. The following message may be used to help describe the emergency situation to the 911 operator or Delaware County emergency management personnel:

*“This is an emergency. This is \_\_\_\_\_ (Identify yourself; name, position) \_\_\_\_\_.*

*Lake Delhi Dam, located 1.5 miles south of Delhi, IA is failing. The downstream area must be evacuated immediately. Repeat, Lake Delhi Dam, is failing; evacuate the area along low-lying portions of the Maquoketa River.*

*We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 3. Reference the evacuation map in your copy of the Emergency Action Plan.*

*I can be contacted at the following number \_\_\_\_\_. If you cannot reach me, please call the following alternative number \_\_\_\_\_.”*

2. Do whatever is necessary to bring people in immediate danger (anyone on the dam, downstream from the dam, boating on the reservoir, or evacuees) to safety if directed by the Sheriff.
3. Keep in frequent contact with the Sheriff, Emergency Management and emergency services to keep them up-to-date on the condition of the dam. They will tell you how you can help handle the emergency.
4. If all means of communication are lost: (1) try to find out why, (2) try to get to another radio or telephone that works, or (3) get someone else to try to re-establish communications. If these means fail, handle the immediate problems as well as you can, and periodically try to re-establish contact with the Sheriff and emergency services.

The following pre-scripted message may be used as a guide for the Sheriff, Delaware County Emergency Management and emergency services personnel to communicate the status of the emergency with the public:

*Attention: This is an emergency message from the Sheriff. Listen carefully. Your life may depend on immediate action.*

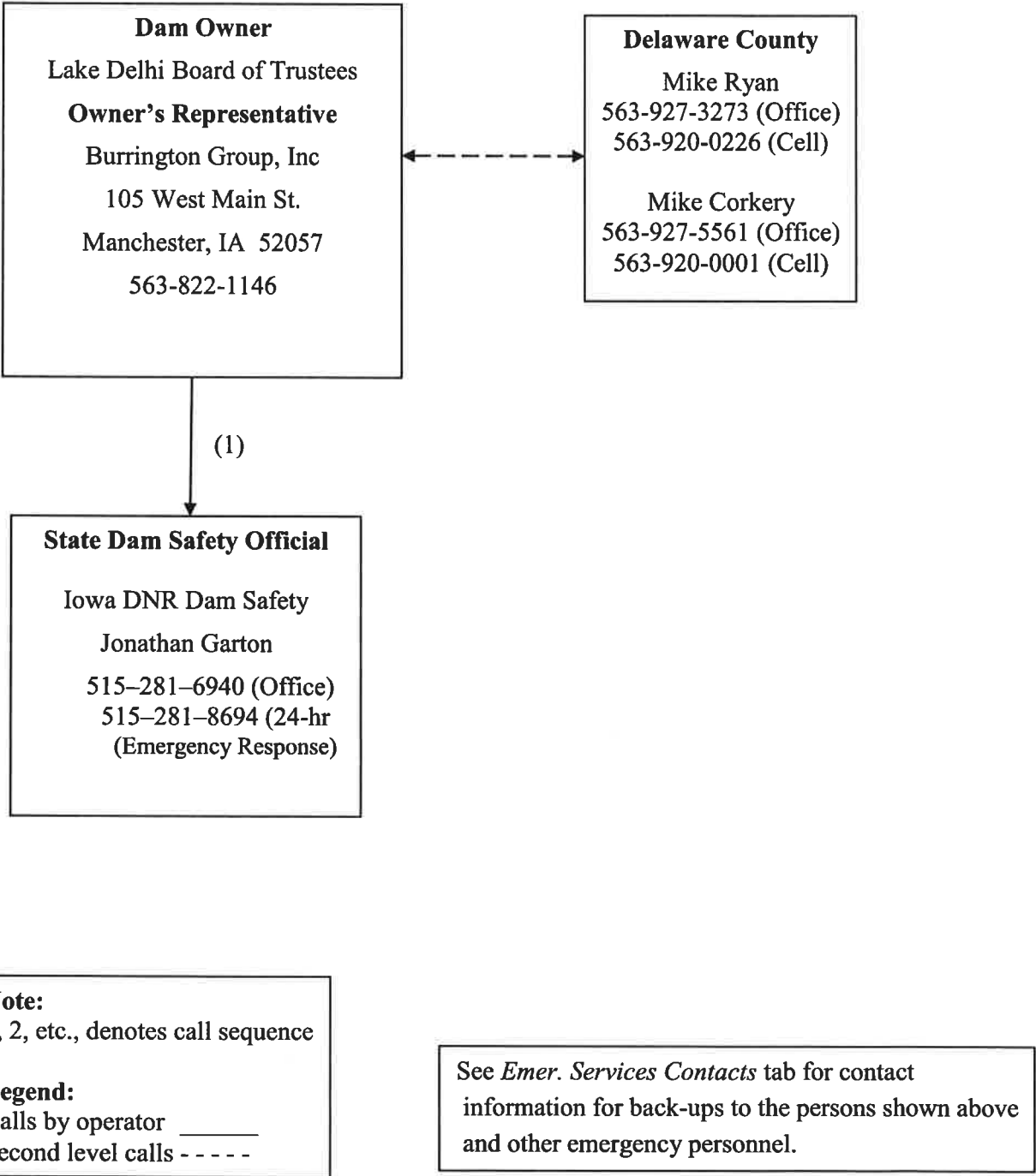
*Lake Delhi Dam, located 1.5 miles south of Delhi, IA, is failing. Repeat, Lake Delhi Dam, located 1.5 miles south of Delhi, IA, is failing.*

*If you are in or near this area, proceed immediately to high ground away from the valley. Do not travel on 230<sup>th</sup> Ave/County Road X31 across the dam or 231<sup>st</sup>; 232<sup>nd</sup> Ave; 264<sup>th</sup> St; or Quartet Road east of the dam or return to your home to recover your possessions. You cannot outrun or drive away from the flood wave. Proceed immediately to high ground away from the valley.*

Repeat message.

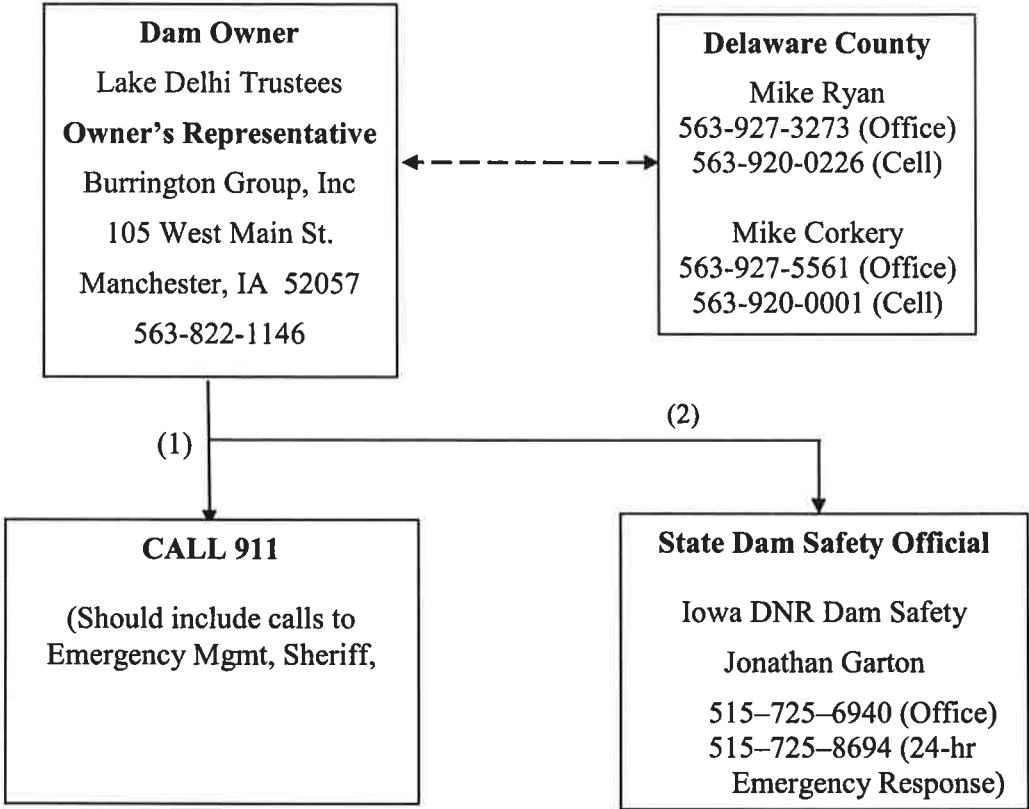
Emergency Level 1 Notifications

Nonemergency unusual event;  
slowly developing



Emergency Level 2 Notifications

Emergency event, potential dam failure situation; rapidly developing



**Note:**  
1, 2, etc., denotes call sequence

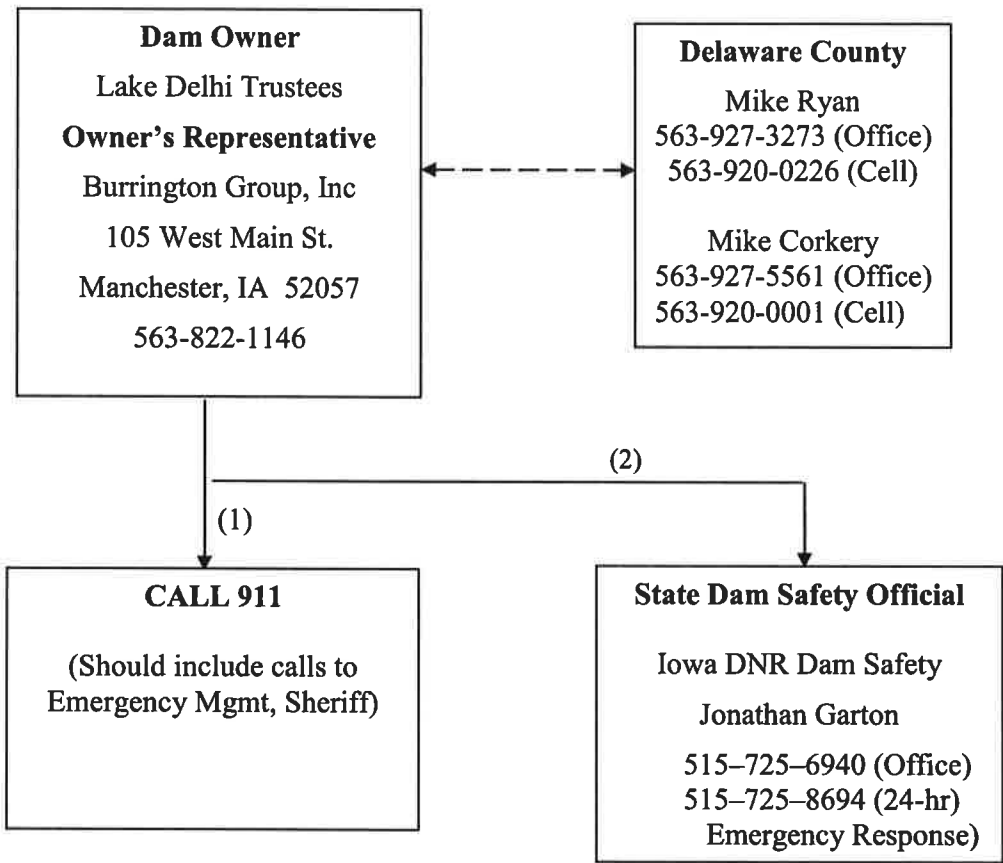
**Legend:**  
Calls by operator \_\_\_\_\_  
Second level calls - - - - -

See *Communications* tab for pre-scripted messages.

See *Emer. Services Contacts* tab for contact information for back-ups to the persons shown above and other emergency personnel.

Emergency Level 3 Notifications

Urgent event, dam failure appears imminent, or is in progress



**Note:**  
1, 2, etc., denotes call sequence

**Legend**  
Calls by owner's rep. \_\_\_\_\_  
Second level calls - - - - -

See *Communications* tab  
for pre-scripted messages.

See *Emer. Services Contacts*  
tab for contact information for  
back-ups to the persons shown  
above and other emergency  
personnel.

Emergency Services Contacts

Agency / Organization	Principal contact	Address	Office telephone number	Alternate telephone numbers
Delaware County Board of Supervisors	Jeff Madlom (Dist 1) Peter Buschmann (Dist 2) Shirley Helmrichs (Dist 3)	Delaware County Board of Supervisors Courthouse 301 East Main Street Rm 203 Manchester, IA 52057	563-927-2515	
Delaware County Road Department	Anthony T. Bardgett, PE Engineer	Delaware County Engineer 2139 Highway 38 Manchester, IA 52057-8790	563-927-3505	563-927-3135 Or 911
Delaware County Conservation District	Garlyn Glanz Director	Nature Center/Office/Shop 2379 Jefferson Rd Manchester, IA 52057	563-927-3410	911
Delaware County Sheriff	John LeClere Sheriff	304 E. Delaware Street P.O. Box 116 Manchester, Iowa 52057	563-927-3135 Daytime	911
Delaware County Emergency Management Coordinator	Mike Ryan Coordinator	12 Southside Road Earlville, IA 52041	563-927-3723	563-920-0226 (cell)
Delhi Fire Department	Joe Vorwald Chief	404 Franklin Street Delhi, IA 52223	563-608-3156	911
TV Station	KCRG Cedar Rapids/Iowa City/Dubuque KWWL Waterloo/Cedar Falls	501 2nd Ave SE Cedar Rapids, IA 52401 511 E 5 <sup>th</sup> St, Waterloo, Iowa 50703	319-398-8422  319-291-1200	319-365-9999
Radio Station	KMCH Manchester  WMT Cedar Rapids	212 East Main St  600 Old Marion Road NE Cedar Rapids, Iowa 52402	563-927-6249  319.365.0600	

## Step 4 Expected Actions

If the Communications Center or Sheriff receives a 911 call regarding observations of an unusual or emergency event at the dam, they should immediately contact the Iowa DNR Dam Safety staff. After the Dam Safety staff determines the emergency level, the following actions should be taken.

**Emergency Level 1—Nonemergency, unusual event; is slowly developing:**

- A. The Owner’s representative should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also, check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the Iowa DNR Dam Safety staff; refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.**
- B. Record all contacts that were made on the *Contact Checklist* (Appendix A–1). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A–2). Note the time of changing conditions. Document the situation with photographs and video, if possible.

**Emergency Level 2—Potential dam failure situation; rapidly developing:**

- A. The Owner’s representative should contact the sheriff to inform him/her that the EAP has been activated and if current conditions get worse, an emergency situation may require evacuation. Preparations should be made for possible road closures and evacuations.
- B. Provide updates to the Sheriff, Emergency Management and emergency services personnel to assist them in making timely decisions concerning the need for warnings, road closures, and evacuations.
- C. If time permits, the Owner’s representative should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also, check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If piping, increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the Iowa DNR Dam Safety staff; refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.**
- D. Record all contacts that were made on the *Contact Checklist* (Appendix A–1). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A–2). Note the time of changing conditions. Document the situation with photographs and video, if possible.
- E. If time permits, the following emergency remedial actions should be taken as appropriate.

**Emergency Level 2—Potential dam failure situation; rapidly developing—continued:*****Emergency remedial actions***

If time permits, the following emergency remedial actions should be considered for Emergency Level 2 conditions. Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam. Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions. Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam. Time permitting, any remedial action should be developed through consultation with the Iowa DNR Dam Safety staff. See *Resources Available* (Appendix B-1) for sources of equipment and materials to assist with remedial actions.

***Embankment overtopping***

1. If the water level in the reservoir is no longer rising, place sandbags along the low areas of the top of the dam to control wave action, reduce the likelihood of flow concentration during minor overtopping, and to safely direct more water through the spillway.
2. Cover the weak areas of the top of the dam and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.

***Seepage and sinkholes***

1. Open the low level gate (if available) to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. If the gate is damaged or blocked, pumping or siphoning may be required.

Continue lowering the water level until the seepage stops.

2. If the entrance to the seepage origination point is observed in the reservoir (possible whirlpool) and is accessible, attempt to reduce the flow by plugging the entrance with readily available materials such as hay bales, bentonite, soil or rock fill, or plastic sheeting.
3. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage.
4. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

***Embankment movement***

1. Open outlet(s) and lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the gate is damaged or blocked, pumping or siphoning may be required.
2. Repair settlement of the crest by placing sandbags or earth and rock fill materials in the damaged area to restore freeboard.
3. Stabilize slides by placing a soil or rock fill buttress against the toe of the slide.

***Earthquake***

1. Immediately conduct a general overall visual inspection of the dam.
2. Perform a field survey to determine if there has been any settlement and movement of the dam embankment, spillway, and low-level outlet works.
3. Drain the reservoir, if required.



**Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

- A. The Owner's representative shall immediately contact 911 and others shown on the notification chart.
- B. The Sheriff shall lead the efforts to carry out warnings, close roads, and evacuate people at risk downstream from the dam (see *Evacuation Map* tab).
- C. Emergency management services personnel shall alert the public and immediately evacuate at-risk people and close roads as necessary.
- D. The Owner's representative shall maintain continuous communication and provide the Sheriff with updates of the situation to assist him/her in making timely decisions concerning warnings and evacuations.
- E. The Owner's representative should record all contacts that were made on the *Contact Checklist* (Appendix A–1). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A–2). Note the time of changing conditions. Document the situation with photographs and video, if possible.
- F. Advise people monitoring the dam to follow safe procedures. Everyone should stay away from any of the failing structures or slopes and out of the potential breach inundation areas.

## Step 5 Termination

Whenever the EAP has been activated, an emergency level has been declared, all EAP actions have been completed, and the emergency is over, the EAP operations must eventually be terminated and follow-up procedures completed.

***Termination responsibilities***

The Sheriff is responsible for terminating EAP operations and relaying this decision to the Owner’s representative. It is then the responsibility of each person to notify the same group of contacts that were notified during the original event notification process to inform those people that the event has been terminated.

Prior to termination of an Emergency Level 3 event that has not caused actual dam failure, the Iowa DNR Dam Safety staff will inspect the dam or require the inspection of the dam to determine whether any damage has occurred that could potentially result in loss of life, injury, or property damage. If it is determined that conditions do not pose a threat to people or property, the Sheriff will be advised to terminate EAP operations as described above.

The Owner’s representative shall assure that the *Dam Safety Emergency Situation Report* (Appendix A–3) is completed to document the emergency event and all actions that were taken. The Owner shall distribute copies of the completed report to the Iowa DNR Dam Safety staff.

# Maintenance—EAP Review and Revision

**EAP annual review**

The Owner will review and, if needed, update the EAP at least once each year. The EAP annual review will include the following:

- Calling all contacts on the three notification charts in the EAP to verify that the phone numbers and persons in the specified positions are current. The EAP will be revised if any of the contacts have changed.
- Contacting the local law enforcement agency to verify the phone numbers and persons in the specified positions. In addition, the Owner’s representative will ask if the person contacted knows where the EAP is kept and if responsibilities described in the EAP are understood.
- Calling the locally available resources to verify that the phone numbers, addresses, and services are current.

**Revisions**

The Owner is responsible for updating the EAP document. When revisions occur, the Owner will provide the revised pages and a revised revision summary page to all the EAP document holders. The document holders are responsible for revising outdated copy of the respective document(s) whenever revisions are received. Outdated pages shall be immediately discarded to avoid any confusion with the revisions.

**EAP periodic test**

The owner will host and facilitate a periodic test of the EAP at least once every 5 years.

The periodic test will consist of a meeting, including a tabletop exercise, conducted at the Lake Delhi Recreation Association office. Attendance should include the Owner, Owner’s representative, at least one representative of the local law enforcement agency, and others with key responsibilities listed in the EAP. Other organizations that may be involved with an unusual or emergency event at the dam are encouraged to be invited to participate. Before the tabletop exercise begins, meeting participants will visit the dam during the periodic test to familiarize themselves with the dam site.

The tabletop exercise will begin with the facilitator presenting a scenario of an unusual or emergency event at the dam. The scenario will be developed prior to the exercise. Once the scenario has been presented, the participants will discuss the responses and actions that they would take to address and resolve the scenario. The narrator will control the discussion, ensuring realistic responses and developing the scenario throughout the exercise. The owner should complete an event log as they would during an actual event.

After the tabletop exercise, the five sections of the EAP will be reviewed and discussed. Mutual aid agreements and other emergency procedures can be discussed. The owner will prepare a written summary of the periodic test and revise the EAP, as necessary.

Delaware County Emergency Management will assist with exercise design and conducting the table top exercise.

Record of Holders of Control Copies

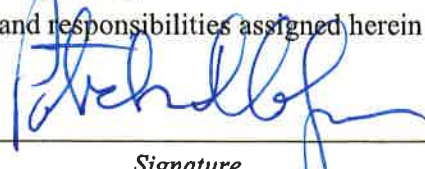
Copy Number	Organization	Person receiving copy
1	Burrington Group, Inc. 105 West Main Street Manchester, IA 52057	
2	Lake Delhi Taxing District Trustees 712A 3rd Street Delhi, IA 52223	Laurie Kramer, Secretary
3	Delaware County Sherriff's Office 304 E. Delaware Street P.O. Box 116 Manchester, Iowa 52057	John LeClere
4	Delaware County Emergency Management 208 East Main Street Manchester, IA 52057	Mike Ryan
5	Iowa Department of Natural Resources 502 E 9 <sup>th</sup> Street Des Moines, IA 50319	Jonathan Garton

# Record of Revisions and Updates Made

Revision Number	Date	Revisions made	By whom

## Concurrences

By my signature, I acknowledge that I, or my representative, have reviewed this plan and concur with the tasks and responsibilities assigned herein for me and my organization.

1.  Lake Delhi District Trustee 6-23-17  
Signature Organization Date

Printed name and title: Lake Delhi District Trustees

2.  Delaware Co. Sheriff 6/21/2017  
Signature Organization Date

Printed name and title: John LeClere, Sheriff, Delaware County

3.  Delaware Co EMT 6/19/17  
Signature Organization Date

Printed name and title: Mike Ryan, Emergency Management Coordinator, Delaware County

4.  Iowa DNR 6/19/17  
Signature Organization Date

Printed name and title: Jonathan Garton, Iowa DNR Dam Safety, Des Moines, IA

# Appendices—Forms, Glossary, Maps, and Supporting Data

## Appendix A

- A-1 Contact Checklist
- A-2 Unusual or Emergency Event Log Form
- A-3 Dam Emergency Situation Report Form
- A-4 Glossary of Terms

## Appendix B

- B-1 Resources Available
- B-2 Location and Vicinity Maps
- B-3 Evacuation Map
- B-4 Residents/Businesses/Highways at Risk
- B-5 Plan View of Dam
- B-6 Profile of Principal Spillway
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Appendix A-1  
Contact Checklist

Lake Delhi Dam

Delaware County, Delhi, IA Date \_\_\_\_\_

The following contacts should be made immediately after the emergency level is determined (see pages 6 and 7 for guidance to determine the appropriate emergency level for a specific situation). The person making the contacts should initial and record the time of the call and who was notified for each contact made. See the *Notification Charts* tab for critical contact information and *Emer. Services Contacts* tab for contact information for other possible emergency services.

Emergency Level 1 (see page 10)	Person Contacted	Time Contacted	Contacted by
____ Delaware County	_____	_____	_____
____ _____	_____	_____	_____

Emergency Level 2 (see page 11)	Person Contacted	Time Contacted	Contacted by
____ Sheriff	_____	_____	_____
____ Iowa Dept. of Natural Resources	_____	_____	_____
____ Delaware County	_____	_____	_____
____ _____	_____	_____	_____

Emergency Level 3 (see page 12)	Person Contacted	Time Contacted	Contacted by
____ Sheriff or 911	_____	_____	_____
____ Iowa Dept. of Natural Resources	_____	_____	_____
____ Delaware County	_____	_____	_____
____ _____	_____	_____	_____



Appendix A–2  
Unusual or Emergency Event Log

(To be completed during the emergency.)

Dam name: Lake Delhi Dam County: Delaware

When and how was the event detected?  
\_\_\_\_\_

Weather conditions: \_\_\_\_\_

General description of the emergency situation:  
\_\_\_\_\_  
\_\_\_\_\_

Emergency level determination: \_\_\_\_\_ Made by: \_\_\_\_\_

Actions and Event Progression

Date	Time	Action/event progression	Taken by

Report prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Appendix A-3  
Dam Emergency Situation Report

(to be completed following the termination of the emergency)

Dam name: Lake Delhi Dam

National Inventory of Dams (NID-IA) No.:1297

Dam location: 1.5 miles south of Delhi, IA      Delaware      Maquoketa River  
(City)      (County)      (Stream/River)

Date:\_\_\_\_\_ Time: \_\_\_\_\_

Weather conditions: \_\_\_\_\_

General description of emergency situation:

\_\_\_\_\_  
\_\_\_\_\_

Area(s) of dam affected:

\_\_\_\_\_  
\_\_\_\_\_

Extent of dam damage: \_\_\_\_\_

Possible cause(s): \_\_\_\_\_

Effect on dam’s operation: \_\_\_\_\_

Initial reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Maximum reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Final reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Description of area flooded downstream/damages/injuries/loss of life: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Other data and comments:

\_\_\_\_\_

Observer’s name and telephone number: \_\_\_\_\_

Report prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

# Appendix A–4

## Glossary of Terms

Abutment	That part of the valley-side against which the dam is constructed. The left and right abutments of dams are defined with the observer looking downstream from the dam.
Acre-foot	A unit of volumetric measure that would cover 1 acre to a depth of 1 foot. One acre-foot is equal to 43,560 cubic feet or 325,850 gallons.
Berm	A nearly horizontal step (bench) in the upstream or downstream sloping face of the dam.
Boil	A disruption of the soil surface due to water discharging from below the surface. Eroded soil may be deposited in the form of a ring (miniature volcano) around the disruption.
Breach	An opening through the dam that allows draining of the reservoir. A controlled breach is an intentionally constructed opening. An uncontrolled breach is an unintended failure of the dam.
Conduit	A closed channel (round pipe or rectangular box) that conveys water through, around, or under the dam.
Control section	A usually level segment in the profile of an open channel spillway above which water in the reservoir discharges through the spillway.
Cross section	A slice through the dam showing elevation vertically and direction of natural water flow horizontally from left to right. Also, a slice through a spillway showing elevation vertically and left and right sides of the spillway looking downstream.
Dam	An artificial barrier generally constructed across a watercourse for the purpose of impounding or diverting water.
Dam failure	The uncontrolled release of a dam’s impounded water.
Dam Operator	The person(s) or unit(s) of government with responsibility for the operation and maintenance of dam.
Drain, toe or foundation, or blanket	A water collection system of sand and gravel and typically pipes along the downstream portion of the dam to collect seepage and convey it to a safe outlet.
Drainage area (watershed)	The geographic area on which rainfall flows into the dam.
Drawdown	The lowering or releasing of the water level in a reservoir over time or the volume lowered or released over a particular period of time.
Emergency	A condition that develops unexpectedly, endangers the structural integrity of the dam and/or downstream human life and property, and requires immediate action.

<b>Emergency Action Plan (EAP)</b>	A formal document identifying potential emergency conditions that may occur at the dam and specifying preplanned actions to minimize potential failure of the dam or minimize failure consequences including loss of life, property damage, and environmental impacts.
<b>Evacuation map</b>	A map showing the geographic area downstream of a dam that should be evacuated if it is threatened to be flooded by a breach of the dam or other large discharge.
<b>Filter</b>	The layers of sand and gravel in a drain that allow seepage through an embankment to discharge into the drain without eroding the embankment soil.
<b>Freeboard</b>	Vertical distance between a stated water level in the reservoir and the top of dam.
<b>Gate, slide or sluice, or regulating</b>	An operable, watertight valve to manage the discharge of water from the dam.
<b>Groin</b>	The area along the intersection of the face of a dam and the abutment.
<b>Hazard classification</b>	A system that categorizes dams (high, significant, or low) according to the degree of their potential to create adverse incremental consequences such as loss of life, property damage, or environmental impacts of a failure or mis-operation of a dam.
<b>Height, dam</b>	The vertical distance between the lowest point along the top of the dam and the lowest point at the downstream toe, which usually occurs in the bed of the outlet channel.
<b>Hydrograph, inflow or outflow, or breach</b>	A graphical representation of either the flow rate or flow depth at a specific point above or below the dam over time for a specific flood occurrence.
<b>Incident Commander</b>	The highest predetermined official available at the scene of an emergency situation.
<b>Instrumentation</b>	An arrangement of devices installed into or near dams that provide measurements to evaluate the structural behavior and other performance parameters of the dam and appurtenant structures.
<b>Inundation area or map</b>	The geographic area downstream of the dam that would be flooded by a breach of the dam or other large discharge.
<b>Notification</b>	To immediately inform appropriate individuals, organizations, or agencies about a potentially emergency situation so they can initiate appropriate actions.
<b>Outlet works (principal spillway)</b>	An appurtenant structure that provides for controlled passage of normal water flows through the dam.
<b>Piping</b>	The progressive destruction of an embankment or embankment foundation by internal erosion of the soil by seepage flows.

<b>Probable Maximum Precipitation (PMP) or Flood (PMF)</b>	The theoretically greatest precipitation or resulting flood that is meteorologically feasible for a given duration over a specific drainage area at a particular geographical location.
<b>Reservoir</b>	The body of water impounded or potentially impounded by the dam.
<b>Riprap</b>	A layer of large rock, precast blocks, bags of cement, or other suitable material, generally placed on an embankment or along a watercourse as protection against wave action, erosion, or scour.
<b>Risk</b>	A measure of the likelihood and severity of an adverse consequence.
<b>Seepage</b>	The natural movement of water through the embankment, foundation, or abutments of the dam.
<b>Slide</b>	The movement of a mass of earth down a slope on the embankment or abutment of the dam.
<b>Spillway (auxiliary or emergency)</b>	The appurtenant structure that provides the controlled conveyance of excess water through, over, or around the dam.
<b>Spillway capacity</b>	The maximum discharge the spillway can safely convey with the reservoir at the maximum design elevation.
<b>Spillway crest</b>	The lowest level at which reservoir water can flow into the spillway.
<b>Tailwater</b>	The body of water immediately downstream of the embankment at a specific point in time.
<b>Toe of dam</b>	The junction of the upstream or downstream face of an embankment with the ground surface.
<b>Top of dam (crest of dam)</b>	The elevation of the uppermost surface of an embankment which can safely impound water behind the dam.

# Appendix B–1

## Resources Available

Locally available equipment, labor, and materials:  
The Delaware County Secondary Roads Department has the following resources that can be utilized in the event of an emergency:

Front-end loaders	dump trucks
Backhoes	Sand
Track hoe	
Graders	

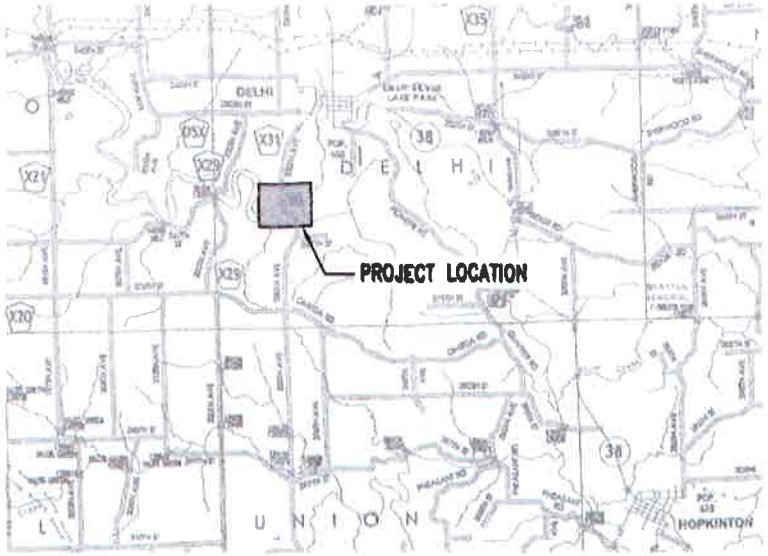
Contact the Delaware County Road Department—see *Emer. Services Contacts* tab.

Other locally available resources include:

Heavy equipment service and rental	Sand and gravel supply	Ready-mix concrete supply
Tegeler Wrecker & Crane 302 5 <sup>th</sup> Street NW Dyersville, IA 52040  563-875-8135		
Pumps	Diving contractor	Sand bags
Delaware County County Emergency Management 208 East Main Street Manchester, IA 52057  563-920-0226 (cell)		Delaware County County Emergency Management 208 E. Main Street Manchester, IA 52057  563-920-0226 (cell)

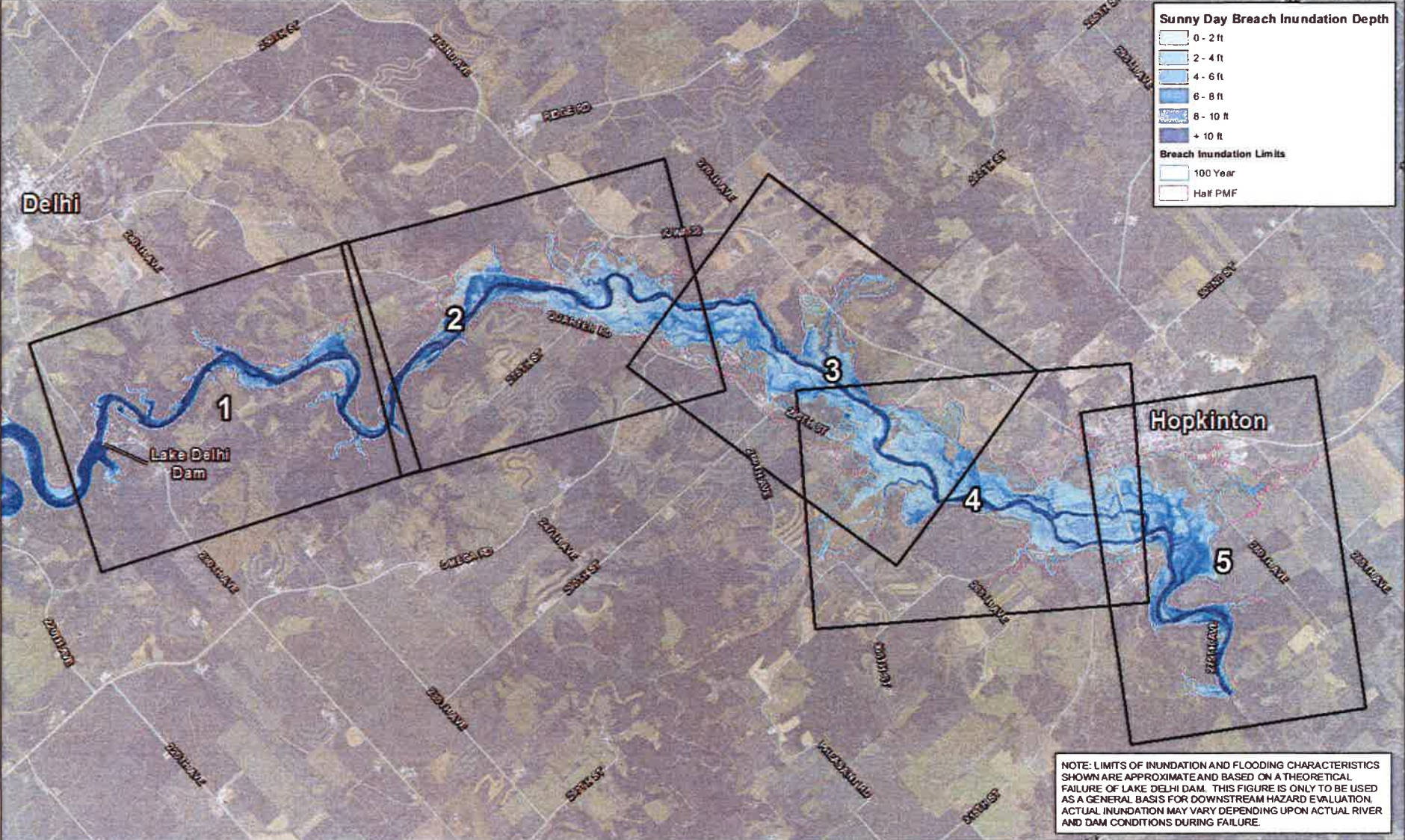
# Appendix B-2



## Location and Vicinity Maps



## Appendix B–3 Inundation Maps







0 1,500 3,000 6,000 Feet

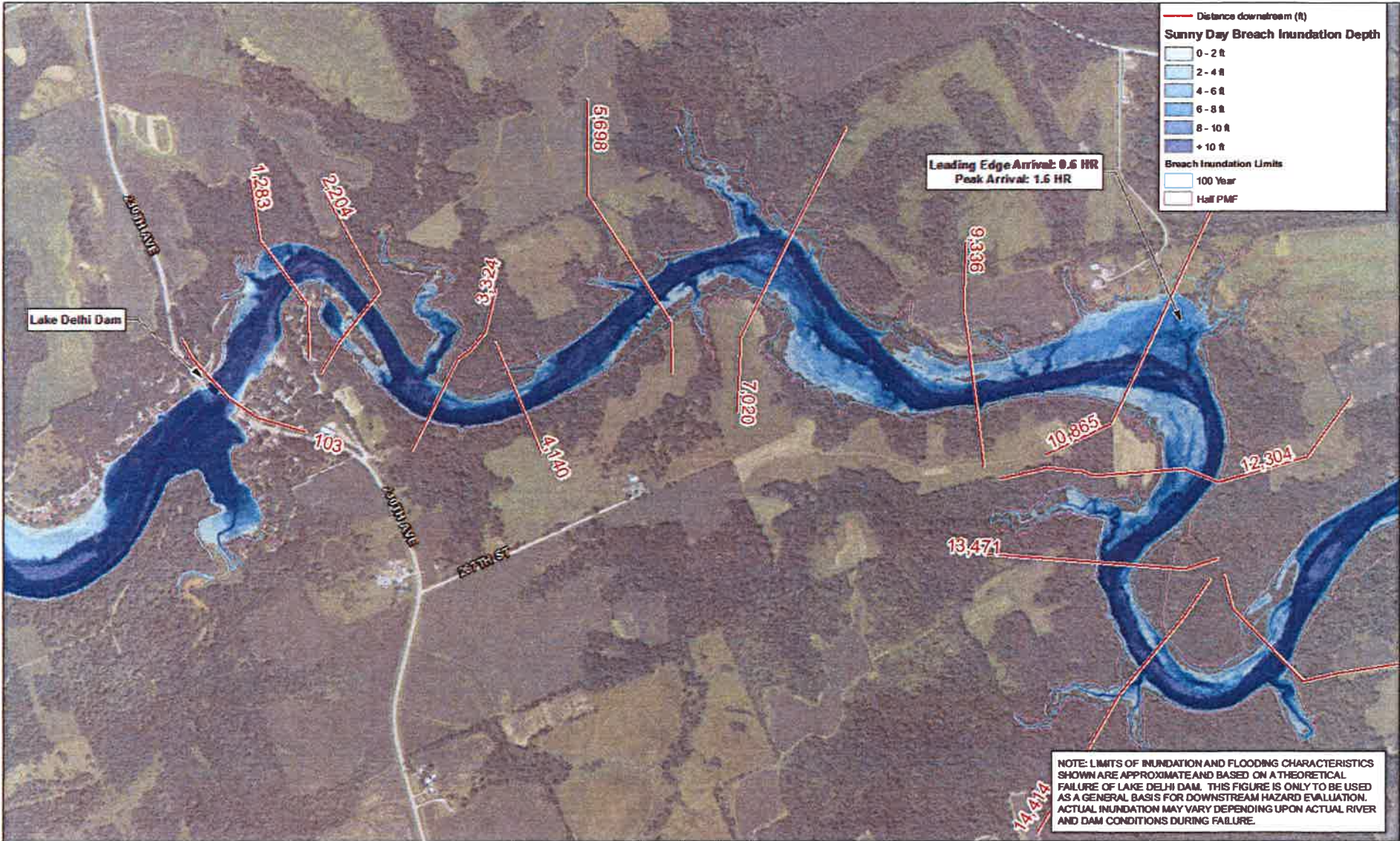
REVISIONS	DWN	CKD	APPD

DRAWN BY: H. RANSCHAU  
CHECKED BY: A. JUDD  
APPROVED BY:   
DATE: APRIL 2016

LAKE DELHI DAM  
DELAWARE COUNTY,  
IOWA

LAKE DELHI DAM EAP  
DAM BREACH INUNDATION  
INDEX MAP







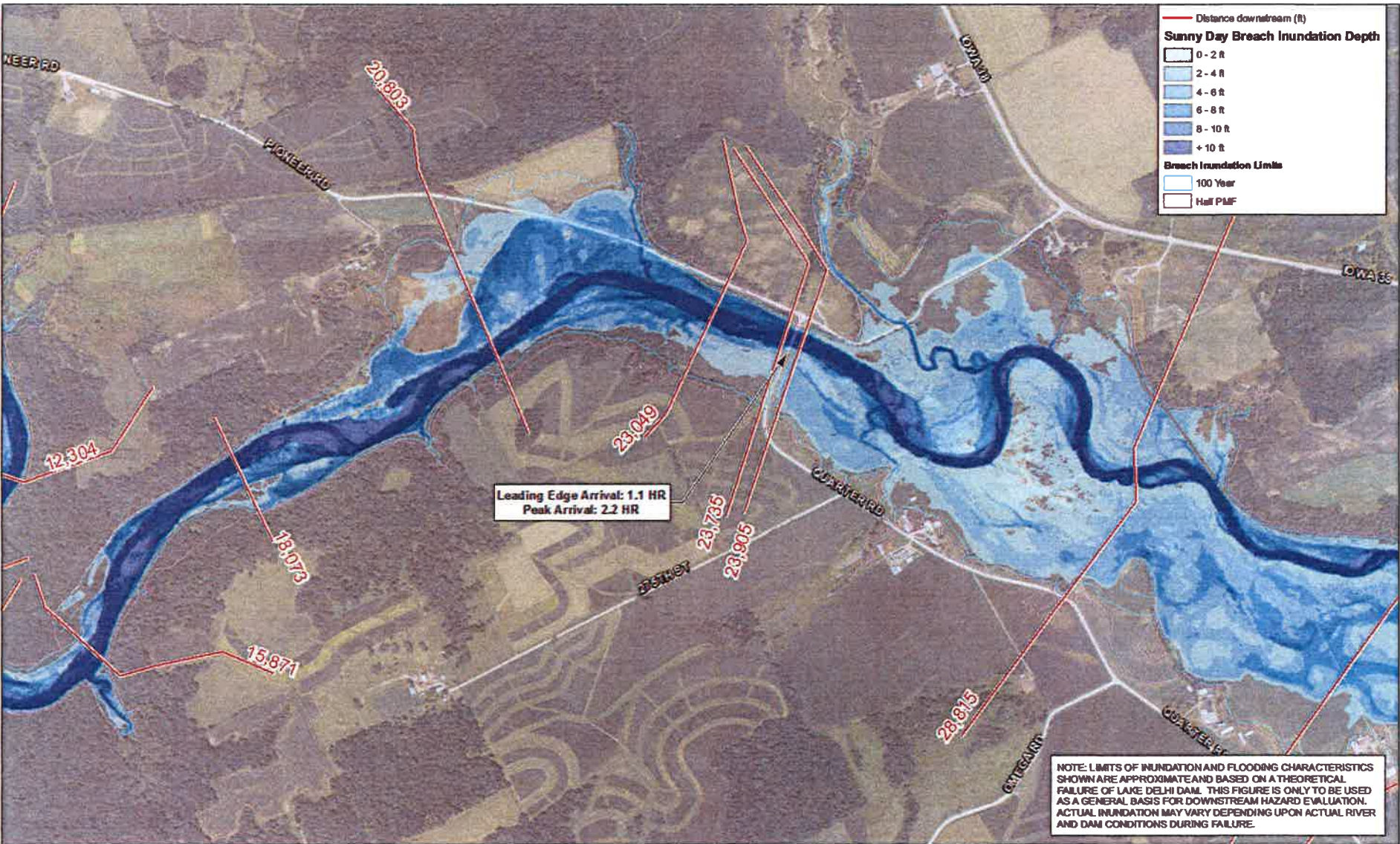
REVISIONS	OWN	CKD	APPD

DRAWN BY: H. RANSCHAU  
CHECKED BY: A. JUDD  
APPROVED BY:   
DATE: APRIL-2016

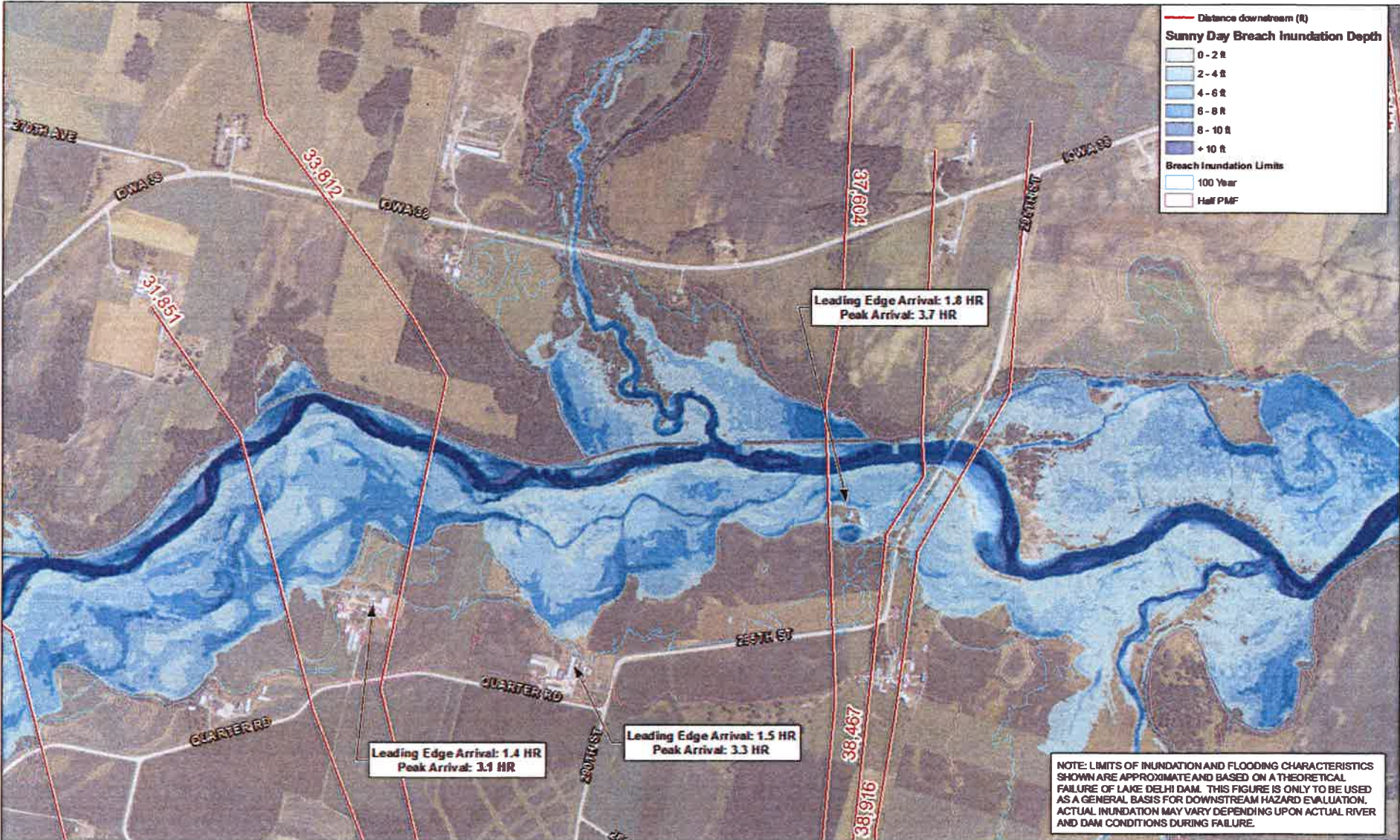
**LAKE DELHI DAM  
DELAWARE COUNTY,  
IOWA**

**LAKE DELHI DAM EAP  
DAM BREACH INUNDATION MAPS  
MAP 1 of 5**

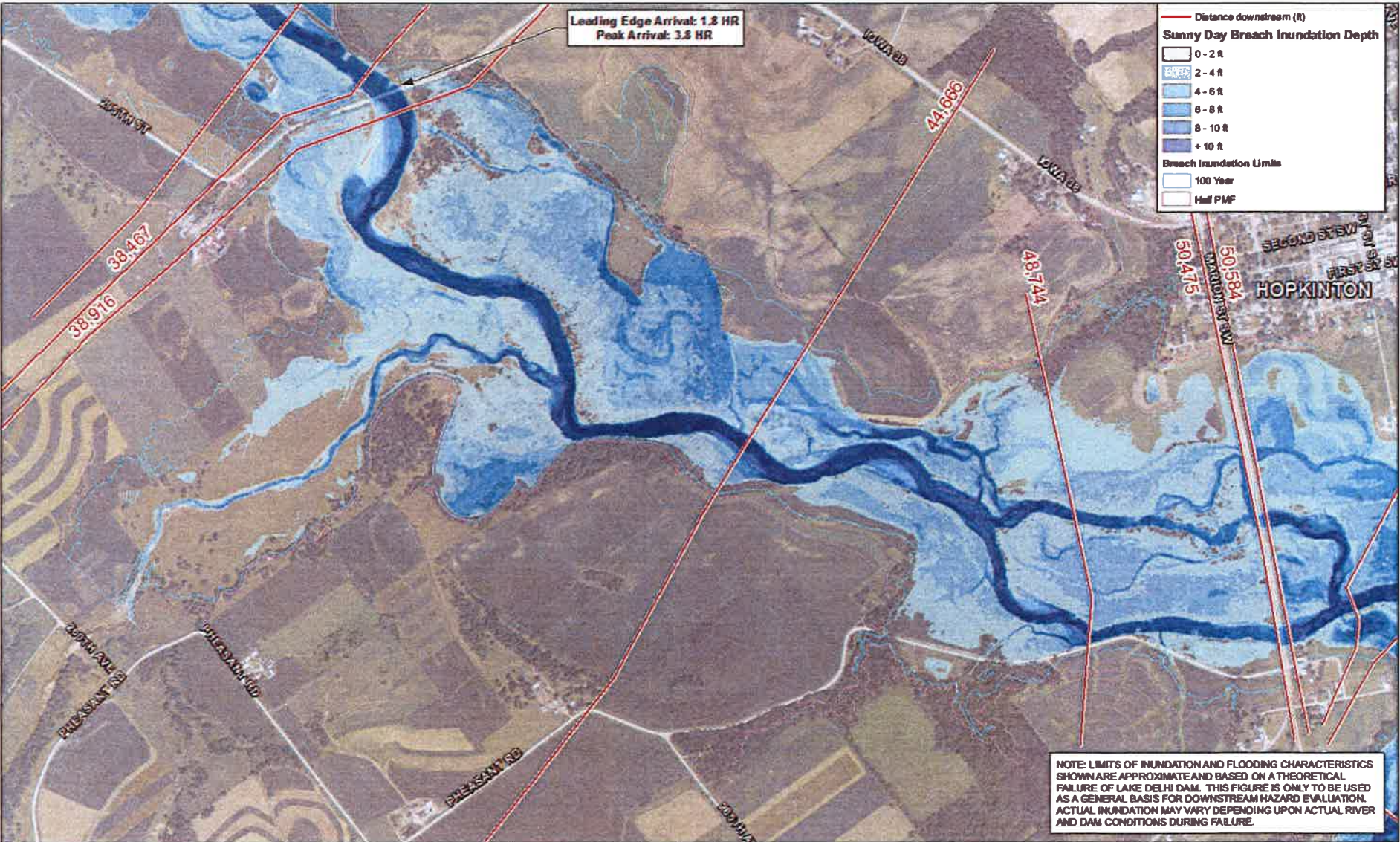














04058101620

Feet

REVISIONS	DWH	CKD	APPD

DRAWN BY: H. RANSCHAU

CHECKED BY: A. JUDD

APPROVED BY:

DATE: APRIL-2016

LAKE DELHI DAM

DELAWARE COUNTY,

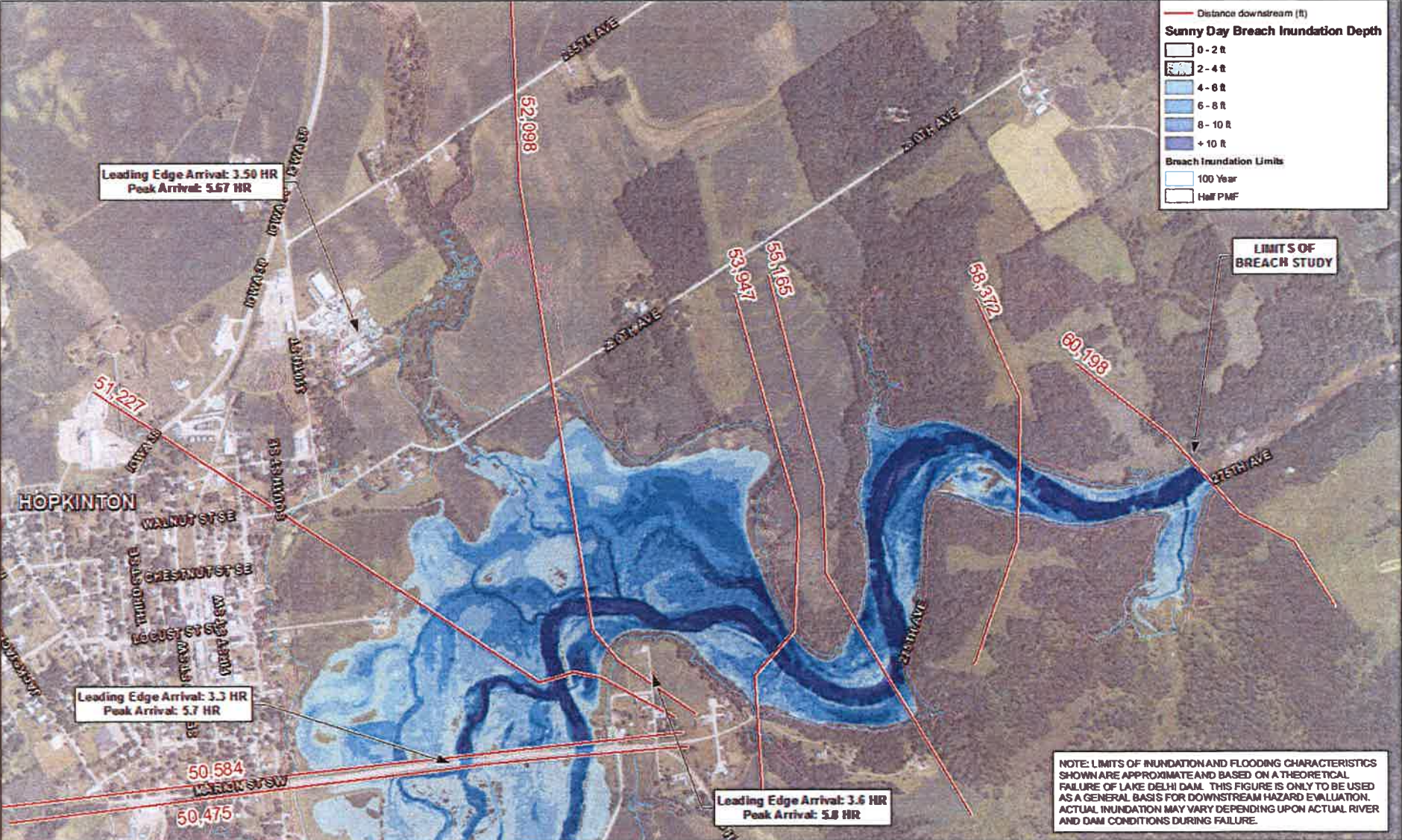
IOWA

LAKE DELHI DAM EAP

DAM BREACH INUNDATION MAPS

MAP 4 of 5







Stanley Consultants INC.



0 400 800 1,600 Feet

REVISIONS	DWN	CKD	APPD

DRAWN BY: H. RANSCHAU  
CHECKED BY: A. JUDD  
APPROVED BY:   
DATE: APRIL-2016

**LAKE DELHI DAM**  
**DELAWARE COUNTY,**  
**IOWA**

**LAKE DELHI DAM EAP**  
**DAM BREACH INUNDATION MAPS**  
**MAP 5 of 5**

Appendix B–4

Residents/Businesses/Highways at Risk

During a large flood, emergency flood notification measures will be enacted through the National Weather Service. Potential risk situations at the dam should be communicated through the standard protocol in this EAP. Breach formation during normal flow conditions will require the dam owner to initiate emergency flood notification procedures. A major flood caused by a sudden breach of the dam is estimated to inundate fifty-five properties. The estimated floodwave is less than the 100-year flood but there will be no forewarning through the National Weather Service. The depth and timing downstream of Lake Delhi Dam is shown on the Inundation Maps in Appendix B-3. A contact list for the 55 properties is provided by the following table.

PARCEL ID#	DEEDHOLDER	PHONE NUMBER	DEEDHOLDER ADDRESS	DEEDHOLDER CITY, ST, ZIP
410129901410 220350000910 370110001400 220350001230 370020002500 410129901400	Herington, Robert D	563-920-3439 Nathan Freeze 563-357-2043 Joel Kortenbach	1230 English Ln NE Apt 225	Cedar Rapids, IA52402-7465
410139901300 410249902500 410139900900 620000101700	Lehman, Larry M Co- Trustee & Asset Administrator, Inc Co- Trustee of the land trst	319-390-3512 h 319-533- 8824 c	5050 Valley View Dr	Cedar Rapids, IA52404
410259900700	McQuillen, Matthew G & Elizabeth A	319-480- 1233M 319- 462-2918 h	18936 Shooting Star Rd	Anamosa, IA52205
410259900200	Rose, Daniel D	563-926-2090 h	2708 315th St	Hopkinton, IA52237
410139900800 370140002000 410139900900	Wendt, Karl E & Mary B	563-920-5528 K	3110 State Hwy 38	Hopkinton, IA52237- 7632
620000102400 410249902800	Hansel, Curtis A		742 43rd St NE	Cedar Rapids, IA52402
220290001610 220290002000 220290002100 220290001800 220280001100 220280000730 220280001300 220330000100	Harbach, James BJ's Auto	563-920-0019	945 E Main St	Manchester, IA52057

PARCEL ID#	DEEDHOLDER	PHONE NUMBER	DEEDHOLDER ADDRESS	DEEDHOLDER CITY, ST, ZIP
220290200900 220280000800 220280000710	Delaware County, Iowa Delaware County Conservation	563-920-9685 G	2379 Jefferson Rd	Manchester, IA52057
370140001700	Herschberger, Ivan J & Leona M		2687 Pheasant Rd	Hopkinton, IA52237
220340000300 220330001900	Hargrafen, John	563-920-7289 J	2797 State Hwy 38	Hopkinton, IA52237-
410259900110 610000102600 220280001400 410249901810 220330000500	Delaware County Iowa Auditor's Office	563-920-8477 C. 563-920- 7591 S. 563- 608-1881 D.	301 E Main St	Manchester, IA52057-
220350000800 370030002200 220340001000 220350000610 220340000500	Hoeger, Joseph D	563-920-4233 J	2780 Quarter Rd	Hopkinton, IA52237-
220350000910	Herington, Robert D Freeze, Michael	563-920-5239 Mike Freeze	2689 Pioneer Rd	Delhi, IA52223
370020000500	Bradke, Russell B	563-926-2374	207 Grove St NE	Hopkinton, IA52237- 7702
220330001000 220340000400	Nurre, Robert & Ruth Revocable Trust (1/2 Int) Nurre, Robert A & Ruth A Trustees Nurre, Alan J &		502 Pinehaven Dr Apt #109	Monticello, IA52310
220340001810 220340001200	Miles, Craig A	563-920-7144	2734 Pioneer Rd	Delhi, IA52223-
370020001020	Hunt, Richard C (1/2 Int) Hunt, Jean M (1/2 Int) c/o Hunt, Richard C	563-920-5339	2888 Quarter Rd	Hopkinton, IA52237
370020000700	Goedken, Timothy John, Trustee of the Timothy John Goedken Trust	563-920-4512T 563-920-9590J	2856 Quarter Road	Hopkinton, IA52237



PARCEL ID#	DEEDHOLDER	PHONE NUMBER	DEEDHOLDER ADDRESS	DEEDHOLDER CITY, ST, ZIP
220330000300	Hutchings, Paul A as Trustees of the Paul A Hutchings Revocable Trust dated 9/23/1997	563-920-0019	3315 Windfield Ridge Dr	Burlington, NC27215
370140000710 370140002400	Gienapp, Michael & Carmon	563-920-9893 M	2653 Pheasant Rd	Hopkinton, IA52237
220350000710	Hoeger, Aloysius C.		2356 260th Ave	Delhi, IA52223-8463
370110002400 370020002110	Goedken, David J & Jolene M		364 Woodmere Dr	St Charles, MO63303-
370020001300	Meehan, Patrick J & Margaret	563-926-2573 h	2857 State Hwy 38	Hopkinton, IA52237-
410139901200 410249900100 620000102700	West, James Michael	563-419-1796 J	603 S Locust St	Edgewood, IA52042
370110002200	Larkin, Denise		303 S Water St	New Hampton, IA50659-
370110002100	Supple, Scott R & Kristine L	563-542-0078 S	2939 State Hwy 38	Hopkinton, IA52237-
370140001600	Herschberger, Ivan J & Leona M		2687 Pheasant Rd	Hopkinton, IA52237
410259900400 410190001300 620000204800	Gates, Shirley A	319-490-3487 C 319-490-3489 G	3162 280th Ave	Hopkinton, IA52237
610000101000	Mast, Wilbur M & Nancy L	319-481-7470 c	212 Cascade St SW	Hopkinton,, IA52237-
370110000600 370110001800 370100001900	Beitz, John M & Carol	319-481-0369 c 563-926-2785 h	2658 295th St	Hopkinton, IA52237-
410139901810	Parsons, Norman W	563-926-2426 h 563-608-2792 c	PO Box 363	Hopkinton, IA52237
410249901300 410249901000 410249902150 410249900950 410249900960	Dettbarn, A M & Mary K	563-926-2726 h	2725 316th St	Hopkinton, IA52237-
410019900900	Lambert Lulabel J	563-926-2594 h	3021 State Hwy 38	Hopkinton, IA52237-

PARCEL ID#	DEEDHOLDER	PHONE NUMBER	DEEDHOLDER ADDRESS	DEEDHOLDER CITY, ST, ZIP
410139902000 370140002500	Freeze, James L & Diane L	563-920-8916	2936 State Hwy 38	Hopkinton, IA52237-7701
410019900810	Stutzman, Noah H & Anna O		2870 State Hwy 38	Hopkinton, IA52237
410249902110 410249902100	Sheppard, Larry K & Margaret	563-920-8358 P 563-920-8493 L	2868 190th Ave	Manchester, IA52057
220290100420 220290100410 220290001700 220290100100	Lake Delhi Combined Recreational Facility & Water Quality District	563-920-9863 Laurie Kramer	712A Third St	Delhi, IA52223
220290000600	Freeman, Roger S		8122 N 18th Way	Phoenix, AZ85020-3964
220290001000	Wilson, Eldon J	Marilyn Wilson 563-920-6969	2650 230th Ave	Delhi, IA52223-
220290001600	Whitman, Ann McMahon & Jon Alan	563-920-2138 J	2359 267th St	Delhi, IA52223
220290200900	Holub, Thomas Joseph & Jones, Teresa Lynn & Warren, Traci Ann c/o Jones, Teresa Lynn		5050 Schwiebert Dr	Walker, IA52352
220290200800	Dempster, Beverly J		101 W Washington St	Monticello, IA52310
220290000100	Koopmann, Rose A Revocable Trust Koopmann, Rose A Trustee	563-920 1471 Larae Koopmann	21 6th St	Delhi, IA52223
220290000210	Iowa Department Of Natural Resources		Wallace State Office Bldg	Des Moines, IA50319-
220290201300 220290201410	Hawker, Larry Et Al Hawker, Robert E/Life Use		120 Park Ave S	Eldridge, IA52748-
410139901310 610000102300	Hopkinton, City Of	563-926-2921WW 563-926-2181 CH		Hopkinton, IA52237-0154
220340001800 220340001210 220340001840	Miles, Randall J & Deborah H	563-920-0263 R	2265 275th St	Delhi, IA52223-
220350000220 220340001860 220340001850	Miles, Ronald J	563-608-1060 Mark Miles	2719 Hwy 38	Hopkinton, IA52237

PARCEL ID#	DEEDHOLDER	PHONE NUMBER	DEEDHOLDER ADDRESS	DEEDHOLDER CITY, ST, ZIP
410249902160	Yonkovic, Patrick J & Lisa M		PO Box 353	Hopkinton, IA52237
220290100400	Rocky Nook Association Inc	319-429-6402 Tammy Blum	PO Box 317	Delhi, IA52223
620000105000 620000105100 620000105200 620249902130 620000104310	Lange, Ricky L & Diane K	563-926-2478 h 563-920-3991 c	308 Franklin St SW	Hopkinton, IA52237-
610000103100 610000103010	Davis, Steven & Julie	563-920-0409 S	312 Mill Street	Hopkinton, IA 52237
Jeanne Muellerleile	Camp Courageous of Iowa	319-480-7880 Jeanne Muellerleile		Monticello, IA52310
610000100110	Book, Catherine	563-926-2911 h 563-608-2911 c	406 Locust Street, PO Box 96	Hopkinton, IA 52237
Notes: Capital Initial after phone number re: A persons name. c after a phone number re: cell. h re: house				
First and last names listed with phone numbers are representatives for property.				

**Basis for computation of evacuation area and flooding depths**

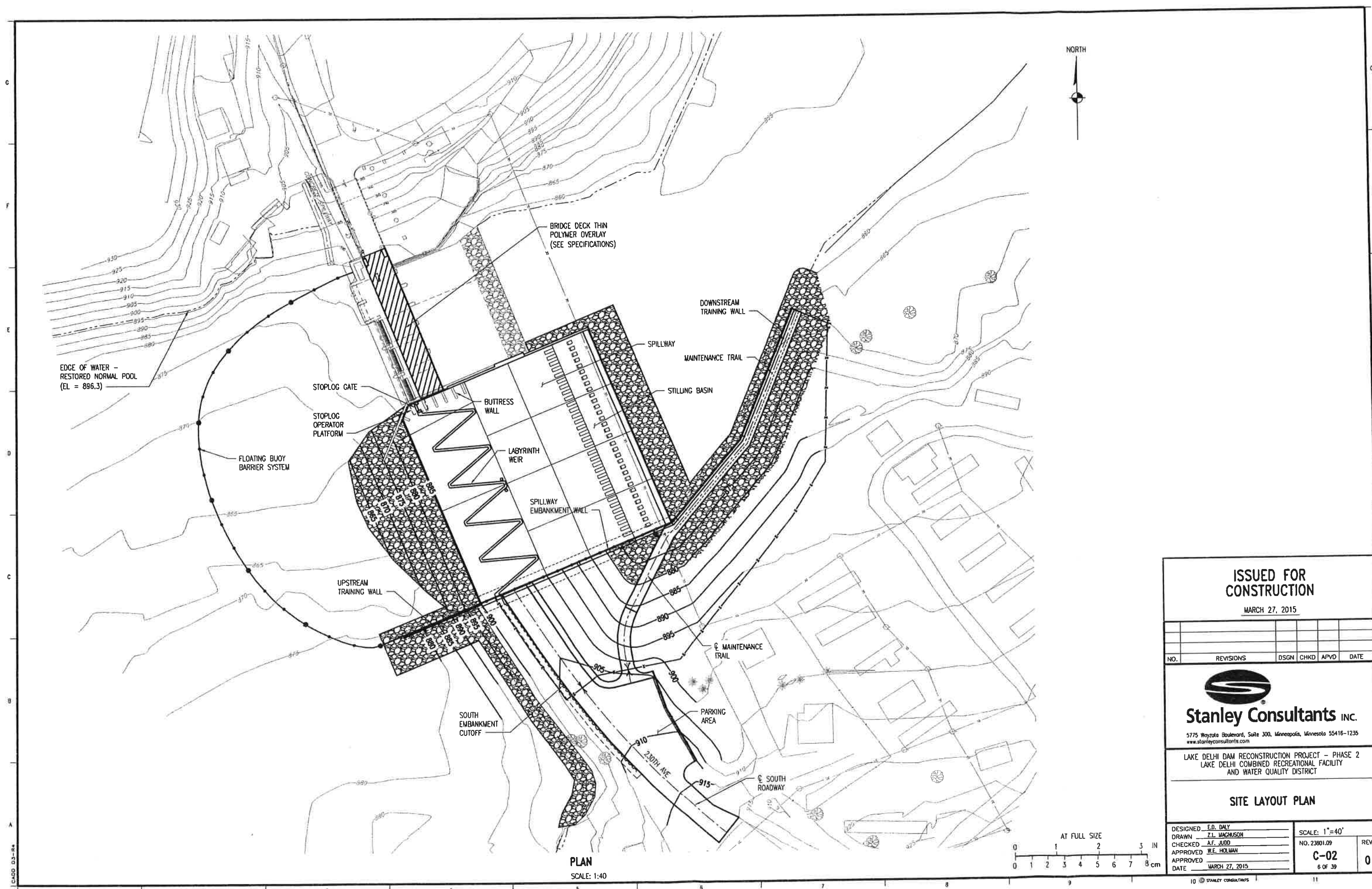
Breach inundation study completed by Stanley Consultants 2013

Hydraulic model used: HEC-HMS and HEC-RAS

Model assumptions:

- ☐ “Sunny-Day” Breach (500 cfs)
- ☐ Water surface elevation in reservoir prior to breach = 896.3 (normal pool)
- ☐ Total volume of breach hydrograph = 7502 acre-ft
- ☐ Rise in water level at time of breach = 16 ft (above bottom river bottom directly downstream of dam)
- ☐ Peak breach discharge = 23,000 ft³/s
- ☐ Downstream area defined by lidar

Appendix B–5  
Plan View of Dam



ISSUED FOR  
CONSTRUCTION

MARCH 27, 2015

NO.	REVISIONS	DSGN	CHKD	APVD	DATE



**Stanley Consultants INC.**

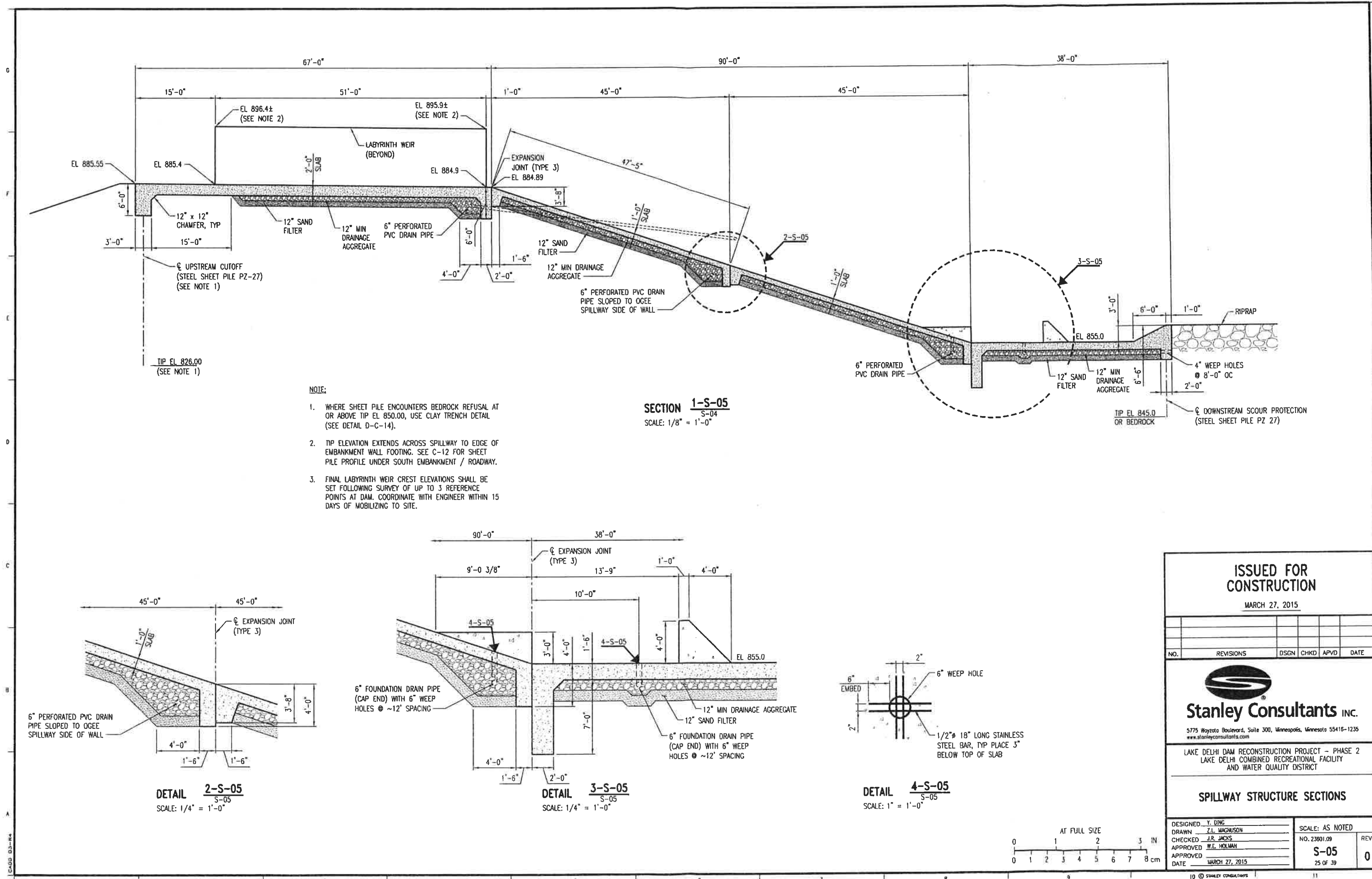
5775 Weyzata Boulevard, Suite 300, Minneapolis, Minnesota 55416-1235  
www.stanleyconsultants.com

LAKE DELHI DAM RECONSTRUCTION PROJECT - PHASE 2  
LAKE DELHI COMBINED RECREATIONAL FACILITY  
AND WATER QUALITY DISTRICT

**SITE LAYOUT PLAN**

DESIGNED <u>E.D. DALY</u>	SCALE: 1"=40'	REV.
DRAWN <u>E.L. WACHUSON</u>	NO. 23801.09	0
CHECKED <u>A.F. JUDD</u>	<b>C-02</b>	
APPROVED <u>M.E. HOLMAN</u>	6 OF 39	
DATE <u>MARCH 27, 2015</u>		

Appendix B–6  
Profile of Labryinth Spillway



**ISSUED FOR CONSTRUCTION**

MARCH 27, 2015

NO.	REVISIONS	DSGN	CHKD	APVD	DATE

**Stanley Consultants INC.**

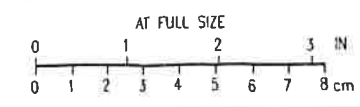
5775 Wayzata Boulevard, Suite 300, Minneapolis, Minnesota 55415-1235  
www.stanleyconsultants.com

LAKE DELHI DAM RECONSTRUCTION PROJECT - PHASE 2  
LAKE DELHI COMBINED RECREATIONAL FACILITY  
AND WATER QUALITY DISTRICT

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SPILLWAY STRUCTURE SECTIONS

DESIGNED: Y. DING DRAWN: J.L. MAGNUSON CHECKED: J.R. JACKS APPROVED: W.E. HOLMAN DATE: MARCH 27, 2015	SCALE: AS NOTED <div style="display: flex; justify-content: space-between;"> <div> <b>S-05</b> 25 OF 39         </div> <div>           REV. 0         </div> </div>
-------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------



CADD 03-14

Appendix B–7  
Reservoir Elevation-Area-Volume  
and Spillway Capacity Data

Elevation	Reservoir Surface acres	Reservoir Storage acre ft	Spillway Discharge ft <sup>3</sup> /s	Notes
864	0.0	0	0	Stream bed
870	9	12	0	
875	30	107	0	
880	59	326	0	Gated Spillway - closed
885	127	781	0	
890	250	1696	0	
895	435	3394	0	
896.3	465	3844	0 - 19,700	Normal Pool
900	605	5961	39,800	
905	753	9363	68,000	Top of Dam



Appendix B–8

Dam Data

Dam name: <b>Lake Delhi Dam</b>	Dam length: <b>360ft</b>
State: <b>IA</b>	Dam height: <b>49 ft</b>
NID ID: <b>IA01297</b>	Dam volume: <b>3844 yd<sup>3</sup> (@Principle spillway)</b>
Longitude: <b>42°24’35.11” N</b>	<b>9636 yd<sup>3</sup> (@Top of dam)</b>
Latitude: <b>91°20’33.42” W</b>	Max. discharge: <b>24,310 ft<sup>3</sup>/s</b>
PLSS location: <b>NE,S30,T88N,R4W</b>	Max. storage: <b>See Dam Volume</b>
County: <b>Delaware</b>	Normal storage: <b>See Dam Volume</b>
Stream: <b>Maquoketa River</b>	Surface area: <b>440 acres</b>
Nearest downstream town: <b>Hopkinton</b>	Drainage area: <b>349 mi<sup>2</sup></b>
Distance to nearest downstream town: <b>9 mi</b>	Hazard classification: <b>Moderate</b>
Owner: <b>Lake Delhi Taxing District Trustees</b>	Inspection frequency: <b>1 yr</b>
Operator: <b>Lake Delhi Taxing District Trustees</b>	Principal spillway type: <b>Labyrinth Weir and Spillway Gates</b>
Dam designer: <b>Stanley Consultants</b>	Principal spillway conduit diameter: <b>N/A</b>
Purpose of dam: <b>Recreation</b>	Auxiliary spillway type: <b>N/A</b>
Year constructed: <b>1922</b>	Auxiliary spillway width: <b>N/A</b>
Year Modified: <b>2015-2016</b>	