EMERGENCY ACTION PLAN
FOR
ESTABROOK DAM

FIELD FILE NUMBER: 40.08

KEY SEQUENCE NUMBER: 857
(FROM DNR'S DAMS DATABASE)

NATIONAL INVENTORY OF DAMS NUMBER: WI00926

COUNTY: MILWAUKEE

OWNER: MILWAUKEE COUNTY

OPERATOR: MILWAUKEE COUNTY
DEPARTMENT OF PARKS, RECREATION AND CULTURE

DAM ADDRESS: 4400 N. ESTABROOK DR.
MILWAUKEE, WI 53211

DATE: JUNE 24, 2016

REVISION DATES:

1ST REVISION: _____
(DATE) (SIGNATURE)

2ND REVISION: _____
(DATE) (SIGNATURE)

3RD REVISION: _____
(DATE) (SIGNATURE)

4TH REVISION: _____
(DATE) (SIGNATURE)

THE DAM OWNER/OPERATOR IS RESPONSIBLE FOR THE ANNUAL REVIEW AND UPDATING OF THE EAP

Please notify your Regional DNR person immediately if data in this EAP is revised.

Contents

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 Estabrook Dam. Wisconsin Administrative Code (NR 333.07) requires an Emergency Action Plan (EAP) for all new existing dams that meet certain criteria or pose a threat to life or property.

Estabrook Dam is owned and operated by Milwaukee County. It was built in the late 1930's to create a recreational water level in Estabrook Park and was constructed with gates that could be opened and closed to maintain the recreational water level. Currently, the Milwaukee Parks Department is in the planning stages of completely repairing and upgrading the Estabrook Dam as it has fallen into disrepair and is not functional. In July 2009, the Wisconsin Department of Natural Resources issued an Administrative Order requiring Estabrook's flood gates be placed in an open position until such time that Estabrook Dam can be repaired or abandoned. The gates have remained open to this day. After the renovations are completed, Estabrook's 10 gates will be closed and remain closed unless manipulation is needed to adjust the rivers water level.

Because the gates will be in a closed position, an advanced warning of rising waters is of the utmost importance. In the event that heavy rains occur and water levers rise significantly, gates need to be opened accordingly in advance of the surge to prevent significant flooding upstream. The risk of loss is greatest in the floodplains upstream from the Dam, specifically in the Glendale area.

If a flood greater than a 10-year frequency event occurs, all 10 gates must be fully open. If these gates are not fully open, the dam may or will cause flooding to upstream properties. The extent of the flooding will depend on how many gates are open, and how severe of a flood. SEWRPC documented by river modeling that the dam will impact flood levels if the 10 gates are not all open, and a flood greater than a 10-year frequency is experienced.

This plan identifies specific procedures to assess the condition of Estabrook Dam and identify potential signs failure, steps to take to prevent the loss of life and minimize property damage, and the specific individuals that will carry out these procedures. It is the mission of the Milwaukee County Office of Emergency Management (OEM) through the development and use of this plan and supporting documents to be able to effectively respond to emergency conditions at and around Estabrook Dam. In order to effectively respond to an actual or impending emergency, the Milwaukee County OEM must coordinate and support the actions of a wide variety of government, non-governmental, and private individuals in order to have the most successful outcomes.

Potential Impacted Area

See *Evacuation Map* tab (Appendix B–4) and *Floodplain* tab (Appendix B–5) for the locations and businesses that may be flooded if the dam should fail.

Because the majority of the Estabrook floodplain in upstream from the dam, the evacuation area primarily lies the City of Glendale. There are no permanent dwellings in the Estabrook Park floodplain. Upstream in Glendale, approximately 430 homes lie within the floodplain and would be affected if Estabrook's gates were not opened appropriately for rising waters.

Dam Description

Height: 15 ft
Built: 1940
Legal Description: Sects. S5, T7N, R22E
Latitude: 43.10200 Longitude: -87.91210
National Inventory of Dams No.: Wi00926

Drainage Area: 694.00 mi
Hazard Classification: Low
Dam Operator: Milwaukee County Parks Department
Major Property Owner: Milwaukee County

See detailed design data in *Appendix B* tab.

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

Estabrook Dam, can be accessed by either traveling north or south on Interstate 43 between Silver Springs Dr. and Hwy 190. While on Interstate 43, exit onto Hampton Rd traveling east 0.3 mi to Estabrook Pkwy. Head southeast on Estabrook Pkwy and take first right turn onto the unmarked dam service rd.

Roles and Responsibilities

Milwaukee County's Representative (Dam Operator)

- As soon as an emergency event is observed or reported, immediately determine the emergency level (see *Emergency Levels* tab).
  - Level 3: unusual event, slowly developing
  - Level 2: potential dam failure situation, rapidly developing
  - Level 1: 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 911 Communications and OEM 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 (Milwaukee Fire Department)

- 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 1 situation occurs.
- When a Level 1 situation occurs:
  - Initiate warnings and order evacuation of people at risk upstream (downstream if needed) 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 (Milwaukee OEM)

- Maintain communication with media.
- When a Level 2 situation occurs:
  - Prepare emergency management personnel for possible evacuations that may be needed if a Level 1 situation occurs.
  - Alert the public as appropriate.
- When a Level 1 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.

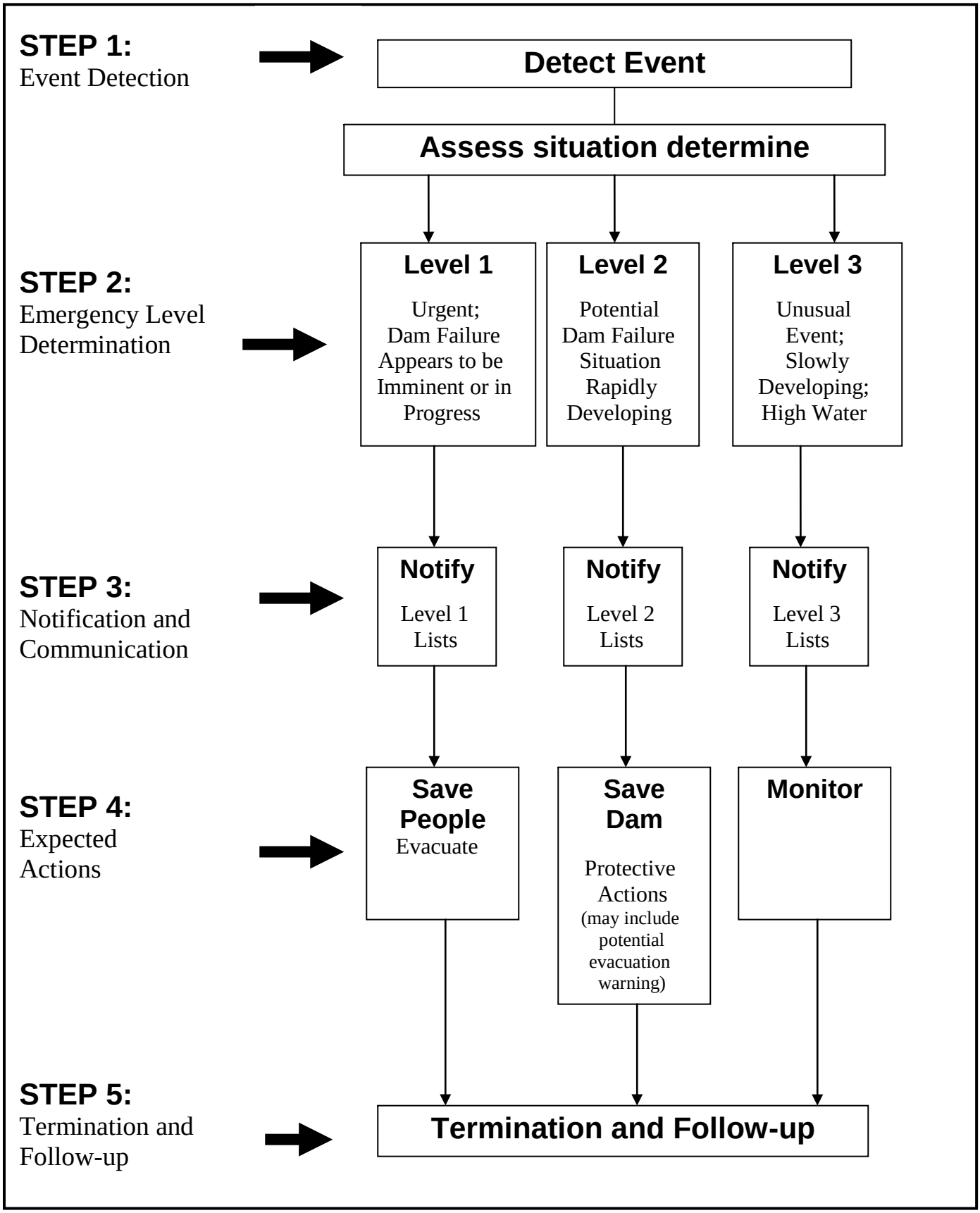
Dam Operator's Technical Representatives (NRCS, DNR Engineer, Consultant)

- 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.

State Dam Safety Agency (WI Department of Natural Resources, Central Office Dam Safety Engineer/Regional Water Management Engineer)

- 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.

Level of Emergency Determination Chart



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, or the public
- 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 dam operator or his alternate is responsible for classifying the event into one of the following three emergency levels:

Emergency Level 3—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. NRCS technical representatives, dam owner's consultant or the DNR Engineer (through the DNR Duty Office at 608-576-5358 during office hours or by pager at 608-376-9049) 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 Communications/OEM 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 (dam gate failure) and flash flooding upstream but there is not an immediate threat of dam failure. The 911 Communications/OEM 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 911 Communications/OEM. If the dam condition worsens and failure becomes imminent, 911 Communications/OEM must be notified immediately of the change in the emergency level to evacuate the people at risk upstream (if applicable, downstream).

The State Dam Safety Office 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 through the auxiliary 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 1—Urgent; dam failure appears imminent or is in progress:
This is an extremely urgent situation when a dam failure (gate failure) is occurring or obviously is about to occur and cannot be prevented. Flash flooding will occur upstream of the dam if gates are closed during heavy rain. This situation is also applicable when flow through the earth spillway is causing downstream flooding of people and roads. 911 Communications 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 pages for guidance in determining the proper emergency level for various situations.

Guidance for Determining the Emergency Level

Event	Situation	Emergency level *
Auxiliary/Earth spillway flow	Reservoir water surface elevation at auxiliary spillway crest or spillway is flowing with no active erosion	3
	Spillway flowing with active gully erosion	2
	Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise	2
	Spillway flowing with an advancing headcut that is threatening the control section	1
	Spillway flow that is flooding people downstream	1
Gate Failure	Gates will not open during heavy rain/flooding.	1
Embankment overtopping	Reservoir level is 1 foot below the top of the dam	2
	Water from the reservoir is flowing over the top of the dam	1
Seepage	New seepage areas in or near the dam	3
	New seepage areas with cloudy discharge	2
	Seepage with cloudy discharge; increasing flow rate	1
Sinkholes	Observation of new sinkhole in reservoir area or on embankment	2
	Rapidly enlarging sinkhole	1
Embankment/ structural component cracking	New cracks in the embankment/structural component greater than ¼-inch wide without seepage	3
	Cracks in the embankment/structural component with seepage	2
Embankment/ structural component movement	Visual movement/slippage of the embankment slope/structural component	2
	Sudden or rapidly proceeding slides of the embankment slopes/structural component	1
Instruments	Instrumentation readings beyond predetermined values	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	1
Sabotage/ vandalism	Unauthorized operation of the dam	3
	Damage to dam or appurtenance with no impacts to the functioning of the dam	3
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam	2
	Damage to dam or appurtenances that has resulted in seepage flow	2
	Damage to dam or appurtenances that has resulted in uncontrolled water release	1

* Emergency Level 3: Nonemergency unusual event, slowly developing
* Emergency Level 2: Potential dam failure situation, rapidly developing
* Emergency Level 1: Urgent; dam failure appears imminent or is in progress

Examples of Emergency Situations

The following are examples of conditions that usually constitute an emergency situation that may occur at a dam. Adverse or unusual conditions that can cause the failure of a dam are typically related to aging or design and construction oversights. Extreme weather events that exceed the original designed conditions can cause significant flow through the auxiliary spillway or overtopping of the embankment. However, accidental or intentional damage to the dam may also result in emergency conditions. The conditions have been grouped to identify the most likely emergency-level condition. The groupings are provided as guidance only. Not all emergency conditions may be listed, and the dam operator is urged to use conservative judgment in determining whether a specific condition should be defined as an emergency situation at the dam.

Pre-existing conditions on this dam: There has been a small seepage area near the downstream toe on the north side of the release channel. This was first noticed in the 1990s, but has not changed since that time.

Earth Spillway Flows

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

1. Significant erosion or headcutting of the spillway is occurring, but the rate does not appear to threaten an imminent breach of the spillway crest that would result in an uncontrolled release of the reservoir.
2. Flow through the earth auxiliary spillway is or is expected to cause flooding that could threaten people, homes, and/or roads downstream from the dam.

Emergency Level 1—Urgent; dam failure appears imminent or is in progress:

1. Significant erosion or headcutting of the spillway is occurring at a rapid rate, and a breach of the control section appears imminent.
2. Flow through the earth auxiliary spillway is causing flooding that is threatening people, homes, and/or roads downstream from the dam.

Embankment Overtopping

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

1. The reservoir level is within 1 foot from the top of the dam.

Emergency Level 1—Urgent; dam failure appears imminent or is in progress:

1. The reservoir level has exceeded the top of the dam, and flow is occurring over the embankment.

Seepage and Sinkholes

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

1. Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.
2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or enlarging sinkhole(s) near the dam or settlement of the dam is observed.
4. Reservoir level is falling without apparent cause.

5. The following known dam defects are or will soon be inundated by a rise in the reservoir:
    - Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
    - Transverse cracks extending through the dam, abutments, or foundation.

Emergency Level 1—Urgent; dam failure appears imminent or is in progress:

1. Rapidly increasing cloudy seepage or soil deposits at seepage exit points to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapidly enlarging sinkhole(s) are forming on the dam or abutments to the extent that failure appears imminent or is in progress.
6. Rapidly increasing flow through crack(s) eroding materials to the extent that failure appears imminent or is in progress.

Embankment Movement and Cracking

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

1. Settlement of the crest, slopes, abutments and/or foundation of the dam that may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam that may eventually result in breaching of the dam.

Emergency Level 1—Urgent; dam failure appears imminent or is in progress:

1. Sudden or rapidly proceeding slides, settlement, or cracking of the embankment crest, slopes, abutments, and/or foundation, and breaching of the dam 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 3—Nonemergency, unusual event; slowly developing:
The Dam Operator or Representative should contact the DNR Dam Safety Officials through the DNR Duty Office at 608-576-5358 during office hours or by pager at 608-376-9049. 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 911 Communications or Emergency management personnel:

"This is _____Identify yourself; name, position)_____.

We have an emergency condition at Estabrook, located in Estabrook Park in Milwaukee, WI.

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

We have notified the following authorities: Milwaukee County, Milwaukee County Emergency Management, the City of Milwaukee, the City of Glendale, the North Shore Fire Department, the Glendale Police Department and the Wisconsin Department of Natural Resources.

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 the upstream floodplains (Glendale) of the Milwaukee River. (If applicable, the low-lying areas of the Milwaukee River downstream).

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 1—Urgent event; dam failure appears imminent or is in progress:
911 Communications/OEM should be contacted immediately and the area evacuated (see *Evacuation Map* tab). The following actions should be taken:

1. Call 911 Communications. 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 emergency management personnel:

   "This is an emergency. This is _____Identify yourself; name, position)_____.

   The Estabrook Dam located in Estabrook Park, is failing. The upstream floodplain area in Glendale (if applicable, the downstream area) must be evacuated immediately. Repeat, The Estabrook Dam located in Estabrook Park, is failing. The upstream floodplain area in Glendale (if applicable, the downstream area) must be evacuated immediately

   We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 1. Reference the evacuation map in your copy of the Emergency Action Plan. We have notified the following authorities: Milwaukee County, Milwaukee County Office of Emergency Management, the City of Milwaukee, the City of Glendale, the North Shore Fire Department, the Glendale Police Department and the Wisconsin Department of Natural Resources.,

   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/upstream from the dam, boating on the reservoir, or evacuees) to safety if directed by the emergency services.
3. Keep in frequent contact with 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 prescripted message may be used as a guide for emergency services personnel to communicate the status of the emergency with the public:

Attention: This is an emergency message from the Milwaukee County Office of Emergency Management. Listen carefully. Your life may depend on immediate action.

Estabrook Dam, located in Esatabrook Park in the City of Milwaukee, is failing. Repeat. Estabrook Dam, located in Esatabrook Park in the City of Milwaukee, is failing

If you are in or near this area or near the Milwaukee River floodplain in the City of Glendale, proceed immediately to high ground away from the river. Do not travel on (Name of road/highway) (N/S/E/W) of (Name of community) 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 Milwaukee River. Repeat message.

Emergency Level 3 Notifications

Nonemergency
Unusual event, slowly developing, high water

Milwaukee County Parks
Guy Smith
Chief of Operations
414-257-4782

Office of Emergency Management (OEM) Director
Christine Westrich
414-278-4751
414-235-1450

DNR Dam Safety Officials
608-576-5358
608-376-9049, pager

WI DNR Duty Officer
414-286-8500 during business hours

City of Milwaukee Fire Department
Non-emergency dispatch: 414-347-2323

North Shore Fire Department
Non-emergency dispatch: 414-962-4619

Note: 1, 2, etc. denote call sequence

Legend:
Calls by operator ———————
Second level calls -·-·-·-·-·-·-·-

See "Contacts" tab for contact information for backups to the persons shown above and other emergency personnel.

Emergency Level 2 Notifications

Emergency Event
Potential dam failure; rapidly developing

City of Milwaukee Fire Department
911

North Shore Fire Department
911

DNR Dam Safety Officials
608-576-5358
608-376-9049, pager

Office of Emergency Management (OEM) Director
Christine Westrich
414-278-4751
414-235-1450

Milwaukee County Parks Chief of Operations
Guy Smith
414-257-4782
414-378-5369

WI DNR Water Management Engineer
Tanya Lourigan
608-275-3287

City of Glendale
414-228-1705

Park Director
John Dargle
414-704-3074

County Executive
Chris Abele
414-278-4211

Note: 1, 2, etc. denote call sequence

Legend:
Calls by operator ———
Second level calls - - - -

See "Step 3" tab for pre-scripted messages.

See "Contacts" tab for contact information for backups to the persons shown above and other emergency personnel.

Emergency Level 1 Notifications

Urgent Event
Dam failure is imminent or in progress

City of Milwaukee Fire Department
911

North Shore Fire Department
911

DNR Dam Safety Officials
608-576-5358
608-376-9049, pager

Office of Emergency Management (OEM) Director
Christine Westrich
414-278-4751
414-235-1450

Milwaukee County Parks
Chief of Operations
Guy Smith
414-257-4782
414-378-5369

WI DNR Water Management Engineer- Tanya Lourigan
608-275-3287

City of Glendale Business Administrator - Richard Maslowski
414-228-1745

City of Glendale Public Works
414-228-1710

John Dargle, Director
414-704-3074

Co. Exec. Chris Abele
414-278-4211

Note: 1, 2, etc. denote call sequence

Legend:
Calls by operator _____
Second level calls - - - - - - -

See "Step 3" tab for pre-scripted messages.

See "Contacts" tab for contact information for backups to the persons shown above and other emergency personnel.

Emergency Services Contacts

Agency / Organization	Principal contact	Address	Office telephone number	Alternate telephone numbers	Email Address
Milwaukee County Parks	Guy Smith, Chief of Operations	9480 Watertown Plank Rd. Wauwatosa WI 53226	414-257-4782	414-378-5369	Guy.smith@milwaukeecountywi.gov
Milwaukee County Parks	John Dargle, Director	9480 Watertown Plank Rd. Wauwatosa WI 53226	414-257-7726	414-278-4211	John.dargle@milwaukeecountywi.gov
Milwaukee County	Chris Abele, County Executive	901 N. 9th St. Milwaukee, WI 53233	414-278-4211		Chris.able@milwaukeecountywi.gov
Milwaukee County Office of Emergency Management	Christine Westrich, Director	901 North 9th Street Milwaukee, WI 53233	414-278-4751	414-235-1450	Christine.westrich@milwaukeecountywi.gov
City of Milwaukee	Tom Barrett, Mayor	200 E. Wells Street City Hall Rm.201 Milwaukee, WI 53202	414-286-2200		mayor@milwaukee.gov
City of Milwaukee Fire Department	Mark A. Rohlfing, Chief	711 West Wells Street Milwaukee, WI 53233	414-286-8948		
North Shore Fire Department	Robert Whitaker, Chief	4401 River Lane Brown Deer, WI 53223	414-357-0113 x108	414-962-4619 (24/7 dispatch)	rwhitaker@nsfire.org
WI Dept. of Natural Resources	Tanya Lourigan, Water Management Engineer	3911 Fish Hatchery Rd. Fitchburg, WI 53711	608-257-3287		Tanya.Lourigan@wisconsin.gov
Wisconsin Sate Warning Center			800-943-0003		
City of Glendale	Richard Maslowski, Business Administrator	5909 N. Milwaukee River Parkway Milwaukee, WI 53209	414-228-1700	414-228-1745	
City of Milwaukee DPW	Ghassan Korban, Commissioner of Public Works	841 N. Broadway Street Milwaukee, WI 53202	414-286-2489	414-286-8314	dpwmilw@milwaukee.gov
City of Glendale DPW	Dave Eastman	5909 N Milwaukee River Parkway Glendale, WI 53209	(414) 228-1710		D.Eastman@glendale-wi.org

* Back-up to primary contact

Step 4 Expected Actions

If 911 Communications receives a 911 call regarding observations of an unusual or emergency event at the dam, they should immediately contact the Dam Operator and Office of Emergency Management. After the Operator/OEM determines the emergency level, the following actions should be taken.

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

A. The Dam Operator or Emergency Management Personnel 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, GATES, 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 DNR Engineer (through the DNR Duty Office at 608-576-5358 during office hours or by pager at 608-376-9049); 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.

C. The DNR Engineer should contact NRCS and request technical staff to investigate the situation and recommend corrective actions.

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

A. The Dam Operator should contact 911 Communications and OEM to report the situation .

B. Emergency Management Personnel should contact the Milwaukee Fire Department to inform them 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.

C. Provide updates to the Fire Department and emergency services personnel to assist them in making timely decisions concerning the need for warnings, road closures, and evacuations.

D. The DNR Engineer 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, GATES, 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 NRCS; refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.**

E. 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. If time permits, the following emergency remedial actions should be taken as appropriate.

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

A. The Dam Operator shall immediately contact the individuals shown on the notification chart.

B. The Milwaukee County Sheriff's Department shall lead the efforts to carry out warnings, close roads, and evacuate people at risk upstream or downstream from the dam (see *Evacuation Map* tab).

C. Emergency management personnel shall alert the public and immediately evacuate at-risk people and close roads as necessary.

D. The Dam Operator and Emergency Management Personnel shall maintain continuous communication and provide the Milwaukee Fire Department and Milwaukee County Sheriff's Office with updates of the situation to assist them in making timely decisions concerning warnings and evacuations.

E. The Dam Operator 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 Milwaukee Fire Department is responsible for terminating EAP operations and relaying this decision to OEM. 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, Wisconsin DNR Dam Safety Officer 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 Office of Emergency Management 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. OEM shall distribute copies of the completed report to the Wisconsin DNR and the NRCS State Conservation Engineer.

Maintenance—EAP Review and Revision

EAP annual review

The dam owner or representative 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 listed local agencies to verify the phone numbers and persons in the specified positions. In addition, the dam owner 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

Milwaukee County OEM and Department of Parks, Recreation and Culture are jointly responsible for updating the EAP document. The EAP document held by OEM as the master document. When revisions occur, Milwaukee County OEM 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 dam owner will host and facilitate a periodic test of the EAP at least once every two (2) years.

The periodic test will consist of a meeting, including a tabletop exercise, conducted at the Parks Administration office. Attendance should include the Milwaukee County Parks, DNR Dam Safety staff, at least one representative of the local law enforcement agency, and others with key responsibilities listed in the EAP. At the discretion of Milwaukee County Parks other organizations that may be involved with an unusual or emergency event at the dam are encouraged 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. Milwaukee County OEM will 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. Milwaukee County OEM will prepare a written summary of the periodic test and revise the EAP, as necessary.

Record of Holders of Control Copies of this EAP

Copy Number	Organization	Person receiving copy
1	Milwaukee County Parks	John Dargle, Director
2	Milwaukee County Office of Emergency Management	Christine Westrich, Director
3	Milwaukee Fire Department	Mark A. Rohlfing, Chief
4	North Shore Fire Department	Robert Whitaker, Chief
5	Wisconsin Department of Natural Resources	Tanya Lourigan, Water Management Engineer
6		
7		
8		

Record of Revisions and Updates Made to EAP

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._____

Signature *Organization* *Date*

Printed name and title: _____

2. _____

Signature *Organization* *Date*

Printed name and title: _____

3._____

Signature *Organization* *Date*

Printed name and title: _____

4._____

Signature *Organization* *Date*

Printed name and title: _____

5._____

Signature *Organization* *Date*

Printed name and title: _____

6._____

Signature *Organization* *Date*

Printed name and title: _____

7._____

Signature *Organization* *Date*

Printed name and title: _____

Appendices—Forms, Glossary, Maps, and Supporting Data

Appendix A

Appendix B

Appendix A–1

Contact Checklist

Estabrook Dam

Estabrook Park, Milwaukee, WI. Date _____

The following contacts should be made immediately after the emergency level is determined (see pages 7–10 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 12)	Person Contacted	Time Contacted	Contacted by
___ DNR Duty Officer	_____	_____	_____
___ Local Law Enforcement or Local Emergency Management	_____	_____	_____
___ Owner's Consultant	_____	_____	_____

Emergency Level 2 (see page 13)	Person Contacted	Time Contacted	Contacted by
____ NRCS District Conservationist	_____	_____	_____
____ Local Law Enforcement or Local Emergency Management	_____	_____	_____
____ DNR Water Management Engineer	_____	_____	_____

Emergency Level 3 (see page 14)	Person Contacted	Time Contacted	Contacted by
____ Statewide Warning Center	_____	_____	_____
____ Local Law Enforcement or Local Emergency Manager	_____	_____	_____
____ DNR Water Management Engineer	_____	_____	_____

Appendix A–2

Unusual or Emergency Event Log

(to be completed during the emergency)

Dam name: Estabrook Dam County: Milwaukee

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: Estabrook Dam

National Inventory of Dams (NID) No.: WI00926

Dam location: Estabrook Park (*City*) Milwaukee (*County*) Milwaukee (*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 valleyside 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.

Emergency Action Plan (EAP)	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.
Evacuation map	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.
Filter	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.
Freeboard	Vertical distance between a stated water level in the reservoir and the top of dam.
Gate, slide or sluice, or regulating	An operable, watertight valve to manage the discharge of water from the dam.
Groin	The area along the intersection of the face of a dam and the abutment.
Hazard classification	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 misoperation of a dam.
Height, dam	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.
Hydrograph, inflow or outflow, or breach	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.
Incident Commander	The highest predetermined official available at the scene of an emergency situation.
Instrumentation	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.
Inundation area or map	The geographic area downstream of the dam that would be flooded by a breach of the dam or other large discharge.
Notification	To immediately inform appropriate individuals, organizations, or agencies about a potentially emergency situation so they can initiate appropriate actions.
Outlet works (principal spillway)	An appurtenant structure that provides for controlled passage of normal water flows through the dam.
Piping	The progressive destruction of an embankment or embankment foundation by internal erosion of the soil by seepage flows.

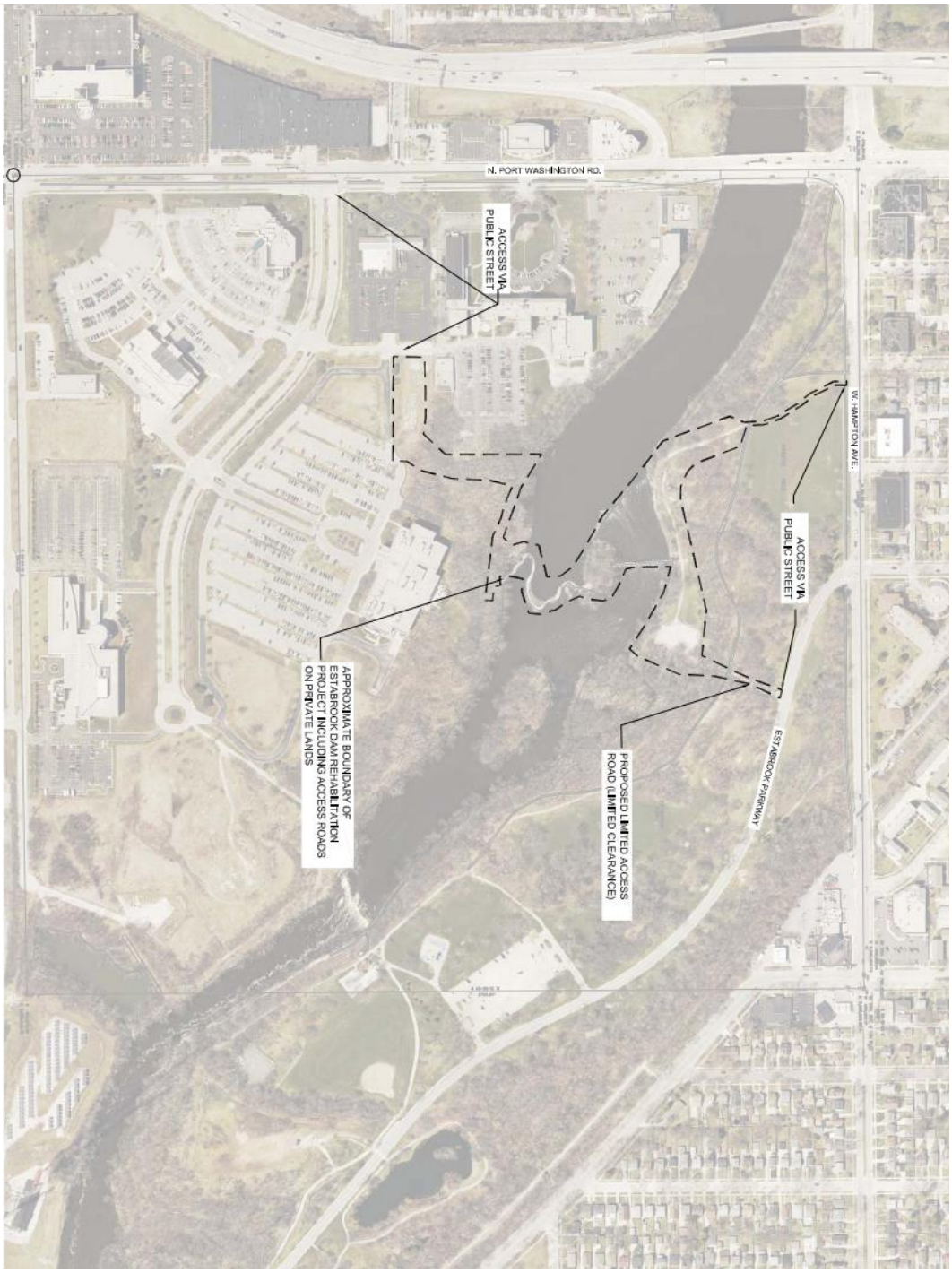
Probable Maximum Precipitation (PMP) or Flood (PMF)	The theoretically greatest precipitation or resulting flood that is meteorologically feasible for a given duration over a specific drainage area at a particular geographical location.
Reservoir	The body of water impounded or potentially impounded by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

Appendix B–1
Resources Available

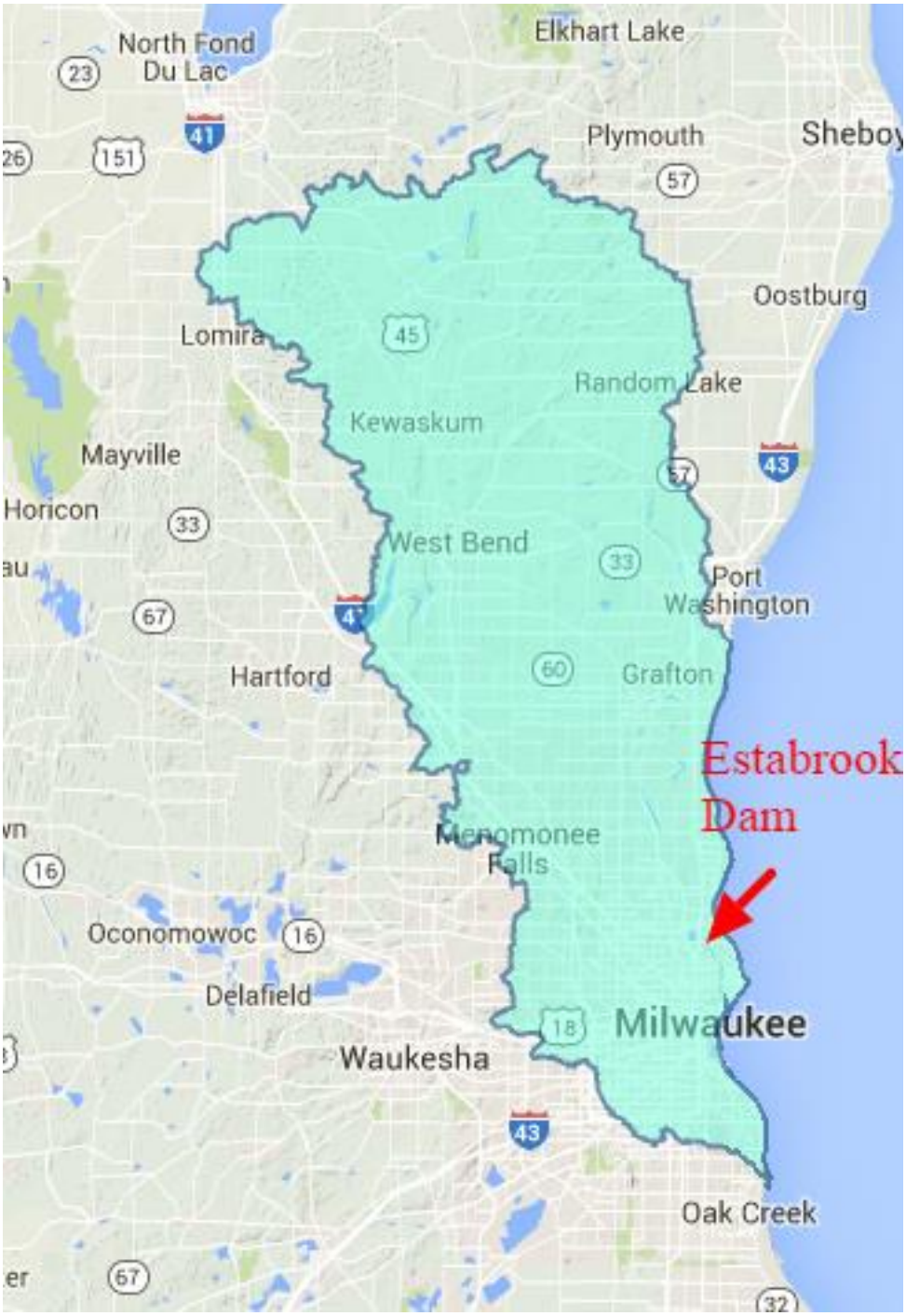
Milwaukee County Parks has the following resources that can be utilized in the event of an emergency:

Heavy equipment service and rental	**Sand and gravel supply**	**Ready-mix concrete supply**
Seivert Trucking 5324 W. Drexel Ave. Franklin, WI **414-421-0700**	Franklin Aggregates (gravel) 5713 W Rawson (quarry) Franklin, WI **414-423-2550**	Schmitz Ready Mix, Inc. 5400 N. 124thStreet Milwaukee, WI 53225 **414-831-2400**
D.F. Tomasini, Inc. N70 W25176 Indian Grass Lane Sussex, WI 53089 **262-820-8300**	Wolf Construction (sand) 612 N. Sawyer Road Oconomowoc, WI **262-965-2121**	
Pumps and Rental Equipment	**Diving contractor**	**Sand bags**
Lincoln Contractors Supply, Inc. 11111 W. Hayes Avenue Milwaukee, WI 53227 **414-541-1327**	Pirates Cove Inc. 1103 W. Oklahoma Avenue Milwaukee, WI 53215 **414-482-1430**	Berg Bag Company 410 3rd Avenue North Minneapolis, MN 55401 **800-658-7201 or 612-332-8845** **612-699-0899 after hours**
		Associated Bag Company 400 W. Boden Street Milwaukee, WI 553207 414-769-1000
Additional Resources	**Additional Resources**	**Additional Resources**

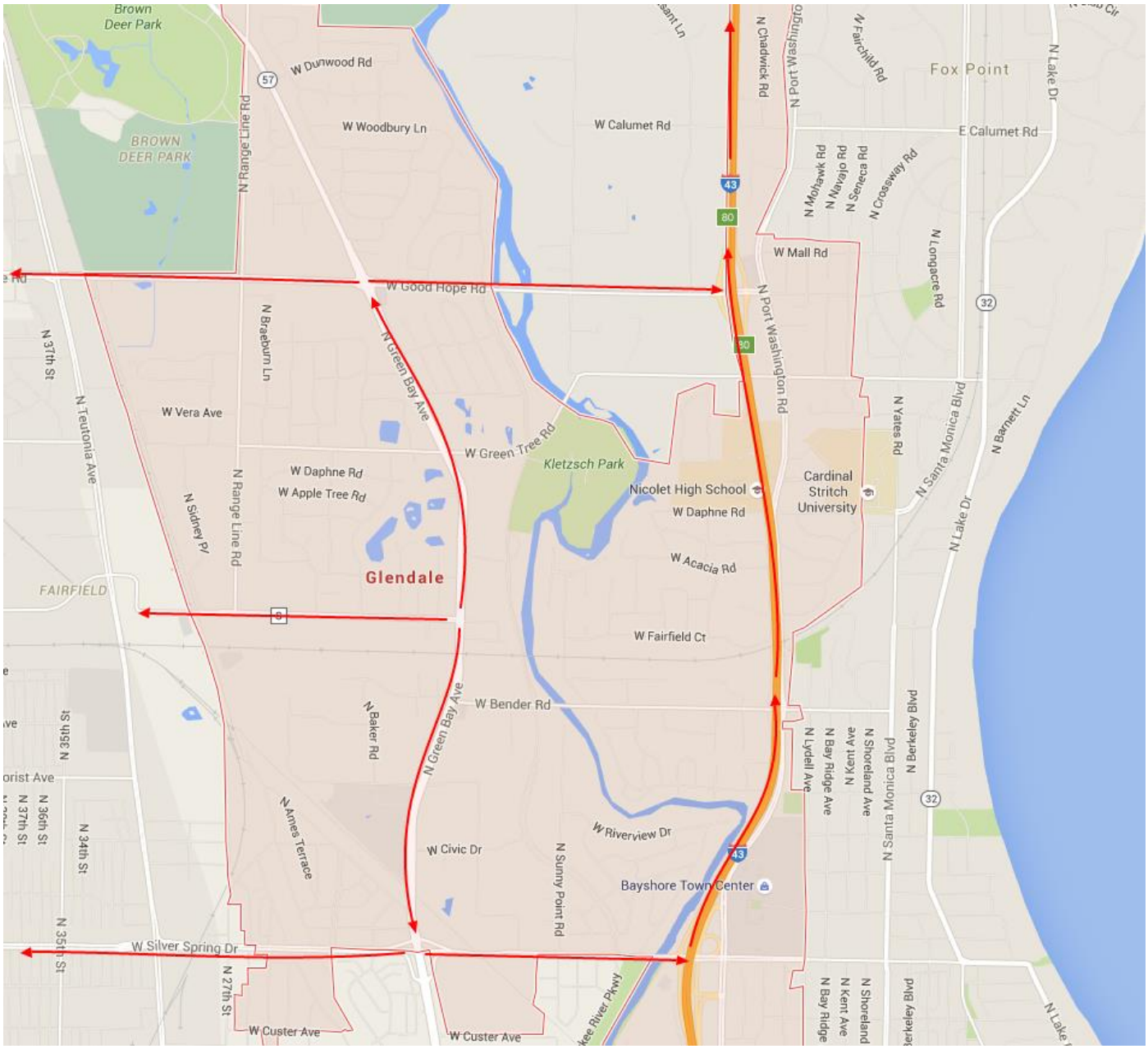
Appendix B–2
Location and Vicinity Maps
Indicating Access Roads



Appendix B–3
Watershed Map

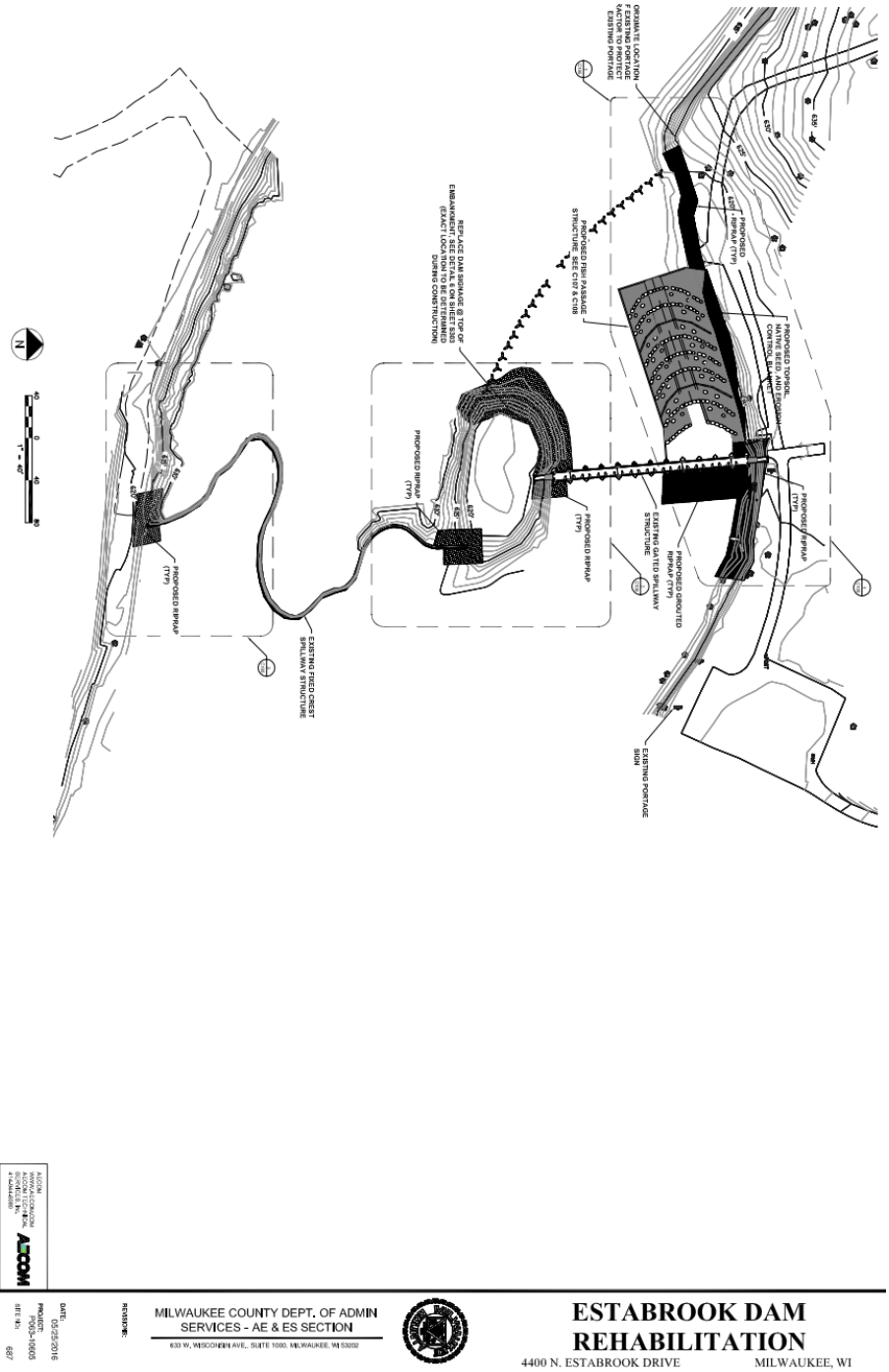


Appendix B–4
Evacuation Map



Appendix B–5
Estabrook Floodplain Map

Appendix B–6
Plan View of Dam

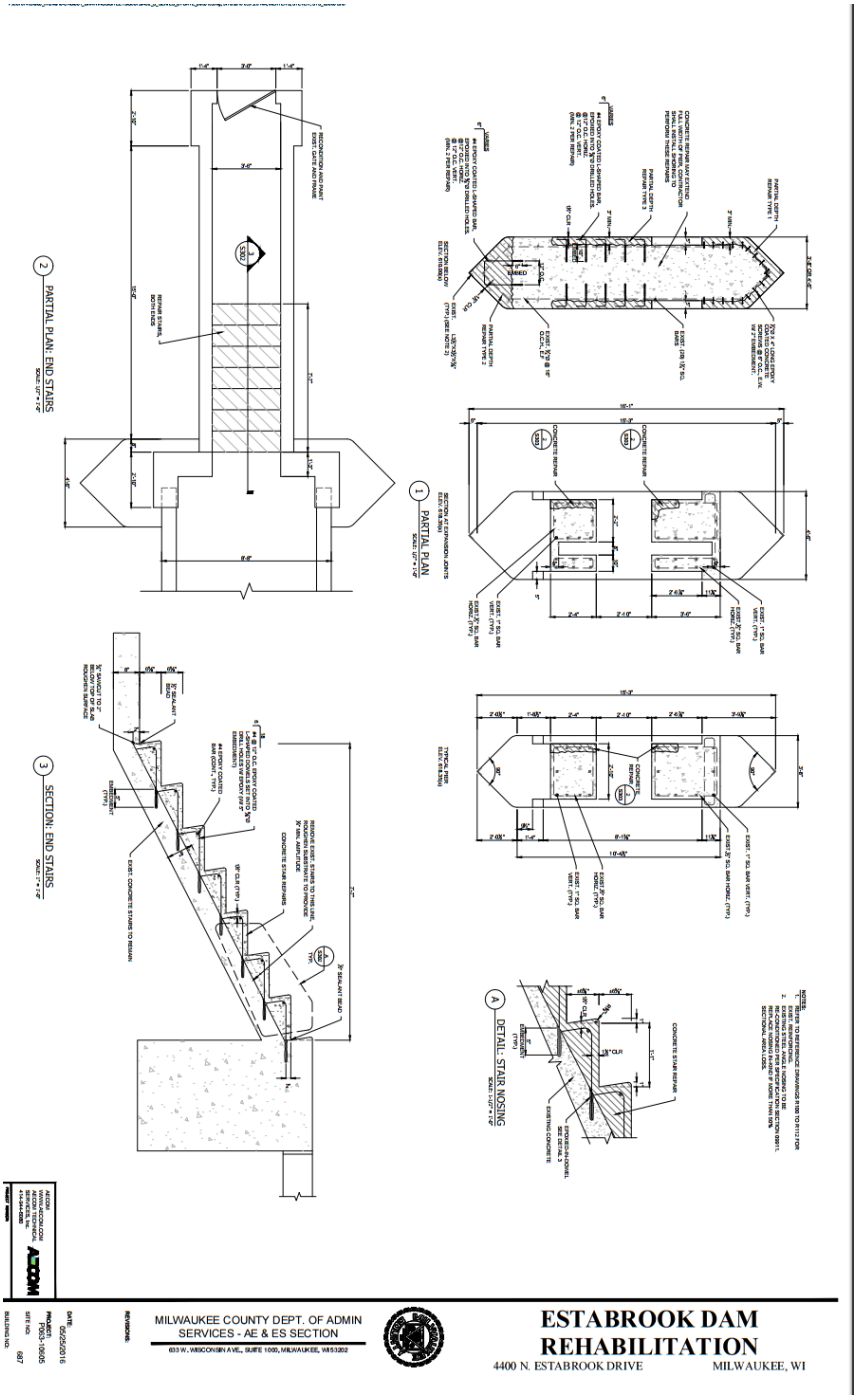


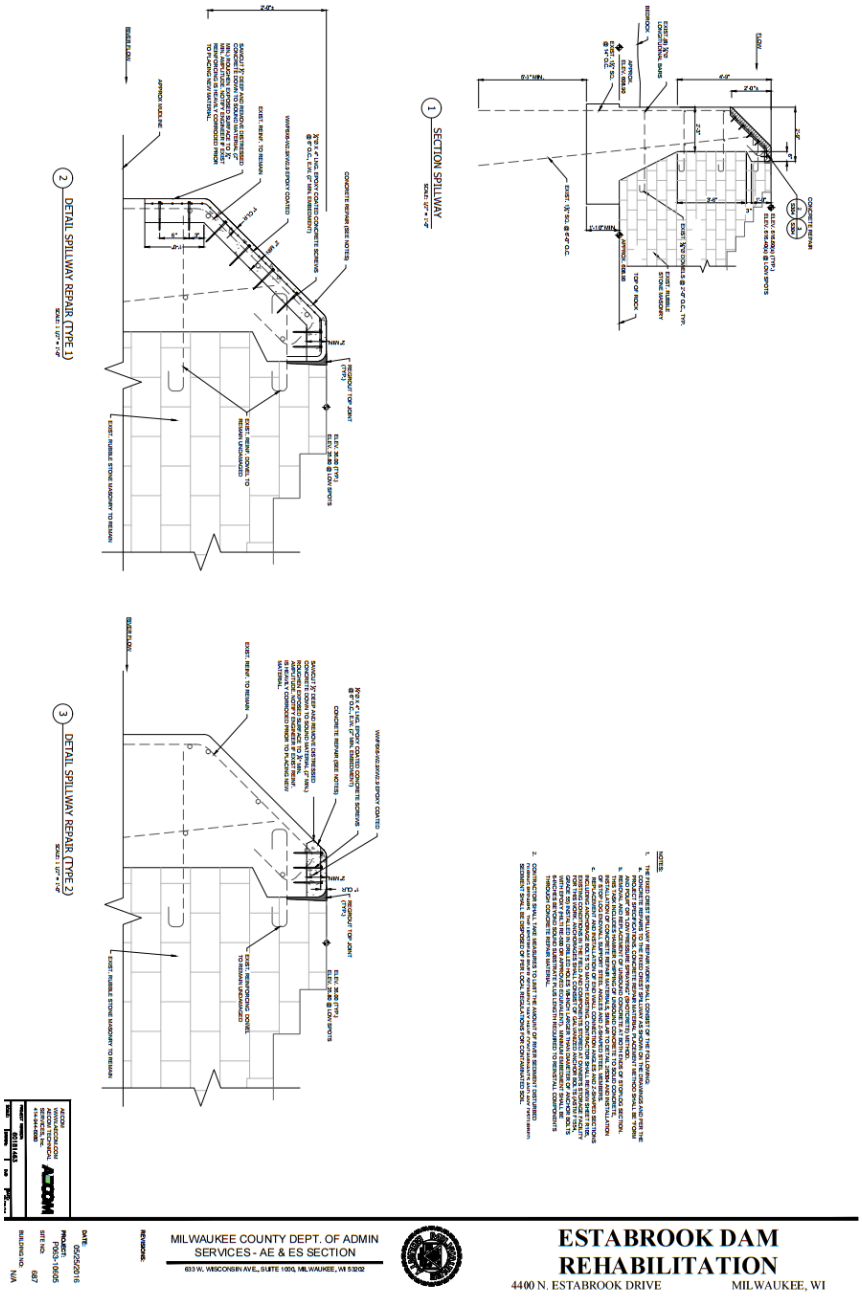
AECOM
AECOM TECHNICAL SERVICES, INC.
MILWAUKEE COUNTY DEPT. OF ADMIN SERVICES - AE & ES SECTION
633 W. WISCONSIN AVE., SUITE 1000, MILWAUKEE, WI 53203

DATE: 05/25/2016
PROJECT: P0503-10005
SITE No.: 687
DRAWN No.: N/A
REVISIONS:

ESTABROOK DAM REHABILITATION
4400 N. ESTABROOK DRIVE MILWAUKEE, WI

Appendix B–7
Profile of Principal Spillway




1 SECTION SPILLWAY
SCALE: 1/2" = 1'-0"
2 DETAIL SPILLWAY REPAIR (TYPE 1)
SCALE: 1 1/2" = 1'-0"
3 DETAIL SPILLWAY REPAIR (TYPE 2)
SCALE: 1 1/2" = 1'-0"
NOTES:
MILWAUKEE COUNTY DEPT. OF ADMIN
SERVICES - AE & ES SECTION
633 W. WISCONSIN AVE., SUITE 1000, MILWAUKEE, WI 53202
ESTABROOK DAM
REHABILITATION
4400 N. ESTABROOK DRIVE
MILWAUKEE, WI

Appendix B–8
Reservoir Elevation-area-volume and Spillway Capacity Data

Water Surface Elevation	Reservoir Surface acres	Reservoir Storage acre ft	Spillway Discharge ft^3/s
Principal Spillway Crest			
Auxiliary Spillway Crest			

Appendix B–9
National Inventory of Dams (NID) Data

Dam name: **Estabrook Dam**

State: **Wisconsin**

NID ID: **WI00926**

Longitude:– **87.9121**

Latitude: **43.102**

County: **Milwaukee**

Stream: **Milwaukee River**

Nearest town: **Milwaukee**

Distance to nearest town: **0 mi**

Operator: **Milwaukke County Parks Dept.**

Year constructed: **1940**

Max. discharge: **25800 ft^3/s**

Max. storage: **700acre-ft**

Normal storage: **700 acre-ft**

Surface area: **103 acre**

Drainage area: **694 mi^2**

Inspection frequency: **0 yr**

State regulated?: **Yes**

State reg. agency: **WIDNR**

Federal funding: UNK

Federal design: UNK

Federal constructed: UNK

Program authority: **Flood control**

Watershed No.: **MI02**

Watershed name: **Milwaukee River South**

Service life: **UNK yr**

O&M insp. resp.: **WI DNR**

O&M insp. current?: **No**

Population at risk: **800+**

Dam height: **15 ft**

Dam length: **562 ft**

Dam volume: _____ **yd^3**

Design hazard potential: **Low**

Current hazard potential: **Low**

Principal spillway type: **Controlled Spillway**

Auxiliary spillway type: **Fixed Cress**