



Emergency Action Plan

City of Columbia, Missouri

Columbia Municipal Power Plant
Project No. 85059

Revision A
November 2015



Emergency Action Plan

prepared for

**City of Columbia, Missouri
Columbia Municipal Power Plant
Columbia, Missouri**

Project No. 85059

**Revision A
November 2015**

prepared by

**Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri**

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LIST OF ABBREVIATIONS

| <u>Abbreviation</u> | <u>Term/Phrase/Name</u> |
|----------------------------|--------------------------------|
| BMcD | Burns & McDonnell |
| CCR | Coal Combustion Residuals |
| EAP | Emergency Action Plan |

1.0 INTRODUCTION

Emergency Action Plans (EAPs) are important documents to have in the event of an emergency involving the potential failure of a dam. They contain critical information necessary to effectively warn and evacuate people at risk and other citizens downstream from the dam.

1.1 Purpose

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

This EAP defines responsibilities and procedures to initiate emergency actions to warn emergency responders and downstream residents of impending or actual failure of the dam.

1.2 Site Description

More's Lake Dam is part of a coal combustion residual (CCR) surface impoundment at the Columbia Municipal Power Plant in Columbia, Missouri, owned by the City of Columbia Water & Light Department. The Columbia Municipal Power Plant is located in Boone County at 1501 Business Loop 70 East, Columbia, Missouri 65201.

The CCR impoundment currently stores both fly ash and bottom ash slurries. Sluicing has ceased to the impoundment, however, and it is currently classified as an inactive impoundment. The impoundment will be closed, with all CCR being removed from the impoundment, by April 2018. The lake will potentially be restored for recreational use following clean closure.

1.3 Potential Impacted Area

In the case of a dam breach, it is possible that water would follow the unnamed tributary to Bear Creek. It is also possible that there is enough capacity for the water to remain south of Interstate 70 with little movement away from the power plant campus. Critical infrastructure along the tributary evaluated within two miles downgradient (per previous inundation mapping provided by the City of Columbia) of the dam includes the City of Missouri Water and Light storage facilities, Interstate Highway 70, State Highway 763, an area of commercial development that includes a health care facility, hotels, and residential subdivisions. A breach of the More's Lake Dam would affect areas downstream containing infrastructure while potentially creating risk of loss of human life and property damage. A map of critical infrastructure downgradient of More's Lake Dam is shown in Appendix A.

2.0 EMERGENCY ACTION AND RESPONSE

This EAP provides general guidance for recognizing and characterizing an emergency situation occurring at the dam. The dam owner should act quickly to evaluate the emergency situation and then follow the notification procedures according to the corresponding level of emergency.

2.1 Responsible Plant Personnel

The plant manager and plant engineer shall be responsible for notifying authorities in the case of a potential or actual dam failure.

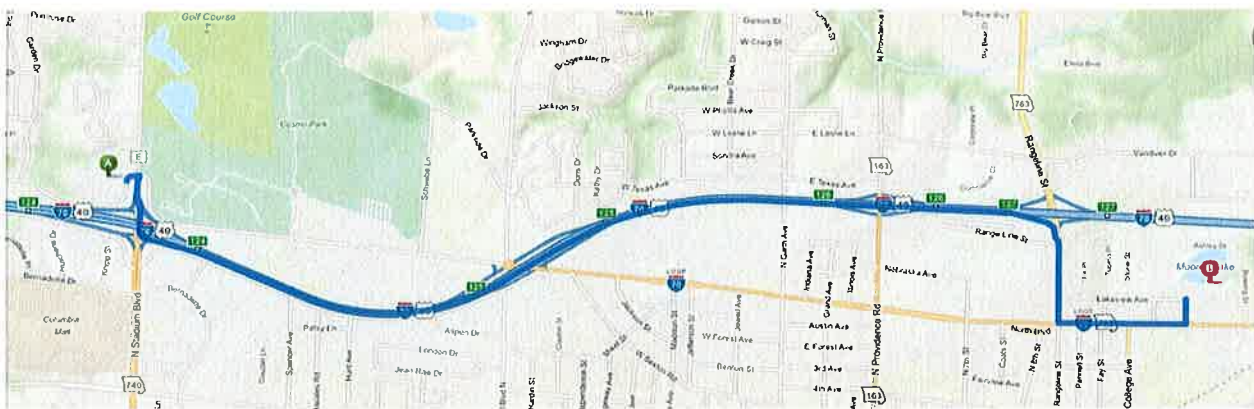
2.2 Emergency Responders

In the case of a potential or actual dam failure, proper emergency protocol shall be followed as outlined in the Emergency Level Notifications in Appendix B. The City of Columbia shall always contact the state dam safety official and the plant engineer in any emergency scenario. In Level 2 and Level 3 scenarios, 911 and emergency responders must also be contacted. The appropriate emergency team of responders to be contacted is detailed in Appendix B.

2.3 Directions to Dam

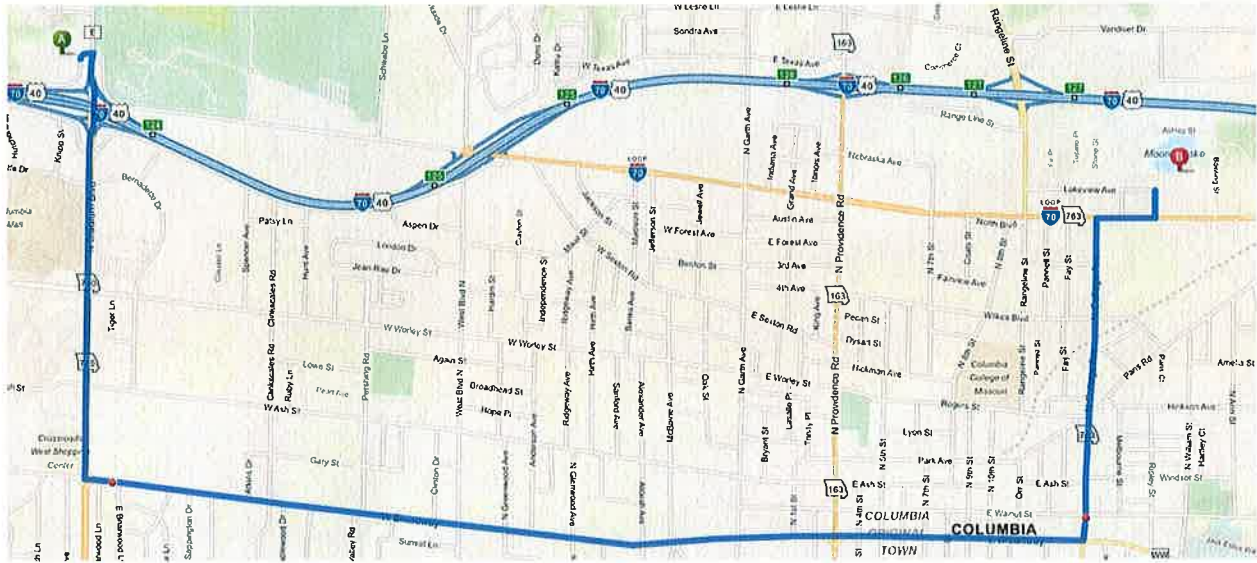
From Boone County's Fire Protection District (located at 2201 I-70 Drive Northwest, Columbia, MO 65202), More's Lake Dam can be accessed by traveling east on I-70 E/US-40 E for approximately 2.4 miles, taking exit 127 for Rangeline Street/MO-763 and heading south (right) for approximately 0.3 miles, and then turning left (east) onto I-70 Business Loop and following for approximately 0.4 miles, then taking the second left onto Edison Street for the entrance of the Columbia Power Plant. The Columbia Power Plant is located just north of I-70 Business Loop, and More's Lake Dam is at the northern portion of the site.

Figure 2-1: More's Lake Dam I-70 Access Route



In the chance that I-70 E/US-40 E is inundated, an alternate route to the dam is available by taking North Stadium Blvd south for approximately 1.1 miles, turning left (east) onto West Broadway for approximately 2.7 miles, and turning left (north) onto North College Ave for approximately 0.9 miles until I-70 Business Loop is reached. Take a right (east) onto I-70 Business Loop and then take the second left onto Edison Street for the entrance of the Columbia Power Plant.

Figure 2-2: More's Lake Dam Alternate Access Route



2.4 Initiation of Emergency Action Plan

The Emergency Action Plan shall be initiated when one or more of the Level 1, Level 2, or Level 3 emergency issues described below are discovered during routine inspections or during operation or maintenance activities.

This information should be used as a general guide for recognizing and characterizing the type of emergency situation occurring at the dam. The dam owner should notify the appropriate emergency contacts based upon the emergency level assigned to each situation.

Level 1 Emergency - Nonemergency, unusual event, slow to develop

- Reservoir water surface elevation at emergency spillway crest or spillway is flowing with no active erosion.
- New seepage areas in or near the dam.
- New cracks in the embankment greater than ¼-inch wide without seepage.
- Visual movement/slippage of the embankment slope.

- Instrumentation readings beyond predetermined values.
- Measurable earthquake felt or reported on or within 50 miles of the dam.
- Damage (vandalism/sabotage) to dam or appurtenances with no impacts to the functioning of the dam.
- Modification (vandalism/sabotage) to the dam or appurtenances that could adversely impact the functioning of the dam.

Level 2 Emergency - Potential dam failure situation, rapidly developing

- Spillway flowing with active gully erosion.
- Spillway flow that could result in flooding of people downstream, if the reservoir level continues to rise.
- Reservoir level is 1 foot below the top of the dam.
- New seepage areas with cloudy discharge or increasing flow rate.
- Observation of new sinkhole in reservoir area, on embankment or downstream of dam.
- Cracks in the embankment with seepage.
- Earthquake resulting in visible damage to the dam or appurtenances.
- Verified bomb threat that, if carried out, could result in damage to the dam.
- Damage to dam (vandalism/sabotage) or appurtenances that has resulted in seepage flow.

Level 3 Emergency - Urgent; dam failure imminent or is in progress

- Spillway flowing with an advancing headcut that is threatening the control section.
- Spillway flow that is flooding people downstream.
- Water from the reservoir is flowing over the top of the dam (not just auxiliary/emergency spillway).
- Seepage that is obviously eroding soil from within the embankment or rapidly increasing in flow rate.
- Rapidly enlarging sinkhole.
- Sudden or rapidly progressing slides of the embankment slopes.
- Earthquake resulting in uncontrolled release of water from the dam.
- Detonated bomb that has resulted in damage to the dam or appurtenances.

- Damage to dam (vandalism/sabotage) or appurtenances that has resulted in uncontrolled water release.

2.4.1 Emergency Services Contacts

Emergency Services Contacts have been identified in Appendix B. Follow Emergency Notification flow chart for sequence of contacts.

2.4.2 Residents, Businesses, Entities, and Infrastructure at Risk

Potential residents, businesses, entities, and infrastructure at risk have been identified in Section 1.3 and in Appendix B. A critical infrastructure map showing potentially impacted areas is included in Appendix A.

3.0 EMERGENCY ACTION PLAN REVIEW/REVISION

The EAP shall be reviewed annually with plant personnel and local emergency responders for any necessary updates and additions.

3.1 Review of the Plan Following an Event

In the event of a Level 1, Level 2, or Level 3 emergency, the EAP shall be reviewed to evaluate the effectiveness of the plan during the emergency, and to discuss any portion of the plan that may require revision in order to increase the effectiveness of the plan.

3.2 Annual Plan Review

The City of Columbia commits to assessment of this EAP, at a minimum, on an annual basis, during which every part of the plan will be reviewed. The Plan will be amended for changes in the response team, emergency services contacts, and in entities at risk. If the EAP has been implemented at any time during the year prior to review of the plan, the response to that situation shall be discussed and the plan amended, if necessary, as a result of that discussion.

3.3 Annual Meeting with Emergency Responders

In addition to City of Columbia staff, Emergency Responders that shall be invited to the annual review of the EAP shall include but not be limited to:

- State Dam Safety Official for Missouri
- County Emergency Director/Sheriff
- Local Law Enforcement

APPENDIX A - CRITICAL INFRASTRUCTURE MAP

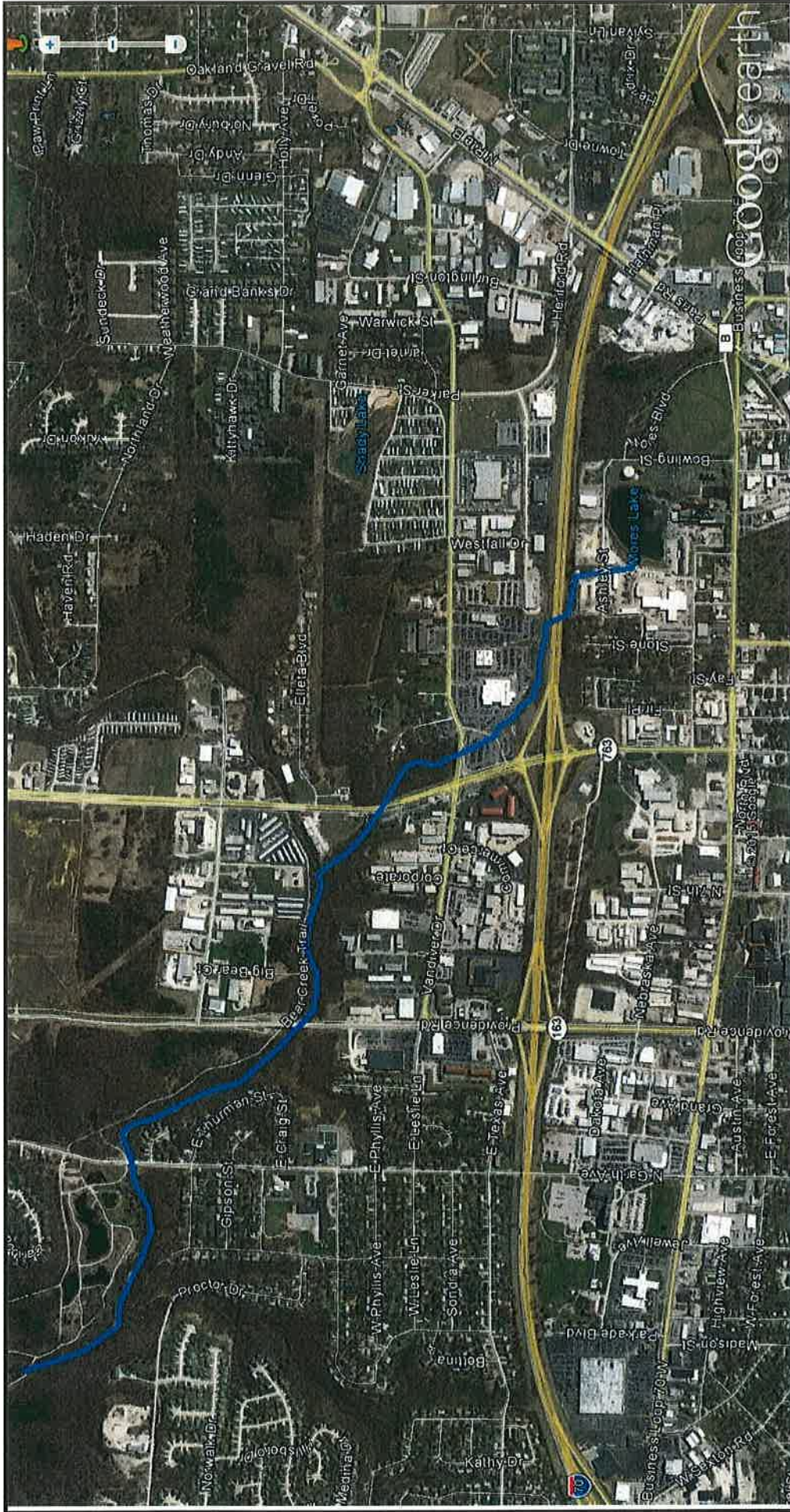


FIG. A1
 DOWNGRADIENT CRITICAL
 INFRASTRUCTURE MAP



APPENDIX B - NATIONAL INVENTORY OF DAMS (NID) DATA

Emergency Action Plan

More's Lake Dam

National Inventory of Dams, or NID, MO011173

Boone County, Missouri

SEMA Area F

Reviewed and Updated:

12/22/2008



Image Source: Google Earth

Columbia Water & Light Dept.

Name of dam owner/operator

Scott Olsen

Name of county Emergency Management Director

Boone County, Missouri

Date

Date

Basic EAP Data

More's Lake Dam, Boone County, NID MO011173

Purpose

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

Notification Procedure

This EAP provides general guidance for recognizing and characterizing an emergency situation occurring at the dam. The dam owner should act quickly to evaluate the emergency situation and then follow the notification procedures according to the corresponding level of emergency.

Potential Impacted Area

See *Critical Infrastructure Map* (Appendix A) and *Residents/Businesses/Entities at Risk* table for the locations and contact information of the following residents and businesses that may be flooded if the dam should fail. This list may also include critical infrastructure such as pipelines, power plants, substations, or sewer plants.

Critical infrastructure within two miles down gradient of the dam includes the City of Missouri Water & Light storage facilities, Interstate Highway 70, State Highway 763, an area of commercial development that includes a health care facility, and residential subdivisions.

Directions to dam (Review Arrival Time Map that shows major roads to the dam)

Starting at the Boone County Fire Protection Station located at 2201 I-70 Drive NW, get on I-70 E/US-40 E for 2.4 miles, and take exit 127 for Rangeline Street/MO-763 toward Moberly. Keep right at the fork to merge onto MO-763 S/Rangeline Street. After 0.3 miles, turn left onto I-70 Business Loop, and follow for 0.4 miles. The Columbia Power Plant is located just north of I-70 Business Loop, and More's Lake Dam is at the northern portion of the site.

Guidance for Determining the Emergency Level

This information should be used as a general guide for recognizing and characterizing the type of emergency situation occurring at the dam. The dam owner should notify the appropriate emergency contacts based upon the emergency level assigned to each situation.

Level 1 Emergency - Nonemergency, unusual event, slow to develop

- Reservoir water surface elevation at emergency spillway crest or spillway is flowing with no active erosion.
- New seepage areas in or near the dam.
- New cracks in the embankment greater than ¼-inch wide without seepage.
- Visual movement/slippage of the embankment slope.
- Instrumentation readings beyond predetermined values.
- Measurable earthquake felt or reported on or within 50 miles of the dam.
- Damage (vandalism/sabotage) to dam or appurtenances with no impacts to the functioning of the dam.
- Modification (vandalism/sabotage) to the dam or appurtenances that could adversely impact the functioning of the dam.

Level 2 Emergency - Potential dam failure situation, rapidly developing

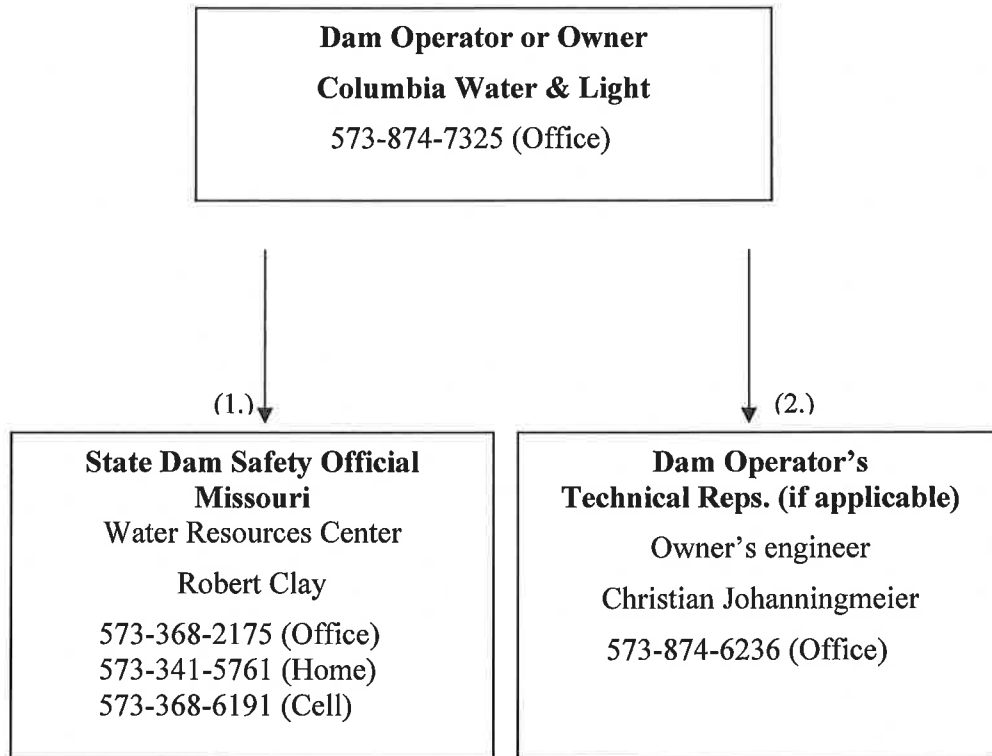
- Spillway flowing with active gully erosion.
- Spillway flow that could result in flooding of people downstream, if the reservoir level continues to rise.
- Reservoir level is 1 foot below the top of the dam.
- New seepage areas with cloudy discharge or increasing flow rate.
- Observation of new sinkhole in reservoir area, on embankment or downstream of dam.
- Cracks in the embankment with seepage.
- Earthquake resulting in visible damage to the dam or appurtenances.
- Verified bomb threat that, if carried out, could result in damage to the dam.
- Damage to dam (vandalism/sabotage) or appurtenances that has resulted in seepage flow.

Level 3 Emergency - Urgent; dam failure imminent or is in progress

- Spillway flowing with an advancing headcut that is threatening the control section.
- Spillway flow that is flooding people downstream.
- Water from the reservoir is flowing over the top of the dam (not just auxiliary/emergency spillway).
- Seepage that is obviously eroding soil from within the embankment or rapidly increasing in flow rate.
- Rapidly enlarging sinkhole.
- Sudden or rapidly progressing slides of the embankment slopes.
- Earthquake resulting in uncontrolled release of water from the dam.
- Detonated bomb that has resulted in damage to the dam or appurtenances.
- Damage to dam (vandalism/sabotage) or appurtenances that has resulted in uncontrolled water release.

Emergency Level 1 Notifications

Nonemergency, unusual event; slowly developing.



Note:

1., 2., etc., denotes call sequence

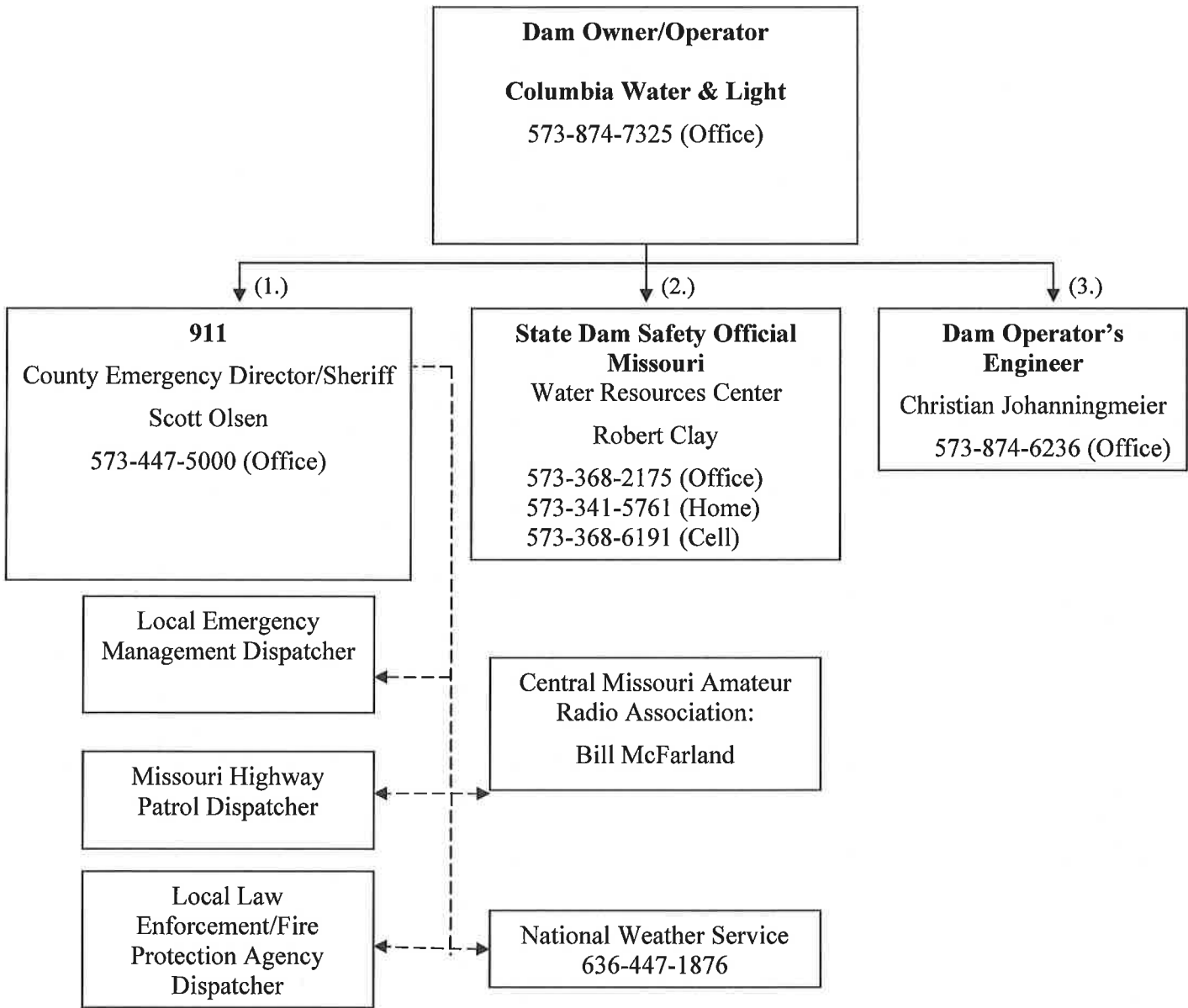
Legend:

Calls by operator/owner _____
Second level calls - - - - -

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

Emergency Level 2 Notifications

Emergency event, potential dam failure situation; rapidly developing.



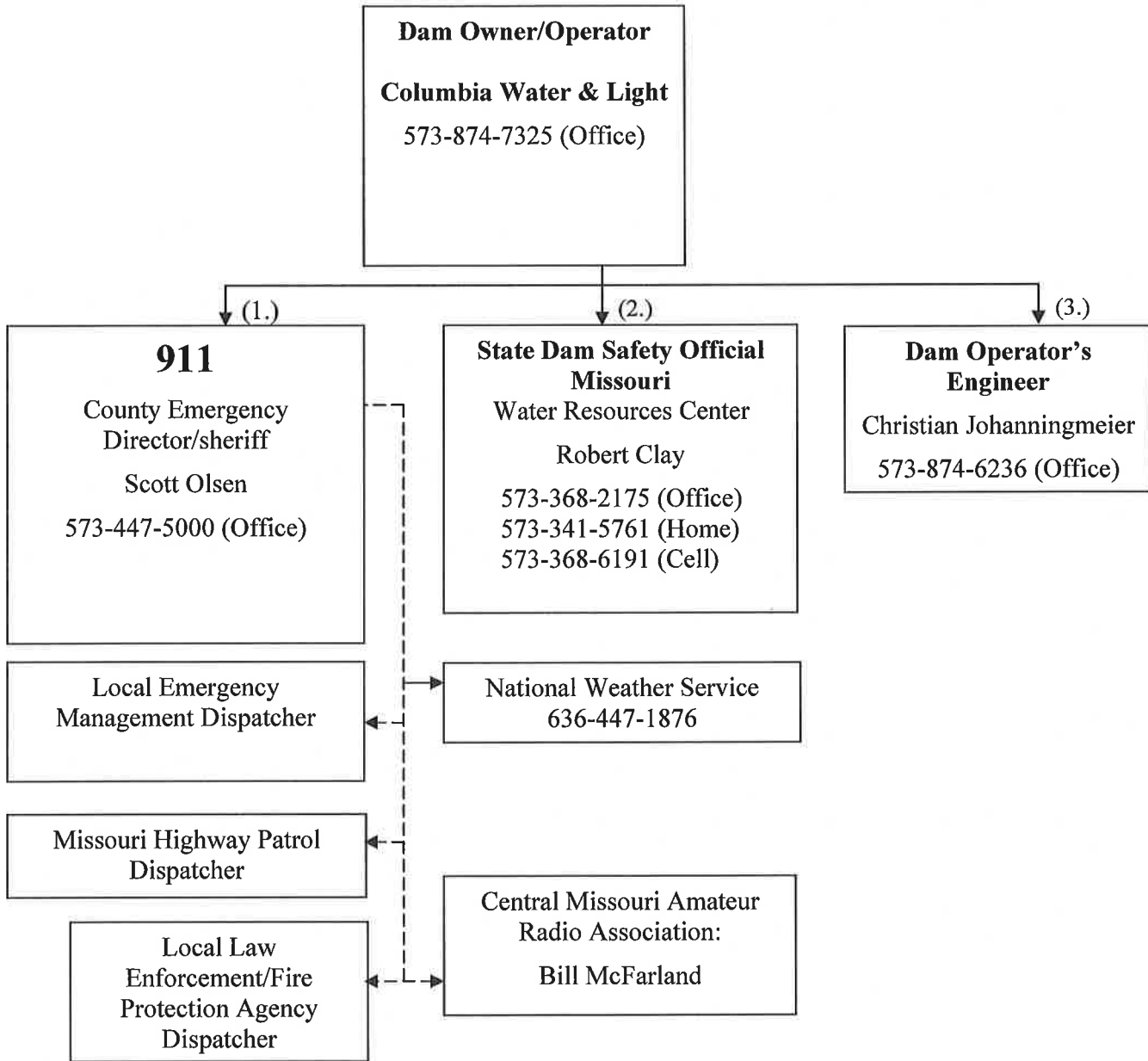
Note:
1., 2., etc., denotes call sequence

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

See *Emergency Services Contacts* sheet for contact information about 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 operator/owner _____
Second level calls - - - - -

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

Emergency Services Contacts

| Agency / Organization | Principal Contact | Address | Office Phone No. with Area Code | Alternate Telephone Numbers |
|---|---|--|---------------------------------|---|
| Boone County Sheriff | Dwayne Carey | 2121 County Dr Columbia, MO | 573-875-1111 ext. 6227 | |
| Owner/Representative of More's Lake Dam | Columbia Water & Light | 701 East Broadway Columbia, MO | 573-874-7325 | |
| County Emergency Management Director | Scott Olsen | 2201 I-70 Drive NW Columbia, MO | 573-447-5000 | |
| Boone County Fire Department | Scott Olsen | 2201 I-70 Drive NW Columbia, MO | 573-447-5000 | |
| Columbia Police Department | Ken Burton | 600 East Walnut Columbia, MO | 573-442-6131 | Emergency: 911 |
| Missouri State Highway Patrol | Captain Michael A. Turner | 1510 E. Elm St. Jefferson City, MO | 573-751-1000 | Emergency: 800-525-5555 |
| Boone County Public Works | Hilary Matney, Risk Management Specialist | 5551 S. Tom Brass Road Columbia, MO | 573-449-8515 | |
| Water Resources Center Dam and Reservoir Safety Program | Robert Clay Chief Engineer | 111 Fairgrounds Rd. Rolla, MO 65401 | 573-368-2175 | 573-341-5761 (H) 573-368-6191 (C) |
| Department of Natural Resources Emergency Response | Duty Officer EER | P.O. Box 176 Jefferson City, MO 65102 | 24 HOUR NO: 573-634-2436 | 573-526-3380 (Brian Allen, Chief, EER) |
| SEMA Floodplain Administrator | Tim Terry | P.O. Box 6015 701 E. Broadway Columbia, MO 65205 | (573) 874-7639 | |
| National Weather Service | Jim Kramper | St. Charles, MO | 636-447-1876 | 1-800-852-7497 636-447-1769 (Fax) |
| National Weather Service | Andy Bailey | Kansas City, MO | 816-540-5417 | |
| National Weather Service | Steve Runnels | Springfield, MO | 417-863-1456 | |
| National Weather Service | Ricky Shanklin | Paducah, KY | 270-744-6440 | |
| Missouri Department of Transportation | Emergency Operation Center 24-hour cell no. | | 573-522-9503 | |
| Missouri Department of Transportation | Mike Schupp, Area Engineer | | 660-882-3197 | |
| Natural Resources Conservation Service (For NRCS Dams) | Dick Purcell State Engineer | 601 Bus. Loop 70 W.Columbia, MO 65203 | 573-876-0910 | |
| KOMU 8 TV Station | Chris Swisher | 5550 Hwy 63 South Columbia, MO | 573-884-4399 | |
| Local Radio Station KOPN 89.5 FM | David Owens | 915 E. Broadway Columbia, MO | 573-874-1139 | 573-874-5676 (Studio) |

Residents/Businesses/Entities/Infrastructure at Risk

| Entity No. | Resident/business or other impacted entity | Address | Phone No. with area code | Approximate distance downstream from dam (mi) |
|------------|--|---|--------------------------|---|
| 1 | Interstate - 70 | N/A | 1-888-275-6636 | 0.2 |
| 2 | Joe Machens Car Dealerships | 1112-1120 Vandiver Dr., Columbia, MO 65202 | 573-818-2488 | 0.4 |
| 3 | Midwest Autoworx | 2001 Rangeline St., Columbia, MO 65202 | 573-474-5574 | 0.7 |
| 4 | Columbia Car Rental | 2115 Rangeline St., Columbia, MO 65202 | 573-443-7600 | 0.7 |
| 5 | Parkade Subdivision | Near intersection of N. Garth Ave. and N. Garth Ct., Columbia, MO 65203 | | 1.5 |

Resources Available

Locally available resources include: (if not available please note)

| Heavy Equipment Service and Rental | Sand and Gravel Supply | Ready-mix Concrete Supply |
|--|--|--|
| Schultz Excavating & Crane Service 5600 E Highway Hh, Columbia, MO 573-474-4121 | A J's Trucking 3125 N Route Z Columbia, MO 573-881-3350 | Columbia Ready Mix 2600 N Stadium Blvd, Columbia, MO 573-445-3901 |
| Pumps | Diving Service | Sand Bags |
| A1 Tool & Equipment Rental 2201 Vandiver Drive, Columbia, MO 573-474-7368 | N/A | Westlake Ace Hardware 1900 Business Loop 70 E Columbia, MO 573-449-7277 |

Appendix B
National Inventory of Dams (NID) Data

| | |
|------------------------------------|--|
| Dam name: Mores Lake Dam | Type of dam: Earth |
| State: Missouri | Max. discharge: unknown |
| NID ID: MO11173 | Max. storage: 112 acre-ft. |
| Sec: 06 Township: 48 N Range: 12 W | Normal storage: 51 acre-ft. |
| Longitude: -92.3183 | Surface area: 7 acres |
| Latitude: 38.9663 | Drainage area: 29 acres |
| Longitude: 92° 19' 02" | Inspection frequency: 0 yrs. |
| Latitude: 38° 57' 58" | State regulatory agency: NONE |
| County: Boone | Dam height: 30 ft. |
| Stream: TR-Bear Creek | Dam length: ft. |
| Nearest town downstream: N/A | Current hazard class: not listed - unregulated |
| Distance to nearest town: N/A | Principal spillway type: 8" ductile iron pipe |
| Year constructed: 1904 | Emergency spillway type: same |
| Nearest town: N/A | |

Comments: _____

APPENDIX C - UNUSUAL OR EMERGENCY EVENT LOG

Appendix C

Unusual or Emergency Event Log (To be completed during the emergency)

Dam name:

County:

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 | Recorded by |
|------|------|--------------------------|----------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

APPENDIX D - GLOSSARY

Appendix D

Glossary

| | |
|-------------------------------|--|
| Abutment | The 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. |
| Appurtenances | Structures incident to or annexed to dams essential to the proper operation, maintenance or functioning of the dam. This includes such structures as spillways, low level outlet works and water conduits, such as tunnels, pipelines or penstocks, either through a dam or its abutments. |
| 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. |
| Control section | An usually level segment in the profile of an open channel spillway above which water in the reservoir discharges through the spillway. |
| Dam | An artificial barrier generally constructed across a watercourse for the purpose of impounding or diverting water. |
| Emergency spillway | The appurtenant structure that provides the controlled conveyance of excess water through, over, or around the dam. |
| 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 spillway structures. Examples include seepage measuring weirs, piezometers, inclinometers and survey monuments. |
| Low level outlet works | An appurtenant structure, usually consisting of a pipe through the embankment or principal spillway structure equipped with a valve, whose purpose is to allow lowering the lake level. |
| Principal spillway | The appurtenant structure that conveys normal inflow through or around the embankment. |
| Reservoir | The body of water impounded or potentially impounded by the dam. |
| Seepage | The natural movement of water through the embankment, foundation, or abutment of the dam. |

APPENDIX E - RECORD OF HOLDERS, REVISIONS & UPDATES

Appendix E
Record of Holders of Control Copies of this EAP

| Copy Number | Organization | Person receiving Copy | E-mail Address |
|--------------------|--|---|--|
| 1 | Columbia Water & Light 701 East Broadway Columbia, MO | Christian Johanningmeier (Owner's Engineer) | Christian.Johanningmeier@Como.gov 573-874-7325 |
| 2 | City Emergency Management Director (Columbia, MO) | Terry Cassil | TCassil@boonecountymo.org 573-489-2155 |
| 3 | Missouri Dept. of Natural Resources Dam Safety Program and address | Bob Clay | Bob.Clay@dnr.mo.gov |

Record of Revisions and Updates Made to EAP

| Revision Number | Date | Revisions made | By whom |
|------------------------|-------------|-----------------------|----------------|
| | | | |



CREATE AMAZING.

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