EMERGENCY ACTION PLAN

GREEN HOLLOW DAM I
FLYING D RANCH

Flying D Ranch
c/o Turner Enterprises Inc.
1123 Research Drive
Bozeman, MT 59718

January 1, 2002

Updated: January 27, 2003
January 25, 2005
May 10, 2006
October 2008
October 2009
December 3, 2010
December 19, 2011
March 13, 2013
July 17, 2014

If Green Hollow Dam is failing or failure seems imminent, call: 911

Gallatin County Sheriff..... [redacted]or 911

Disaster and Emergency Services, Patrick Lonergan ..... 5[redacted]or 911
..... Cell: [redacted]

Flying D Ranch, Danny Johnson, Manager..... 7[redacted]
..... Cell: 5[redacted]

Carter Kruse, Aquatic Resource Coordinator, Turner Enterprises .....[redacted]
..... Cell: [redacted]

TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose

The purpose of this emergency action plan (EAP) is primarily to safeguard lives and secondarily to reduce property damage to the citizens of Gallatin County living along Spanish Creek and the Gallatin River, in the event of flooding caused by a failure of Green Hollow Dam.

B. Description of Dam

Green Hollow Dam is in Gallatin County, in Sections 9 and 10, Township 4 South (T4S), Range 3 East (R3E), and located on Green Hollow Creek, a tributary of Spanish Creek. It is owned by Turner Enterprises Inc., 1123 Research Drive, Bozeman, MT 59718, and is used for recreational purposes. Technical data pertaining to Green Hollow Dam and its structures are shown in Appendix A.

C. Access to Dam

Green Hollow Dam is located six miles south of Gallatin Gateway on Highway 191 and four miles west on Spanish Creek Road. As shown on the inundation map in Appendix B, one road accesses the Green Hollow Dam from Highway 191. Note that the road may become flooded! The nearest telephone is at the home of Rob Arnaud PO Box 478, Gallatin Gateway, MT 59730. Phone number, [redacted]

D. Hazard Area

The evacuation area extends along Spanish Creek to the Gallatin River, as shown in Appendix B. Hazards include the possible inundation of State Highway 191. Inundation and evacuation maps are in Appendix B.

E. Responsibility and Authority

Pursuant to the Dam Safety Act, Chapter 15 of Title 85, MCA, the dam owner is responsible for production, coordination, maintenance, and implementation of this emergency action plan. The extent of owner implementation was defined through coordination of this plan with the County Sheriff and Disaster and Emergency Services (DES) coordinator.

F. Periodic Review/Update

The owner shall review/update this EAP annually. Review/update by a qualified professional engineer will be accomplished as required by the dam's operating permit, but no less than every five years.

G. Approval

By my signature, I acknowledge that I, or my representative, have reviewed this plan and agree to the tasks and responsibilities assigned herein for my department and/or agency.

_____ Signature Date
OWNER, GREEN HOLLOW DAM / FLYING D RANCH

_____
Print name

_____ Signature Date
GALLATIN COUNTY SHERIFF'S DEPARTMENT

_____
Print name

_____ Signature Date
GALLATIN COUNTY DISASTER AND EMERGENCY SERVICES

_____
Print name

II. NOTIFICATION PROCEDURES

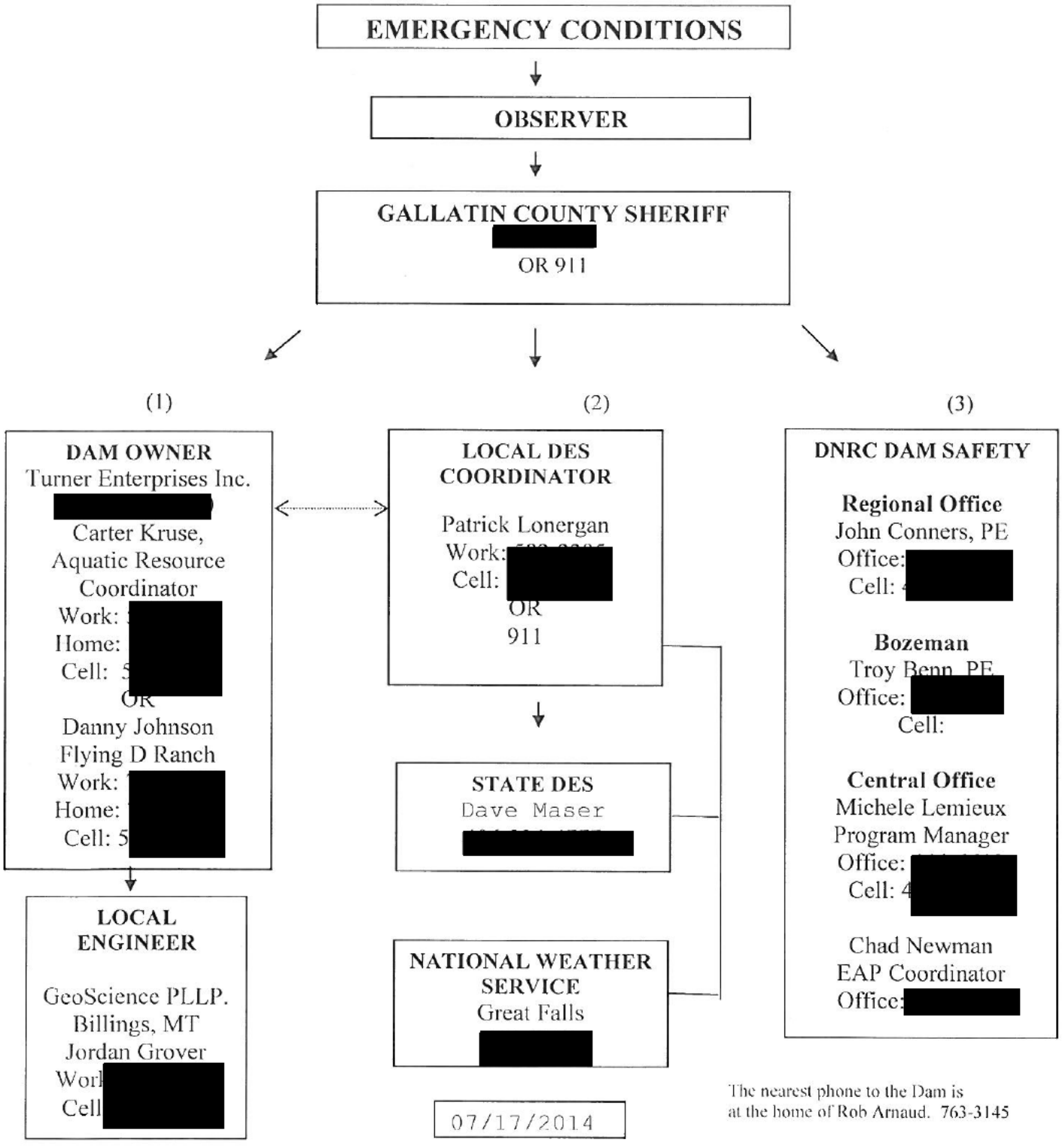
A. Imminent or Actual Failure

If GREEN HOLLOW DAM IS FAILING, TWO THINGS MUST BE DONE IMMEDIATELY:

(1) Residents in the hazard area downstream from the dam must be warned according to the county warning plan, and initiated as shown in Figure 1, and

(2) Any steps that might save the dam or reduce damage to the dam or hazard area downstream should be taken. (Refer to the map in Appendix B to determine the areas that are likely to be inundated if the dam fails).

FIGURE 1
GREEN HOLLOW DAM
ACTUAL OR IMMINENT FAILURE
"NOTIFICATION FLOW CHART"



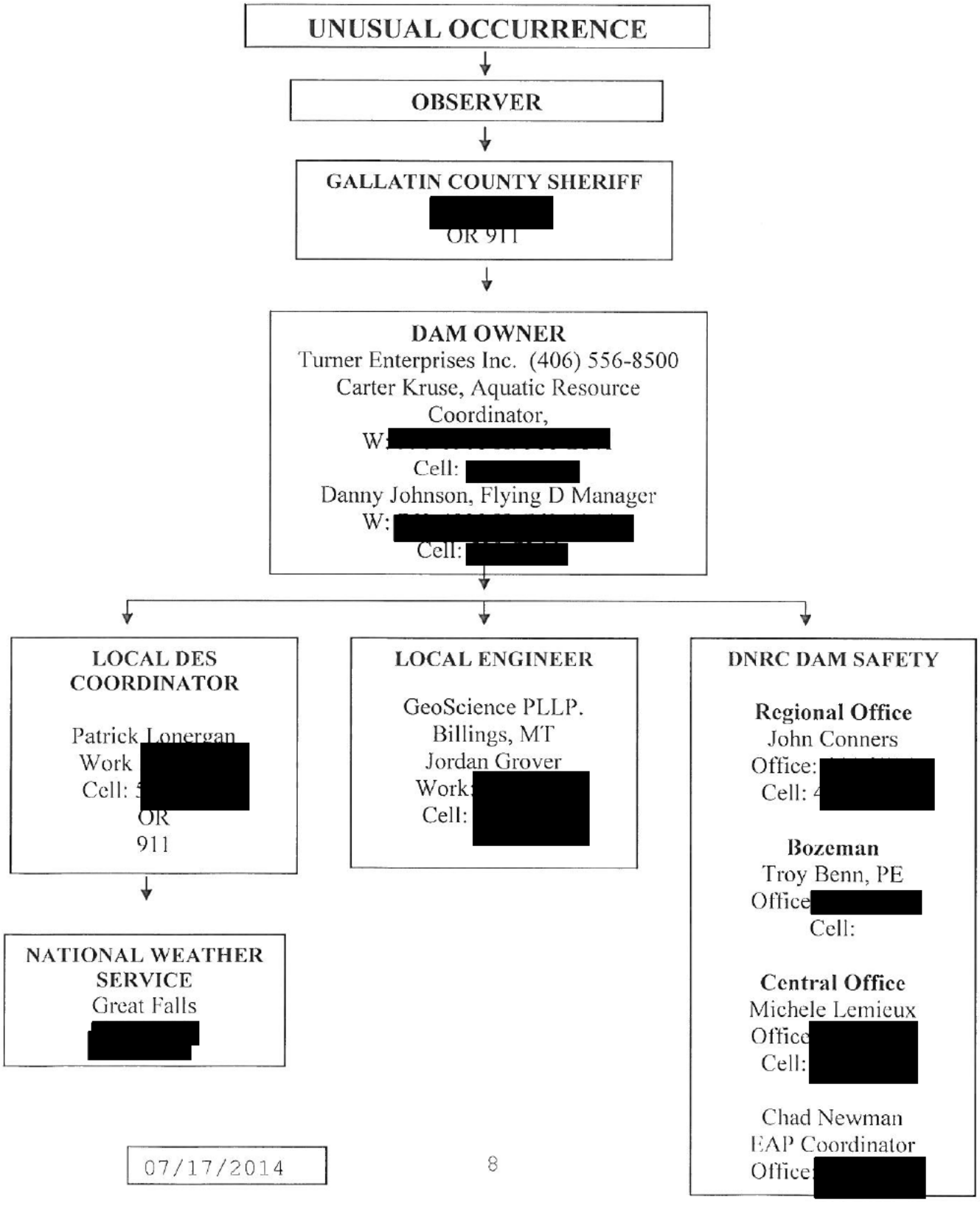
As dam owner, it is your responsibility to:

1. Call the Sheriff's Dispatch Center (911) and Disaster and Emergency Services ([redacted] or 911), if they have not already been notified. Be sure to say, "This is an emergency." They will call other authorities and the media and begin the warning plan.
2. Warn anyone in the immediate area of danger, and if directed to do so by the sheriff, evacuate them to safety. This includes someone boating on the reservoir, directly on or below the dam, and anyone further downstream.
3. Contact the Disaster and Emergency Services staff at least once every hour. They may request your assistance in evacuating residents.
4. If all means of communication are lost:
   a. Attempt to find out why.
   b. Get someone else to try to reestablish communications. If these means fail, take care of immediate problems and send someone to get to another radio or telephone that works.

B. Potentially Hazardous Situation

A potentially hazardous situation is an event or condition not normally encountered in the routine operation of the dam and reservoir. Among the unusual occurrences that may affect the dam are dam embankment problems (see section B.2), failure of the spillway or outlet works, heavy precipitation or rapid spring snow melt, landslides, earthquakes, erosion, theft, vandalism, acts of sabotage, and serious accidents. These occurrences may endanger the dam, the public, or the downstream valley and may necessitate a temporary or permanent revision of the dam's operating procedures. Help in these situations can be obtained by notifying those people shown in Figure 2.

FIGURE 2
GREEN HOLLOW DAM
UNUSUAL OCCURENCE
"NOTIFICATION FLOW CHART"



1. If the dam owner discovers an unusual condition of the dam embankment that could threaten the structure:

   a. Have a qualified engineer inspect the dam as soon as possible to determine whether emergency action is necessary.
   b. Notify the county Disaster and Emergency Services Coordinator ([redacted]r 911) of the potential problem.
   c. Contact the Dam Safety Program of the Department of Natural Resources and Conservation (DNRC).

2. Among the conditions the dam owner should watch for are:
   a. Overtopping of the dam by flood waters
   b. Loss of material from the dam crest due to storm wave erosion
   c. Slides on either the upstream or downstream slope of the embankment as evidenced by
      1. Sloughing
      2. Cracking
      3. Bulging
      4. Scarping
   d. Erosional flows through, beneath, or around the embankment as evidenced by
      1. Excessive seepage
      2. Discoloration of the seepage
      3. Boils on the downstream side
      4. Sinkholes
      5. Changes in the flow from drains
   e. Failure of outlets or spillways due to clogging or erosion
   f. Movement of the dam on its foundation as evidenced by
      1. Misalignment
      2. Settlement
      3. Cracking

3. Before calling either an engineer or DNRC to report a problem, the dam owner shall use the form in Appendix D to ensure sufficient information is provided for the engineer to analyze the problems. After talking to the engineer, it may be helpful to document the condition of the dam by making a sketch on the form in Appendix D, showing the extent of the problem. Revise the sketch periodically if the problem develops further. Section III includes further guidelines for courses of action to take to mitigate the effect of many problems.

C. Posting of the Notification Flowchart and Distribution of the EAP.

The Notification Flowchart is posted at the Turner residence located upstream from the dam and a copy of the EAP is located at the Flying D Ranch office and in the Aquatic Resource Coordinator's office. A plan distribution list is found in Appendix E.

III. MITIGATION ACTIONS

Besides normal monitoring of the dam's condition, which is done at least monthly, the owner will provide continuous monitoring and inspection during and after extreme events such as storms and earthquakes. Information on the magnitude of an earthquake or storm can be obtained from the DNRC Dam Safety Program. Actions are suggested below to mitigate problems that may develop, but those actions should never be continued at the risk of injury or at the expense of lessening efforts related to evacuation. Monitoring should identify any of the following potential problems.

A. Potential Problems and Immediate Response Actions

1. OVERTOPPING BY FLOOD WATERS
   - a. Open outlet to its maximum safe capacity.
   - b. Place sandbags along the crest to increase freeboard and force more water through the spillway and outlet.
   - c. Provide erosion-resistant protection to the downstream slope by placing plastic sheets or other materials over eroding areas.
   - d. Divert flood waters around the reservoir basin, if possible.
   - e. Create additional spillway capacity by making a controlled breach in a low embankment or dike section where the foundation materials are erosion-resistant.

2. LOSS OF FREEBOARD OR DAM CROSS SECTION DUE TO STORM WAVE EROSION
   - a. Place additional riprap or sandbags in damaged areas to prevent further embankment erosion.
   - b. Lower the water level to an elevation below the damaged area.

3. SLIDES IN THE UPSTREAM OR DOWNSTREAM SLOPE OF THE EMBANKMENT
   - a. Lower the water level at a rate and to an elevation considered safe, given the slope condition. If the outlet is damaged or blocked, pumping, siphoning, or a controlled breach may be required.
   - b. Stabilize slides on the downstream slope by
     1. weighting the toe area with additional soil, rock, or gravel, and
     2. restoring lost freeboard by placing sandbags at the crest.

4. EROSIONAL FLOWS THROUGH THE EMBANKMENT, FOUNDATION, OR ABUTMENTS
   - a. Plug the flow with whatever material is available (hay bales, bentonite, or plastic sheeting if the entrance to the leak is in the reservoir basin).
   - b. Lower the water level until the flow decreases to a non-erosive velocity or stops.
   - c. Place a protective sand-and-gravel filter or boil ring over the exit area to hold materials in place.

5. FAILURE OF APPURTENANT STRUCTURES SUCH AS OUTLETS OR SPILLWAYS
   a. Implement temporary measures to protect the damaged structure, such as closing an outlet or protecting a damaged spillway with riprap.
   b. Lower the water level to a safe elevation. If the outlet is inoperable, pumping, siphoning, or a controlled breach may be required.

6. MASS MOVEMENT OF THE DAM ON ITS FOUNDATION (SPREADING OR MASS SLIDING FAILURE)
   a. Immediately lower the water level until excessive movement stops.

7. EXCESSIVE SEEPAGE AND HIGH LEVEL SATURATION OF THE EMBANKMENT
   a. Lower the water to a safe level.
   b. Continue frequent monitoring for signs of slides, cracking or concentrated seepage.

8. SPILLWAY BACKCUTTING, THREATENING RESERVOIR EVACUATION
   a. Reduce the flow over the spillway by fully opening the main outlet.
   b. Provide temporary protection at the point of erosion by placing sandbags, riprap materials, or plastic sheets weighted with sandbags.
   c. When the inflow subsides, lower the water to a safe level.

9. EXCESSIVE SETTLEMENT OF THE EMBANKMENT
   a. Lower the water level by releasing it through the outlet pumping, siphoning, or a controlled breach.
   b. If necessary, restore freeboard, preferably by placing sandbags.

B. Emergency Supplies and Resources

In the vicinity of Green Hollow Dam are soils suitable for emergency repairs. The southwest bank and hillside across the emergency spillway are composed of a layer of clayey, silty soil that is fairly impermeable. Upstream from the reservoir are sand and gravels. One mile upstream from the reservoir, ballast rock and riprap are available.

C. Local Contractors and Engineers

CONTRACTORS:

Sime Construction.....

.....

CK May Excavating.....

Miller & Sons Excavating Contractors:.....

.....

TMC Inc.....

ENGINEERS:

GeoScience, PLLP

Jordan Grover .....Office:

..... Cell:

Whitten & Borges, PC

William Freese .....Office:

..... Cell:

Pioneer Technical Services

George Austiguy .....Office:

..... Cell:

MONTANA DNRC:

John Conners, Regional Engineer.....Office:

..... Cell:

Regional Office, Bozeman

Troy Benn .....Office:

.....

Central Office, Helena

Michele Lemieux .....Office:

..... Cell:

Chad Newman .....Office:

07/17/2014

APPENDICES

APPENDIX A
Technical Data

APPENDIX A

Technical Data for Green Hollow Dam

Max Reservoir Capacity to the Crest of the Dam: ..... 290 acre-feet (94,511,000 gallons)

Normal Reservoir Capacity Measured to the Principal Spillway Crest
..... 174 acre-feet (56,706,600 gallons)

Normal Water Depth Measured from the Streambed to the Crest of the Principal Spillway
.....40 feet

Dam Height Measured From Streambed to Crest of the Dam:.....47 feet

Dam Crest Width: .....16 feet

Dam Width at Base:.....204 feet

Length of Dam Crest: .....645 feet

Outlet Capacity at Emergency Spillway Crest: .....130 cubic feet per second

Emergency Spillway Capacity @ Reservoir Elevation 5622 ft.....4,475 cubic feet per second

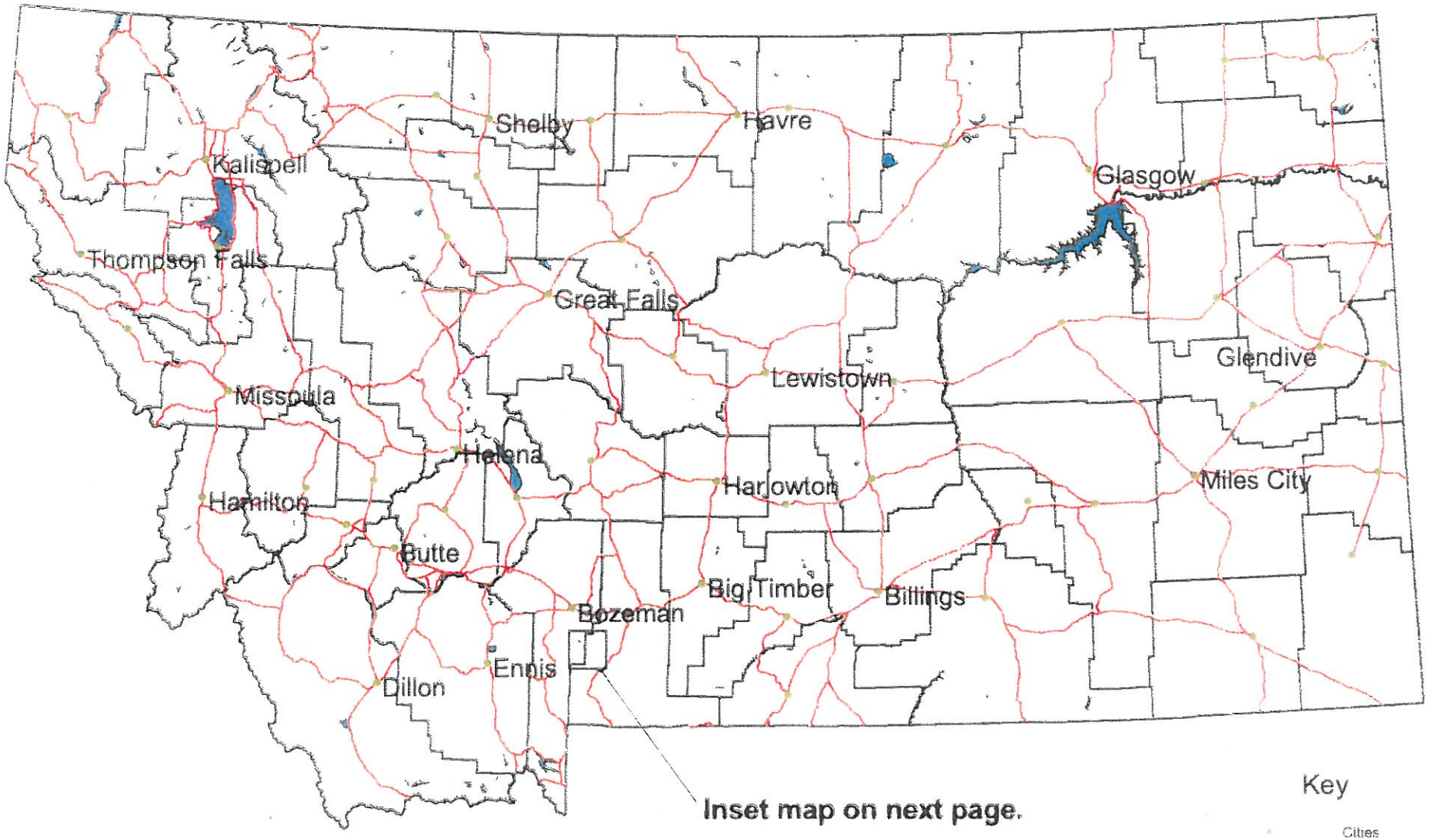
Date Constructed.....1990

Slope of Upstream Face of Dam (Horizontal to Vertical)
..... 2:1

Slope of Downstream Face of Dam (Horizontal to Vertical)..... .....2:1

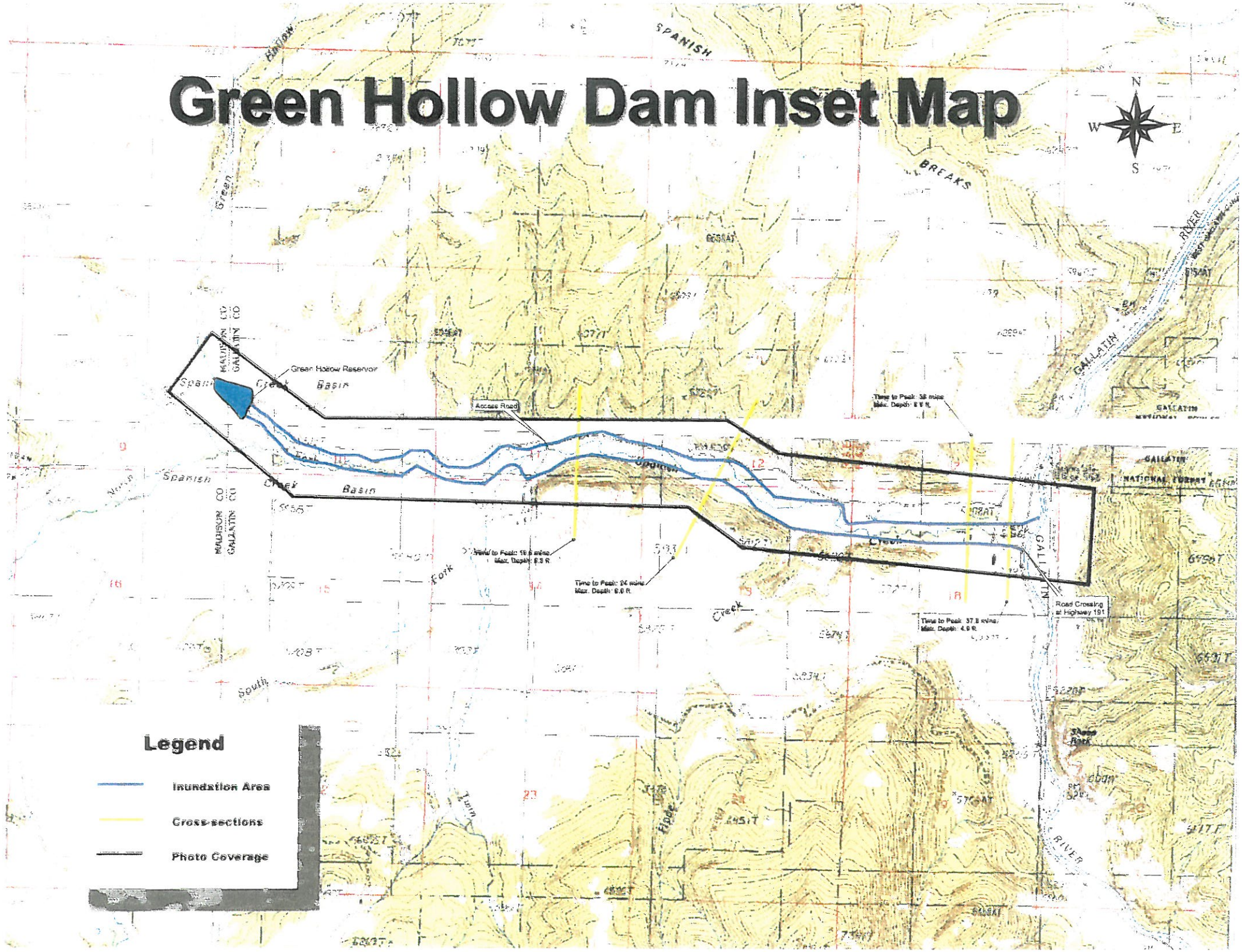
APPENDIX B
Inundation & Evacuation Maps

Green Hollow Overview Map



Kevin Pramore--August 2001

Green Hollow Dam Inset Map



Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Cross-section

Approximate Scale: Photo = 1/2 mile

Photo 1 of 8

July, 2001
Kevin Premore

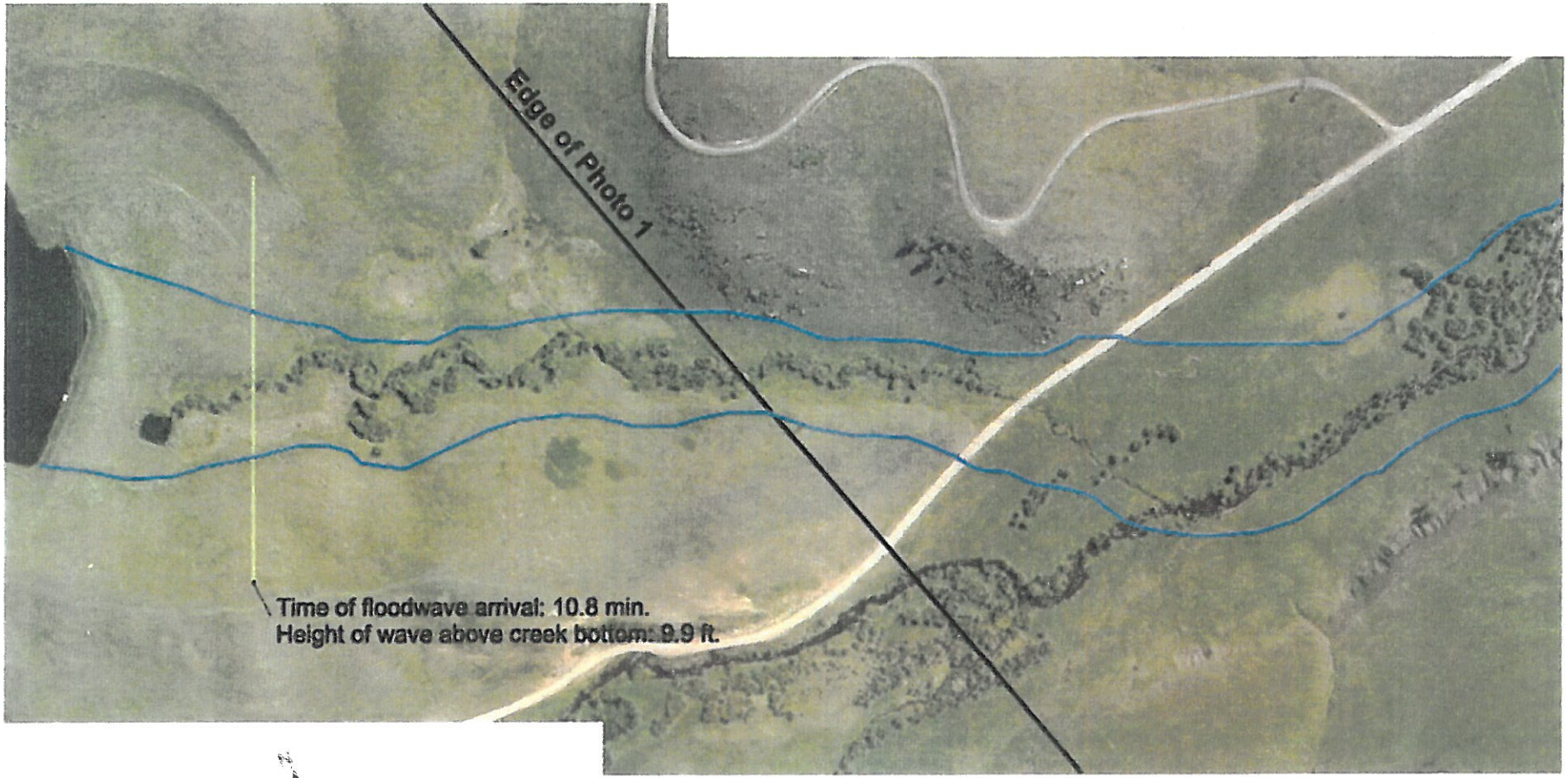
Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Cross-section

Edge of Photo 1



Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Edge of Photo 2

Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

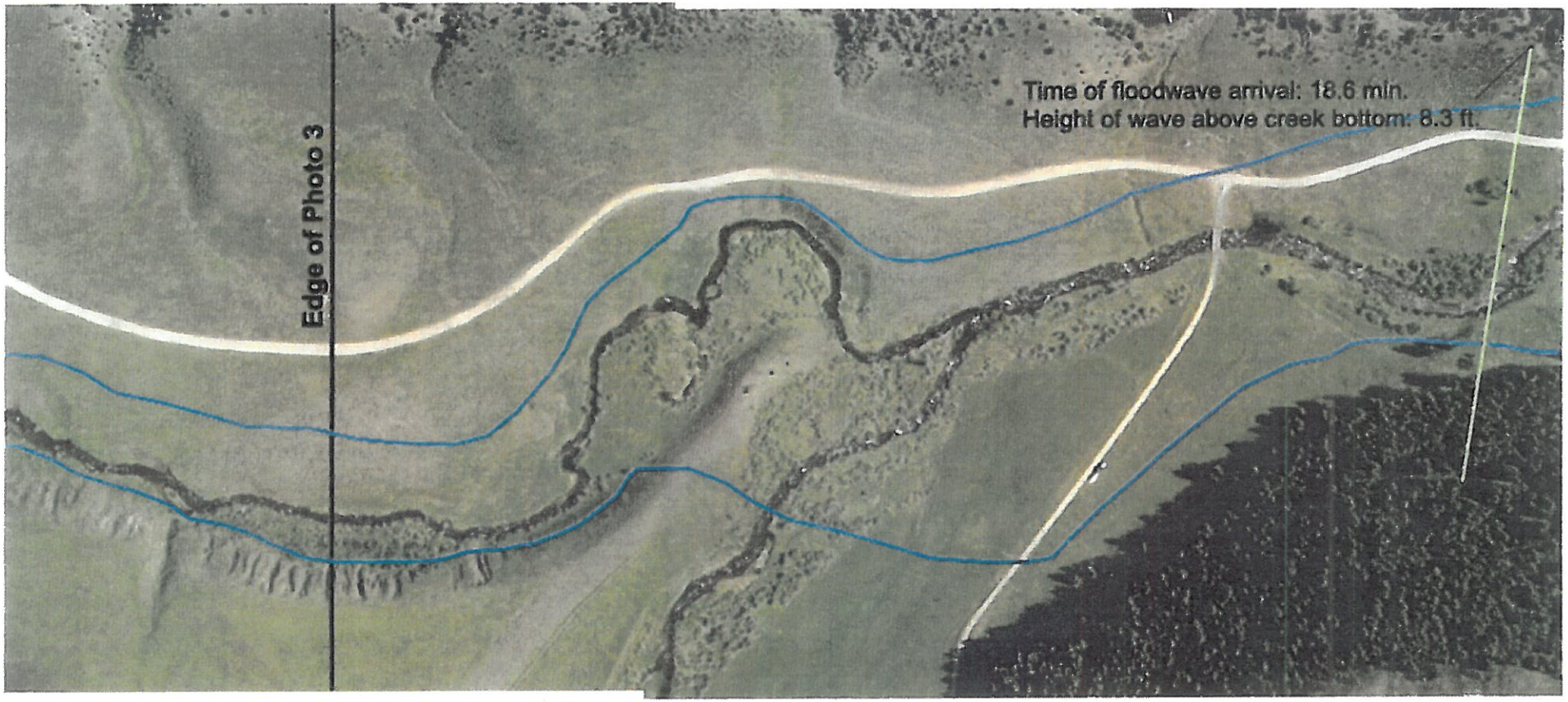
Green Hollow Dam Evacuation Photos

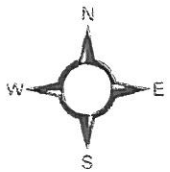
Key to Features

Inundation Area

Cross-section

Edge of Photo 3





Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

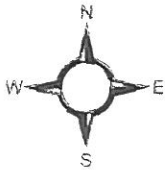
Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Cross-section

Edge of Photo 4



Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

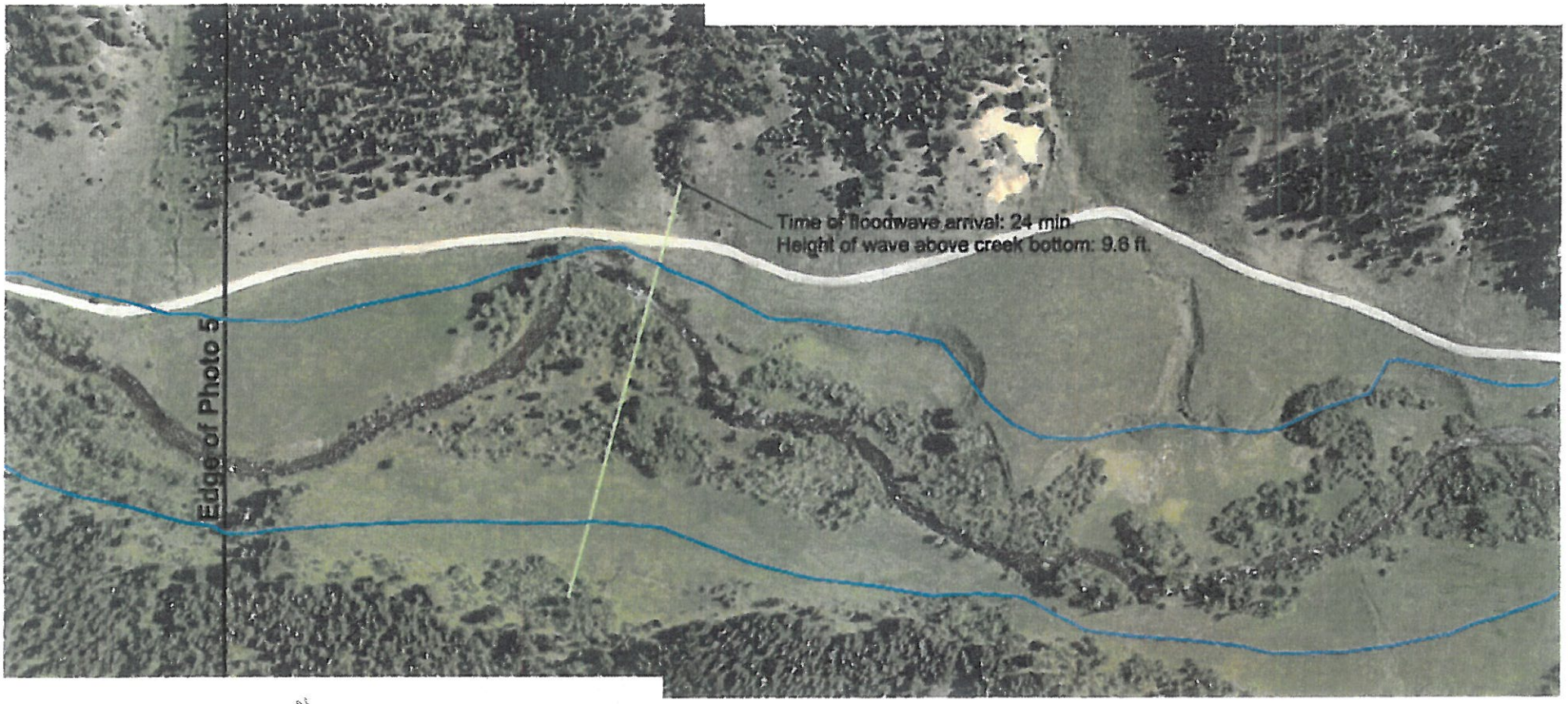
Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Cross-section

Edge of Photo 5



Approximate Scale: Photo = 1/2 mile

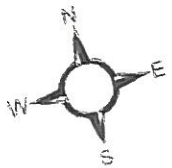
July, 2001
Kevin Premore

Green Hollow Dam Evacuation Photos

Key to Features

Inundation Area

Edge of photo 6



Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

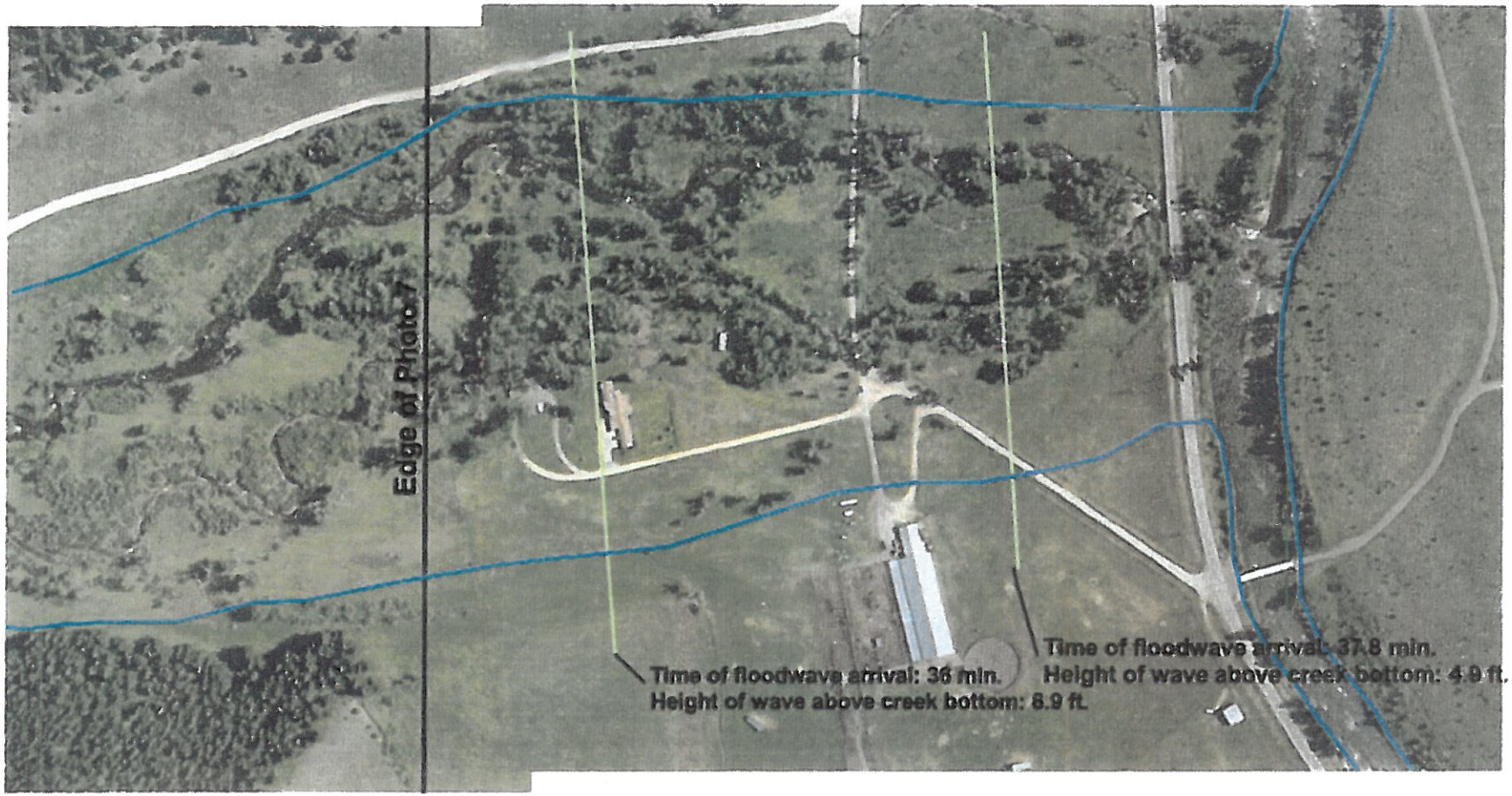
Green Hollow Dam Evacuation Photos

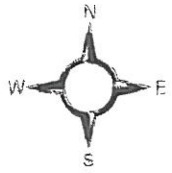
Key to Features

Inundation Area

Cross-section

Edge of Photo 7





Approximate Scale: Photo = 1/2 mile

July, 2001
Kevin Premore

APPENDIX C
Telephone Directory

Appendix C
TELEPHONE DIRECTORY

A. Priority One

1. SHERIFF, Gallatin County 911
..... [redacted]

2. DISASTER AND EMERGENCY SERVICES, Gallatin County

Patrick Lonergan ..... Office: [redacted]
..... Cell:
.....

State Disaster and Emergency Services (Helena)
Dave Maser ..... [redacted]

B. Priority Two

3. LOCAL ENGINEERS

GeoScience, PLLP
Jordan Grover ..... Office [redacted]
..... Cell:

Whitten & Borges, PC
William Freese ..... Office
..... Cell:

Pioneer Technical Services
George Austiguy ..... Office
..... Cell:

4. MONTANA DEPT. OF NATURAL RESOURCES AND CONSERVATION

John Conners, Regional Engineer ..... Office: [redacted]
..... Cell:

Michele Lemieux, Dam Safety Program Manager: ..... Office:
..... Cell:

Mr. Laurence Siroky, Water Operations Bureau Chief ..... Office:
..... Home:
..... Cell:

5. NATIONAL WEATHER SERVICE

Missoula.....

Great Falls.....

6. MONTANA DEPT OF TRANSPORTATION (Bozeman) .....

GALLATIN COUNTY ROAD OFFICE .....

7. MONTANA DEPT OF FISH, WILDLIFE & PARKS .....

8. U.S. FOREST SERVICE (Gallatin NF) .....

[redacted]

07/17/2014

APPENDIX D
Dam Incident Report Form

APPENDIX D

DAM INCIDENT REPORT FORM

DATE:_____ TIME:_____

NAME OF DAM:_____

STREAM NAME:_____

LOCATION:_____

COUNTY:_____

OBSERVER:_____

OBSERVER TELEPHONE:_____

NATURE OF PROBLEM:_____

_____

LOCATION OF PROBLEM AREA (Looking Downstream):_____

_____

EXTENT OF PROBLEM AREA:_____

FLOW QUANTITY AND COLOR: _____

WATER LEVEL IN RESERVOIR:_____

IS SITUATION WORSENING? _____

EMERGENCY STATUS:_____

CURRENT WEATHER CONDITIONS:_____

ADDITIONAL COMMENTS:_____

APPENDIX E
Plan Distribution List

APPENDIX E

Emergency Action Plan Distribution List

PLAN HOLDER	NUMBER OF COPIES
Dam Owner, Turner Enterprises Inc.	2
Dam Tender, Mr. Carter Kruse	1
Gallatin County Sheriff	1
Local DES Coordinator	1
DNRC Dam Safety Program	1
DNRC Bozeman Office	1
National Weather Service	1
Montana DES Coordinator	1