EMERGENCY ACTION PLAN

BIG SKY DAM
MT-1395

OWNER:

BOYNE USA RESORTS
P.O. Box 160001
BIG SKY, MT 59716

PHONE: (406) 995-5857

ORIGINAL DATE: JUNE 1995

REVISION:
June 2016

COPY NO. _____

TABLE OF CONTENTS

1 INTRODUCTION 2
1.1 Purpose 2
1.2 Description of Dam 2
1.3 Access to Dam 2
1.4 Hazard Area 2
1.5 Responsibility and Authority 4
1.6 Periodic Review and Updating 5
1.7 Approval (signatures)..... 5

2 NOTIFICATION PROCEDURES 7
2.1 Failure is Imminent or Has Occurred 7
2.2 What the Dam Owner Should Do 7
2.3 Potentially Hazardous Situation is Developing 10
2.4 What the Dam Owner Should Do 10
2.5 Conditions to Watch For 10
2.6 Required Data Forms 10
2.7 Posting the Notification Flowchart and Distribution of EAP 10
2.8 Telephone Directory 11
2.8.1 First Priority 11
2.8.2 Second Priority 12
2.9 Evacuation Procedures 13
2.10 Example Emergency Broadcast System Announcement 14

3 MITIGATION ACTIONS 15
3.1 Potential Problems and Possible Immediate Response Actions 15
3.1.1 Overtopping by flood waters 15
3.1.2 Loss of dam cross section due to storm wave erosion 15
3.1.3 Landslides in the dam embankment 16
3.1.4 Seepage through the embankment, foundation, or abutments 16
3.1.5 Failure of appurtenant structures such as outlets or spillways 16
3.1.6 Mass movement of the dam on its foundation, (spreading or mass sliding failure) 16
3.1.7 Excessive seepage and high level saturation of the embankment 17
3.1.8 Spillway back cutting threatening reservoir evacuation 17
3.1.9 Excessive settlement of the embankment 17
3.1.10 Loss of abutment support. 17
3.1.11 Earthquake Zone 17
3.2 Emergency Supplies and Resources 18
3.3 Local Contractors 18

LIST OF FIGURES

FIGURE 1: VICINITY MAP 3
FIGURE 2: IMMINENT FAILURE NOTIFICATION FLOWCHART 8
FIGURE 3: UNUSUAL OCCURRENCE NOTIFICATION FLOWCHART 9

LIST OF TABLES

TABLE 1: IMMEDIATE NOTIFICATION LIST 1
TABLE 2: DAMBREAK FLOOD CHARACTERISTICS 4
TABLE 3: EAP OFFICIAL DISTRIBUTION LIST 6

APPENDICES

APPENDIX A - DAM INCIDENT REPORT FORM……..21
APPENDIX B - INUNDATION AND EVACUATION MAPS……22
APPENDIX C - TECHNICAL DATA FOR BIG SKY DAM……23

TABLE 1: IMMEDIATE NOTIFICATION LIST

If Big Sky Dam is failing or failure seems imminent, call:

Emergency Services Dispatch Center	911
Disaster and Emergency Services (Gallatin)	[redacted]
Mike Unruh, Director, Mountain Operations	[redacted] (office) [redacted] (cell)
John Knapton, Manager, Mountain Operations	[redacted] (office) [redacted] (cell)
Taylor Middleton, General Manager	[redacted] office [redacted] (cell) [redacted] (home)
Big Sky Fire Department	911 (Emergency) [redacted]
Big Sky Homeowner's Association	[redacted]
Lone Moose Homeowner's Association	[redacted]

1 INTRODUCTION

1.1 Purpose

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

1.2 Description of Dam

Big Sky Dam is located in Madison County, Sections 29 and 30, Township 6 South, Range 3 East on the Middle Fork of West Fork Gallatin River, tributary to Gallatin River as shown on Figure 1. It is owned by Boyne USA Resorts, P.O. Box 1, Big Sky, Montana, 59716, and is used for primarily for recreation and water supply. Technical data pertaining to Big Sky Dam is listed in Appendix C.

1.3 Access to Dam

Traveling north on U.S. 191 from Bozeman to the Big Sky turn off, then approximately 10 miles west on State Highway 64 to the Mountain Village area accesses Big Sky Dam. As shown on the inundation map in Appendix B, one road (State Highway 64) accesses the Big Sky Dam from Highway 191. **Note that this road is within the dam break floodplain and the valley below the dam will be flooded.** The nearest telephone is at the Huntley Shoshone or Summit Hotel front desk. Note that the outlet gate controls may become inundated during a major flood event.

1.4 Hazard Area

The evacuation area would extend downstream along the following stream reaches; 1) Middle Fork of West Fork Gallatin River in the steep canyon to the Highway 64 bridge, 2) across the Lower Meadow area to the confluence with the South Fork of West Fork Gallatin River, and 3) to the confluence with the Gallatin River.

FIGURE 1: VICINITY MAP

These three reaches are delineated on the mapping included in Appendix B. The characteristics of the dam break flooding are shown on Table 1. Upon entering the Gallatin River, the dam break would be approximately equal a 2- to 5-year flood event for that stream.

TABLE 2: DAMBREAK FLOOD CHARACTERISTICS

RVR MILE FROM DAM	MAX FLOW (CFS)	MAX DEPTH (FT)	TIME (HR) FLOOD	T ME (HR) MAX DEPTH	LOCATION
.00	24,954	14.90	.00	.00	Just below dam
.74	16,945	7.88	.12	.20	In canyon below dam
1.40	12,699	7.86	.26	.33	In canyon below dam
2.35	9,682	7.54	.49	.57	In canyon below dam
3.58	7,241	7.09	.86	.93	In canyon below dam
4.19	7,099	11.96	.86	.94	At 1st Highway 64 bridge
4.28	6,894	10.81	.87	.95	At Two Moon Drive bridge
4.85	6,002	7.07	1.17	1.25	At golf course main road
5.08	5,757	7.15	1.21	1.29	At golf course dam
5.48	5,699	13.84	1.22	1.31	At Little Coyote Rd. bridge
5.93	5,559	9.28	1.24	1.32	At Highway 64 culvert
6.80	4,789	6.16	1.72	1.80	At Highway 64 bridge
7.84	4,736	12.57	1.73	1.81	1 mile down Gallatin River

1.5 Responsibility and Authority

Pursuant to the State of Montana Dam Safety Act, Chapter 15 of Title 85, the dam owner is responsible for production, coordination, maintenance, and implementation of this emergency action plan. Extent of owner implementation was defined through coordination of this plan with the Gallatin County sheriff and disaster and emergency services personnel.

1.6 Periodic Review and Updating

This document requires periodic review and updating. Each copy should be kept current and the distribution list is shown on Table 2. The owner will review and update the EAP on at least a yearly basis and distribute revisions to each copyholder shown on the distribution list. The EAP will be reviewed and updated by a professional engineer as required by the dam's operating permit, but no less than every five years.

1.7 Approval

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

_____Signature Date_____/_____/____
OWNER'S REPRESENTATIVE, BOYNE USA RESORTS

_____Signature Date_____/_____/____
GALLATIN COUNTY SHERIFF'S DEPARTMENT

_____Signature Date_____/_____/____
GALLATIN COUNTY DISASTER AND EMERGENCY SERVICES

_____Signature Date_____/_____/____
MADISON COUNTY DISASTER AND EMERGENCY SERVICES

.

TABLE 3: EAP OFFICIAL DISTRIBUTION LIST

Location	Copy #
Boyne USA Resorts: Facilities Office	1
Boyne USA Resorts: Mike Unruh	2
Boyne USA Resort: John Knapton	3
Boyne USA Resorts: Taylor Middleton	4
Boyne USA Resorts: Spare Copy	5
Gallatin County Sheriff	6
Gallatin County DES	7
Big Sky Homeowners Association	8
Lone Moose Homeowners Association	9
Northwestern Energy	10
Big Sky Fire Department	11
Big Sky Water and Sewer Superintendent	12
DNRC Dam Safety Section	13
Morrison-Maierle, Inc., Bozeman Office	14
Morrison-Maierle, Inc., Helena Office	15
Madison County DES	16

2 NOTIFICATION PROCEDURES

2.1 Failure is Imminent or Has Occurred

If Big Sky Dam is failing, two things must be undertaken immediately: (1) the hazard area downstream from the dam must be evacuated, and (2) any steps that might save the dam or reduce damage to the dam or hazard area should be taken. (Refer to the map in Appendix B to determine the areas that are likely to be inundated if the dam fails). The evacuation will be handled according to the Emergency Action Plan.

2.2 What the Dam Owner Should Do

As dam owner, it is your responsibility to:

A. Call the Emergency Services Dispatch Center 911. Be sure to say, "This is an emergency". They will call other authorities and the media and begin the evacuation.

B. Do whatever is necessary to bring anyone in immediate danger (someone on the dam, or directly below the dam, or boating on the reservoir, or evacuees if directed by the sheriff) to safety.

C. Keep in frequent touch with Disaster and Emergency Services. They will tell you how to handle the emergency.

D. 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 reestablish communications. If these means fail, handle the immediate problems as well as you can, and periodically try to reestablish contact with Disaster and Emergency Services. Big Sky Fire Department and local law enforcement may also be reached via the “South” radio channel available on Ski Patrol and some Resort Leadership radios.

E. It is important that you accurately judge whether the dam is about to fail. If you aren't sure whether the dam is threatened, seek advice from a qualified engineer or call the Department of Natural Resources and Conservation Dam Safety Section ([redacted]).

FIGURE 2 BIG SKY DAM
IMMINENT FAILURE
"NOTIFICATION FLOWCHART"

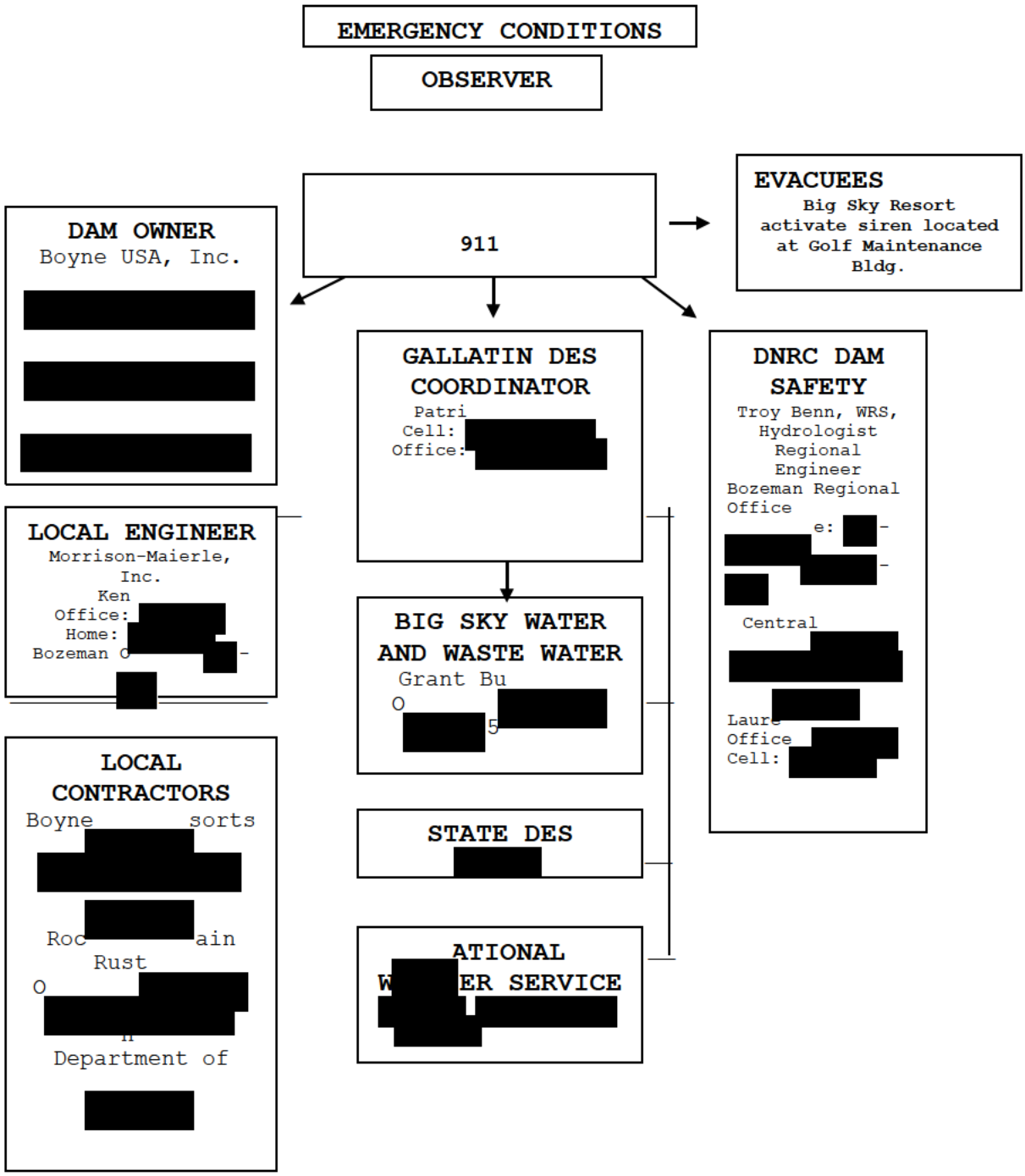
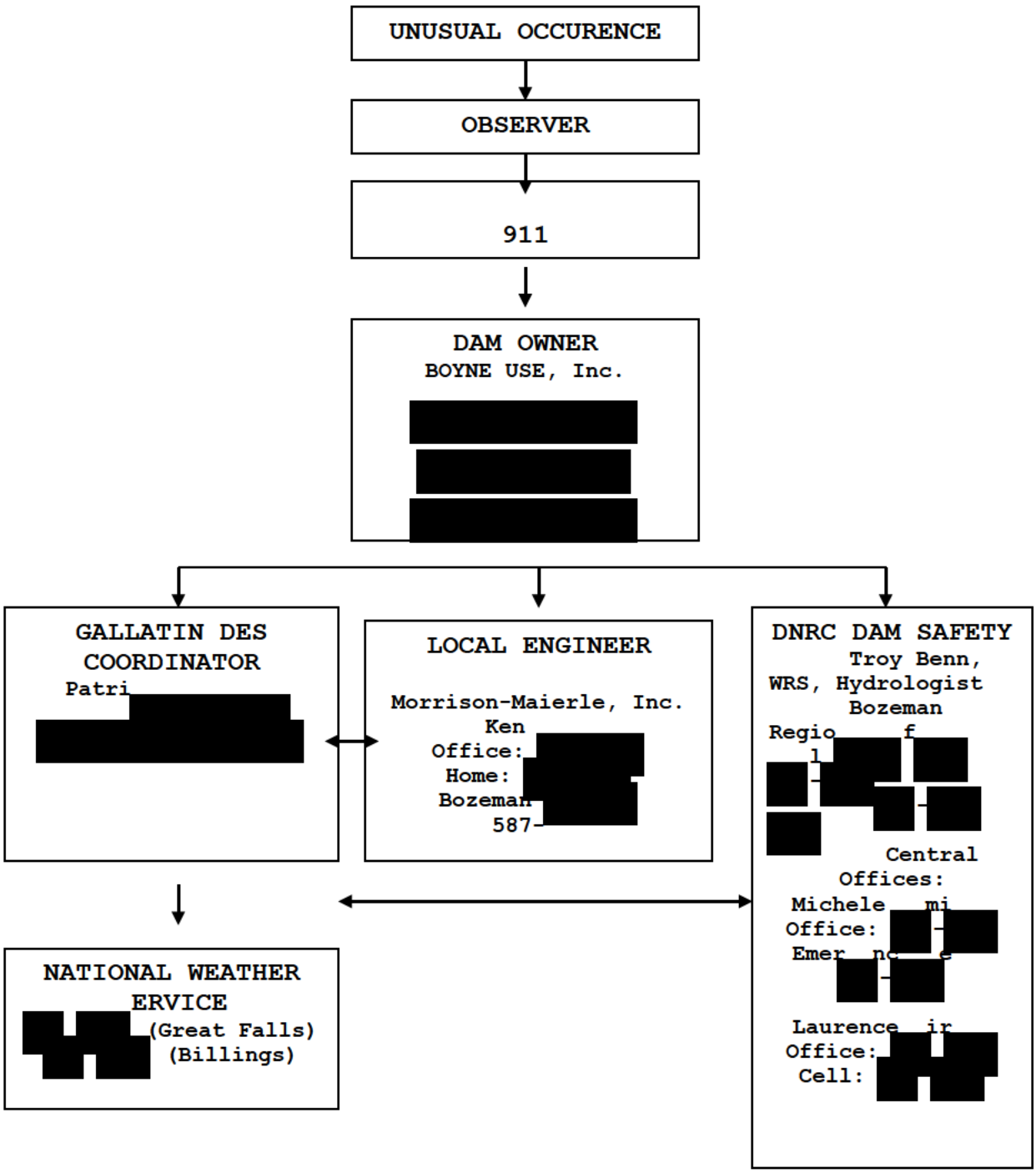


Figure 2 Big Sky Dam
UNUSUAL OCCURRENCE "NOTIFIATION FLOWCHART"



2.3 Potentially Hazardous Situation is Developing

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, failure of the spillway or outlet works, heavy precipitation or rapid spring snowmelt, 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.

2.4 What the Dam Owner Should Do

If you discover an unusual condition of the dam embankment that could threaten the structure:

A. Complete the Dam Incident Report Form in Appendix A.

B. Initiate the Potentially Hazardous Situation Flowchart, Figure 2 on page 8.

2.5 Conditions to Watch For

Among the conditions you should watch for are: overtopping of the dam by flood waters; loss of material from the dam crest due to storm wave erosion; slides on either the upstream or downstream slope of embankment as evidenced by sloughing, cracking, bulging, or scarping of the embankment; erosion flows through, beneath, or around the embankment as evidenced by excessive seepage, discolorment of the seepage, boils on the downstream side, sinkholes, changes in piezometer levels or changes in the flow from drains; failure of outlets or spillways due to clogging or erosion; movement of the dam on its foundation as evidenced by misalignment, settlement, or cracking; or loss of abutment support as evidenced by cracking.

2.6 Required Data Forms

When you call either an engineer or the DNRC to report a problem, use the form in Appendix A to ensure that you can provide sufficient information for the engineer to analyze the problems. In addition, prepare a sketch showing the extent of the problem. Revise the sketch periodically if the problem develops further. Section 3 includes further guidelines for courses of action to take to mitigate the effect of many problems.

2.7 Posting the Notification Flowchart and Distribution of EAP

The notification flowchart is posted at the Boyne USA offices located in the Big Sky Facilities Office. The Gallatin County Sheriff's Office and the Gallatin County DES Coordinator also have copies of the plan.

2.8 Telephone Directory

2.8.1 First Priority

A. **911**

B. **SHERIFF**
Gallatin County
Madison County

C. **DISASTER AND EMERGENCY SERVICES**
Gallatin County Office
Madison County Office
State:

Montana Disaster and Emergency Services Division (Helena)
Duty Officer

D. EVACUEES (in order of evacuation)

NOTE: The evacuees in the Meadow Village Area should be immediately warned by activating the emergency warning siren at the Golf Course.

Telephone numbers are not available for all homeowners because of the number of part-time and out-of-state homeowners. Therefore, the emergency warning siren should be activated and a house to house warning issued if time allows.

The house numbers listed on the aerial map in Appendix B are in the general vicinity of the homes.

NOTE: This area is growing rapidly and the aerial base map does not list all current conditions.

2.8.2 Second Priority

A. Montana Dept. of Natural Resources and Conservation (DNRC), Dam Safety Section

WRS, Hydrologist
Troy Benn: Cell/Home: [redacted]
Office: [redacted]

Dam Safety Engineer:
Michele Lemieux: Work: [redacted]
Emergency cell: [redacted]

B. Morrison-Maierle Inc.
Ken Salo: Work: [redacted]
Home: [redacted]
Bozeman Office: [redacted]

C: NTL Engineering, Inc. [redacted]

D: U.S. Natural Resources Conservation Service [redacted]

E: National Weather Service
Missoula [redacted]
Great Falls
Billings

F. Montana Department of Fish, Wildlife and Parks [redacted]

2.9 Evacuation Procedures

The areas requiring evacuation are shown on the dam break flood inundation mapping included in Appendix B. This inundation is based upon a clear weather dam break or one not occurring during a major flood event. The dam break flooding will travel quickly with an average speed of 5 to 10 miles per hour and range in depth from 6 to 15 feet.

The evacuees in the Meadow Village Area should be immediately warned by activating the emergency warning siren at the Golf Course.

Telephone numbers are not available for all homeowners because of the number of part time and out-of-state homeowners. Therefore, the emergency warning siren should be activated and a house to house warning issued if time allows.

When failure is imminent or has occurred, evacuees should be instructed to proceed directly to high ground and to avoid the valley of the Middle Fork of West Fork Gallatin River. Because of the quickness and depth of the dam break, there is a tremendous threat to life. Therefore, the most important consideration is to get to a safe location. Possessions and livestock should be left behind.

When an unusual occurrence has developed, the need for evacuation and the urgency of evacuation should be based on the seriousness of the problem. If deemed appropriate, a slower evacuation using normal access routes may be used.

A general evacuation order should be issued to residents and recreationists along the floodplain of the Gallatin River. Residences on or near Middle Fork of West Fork Gallatin River starting at the dam and proceeding in order downstream to the confluence with the Gallatin River shall be notified in accordance to the county disaster response plan.

2.10 Example Emergency Broadcast System Announcement

Example when failure is imminent or has occurred

ATTENTION: THIS IS AN EMERGENCY MESSAGE FROM THE _____ DEPARTMENT. LISTEN CAREFULLY. YOUR LIFE MAY DEPEND ON IMMEDIATE ACTION. BIG SKY DAM LOCATED ON MIDDLE FORK OF WEST FORK GALLATIN RIVER HAS FAILED. REPEAT: BIG SKY DAM ON MIDDLE FORK OF WEST FORK GALLATIN RIVER HAS FAILED. IF YOU LIVE IN OR NEAR THE MIDDLE FORK OF WEST FORK GALLATIN RIVER VALLEY PROCEED IMMEDIATELY TO HIGH GROUND AWAY FROM THE STREAM VALLEY. DO NOT TRAVEL IN THE MIDDLE FORK OF WEST FORK GALLATIN RIVER VALLEY OR RETURN TO THE MIDDLE FORK OF WEST FORK GALLATIN RIVER VALLEY FOR POSSESSIONS. YOU CANNOT OUTRUN OR DRIVE AWAY FROM THE FLOOD WAVE. PROCEED IMMEDIATELY TO HIGH GROUND AWAY FROM THE STREAM VALLEY.

(Repeat message)

3 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. The magnitude of an earthquake or storm can be obtained from DNRC Dam Safety, [redacted] Actions suggested to mitigate problems that develop 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.

3.1 Potential Problems and Possible Immediate Response Actions

3.1.1 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.

3.1.2 Loss of 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.

3.1.3 Landslides in the dam 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 weighting the toe area with additional soil, rock, or gravel and then restore lost freeboard by placing sandbags at crest.

3.1.4 Seepage through the embankment, foundation, or abutments

A. Plug the flow with the best available material soil, sand bags, 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 until it stops or until the reservoir is drained.

C. Place protective sand and gravel filter or boil ring over the exit area to hold materials in place.

3.1.5 Failure of appurtenant structures such as outlets or spillways

A. Implement temporary measures to protect the damaged structure, such as closing an outlet or providing a temporary dike to protect a damaged spillway.

B. Lower the water level to a safe elevation. If the outlet is inoperable, pumping, siphoning, or a controlled breach may be required.

3.1.6 Mass movement of the dam on its foundation, (spreading or mass sliding failure)

A. Immediately lower the water level until excessive movement stops.

B.

3.1.7 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.

3.1.8 Spillway back cutting 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.

3.1.9 Excessive settlement of the embankment

A. Lower the water level by releasing it through the outlet or by pumping, siphoning, or a controlled breach.

B. If necessary, restore freeboard, preferably by placing sandbags.

3.1.10 Loss of abutment support.

A. Lower the water level by releasing it through the outlet.

B. Attempt to block water movement through the dam by placing plastic sheets on the upstream face.

3.1.11 Earthquake Zone

Big Sky Dam is located in an area subject to earthquakes of a damaging intensity (zone 4). If you have felt an earthquake or one has been reported to have occurred in the area with a Richter magnitude of 4.0 or greater within a 30 miles radius, 5.5 or greater within 90 miles, or 6.5 or greater within a 180 mile radius from the site, follow the following procedures:

A. Immediately conduct a general overall visual inspection of the dam.

B. Perform field survey to determine if there has been any settlement and movement of the dam embankment, spillway and low-level outlet works.

C. Drain reservoir as required.

3.2 Emergency Supplies and Resources

Soils and rock suitable for emergency repairs are available in the vicinity of Big Sky Dam. Selected areas surrounding Mountain Village are composed of clayey, silty soil that should be fairly impermeable. Sands, gravel and riprap rock are also available in the surrounding area.

A gravel pit is located at the intersection of Highways 191 and 64 (entrance to Big Sky) as well as within the Resort complex near the Madison Base Area facilities.

There are several riprap sources located in the hillside surrounding the Mountain Village area, which can be quickly located for use by the Boyne USA Resorts personnel.

3.3 Local Contractors

Boyne USA Resorts	[redacted]
Gallatin County Road Department	[redacted]
Rocky Mountain Rustics	[redacted]
Montana Department of Highways	[redacted]

APPENDICES

APPENDIX A - DAM INCIDENT REPORT FORM
APPENDIX B - INUNDATION AND EVACUATION MAPS
APPENDIX C - TECHNICAL DATA FOR BIG SKY DAM

APPENDIX A
DAM INCIDENT REPORT FORM

DAM INCIDENT REPORT FORM

DATE: ____/_____/_____
TIME: _____

NAME OF DAM: Big Sky Dam - 1395

STREAM: Middle Fork of West Fork Gallatin River

LOCATION: Section 29 and 30, Township 6 South, Range 3 East

COUNTY: Madison

OBSERVER: _____

OBSERVER TELEPHONE: _____
NATURE OF PROBLEM:
_____

_____

LOCATION OF PROBLEM AREA (Looking Downstream): _____

_____

EXTENT OF PROBLEM AREA: _____

FLOW QUANTITY AND COLOR: _____

_____

WATER LEVEL IN RESERVOIR: _____

WAS SITUATION WORSENING? _____

EMERGENCY STATUS: _____

CURRENT WEATHER CONDITIONS: _____

_____

ADDITIONAL COMMENTS: _____

_____

APPENDIX B
INUNDATION AND EVACUATION MAPS

EVACUEES (in order of evacuation)

NOTE: The evacuees in the Meadow Village Area should be immediately warned by activating the emergency warning siren at the Golf Course.

Telephone numbers are not available for all homeowners because of the number of part-time and out-of-state homeowners. Therefore, the emergency warning siren should be activated and a house to house warning issued if time allows.

The house numbers are in the general vicinity of the homes.

NOTE: This area is growing rapidly and the aerial base map does not list all current conditions.

APPENDIX C
TECHNICAL DATA FOR BIG SKY DAM

RESERVOIR:

Maximum Reservoir Capacity at Crest of the Dam (Elev. 7429): 202 acre-ft
Normal Reservoir Capacity at Emergency Spillway Crest (Elev. 7426): 172 acre-ft
Normal Reservoir Capacity at Principal Spillway Crest (Elev. 7420): 111 acre-ft

DAM:

Normal Reservoir Surface Area: 9.8 acres
Dam Type: Rolled Earth fill
Dam Height: 52 feet
Dam Crest Width: 40 feet
Dam Crest Elevation: 7429 feet
Dam Width at Base: 225 feet
Length of Dam: 400 feet
Low Level Outlet 36" diameter, Reinforced Concrete Pipe, Sluice Gate Controlled
Outlet Capacity: 364 cfs (Greater than 500-Year Recurrence Interval)

Emergency Spillway Capacity:

CMP roadway crossing with earth-lined open channel
Channel Width: 9 feet
Side Slopes: 1 Vertical: 1 Horizontal
Spillway Length: 450 feet
Crest Elevation: 7426 feet
Capacity: 679 cfs (1043-cfs in conjunction with principal spillway, greater than 1000-Year Recurrence Interval)

Dam History:

Date Constructed: 1972-1973;
Owner at time of Construction: Big Sky of Montana, Boyne USA