The National Dam Safety Program

Model State Dam Safety Program

FEMA 316/July 2007

Federal Emergency Management Agency
www.fema.gov

Association of State Dam Safety Officials
www.damsafety.org

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The state dam safety program must define the response required in the event of a dam related emergency*. An emergency or operation resulting in downstream flooding will require action by the agency as well as action by the owner and coordination with the state emergency management agency and local officials. This chapter reviews minimum requirements an agency should address and basic considerations for preparing an Emergency Action Plan. Included in Appendix E are guidelines for developing Emergency Action Plans and example Emergency Action Plans.

I. State Program Requirements

Legislation and regulation recommendations as they relate to emergency response are covered in Chapter I. Normally an agency will define the requirements of an owner and the agency's internal policies regarding emergencies. Reaction and responsibilities of local officials regarding evacuation, security, shelter and care will be established by the state and local emergency management agencies.

Suggested State program requirements are summarized below:

A. Require that owners of high and significant hazard potential* dams prepare, update, and periodically test an Emergency Action Plan;

B. Require that owners provide for the immediate notification of emergency response agencies, any persons who may be endangered if the dam should fail and the state dam safety agency of any condition which threatens the safety of the dam or downstream areas;

C. Require that owners take all necessary actions during an emergency to protect life, health, and property; and

D. Establish an internal emergency response procedure which includes coordination with the state emergency management agency.

II. Basic Considerations for Preparing an Emergency Action Plan

The following basic considerations should be utilized in developing a state program for implementing and monitoring emergency action plans:

A. Many dam owners will have no concept about how an emergency action plan should be developed. A program will be needed to educate owners about the requirements of emergency action plan development and testing. Example plans should be available for owners and engineers to review;

B. Each city, county, or district emergency organization is different. Local input and coordination on monitoring, communication, and evacuation procedures is essential to document how such tasks are handled downstream of each dam;

C. The plan must be kept as simple as possible in both organization and wording. This cannot be accomplished if the plan has lengthy introductions or discussions of authority and scope. Ideally, a novice should be able to read the plan and determine necessary action in the shortest possible time. However, the process of developing an effective emergency action response will require extensive planning and coordination between the state agencies, local agencies and the owner. Training and the performance of EAP exercises is essential to assure timely response and to detect any weakness in the plan. If someone needs to read the plan before taking action, the delay may be critical;

D. In general, the owner's first priority should be to properly operate and maintain the dam, and to implement required structural upgrades. However, it is important that a good emergency plan be available because a dam may be most vulnerable to failure when it is in need of repair and maintenance. When the dam is in good condition the basic plan can be upgraded to include, as necessary, water level monitors, warning sirens, inundation mapping, etc;

E. Plans must be updated frequently. A list should be kept of those individuals or agencies that received an initial copy of the plan. They must be provided with all updates. The notification list should be updated as necessary, but not less than once a year. The entire plan should be updated when the required periodic inspection is performed or when the structure is modified. This will help remind the participants of their obligations;

F. Monitoring and evacuation plans are not a substitute for necessary remedial repairs or upgrades of the dam; and

G. Each emergency action plan should include seven basic elements. A more detailed description of these elements is provided in Appendix E.

1. Emergency Notification Flowchart and Information. A notification flowchart shows who is to be notified, by whom, and in what priority.

The information on the notification flowchart is needed to ensure the timely notification of persons responsible for taking emergency actions;

2. Statement of Purpose. The purpose of an emergency action plan is to provide one method for reduction of the risks to loss of life and to minimize damage due to a dam failure or large spillway release;

3. Emergency Detection, Evaluation, and Action. Early detection and evaluation of the situation(s) or triggering event(s) that initiates or requires an emergency action is crucial. The establishment of procedures for reliable and timely action to reduce the risk to life is imperative and should ensure that the appropriate sequence of steps is taken based on the urgency of the situation;

4. General Responsibilities. A determination of responsibility for EAP-related tasks must be made during the development of the plan. The EAP must clearly specify the dam owner's responsibilities to ensure effective, timely action, including notification of state and local emergency management officials, should an emergency occur at the dam. The EAP must be site-specific, since conditions at and downstream of all dams are different. Dam owners are responsible for developing, maintaining, and implementing the EAP in coordination with local emergency response agencies. State and local emergency management officials are responsible for warning and evacuation notification of persons. The owner may also be responsible for notification of persons living immediately downstream of the dam when emergency authorities are unable to respond in a timely manner;

5. Preparedness. Preparedness actions are taken to moderate or alleviate the effects of a dam failure or operational spillway release and to facilitate response to emergencies;

6. Inundation Maps. An inundation map should delineate the areas that would be flooded as a result of a dam failure. An important security issue for the inundation maps is that they not be distributed as public documents. Security concerns dictate that the maps be available only to responsible entities that have a need for the information. The maps may also be developed or used to depict areas that would be flooded by unusually large spillway releases. Inundation maps are used both by the dam owner and emergency management officials to facilitate timely notification and evacuation of areas affected by a dam failure or flood conditions; and

7. Appendix. The appendix contains information that supports and supplements the material used in the development and maintenance of the EAP.

Other sources of information on emergency action planning are listed in Appendix E.

APPENDIX E

EMERGENCY ACTION PLANS

EAP Reviewer's Checklist

1. General Document Items

	Is the name of the dam clearly labeled in large letters on the binder?
	Is the document a controlled document, including the names, titles, and addresses of all plan holders?
	Are the roles and responsibilities of key emergency personnel clearly documented, preferably at the beginning of the document?
	Is there an up-to-date revision sheet provided near the beginning of the document?
	Are revision numbers and revision dates provided as footers on each page of the document?

2. Detection Items

	Are detection and/or early warning systems at the dam clearly described, including dam operators' observations, instrumentation systems, and observations by the general public?

3. Decision Making Items

	Are the emergency event levels clearly described?
	Are there clear guidelines and decision criteria to help the dam owner determine the appropriate emergency event level for potential unusual and emergency conditions that could occur at the dam?

4. Notification and Communication Items

	Are primary and back-up communication systems among the dam owner, local emergency responders, and other key stakeholders described in the document?
	Are the notification flow charts complete and logical?
	Are phone numbers, after-hours phone numbers, and back-up personnel listed on the notification flow charts?
	Do the notification flow charts include contacts to provide timely engineering support?
	Do the notification flow charts include contacts for timely notification of local emergency management organizations for the more serious emergency event levels?
	Do the notification flow charts minimize the number of calls that the dam operators are required to make, so that they can focus on implementing preventative actions?

5. Pre-planned Action Items

	Are there descriptions of recommended pre-planned actions for potential unusual and emergency conditions at the dam?
	Is a list of locally available engineering, labor, materials, and equipment resources that can be referenced in an emergency?
	Has the contact information for the locally available resources been recently updated or verified?

EAP Reviewer's Checklist

6. Termination and Follow-up Items

	Does the document describe who has the authority to terminate emergency operations?
	Are the procedures for terminating emergency operations clearly described in the document?
	Does the document have guidance on follow-up responsibilities after the emergency is terminated?

7. Inundation Mapping

	Does the inundation map include a north arrow and a bar scale?
	Are the inundation areas clearly delineated and labeled. This is especially important if there are "sunny day" failure and PMF plus breach inundation limits shown on the inundation maps?
	Does the inundation map include a qualification stating that the inundation limits for an actual dam failure may vary in some ways from what is shown on the inundation map?
	Are locals roads, drainages, and other landmarks clearly labeled on the basemap?
	Is the downstream limit of the inundation mapping logical (e.g. at a major reservoir, river, or other water course)?
	Were channel cross sections taken at critical downstream locations, such as at major road crossings, schools, major population centers, etc.?
	Is the following flood inundation information provided at important downstream cross sections: • Peak flood stage • Floodwave arrival time • Maximum water surface elevation • Peak discharge

8. Other Items

	Are there clear procedures for testing and updating the document provided in the document?
	Is the frequency of testing and updating the document clearly described?
	Is the person or position responsible for updating the document indicated in the document along with updated contact information for that person?
	Are the process for training personnel in how to use the document and the frequency and responsibility for this training clearly described in the document?
	Are key hydrologic/hydraulic data, such as spillway and outlet discharge curves and reservoir area capacity curves, provided in the document?
	Does the document include a general location map that shows where the dam is located relative to other key local roads, drainages, and population centers?

Summary of EAP State Guidelines

From ASDSO tech seminar: *EAP for Dam Safety* (2006) Presented by J.France, S.Jamieson, & G.Batchelder Adams		Does the state have the authority to require EAPs?	State Regulated High Hazard Dams		State Regulated Significant Hazard Dams		Format
			No.	EAPs	No.	EAPs	
	Midwest						
IA	Iowa	Yes	75	-	176	-	Guidelines not specific to dams
IL	Illinois	Yes	185	143	287	109	None Found
IN	Indiana	Yes	242	16	225	-	Guidelines
MI	Michigan	Yes	80	79	137	133	DEQ has a set of guidelines and suggests use of FEMA format.
MN	Minnesota	Yes	23	23	155	3	None Found
MO	Missouri	Yes	239	-	210	-	None Found
NE	Nebraska	Yes	101	97	245	6	Guidelines
OH	Ohio	Yes	401	137	556	106	Recommendation
WI	Wisconsin	Yes	62	35	12	11	Sample
		Regional Totals	**1408**	**530**	**2003**	**368**	
	Northeast						

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			No.	EAPs	No.	EAPs	
CT	Connecticut	Yes	227	160	198	159	Should follow guidelines established by the commissioner
DE	Delaware	No	11	3	-	-	None Found
MA	Massachusetts	Yes	334	95	743	54	Emergency action plans must follow one of the examples furnished by the Department
MD	Maryland	No	66	58	84	38	Guidelines
ME	Maine	Yes	26	25	66	39	Emergency plans must follow a model plan supplied by the department
NH	New Hampshire	Yes	89	87	193	140	Guidelines
NJ	New Jersey	Yes	203	193	364	232	Yes
NY	New York	Yes	384	202	757	53	Guidelines/ FEMA-64

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			No.	EAPs	No.	EAPs	
PA	Pennsylvania	Yes	787	377	262	45	Guidelines
RI	Rhode Island	Yes	16	unknown	41	unknown	-
VT	Vermont	No	52	-	134	-	Blanket Procedure
		Regional Totals	**2195**	**1200**	**2842**	**760**	
	Southeast						
AL	Alabama	Yes	172	0	421	0	None Found
AR	Arkansas	Yes	103	92	94	0	Guidelines
FL	Florida	?	99	99	259	220	None Found
GA	Georgia	?	372	15	-	-	None Found
KY	Kentucky	No	157	3	192	2	FEMA 64, Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners
LA	Louisiana	?	11	2	46	1	None Found
MS	Mississippi	Yes	273	14	72	0	FEMA 64, Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners
NC	North Carolina	Yes	1006	202	657	26	None Found

Summary of EAP State Guidelines

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			No.	EAPs	No.	EAPs	
SC	South Carolina	Yes	148	137	458	410	None Found
TN	Tennessee	Yes	148	148	200	2	Guidelines
VA	Virginia	Yes	124	124	166	163	Form
WV	West Virginia	Yes	245	148	65	3	Example
		Regional Totals	**2858**	**984**	**2630**	**827**	
	West						
AK	Alaska	Yes	15	8	29	4	State and Federal Guidelines
AZ	Arizona	Yes	88	66	51	38	Guidelines
CA	California	Yes	395	176	530	87	None Found
CO	Colorado	Yes	264	262	292	287	Rule 16, Model
HI	Hawaii	Yes	76	45	21	10	None Found
ID	Idaho	Yes	105	101	150	38	None Found

Summary of EAP State Guidelines

From ASDSO tech seminar: *EAP for Dam Safety* (2006) Presented by J.France, S.Jamieson, & G.Batchelder Adams		Does the state have the authority to require EAPs?	State Regulated High Hazard Dams		State Regulated Significant Hazard Dams		Format
			No.	EAPs	No.	EAPs	
KS	Kansas	Yes	193	135	257	14	None Found
MT	Montana	Yes	97	95	126	0	Administrative Rules dictate what should be contained in EAP. Refer to: http://www.dnrc.mt.gov/wrd/water_op/dam_safety/damsafetyrules.asp#36.14.406
ND	North Dakota	Yes	28	12	92	1	Some Suggestions
NM	New Mexico	Yes	172	12	91	1	Format similar to the NRCS model
NV	Nevada	Yes	135	91	103	6	FEMA 64, Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners
OK	Oklahoma	Yes	165	124	78	4	None Found

Summary of EAP State Guidelines

From ASDSO tech seminar: *EAP for Dam Safety* (2006) Presented by J.France, S.Jamieson, & G.Batchelder Adams		Does the state have the authority to require EAPs?	State Regulated High Hazard Dams		State Regulated Significant Hazard Dams		Format
			No.	EAPs	No.	EAPs	
OR	Oregon	No	122	59	181	10	-
SD	South Dakota	Yes	47	31	144	6	None Found
TX	Texas	Yes	835	96	809	12	None Found
UT	Utah	Yes	185	103	200	-	Suggestions
WA	Washington	Yes	144	113	189	58	Form
WY	Wyoming	?	83	33	110	4	-

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
The Department has the authority to “implement a program for the protection of life and property from floods and to promote the orderly development and wise use of the flood plains of the state”. There are no direct references to **emergency action plans** in Iowa’s laws or regulations.	
The Department of Natural Resources is authorized by law to...establish standards, and issue permits for the **safe** construction, reconstruction, repair, **operation**, and maintenance of dams.	YES
Indiana has only situational authority to require EAPs. There is no state statute giving them authority to require EAPs.	YES
Owners of high and significant hazard potential dams are required to have an emergency action plan submitted to the department and to the local emergency services coordinator. (Sec. 31523)	YES
The rules require owners of Class I dams to file EAPs. The rules list items that need to be included in an EAP. Only 18 EAPs found in the states files. Some contacts have been made to urge EAP updates.	YES
Emergency action plans are required by regulation (10 CSR 22-3.030(1)(B) and 3.040(1)(A)15).	YES
Emergency procedures are clearly stated in the Guide for Preparing Emergency Preparedness Plans for Dams and Reservoirs. **Emergency Preparedness Plans** are required for all high hazard dams and some significant hazard dams. EPPs are required per the Rules Chapter 12-005. New Safety of Dams and Reservoirs Act went into effect on September 4, 2005. Section 46-1647 requires "the owner of every high hazard potential dam shall develop and periodically test and update an emergency action plan to be implemented in the event of an emergency involving such dam. In order to protect life and property, the department may require the owners of any significant hazard potential dam to develop and periodically test and update an emergency action plan to be implemented in the event of an emergency involving such dams." Codification of new law available from the Nebraska DNR.	YES
In accordance with Ohio Administrative Code Rules 1501:21-15-07, an **emergency action plan** is required for all class I, II and III structures.	YES
Wisconsin regulations require the following for the approval of permits:...documentation and approval of safety requirements, including an **emergency action plan** (Chapter NR 333.07)	YES

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
	YES
There is currently rules and regulations being developed that will require EAPs for certain classifications of dams, and that will provide guidelines and requirements for EAPs. These rules are scheduled to be promulagated in 2007.	
The Department of Conservation and Recreation is authorized to supervise the construction, alteration, repair, removal, enlargement, and emergency action plans of jurisdictional dams in Massachusetts.All proposed dams which would be classified as Significant Hazard Class are also required to have an EAP.	YES
The laws and regulations do not explicitly state that the owner of an existing dam must have an "Emergency Action Plan" Permits for new dams or repairs to existing ones require EAP for high and significant hazard dams.	YES
Maine State Law MRSA 37B Chapter 24 states §1127. Emergency action plans Within 6 months after the determination of classification, the owner of a dam under the commissioner's jurisdiction that is classified as high or significant hazard potential shall prepare an emergency action plan, which must be updated every 2 years. Such emergency action plans must be reviewed for adequacy by the department. All emergency action plans must be available and on file at the appropriate local and county government offices and at the department.	YES
Only 146 of the 193 Significant Hazard dams require an EAP. All high hazard dams and most significant hazard dams are required to have an Emergency Action Plan. Some dams which are classified as Signifcant Hazard solely because they impound public water supplies or contain waste (such as commercial waste or sewage) are exempted from the EAP requirement. EAPs must prepared in accordance with the provisions of Part Env-Wr 500 of the regulations, Guidelines for the Development of an Emergency Action Plan.	YES
Powers and duties of the Department of Environmental Protection are also detailed in N.J.A.C. 7:20-1, which includes regulations relating to the permit process, **emergency procedures**, permit denials...	YES
EAP may be required during permit process for High Hazard dams. Environmental Conservation Law 15-0507 allows promulgation or regs requiring emergency action plans. Regs are being writtten.	YES

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
The owner of any dam or reservoir that may cause loss of life or serious damage to property should a failure of the dam occur **shall develop an emergency action plan** to be followed in the event of a dam hazard emergency.	YES
Dam safety laws are contained in the General Laws of Rhode Island Sections 46-18 and 46-19, dated 1956, as amended. Regulations have not been promulgated since the laws **do not** give the Department such authority. A Bill was passed in July 2006 that requires an EAP to be developed for each high & significant hazard dam by July 1, 2008, by the municipality in which the dam is located.	YES
Procedures for emergency action are described in 10 V.S.A. Section 1095.	YES
00-00-11. Emergency Action Plan. The Owner of a High or Moderate Hazard Potential Dam shall develop an Emergency Action Plan.	
Requirements and Guideline	YES
EAP usually required during permit process	
...include the power to "establish by rule or regulation such policies, requirements or standards governing the construction, **operation** and maintenance of dams or artificial barriers". **Emergency Action Plans** are **not** required under Georgia law or regulations.	
The Secretary of the Natural Resources and Environmental Protection Cabinet is empowered by KRS 151 to exercise the following powers:…to establish standards for the safe construction, enlargement, repair, alteration, maintenance, or **operation** of a dam. **Emergency Action Plans are not required by Kentucky statute or regulation.**	YES
	YES
The Commission may direct the owner of a high hazard dam to develop an **Emergency Action Plan** (Regulations Section 7–C 15).	
The North Carolina Department of Environment and Natural Resources is responsible for the safety of dams and for the adoption of all rules and regulations designed to protect life and property. **Emergency Action Plans** are required as a condition of impoundment for all **new high hazard dams**.	YES

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
The laws and regulation require **Emergency Action Plans** for high hazard and significant hazard dams, based on a 1992 change to the law.	
The regulations require that new dams with a high-hazard potential rating submit **emergency action plans** to the commissioner. The regulations list what should be included in the EAP (1200-5-7-.07).	YES
The Virginia Soil and Water Conservation Board (Board) promulgates the Virginia Impounding Structures Regulations in accordance with Virginia Code, Dam Safety Act, Article 2, Chapter 6, Title 10.1. The Board has the authority to ensure the proper and safe design, construction, maintenance and operation of impounding structures. An Emergency Action Plan and other forms are required, for the Board to issue a dam owner an Operation and Maintenance Certificate to operate the dam.	YES
Emergency action plans are required for all Class I and II dams. (11 AAC 93.167 and 11 AAC 93.171). Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners (FEMA,1998c)	
The director is directed by law to **supervise the operation** and maintenance of all jurisdictional dams to safeguard life and property. Department provides a **template** in MS Word.	YES
The Department of Water Resources, Division of Safety of Dams (department),..., shall supervise the construction, ..., **operation**, and removal of dams and reservoirs for the **protection of life and property** as provided in these provisions (4.1.6075).	
Owners of Class I and II dams are required to prepare, maintain and exercise Emergency Preparedness Plans in accordance with the requirements described in Rule 16.	
Authority currently requires EAP's for all High hazard. Future work to revise rules to include EAP's for all dams. In 2006 the program requested EAP's for all dams (due Sept 30, 2006), EAP training scheduled for Oct-Dec 2006.	YES
The law gives authority to the Idaho Water Resources Board to adopt rules and regulations. (I.C. 42-1714)	YES

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
The Chief Engineer of the Division of Water Resources, Kansas Department of Agriculture is empowered by law to provide for the exclusive regulation of the construction, operation, repair or removal of all dams to the extent required to carry out the protection of public safety. Regulations (KAR 5-40-2k) require each application for a permit to construct a high hazard dam to include an **emergency action plan**. Number of dams/EAP data from 2004 NID submittal.	YES
The law grants the Department the power to adopt rules to classify high-hazard dams and reservoirs; to approve and issue permits; to govern inspections; establish safety standards for the design, construction, operation, and maintenance of high-hazard dams and reservoirs; to establish **emergency procedures** and to establish fees commensurate with costs to cover inspections under the law (85-15-110). The administrative rules require that a high hazard dam owner have an EAP and that it be updated annually.	YES
The North Dakota State Engineer, pursuant to Chapter 61-04 and Sections 61-16.1-38 and 61-16.1-53 of the NDCC and North Dakota State Water Commission, pursuant to Section 61-02-14 of the NDCC, have the power and general jurisdiction to regulate, control and supervise the construction and operation of all dams within the State of North Dakota, both public and private, which they deem necessary. It is **strongly recommended that an Emergency Action Plan be developed** for all dams. The level of detail should be commensurate with the hazard category of the dam. *An operation plan is required for all dams that store greater than 1000 acre-feet. (NDCC 61-03-21). The operation plan must contain emergency procedures and warning plans (NDAC 89-08-04-01). Authority to require an EAP should consider NDCC 61-03-21 and NDAC 89-08-04-01*.	YES
State Engineer Rules and Regulations require EAPs for existing high and significant hazard potential dams with a time frame for compliance (Subsection F of 19.25.12.21 NMAC)	YES
Nevada Administrative Code 535.320 (regulation) currently requires an emergency action plan for all high hazard dams, and will be required for significant hazard dams on or before March 31, 2007.	YES
Rule 785:25-7-7 **requires** owners of existing or proposed dams classified as **high hazard** to provide an **adequate warning system and evacuation plan** to protect downstream lives and property. The plan is to be approved by and filed with the local Civil Defense authorities.	

Summary of EAP State Guidelines

Notes	Reviewed/Updated by State Dam Safety Officials Prior to EAP Training Course
The laws and regulations **do not** specifically require an owner to have an **Emergency Action Plan**. The Director can condition a Permit for new construction to include an Emergency Action Plan; however, no such opportunity is available for existing structures whose hazard rating may have increased in the time since its initial construction/permitting. The Dam Safety program must issue an Order and present the case before a hearings officer before being given legal authority to enforce said Order.	YES
Emergency Preparedness Plans (Rules 74:02:08:09 & :10) are required to be prepared and submitted by the owners of all existing category 1 dams, and as part of the plans and specifications for proposed category 1 dams. For the 16 High Hazard dams with no EAPs, the dam owner is the only downstream hazard.	YES
As required by emergency management planning, the executive director may request, and/or the commission may order a dam owner to provide sufficient data to **plan for potential effects of failure** or malfunction of a dam and/or associated appurtenant facilities (299.17).	YES
Various sections of the Code specify that the state engineer may make rules governing such aspects of the dam safety program as: exemptions, the use of independent consultants on design, construction and operation considerations, review and approval of plans, inspection and reporting procedures, revocation of approval, standard operating and **emergency action plans**.	
The Department of Ecology has supervision and control over all dams and stream obstructions, and authorizes the making of regulations necessary for the **protection of life and property**. **Emergency action plans** are required for all high and significant hazard dams.	YES
Emergency Action Plans are **not** included as part of the dam safety program in Wyoming.	

Emergency Action Plan (EAP)

Rock Creek Watershed, Dam No. 23

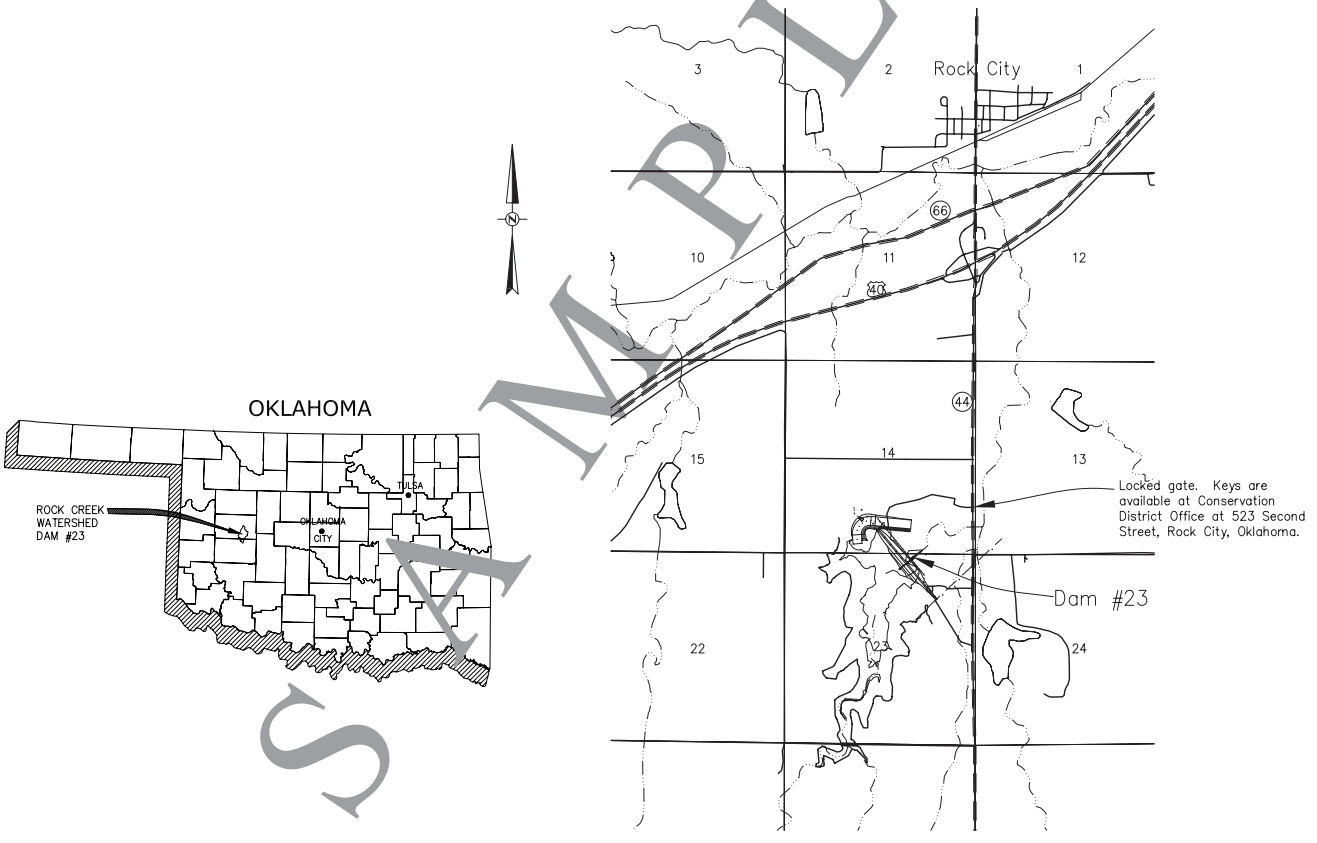
(Rock City Lake)

National Inventory of Dams (NID) No. OK11111

Coal County, Oklahoma

Coal County Conservation District

With assistance from the
U.S. Department of Agriculture
Natural Resources Conservation Service



Reviewed and Updated:

_____ _____

Chair, Coal County Conservation District *Sheriff, Coal County, OK*

_____ _____

Date *Date*

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Basic EAP Data

Purpose:

The purpose of this EAP is to reduce the risk of human life loss and injury and to minimize property damage during an unusual or emergency event at Rock Creek Watershed, Dam No. 23.

Potential Impacted Area:

See *Evacuation Map* tab (Appendix B–4) and *People at Risk* tab (Appendix B–5) for the locations and contact information of the following residents and businesses that may be flooded if the dam should fail and the estimated time for the flood wave to travel from the dam to these locations:

- 6 houses:
  - 4 on the south side of the Elmwood Heights subdivision in southeast Rock City
  - 2 outside city limits:
    - 1 on south side of Rock Creek, south of Rock City
    - 1 on east side of Highway 44 approximately 1 mile south of Rock City
- 3 businesses on east side of Highway 44 south of Rock City:
  - Lori's Music Shop, Larry's Hardware, and Bill's Coffee Shop
- 3 highways:
  - Interstate 40 and OK Highways 44 and 66

Dam Description:

Height: 40 ft
Built: 1960
Legal Description: Sects. 14 and 23, T13N, R21W
Latitude: 35.42875 Longitude: -99.19802
National Inventory of Dams No.: OK11111

Drainage Area: 7.7 mi
Hazard Classification: High
Dam Operator: Coal Co. Cons. District
Major Property Owner: Bryan Babcock
Dam Designer: NRCS

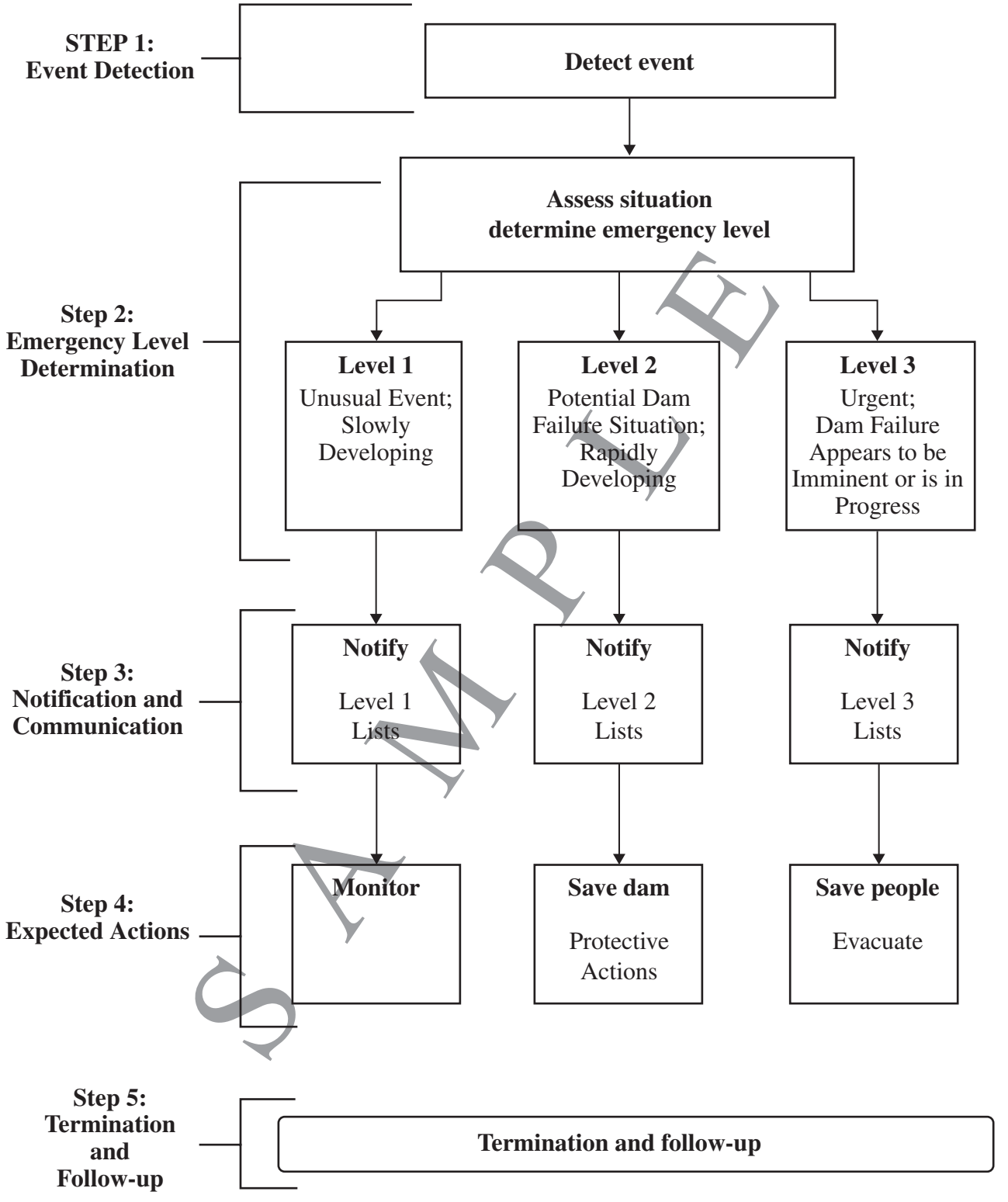
See detailed design data in appendix B tab.

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

Rock Creek, Dam No. 23 can be accessed by traveling south 1.2 miles on OK Highway 44 from the Interstate 40 interchange south of Rock City; turn right (west) on a gated dirt road that goes directly to the left abutment of the dam. Keys for the lock on the gate are available from the Conservation District Manager at 523 Second Street, Rock City, OK. Note that a portion of this road is within the dam breach inundation area and the valley below the dam may be flooded.

An alternate route to the dam is available approximately 0.5 miles south of Rock Creek on Highway 44; turn right on an ungated dirt road that goes to the right abutment of the dam. Note that Highway 44 may be inundated or the bridge may be damaged so access to this alternate route may have to be accessed from Highway 44 south of the dam.

Emergency Action Plan Overview



Roles and Responsibilities

Dam Operator's Representative (Conservation District Manager)

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

Incident Commander (County sheriff)

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

Emergency Management Services (Rock City)

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

Dam Operator's Technical Representatives (NRCS)

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

State Dam Safety Agency (Oklahoma Water Resources Board)

- Advise dam operator on emergency level determination if time permits.
- Advise dam operator on remedial actions to take if Level 2 event occurs and if time permits.

The Five-step EAP Process

Step 1 Event Detection

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

Unusual or emergency events may be detected by:

- Observations at or near the dam by government personnel (local, state, or Federal), landowners, visitors to the dam, or the public
- Evaluation of instrumentation data
- Earthquakes felt or reported in the vicinity of the dam
- Forewarning of conditions, which 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 Conservation District Manager or his alternate is responsible for classifying the event into one of the following three emergency levels:

Emergency level 1—Nonemergency, unusual event, slowly developing:

This situation is not normal but has not yet threatened the operation or structural integrity of the dam, but possibly could if it continues to develop. NRCS technical representatives or State Dam Safety officials should be contacted to investigate the situation and recommend actions to be taken. 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. The Sheriff should be informed if it is determined that the conditions may possibly develop into a worse condition that may require emergency actions.

Emergency level 2—Potential dam failure situation, rapidly developing:

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

If time permits, NRCS and state dam safety officials 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 earth spillway has or is expected to result in flooding of downstream areas and people near the channel could be endangered. Emergency services should be on alert to initiate evacuations or road closures if the flooding increases.

Emergency Level 3—Urgent–Dam failure appears to be imminent or is in progress:

This is an extremely urgent situation when a dam failure is occurring or obviously is about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. This situation is also applicable when flow through the earth spillway is causing downstream flooding of people and roads. The Sheriff 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 following pages for guidance in determining the proper emergency level for various situations.

Guidance for Determining the Emergency Level

Event	Situation	Emergency level*
Earth spillway flow	Reservoir water surface elevation at auxiliary spillway crest or spillway is flowing with no active erosion	1
	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	3
	Spillway flow that is flooding people downstream	3
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	3
Seepage	New seepage areas in or near the dam	1
	New seepage areas with cloudy discharge or increasing flow rate	2
	Seepage with discharge greater than 10 gallons per minute	3
Sinkholes	Observation of new sinkhole in reservoir area or on embankment	2
	Rapidly enlarging sinkhole	3
Embankment cracking	New cracks in the embankment greater than 1/4-inch wide without seepage	1
	Cracks in the embankment with seepage	2
Embankment movement	Visual movement/slippage of the embankment slope	1
	Sudden or rapidly proceeding slides of the embankment slopes	3
Instruments	Instrumentation readings beyond predetermined values	1
Earthquake	Measurable earthquake felt or reported on or within 50 miles of the dam	1
	Earthquake resulting in visible damage to the dam or appurtenances	2
	Earthquake resulting in uncontrolled release of water from the dam	3
Security threat	Verified bomb threat that, if carried out, could result in damage to the dam	2
	Detonated bomb that has resulted in damage to the dam or appurtenances	3
Sabotage/ vandalism	Damage to dam or appurtenances with no impacts to the functioning of the dam	1
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam	1
	Damage to dam or appurtenances that has resulted in seepage flow	2
	Damage to dam or appurtenances that has resulted in uncontrolled water release	3

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

Examples of Emergency Situations

The following are typical examples of conditions that may occur at a dam that usually constitute an emergency situation. 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 head cutting 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 3—Urgent; dam failure appears to be imminent or is in progress:

1. Significant erosion or head cutting of the spillway is occurring at a rapid rate and a breach of the control section appears to be 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 3—Urgent; dam failure appears to be 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 3—Urgent; dam failure appears to be 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 3—Urgent; dam failure appears to be 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 flowcharts for the appropriate emergency level shall be notified immediately.

Communication:

Emergency Level 1—Nonemergency, unusual event; slowly developing:
The Conservation District Manager and NRCS District Conservationist should contact the NRCS State Conservation Engineer and Oklahoma Water Resources Board. Describe the situation and request technical assistance on next steps that should be taken.

Emergency Level 2—Potential dam failure situation; rapidly developing:
The following message may be used to help describe the emergency situation to the Sheriff or Rock City emergency management personnel:

"This is ____(Identify yourself; name, position, etc.)____.

We have an emergency condition at Rock Creek watershed dam no. 23 that is located 2 miles south of Rock City.

We have activated the emergency action plan for this dam and are currently under Emergency Level 2.

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

Please prepare to evacuate the area along low-lying portions of rock creek.

Reference the evacuation map in your copy of the emergency action plan.

We will advise you as soon as the situation is resolved or if the situation gets worse.

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

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

The Sheriff should be contacted immediately, and the potential area flooded, if the dam should fail, must be evacuated (see *Evacuation Map* tab). The following actions should be taken:

1. Call the Sheriff's dispatch center. 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 Sheriff or Rock City emergency management personnel:

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

   Rock Creek watershed dam no. 23 located 2 miles south of Rock City is failing. The downstream area must be evacuated immediately. Repeat, Rock Creek Dam No. 23 is failing; evacuate the area along low-lying portions of Rock Creek.

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

   I can be contacted at the following number _____. If you cannot reach me, please call the following alternative number_____."

2. Do whatever is necessary to bring people in immediate danger to safety if directed by the Sheriff (anyone on the dam, downstream from the dam, boating on the reservoir, or evacuees).

3. Keep in frequent contact with the Sheriff and emergency services to keep them up-to-date on the condition of the dam. They will tell you how you can help handle the emergency.

4. If all means of communication are lost: (1) try to find out why, (2) try to get to another radio or telephone that works, or (3) get someone else to try to re-establish communications. If these means fail, handle the immediate problems as well as you can, and periodically try to reestablish contact with the Sheriff and emergency services.

The following pre-scripted message may be used as a guide for the Sheriff or Rock City emergency services personnel to communicate the status of the emergency with the public:

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

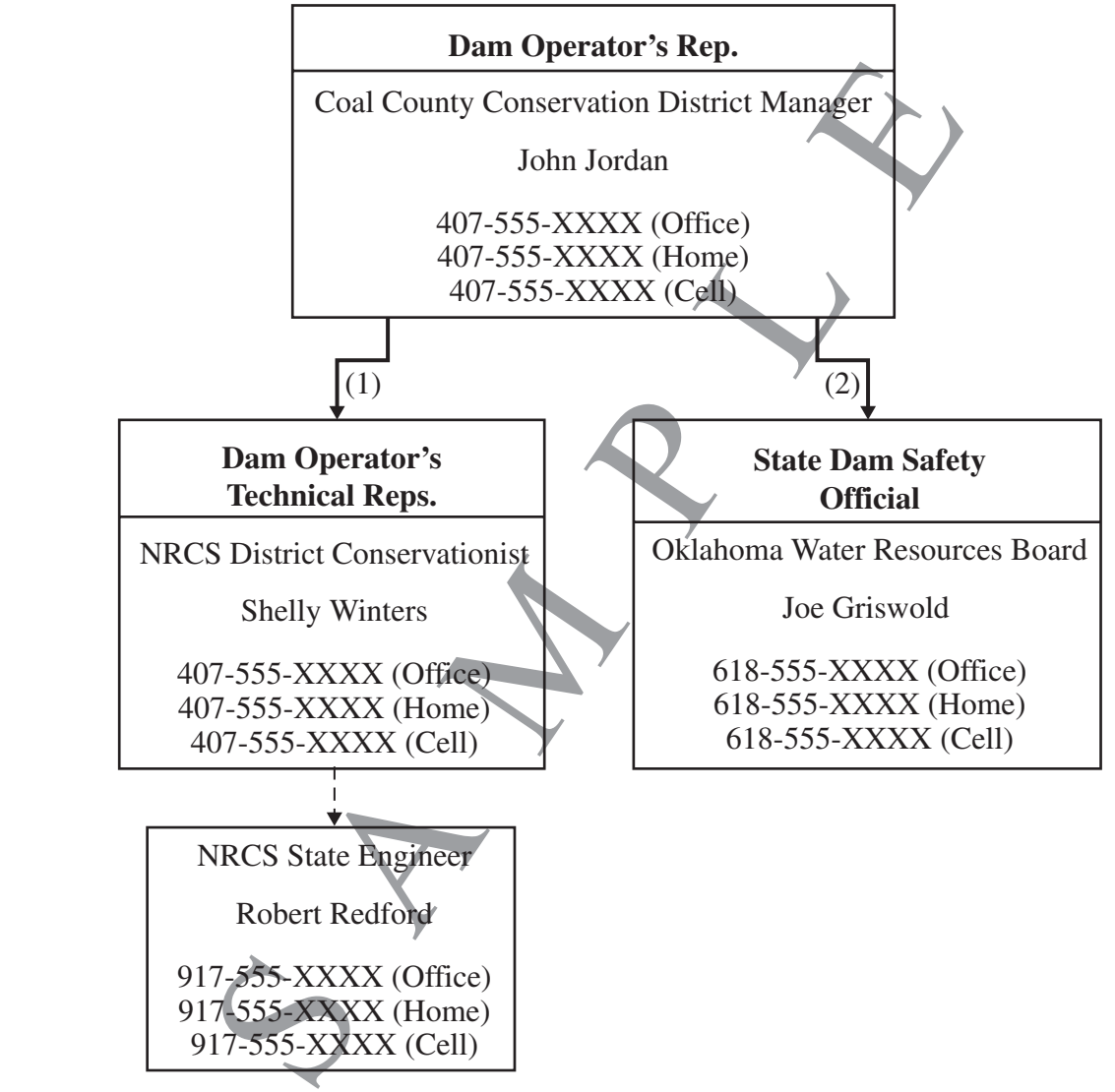
Rock Creek Dam no. 23 located 2 miles south of Rock City is failing. Repeat. Rock Creek Dam No. 23 located 2 miles south of Rock City is failing.

If you are in or near this area, proceed immediately to high ground away from the valley. Do not travel on Highway 44 south of Rock City or return to your home to recover your possessions. You cannot outrun or drive away from the flood wave. Proceed immediately to high ground away from the valley.

Repeat message.

Emergency Level 1 Notifications

Nonemergency
unusual event, slowly developing



Note:
1,2, etc. denotes call sequence

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

See "Contacts" tab for contact information for back-ups to the persons shown above and other emergency personnel

Emergency Level 2 Notifications

Emergency event, potential dam failure situation; rapidly developing

Dam Operator's Rep.

Coal County Conservation District Manager

John Jordan

407-555-XXXX (Office)
407-555-XXXX (Home)
407-555-XXXX (Cell)

(1) (2) (3)

Dam Operator's Technical Reps.

NRCS District Conservationist

Shelly Winters

407-555-XXXX (Office)
407-555-XXXX (Home)
407-555-XXXX2 (Cell)

NRCS State Engineer

Robert Redford

917-555-XXXX (Office)
917-555-XXXX (Home)
917-555-XXXX (Cell)

Incident Commander

Sheriff

Henry Martin

407-555-XXXX (Office)
407-555-XXXX (Home)

Rock City Emergency Management Dispatcher

OK Highway Patrol Dispatcher

Rock City Police Dispatcher

State Dam Safety Official

Oklahoma Water Resources Board

Joe Griswold

618-555-XXXX (Office)
618-555-XXXX (Home)
618-555-XXXX (Cell)

Coal County Amateur Radio Association:

John Turney

KE5GBD
407-555-XXXX

National Weather Service
618-555-XXXX

Note:
1,2, etc. denotes call sequence

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

See "Step 3" tab for prescripted messages

See "Contacts" tab for contact information for back-ups to the persons shown above and other emergency personnel

Emergency Level 3 Notifications

Urgent event, dam failure appears to be imminent or is progress

Dam Operator's Rep.

Coal County Conservation District Manager

John Jordan

407-555-XXXX (Office)
407-555-XXXX (Home)
407-555-XXXX (Cell)

(1) (2) (3)

Incident Commander

Sheriff
Henry Martin

407-555-XXXX (office)
407-555-XXXX (Home)
407-555-XXXX (Cell)
or
24-HOUR 911

State Dam Safety Official

Oklahoma Water Resources Board

Joe Griswold

618-555-XXXX (Office)
618-555-XXXX (Home)
618-555-XXXX (Cell)

Dam Operator's Technical Reps.

NRCS District Conservationist

Shelly Winters

407-555-XXXX (Office)
407-555-XXXX (Home)
407-555-XXXX (Cell)

Rock City Emergency Management Dispatcher

National Weather Service
618-555-XXXX

NRCS State Engineer

Robert Redford

917-555-XXXX (Office)
917-555-XXXX (Home)
917-555-XXXX (Cell)

OK Highway Patrol Dispatcher

Coal County Amateur Radio Association:

John Turney

KE5GBD
407-555-XXXX

Rock City Police Dispatcher

Note:
1,2, etc. denotes call sequence

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

See "Step 3" tab for prescripted messages

See "Contacts" tab for contact information for back-ups to the persons shown above and other emergency personnel

Emergency Services Contacts

Agency / Organization	Principal contact	Address	Office telephone number	Alternate telephone numbers
Coal County Board of Supervisors	Gloria Brown Chair	336 Highway 66 Rock City, OK	407-555-XXXX	
Coal County Road Department	Max Gray Supervisor	973 Ninth Street Rock City, OK	407-555-XXXX	
Coal County Conservation District	John Jordon * District Manager	523 Second Street Rock City, OK	407-555-XXXX	407-555-XXXX (H) 405-555-XXXX (C)
Coal County Conservation District	Mary James * District Secretary	523 Second Street Rock City, OK	407-555-XXXX	407-555-XXXX (H) 405-555-XXXX (C)
Coal County Conservation District	Mike Blain * Board Chair	523 Second Street Rock City, OK	407-555-XXXX	407-555-XXXX (H) 405-555-XXXX (C)
Coal County Sheriff	Henry Martin	336 Highway 66 Rock City, OK	407-555-XXXX	407-555-XXXX (H) 407-555-XXXX (C)
Dry Gulch Television Station KJMT	Chris Klinger Manager	5632 Main Street Dry Gulch, OK	407-555-XXXX	
Landowner of Dam No. 23	Bryon Babcock	R.R. #2 Rock City, OK		407-555-XXXX (H) 407-555-XXXX (C)
National Weather Service	Danny Lee Climatologist	66374 Elm Street Norman, OK	618-555-XXXX	
Natural Resources Conservation Service	Shelly Winters District Conservationist	523 Second Street Rock City, OK	407-555-XXXX	407-555-XXXX (H) 405-555-XXXX (C)
Natural Resources Conservation Service	John Blake * Technician	523 Second Street Rock City, OK	407-555-XXXX	407-555-XXXX (H)
Natural Resources Conservation Service	Robert Redford State Engineer	3458 Farm Road Strong City, OK	917-555-XXXX	917-555-XXXX (H) 917-555-XXXX (C)
Oklahoma Department of Transportation	Bill Dobson District Engineer	539 Center Street Dry Gulch, OK	407-555-XXXX	
Oklahoma Highway Patrol	Richard Barnell	299 First Ave. Dry Gulch, OK	407-555-XXXX	
Oklahoma Water Resources Board	Joe Griswold Dam Safety Officer	1522 Maple Ave. Strong City, OK	618-555-XXXX	618-555-XXXX (H) 618-555-XXXX (C)
Rock City Emergency Management Coordinator	Jeff Powers	121 Main Street Rock City, OK	407-555-XXXX	
Rock City Fire Department	Harry James	336 Maple Street Rock City, OK	407-555-XXXX	
Rock City Police	Red Jones	336 Maple Street Rock City, OK	407-555-XXXX	
Rock City Radio Station 1040 AM	Scott Fagen Manager	667 Eighth Street Rock City, OK	407-555-XXXX	

* Back-up to primary contact

Step 4 Expected Actions

If the police or sheriff receives a 911 call regarding observations of an unusual or emergency event at the dam, they should immediately contact the Conservation District office. After the conservation district manager determines the emergency level, the following actions should be taken. If time permits, NRCS and the Oklahoma Water Resources Board should be contacted for technical consultation.

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

A. The Conservation District Manager should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the NRCS or the Oklahoma Water Resources Board; 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 Conservation District Manager 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 Conservation District Manager should contact the NRCS and the Oklahoma Water Resources Board to report the situation and, if time permits, request technical staff to investigate the situation and recommend corrective actions.
B. The Conservation District Manager should contact the Sheriff to inform him/her that the EAP has been activated and if current conditions get worse, an emergency situation may require evacuation. Preparations should be made for possible road closures and evacuations.
C. Provide updates to the Sheriff and emergency services personnel to assist them in making timely decisions concerning the need for warnings, road closures, and evacuations.
D. If time permits, the Conservation District Manager should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If piping, increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the NRCS and the Oklahoma Water Resources Board; 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 2—Potential dam failure situation; rapidly developing—continued:

Emergency remedial actions

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

Embankment overtopping

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

Seepage and sinkholes

1. Open principal spillway gate to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a nonerosive velocity. If the gate is damaged or blocked, pumping or siphoning may be required.

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

Embankment movement

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

Earthquake

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

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

A. The Conservation District Manager shall immediately contact the Sheriff and others shown on the notification flow chart.

B. The sheriff shall lead the efforts to carry out warnings, close roads, and evacuate people at risk downstream from the dam (see *Evacuation Map* tab).

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

D. The Conservation District Manager shall maintain continuous communication and provide the sheriff with updates of the situation to assist him in making timely decisions concerning warnings and evacuations.

E. The Conservation District Manager should record all contacts that were made on the *Contact Checklist* (Appendix A–1). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A–2). Note the time of changing conditions. Document the situation with photographs and video, if possible.

F. Advise people monitoring the dam to follow safe procedures. Everyone should stay away from any of the failing structures or slopes and out of the potential breach inundation areas.

Step 5 Termination

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

Termination responsibilities

The Sheriff is responsible for terminating EAP operations and relaying this decision to the Conservation District Manager. It is then the responsibility of each person to notify the same group of contacts that he or she notified during the original event notification process to inform those people that the event has been terminated.

Prior to termination of an Emergency Level 3 event that has not caused actual dam failure, the NRCS technical representative or the State 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 Conservation District Manager shall assure that the *Dam Safety Emergency Situation Report* (Appendix A–3) is completed to document the emergency event and all actions that were taken. The Conservation District shall distribute copies of the completed report to the Oklahoma Water Resources Board and the NRCS State Conservation Engineer.

Maintenance—EAP Review and Revision

EAP annual review

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

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

Revisions

The Conservation District is responsible for updating the EAP documents. The EAP document held by the Conservation District is the master document. When revisions occur, the Conservation District 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 Conservation District will host and facilitate a periodic test of the EAP at least once every 5 years.

The periodic test will consist of a meeting, including a tabletop exercise, conducted at the Coal County Conservation District office. Attendance should include the Conservation District Manager, key conservation district staff members, NRCS staff, at least one representative of the local law enforcement agency, and others with key responsibilities listed in the EAP. At the discretion of the Conservation District, 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. The Conservation District Manager should complete an event log as they would during an actual event.

After the tabletop exercise, the five sections of the EAP will be reviewed and discussed. Mutual aid agreements and other emergency procedures can be discussed. The Conservation District 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	Coal County Conservation District 523 Second Street Rock City, OK 50010	John Jordan
2	Coal County Conservation District 523 Second Street Rock City, OK 50010	Mike Blain
3	NRCS Field Office 523 Second Street Rock City, OK 50010	Shelly Winters
4	NRCS State Office 3458 Farm Road Strong City, OK 51020	Robert Redford
5	Coal County Sheriff's Department 336 Highway 66 Rock City, OK 50010	Henry Martin
6	Rock City Emergency Management 121 Main Street Rock City, OK 50010	Jeff Powers
7	Rock City Police Department 336 Maple Street Rock City, OK 50010	Red Jones
8	Oklahoma Water Resources Board 1522 Maple Street Strong City, OK 51020	Joe Griswold

Record of Revisions and Updates Made to EAP

Revision Number	Date	Revisions made	Who
1	9-25-06	Updated 9-15-05 EAP with current contact information for Conservation District personnel and names of new residents in evacuation area	John Jordon

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: Mike Blain, Chair, Coal County Conservation District

2. _____
Signature *Organization* *Date*

Printed name and title: Henry Martin, Sheriff, Coal County

3. _____
Signature *Organization* *Date*

Printed name and title: Jeff Powers, Emergency Management Coordinator, Rock City

4. _____
Signature *Organization* *Date*

Printed name and title: Red Jones, Chief of Police, Rock City

5. _____
Signature *Organization* *Date*

Printed name and title: Shelley Winters, District Conservationist, NRCS, Rock City

6. _____
Signature *Organization* *Date*

Printed name and title: _____

7. _____
Signature *Organization* *Date*

Printed name and title: _____

Appendixes—Forms, Glossary, Maps, and Supporting Data

Appendix A

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

Appendix B

B–1 Resources Available
B–2 Location and Vicinity Maps
B–3 Watershed Project Map
B–4 Evacuation Map
B–5 Residents/Businesses/Highways at Risk
B–6 Plan View of Dam
B–7 Profile of Principal Spillway
B–8 Reservoir Elevation-Area-Volume and Spillway Capacity Data
B–9 National Inventory of Dams (NID) Data

Appendix A–1
Contact Checklist

Rock Creek Watershed, Dam Number 23

Coal County, Oklahoma 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 Flowcharts for critical contact information and page 16 for contact information for other possible emergency services.

Emergency Level 1 (see page 13)	Person Contacted	Time Contacted	Contacted by
___ NRCS District Conservationist	_____	_____	_____
___ NRCS State Conservation Engineer	_____	_____	_____
___ Oklahoma Water Resources Board	_____	_____	_____

Emergency Level 2 (see page 14)	Person Contacted	Time Contacted	Contacted by
____ NRCS District Conservationist	_____	_____	_____
____ NRCS State Conservation Engineer	_____	_____	_____
____ Oklahoma Water Resources Board	_____	_____	_____
____ Sheriff	_____	_____	_____

Emergency Level 3 (see page 15)	Person Contacted	Time Contacted	Contacted by
____ Sheriff	_____	_____	_____
____ Oklahoma Water Resources Board	_____	_____	_____
____ NRCS District Conservationist	_____	_____	_____
____ NRCS State Conservation Engineer	_____	_____	_____

Appendix A–2

Unusual or Emergency Event Log

(to be completed during the emergency)

Dam name: Rock Creek Watershed, Dam No. 23 County: Coal 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	Taken by

Report prepared by: _____ Date: _____

Appendix A–3

Dam Emergency Situation Report

(to be completed following the termination of the emergency)

Dam name: Rock Creek Watershed, Dam No. 23 National Inventory of Dams (NID) No.: OK11111

Dam location: 2 miles South of Rock City (City) Coal County (County) Rock Creek (Stream/River)

Date:_____ Time: _____

Weather conditions: _____

General description of emergency situation: _____

_____

_____

Area(s) of dam affected: _____

_____

_____

Extent of dam damage: _____

Possible cause(s): _____

Effect on dam's operation: _____

Initial reservoir elevation: _____ Time: _____

Maximum reservoir elevation: _____ Time: _____

Final reservoir elevation: _____ Time: _____

Description of area flooded downstream/damages/injuries/loss of life: _____

_____

_____

Other data and comments: _____

_____

Observer's name and telephone number:_____

Report prepared by: _____ Date: _____

Appendix A–4: Glossary of Terms

Abutment That part of the valley side against which the dam is constructed. The left and right abutments of dams are defined with the observer looking downstream from the dam.

Acre-foot A unit of volumetric measure that would cover one acre to a depth of one 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 that has 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	Those 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	That 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

Locally available equipment, labor, and materials:

The County Commissioners have the following resources that can be utilized in the event of an emergency:

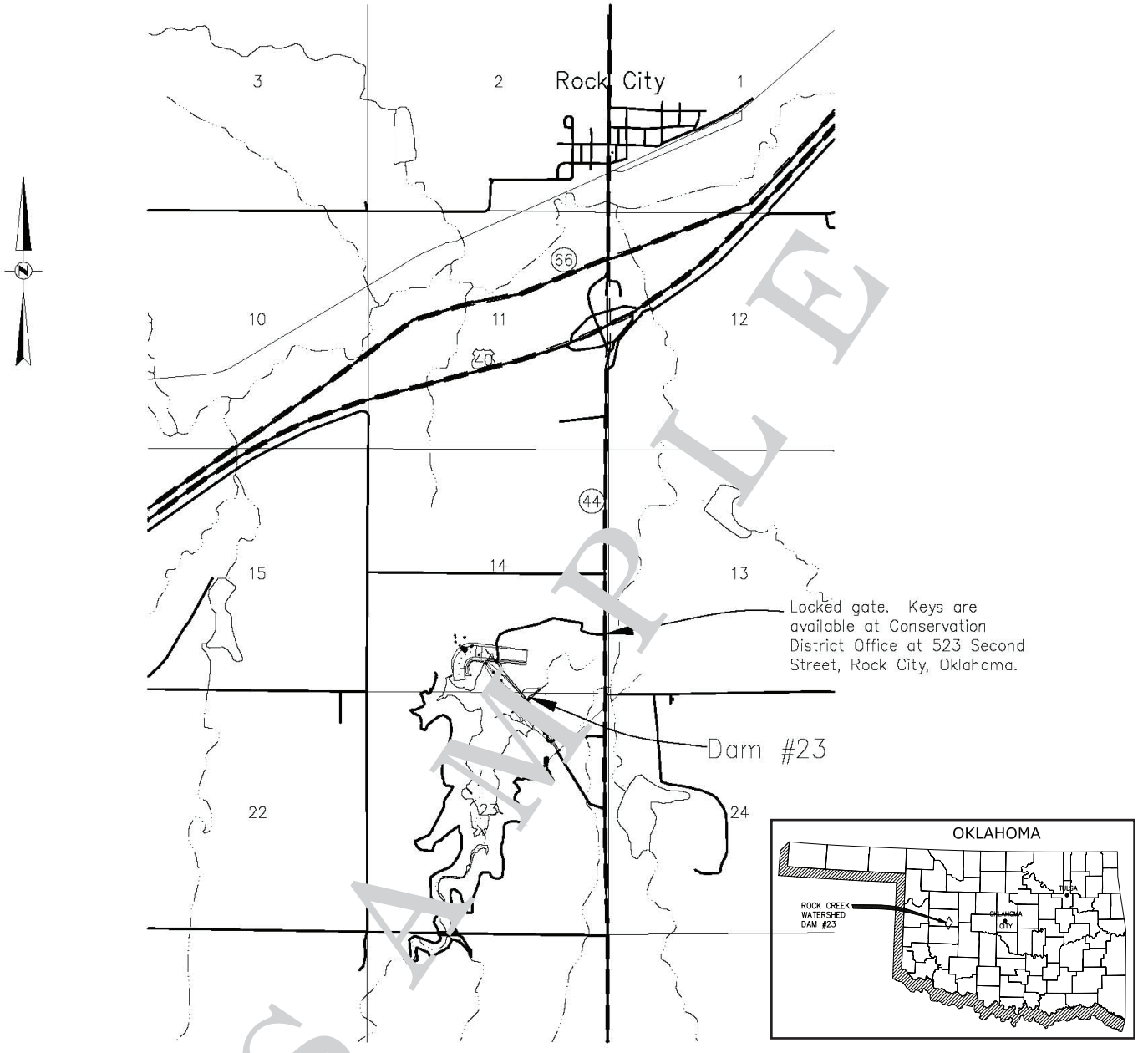
- two front-end loaders
- two backhoes
- one track hoe
- two graders
- two dump trucks
- a sand borrow pit
- a clay borrow pit

Contact the Coal County Road Department—see *Emergency Services Contacts*, page 16.

Other locally available resources include:

Heavy equipment service and rental	**Sand and gravel supply**	**Ready-mix concrete supply**
Bob's Dozer Service	Kern's Sand and Gravel	Burnett Concrete Co.
134 Elm Street Rock City, OK	R.R. 2 Rock City, OK	231 Sixth Street Dry Gulch, OK
407-555-XXXX	407-555-XXXX	407-555-XXXX
Tiller Construction Co.	Renfro Sand Products	
405 Second Street Dry Gulch, OK	334 Aston Ave. Spring Lake, OK	
407-555-XXXX	407-555-XXXX	
Pumps	**Diving contractor**	**Sand bags**
A to Z Rental	Steve White	A to Z Rental
569 Seventh Street Rock City, OK	2201 56th Street Johnstown, OK	5643 Water Street Johnstown, OK
407-555-XXXX	917-555-XXXX	917-555-XXXX

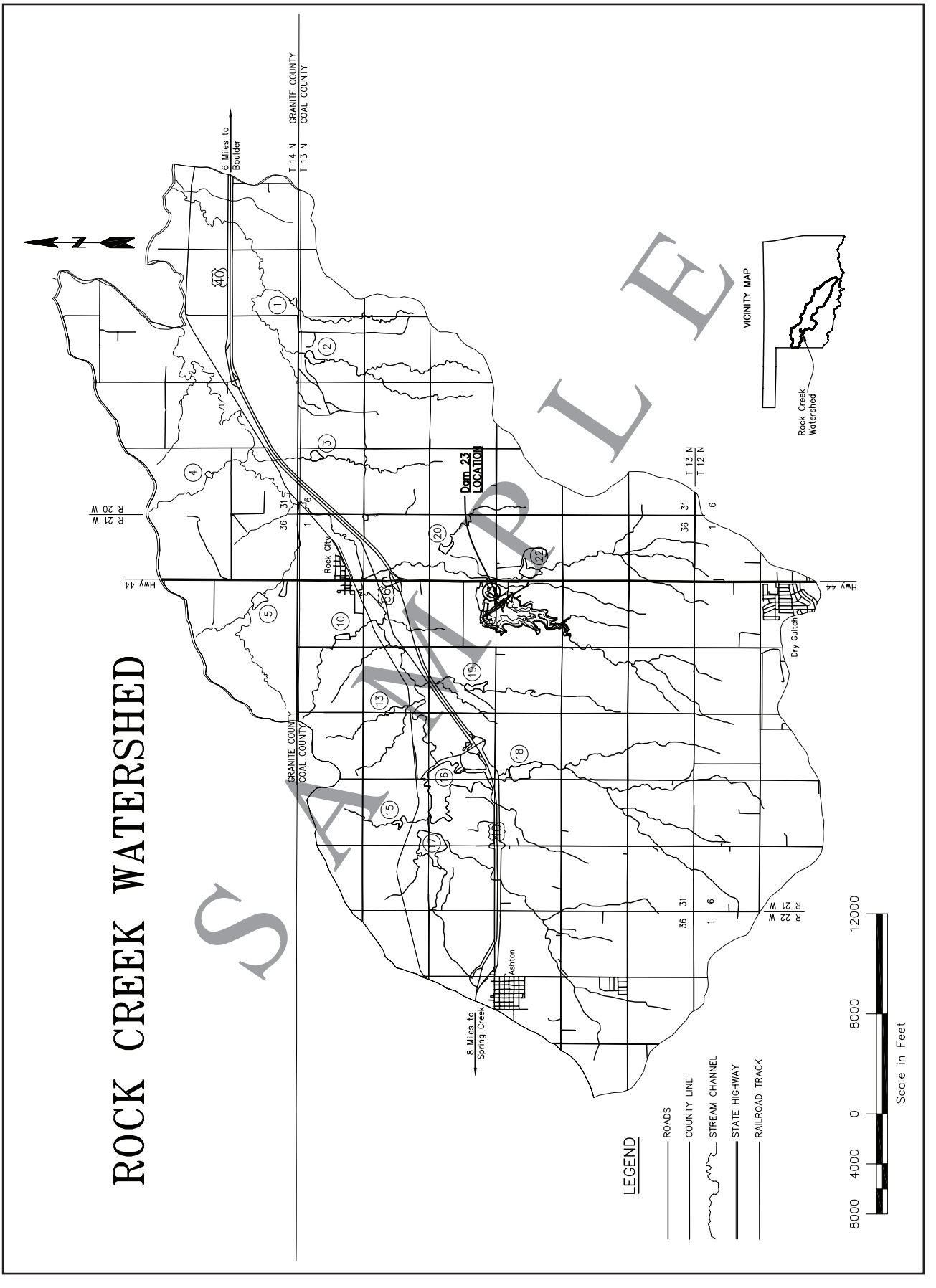
Appendix B–2: Location and Vicinity Maps



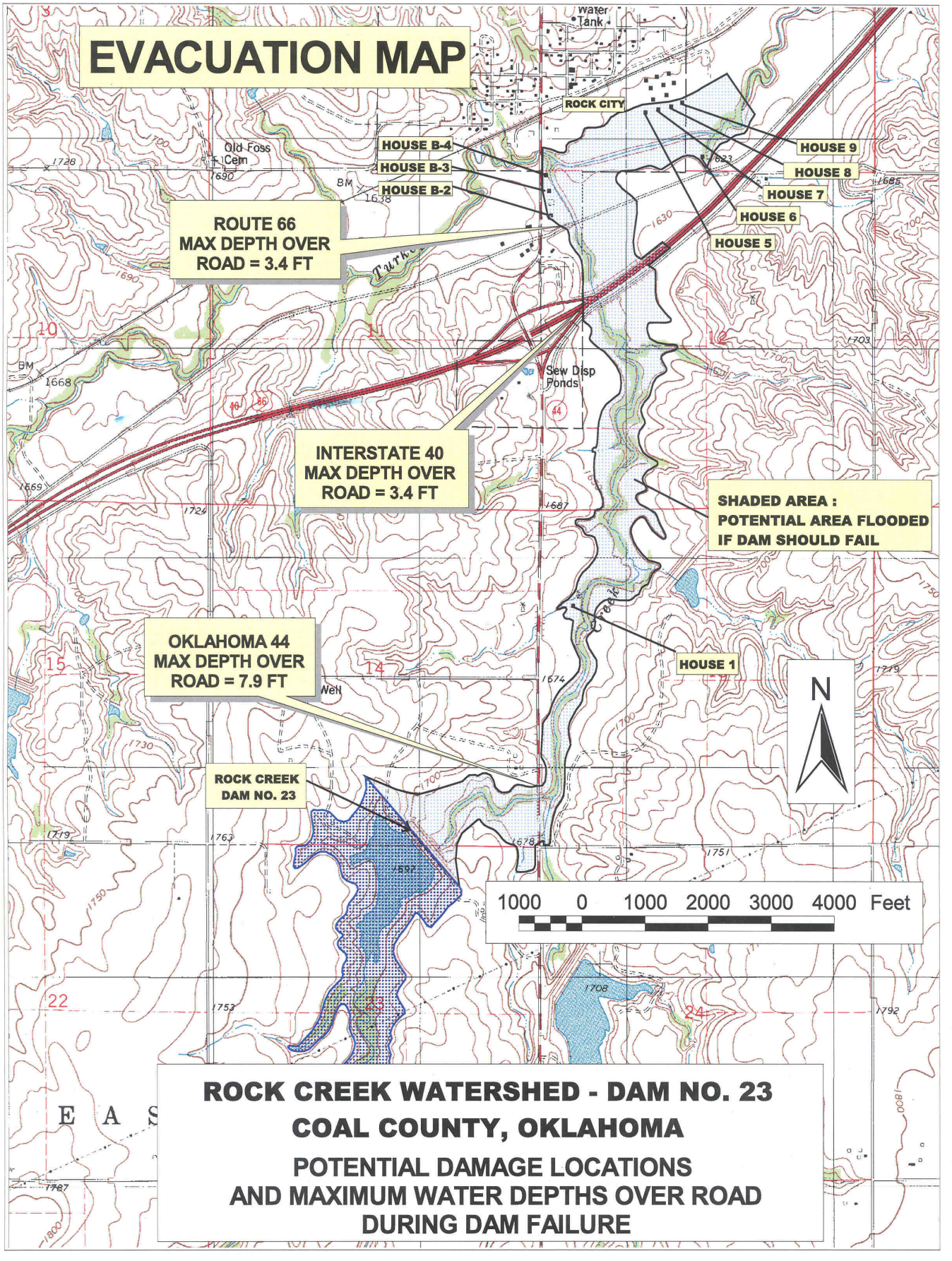
VICINITY MAP

Dam #23 is located approximately 2 miles South and 1/2 mile West of Rock City, Coal County, Oklahoma, in Sections 14 & 23, Township 13 North, Range 21 West.

Appendix B–3: Watershed Project Map



Appendix B–4: Evacuation Map



Appendix B–5: Residents/Businesses/Highways at Risk

A major flood caused by a sudden breach of the dam is estimated to inundate six homes, three businesses, and three highways. These homes and businesses (marked on the evacuation map) are located east of OK Highway 44 and south of Chestnut Street in Rock City.

House/ business no.*	Resident/business	Address	Phone no.	Distance Dstrm. from dam (ft)	Travel time ** (hr)	Max water depth above first floor (ft)
1	Fred and Ethel James	10300 132nd St.	555-XXXX	5,000	0.3	5.4
B-2	Larry's Hardware	3214 Chestnut	555-XXXX	11,400	0.9	0.8
B-3	Lori's Music Shop	2288 Farm Road	555-XXXX	11,600	0.9	2.6
B-4	Bill's Coffee Shop	1455 Sugar St.	555-XXXX	11,800	1.0	4.8
5	Terry and Ann Smith	4812 Chestnut	555-XXXX	13,600	1.1	3.0
6	Amos Hill	5500 Apple Road	555-XXXX	14,000	1.1	3.2
7	Allen and Ruth Jones	4814 Chestnut	555-XXXX	13,800	1.1	1.2
8	Mike and Carol Green	4902 Chestnut	555-XXXX	14,000	1.1	2.4
9	Stephanie Evans	4910 Chestnut	555-XXXX	14,200	1.1	0.5
	OK Highway 44			2,000	0.2	7.9
	Interstate 40			10,000	0.8	3.4
	OK Route 66			11,200	0.9	3.4

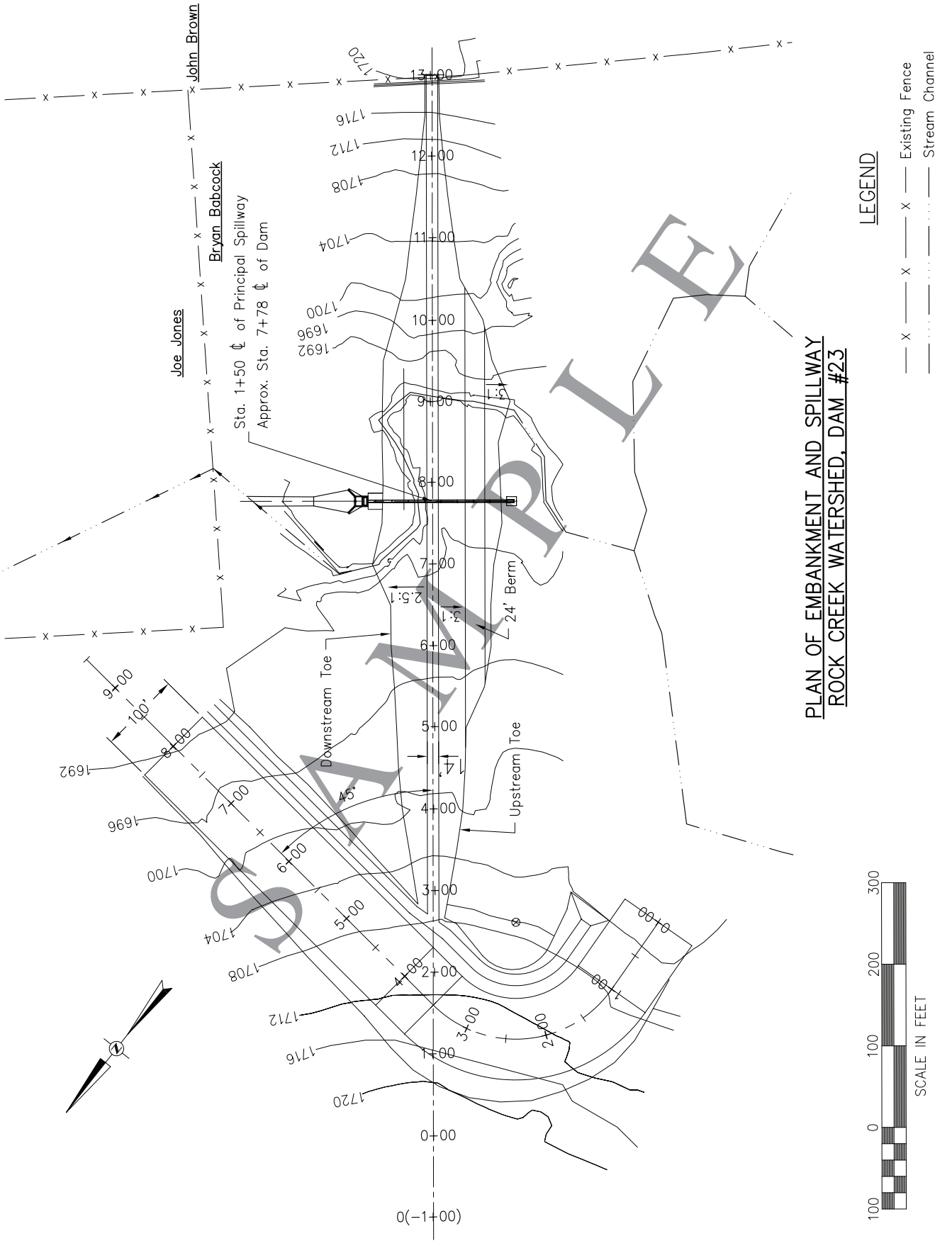
* See appendix B–4.
** Estimated time for breach wave (peak) to travel from dam to downstream locations

Basis for computation of evacuation area and flooding depths

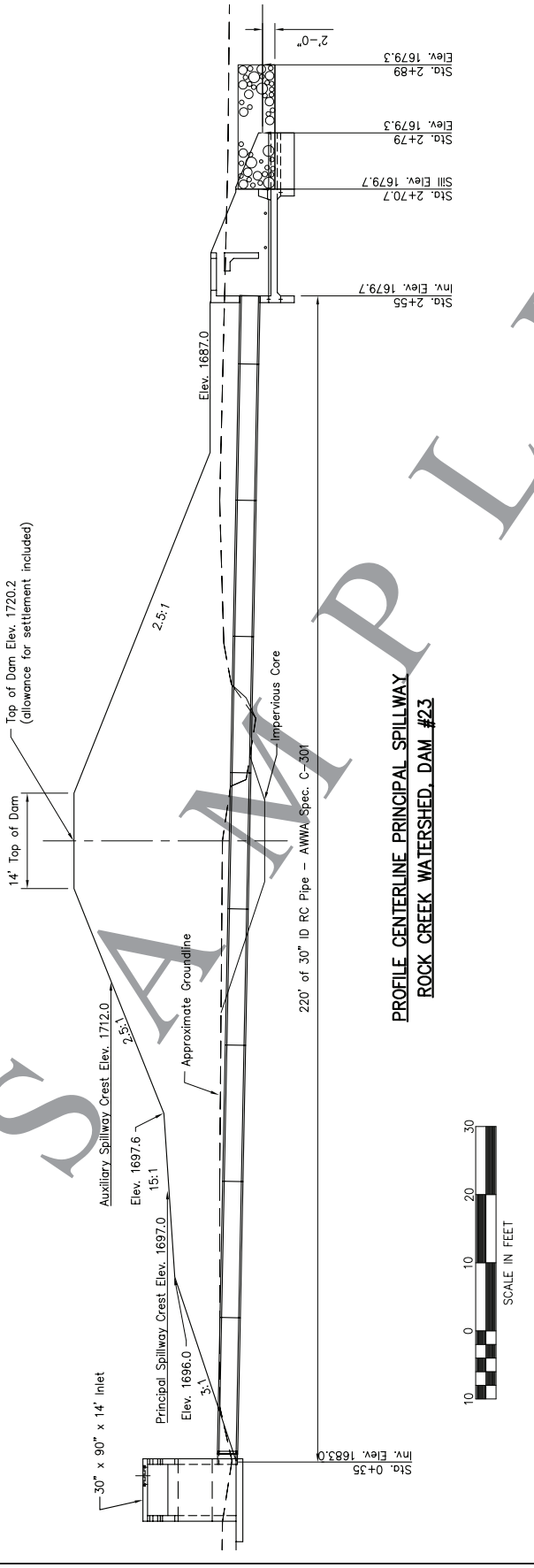
Breach inundation study completed by NRCS–August 2004
Hydraulic model used: NRCS TR–20 (routing); TR–60 (peak discharge); TR–66 (hydrograph)
Model assumptions:

- "Sunny Day" Breach (no inflow into the reservoir)
- Water surface in reservoir prior to breach = 1,770.2 (top of dam)
- Total volume of breach hydrograph = 2,340 ac-ft
- Height of water at time of breach = 36 ft
- Peak breach discharge = 49,700 cfs
- Downstream area defined by field surveys consisting of 10 cross sections and 3 bridge openings

Appendix B–6: Plan View of Dam



Appendix B–7: Profile of Principal Spillway



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

ROCK CREEK WATERSHED
DAM No. 23

Elevation	Reservoir Surface Acres	Reservoir Storage Ac. Ft.	Spillway Discharge cfs
1682.0	0.0	0.0	0
1684.0	0.3	0.3	0
1686.0	2.0	2.5	0
1688.0	3.7	8.2	0
1690.0	8.6	20.5	0
1692.0	15.9	45.0	0
1694.0	18.7	79.6	0
1696.0	23.5	121.8	0
Principal Spillway Crest			
1697.0	26.2	146.7	0
1698.0	31.1	175.4	45
1700.0	40.8	247.3	76
1702.0	49.3	337.4	82
1704.0	62.0	448.7	87
1706.0	71.4	582.1	92
1708.0	86.7	740.2	97
1710.0	98.6	925.5	102
Auxilliary Spillway Crest			
1712.0	115.0	1139.1	108
1714.0	129.9	1384.0	516
1716.0	145.3	1659.2	2090
1718.0	160.7	1965.2	4437
1720.0	178.8	2304.7	7763
Top of Dam			
1720.2	180.6	2340.6	7937

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

Dam name: **Rock Creek 23**

State: **OK**

Federal ID: **OKFP1896**

NID ID: **OK11111**

Longitude: **–99.19802**

Latitude: **35.42875**

Geodetic loc.: **S23 T13N R21W**

County: **Coal**

Stream: **Rock Creek**

Nearest town: **Rock City**

Distance to nearest town: **2 mi**

Operator: **Coal County Cons. Distr.**

Year completed: **1960**

Dam length: **1,030 ft**

Dam height: **40.7 ft**

Max. discharge: **2,090 cfs**

Max. storage: **2,340 ac-ft**

Normal storage: **147 ac-ft**

Surface area: **26 ac**

Drainage area: **7.7 mi^2**

Hazard potential: **High**

EAP?: **Yes**

Inspection frequency: **5 yr**

State regulated?: **Yes**

State reg. agency: **Oklahoma Water Resources Board**

Spillway width: **100 ft**

Dam volume: **62,367 yd^3**

Federal funding: **USDA NRCS**

Federal design: **USDA NRCS**

Federal constructed: **USDA NRCS**

Program auth.: **Flood prevention**

Watershed No.: **3015**

Watershed name: **Rock Creek**

Service life: **50 yr**

O&M insp. resp.: **Coal Co. Cons. Distr.**

O&M insp. current?: **Yes**

Population at risk: **45**

Design hazard potential: **High**

Hazard potential class. year: **2006**

EAP year: **2006**

Sediment storage: **152 ac-ft**

Flood storage: **773 ac-ft**

Surcharge storage: **1,415 ac-ft**

Other storage: **0 ac-ft**

Principal spillway type: **Concrete pipe**

Primary aux. spillway type: **Vegetated earth**

Conduit height: **2.5 ft**

EAP and Dam Safety References

1. Arizona Department of Water Resources, Emergency Action Plan Requirements.
2. Colorado Dam Safety Manual.
3. Colorado Model for Preparing a Dam Safety Emergency Preparedness Plan.
4. Connecticut Department of Environmental Protection, Guidelines for Dam Emergency Operation Plan
5. Federal Guidelines for the Evaluation of Hydropower Projects.
6. FEMA 64 - Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners.
7. FEMA 145 – Dam Safety an Owner's Guidance Manual.
8. Indiana Department of Natural Resources, Dam Safety Inspection Manual.
9. Interagency Committee on Dam Safety EAP Guidelines for Dam Owners.
10. Iowa Model Plan: An Emergency Preparedness Plan for Water Utilities
11. Maryland Model EAP for High Hazard Dams.
12. Maryland Model EAP for Significant Hazard Dams.
13. Nebraska Guide for Preparing Emergency Preparedness Plans for Dams and Reservoirs.
14. New Hampshire Department of Environmental Services, Dam Bureau, Guidelines for Development of Emergency Action Plans (Template).
15. New Jersey Department of Environmental Protection Guidelines for Developing an Emergency Action Plan.
16. New York Department of Environmental Conservation Policies and Procedures Manual.
17. Guidelines for Cooperation with the Alaska Dam Safety Program.
18. Pennsylvania Department of Environmental Protection, Guidelines for Developing an Emergency Action Plan.
19. Utah Dam Safety Guide to Emergency Action Plan Development and Implementation.
20. Virginia Department of Conservation and Recreation, Emergency Action Plan for Class I, Class II and Class III Impounding Structures.
21. Washington Department of Ecology, Simplified Emergency Action Plan Form.
22. West Virginia Department of Environmental Protection, Example Monitoring and Emergency Action Plan.
23. Wisconsin Sample Emergency Action Plan Format.