

## **APPENDIX H**

### **PUBLIC INVOLVEMENT**

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## **APPENDIX H** **PUBLIC INVOLVEMENT**

As stated in the main report, public involvement played an important role throughout the Upper Mississippi River System Flow Frequency Study. The public involvement techniques described in this appendix show how the public was kept informed about the study, and how the public had the opportunity be involved in and offer comments about the study.

### **NEWSLETTERS**

Six newsletters were sent to a mailing list of over 3,000 names. The list included congressional representatives; Federal, State, county, and city agencies; drainage districts; industry; businesses; Indian tribes; libraries; environmental groups; media; and the general public. At the end of each newsletter, a point of contact and contact information were given and questions or comments were welcomed. A copy of each newsletter is included at the end of this appendix. A summary of the main topics in each newsletter follows:

#### **DECEMBER 1997**

The December 1997 newsletter announced the beginning of the study and explained the study purpose and several terms that would be used in subsequent newsletters. The many players on the study, the Federal/State Study Team (Task Force) and the Technical Advisory Group, were introduced and the public was invited to join the Citizens' Public Involvement (PI) Group.

#### **FEBRUARY 1999**

The second newsletter provided a study update and a summary of the Task Force meeting. Members of the Citizens' Public Involvement Group were named and a summary was given of the Group's two meetings to date. The newsletter also contained statements from some of the Task Force and PI Group members.

#### **NOVEMBER 1999**

Study progress and meeting summaries from the Citizens PI Group and Task Force meetings were given in this newsletter. The study's web site address was provided as a means for the public to obtain additional study information.

#### **DECEMBER 2000**

The fourth newsletter brought readers up to date on the study's status (both delays and progress). The hydrologic and hydraulic assumptions as of the newsletter's release were summarized. The Public Law (PL) 84-99 Program policy regarding levees was explained and the Federal Emergency Management Agency (FEMA) points of contact for levee

issues were listed. The newsletter also provided a summary of Citizens' PI Group and Task Force meetings.

### NOVEMBER 2001

This newsletter was termed a "Special Edition" newsletter. The study team provided answers to 17 Frequently Asked Questions (FAQ's).

### APRIL 2003

This sixth and final newsletter provided detailed information about the May 2003 public open houses. The newsletter also gave a study update and summarized the final two Citizens' Public Involvement and Task Force meetings.

## **CITIZENS' PUBLIC INVOLVEMENT GROUP**

A Citizens' Public Involvement Group was formed at the beginning of the study to represent the interested publics. The December 1997 newsletter invited members of the public to join and participate in the Group. Both members of the general public and organization/agency representatives expressed an interest in becoming members of the PI Group. Participation in the Group was entirely voluntary; the Corps of Engineers provided no funding for the transportation or lodging costs of non-Corps of Engineers Group members (see Guidelines following Table H-1). Therefore, meeting attendance varied at each meeting. The Group's membership is listed in Table H-1 on pages H-3 and H-4.

The Group met to receive information about the study and to provide to the Task Force the public's issues and concerns related to this study. The Group was encouraged to discuss the issues and the study progress with their organizations, associates, friends, and neighbors. One of the major tasks of the PI Group was to assist the Corps of Engineers and the Task Force in developing the overall public involvement program for the study, including the format of and information provided at the May 2003 public open houses.

TABLE H-1. Upper Mississippi River System Flow Frequency Study  
Membership of Citizens' Public Involvement Group

NAME	MEETINGS ATTENDED	NOTES
Martin Becker, Atlanta, GA	Mar 25, 1998	
William Maczuk, Berger Levee District New Haven, MO		Replaced Stuart Kase in Jun 99. (Mr. Kase attended the Mar 25, 1998, mtg.)
Ron Seibel, Walcott, IA		
Ed Keeven, O'Fallan, MO	Mar 25, 1998	
Seeley G. Lodwick, Green Bay Farms, Wever, IA	Apr 28, 1999	
Richard Bemes, Burlington, IA		
Joe Wlosinski, Upper Midwest Environmental Sciences Center, La Crosse, WI		
M.J. "Jim" Whiting, Whiting, Iowa	Mar 25, 1998, Nov 17, 1998 Apr 28, 1999, Dec 1, 1999	
Lanny Meng, Oregon, MO	Jun 28, 2000	
Dan LaHue, Rock Port, MO		
Paul H. Tiemeyer, Rock Port, MO		
John Robb, Gladstone, IL		
F. John Taylor, Virginia, IL	Mar 25, 1998, Nov 17, 1998 Dec 1, 1999	
Liz Anderson, Editor, The Enterprise-Courier Charleston, MO		
Don Meisner, SIMPCO, Sioux City, IA	Mar 25, 1998	
John Cambridge, Olsson Environmental Sciences, Lincoln, Nebraska		
David McMurray, Chairman, Upper Mississippi, Illinois, & Missouri Rivers Association (UMIMRA) Burlington, IA 52601	Mar 25, 1998, Nov 17, 1998 Apr 28, 1999, Dec 1, 1999 Jun 28, 2000, Jun 20, 2001 Oct 9, 2002	
Mike Klingner, Klingner & Associates, P.C. Quincy, IL	Nov 17, 1998, Apr 28, 1999 Apr 28, 1999, Dec 1, 1999 Jun 28, 2000, Jun 20, 2001 Oct 9, 2002	
Norman Haerr, Fabius River Drainage District Taylor, MO	Nov 17, 1998, Apr 28, 1999 Jun 28, 2000	
Mike Rausch, Lima Lake Drainage District Jacksonville, IL		
Clair Wilson, Hillview Levee & Drainage District/UMIMRA Winchester, IL	Nov 17, 1998, Apr 28, 1999 Dec 1, 1999, Jun 28, 2000 Jun 20, 2001	
William D. Lay, Fayette, MO	Nov 17, 1998, Apr 28, 1999 Dec 1, 1999, Jun 20, 2001 Oct 9, 2002	
Joe Gibbs, P.E., Columbia, MO	Nov 17, 1998, Apr 28, 1999 Dec 1, 1999, Jun 28, 2000 Oct 9, 2002	
Charles Kempf, Ameren/UE, Eldon, MO	Mar 25, 1998, Nov 17, 1998 Dec 1, 1999, June 20, 2001	Retired March 31, 2002. Replaced by David Fitzgerald, Ameren/UE, who attended the Oct 9, 2002 mtg.
Wilmer Erling, MLDDA Tri County Levee District, Hermann, MO	Mar 25, 1998	
David M. Shaffer, Commissioner, IGDD, Ursa, IL	Mar 25, 1998	
Nancy Newlon, Thurman, IA		
Heather Hampton-Knode, Executive Director UMIMRA, Hillsboro, IL	Nov 17, 1998, Apr 28, 1999	Joined PI Group at the Nov 98 mtg.

NAME	MEETINGS ATTENDED	NOTES
Peggy Smart Smart Brothers Farms, Inc., Tebbetts, MO	Apr 28, 1999, Dec 1, 1999 Jun 28, 2000	Joined PI Group at the Apr 99 mtg.
Nicholas Pinter, Geology Department Southern Illinois University, Carbondale, IL	Dec 1, 1999, Jun 20, 2001	Joined PI Group at the Dec 99 mtg.
Mike Garvey, Vice President Greenway Network, Inc., St. Peters, MO	Dec 1, 1999, Jun 28, 2000 Jun 20, 2001	Joined PI Group at the Dec 99 mtg.
Ted Heisel, Senior Law & Policy Coordinator MO Coalition for the Environment St. Louis, MO	Jun 20, 2001, Oct 9, 2002	Joined PI Group at the Jun 01 mtg.
Paul Soyke, Coal Valley, IL	Mar 25, 1998, Nov 17, 1998 Apr 28, 1998, Dec 1, 1999 Jun 28, 2000	Retired from Corps of Engineers in Dec 2000; formerly PI Group Chairperson.
Laura Abney, U.S. Army Corps of Engineers Rock Island, IL	Jun 20, 2001, Oct 9, 2002	Replaced Paul Soyke as PI Group Chairperson..
Arlen Feldman, U.S. Army Corps of Engineers Water Resources Support Center Hydrologic Engineering Center , Davis, CA	Nov 17, 1998, Apr 28, 1999 Dec 1, 1999, Jun 28, 2000 Jun 20, 2001, Oct 9, 2002	Joined PI Group at the November 1998 mtg.
Sue Simmons, U.S. Army Corps of Engineers Rock Island, IL	Mar 25, 1998, Nov 17, 1998 Dec 1, 1999, Jun 20, 2001 Oct 9, 2002	Jacque Chandler (Corps of Engineers, Rock Island) attended the Apr 28, 1999, & Jun 28, 2000, mtgs for S. Simmons.
George Gitter, U.S. Army Corps of Engineers Rock Island, IL	Mar 25, 1998, Nov 17, 1998 Jun 20, 2001	Attended portions of the June 2001 mtg.
Heather Anderson, U.S. Army Corps of Engineers Rock Island, IL	Jun 20, 2001	Replaced George Gitter as Study Coordinator. Attended portions of the June 2001 mtg.
Andrew Leichty, U.S. Army Corps of Engineers Rock Island, IL		Replaced Heather Wiese Anderson in Apr 2002 as Study Coordinator
Holly Stoerker, Director, Upper Mississippi River Basin Association, St. Paul, MN	Jun 28, 2000, Jun 20, 2001, Oct 9, 2002	Not an official member of the PI Group, but received meeting information.
Dean Rebuffoni, Mississippi River Specialist Sierra Club, Minneapolis, MN		Not an official member of the PI Group, but received meeting information.
Melissa Samet, Senior Director, Water Resources, American Rivers, Fairfax, CA		Not an official member of the PI Group, but information was previously sent to Scott Faber, American Rivers. (Mr. Faber has taken a position with another agency.)
Rebecca Wodder, President, American Rivers Washington, DC		Not an official member of the PI Group, but information was previously sent to Scott Faber, American Rivers. (Mr. Faber has taken a position with another agency.)

The following paragraphs discuss the PI Group's guidelines and summarize the PI Group meetings.

#### CORPS OF ENGINEERS GUIDELINES FOR THE OPERATION OF THE CITIZENS' PUBLIC INVOLVEMENT GROUP

Before the PI Group met for the first time, the Corps of Engineers drafted guidelines for the conduct of the PI Group and the role the Group would play in the study process. The guidelines were discussed at the first meeting on March 25, 1998, and further discussed and accepted by the PI Group at its second meeting on November 17, 1998. The guidelines are listed below.

##### I. The Citizens' Public Involvement Group membership:

(1) Will consist of volunteer parties interested in the public involvement aspects of the Upper Mississippi, Lower Missouri, and Illinois Rivers Flow Frequency Study.

(2) Will be kept open and will welcome new members at all times.

(3) Will have no limitation on the number of members.

II. Members of the Citizens' Public Involvement Group will be notified in advance of scheduled meeting dates and places. Meetings will be scheduled to coincide with State/Federal Study Team (Task Force) meetings or on an as-needed basis. All meetings will be open to the public.

III. The purposes of the Citizens' Public Involvement Group will be:

(1) To represent the interested publics and provide information to the State/Federal Study Team on public concerns and issues pertaining to the Flow Frequency Study.

(2) To relay to the Task Force the range of concerns the public has regarding the Flow Frequency Study.

(3) To assist in developing the public involvement portion of the Flow Frequency Study.

IV. Meetings will be chaired by a representative from the Corps of Engineers, who will serve as the Group spokesperson at the Task Force meetings.

V. The agenda for each meeting will be developed by the Citizens' Public Involvement Group Chairperson, with input from the Group. A preliminary agenda will be proposed at the end of each meeting. A draft agenda will be sent to Group members prior to each meeting. Comments about the agenda should be sent to the Citizens' Public Involvement Group Chairperson.

VI. Meeting minutes will be prepared in draft and final format by the Corps of Engineers.

VII. The Corps of Engineers will bear the cost of logistical arrangements for the meeting rooms for the Citizens' Public Involvement Group meetings. Group participants will be responsible for their own transportation, labor, lodging, meals, and incidental costs.

VIII. The Corps of Engineers will not be considered members of the Citizens' Public Involvement Group in a voting situation. However, should the Group vote

result in a tie, the Citizens' Public Involvement Group Chairperson will vote to break the tie.

IX. All decision-making authority regarding the management of the Flow Frequency Study will remain under the exclusive jurisdiction of the U.S. Army Corps of Engineers.

X. There will be no formal procedure from resigning from the Citizens' Public Involvement Group. Although a written notification would be desired, a member who chooses to resign may do so by not attending further meetings.

XI. This charter may be amended if a majority of the Citizens' Public Involvement Group members deem it necessary. A majority will consist of more than 60% of the members in attendance who have attended at least one previous meeting.

## CITIZENS' PUBLIC INVOLVEMENT GROUP MEETINGS

The PI Group met seven times throughout the study period. Each meeting took place in St. Louis, Missouri, because it seemed to be the most centrally located place for the majority of both the PI Group and Task Force members and for the Corps of Engineers study team members. A summary of each meeting follows. Complete minutes are attached at the end of this appendix and are posted on the study's website.

### March 25, 1998

The PI Group held its first meeting on March 25, 1998. Introductions were made and the meeting format and schedule were discussed. The Group raised several pertinent questions and was concerned that they be made aware of the Task Force findings. The Group also asked that a Technical Expert be assigned to the Group to explain the Task Force findings. Mr. S. K. Nanda (Corps of Engineers, Rock Island District), Task Force Chairman, and Dr. David Goldman (Corps of Engineers, Hydrologic Engineering Center), Task Force member, attended part of the meeting and addressed several of the Group's questions.

### November 17, 1998

Arlen Feldman, Chief, Research Division, of the Corps of Engineers' Hydrologic Engineering Center attended the meeting to answer questions and explain some of the study elements. Several PI Group members were concerned about the effect the study will have on the PL 84-99 Program.

### April 28, 1999

The PI Group discussed their concerns that the best technical data are used in the study, accuracy of the data, the importance of determining levee failure points, and the importance of the study's

assumptions. Arlen Feldman agreed to be the Advisor to the Group. Mr. Feldman's charter is shown below.

Charter- Advisor to Citizens' Public Involvement Group – Arlen Feldman

The advisor to the Citizen's Public Involvement Group for the Upper Mississippi River System Flow-Frequency Study would be expected to explain to the Public Involvement Group at what points in the study they will have input and how that input will be used. Throughout the study, the advisor would also be expected to keep the Public Involvement Group informed as to the assumptions that are or need to be made in the model and the time frame in which they are to be made. This will require close coordination with the Technical Committee and the Public Involvement Group.

We would then expect the advisor to discuss the assumption and any alternate assumptions, describing the impact of those assumptions and the differing potential outcomes. As much as possible, the advisor should also help identify the impact of existing regulations as they might impact the results of the assumptions or the model development.

The advisor should function as a quasi-independent advisor to the group within the scope of this charter and the limits of technical expertise. He should also provide advice to the group on studies that might be required to address the group's issues. (7/14/99)

The advisor should explain the policies and policy differences that may play into the assumptions or the development of the data or the models.

The advisor would be expected to assist the chairman of the Public Involvement Group to present issues or concerns to the Task Force, Technical Committee, or others as appropriate.

It is important that the Public Involvement Group have input into the process at the appropriate times and that their input be based on knowledge of the assumptions and the differing outcomes of varying assumptions. The study will be well served if the public understands the process and results.

December 1, 1999

The format and content of the upcoming public meetings were discussed. (Note: public meetings were not held until May 2003 and were designed in an open house format.) Among the other topics discussed were levee issues, regulated and unregulated flows, study assumptions, climate and land use changes, Digital Terrain Models, river hydraulics, and stage frequency.

### June 28, 2000

At the fifth meeting of the Citizens' Public Involvement Group, the status of the Missouri River Master Plan was provided. Study assumptions were again discussed for the period of record, climate change, unregulated flow frequency, regulated flow frequency, interpolation of flow statistics between gages, and regulated stage frequency.

### June 20, 2001

Jerry Skalak, Regional Project Manager provided an update of the various study activities. The status of the study's assumptions was further discussed. A presentation was made on how cross sections were developed in St. Louis District after the 1993 flood using the Digital Terrain Model (DTM) and how the new cross sections would be used in the UNET Model. Suggested dates, locations, times, and format for the public open houses were discussed. There was much dialogue concerning FEMA and levee issues.

### October 9, 2002

The Citizens' Public Involvement Group held its last meeting on October 9, 2002. The status of letters that were mailed to levee district representatives was discussed (see paragraph below). Mr. Feldman explained the procedure for estimating regulated, existing condition, and state-frequency relationships. Mr. Skalak discussed the status of the open houses and stated that they would be postponed due to budgeting and scheduling problems. (Note: The open houses were rescheduled for May 2003 – see Public Open Houses write-up below.) An overview of the format that was agreed upon at the June 2001 PI Group meeting was given, the draft presentation that will be shown at the open houses was shown, and displays were discussed. Several Task Force members joined the PI Group meeting for a Question and Answer session.

### LETTERS TO LEVEE DISTRICT REPRESENTATIVES

At the June 2001 PI Group meeting, the Group expressed concern that the most accurate levee elevation information be used by the Corps of Engineers in its modeling efforts. To verify the accuracy of the information, a letter was sent to the identified levee district representatives in each of the five Corps of Engineers Districts (St. Paul, Rock Island, St. Louis, Omaha, and Kansas City) asking for verification of levee elevations (upstream or downstream) at which overtopping may occur. A table with the names of the levee districts, river miles, and levee overtopping elevation for each identified levee was attached to the letter. Several discrepancies were reported and certified and were taken into account as each Corps District's UNET model was refined. Copies of the letters, tables, and a subsequent addendum giving further guidance are attached at the end of this appendix and are also posted on the study's website.

### PUBLIC OPEN HOUSES

Methods of providing information about the study results to the public were discussed at several of the Citizens' Public Involvement Group meetings. The Group determined that an open house,

with informal and formal sessions, would be the best format to use. The Group reviewed and offered suggestions on the presentation that will be shown at the open houses and discussed displays and handouts. The Corps of Engineers study team encouraged the PI Group members (as well as Task Force members) to attend and participate in the open houses within their localities.

An invitation to participate in an open house was provided to those on the study's mailing list via the April 2003 study newsletter. In addition, a news release was sent to almost 460 media outlets in the study area. A copy of the news release is provided at the end of this appendix.

## OPEN HOUSE CONDUCT

A series of eight public open houses were held May 2003 in locations along the Mississippi, Missouri, and Illinois Rivers. The purpose of the open houses was to explain the reason for and the results of the Upper Mississippi River System Flow Frequency Study and to respond to questions or concerns.

Open house sessions were held from 1:00-4:00 p.m. and 5:30-8:30 p.m. Each session was identical (in St. Paul, Minnesota, an afternoon-only session was held). The beginning and ending hours of each session were informal, which allowed participants to attend according to their schedules. Participants visited displays and discussed their specific questions and comments on a one-on-one basis with study personnel. Representatives from the Corps of Engineers, the Federal Emergency Management Agency, and the specific State in which the open house was held were present to discuss the study with open house participants. In some locations, members of the Citizens' Public Involvement Group were present as well. Displays included a general study overview, maps, and draft river profiles.

The middle hour of each session was formal, with presentations by the Corps of Engineers and the Federal Emergency Management Agency, followed by questions and answers. The Corps of Engineers presentation was identical at each open house, except for District-specific information. A copy of the presentation given in Quincy, Illinois, is attached at the end of this appendix. That presentation, as well as the presentations used at the other seven open houses, are provided on the study's website at [www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm](http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm).

Handouts provided at each meeting were a study fact sheet and Frequently Asked Questions (FAQ's), which were updated from the November 2001 "Special Edition" newsletter. The fact sheet and FAQ's are attached at the end of this appendix.

Comment sheets also were provided at each open house. The purpose of the comment sheets was to give the study team an understanding of the publics' reactions to the study findings. Tables H-2, H-3, and H-4 provide information provided on the comment sheets.

TABLE H-2. May 2003 Open House Summary

<b>Location</b>	<b>Total Attendance</b>	<b>Comment Sheets Returned</b>	<b>Percent</b>
St. Louis, MO	52	19	37%
Kansas City, MO	26	12	46%
Omaha, NE	28	13	46%
Quincy, IL	32	8	25%
Peoria, IL	22	13	59%
Davenport, IA	32	15	47%
LaCrosse, WI	16	8	50%
St. Paul, MN	3	0	0%
Total	211	88	

TABLE H-3. Category of Primary Interest in the Flow Frequency Study

	<b>Number</b>	<b>Percent</b>
Levee / Drainage Dist	14	16
Agriculture	11	13
Other Business/Industry	10	12
City/County Govt	9	11
Federal Government	9	11
State Government	6	7
Environmental	6	7
Personal (no particular affiliations)	6	7
Property Owner	5	6
Other Business/Industry	5	6
Regional Planning	3	4
Education	1	1
Recreation	1	1
Media	0	0
Total Responses	86	

## SUMMARY OF COMMENTS

Comments received at the open houses are summarized in Table H-4. The comments also are available for viewing on the study's website.

TABLE H-4. May 2003 Flow Frequency Study Open Houses	
Category Code	Comment
<b>1=Study Findings/Data</b>	
1	My concern is that every effort be made to manage the rivers to prevent flooding and provide for barge navigation.
1	At some point, you will have to explain to the public why your results differ from certain scientists work.
1	The Corps should stop endorsing/promoting risky floodplain development and economically unjustified navigation on MO river.
1	I am concerned about flooding. There is a controversy about the COE economic standards used to justify building locks, dams, and levees.
1	Minimum range of low river levels on MO River at St. Charles and Miss. low levels at Chain of Rocks just N of St. Louis. Who has this information and how do I get the information?
1	There's too much of a gap and the ramifications are too great with this study between Dr. Nick Pinter's study of the Mississippi and Missouri River.
1	The new numbers FEMA said they'll accept as the best available data, will allow additional floodplain development and give a false sense of security for municipalities developers building below an accurate elevation.
1	Study team members denied that consideration of spring rise flows were made for study. Were they made or not? If so, for what spring rise flows?
1	Nothing should be made indicating rises due to increases in discharge rates.
1	Existing projects should be grandfathered in.
1	Drainage areas for various points on the MO navigational requirements (freeboard) for new bridges.
1	Very informative-it seems to be a sound process for determining water surface profiles for such a large river system. Do models such as HEC-RAS need to be used to calibrate to these new profiles in order to create a useable effective model? (will this be FEMA's objective?)
1	Good program on study and results. What about analyzing the results?
1	Why are the flood stages changing? Environmental factors that caused the change?
1	The National Weather Service has great interest in the river levels and flood damage.
1	The numbers help our understanding of flood frequency and how we can distribute that information to the public.

1	The results have relevance to the NWS Automated Hydrologic Prediction System and the inundation information is key to NWS Warning offices. It will be important to work with the NWS to make these efforts as portable as possible to the real time warning personnel.
1	How will the results effect the restoration or replacement of the islands that have disappeared in the past 20 years?
1	I'm surprised that the public involvement volunteer group is credited with helping to check the accuracy of elevation data. This prompts the question as how John Q Citizen would do such a thing, given the data acquisition was a highly technical task and expensive.
1	There should be confidence intervals around the profile, which are a mean.
1	What is flood elevation of IL River at Farm Creek for 100 or 200 years? Need hydraulic profile for Farm Creek through East Peoria.
1	The Corps should recommend to Congress that the levees having less protection should be improved to 100 year level. If unable to do so, mention the specific implications of revised flow levels to certain areas in the region; i.e., Hannibal.
1	On table C-I-4 you need to insert Village of Liverpool Levee that was constructed in 2000/01.
1	I hope the results of this study provides accurate data to prevent illogical flood plain development, reduce government costs associated with flood losses, and encourage wetlands restoration along the Mississippi and Illinois Rivers.
1	River flow data is important for the future.
1	I hope the report is used to encourage establishment of wetlands and restoration of backwater areas along the river.
1	Protecting the rivers as a natural resource and the future sustainability of the river as an ecosystem and habitat for fish, mussels, water birds, and best weather quality are key concerns.
1	Concern for the environmental health of Missouri River and the fish habitat well being should be a priority for use of this study.
1	Local politicians should be briefed on information like this because the mayor of Davenport stated there was 3 100 year floods in the past 10 years and that causing folks a lot of confusion.
1	If the floodplain is being squeezed in and the rest of the river is raised so high, doesn't this imply that the levee districts are causing increased flooding elsewhere? Are they liable for flood damage to homes in 2001?
1	The levee districts can be built or improved, so can city floodwalls. Don't these have a much greater chance of raising flood levels?
1	With the Flow study our levee is below the 100 year certification, which I hope the PL84-99 program can return our levee to a 100 year certification and the Corps of Engineers take the ball and tell Congress it's needed.
1	Outcome of this study will have a major impact on the ability, or inability, of the Quincy area to grow economically.
1	Following adoption of the report's findings, the current levee system should be upgraded to keep it at the current flood protection level (i.e. 500-yr levees remain at

	500-yr protection under new guidelines.
1	The necessary upgrading should be completed as soon as possible.
<b>2=Mapping</b>	
2	The main item that may need more discussion is explaining in more detail the use of the study results, specifically with FEMA and how this relates to the map modernization program.
2	Wish the map products in urban areas could come out sooner than minimum of 5 years.
2	The new FEMA maps will not change our current insurance rates.
<b>3-Presentation/Format</b>	
3	Was hoping to get into discussion and more detail of those that disagree with this study.
3	Commend Corps on conduct of study and acceptance of input from the public and organizations.
3	Information interesting.
3	Remarkable scope for the open house for a technical issue.
3	It was not made clear what "Flow Frequency" means, what would change Flow Frequency from that previously reported, what three sources of data has been, or what relationship there is if any between Flow Frequency and "profile."
3	I work for a consulting engineering firm specializing in land development. Our clients want to know how this will affect them? I received the answer from discussions with FEMA representatives.
3	A very good informative program.
3	In a general audience, it is hard to know how to gear the presentation-more or less technical. As an engineer and levee owner I was hoping for a technical presentation.
3	Meeting was well planned and educational. It answered several questions I had. The presenters with US Army COE were very helpful.
3	Good
3	It would be helpful to get profile information prior to meeting.
3	Appropriate level of information for public open house.
3	I would have enjoyed more discussion of reasons behind increased flows and lowered WSELS and vice-versa. i.e.-aggradation, degradation, channel or levee changes.
3	Groups well represented; all presented well.
3	Team members open to comments and questions
3	I disagree with team members did not "approach me," but they were very open and I spoke with all of them except 1.
3	Very good program.
3	The information shared today helps me to gain a better understanding of how it all works.
3	The meeting confirmed my understanding of the study, its results and the future application of the data.
3	The open house forum worked well followed by questions and answers. Corps and FEMA officials were friendly and professional.
3	Good information for planning work in the La Crosse area as well as other communities along the waterway.

3	Would like to see a map of the 1979 flood level compared to the new level.
3	Some slides on presentation were a little hard to read.
3	Would have liked more maps especially for the Quad City area.
3	Did enjoy after meeting questions and answers.
3	Speakers presented material very well.
3	Well done, would have liked information to take home, but I understand it's a draft. I'm anxious to see it on the web site.
3	A hard copy outline of the presentation would be helpful.
3	Screen for slides was too low to be seen, the sound system wasn't adequate nor was there any effort by speakers to use it.
3	The Corps was very unprepared to answer most questions.
3	The sound system could have been louder.
3	Corps presentation very well done, they answered all questions and concerns I had.
3	Punctuality, start on time, don't waste people's time and money. St. Louis Post-Dispatch newspapers article gave no indication of "informal sessions." I assumed presentation began at 1300 hrs.

#### **4=Miscellaneous**

4	Notification (Monday News)- very brief.
4	Please provide me with your upcoming web site address for monitoring the flow activity.
4	National park service, East Missouri NRRA and others.
4	On the tabulated form of the river miles with the corresponding elevations, either left align the river mile column or put all river miles in 2 place decimal format.
4	I want to build a home on stilts on the riverbanks to avoid flooding. I'm sure this could be designed to not impact flood levels, but Federal agencies seem to not want individuals living on the rivers and they regulate against it.
4	We completed a comprehensive plan with BI-STATE planning help and flood plain zoning was an important segment of our plan.

<b>Category Code</b>	<b>Comments Recorded by Study Team Members:</b>
1	This was a very complex subject. Building the levees has been going on for over 100 yrs. We seem to be working to create a problem caused urban sprawl, movement out from central sites has caused more problems than we are solving.
1	Are there any plans to use flood plains like Grafton Illinois to store flood waters so flooding can be prevented?
1	A small number of PL84-99 levees were given levee elevation tables. PL84-99 mailing list isn't complete.
1	See no benefit of study to the stakeholders along the rivers. Efforts should have been made to consult with stakeholders at start of study.
3	I got a lot of good information.
3	Time of public meetings: to get better involvement of levee district, the meetings need to be after 7pm and in more places along river.
4	Need much more effort to involve public.

4	Bagnell normal lake levee is usually 4 inches higher than authorized. This has adverse effect on level district along Osage River and downstream at times of flooding.
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## STUDY WEBSITE

A website was established in 1999 to provide the public with information as the Upper Mississippi River System Flow Frequency Study progressed. Among the items included on the website are a study map, names of and contact information for Corps of Engineers project managers and Federal and State Task Force members, study newsletters, Frequently Asked Questions, minutes from the Task Force and the Citizens' Public Involvement Group meetings, letters and levee elevation tables sent to levee and drainage district representatives in each involved Corps District, and public open house information. This final report will be posted on the website.

The study's website address is [www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm](http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm).



**US Army Corps  
of Engineers**

## **UPPER MISSISSIPPI, LOWER MISSOURI, AND ILLINOIS RIVERS FLOW FREQUENCY STUDY**

### **NOTICE OF INITIATION AND PUBLIC INVOLVEMENT NEWSLETTER**

November 1997

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The U.S. Army Corps of Engineers, in partnership with State and Federal agencies, has initiated a study to develop flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers (the attached map shows the study area). The Upper Mississippi is that portion of the river above the mouth of the Ohio River and includes the Illinois River. The Lower Missouri is that portion of the river below Gavins Point Dam. Flow frequencies will not be developed for the tributaries.

As part of the study's public involvement program, periodic newsletters will be developed to keep all interested persons informed of the study's progress and preliminary results of the study. The purpose of this initial newsletter is to announce the study's initiation and purpose, and to familiarize the reader with some of the study terms. Terms are defined at the end of each section of this newsletter.

#### **TERMS - WHAT DO THEY MEAN?**

Flow Frequency – Probability of exceedance of a given flow magnitude at a specific location. Flow frequency is the probability of a peak discharge being exceeded in any year; i.e., a 100-year flood has a 1 percent chance of exceedance in any given year. The flow magnitude and associated water depth for a given flow frequency are the basis for floodplain development regulation such as the 1 percent map for flood insurance.

**WHY DO WE NEED TO STUDY FLOW FREQUENCIES?** Flow frequencies need to be reviewed on a periodic basis as we obtain more data on, and insight about, the rivers' floods. Upper Mississippi River flood profiles were last developed by an interagency task force in 1979. The 1979 task force recommended revisiting the profiles when additional flow data became available and mathematical models were developed to better define the hydraulics of the river system. We have over 20 years of additional records since 1977 (including the Great Flood of 1993) and a new UNET model has just been completed for the entire Upper Mississippi River.

The study includes reviewing the methodology used in determining flood-flow frequency, selecting and applying the appropriate flow frequency analysis method, analyzing the effects of reductions in flood runoff attributable to flood control reservoirs, considering potential effects of levee overtopping and/or breaches, determining and selecting the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequency, and developing these profiles.

Following the Great Flood of 1993, two major studies were done to examine flooding on the Upper Mississippi and Lower Missouri Rivers. The first was A Blueprint for Change (Parts I thru V), Sharing the Challenge: Floodplain Management into the 21<sup>st</sup> Century, Report of the Interagency Floodplain Management Review Committee to the Administration Floodplain Management Task Force, dated June 1994. This document is also known as the “Galloway Report.” The second was the Floodplain Management Assessment of the Upper Mississippi and Lower Missouri Rivers and Tributaries, U.S. Army Corps of Engineers, dated June 1995. Both studies recognized the need to update flow frequencies on a periodic basis.

#### **TERMS – WHAT DO THEY MEAN?**

Hydrology – a science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil, and in the atmosphere.

Hydraulics – a branch of science that deals with practical applications of water in motion.

UNET Model – The Unsteady NETwork (UNET) model is a numerical model that can represent the movement of floodwaters in a complex network of open channels. The UNET model can stimulate the entire 1993 flood at a given location and includes the effects of local levee breaks on river stages.

**WHO ARE THE PLANNING PARTNERS?** The study will be conducted by a Federal/State study team with assistance from a specially formed Technical Advisory Group experienced in flood issues. The composition of each group is shown in the following tables:

<b>MEMBERSHIP OF THE FEDERAL/STATE STUDY TEAM</b>
Bureau of Reclamation (Ken Bullard)
Corps of Engineers – Headquarters, Washington, D.C.
Corps of Engineers – Hydrologic Engineering Center, Davis, California
Corps of Engineers – Mississippi Valley Division, Vicksburg, Mississippi
Corps of Engineers – North West Division, Missouri River Region, Omaha, Nebraska
Corps of Engineers – Kansas City District, Kansas City, Missouri
Corps of Engineers – Omaha District, Omaha, Nebraska
Corps of Engineers – Rock Island District, Rock Island, Illinois
Corps of Engineers – St. Louis District, St. Louis, Missouri
Corps of Engineers – St. Paul District, St. Paul, Minnesota
Federal Emergency Management Agency (Frank Tsai)
National Weather Service (Leslie Julian)
Natural Resources Conservation Service (Don Woodward)
United States Geological Survey (William Kirby)
State of Illinois
State of Iowa
State of Kansas
State of Minnesota
State of Missouri
State of Nebraska
State of Wisconsin

MEMBERSHIP OF THE TECHNICAL ADVISORY GROUP		
INDIVIDUAL	ORGANIZATION	VITAE
Dr. Jon Hosking	IBM Watson Research Center	Statistician at the IBM Watson Research Center. Dr. Hosking is a well known statistician who has published extensively on the application of statistical methods to water resource engineering problems. Most recently he has co-authored a book with Dr. James Wallis summarizing their work on the application of regional analysis with L-moments. This approach is now used by the National Weather Service to develop rainfall depth-duration frequency curves for the nation.
Dr. William Lane	Bureau of Reclamation, retired	Currently a private consultant in water resources engineering. Author of numerous papers in the field, as well as the computer program LAST, a statistical stream flow model. Recently retired from the U.S. Bureau of Reclamation where he was a recognized expert in statistical hydrology, application of computer models to water resource engineering problems.
Dr. David Maidment	University of Texas	Professor of Civil Engineering, University of Texas. Dr. Maidment has published extensively on the development of methods for modeling watershed precipitation-runoff dynamics. In particular, his work has involved the application of Geographic Information Systems for developing these models. Most recently, he has developed a model of this type for the Upper Mississippi Basin.
Dr. Kenneth Potter	University of Wisconsin	Professor of Civil and Environmental Engineering, University of Wisconsin. Dr. Potter is a recognized expert in the field of statistical hydrology and the application of models to water resource engineering problems. He has published extensively on this subject in numerous engineering journals. Most recently, he has served as a member of the National Research Council review of the flood-frequency analysis developed by the Corps of Engineers for the American River.
Dr. Jerry Stedinger	Cornell University	Professor of Civil and Environmental Engineering, Cornell University. Dr. Stedinger is a recognized expert in the field of statistical hydrology. He has published extensively on problems involving flow frequency analysis, low-flow analysis, and statistical hydrology. Most recently, he has served as a member of the National Research Council review of the flood-frequency analysis developed by the Corps of Engineers for the American River.
Mr. Wilbert Thomas	Michael Baker Consultants; United States Geological Survey, retired	Consultant with Michael Baker Jr, Inc., a FEMA designated contractor. Recently retired from the U.S. Geological Survey. He is a recognized expert in flow frequency analysis with extensive experience in examining data from across the country, experience with application of models to water resource problems, and a publisher of numerous papers on water resources engineering. Most recently, he has published work on analysis of the 1993 flood in the Upper Mississippi River Basin.

## **TERMS – WHAT DO THEY MEAN?**

The Technical Advisory Group - a panel of nationally renowned scientists, knowledgeable in flow frequency analysis, who will propose the methodologies that will be used in the study.

## **WHAT ARE THE PARTNERS' ROLES IN THE STUDY?**

The Federal/State Study Team will provide data sets for a contractor to use to conduct analyses to update flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers.

The Technical Advisory Group will recommend methodologies to determine flow frequencies for large river basins.

**MEETINGS TO DATE.** The Federal/State Study Team has had two meetings.

The first meeting was held on June 3, 1997, in St. Louis, Missouri, to organize the group and discuss the scope of the effort required to revise the flow frequencies for the Upper Mississippi and Lower Missouri Rivers.

The second meeting was held on September 23, 1997, in St. Louis, Missouri, to discuss the available methodologies for the determination of flow frequencies and work items for the study.

**DO YOU WANT TO BECOME INVOLVED?** We will be forming a Citizen's Public Involvement Group for this Flow Frequency Study. The Citizen's Public Involvement Group will work with the Federal/State Study Team to develop ways to involve the public in the study process. This group will be open to all members of the public. If you are interested in becoming directly involved in the study, please contact Mr. George Gitter, Flow Frequency Study Coordinator, Rock Island District Corps of Engineers (see Study Point of Contact paragraph on the following page).

**MAILING LIST.** This notice of initiation/newsletter is being sent to Federal and State agencies involved in flood control, and county and city governments along the main-stem rivers in the study area. The newsletter also is being sent to congressional interests, levee and drainage districts, organizations within the study area, and individuals known to have an interest in the flow frequency study. If you received this notice, you are on our mailing list and will continue to receive the newsletters.

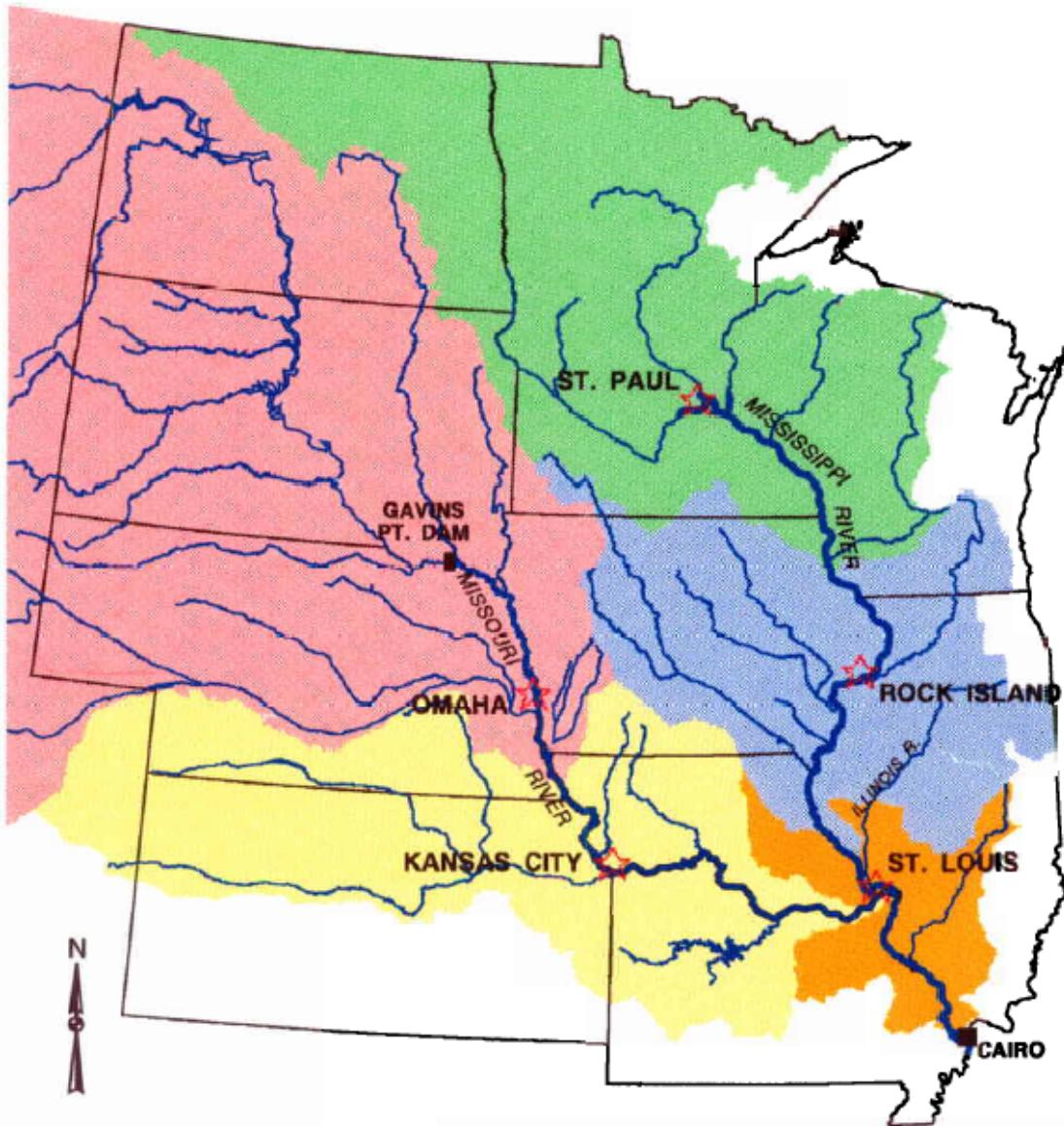
If you become aware of others who should be informed of this study and who may want to be added to our mailing list, please ask them to contact Mr. Gitter (see Study Point of Contact paragraph on the following page).

**STUDY POINT OF CONTACT.** For further information or questions about the flow frequency study, or if you have comments about the study, please contact Mr. George F. Gitter, AICP, Study Coordinator, Rock Island District, Corps of Engineers, by telephone (309) 794-5387, Fax (309) 794-5710, or Internet: [George.F.Gitter@usace.army.mil](mailto:George.F.Gitter@usace.army.mil). If you prefer, you may write to Mr. Gitter at the address listed below:

U.S. Army Engineer District, Rock Island  
ATTN: CEMVR-PD-F (Gitter)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, Illinois 61204-2004

*We welcome your input.*

**UPPER MISSISSIPPI, LOWER MISSOURI  
AND ILLINOIS RIVERS  
FLOOD FREQUENCY STUDY**



★ COE DISTRICT OFFICES

- KANSAS CITY DIST.
- OMAHA DIST.
- ROCK ISLAND DIST.
- SAINT LOUIS DIST.
- SAINT PAUL DIST.

**UPPER MISSISSIPPI, LOWER MISSOURI  
AND ILLINOIS RIVERS  
FLOOD FREQUENCY STUDY AREA**

October 1997



US Army Corps  
of Engineers  
Rock Island District



**US Army Corps  
of Engineers**

## **UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY (Upper Mississippi, Lower Missouri, & Illinois Rivers)**

### **PUBLIC INVOLVEMENT NEWSLETTER**

February 1999

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In November 1997, the first Upper Mississippi, Lower Missouri, and Illinois Rivers Flow Frequency Study newsletter was mailed to an extensive distribution list announcing the study's initiation. The study was initiated to develop flow frequencies for the study area described in the paragraph below. The purpose of this second newsletter is to provide an update on the study's progress.

*Please note* that the name of the study has changed. However, the study area has **NOT** changed. The study area still includes the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers. The Upper Mississippi is that portion of the river above the mouth of the Ohio River and includes the Illinois River. The Lower Missouri is that portion of the river below Gavins Point Dam. Flow frequencies will not be developed for the tributaries.

### **BACKGROUND INFORMATION**

The U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated the 4-year study to develop flow frequencies for the study area mentioned above. The study partners formed a Task Force which includes representatives from the U.S. Army Corps of Engineers; Bureau of Reclamation; Federal Emergency Management Agency; National Weather Service; Natural Resources Conservation Service; United States Geological Survey; and the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin.

A Technical Advisory Group, consisting of a panel of nationally renowned scientists knowledgeable in flow frequency analysis, has been contracted by the Corps of Engineers to review and discuss study issues and findings.

By the end of the study, the Corps and partnering State and Federal agencies will select and apply the appropriate flow frequency analysis method and analyze the effects of reductions in flood runoff attributable to flood control reservoirs. The Task Force also will consider potential effects of levee overtopping and/or breaches, determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and develop these profiles.

## **COMMENTS FROM THE STUDY'S "PARTNERS"**

As stated on the first page, six Federal agencies are members of the Task Force. Each agency brings its own expertise to the Task Force. Following are statements from two of the Task Force members on why the study is important to their agency.

- Dr. William H. Kirby, U.S. Geological Survey (USGS) Hydrologist:

The USGS appreciates the opportunity to be involved in the Upper Mississippi River System Flow Frequency Study. The USGS is participating by serving on the study's Task Force.

The study is important to the USGS because the USGS, in cooperation with State, local, and other Federal partners, conducts investigations of flood magnitude and frequency throughout the Mississippi River basin and the rest of the Nation. The results of these investigations are published for use by all parties, public and private, in mitigating and managing flood hazards and risks (see, for example, M.E. Jennings and others, 1994, Nationwide summary of USGS regional regression equations for estimating magnitude and frequency of floods for ungaged sites, 1993, USGS Water-Resources Investigations Report 94-4002, or World-Wide Web page <http://water.usgs.gov/public/osw/programs/nffp.html>).

To promote effective and efficient planning and management, it is important that the methods and results of flood studies be uniform and consistent among localities and agencies. Participation in this study gives the USGS the opportunity both to become aware of developments and adaptations of standard flood-frequency analysis methods that may be needed for large main-stem rivers and to help ensure consistency between methods used in this and other flood studies.

- Mr. Donald E. Woodward, National Hydraulic Engineer, Natural Resources Conservation Service (NRCS):

The NRCS is interested in the study because the outcome impacts the level of protection provided by the existing levees and determines the design requirements of future levees in agricultural areas. The results will determine procedures to use to develop frequency curves for other large gaged river basins. The results also add to the knowledge of development of frequency curves for gaged river basins. NRCS is providing peer review of the procedures being used and oversight to the conduct of the study.

NRCS, at this point in time, does not anticipate any changes in our policy or regulations as a result of this study.

## **STUDY PROGRESS TO DATE**

The Task Force has collected data, estimated unregulated flows, and made a preliminary analysis of flood frequencies. One of the key questions is: which analytical flood frequency relationship is appropriate for the Upper Mississippi River System? The previous Interagency study limited their analysis to basins less than 3,000 square miles, and all of the main-stem gages are significantly larger than that. Also, about 30 years of additional stream flow data have been collected since that original study, and new statistical methods and more powerful computer resources are now available for this analysis. The target date for the methodology recommendation is April 1, 1999. With guidance from the Corps of Engineers' Hydrologic Engineering Center in Davis, California, the selected methodology will be applied to the unregulated flow values by the Corps districts. The target completion date for the hydrology study is September 1999.

## **TASK FORCE MEETS**

The Task Force met on March 26, and November 18, 1998. Both meetings were held in St. Louis, Missouri, which is the location where the meetings will most likely continue to be held.

The Plan of Study was approved by the Corps of Engineers' Headquarters in Washington, D.C., at the March 26 meeting. All Task Force members concurred with the study plan.

At the November 18 meeting, Dr. David Goldman, a Senior Hydraulic Engineer at the Hydrologic Engineering Center, gave a status report on the Flow Frequency Study's hydrology methodology. A representative from each of the five participating Corps districts reported on progress made to date on work items pertaining to hydrology. Dr. Eugene Stakhiv, the Chief of the Policy and Special Studies Division at the Corps of Engineers' Institute of Water Resources, elaborated on risk and uncertainty procedures.

## **CITIZENS' PUBLIC INVOLVEMENT GROUP FORMED/MEETS**

In the November 1997 newsletter, members of the public were invited to join a Citizens' Public Involvement (P.I.) Group to work with the Federal/State Study Team (Task Force) to develop ways to involve the public in the study process. Forty persons indicated an interest in joining the group.

The P.I. Group has held two meetings. P.I. Group meetings are held in the afternoon before the Task Force meetings. Results of the P.I. Group meetings are reported at the Task Force meetings.

The first meeting took place on March 25, 1998, with 14 members attending.

The second P.I. Group meeting was held on November 17, 1998, with 11 members attending. Members in attendance included:

- Coy Again, New Franklin, Missouri
- Joseph B. Gibbs, P.E. Columbia, Missouri
- Norman L. Haerr (Fabius River Drainage District), Taylor, Missouri
- Charles L. Kempf (Ameren/UE), Eldon, Missouri
- Mike Klingner (Klingner & Associates, P.C.; Upper Mississippi, Illinois, & Missouri Rivers Association), Quincy, Illinois
- Bill Lay, Fayette, Missouri
- David McMurray (Upper Mississippi, Illinois, & Missouri Rivers Association), Burlington, Iowa
- Nancy Philippi (Wetlands Initiative), Chicago, Illinois
- F. John Taylor, Virginia, Illinois
- M. J. (Jim) Whiting (Retired Farmer), Whiting, Iowa
- Clair Wilson (Hillview Levee & Drainage District), Winchester, Illinois

Many of the same issues were discussed at both meetings. The Citizens' Public Involvement Group represents the public and most members of the group live within the study area and will be directly affected by the decisions that will be made at the end of the study. The group stressed the importance of a close working relationship with the Task Force so the Task Force understands study issues from the group's perspective. The P.I. Group also expressed a concern that it be included and involved throughout the study process.

Mr. Arlen Feldman, a Hydraulic Engineer and Chief of the Research Division at the Corps of Engineers' Hydrologic Engineering Center, was present at the second P.I. Group meeting to explain study issues to the group and to answer technical questions. Mr. Feldman is also a member of the Task Force.

Many group members questioned how and if the results of the Flow Frequency Study would affect the Missouri River Master Manual. Two questions arose: Which of the eight Missouri River Master Plans will be used? Will the Master Plan be used in the study? "Several new operation plans are being considered in that study; the Flow Frequency Study will use the currently authorized plan," Mr. Feldman answered. He further stated that if the Missouri River operating plan does change significantly as to effect peak flows, the new operating plan can be examined using the methodology developed in this Flow Frequency Study.

The P.I. Group asked how reservoirs fit into the study. The study team will look at the natural flow of the rivers and at reservoir regulations and at how much the reservoirs reduce flooding, Mr. Feldman said. The first part of the study is concentrating on determining the unregulated frequency curve by analyzing the river system without reservoirs. After the basic analytical flood frequency relationships are determined for unregulated conditions, the reservoirs will be added to the system to determine the regulated flood frequency curves. Reservoirs have different functions; however, any significant reservoirs in the river system which have an impact on flooding will be included in the study. Non-Corps reservoirs will be included. Each of the five involved Corps of Engineers districts (Rock Island, St. Paul, St. Louis, Kansas City, and Omaha) will evaluate which reservoirs have significant impacts.

The group also discussed the effects of wetlands. Members were concerned about the impact wetlands have; e.g., will more concrete in an area change the amount of flow and cause larger runoffs? Currently, the Corps of Engineers' Institute for Water Resources is looking at uncertainty in respect to land use development; however, the Corps hydrologists do not think so.

When asked if there were studies on the effect of wetlands, Mr. Feldman replied that he hasn't seen any studies that are definitive for the whole Upper Mississippi River, Illinois River, and Lower Missouri River basin area. "Several studies conducted by the Hydrologic Engineering Center and others show that wetlands only have significant impacts on the magnitude of smaller (say, 4% (25-year) or smaller) floods," he said. "The Floodplain Management Assessment, dated June 1995, did examine the effect of wetlands on the 1993 flood event. Due to the large basin size and amount of rainfall in the 1993 event, wetlands would have impacted discharges only in localized areas."

### **Would you like to join the Citizens' Public Involvement Group?**

If you would like to become a member of the Citizens P.I. Group, please contact the Group's chairman, Mr. Paul Soyke, Chief of the Economic and Social Analysis Branch at the Rock Island District, Corps of Engineers. You may contact Mr. Soyke by telephone 309/794-5231, Fax 309/794-5883, or email [Paul.D.Soyke@usace.army.mil](mailto:Paul.D.Soyke@usace.army.mil). If you prefer, you may write to him at the Rock Island District office, ATTN: CEMVR-PM-A (Soyke). See the Study Point of Contact section on page 6 for the address.

We are grateful to those who have agreed to become members of the group and who have taken their time to attend group meetings. To provide understanding and information about *all* aspects of the study area to the Task Force, a well-balanced group is necessary. **Environmental groups are welcome and encouraged to join the group.** A notice of the next P.I. Group meeting will be sent to group members. Meetings are held the day before the Task Force meetings. The next meeting is scheduled for April 1999 in St. Louis, Missouri.

## **Citizens' Public Involvement Group members comment**

We've asked a few members of the Citizens' Public Involvement Group to state why belonging to the group is important to them. Following are their replies.

- Paul Soyke, Citizens' Public Involvement Group Chairman:

The Citizens' Public Involvement Group was organized to represent the interested publics and to provide information to the Federal/State Study Team (Task Force) on public issues and concerns related to this study. The group meets to receive information about the study and to provide information and public concerns to the Task Force. One of the major tasks of the Public Involvement Group is to assist the Corps of Engineers and the Task Force in developing the overall public involvement program for the study.

Most of the work being done during this study is highly technical. A Task Force member attends the P.I. Group meetings to hear what the issues are and to answer questions.

As the study progresses and it is time for public forums (tentatively scheduled for summer 2000), the group will be a valuable asset in helping the Corps explain the issues to the public and in designing the most appropriate format for the public forums. During the interim, the group is encouraged to discuss the issues and the study progress with their organizations, friends, and neighbors.

We have a very interested and dedicated group who spend considerable time and resources being involved with this study. By having a core group that represents a variety of interests and locations within the study area, we can learn of the issues and concerns and address them during the study. Citizens, in their own language, can then also explain those issues and the interim results to other members of the public. We believe that their service to the public at large will be valuable to the public's understanding of the results. The group's efforts are very much appreciated.

- Coy Again, New Franklin, Missouri:

My reason for joining the P.I. Group was to gather firsthand information that would be of value to the four levee districts in my area (Boone Femme Levee District No. 1 and Howard County Levee Districts Nos. 1, 2, and 3, which cover an area from below Glasgow, Missouri, to below Boonville, Missouri).

All I can see that will be accomplished will be updating the group on progress of the Flow Frequency Study. Everyone's main concern is how and when releases are made at Gavin's Point. That is the real concern of all the levee districts in my area.

- Charlie Kempf, Ameren/UE:

The main reason Ameren/UE wanted me to join the Citizens' P.I. Group was to see what changes might take place which would affect the reservoirs (especially Lake of the Ozarks) in the Osage River Basin, and also any changes that would be affecting flows on the Lower Missouri River.

The main thing I would like to see the Citizens' P.I. Group accomplish is to not only have their input heard, but also factored into the decisions which the Corps of Engineers will be making on the Missouri Master Manual and other river related issues. Thanks for allowing us to participate.

- Dave McMurray, Upper Mississippi, Illinois and Missouri Rivers Association (UMIMRA):

I am currently serving as Chairman of UMIMRA. The Association and its membership are extremely interested in supporting accurate science in understanding and management of river flows and ultimately flood protection systems.

The Citizens' P.I. Group must, as its name implies, be involved in the study and determination of flow rates and their frequency. As in most studies there are facts, there are assumptions made for unknown facts, and there are assumptions as to how the facts and assumptions interrelate to describe the study's ultimate conclusion. The group should be used to evaluate those assumptions made by the statisticians and other scientists. The results of the study may affect legal rights and social policy for many years.

It is important that the results be accurate and be based upon reality and not only upon conservatively derived statistical assumptions. In the alternative it is important to know the difference between the facts and assumptions; understand what the impact of each may be upon affected areas, people, and communities; and to make sure that policy makers understand the difference by including each in the final report.

- F. John Taylor, Virginia, Illinois:

My reason for joining the Citizens' P.I. Group was the concern of representatives of the various drainage districts in the Illinois Valley Flood Control Association as to what impact the study might have on agricultural drainage districts. One important thing would be for all governmental agencies, both State and Federal, to use the same criteria. If we are going to make proper decisions we need accurate and current data which I would hope this study would provide.

### **STUDY POINT OF CONTACT**

For further information or questions about the Flow Frequency Study, or if you have comments about the study, please contact Mr. George F. Gitter, AICP, Study Coordinator, Rock Island District, Corps of Engineers, by telephone (309) 794-5387, Fax (309) 794-5710, or email: [George.F.Gitter@usace.army.mil](mailto:George.F.Gitter@usace.army.mil). If you prefer, you may write to Mr. Gitter at the address listed below:

U.S. Army Engineer District, Rock Island  
ATTN: CEMVR-PM-M (Gitter)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, Illinois 61204-2004

If you are aware of others who should be informed of this study and who may want to be added to our mailing list, please ask them to contact Mr. Gitter.

*We welcome your input.*



**US Army Corps  
of Engineers**

## **UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY (Upper Mississippi, Lower Missouri, & Illinois Rivers)**

### **PUBLIC INVOLVEMENT NEWSLETTER**

November 1999

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This is the third Upper Mississippi River System Flow Frequency Study newsletter (the first two are dated November 1997 and February 1999). The purpose of this newsletter is to continue to provide the public with updated information about the study's progress.

#### **STUDY BACKGROUND**

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated a study to develop flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers. The Upper Mississippi is that portion of the river above the mouth of the Ohio River and includes the Illinois River. The Lower Missouri is that portion of the river below Gavins Point Dam. Flow frequencies are not being developed for the tributaries.

The study partners formed a Task Force which includes representatives from the U.S. Army Corps of Engineers; Bureau of Reclamation; Federal Emergency Management Agency; National Weather Service; Natural Resources Conservation Service; United States Geological Survey; Tennessee Valley Authority; and the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin.

A Technical Advisory Group, consisting of a panel of nationally renowned scientists knowledgeable in flow frequency analysis, has been contracted by the Corps of Engineers to review and discuss study issues and findings. The members of the Technical Advisory Group are listed in the November 1997 study newsletter.

By the end of the study, the Corps and partnering State and Federal agencies will select and apply the appropriate flow frequency analysis methods and analyze the effects of reductions in flood runoff attributable to flood control reservoirs. The Task Force also will consider potential effects of levee overtopping and/or breaches, determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and develop these profiles.

## **STUDY PROGRESS CONTINUES**

Dr. David Goldman (Corps of Engineers' Hydrologic Engineering Center (HEC), Davis, California), in consultation with the Technical Advisory Group, has provided recommended methods for estimating the flow frequencies in the Upper Mississippi River Basin. These draft procedures are being reviewed prior to final acceptance. The flow frequency methods will be essentially as described in *Bulletin 17B, "Guidelines for Determining Flood Flow Frequency,"* prepared by the Interagency Advisory Committee on Water Data (IACWD) in 1982. Although this document was not necessarily intended to apply to very large river basins, the recommended procedures have been found to be appropriate for this study.

The five Corps of Engineers districts involved in this study (St. Paul, Rock Island, St. Louis, Omaha, and Kansas City Districts) have nearly completed all work to develop estimated unregulated flow values. The unregulated flow values are the computed flood flows that would have occurred if the rivers were not regulated by flood control reservoirs. The estimated unregulated flow values will be used in combination with flow records that predate the reservoirs to create a simulated record of unregulated flows. A flow frequency curve – that is, the relationship between flow and annual probability of occurrence – will be determined for the unregulated flows. Then the relationship between unregulated flood flows and regulated flood flows is used to calculate the flow frequency curve for existing conditions.

Since separate flow frequency curves will be developed for each selected gage location, the values will be adjusted, or smoothed, to obtain consistent estimates of the flood flows. The hydrology portion of the study is currently scheduled for completion by June 2000. Although this is later than originally scheduled, it is not expected to impact the overall study schedule.

The required Digital Elevation Models (DEMs) and cross sections needed to create the hydraulic models are being prepared as part of another Corps of Engineers project and are furnished for use in the Flow Frequency Study at no cost. These DEMs and cross sections are currently scheduled for completion in March 2000. The districts are working on the hydraulic models that will be used to develop flood profiles. The UNET computer program will be used to perform the hydraulic modeling. This unsteady-flow model can predict changes in flood levels over time based on flood hydrographs consistent with the flow frequency curves and the physical characteristics of the channel and floodplain. A hydrograph is the relationship between time and flow. The hydraulic models are scheduled to be ready for use in September 2000. The Flow Frequency Study is now scheduled for completion in March 2002.

## **CITIZENS' PUBLIC INVOLVEMENT GROUP MEETS**

The Citizens' Public Involvement (P.I.) Group met on April 28, 1999. A major concern of the P.I. Group is that data on numerous private levees along the Upper Mississippi, Lower Missouri, and Illinois Rivers are not readily available and that it is important to have the information so it can be included in modeling efforts. The Corps of Engineers is working to gather as much information as possible on the non-Federal levees. (NOTE: If you have information about a private levee that is not eligible under Public Law 84-99, please mail the information (e.g., location (river), height, length, elevation at which the levee fails, date last inspected) to the address listed at the end of this newsletter, ATTN: CEMVR-PM-AE (Simmons).)

At the next meeting, the P.I. Group will begin to plan for the upcoming public meetings which are tentatively scheduled for the winter of 2001. According to the Plan of Study, one public meeting will be held within the boundaries of each of the five involved Corps of Engineers Districts. An announcement of the dates and locations of the meetings will be made well in advance of the public meetings.

## TASK FORCE MEETS

The Task Force met on April 29, 1999, in St. Louis, Missouri. A complete summary of this meeting is available on the Internet at the address listed on page 6 of this newsletter. A list of the attendees is provided in the transcript, which is available on request from the Rock Island District, Corps of Engineers.

A brief summary of the meeting follows.

- Dr. David Goldman (Hydrologic Engineering Center) provided a summary of the status of his work. He emphasized that there are no significant differences between the various flood distribution methodologies evaluated.
- Mr. Rolf Olsen (Corps of Engineers' Institute of Water Resources (IWR), Alexandria, Virginia) spoke about risk and uncertainty related to climate change impacts on flow frequency relationships. He concluded by stating that based on the findings related to changes in climate there is no reason to reject using Bulletin 17B for flow frequency determinations.
- Mr. Paul Soyke (Rock Island District, Corps of Engineers) provided a summary of the views of the Citizens' Public Involvement Group. The group has accepted Mr. Arlen Feldman, Hydrologic Engineering Center, as their technical advisor.
- Mr. Dennis Morgan (St. Louis District, Corps of Engineers) provided an update of the progress of the mapping efforts begun as a part of the Scientific Assessment Strategy Team (SAST), which was recently funded with an additional \$5 million. The mapping will result in digital elevation models and digital cross sections for use in hydraulic models. While this data could be used to create topographic maps (with contours), this would require additional effort and cost. The goal is to acquire elevation data that would be suitable for engineers to evaluate flooding in the area.
- Mr. Alan Johnson (Federal Emergency Management Agency (FEMA), Washington, D.C.) then discussed FEMA initiatives related to the mapping and the flow frequency study. He indicated that FEMA is undergoing a large reinvention of its mapping program. It will essentially replace existing maps with new digital mapping. This will require approximately \$865 million. Cooperating technical communities are being identified to help accomplish the work. Funding is a major concern and FEMA wants to cooperate with and take full advantage of the Flow Frequency Study. Mr. Earl Eiker (Corps of Engineers' Headquarters Office, Washington, D.C.) commented on the value of coordinating the Flow Frequency Study with FEMA.

Each of the Federal Agency representatives present provided brief comments.

- Mr. Rick Hulzinga (United States Geological Survey, Rolla, Missouri) pledged continuing support to the study.
- Mr. Donald Woodward (National Resources Conservation Service, Washington, D.C.) commented on the interest and importance of this phase of the study and recommended patience and persistence.
- Ms. Lesley Julian (National Weather Service, Silver Springs, Maryland) indicated her appreciation to be a part of the study and stated that although there seems to be changes in precipitation, they do not seem to have a noticeable impact on flood flow frequency relationships.
- Mr. Ken Bullard (Bureau of Reclamation, Denver, Colorado) commented that the statistics must be smoothed so as to have consistency throughout the study river reach.



- Mr. Alan Johnson (FEMA) commented on the technical aspects of the frequency analysis as a basis to be responsive during the Flood Insurance Rate Map appeals process. He went on to emphasize the importance to FEMA of how levees are to be treated and of the mapping aspects of the study.
- Mr. Albert Schulz (FEMA, Region VII, Kansas City, Missouri) noted that this study is the basis for future studies and is paving the way for major changes.
- Mr. Gregory Lowe (Tennessee Valley Authority, Knoxville, Tennessee) mentioned the value of the partnerships that have been formed due to the Flow Frequency Study and that the TVA is very glad to be a part of it

The representatives of the various States involved also made brief comments.

- Mr. Mel Allison (Department of Natural Resources, Springfield, Illinois) is looking forward to implementation of the study and is impressed by the study to date.
- Mr. Dennis Lawlor (Department of Agriculture, Topeka, Kansas) expressed appreciation to be a part of the study and emphasized that as a regulatory agency the end results and mapping are very important.
- Mr. Dave Ford (Department of Natural Resources, St. Paul, Minnesota) noted Mr. Feldman's outstanding job with the Citizens' Public Involvement Group and emphasized the importance of explaining the study and results so that the public can understand everything clearly. He thought that a Web site may be a good way to get more information out to more people. (NOTE: See **DID YOU KNOW?** on page 5 of this newsletter.)
- Mr. George Riedel (State Emergency Management Agency, Jefferson City, Missouri) was pleased that efforts are underway to develop mapping in coordination with FEMA.
- Mr. Charlie DuCharme (Department of Natural Resources, Jefferson City, Missouri) encouraged everyone to stick together since with such a large project and so much coordination required this will be difficult.
- Mr. Brian Dunnigan (Natural Resources, Lincoln, Nebraska) also mentioned the value in coordination with all the states and the importance of having FEMA support the final products.
- Mr. Bob Watson (Department of Natural Resources, Madison, Wisconsin) emphasized the importance of the mapping indicating if a property owner is in the floodplain or not.

## **UPCOMING MEETINGS**

The next Citizens' Public Involvement Group meeting is scheduled for December 1, 1999, in St. Louis, Missouri. The next Task Force meeting is anticipated in the spring of 2000 to discuss the final hydrology.

## **NEW PROJECT MANAGER SELECTED**

Mr. Dennis Hamilton (Rock Island District, Corps of Engineers) has been appointed as the Project Manager for the Flow Frequency Study. Mr. Hamilton is a registered professional engineer with broad experience in managing and developing water resource projects and studies. As the Project Manager, Mr. Hamilton is responsible for overall management and leadership of the study. Mr. Hamilton may be contacted by telephone at (309) 794-5634 or email: [Dennis.W.Hamilton@usace.army.mil](mailto:Dennis.W.Hamilton@usace.army.mil).

## **RELATED ISSUES**

### **AMERICAN HERITAGE RIVERS NAVIGATOR NAMED FOR THE UPPER MISSISSIPPI RIVER**

The Corps of Engineers has named Mr. Owen Dutt, St. Louis District, as the River Navigator for the Upper Mississippi River. A River Navigator is a Federal employee who serves as single point of contact for river communities to enhance their awareness of and access to Federal programs and services. The Upper Mississippi River is one of 14 rivers designated by President Clinton as an American Heritage River. Others are the Blackstone and Woonasquatucket, Connecticut, Hanalei, Lower Mississippi, Potomac, Susquehanna and Lackawanna, Cuyahoga, Detroit, Hudson, Willamette, Rio Grande, New River, and St. John's Rivers.

There are 57 communities on the Upper Mississippi River participating in the American Heritage Rivers Initiative. These communities range from Bemidji, Minnesota, to St. Louis, Missouri. To assist the River Navigator, many Federal agencies have appointed River Pilots who will assist the American Heritage Rivers Initiative communities with the programs specific to that agency. Corps of Engineers River Pilots are Russel K. Snyder, St. Paul District; Paul D. Soyke, Rock Island District; and Dennis S. Fenske, St. Louis District.

As the River Navigator for the Upper Mississippi River, Mr. Dutt will work with the river communities, organizations, and Federal agency River Pilots within the multi-state area to develop and implement plans to revitalize and sustain the communities' economy, and to restore the environment along the river. Mr. Dutt's former position as Chief of Planning Division provides him with the experience, knowledge, and expertise to assist the river communities.

### **FLOOD INSURANCE MAP COORDINATION COMMITTEE FORMED**

Based on recommendations from FEMA and in coordination with the Flow Frequency Study Task Force, a coordination committee was formed to address the use of the Flow Frequency Study products to update Flood Insurance Rate Maps (FIRMs). The committee includes representatives from the Corps of Engineers, FEMA, and the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin.

The new flow frequency estimates and flood profiles to be developed by the Flow Frequency Study will be helpful for revising FIRMs only after existing Federal and non-Federal levee systems are evaluated and certified in accordance with FEMA requirements. The inundated areas shown on FIRMs can be based on only those levees properly certified as providing 100-year flood protection. Funds for evaluating existing levee systems and updating FIRMs in coordination with the affected states and communities are not currently available. (NOTE: See request for levee information in the first paragraph under the Citizens' Public Involvement Group section on page 2 of this newsletter.)

### **DID YOU KNOW?**

The study area map, study newsletters, Citizens' Public Involvement Group meeting minutes, and Task Force meeting minutes can be viewed on the Corps of Engineers' web site at <http://www.mvr.usace.army.mil/>. Click on "Flow Frequency Study."

## **STUDY POINT OF CONTACT**

For further information or questions about the Flow Frequency Study, or if you have comments about the study, please contact Mr. George F. Gitter, AICP, Study Coordinator, Rock Island District, Corps of Engineers, by telephone (309) 794-5387, Fax (309) 794-5710, or email: [George.F.Gitter@usace.army.mil](mailto:George.F.Gitter@usace.army.mil). If you prefer, you may write to Mr. Gitter at the following address:

U.S. Army Engineer District, Rock Island  
ATTN: CEMVR-PM-M (Gitter)  
Clock Tower Building  
P.O. Box 2004  
Rock Island, Illinois 61204-2004

If you are aware of others who should be informed of this study and who may want to be added to our mailing list, please ask them to contact Mr. Gitter.

*We welcome your input.*



**US Army Corps  
of Engineers**

## **UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY (Upper Mississippi, Lower Missouri, & Illinois Rivers)**

### **PUBLIC INVOLVEMENT NEWSLETTER**

December 2000

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This is the fourth Upper Mississippi River System Flow Frequency Study newsletter. The purpose of this newsletter is to continue to provide the public with updated information about the study's progress.

#### **STUDY BACKGROUND**

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated a study to develop flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers. Three groups were formed to assist with this study: the State and Federal agencies' Task Force, the Citizens' Public Involvement Group, and a Corps of Engineers-contracted Technical Advisory Group, whose members include a panel of nationally renowned scientists knowledgeable in flow frequency analysis.

By the end of the study, the Corps and partnering State and Federal agencies will select and apply the appropriate flow frequency analysis methods and analyze the effects of reductions in flood runoff attributable to flood control reservoirs, consider potential effects of levee overtopping and/or breaches, determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and develop these profiles.

The study map (in color), study newsletters, and minutes from the Task Force meeting and the Citizens' Public Involvement Group meeting can be viewed on the Corps of Engineers' web site at <http://www.mvr.usace.army.mil/>. Click on "Flow Frequency Study."

Those who do not have Internet access may request a copy of previous newsletters by writing to the address at the end of this newsletter.

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## **STUDY EXPERIENCES DELAYS**

The UMRS Flow Frequency Study is dependent on creating digital terrain models for the flow frequency study area. Each of the five involved Corps of Engineers Districts (Omaha, St. Paul, Rock Island, St. Louis, and Kansas City) is currently working with a contractor to complete this task. **The digital terrain models (DTMs) are used to describe the geometry of the floodplain for the hydraulic models.**

The contractor is currently collecting additional ground control point data and 300+ miles of levee crest survey data to support quality control of the DTMs.

The Flow Frequency Study's original completion date was September 2001. As announced in the last study newsletter, the study's completion date was approved to be changed to March 2002. However, gathering digital terrain model data for the complex UNET unsteady flow model has required more time by the contractor than originally anticipated. It is anticipated that additional time may be required to obtain accurate data and complete the study.

The Corps welcomes the assistance of the States, local governments, and landowners in supplying recent and accurate floodplain and levee elevation data for use in performing quality control of the new floodplain digital elevation model data. Elevation data or a suggested person(s) to contact should be submitted to Ms. Heather Wiese at the Corps' Rock Island District (see Study Point of Contact, page 6).

## **STUDY PROGRESS CONTINUES**

Meanwhile, the Upper Mississippi River System Flow Frequency Study is continuing in other areas. The study team is finalizing unregulated and regulated flow frequency analyses and report appendices, and developing water surface profiling and risk and uncertainty software. Omaha, Kansas City, and St. Louis Districts have received adequate data to proceed with UNET model development. **The UNET model is a one-dimensional numerical model that can represent the movement of floodwaters in a complex network of open channels. The UNET model can continuously stimulate many years of flow record, including the 1993 flood, at all locations along the Mississippi, Missouri and Illinois Rivers. The UNET model also simulates the effects of local levee breaks on river stages.**

## **STUDY ASSUMPTIONS**

As stated on page 1 under "Study Background," by the end of the study the Task Force will determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and will develop these profiles. To accomplish this, certain "assumptions" must be made by the study team that can be built into the model. Following is a summary of the hydrologic and hydraulic assumptions being made *to date*.

**Hydrologic Assumptions. Hydrology is a science dealing with the quantity and distribution of water.**

1. Period of Record - The period 1898-1998 was chosen because land use was relatively consistent, the period of record flows can be adequately adjusted for the effects of channelization by using hydraulic models, and this period of record is long enough to provide useful estimates of flood frequency.
2. Climate Change - The climate for the period of record, 1898-1998, is assumed to be stationary; i.e., not significantly changing. The analysis by the Corps of Engineers' Institute for Water Resources (IWR) showed possible trends for some stations but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability. Consequently, standard flood frequency statistical analysis will be used to capture the overall variability in the flood record.
3. Unregulated Flow Frequency - The log-Pearson Type III analytical frequency distribution will be used for the unregulated (without dams) flow-frequency analysis. **Log Pearson Type III is the recommended method for flood flow frequency analysis used by all Federal agencies.**

Several new analytical distributions and parameter estimation methods were evaluated using the period of record. Significant differences between the application of the log-Pearson and other distributions were not found and hence it was decided to continue to use this standard distribution. The 'regional shape' factor, skew, is important and much analysis is going into determining appropriate values. The Technical Advisory Group recommended estimating the mean and standard deviation of the peak annual flow distribution from the gage record and interpolating these values with drainage area for locations on the main stem river between the gages. The regional skew will be obtained by taking a best average estimate from gages situated in similar hydrologic and meteorologic conditions.

4. Regulated Flow Frequency - The regulated flow (with dams) frequency curve will be determined using a regulated vs. unregulated flow relationship (determined from UNET river-hydraulic flood routings or reservoir simulation models) and the unregulated frequency curve.

5. Regulated Stage Frequency - Risk and uncertainty will be evaluated in the frequency analysis per current Corps requirements.

**Hydraulic Assumptions. Hydraulics, as related to this study, is the determination of water surface elevations.**

1. Methodology - The table below shows the flood recurrence intervals and corresponding annual percent chance of exceedance that will be a published product of the UMRS Flow Frequency Study. In general, flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 2-, 5-, 10-, 50-, 100-, 200-, or 500-year period have been selected as having special significance for floodplain management. These events have a 50, 20, 10, 2, 1, 0.5, and 0.2-percent chance, respectively, of being equaled or exceeded during any year.

FLOOD EVENT	ANNUAL PERCENT CHANCE OF EXCEEDANCE
2-year flood	50%
5-year flood	20%
10-year flood	10%
50-year flood	2%
100-year flood	1%
200-year flood	0.5%
500-year flood	0.2%

The Flow Frequency Study will develop these profiles by rating final flow frequency values with UNET model generated single-valued discharge-stage rating curves.

2. Levee Impacts - Flow-frequency water surface profiles for the Flow Frequency Study are being computed based on system performance of the existing levee system. Computation of water surface profiles based on assumption of no Public Law (PL) 84-99 (Emergency Flood Control Act of 1955) levee overtopping is considered unrealistic by Corps Headquarters and several states. The consensus of the Flood Insurance Rate Map

Subtask Force (the Corps of Engineers, Federal Emergency Management Agency (FEMA), and the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin) is that the final flood profiles should be based on existing conditions.

## LEVEE ISSUES

The Corps of Engineers is responsible for administering the PL 84-99 Program. Under the current policy, PL 84-99 has no provisions for or against levee raises, for both Federal and non-Federal levees. All levee raises are the responsibility of the levee owners and must meet the State requirements. For non-PL 84-99 levees, the public law does not fund maintenance or improvements – including a levee raise. It is the sponsor’s responsibility to raise the levee to meet the Federal minimum requirements in order for a levee to be admitted to the PL 84-99 Program, as long as the levee raise is in conformance with State criteria.

Under the current policy, PL 84-99 allows the Corps of Engineers to supplement a levee system owner’s efforts to fight floods. This flood fighting support applies to both Federal and non-Federal levee systems enrolled in the PL 84-99 Program. Under the authority of PL 84-99, an eligible flood protective system can be rehabilitated if damaged by a significant flood event. The flood system would be restored to its pre-disaster status at no cost to the Federal system owner, and at 20% cost to the eligible non-Federal system owner. All systems considered eligible for PL 84-99 rehabilitation assistance should have met construction and maintenance criteria established for the program prior to the damaging flood event. The criteria are verified by levee system inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested Federal, State, and local agencies following any federally declared natural disaster event.

FEMA is the appropriate agency to address questions regarding the implementation of any changes to the Flood Insurance Program resulting from the Upper Mississippi River System Flow Frequency Study. The FEMA Regional Office VII in Kansas City has jurisdiction over the States of Nebraska, Kansas, Iowa, and Missouri. The FEMA Regional Office V in Chicago has jurisdiction over the States of Minnesota, Wisconsin, and Illinois.

Questions may be addressed to the following offices:

Federal Emergency Management Agency  
Region VII  
ATTN: Mr. Al Schulz  
2323 Grand Boulevard, Suite 90  
Kansas City, Missouri 64108

[al.schulz@fema.gov](mailto:al.schulz@fema.gov)

Federal Emergency Management Agency  
Region V  
ATTN: Mr. Ken Hinterlong  
536 South Clark Street, 6th Floor  
Chicago, IL 60605-1521

[ken.hinterlong@fema.gov](mailto:ken.hinterlong@fema.gov)

### **CITIZENS' PUBLIC INVOLVEMENT GROUP MEETS**

The Citizens' Public Involvement (P.I.) Group held its fifth meeting on June 28, 2000. Topics included at their meeting follow:

Mr. Paul Soyke, Rock Island District, Corps of Engineers, led the P.I. Group in a discussion on a proposed draft plan for upcoming public meetings. The purpose of the public meetings will be to explain the reason for and the results of the Flow Frequency Study to the general public. The goal of the meetings will be to try to assure that the public understands the results and how they may be directly impacted by any changes. This will be accomplished by using an open house format that would offer the public one-on-one conversations with the study team, displays for viewing, and a formal presentation with a question and answer session. The meetings will be held along the Mississippi, Missouri, and Illinois Rivers in several communities throughout the study area. The P.I. Group members are concerned that the appropriate locations are selected and that an adequate number of meetings are held.

Mr. S. K. Nanda, Chairman of the Task Force, explained that if a Federal or PL 84-99 levee is damaged or breached during a flood event, the Corps may rebuild it to its authorized elevation. Each levee district is responsible for its own upgrades and the levees must meet State permitting requirements. (See the discussion on page 3 under **Levee Issues**.)

Mr. Joe McCormick, Corps of Engineers, Mississippi Valley Division, and Mr. Arlen Feldman, Corps of Engineers' Hydrologic Engineering Center (HEC), discussed the difference between a Standard Project Flood

and a Project Design Flood. The Mississippi River and Tributaries (MR&T) Project provides protection to the lower Mississippi River Valley from a flood referred to as a Project Design Flood (PDF). The development of the design discharges for that flood is consistent with the procedure used to develop discharges for Standard Project Floods (SPF) for other areas. Therefore, the PDF is on the order of magnitude of an SPF even though it is not referred to as an SPF. The SPF is defined as a flood producing "discharges that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations." In other words, the SPF is a very large flood, but not the largest flood possible.

The PDF was selected for the lower Mississippi River after investigating 35 different Hypothetical Storm Series developed for the Mississippi River Commission by the National Weather Service. The one selected for the design of the MR&T Project was chosen because, of all the floods investigated, it produced the largest discharges from Cairo to the Gulf of Mexico. Thus, neither the SPF nor the PDF are based on a frequency flood technique, but rather on a procedure that determines the discharges that could be produced by very large flood events. Therefore, there is not a specific frequency that can be associated with either the SPF or the PDF.

Once finalized, the June 28, 2000, Citizens' Public Involvement Group meeting minutes will be available for viewing on the Corps' Flow Frequency Study's web site at the address shown on the first page of this newsletter.

### **New P.I. Group Chairperson Announced**

Mr. Paul Soyke, Chairman of the Citizens' Public Involvement Group since the beginning of the Flow Frequency Study, is retiring from Federal service on December 2, 2000. Mr. Soyke's replacement will be Ms. Laura Abney, also from the Corps of Engineers' Rock Island District. Ms. Abney, an agricultural economist who came to the Corps of Engineers in November 1999 with 16+ years experience with the U.S. Department of Agriculture (USDA), has facilitation and training skills.

### **TASK FORCE MEETS**

The Task Force met on June 29, 2000, in St. Louis, Missouri. A brief summary of the meeting follows. A complete summary of this meeting is available on the Internet at the address listed on the first page of this newsletter. The transcript, which includes a list of the

meeting attendees, is available upon request from the Rock Island District, Corps of Engineers.

Agencies/groups that were represented at the meeting were: Corps of Engineers, Federal Emergency Management Agency; U.S. Geological Survey; Bureau of Reclamation; States of Illinois, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin; Upper Mississippi River Basin Association; and the Citizens' Public Involvement Group.

Dr. David Goldman, Corps of Engineers' Hydrologic Engineering Center (HEC), provided a summary of the essentially final selected methodology for developing the required frequency relationships. The principal remaining work on the hydrology has to do with completing the Illinois River, which may be affected by backwater. Additional work also remains on the Mississippi and Missouri Rivers below St. Charles and Alton to St. Louis. This reach is complicated by high Missouri River flows that can cross the Missouri and Mississippi delta and flow directly into the Mississippi River.

Dr. Goldman described in general terms the process of developing stage profiles for the Upper Mississippi based on the unsteady flow modeling techniques. The process includes combining the flow frequency curve for unregulated conditions with a curve that depicts the regulated and unregulated relationship. The regulated flow versus probability curve is obtained from this process for each point location or station along the river. Next, a rating curve for each point is developed using UNET. The stage frequency at each point or river station, or the profile for a given probability flow, can then be obtained from the station rating curves and the regulated frequency curves. HEC has been contracted to develop software to accomplish most of this process automatically as well as address the uncertainty aspects of the process.

Mr. Earl Eiker, from the Corps of Engineers Headquarters in Washington, D.C., spoke about the necessity to evaluate risk and uncertainty in the study. Risk and uncertainty are intrinsic in water resource planning and design. For hydrologic and hydraulic analysis, the principal variables are discharge and stage. Uncertainty in discharge exists because record lengths are often short or do not exist where needed, precipitation-runoff computation methods are inaccurate, and the effects of flood flow regulation measurements are not precisely known. Uncertainty factors that affect stage might include conveyance roughness, cross-section geometry, sediment transport, flow regime, and bed form.

Mr. S. K. Nanda, Chairman of the Task Force, stated that the inundation mapping aspect has been removed from the

study and will be accomplished later under agreements with FEMA.

Mr. Rolf Olsen, Corps of Engineers' Water Resources Support Center (WRC), provided an update on the investigation of impacts of climate variability and land use changes on flow frequency. He demonstrated some clear trends in temperature and rainfall. However, though most forecasts agree that temperature will probably continue to increase in our study area, the amount and impacts are not certain. He clearly identified impacts of land use on runoff and showed that major changes in land use occurred prior to 1900. This supports the decision to not include in the flow frequency analysis the flow records prior to 1900. In general, there is a great deal of uncertainty in the prediction and use of trends in both climate and land use.

Mr. Dennis Hamilton, Rock Island District, Corps of Engineers, and Mr. Bill Blanton, FEMA, Washington, D.C., provided a brief update to the Task Force regarding using the results of the flow frequency study to update FEMA flood insurance rate maps (FIRMs). Work is in progress to develop a Memorandum of Understanding (MOU) between the Corps of Engineers and FEMA to accomplish the FIRM updates.

The Task Force discussed the assumed levee heights for failure analysis. Mr. Eiker indicated that the no overtopping assumption is not considered appropriate by the Corps of Engineers. In general, the States would not support an assumption that the levees would never be overtopped.

Meeting participants and Federal and State representatives expressed support for the study and appreciation for their involvement. They also expressed support for use of the Bulletin 17B approach and using data pertaining to years after 1900 only.

Mr. Nanda ended the meeting by encouraging the drainage districts to check Digital Terrain Model data and encouraging the States to develop a joint view of how to determine the floodway and address the levee assumptions.

## UPCOMING MEETINGS

The next Citizens' Public Involvement Group meeting and Task Force meeting are anticipated to be held in summer 2001.

## NEW PROJECT MANAGER SELECTED

Mr. Jerry Skalak, Rock Island District, Corps of Engineers, has been appointed as the new Project Manager for the

Flow Frequency Study. Mr. Skalak is a Wisconsin native who began his Government service career with the Defense Mapping Agency in San Antonio, Texas. He came to Rock Island District in 1988. In 1995, he received his Master's degree in Water Resources Management from the University of Wisconsin - Madison. Mr. Skalak has played multiple roles in the management of the District's Environmental Management Program (EMP) activities, most recently serving as project manager for the Long Term Resources Management element of that program. In March 2000, Mr. Skalak assumed regional project manager responsibilities for both the Upper Mississippi River System Flow Frequency Study and the Comprehensive Plan. He also heads up the District's Floodplain Management Services and Planning Assistance to States Programs. Mr. Skalak may be contacted by telephone at (309) 794-5605. He also may be reached by email at [Jerry.A.Skalak@usace.army.mil](mailto:Jerry.A.Skalak@usace.army.mil).

## QUESTIONS/ANSWERS

The Flow Frequency Study team has tried to inform the public of study progress through the study newsletters; however, there are many unanswered questions about the study. In the next few months the Flow Frequency Study team plans to release a "Special Edition" newsletter to address Frequently Asked Questions (FAQs) with the hope of increasing the public's understanding of this study. If you have a question that you would like to see addressed in our FAQ Edition, please submit them to Ms. Heather Wiese at the address on this page. Although we cannot promise that every question submitted will be answered in print, we will make every effort to answer those that are asked repeatedly. The following questions are examples of FAQs.

**Q. Do navigation dams control flooding?**

A. No, because navigation dams release all incoming flows and have negligible storage capacity.

**Q. What flood data are used in the flow frequency analysis? Can there be more than one flood peak per year?**

A. This study will be using annual series analysis which utilizes the highest flow per year at each river gage site.

## STUDY POINT OF CONTACT

Ms. Heather Wiese, Rock Island District, Corps of Engineers, has replaced Mr. George Gitter as the Flow Frequency Study point of contact. Ms. Wiese joins the study with a background in civil engineering.

For further information or questions about the Flow Frequency Study, or if you have comments about the study, please contact Ms. Wiese by telephone at (309) 794-5387, fax (309) 794-5710, or email: [Heather.L.Wiese@usace.army.mil](mailto:Heather.L.Wiese@usace.army.mil). If you prefer, you may write to Ms. Wiese at the following address:

U.S. Army Engineer District, Rock Island  
ATTN: CEMVR-PM-M (Wiese)  
Clock Tower Building - P.O. Box 2004  
Rock Island, Illinois 61204-2004

If you are aware of others who should be informed of this study and who may want to be added to our mailing list, please ask them to contact Ms. Wiese.

*We welcome your input.*



US Army Corps  
of Engineers  
Rock Island District

# Upper Mississippi River System Flow Frequency Study

(Upper Mississippi, Lower Missouri & Illinois Rivers)

## Public Involvement "Special Edition" Newsletter

### FREQUENTLY ASKED QUESTIONS

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated a study to update flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers.

As part of the study's public involvement program, newsletters have been sent to keep interested persons informed of the study's progress and preliminary results.

This "Special Edition" newsletter has been written to share some of the more Frequently Asked Questions (FAQs) about the Upper Mississippi River System Flow Frequency Study.

These questions and answers, plus additional study information including previous newsletters and meeting minutes, are available on the study's website at <http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.

#### WHAT IS THE PURPOSE OF THE FLOW FREQUENCY STUDY?

The purpose of the Upper Mississippi River System Flow Frequency Study is to update<sup>1</sup> the discharge frequency relationships and water surface elevations for the Mississippi River and Illinois River above Cairo, Illinois, and the Missouri River downstream from Gavins Point Dam. (See the study map on page 4 of this newsletter.)

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- \* Federal Emergency Management Agency (FEMA)
- \* National Weather Service
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- \* States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin

The Task Force is assisted by the Technical Advisory Group, a panel of nationally renowned scientists who are knowledgeable and experienced in flood issues.

Additionally, a Citizens' Public Involvement Group was formed to assure that the Task Force is well informed as to the concerns of the citizens in the study area.

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Hydrology is a science dealing with the quantity and distribution of water (e.g., how much?).

Hydraulics, as related to this study, is the determination of water surface elevations (e.g., how high?).

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##### Hydrology Assumptions and Methodology

(The assumptions listed below have been approved by the Flow Frequency Study Technical Advisory Group and the Federal Interagency Advisory Group.)

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1. The UNET model will utilize existing line and grade of all levees.
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The U.S. Army Corps of Engineers is responsible for administering the Public Law (PL) 84-99 Flood and Coastal Storm Emergencies Program. Under the current policy, PL 84-99 has no provisions for or against Federal or non-Federal levee raises. Raising existing non-Federal levees is the responsibility of the levee owners and must meet the State requirements.

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Before the flood flow frequency profiles being prepared by the U.S. Army Corps of Engineers can be reflected on revised FEMA Flood Insurance Rate Maps (FIRMs), several key steps have to be addressed:

\* The structural adequacy of existing levees has to be assessed based on the new study results. In accordance with Section 65.10 of the National Flood Insurance Program (NFIP) regulations, FEMA only recognizes those levee systems on FIRMs as providing protection from the 1% annual chance flood (commonly referred to as the 100-year flood) that meet minimum design, operation, and maintenance standards.

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\* The revised flood flow frequency profiles have to be mapped on suitable topographic maps, and the results depicted on base maps that can then be converted to FIRMs.

(A base map covers the entire geographic area of the community and is used as the source for physical features – most notably roads and road names, railroads and names, streams, corporate limits and section lines – on the FIRM.)

The necessary funding for this effort is substantial. Unfortunately, the funding has not been made available to date. FEMA has proposed a cost-sharing plan, whereby one-third of the required funds will be provided by FEMA, one-third by the Corps of Engineers, and one-third by the impacted States.

**Contact persons are:**

**FEMA Headquarters** – Bill Blanton  
202-646-3151 – bill.blanton@fema.gov

**FEMA Region V** – Ken Hinterlong  
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**FEMA Region VII** – Albert Schulz  
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An SPF is a flood producing discharges that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations.

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"The Floodplain Management Assessment of the Upper Mississippi River and Lower Missouri Rivers and Tributaries," U.S. Army Corps of Engineers, June 1995 (Appendix A) summarizes a range of additional levee scenarios, assumptions, and results. The "no levee overtopping" scenarios are included in Appendix A. Appendix A can be viewed as six .pdf documents (table of contents and one document each for Kansas City, Omaha, Rock Island, St. Paul, and St. Louis Districts) on the Flow Frequency Study's website at <http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.

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## **HOW DOES THE FLOW FREQUENCY STUDY AFFECT THE MISSOURI RIVER MASTER PLAN?**

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The draft study report also will be available for review on the Flow Frequency Study's website or at libraries at the Corps

of Engineers Districts participating in this study: Kansas City, Omaha, Rock Island, St. Louis, and St. Paul. Information on other locations where the draft report will be available for review and on how to obtain a report will be made available next fall.

## **HOW MANY NEWSLETTERS HAVE BEEN ISSUED TO DATE?**

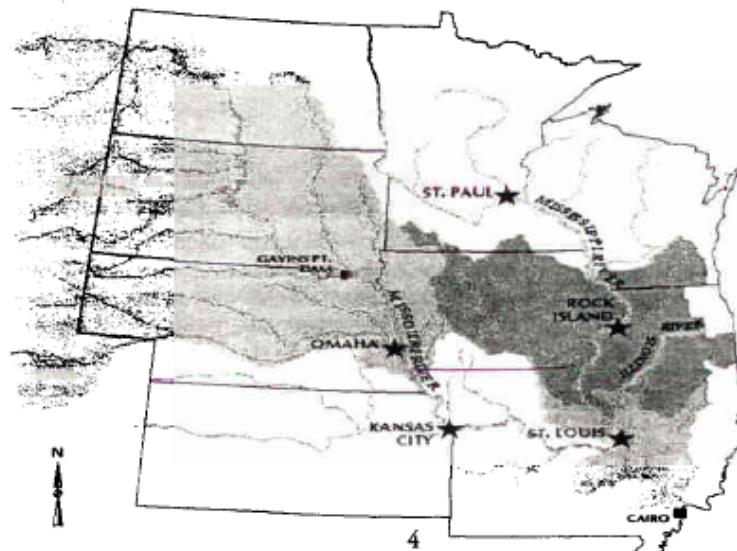
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Should you want a paper copy of any or all of these newsletters, or should you or someone you know want to be added to the study's mailing list, please contact Ms. Sue Simmons at 309/794-5573, FAX at 309/794-5883, email at [suzanne.r.simmons@usace.army.mil](mailto:suzanne.r.simmons@usace.army.mil), or write to the following address:

U.S. Army Corps of Engineers, Rock Island  
ATTN: CEMVR-PM-A (Simmons)  
Clock Tower Building – P.O. Box 2004  
Rock Island, Illinois 61204-2004

## **WHO CAN I CONTACT IF I HAVE A QUESTION?**

For more study information or to provide comments, contact Mr. Jerry Skalak, Project Manager, by telephone at 309/794-5605, FAX at 309/794-5710, e-mail at [jerry.a.skalak@usace.army.mil](mailto:jerry.a.skalak@usace.army.mil), or write to Mr. Skalak at the address listed above, ATTN: CEMVR-PM-M.





**US Army Corps  
of Engineers**

# **UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY (Upper Mississippi, Lower Missouri, & Illinois Rivers)**

## **PUBLIC INVOLVEMENT “SPECIAL EDITION” NEWSLETTER FREQUENTLY ASKED QUESTIONS**

November 2001

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated a study to update flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers.

As part of the study's public involvement program, newsletters have been sent to keep interested persons informed of the study's progress and preliminary results.

This “Special Edition” newsletter has been written to share some of the more Frequently Asked Questions (FAQs) about the Upper Mississippi River System Flow Frequency Study.

These questions and answers, plus additional study information including previous newsletters and meeting minutes, are available on the study's website at <http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.

### **1. WHAT IS THE PURPOSE OF THE FLOW FREQUENCY STUDY?**

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U.S. Army Corps of Engineers, Rock Island  
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Clock Tower Building – P.O. Box 2004  
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**US Army Corps  
of Engineers**

# UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY (Upper Mississippi, Lower Missouri, & Illinois Rivers)

## PUBLIC INVOLVEMENT NEWSLETTER

April 2003

### PUBLIC OPEN HOUSES PLANNED

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated the Upper Mississippi River System Flow Frequency Study to develop flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers. Four groups were formed to assist with this study: the State and Federal agencies' Task Force, the Citizens' Public Involvement Group, and two Technical Advisory Groups, whose members include nationally renowned scientists knowledgeable in flow frequency analysis.

The study is now nearing its conclusion and the Corps and partnering State and Federal agencies have analyzed the effects of reductions in flood runoff attributable to flood control reservoirs, considered potential effects of levee overtopping and/or breaches, and have selected the appropriate hydraulic model to develop water surface profiles for a range of flow frequencies.

*You are invited to attend an upcoming open house to view the study results. Eight open houses will be held in May 2003. Please see pages 4 and 5 for further information.*

### STUDY UPDATE

The Upper Mississippi River System Flow Frequency Study is scheduled for completion on June 30, 2003. Currently, the profile results from the hydraulic Unsteady NETwork (UNET) model are being checked and reviewed by technical review teams. This model can represent the movement of floodwaters in a complex network of open channels. The UNET model can continuously simulate many years of flow record, including the 1993 flood, at all locations along the Mississippi, Missouri, and Illinois Rivers. The UNET model also simulates the effects of local levee breaks on river stages.

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Technical reviews are scheduled to be completed in April 2003.

Results of the study will be made public at the May open houses. Final publication, to include Internet access, will occur in June 2003.

### MODELING WORK CONTINUES

The five involved Corps of Engineers Districts (St. Paul, Rock Island, St. Louis, Omaha, and Kansas City) are continuing their modeling efforts. Each District has been in contact with levee and drainage district points of contact within their Districts, as well as with the States' points of contact, to assure that the best available levee elevation information is used in the UNET model.

The Districts produced a numerical hydraulic model that is used in the process of computing stage-frequency relationships. Within those models, during extreme flood events, flow from the main river channel may overtop a levee and fill the protected area. Each District

worked with a contractor to gather information for digital terrain models, which are used to describe the geometry of the floodplain for the hydraulic models. The information that was gathered was then entered into the UNET model.

Levee and drainage district representatives were asked to verify the elevations (upstream, downstream, or inter-district) at which overtopping may occur for their levee districts. Discrepancies reported and certified were taken into account as each Corps District's UNET model was refined.

## WHAT'S ON THE WEB?

A study area map, study newsletters, Frequently Asked Questions, and minutes from the Task Force and the Citizens' Public Involvement Group meetings can be viewed on the Flow Frequency Study's website at [www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flow\\_freq.htm](http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flow_freq.htm). Also available for viewing are the letters and levee elevation tables sent to levee and drainage district representatives in each Corps District (as discussed above). After the May 2003 open houses, the presentation shown at the open houses will be added to the website.

Those who do not have Internet access may request a copy of the material provided on the website by writing to the address at the end of this newsletter.

## CITIZENS' PUBLIC INVOLVEMENT GROUP MEETS

The Citizens' Public Involvement Group met twice since the last Flow Frequency Study newsletter was released. The Group's sixth and seventh meetings were held on June 20, 2001, and October 9, 2002, respectively. Following are a few of the topics discussed.

### JUNE 20, 2001

At this meeting, the Group spent considerable time discussing the November 2002 public open houses and the way to best present the study results to the open house attendees. (The open houses were subsequently postponed and rescheduled for May 2003. Information about the open houses is provided on pages 4 and 5 of this newsletter.)

Mr. Jerry Skalak, Corps of Engineers, Rock Island District, the study's Regional Project Manager, stated that the study's findings will be provided to the Federal

Emergency Management Agency (FEMA) for possible updating of the Digital Flood Insurance Rate Maps.

Mr. S. K. Nanda, Corps of Engineers, Rock Island District, Chairman of the State and Federal Task Force, stated that the periods between 1898 through 1998 will be used in the study because 1998 is when the study started. The study team looked at adding the 2001 flood, but found that there were no significant changes in the flow frequencies.

### OCTOBER 9, 2002

The Citizens' Public Involvement Group held its final meeting on October 9.

The upcoming open houses were discussed in greater detail and Group members commented on the presentation that will be shown to the public.

Several Task Force members joined the meeting and provided answers to many of the Group's concerns:

- Q. Many levees were designed for the 50-year flood to comply with the mandate in the 1954 Flood Control Act that levees must provide protection against a 50-year flood event. Does the Corps of Engineers have the authority and funding to maintain the required level of protection?  
  
A. Mr. Nanda said that the Corps of Engineers Headquarters is currently reviewing this question. The answer will be posted on the Flow Frequency Study's website by the time the final report is completed in June 2003. (Note: Policy determination is expected by May 1, 2003.)
- Q. What happens to those levees that are part of the Public Law 84-99 Program if the water surface profiles are raised, for example, 1½ feet? Will it take a congressional mandate to determine if the levees are still part of the Public Law 84-99 Program?  
  
A. Mr. Nanda said that the Corps of Engineers Headquarters also is reviewing this question. The answer will be posted on the Flow Frequency Study's website by the time the final report is completed in June 2003.
- Q. Will the Flow Frequency Study results be used to "kick" levees out of FEMA's Program?

A. Mr. Al Schulz, FEMA Region VII, Kansas City, MO, said that from FEMA's perspective, it is only concerned with 100-year levees. Mr. Schulz responded that if a levee is decertified and studies show economic and legal feasibility to bring the levees up to certification level, FEMA will work with private levee districts and will delay publishing maps until their improvements are finished. FEMA will try to avoid and minimize hardships.

- Q. Will there be a grace period to make improvements?

A. Mr. Schulz stated that due to FEMA's publication process, there may be several years before leveed areas are re-mapped. For currently certified levees to maintain certification, FEMA will work with communities and levee districts to allow time for re-certification.

## TASK FORCE MEETS

The Task Force also has met twice since the last newsletter: June 21, 2001, and October 10, 2002.

Agencies/groups that were represented at the meetings were: Corps of Engineers, Federal Emergency Management Agency; U.S. Geological Survey; Bureau of Reclamation; States of Illinois, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin; Upper Mississippi River Basin Association; and the Citizens' Public Involvement Group.

A brief summary of both meetings follows. Verbatim transcripts are available upon request from the Rock Island District, Corps of Engineers.

### JUNE 21, 2001

Discussions included modeling efforts undertaken by the Districts for the study. The purposes for modeling are to 1) develop stage flow relationship, 2) quantify impacts of reservoirs, and 3) evaluate impacts of levee overtopping. The steps in the modeling effort include 1) collect topographic data, 2) format data and put it into the model (e.g., build the model), 3) calibrate the model – first for flow and then for stage, and 4) make production runs including simulation of the period of record. (Please refer to pages 1 and 2 of this newsletter. The modeling efforts have been completed by each District and verification letters have been sent to levee district representatives and to State representatives.)

Concerns that stemmed from the previous day's Citizens' Public Involvement Group meeting were summarized. Among the Group's concerns are that all the data used in the study be available for the public, including the assumptions, uncertainty bands, and other data used. The Group requested that the Corps release the data as soon as they are available to utilize the updated information in areas that need it now and that the Corps and FEMA coordinate to update the maps as quickly as possible.

### OCTOBER 10, 2002

Study progress since the last Task Force Meeting and issues remaining in finalizing stage frequency estimates were discussed.

The Technical Advisory Group and the Inter-Agency Advisory Group reviewed methodology for a regional study and split record testing that was performed to avoid the high sampling errors obtained during single site analysis. By combining the flow frequency curve, the relationship between unregulated and regulated flows, and the rating curve, the Districts have obtained stage frequency curves at cross sections along the various waterways. The 100-year profile can be obtained by plotting the one percent stages for each cross section location. Problems with the methodology include the interpolation of statistics and difficulties at confluences. The Districts are applying some trial approaches to find if better results can be obtained.

Climate change and land use variability impacts on the flow frequency estimations were discussed. The climate for the period of record, 1898-1998, is assumed to be stationary; i.e., not significantly changing. The analysis by the Corps of Engineers' Institute for Water Resources (IWR) showed possible trends for some stations, but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability. Consequently, standard flood frequency statistical analysis will be used to capture the overall variability in the flood of record.

Each Corps of Engineers District gave a progress report. Preliminary results were presented which indicated some significant and some insignificant changes from previously published values.

Discussion included concerns that there should be consistencies in methodology and assumptions among the Districts in their study efforts and consistencies among the States on regulatory issues.

The importance of communicating the study results to the public, discussing any uncertainty about the study results, and processing the study results and other information after the study is completed were stressed. Also, lessons learned from the study should be identified.

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## PUBLIC OPEN HOUSES

The public is invited to attend any of the open houses that will be held in May 2003. The purpose of the open houses is to explain the reason for the Flow Frequency Study, present the study results, and respond to questions or concerns.

The open houses will be held in eight locations along the Mississippi, Missouri, and Illinois Rivers. Sessions will be held from 1:00-4:00 p.m. and 5:30-8:30 p.m. Each session will be identical (except for the last open house on May 28th in St. Paul, MN. Please see below for further details of that open house).

The beginning and ending hours of each session will be informal. Attendees can come and go as they please, visit displays, meet with study personnel, and have specific questions answered on a one-on-one basis. Displays will include maps of the study area, new river profiles (in draft; the profiles will not be considered final until the final report is released in June 2003), and cross-section information for each District.

The middle hour of each session will be formal. A presentation describing the study and its findings will be given, followed by general questions and answers.

1:00-2:00 p.m. – informal session  
2:00-3:00 p.m. – formal presentation/Q's&A's  
3:00-4:00 p.m. – informal session

5:30-6:30 p.m. – informal session  
6:30-7:30 p.m. – formal presentation/Q's&A's  
7:30-8:30 p.m. – informal session

Comments received at the open houses will be summarized on the study's website and will become part of the final report.

The dates and locations for each of the open houses follows.

**TUESDAY, MAY 6 - ST. LOUIS, MO**  
Spazio Banquet and Conference Center in Westport  
12031 Lackland Road  
St. Louis, MO

**Wednesday, May 7 - KAnsas City, MO**  
Hyatt Regency Crown Center  
2345 McGee Street  
Kansas City, MO

**Thursday – May 8 – Omaha, Ne**

Holiday Inn Omaha-Central-I-80  
3321 South 72nd Street  
Omaha, NE

**Monday –May 19 – Quincy, IL**  
Holiday Inn Quincy  
201 South 3rd Street  
Quincy, IL

**Tuesday –May 20 – Peoria, II**  
Holiday Inn City Centre  
500 Hamilton Boulevard  
Peoria, IL

**Wednesday – May 21 – Davenport, Ia**  
Holiday Inn  
5202 Brady Street  
Davenport, IA

**Thursday – May 22 – La Crosse, WI**  
La Crosse Center  
300 Harborview Plaza  
La Crosse, WI

**WEDNESDAY – MAY 28 – ST. PAUL, MN \***  
U.S. Army Corps of Engineers  
Conference Rooms 5A and 5B  
190 5th Street East  
St. Paul, MN

\* An afternoon session only will be held at this location. The format will be identical to the other sessions. Conference Rooms 5A and 5B are on the 5th floor of the Corps of Engineers office building in downtown St. Paul. Due to the security system in the building, open house attendees will need to be escorted up to the conference room. There will be signs at all publicly accessible elevators (i.e., basement and 1st and 2nd floors) directing attendees to gather on the 2nd floor of the building by the elevators. An escort will be at the

elevators on the 2nd floor to take attendees to the

conference rooms on 5th floor.

**PLEASE NOTE:** Study results for the entire system will be available at all open houses. However, the technical staff present at each open house will be most familiar with the specifically identified river reach or reaches shown below:

OPEN HOUSE LOCATION	DATE	APPROXIMATE RIVER REACH(ES) TO BE PRESENTED	RIVER
St. Louis, MO	May 6	L&D 24 (Clarksville, MO) to Thebes, IL St. Louis, MO, to Boonville, MO LaGrange L&D to Grafton, IL	Mississippi Missouri Illinois
Kansas City, MO	May 7	Boonville, MO, to St. Joseph, MO	Missouri
Omaha, NE	May 8	Gavins Point Dam to St. Joseph, MO	Missouri
Quincy, IL	May 19	L&D 18 (Burlington, IA) to L&D 24 (Clarksville, MO)	Mississippi
Peoria, IL	May 20	Lockport L&D to LaGrange L&D	Illinois
Davenport, IA	May 21	L&D 11 (Dubuque, IA) to L&D 18 (Burlington, IA)	Mississippi
La Crosse, WI	May 22	L&D 4 (Alma, WI) to L&D 11 (Dubuque, IA)	Mississippi
St. Paul, MN	May 28	Anoka, MN, to L&D 4 (Alma, WI)	Mississippi

## LAST NEWSLETTER

This is the last newsletter for the Upper Mississippi River System Flow Frequency Study. Thank you for your interest in the study. We look forward to seeing you at the public open houses and encourage you to continue to view the study's website and to keep informed of other Corps of Engineers studies and programs.

## WHAT HAPPENS NEXT?

As stated above, the Upper Mississippi River System Flow Frequency Study will conclude in June 2003. Study products include updated digital floodplain elevation data, flow-frequency relationships, UNET hydraulic models, and stage-frequency relationships. New flood frequency water surface profiles will be used by the Corps of Engineers and other Federal and State agencies.

## STUDY POINT OF CONTACT

Mr. Andrew Leichty, Rock Island District, Corps of Engineers, replaced Ms. Heather Wiese as the Flow Frequency Study's Coordinator in April 2002.

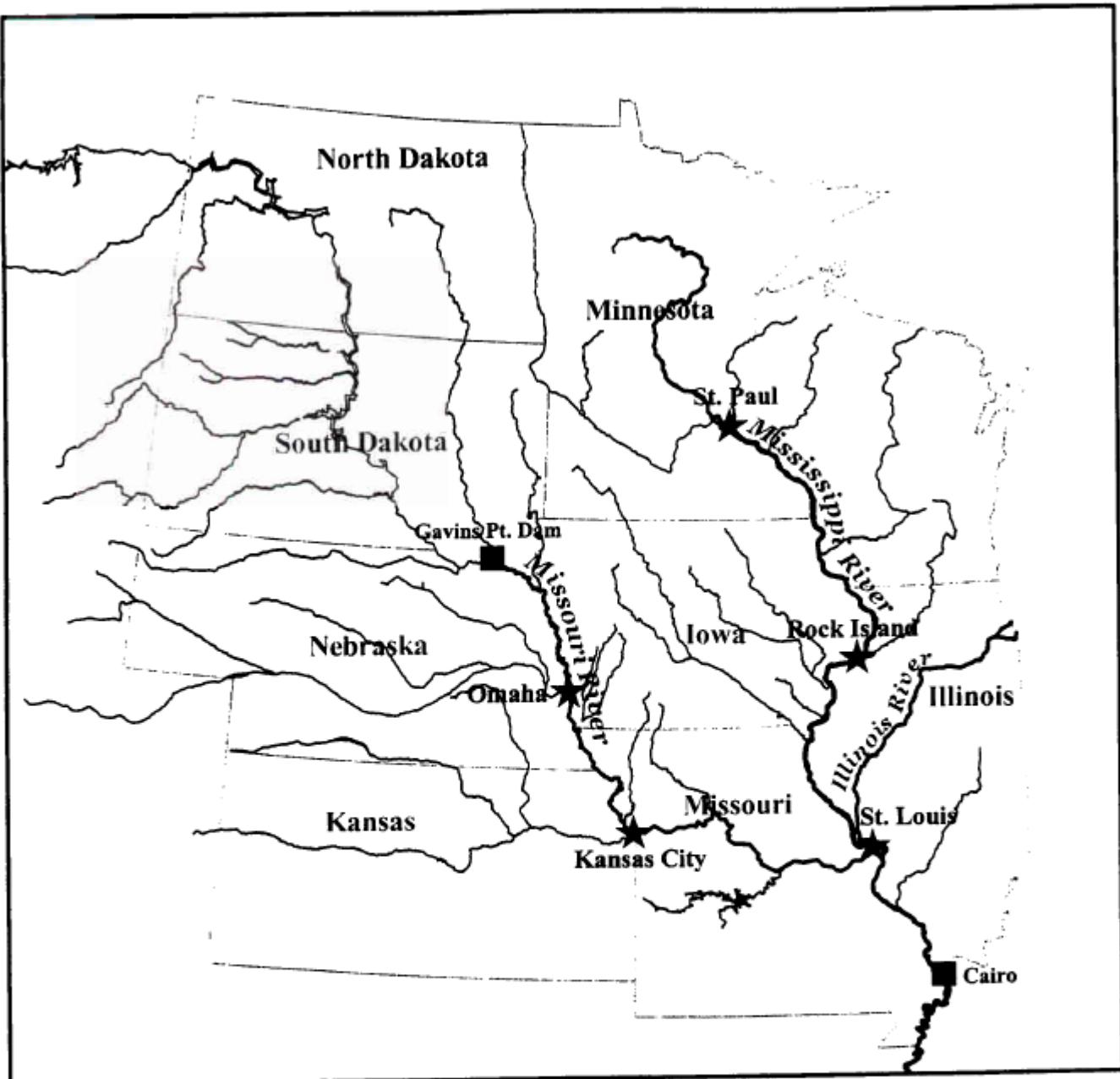
For further information or questions about the study, or if you have comments, please contact Mr. Leichty by telephone 309/794-5399, fax 309/794-5710, or email: [Andrew.L.Leichty@usace.army.mil](mailto:Andrew.L.Leichty@usace.army.mil).

If you prefer, you may write to Mr. Leichty at the following address:

U.S. Army Engineer District, Rock Island  
ATTN: CEMVR-PM-M (Leichty)  
Clock Tower Building - P.O. Box 2004  
Rock Island, Illinois 61204-2004

*We welcome your input*

## UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY AREA MAP



USACE District Offices

Kansas City District  
Omaha District  
Rock Island District  
St. Louis District  
St. Paul District

**UPPER MISSISSIPPI, LOWER MISSOURI, AND ILLINOIS RIVERS  
FLOW FREQUENCY STUDY  
CITIZENS' PUBLIC INVOLVEMENT GROUP MEETING  
March 25, 1998**

**Final Minutes (Approved 11/17/98 )**

1. The Citizens' Public Involvement (P.I.) Group met for the first time on Wednesday, March 25, 1998, from 1-5 p.m., at the Airport Hilton Hotel in St. Louis, Missouri. An attendance list is attached.
2. Jeannette Thompson, Fleishman Hillard, Inc., was hired to facilitate this organizational meeting. Ms. Thompson began the meeting by introducing herself and the U.S. Army Corps of Engineers, Rock Island District representatives: Paul Soyke, Citizens' P.I. Group Chairperson; George Gitter, Flow Frequency Study Coordinator; and Sue Simmons, Citizens' P.I. Group Recording Secretary.
3. S. K. Nanda, Chairperson for the Flow Frequency Study's Task Force, welcomed the group and gave an overview of the study including: study area, background, and purpose; levels of quality control within the study; Task Force (Federal/State Study Team) members; and a study timeline. NOTE: This information is contained in the Summary Draft Plan of Study (March 1998) that all P.I. Group members previously received.
4. George Gitter also presented a study timeline, which showed that the study started in October 1997 and is scheduled to end in September 2001.
5. Paul Soyke welcomed the group members and explained the significance of their participation in the study. The Group will play an important role in assuring that the Task Force understands the concerns of the citizens in the study area. Mr. Soyke said as Chairperson he will assure that the P.I. Group and Task Force educate each other on what the respective groups are doing and that the P.I. Group's concerns are heard.
6. Paul Soyke explained that the Task Force meeting on Thursday, March 26<sup>th</sup> was open to all P.I. Group members and that he would present the Group's concerns to the Task Force. (See paragraph 14 below for a list of the concerns that were reported to the Task Force.) The P.I. Group members will receive a copy of the minutes from the Task Force meetings. Those P.I. Group members who were not present at the Task Force meeting, and who have questions about or comments on the Task Force minutes, can provide them in writing to Mr. Soyke. Mr. Soyke will try to get an answer by the next meeting.
7. St. Louis will probably be the site for most Task Force and Citizens' P.I. Group meetings. The current schedule is for the Citizens' P.I. Group to meet the afternoon before the Task Force meetings. That schedule works well because the P.I. Group Chairman reports the Group's issues and concerns at the Task Force meeting the next morning. However, if the P.I. Group deems that a meeting is necessary at other times, we will try to schedule it. When scheduling those meetings, the schedules of those who farm will be considered (e.g., we will try to avoid the months of April, May, June, September, October, and November). The idea of surveying the Group to find out what dates would be best for them was considered. For now, unless it is too difficult for most of the Group members to attend the P.I. Group meetings that are scheduled the day before the Task Force meetings, scheduling will remain as is.
8. All Citizens' P.I. Group members will receive a copy of the Group's minutes. Those who attended the meeting will receive a copy of the draft minutes and will be asked to provide comments, corrections, etc. Corrected minutes (marked "pending approval") will be sent to all P.I. Group members and also will be made public. The minutes will be approved as final at the next P.I. Group meeting (date not determined at this time).

9. Many issues and questions were raised throughout the afternoon. Every effort will be made to address unanswered questions by or during the next P.I. Group meeting.

- a. How does Flow Frequency Study affect Missouri River Master Plan?
- b. Is the Illinois River part of this study? *Yes, but only the main stem.*
- c. The hydrology must be accurate – the Task Force must focus on the right hydrology. There is concern that environmentalists could criticize and stop flood control projects if the hydrology is incorrect.
- d. The P.I. Group agreed that they not only want someone to listen to them, they want action.
- e. What is the focus of the P.I. Group and the study? *Paul Soyke responded that the P.I. Group must be assured that the Task Force performs the best hydrology because the flood profiles will be used on all future studies. The Task Force will educate the P.I. Group and the P.I. Group will provide feedback to the Task Force.*
- f. What is the role of reservoirs in the Flow Frequency Study?
- g. How will the study affect flood control benefits? *By assuring that the best hydrology is used in measuring benefits.*
- h. A P.I. Group member recommended that the P.I. Group have a technical advisor separate from the Task Force. This advisor would be funded by the Corps of Engineers and would assure another level of Quality Control by reviewing the Task Force findings for the P.I. Group. The Group agreed that it wants a technical expert. **Paul Soyke will begin to pursue this issue with the Planning Division Chief and the Office of Counsel.**
  - i. The P.I. Group member further recommended that each member of the Group be provided with copies of the Task Force's draft reports and have the right to approve or disapprove the Task Force findings. However, another P.I. Group member stated that he did not have the expertise to assess the Task Force findings and felt that the Group should rely on the experts that the Task Force has hired. *Paul Soyke stated that the P.I. Group has to be given the information to understand what the Task Force is doing.*
  - j. The P.I. Group wants to be heard; the members will not be “yes men.” The P.I. Group wants to be involved throughout the study process.
  - k. The P.I. Group needs input from the Task Force so it can understand and buy into what goes into the flow frequency model. *Paul Soyke said that that is the purpose of the P.I. Group -- to try to get answers that the Group can understand.*
10. The Group began to discuss the charter, but did not complete the task. The charter will be discussed at the next meeting. Following are the issues relating to the charter that were discussed:
  - a. The membership of the Citizens' Public Involvement Group will be kept open at all times. There will be no limitation on number of members; new members are welcome.
  - b. There is no formal procedure for resigning from the Group. A written notification would be appreciated; however, if a person chooses to resign, then he/she can just stop coming to the meetings.
  - c. The agenda will be developed by the Chairperson, with input from the P.I. Group. A preliminary agenda will be proposed at the end of each meeting and will include a time slot for previous business as well as new business. A draft agenda will be sent prior to the meetings. Comments about the agenda should be sent to the P.I. Group Chairperson.

- d. The charter will contain a provision for amendments, if necessary.
  - e. Paragraph VI will be rewritten for clarification. The Corps of Engineers will pay for the meeting room costs for the Citizens' P.I. Group meetings. The P.I. Group members (excluding the Corps of Engineers members) will be responsible for their own transportation, lodging, and meals.
  - f. The P.I. Group recommended that it have its own technical advisor to review the Task Force's findings. **As stated above, Paul Soyke will pursue this issue with the Planning Division Chief and the Office of Counsel.**
  - g. If the P.I. Group does not agree with the study findings, a provision for appeal rights, such as an Alternate Dispute Resolution, should be written into the charter. (A Group member stated that FEMA has an appeal rights procedure.)
11. Dr. David Goldman, from the Corps of Engineers' Hydrologic Engineering Center and a member of the Task Force, visited with the P.I. Group for a few minutes. He stated the following:
- a. In response to concern about using a computer model rather than a physical model, Dr. Goldman stated that the Task Force will not use physical models, but mathematical models. The computer (mathematical) models are less expensive than physical models. These computer models can reproduce what has been observed for the past 100 years. Flood records are used to verify the model's findings. The models have been used at several locations.
  - b. The Task Force is using the UNET model, which allows more flexibility by looking at a whole flood event. **If a P.I. Group member is interested in getting a write-up of the UNET model, he/she should contact George Gitter.**
  - c. Dr. Goldman was asked, as a technical person, how a sixth level of Quality Control should be part of the process? *Dr. Goldman replied that the Task Force's draft technical reports will be available for the public to comment on.*
  - d. The question of the P.I. Group getting its own technical expert came up. Dr. Goldman explained that the technical experts used by the Task Force are world-wide experts; however, he had no problem with the P.I. Group getting its own technical expert if the group felt it was necessary.
  - e. George Gitter suggested that as the study proceeds, that various Task Force members attend upcoming P.I. Group meetings to explain study progress to the Group and to answer questions.
12. Martin Becker, a P.I. Group member, expressed concern on several occasions that the technical people are censoring information that will adversely affect the credibility of the outcome of the study. This is information which he has been trying to present for 9 months.
13. Mr. Becker asked that the following responses to his questions be included in these minutes:
- a. Dr. David Goldman said that he had no problem with distributing correspondence and draft reports back and forth from the Technical Advisory Group (TAG).

*(Although Dr. Goldman did not say this in response to Mr. Becker's question, the meeting notes indicate that earlier in the meeting Dr. Goldman said that after the TAG agrees, the draft SOW in the Plan of Study would be available for comment.)*
  - b. Dr. Goldman could not comment on the need for an alternative dispute resolution procedure; but that as an engineer, he would always be willing to listen to other opinions about the analyses performed.

- c. S. K. Nanda will draft a letter for Martin Becker saying that the Task Force would not try to change 17B for smaller basins.

*(Mr. Nanda later amended this statement as follows: Mr. Martin Becker raised the question whether this study will change the Bulletin 17B guidelines. It is not the charter of this Task Force to change Bulletin 17-B guidelines for which there exists a separate committee. This is a special regional study of large drainage areas.)*

14. The list of issues that the P.I. Group members asked Paul Soyke to bring forth to the Task Force are summarized below. Mr. Soyke presented the issues at the March 26<sup>th</sup> Task Force meeting. The P.I. Group members who were present at the meeting concurred with these statements.

- a. The Task Force needs to educate the P.I. Group on all important issues in a way that the Group can understand.
- b. How will risk and uncertainty be used and how will it improve the study? There needs to be a balance of making conservative estimates vs. the most accurate estimates. *(Dr. Eugene Stakhiv will be asked to make a presentation to the P.I. Group.)*
- c. The P.I. Group wants to assure that the Task Force understands and responds to the Group's issues. The P.I. Group wants credibility and will not be a "yes" group.
- d. The P.I. Group wants to assure that the Task Force interacts in a manner to maintain its credibility with the P.I. Group.
- e. There are some concerns with the Plan of Study that need to be addressed before they are overcome by events.
- f. The Task Force needs to hear the P.I. Group's input and assure the Group's understanding as issues arise rather than at the end of the study. The Task Force needs to know where the problems are.
- g. The Group is considering a dispute resolution process and providing a technical expert. How can the Group be assured of accuracy?
- h. Will the final results of the Flow Frequency Study affect the Missouri Master Manual?
- i. How do reservoirs fit into this study?

15. Since an agenda for the next P.I. Group meeting was not determined, the Chairman will send the proposed agenda for the next meeting with the meeting announcement.

/s/  
SUZANNE R. SIMMONS  
Recording Secretary  
Citizens' Public Involvement Group

Attachment

### **Attendance List**

Upper Mississippi River System Flow Frequency Study

(Upper Mississippi, Lower Missouri, & Illinois Rivers)

Citizens' Public Involvement Group Meeting

March 25, 1998

Sue Simmons	US Army Corps of Engineers, Rock Island, IL
Coy Again	New Franklin, MO
Martin Becker	Atlanta, GA
Bill Griffin	Macomb, IL
Russell Shriver	Ursa, IL
David Shaffer	Ursa, IL
Edwin Keeven	O'Fallon, MO
George Gitter	US Army Corps of Engineers, Rock Island, IL
Wilmer Erling	MLDDA Tri Co. Levee District, Hermann, MO
Marvin Meyer	MLDDA, St. Charles, MO
Stuart Case	New Haven, MO
Kathryn Meisner	Sioux City, IA
Don "Skip" Meisner	Sioux City, IA
Jim Whiting	Retired Farmer, Whiting, IA
F. John Taylor	Virginia, IL
Paul Soyke	US Army Corps of Engineers, Rock Island, IL
Jeanette Thompson	Fleishman-Hillard, Inc., St. Louis, MO
Charlie Kempf	Eldon, MO
Dave McMurray	UMIMRA, Burlington, IA

Attachment 1

**UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY**  
**(Upper Mississippi, Lower Missouri, & Illinois Rivers)**  
**CITIZENS' PUBLIC INVOLVEMENT GROUP MEETING**  
**November 17, 1998**

**Final Minutes (Approved 4/28/99)**

1. The Citizens' Public Involvement (P.I.) Group held its second meeting on November 17, 1998, in St. Louis, Missouri. A meeting agenda is attached. The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
  2. The meeting began with Chairperson Paul Soyke (Corps of Engineers, Rock Island District) asking attendees to introduce themselves. An attendance list is attached.
  3. The P.I. Group expressed its concern with the study's name change. The name has been changed from "Upper Mississippi, Lower Missouri, and Illinois Rivers Flow Frequency Study" to "Upper Mississippi River System Flow Frequency Study." There was concern that since the names of the Lower Missouri and Illinois Rivers were removed from the study title, that the public would think that those rivers were no longer a part of the study. George Gitter (Corps of Engineers, Rock Island District) explained that the study's boundaries have not changed and that the title change had to do only with the long study name and space limitations on budget documents. **George and Paul will look into assuring that the major rivers in the study are evident in documents that go to the public.**
  4. There were no additions or corrections to the minutes (pending approval) of the March 1998 meeting that were mailed to the P.I. Group in May. Charlie Kempf (Ameren/UE) moved that the minutes (pending approval --dated 5/14/98) be approved as final; Jim Whiting (retired farmer) seconded the motion. The P.I. Group voted unanimously to approve the motion. A copy of the final minutes (approved 11/17/98) will be mailed to each P.I. Group member and to the Task Force Chairman for release at his discretion.
  5. Arlen Feldman, Chief, Research Division, of the Corps of Engineers' Hydrologic Engineering Center in Davis, California, attended the meeting to answer questions and to explain some of the study's elements. The paragraphs below reflect the questions, answers, and discussions on hydrology that occurred.
    - a. *Q. (From the March 1998 meeting) - What is the role of the reservoirs in relation to the study?*
      - A. The study team will look at the natural flow of the rivers and at reservoir regulations and at how much the reservoirs reduce flooding. The first part of the study is concentrating on determining the unregulated frequency curve by analyzing the river system without reservoirs. Reservoirs modify floods, so the team will then look at what happens when a reservoir is added on the system, which will help them determine the impacts of flooding. See attached chart entitled "Table 1 – Flood-damage-mitigation Measures," which Arlen showed and explained to the P.I. Group.
- Reservoirs have different functions; however, any significant reservoirs in the river system which have an impact on flooding will be included in the study. Non-Corps reservoirs will be included. Each of the five involved Corps of Engineers districts (Rock Island, St. Paul, St. Louis, Kansas City, and Omaha) will evaluate which reservoirs have significant impacts.
- b. Some Group members are concerned about the impact of flooding downstream of Gavins Point. The study will look at the natural flows at Gavins Point to calculate the unregulated frequency curve; and then add reservoirs to compute existing condition flood frequencies.
  - c. Arlen used a series of graphs to help show how the Corps computes the average annual damages from flooding. Factors include: how often do floods occur? how often does damage from flooding occur?

d. *Q. Which of the eight Missouri River Master Plans will be used? Will the Master Plan be used in the study?* Arlen doesn't know which plan will be used; however, the one that is current at the time will be the one selected. It should be noted that if the Missouri River operating plan does change significantly as to effect peak flows the new operating plan can be examined using the methodology developed in this Flow Frequency study.

*(Arlen later amended his answer as follows: Several new operation plans are being considered in that study; the Flood Frequency Study will use the currently authorized plan. It should be noted that if the Missouri River operating plan does change significantly as to effect peak flows the new operating plan can be examined using the methodology developed in this Flow Frequency Study.)*

e. FEMA will work with the Corps of Engineers throughout the study. There are a lot of data to look at for this study and the team will look at a large range of possibilities. However, FEMA is interested primarily in the 1% flow (100-year flood).

f. The study will develop new flood profiles (stage frequency). It will not look at damages. The information learned in this study will be used for other studies.

g. Other factors used for the study: team will take the levees as they are for this study; risk and uncertainty-looking at a range of possible outcomes will help gain insight; channel roughness values will play a major part - they will be evaluated on a reach by reach basis. It should be noted that this study is using the UNET hydraulic model, which is based on continuity of flow as opposed to the traditional backwater analysis (i.e. HEC-2, HEC-RAS) which uses conservation of energy. Therefore, no conclusion can be drawn by a direct comparison of the friction coefficients (n-value) of the two different hydraulic models.

h. Chris Erickson, Kansas City District, discussed why we're doing the Flow Frequency Study – the team is making its best estimate of the flow/stage frequency relationship. FEMA is also concerned about flood frequencies; e.g., why can there be three 100-year floods in 20 years?

i. The effect the study will have on the PL 84-99 (Emergency Levee Rehabilitation) program concerns the drainage districts. It is vitally important that the study team is well aware of the effects of what impacts this study can have on PL 84-99 program, particularly on the Lower Missouri.

j. Chris said that technically we can have the best flow frequency curves, but policy and politically – it is much more challenging. However, Buddy Arnold of the Corps' Mississippi Valley Division assured the P.I. Group that the Corps is doing the best study it can with the money given.

k. The team will work at mapping the study area until the end of Calendar Year (CY) 1999. They will then put the information in a model at the end of CY99 through 2000 for additional mapping (1-meter contours/4-foot contours). Will go from bluff to bluff. There are two different levee systems up and down the river. Although the Upper Mississippi, Illinois, and Missouri Rivers Association (UMIMRA), who pushed for the study, asked for modeling to the Standard Project Flood, the study will model to a 500-foot flood. Gary Dyhouse of the Corps' St. Louis District said that he is not aware of any Standard Project Flood studies on the main-stem river system.

l. Dave McMurray (Chairman, UMIMRA) said that the Group needs a good definition of how a levee/reservoir regulates flows. Best estimate will be problem - will need to clearly identify levee system - broaden or more definition. The P.I. Group wants a "band" or "range" that defines the X-% chance flood event. They are fearful of the perception that we use one number to the tenth of a foot to define a particular flood event. 100-year flow - under a variety of circumstances - define results and describe them as best estimate. Public has to understand that reservoirs are identified under a certain set of circumstances.

m. *Are we changing the amount of flow because of concrete – will we get larger runoffs?* The Corps of Engineers' Institute for Water Resources is looking at uncertainty in respect to land use development. The Corps hydrologists do not think so. While it is acknowledged that development in localized areas may increase runoff for small basins, a measurable increase in flows for large basins like the Mississippi and Missouri Basins are extremely unlikely.

n. *Are there studies on what is the effect of wetlands?* The Floodplain Management Assessment, June 1995, examined the effect of wetlands on the 1993 flood event. Due to the large basin size and amount of rainfall in the 1993 event, wetlands would have impacted discharges only in localized areas.

o. *Do wetlands have impacts?* It depends on the area.

(*Arlen later amended his answers to questions n. and o. above to the following: Arlen hasn't seen any studies that are definitive for the whole (Upper Mississippi River, Illinois River, and Lower Missouri River) basin area. Several studies conducted by HEC and others show that wetlands only have significant impacts on the magnitude of smaller (say \$4 (25-year) or smaller) floods. The Floodplain Management Assessment, June 1995, examined the effect of wetlands on the 1993 flood event. Due to the large basin size and amount of rainfall in the 1993 event, wetlands would have impacted discharges only in localized areas.*)

p. *Are the models built so data can be superimposed and the study team can go to next step? (asked by Dave McMurray)* Arlen responded that in most cases you would use same model and run the new data through the same process.

q. *After the Flow Frequency Study, can the Corps promise that there will be no 1-meter error on the Missouri River? (asked by Joe Gibbs)* Arlen Feldman and Chris Erickson stated that they hope there are no errors, but cannot promise there will be no errors. However, there will be more consistency. It was pointed out that the tolerance of the topography being developed is plus or minus the contour interval which is plus or minus one-half a meter. It must be fully understood that any errors that might be in the topography do not relate to the same errors in the profiles.

r. Mike Klingner (Klingner & Associates, P.C.; UMIMRA) stated that confidence (uncertainty) limits with documentation are important and would be helpful. Suggest that the Standard Project Flood and the 500-year flood be calculated. Outcome is a public safety issue. Do a comparison – what level each location has. Will ask the Task Force to do a sensitively analysis.

6. Q. (*From the March 1998 meeting*) – *Will the Corps of Engineers provide an independent technical expert for the P.I. Group?*

A. Paul responded that, after checking with Rock Island District management, an independent technical expert would not be provided. Arlen and other members of the study's Inter-Agency Advisory Group are able to provide answers to the P.I. Group. Much discussion about this issue followed; comments are summarized below:

a. Paul suggested that if the P.I. Group is not satisfied with information they receive, then they may look at an independent expert if money allows. He stated that the Mississippi Valley Division Engineer may need to be involved in the decision and suggested that, if the group still wanted their own expert, a letter be written to COL Mudd, Rock Island District Engineer, stating why the P.I. Group would like their own independent technical expert. COL Mudd could then respond to them.

b. Comments made by various Group members: Although there are experts on the study, the experts don't have a farmer among their Group asking questions about how flow will affect his farm (Dave McMurray). Dave also expressed frustration at feeling inadequate after attending the P.I. Group meeting. The P.I. Group needs to understand issues – someone has to help the Group understand. The Group doesn't know what questions to ask

about this study. The P.I. Group members would like someone to tell them when an outside expert is needed. Bill Ley stated that he feels that the Corps can give good information, but also thinks an independent technical expert would be good. P.I. Group members want someone to explain the study to the Group so Group can make decisions. Nancy Philippi (Wetlands Initiative) feels that the cost of an expert would not be that much in comparison to the total study cost.

c.. The consensus of P.I. Group was that they would like a technical expert who understands the study from their perspective and that they need to have a role in the selection process. A motion was made that Dave McMurray represent the P.I. Group by writing to COL Mudd about pursuing a technical expert. **The motion was seconded & unanimously approved**

7. *Q. (From the March 1998 meeting) – Will there be an Alternate Dispute Process (ADR) for the study?*

A. Paul replied that since the Flow Frequency Study is a Corps of Engineers study, the Corps will make the decisions. The Division Engineer will solve disputes or they will be solved in the public involvement process. Although FEMA has an ADR process and they are involved in the study, their process has nothing to do with this study.

8. Buddy Arnold stated that we need to explore a better way for the two afternoon groups (Citizens' Public Involvement Group and Corps & Federal hydrologists) to interact, e.g., changing the meeting times. This was not discussed further. Buddy also stated that the Flow Frequency Study is a technical study and is different from the regular Corps studies.

9. The next topic discussed was adopting the charter. **The decision was unanimous to change the title “charter” to “Corps of Engineers Guidelines for the Operation of the Citizens’ Public Involvement Group (accepted by the Public Involvement Group)”**. The purpose of the P.I. Group is to give Corps input and the “guidelines” are Corps of Engineers guidelines for operation of the Public Involvement Group. The guidelines are attached.

10. In response to a question of the status of the P.I. Group in comparison to others involved in the study, the Group was told that they have equal status as the other agencies.

11. Arlen Feldman discussed Risk and Uncertainty and what the hydrologists are looking at – Uncertainty, Sensitivity & Risk in the Mississippi, Missouri, and Illinois Rivers Flow Frequency Study.

a. Sensitivity – change the major assumptions (e.g., operating plans at reservoirs or when levees fail ) to see how sensitive the resulting frequency curve is to that change?

b. Uncertainty – we don’t know Mother Nature’s time distribution of floods (we have only a 100-year sample – try to estimate true distribution from sample).

c. Arlen showed other overheads (attached):

(1) “Tasks in IWR Study” – trying to learn from the past

(2) “Climate Trends in the Upper Mississippi River Basin” (Mississippi River at Clinton)

(3) “95% Confidence Interval for Probability Distribution (Log Pearson III) (Mississippi River at Hannibal, MO 1979-1996)”

(4) “Climate Variability and Change and Flood Frequency Analysis”

(5) “Climate Variability and Flood Frequency”

(6) "North Atlantic Oscillation"

d. Mike Klingner stated that as a byproduct of the study, facts about concrete/runoff misconception would be useful. Also, he would like the Climate Trends chart expanded. Much of this information should be made available as it is completed, rather than waiting until the entire study is done.

12. S. K. Nanda, Task Force Chairperson, gave a status of the study.

a. Many groups are involved in the study: 5 Corps of Engineers Districts, 2 Corps Divisions, 7 States, 6 Federal Agencies, the Citizens' Public Involvement Group, a "Think Tank" (National Research Council), and the Corps' Institute for Water Resources (providing information on Risk & Uncertainty). All are working together so we will proceed in fashion acceptable to the Nation.

b. The study is a 3-year effort (1998-2001). This year we received only about one-half the money we need – we're trying to get more.

c. Study results after 2001 – hydrology (define flow frequency), hydraulics (will fly floodplain and do digital floodplain mapping).

d. S. K. met w/FEMA Agencies V and VII and discussed what assumptions would be made as to when a levee would fail. Will have a hydraulic model for entire the Missouri and Mississippi River system - will run model on flows – will talk to public & FEMA – not married to any one assumption now. The P.I. Group will have opportunity to see assumptions

e. The study team hasn't decided how much risk and uncertainty to do – run flows for hydraulic models – what percent of reliability of elevation being exceeded?

f. FEMA will define base flood elevation

g. Dave said that the P.I. Group wants an awareness of the assumptions and the Group needs to understand them.

h. At the next meeting, Arlen will discuss the assumptions that the study team is making in defining flow frequency. The unregulated flow frequency is being studied first; many flood and stage frequency analysis methods are being evaluated. The study team will make assumptions in each step.

i. *Will other programs other than UNET be available?* UNET is the Corps of Engineers standard 1-D digital hydraulic unsteady flow model; steady-state hydraulic models like HEC2 will not be used. FEMA is being included in the study from the start to ensure mutual understanding of the results. Digital cross-sections include all of the channel and overbank areas – and will be public information. The study team is considering how to publish the data; one of the main sources will be the UNET model input data.

j. *Will what the group finally comes up with be used?* This is not a Corps of Engineers study, it is an interagency study. FEMA will go to public meetings to discuss findings. The study will not be political. S. K. Nanda will assure all agencies are unanimous in the method, process and final outcome of the study.

k. *The P.I. Group asked S. K. what the Interagency Group might want from the P.I. Group?*

(1) The Group's questions/concerns go through Paul to the Task Force. The Group can ask questions/make statements at the Task Force meeting if there is an issue that Paul does not address

(2) Arlen – maybe the Corps and Federal agency hydrologists would want to know what P.I. Group/public want to see as a result of the study

1. The P.I. Group told S. K. it wants its own expert to represent the Group's viewpoint as to what's going on from the public's perspective so the Group can make intelligent comments. Also, the Group has no expert in mind. S. K. Nanda will discuss with Dave to determine if the Corps of Engineers would pay for an expert.

m. If the Group gets a technical expert, they would like an hour or so with him/her without the Corps' attendance.

n. The Group wants to know assumptions Interagency group is making

13. Discussed "stochastic" – statistically varying climate driving forces, pressure system, rain – may be driven by man's activities & Mother Nature's activities. The study team will look at the data they have more confidence in such as historical records and current (better) data.

14. Concern that study results may not have an impact on Missouri River Master Manual

15. The P.I. Group offered the following suggestions for upcoming newsletter articles:

a. Address the study and its goals.

b. Information on the P.I. Group: a summary with input from the Group, membership listing, and an explanation of the role of the Group.

c. Bluff to bluff information in layman's terms.

d. Discuss the value of wetlands – clear up misinformation.

e. Stress what study is not (looking at one set of relationships) – will provide data that political decisions may be based on.

f. Get viewpoints on the study's results from FEMA, USGS, NRCS and what their involvement is in the study.

16. Report to Task Force. The P.I. Group asked that Paul Soyke bring the following concerns to the Task Force at their 18 November meeting:

a. Change the title of the study back to original title to include Missouri and Illinois Rivers.

b. FEMA policy.

c. Assumptions – levee overtopping.

d. Risk and uncertainty limits -- bands of the uncertainty should be shown rather than a single point.

e. Can we show the Standard Project Flood (SPF) calculations?

f. Impact of frequency at lower lines and impact on Public Law 84-99.

g. Alternative selection for operation of Missouri River – will the P.I. Group be involved? When will the decision be made? Will the Group & the public have the opportunity to comment on Master Plan for Missouri River? Comment on alternatives?

- h. Sensitivity issues need to be presented about issues such as what critical assumptions are made.
- i. The P.I. Group would like an independent technical expert.
- j. How can we get interim information and useful data out to the public?
- k. Concern about data formats and public availability.
- l. Document the rationale behind decisions and assumptions.
- m. Make sure that the Task Force considers what information they want from the P.I. Group.
- n. Get interim information out to the P.I. Group when available.

17. An agenda will be sent out before the next meeting and the P.I. Group will be asked to comment on the agenda items. The assumptions used in the study will be discussed at the next meeting. The assumptions will be sent to the Group 2 weeks ahead of time.

/s/

SUZANNE R. SIMMONS  
Recording Secretary  
Citizens' Public Involvement Group

Attachments

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**

**November 17, 1998**

**1 p.m. - 5 p.m.**

**Draft Agenda**

I.	Welcome	Paul Soyke
II.	Discuss/approve March 1998 meeting minutes	Paul Soyke/P.I. Group
III.	Respond to unanswered March 1998 meeting questions/issues	Paul Soyke
IV.	Discuss/finalize Citizens' P.I. Group charter	Paul Soyke/P.I. Group
V.	Hydrology methodology presentation/discussion	Arlen Feldman <sup>1</sup>
VI.	Risk and uncertainty analysis presentation/discussion	Arlen Feldman
VII.	Discuss content for upcoming newsletter	Paul Soyke/P.I. Group
VIII.	Discuss November 18 report to Task Force	Paul Soyke/P.I. Group
IX.	Develop agenda for next meeting	Paul Soyke/P.I. Group
X.	Adjourn	Paul Soyke

Attachment 1

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<sup>1</sup> Chief, Research Division, Hydrologic Engineering Center, U.S. Army Corps of Engineers

**Attendance List**

Upper Mississippi River System Flow Frequency Study  
(Upper Mississippi, Lower Missouri, & Illinois Rivers)  
Citizens' Public Involvement Group Meeting  
November 17, 1998

Sue Simmons	US Army Corps of Engineers, Rock Island, IL
Coy Again	New Franklin, MO
Joseph Gibbs, P.E.	Columbia, MO
Norman Haerr	Taylor, MO
David McMurray	Burlington, IA
Bill Lay	Fayette, MO
Charles Kempf	Eldon, MO
Jim Whiting	Retired Farmer, Whiting, IA
Paul Soyke	US Army Corps of Engineers, Rock Island, IL
Heather Hampton-Knode	UMIMRA, Hillsboro, IL
George Gitter	US Army Corps of Engineers, Rock Island, IL
F. John Taylor	Virginia, IL
Clair Wilson	Winchester, IL
Buddy Arnold	US Army Corps of Engineers, Mississippi Valley Division, Vicksburg, MO
Mike Klingner	UMIMRA, Quincy, IL
Nancy Philippi	Michigan City, IN
Arlen Feldman	US Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
Chris Erickson	US Army Corps of Engineers, Kansas City, MO
Gary Dyhouse	US Army Corps of Engineers, St. Louis, MO
S. K. Nanda	US Army Corps of Engineers, Rock Island, IL

Attachment 2

**UPPER MISSISSIPPI RIVER SYSTEM  
FLOW FREQUENCY STUDY  
(UPPER MISSISSIPPI, LOWER MISSOURI, AND ILLINOIS RIVERS)**

**CORPS OF ENGINEERS GUIDELINES FOR THE OPERATION OF THE  
CITIZENS' PUBLIC INVOLVEMENT GROUP  
(ACCEPTED BY THE PUBLIC INVOLVEMENT GROUP (11/17/98))**

I. The Citizens' Public Involvement Group membership:

- (1) Will consist of volunteer parties interested in the public involvement aspects of the Upper Mississippi, Lower Missouri, and Illinois Rivers Flow Frequency Study.
- (2) Will be kept open and will welcome new members at all times.
- (3) Will have no limitation on the number of members.

II. Members of the Citizens' Public Involvement Group will be notified in advance of scheduled meeting dates and places. Meetings will be scheduled to coincide with State/Federal Study Team (Task Force) meetings or on an as-needed basis. All meetings will be open to the public.

III. The purposes of the Citizens' Public Involvement Group will be:

- (1) To represent the interested publics and provide information to the State/Federal Study Team on public concerns and issues pertaining to the Flow Frequency Study.
- (2) To relay to the Task Force the range of concerns the public has regarding the Flow Frequency Study.
- (3) To assist in developing the public involvement portion of the Flow Frequency Study.

IV. Meetings will be chaired by a representative from the Corps of Engineers, who will serve as the group spokesperson at the Task Force meetings.

V. The agenda for each meeting will be developed by the Citizens' Public Involvement Group Chairperson, with input from the Group. A preliminary agenda will be proposed at the end of each meeting. A draft agenda will be sent to Group members prior to each meeting. Comments about the agenda should be sent to the Citizens' Public Involvement Group Chairperson.

VI. Meeting minutes will be prepared in draft and final format by the Corps of Engineers.

VII. The Corps of Engineers will bear the cost of logistical arrangements for the meeting rooms for the Citizens' Public Involvement Group meetings. Group participants will be responsible for their own transportation, labor, lodging, meals, and incidental costs.

VIII. The Corps of Engineers will not be considered members of the Citizens' Public Involvement Group in a voting situation. However, should the Group vote result in a tie, the Citizens' Public Involvement Group Chairperson will vote to break the tie.

Attachment 3

IX. All decision-making authority regarding the management of the Flow Frequency Study will remain under the exclusive jurisdiction of the U.S. Army Corps of Engineers.

X. There will be no formal procedure from resigning from the Citizens' Public Involvement Group. Although a written notification would be desired, a member who chooses to resign may do so by not attending further meetings.

XI. This charter may be amended if a majority of the Citizens' Public Involvement Group members deem it necessary. A majority will consist of more than 60% of the members in attendance who have attended at least one previous meeting.

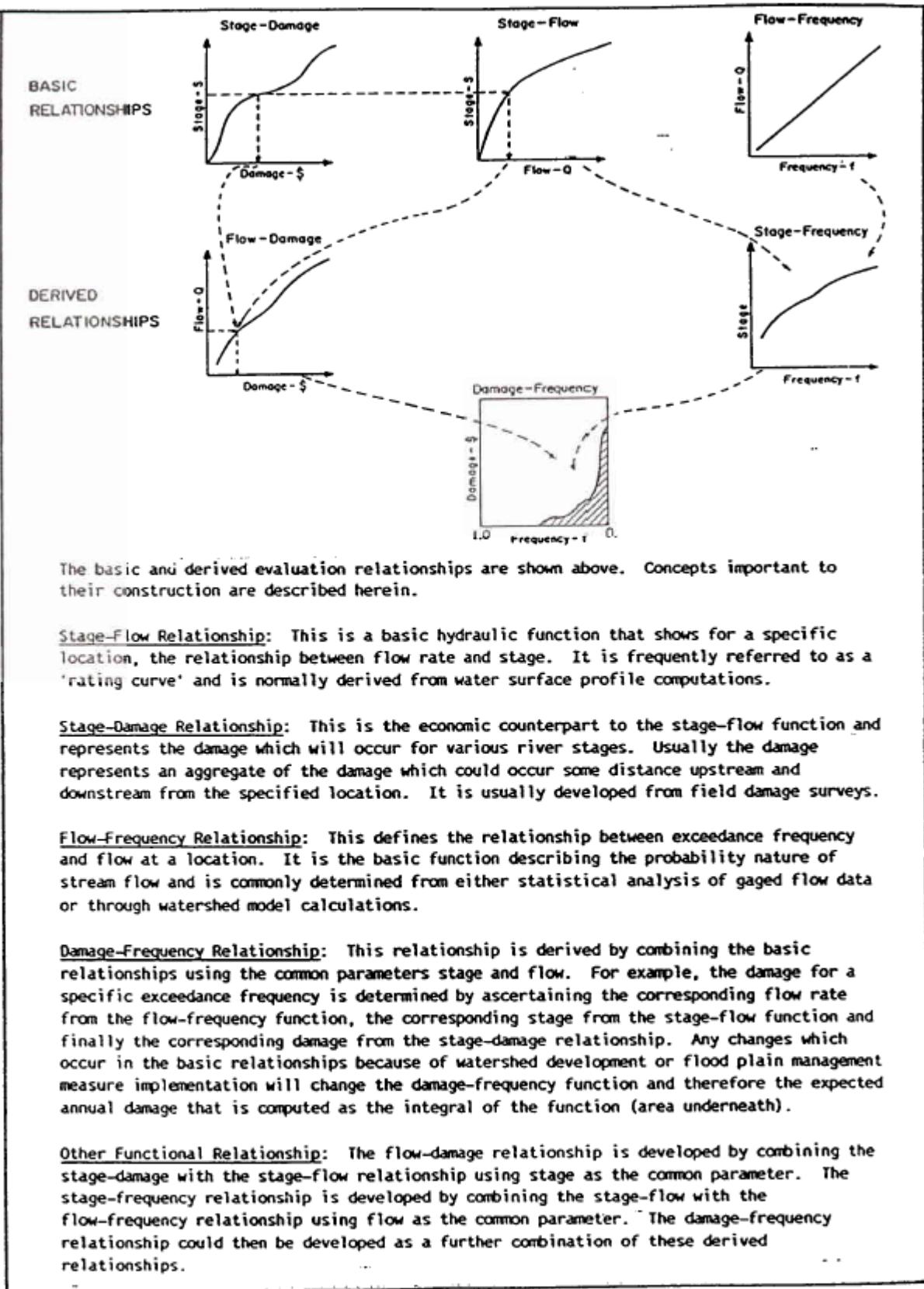


Figure 1-1 BASIC AND DERIVED RELATIONSHIPS

EXHIBIT 1



## Tasks in IWR Study

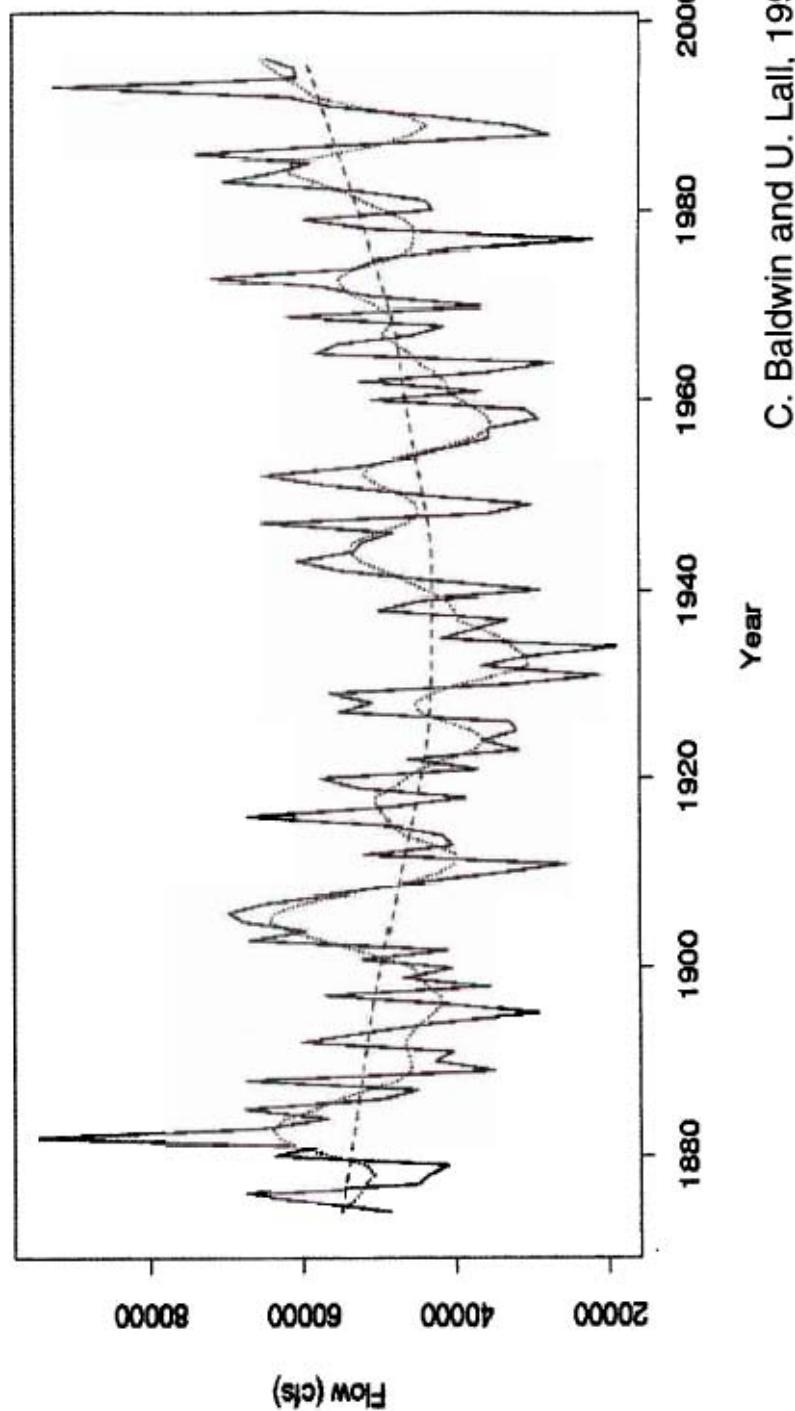
- ◆ Hydroclimatological Analysis of Mississippi and Missouri Basin Floods
- ◆ Non-Stationarity: Land Use Changes and Channel Modifications
  - ◆ Large Basin Hydrology Issues
- ◆ Integrating and Communicating Different Types of Uncertainty
- ◆ Implications of Uncertainty on Floodplain Management

Oct 2015

# Climate Trends in the Upper Mississippi River Basin



**Yearly Average of Daily Flow for Miss. R. at Clinton**  
Raw (solid); Lowess 10 yr span (dotted), 60 yr span (dashed)

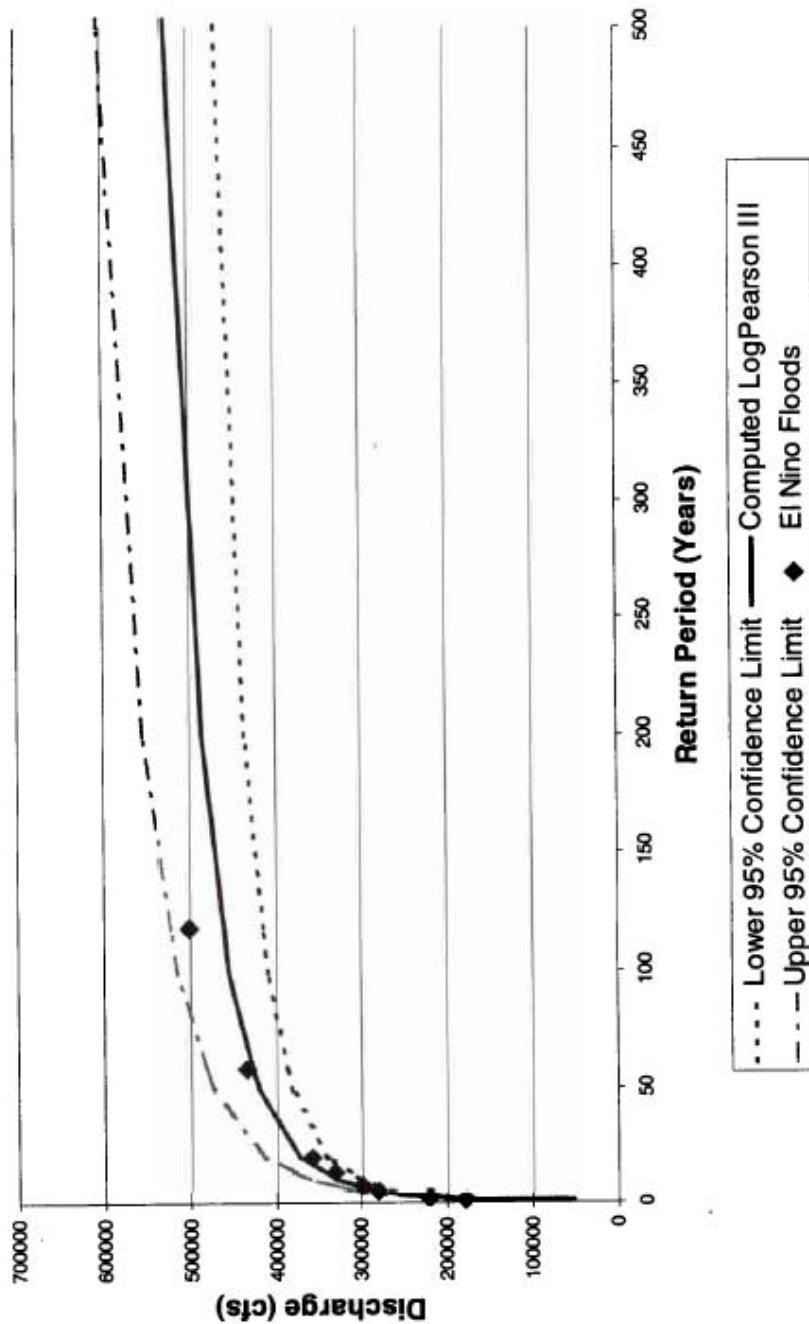


C. Baldwin and U. Lall, 1998



## 95% Confidence Interval for Probability Distribution (Log Pearson III)

Mississippi River at Hannibal, MO 1879-1996



El Nino Years: years following negative winter SOI of -1.0 or lower



## Climate Variability and Change and Flood Frequency Analysis

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- ◆ Flood frequency analysis generally assumes flooding events come from a stationary stochastic process
  - The presence of climate trends and change may negate the stationarity assumption
- ◆ Floods occurring as a result of different atmospheric mechanisms can be considered to belong to different populations
  - Major Mississippi floods may be the result of anomalous large-scale climate patterns



## Climate Variability and Flood Frequency

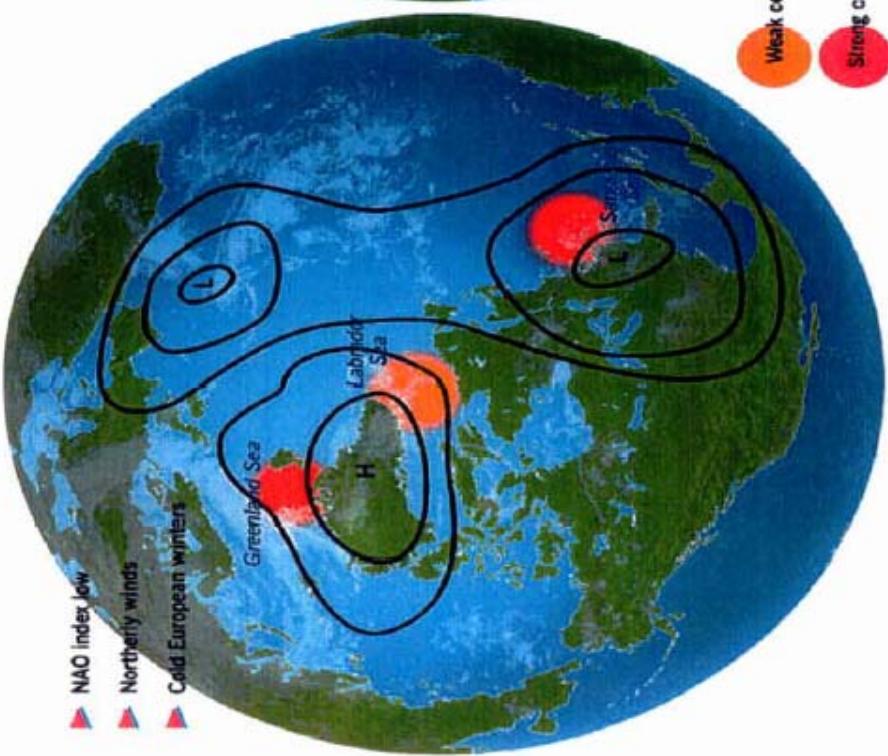


- ◆ What is effect of climate variability on annual flood probability distribution and uncertainty in flood estimates?
  - Fitted distribution including ENSO data may adequately estimate flood risk if frequencies of El Niño do not change
  - Alternative: Model flood events as data from two separate processes

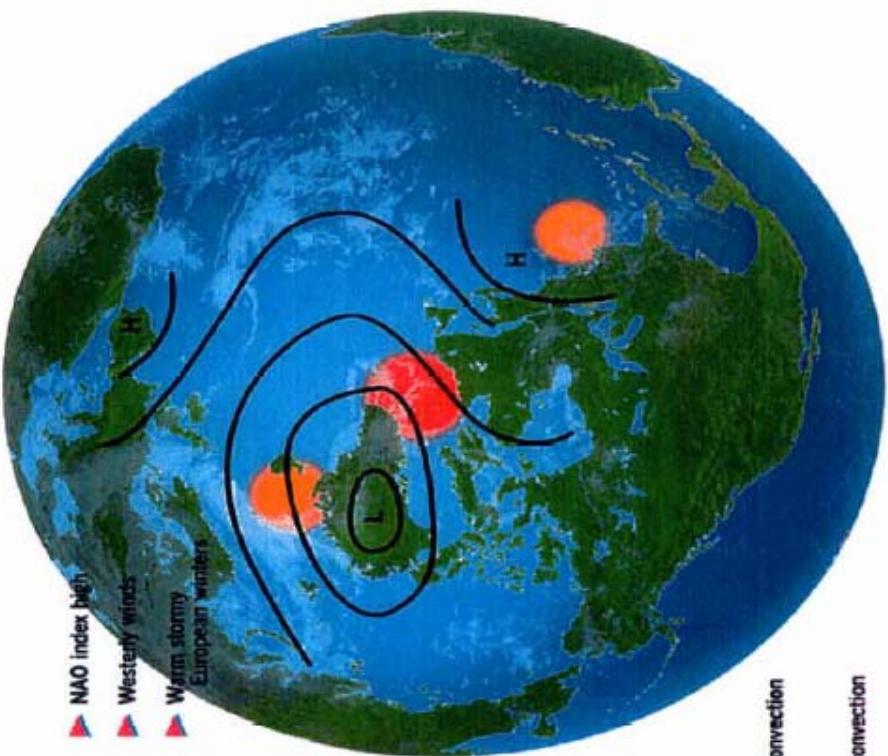
## North Atlantic Oscillation



Late 1960s



Early 1990s



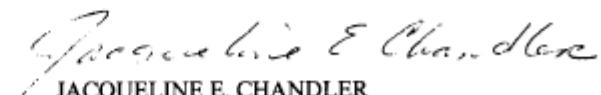
UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, & Illinois Rivers)  
Citizens' Public Involvement Group Meeting

Final Minutes (Approved December 1, 1999)

1. The Citizens' Public Involvement (P.I.) Group held its third meeting on April 28, 1999, in St. Louis, Missouri. A meeting agenda is attached. The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
2. The meeting began with Chairperson Paul Soyke (Corps of Engineers, Rock Island District) asking attendees to introduce themselves. An attendance list is attached.
3. The correction was made to the November 17, 1998 minutes number 12.l. from "SK Nanda said that he and Dave would talk and that the Corps would pay for such an expert." to "SK Nanda will discuss with Dave to determine if the Corps of Engineers would pay for an expert." The corrected minutes were approved and finalized.
4. In response to the unanswered November 17, 1998 meeting question, we will keep the abbreviated name of UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY, with the rest of the title to read in parentheses (Upper Mississippi, Lower Missouri, & Illinois Rivers).
5. Discussion of independent technical expert issue/charter.
  - a. David McMurray reported on the letter asking for an independent specialist to advise the group on the assumptions made in the model on its relative impacts, flood frequency and other impacts.
  - b. Legally the Corps of Engineers can not hire someone who represents another person's interest. But the Corps is providing an expert from the Corps, Arlen Feldman, and has drafted a charter for his participation. Arlen is the Chief of the Research Division at the Corps of Engineers Hydrologic Engineering Center in Davis, California.
  - c. Charter for Arlen Feldman was passed out and approved. (See attached charter.) Bill Lay said that they needed someone to help them with the wording on proposals, as well as content to what would be reasonable and acceptable. He would also like to have studies that will help solve certain problems identified. Arlen said that he was comfortable helping to identify items and solutions to resolve problems. Paul added the following sentence to the Charter at the group's request: "Provide advice to the group on studies that might be required to address the group's issues." David McMurray asked Arlen if he was comfortable playing the devil's advocate, to which Arlen replied that he was, and that he was open to pursue any problems that might arise.
6. Arlen Feldman presented an over view of the study. These are some of the comments, questions, and answers that accompanied that presentation. (See attached packet of slides that were the basis for the information received.)
  - a. There was considerable discussion relating to the historical flows. Arlen pointed out that we need an unchanging set of measured flows as a basis for the model. We can then decide what the underlying statistics are.
  - b. There were questions on the sensitivity to the assumptions and the rating curves. The Technical Advisory Group has varying opinions on the methods and estimates. We consider their opinions. There will be confidence bands around the curves.

- c. There was concern expressed on the policy implications that might result from this study. It is critical to have the best technical data.
  - d. There was a question about peak flows. The study will use annual peaks for the natural condition.
  - e. There was a question on how local levees will be considered and how much data is available. Arlen said that the study will use available data and assumptions on failures; they will be based on historical information, where it is available.
  - f. It is important to get information on the height and probable failure point of private levees. The aerial photos should show all of the levees. The group expressed concern that elevation data on many private levees were not available.
  - g. The study assumptions are critical to the results. Questions were asked about the assumptions and when they would be made. Arlen answered that we do not have a good answer yet. The best guess is that in September the cross sections will be done and in December the aerial photos will be complete with topography.
  - h. SK Nanda came into the meeting and expanded as follows: "We are behind in the study and we are not yet fully funded. What distribution statistics are to be used, etc. In January 2000 we will decide which method to use, Log Normal or the LP3. The aerial photographs will be completed by December 1999 which will include all levees, Federal and private. This information will be incorporated into the hydrological model. The topography, local input, etc., will be gathered after March 2000. With this information we will see where the water level is when the levees fail. For private levees we depend on how the conditions worked in the past. We are still working on what our assumptions are as to when to fail the levee."
  - i. Concern was expressed about the accuracy of topography. SK Nanda responded: "The accuracy we will maintain is in inches. Data should be fairly accurate. Aerials taken after snow melt and before spring flooding maintain data within .6 foot accuracy. 90% of the time we should be within a foot."
7. There is a need to discuss public input for the study process. Paul Soyke asked that for the next meeting that the P.I. Group members think about what kind of Public Meeting format we wish to pursue. Different formats will generate different types of outcomes. We need to educate the public as well as get the public's input. What types of meetings should we plan? Formal, workshops, open houses, what will be the most beneficial? The Corps of Engineers will be sending out information to the P.I. Group, then the group could send out a survey and forward the results to us. The public meeting is currently scheduled for the summer of 2000. We will present the public meeting format at the November 1999 meeting.
8. April 29<sup>th</sup> Report to Task Force: Paul Soyke lead the discussion; recommendations from the group are as follows.
- a. What should we recommend about the failure issues? Should we ask for information by mail, use news media? We will mail out this information by the end of summer. We need to know where failure of levees occurred and in what levee districts.
  - b. We should get a letter to land owners and local offices asking them to come to meetings or to send us the information about levee elevations and failures.
  - c. We need to open the channels of communication by being accessible to the county offices and by use of the Districts websites.
  - d. Questions that we need to ask: What elevations are the levees, and where does the levee fail? How does a levee fail? If it overtops is that failure? If it breaches is that failure?

- e. We need a list of variables that go into the model. We need to know what agencies and regulations are involved and the effects of those regulations on the model.
- 9. The following was agreed to as the presentation to the Task Force:
  - a. Added to Technical Advisor Charter "Provide advice to the Public Involvement Group on studies that might be required to address the group's issues."
  - b. Need to be able to explain the trends, if any, and the cause of trends.
  - c. By the next meeting, need to understand the assumptions and the impact of these assumptions.
  - d. The distribution is a critical assumption and the impact of that assumption should be shown.
  - e. The final documents need to show the uncertainty bands.
  - f. The group was concerned with the assumptions to be made on levee overtopping. We will be working with the group and with the districts to identify the issues and get data on private levees.
  - g. Need a list of the variables with sensitivity and accuracy.
  - h. Looking at how various agencies will use the results and the impacts.
  - i. Working on designing public meetings.
- 10. Paul introduced Dennis Hamilton, who is the new project manager for the study. SK Nanda introduced Earl Eiker, the Chief of Hydrology in Corps HQ.
- 11. The agenda for the next meeting will include discussion about assumption factors, failure of levee overtopping, and the public involvement meeting process. As usual, the agenda will be submitted to the members for their comments.
- 12. The next Public Involvement Group meeting proposed agenda and format will be sent to all group members along with the meeting announcement. The next meeting is tentatively set for November 1999.



JACQUELINE E. CHANDLER  
Acting Recording Secretary

Attachment

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**  
**April 28, 1999**  
**1 p.m. - 5 p.m.**

**Agenda**

- |       |  |  |
|-------|--|--|
| I.    | Welcome  | Paul Soyke   |
| II.   | Discuss/approve November 1998 meeting minutes  | Paul Soyke/P.I. Group  |
| III.  | Respond to unanswered November 1998 meeting questions/issues<br>RE: Study title change: assure major rivers in the study are evident in public documents | Paul Soyke   |
| IV.   | Discuss independent technical expert issue/charter   | Paul Soyke/<br>Dave McMurray/<br>Arlen Feldman<br>P.I. Group |
| V.    | Present overview of the study<br>Plan of study, including assumptions<br>Progress to date<br>Potential impacts/issues                                    | Arlen Feldman  |
| VI.   | Discuss public input into the study process  | Paul Soyke/<br>Arlen Feldman                                 |
| VII.  | Discuss April 29 report to Task Force  | Paul Soyke/P.I. Group  |
| VIII. | Develop agenda for next meeting  | Paul Soyke/P.I. Group  |
| IX.   | Discuss District-specific flow frequency questions   | District representatives/<br>P.I. Group                      |
| X.    | Adjourn  | Paul Soyke   |

Attachment 1

### **Attendance List**

Upper Mississippi River System Flow Frequency Study  
(Upper Mississippi, Lower Missouri, & Illinois Rivers)  
Citizens' Public Involvement Group Meeting  
April 28, 1999

Arlen Feldman	US Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
Dave Ford	MN DNR – Waters, St. Paul, MN
Barb Naramore	UMRBA, St. Paul, MN
Peggy Smart	Farmer, Tebbetts, MO
Heather Hampton-Knode	UMIMRA, Hillsboro, IL
Clair Wilson	Winchester, IL
David McMurray	UMIMRA, Burlington, IA
Paul Soyke	US Army Corps of Engineers, Rock Island, IL
Jacque Chandler	US Army Corps of Engineers, Rock Island, IL
Norman Haerr	Taylor, MO
Seeley Lodwick	Wever, IA
Gordon Dahl	Sloan, IA
Jim Whiting	Retired Farmer, Whiting, IA
Bill Lay	Fayette, MO
Mike Klingner	Quincy, IL
Joseph Gibbs	Columbia, MO

Attachment 2

## Charter

### **Advisor to Citizen's Public Involvement Group Arlen Feldman**

The advisor to the Citizen's Public Involvement Group for the Upper Mississippi River System Flow-Frequency Study would be expected to explain to the Public Involvement Group at what points in the study they will have input and how that input will be used. Throughout the study, the advisor would also be expected to keep the Public Involvement Group informed as to the assumptions that are or need to be made in the model and the time frame in which they are to be made. This will require close coordination with the Technical Committee and the Public Involvement Group.

We would then expect the advisor to discuss the assumption and any alternate assumptions, describing the impact of those assumptions and the differing potential outcomes. As much as possible, the advisor should also help identify the impact of existing regulations as they might impact the results of the assumptions or the model development.

The advisor should function as a quasi-independent advisor to the group within the scope of this charter and the limits of technical expertise. He should also provide advice to the group on studies that might be required to address the group's issues. 7/14/99

The advisor should explain the policies and policy differences that may play into the assumptions or the development of the data or the models.

The advisor would be expected to assist the chairman of the Public Involvement Group to present issues or concerns to the Task Force, Technical Committee, or others as appropriate.

It is important that the Public Involvement Group have input into the process at the appropriate times and that their input be based on knowledge of the assumptions and the differing outcomes of varying assumptions. The study will be well served if the public understands the process and results.

Attachment 3

**Upper Mississippi, Illinois, and Lower  
Missouri River System  
Flow Frequency Study**  
**Public Involvement Session: April 28, 1999**

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Arlen Feldman  
Hydrologic Engineering Center  
U.S. Army Corps of Engineers  
Davis, CA

**Introduction**

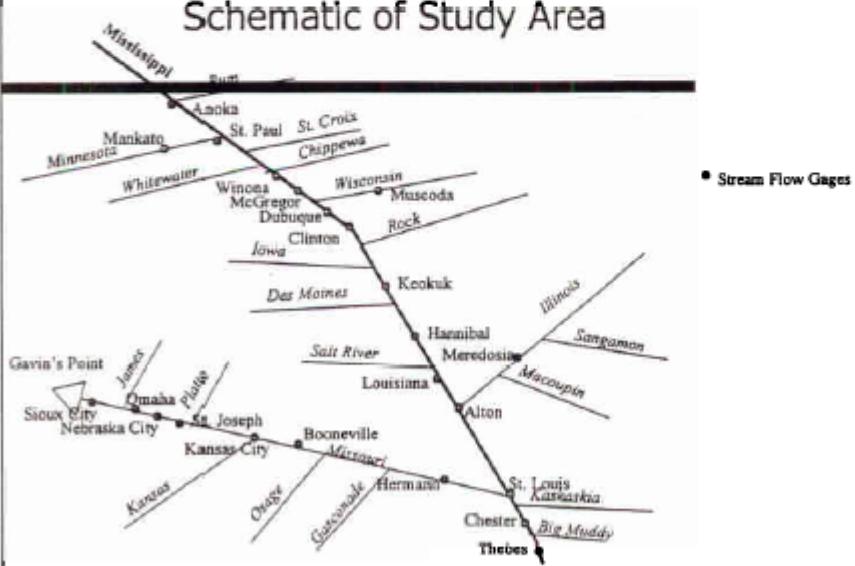
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- Why Study the Upper Mississippi
- How to Perform the Study
  - Address Unregulated Flow Vs. Existing Flow Conditions
  - Flow-Frequency Analysis (Distribution Methods)
  - Large-Flood Prediction
- Use of the Study Results

## Why Study the Upper Mississippi?

- Original Study - Bulletin 17B Guidelines
  - Average 46 Years of Data for 287 Gages
  - Watershed Areas < 3,000 mi<sup>2</sup>
- More Data
  - 22 More Years of Data
- Large Watershed Areas
  - Mississippi River at St. Paul, MN
  - Watershed Area = 36,800 mi<sup>2</sup>
- New Analysis Methods/Computers

Schematic of Study Area

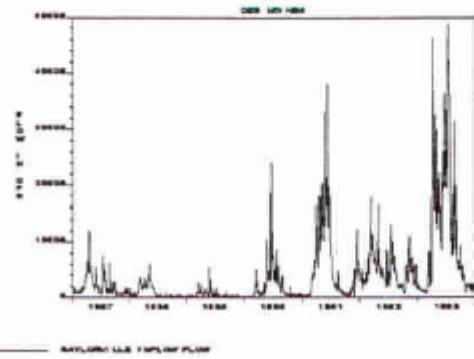


## Overview of How to Perform Study

- Develop Unregulated Flow Records
- Unregulated Flow Frequency
- Develop Regulated Flow Records
- Relationship between Regulated Flow and Unregulated Flow
- Regulated Flow Frequency

## Period of Record - Existing System

- Basin Gage: Mixed Sequence



## Unregulated Flow

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- Have:

- Natural Flows
- Regulated Flows (Dams)
- Levees
- Urbanization

- Want:

- Stationary
- Homogeneous
- Unregulated Flows POR
- Existing-Condition Flows POR

## Create Unregulated Data Set

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- Simulation

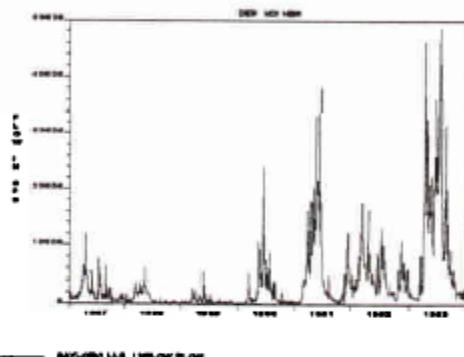
- Period of Record
- Events

- Unregulated Data May Behave as a Statistical Distribution

- Interpolate
- Extrapolate

## Period of Record - Unregulated Flows

### ■ Saylorville Gage



## Flow Frequency - Plotting Position

### ■ Plotting Position - Probability of an Individual Event

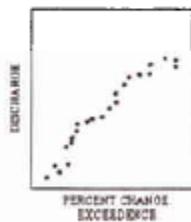
*Cunnane Plotting Position*

- exceedence probability = [rank of event (descending order)] divided by [number of values in the series plus adjustment]

### ■ Probability of Individual Events

### ■ Length of Observed Record

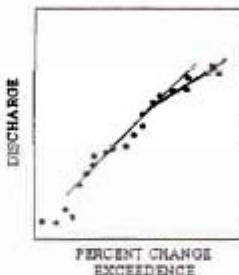
### ■ Unbiased



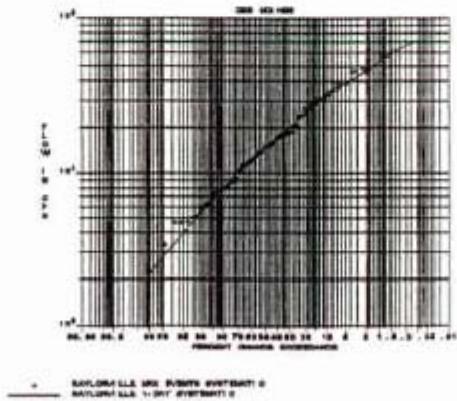
## Flow Frequency - Analytical Distribution

### ■ Log Pearson Type III (LP3) Example

- Mean
- Standard Deviation (slope)
- Skew (curvature)
- Outliers?



## Flow Frequency Plot - Unregulated Flow



## **HEC and TAG Analysis**

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- TAG: Technical Advisory Group
  - Leaders in the Profession
- Determination Best Estimation/Distribution Methods for Unregulated Flows
- Methods: LP3, Log Normal, Generalized Extreme Value, ...

## **Existing Conditions - Regulated Flow**

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- Missouri River Report - "Master Plan"
- Levees
- Dams
- Land Development - Urbanization

## River Hydraulics

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### ■ UNET Model

- River Geometry
- Roughness
- Flow-Energy/Momentum Calculation



## Levees

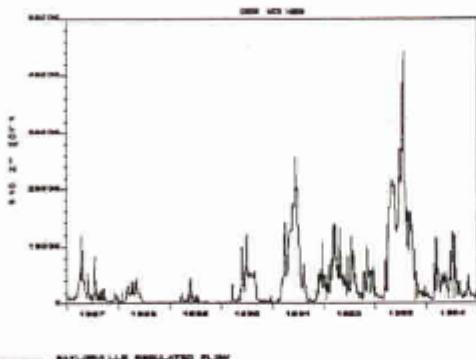
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### ■ What to Assume??

- Failure at what stage?
- Flood Fighting
  - Increase Levee Height?
- Assume Failure When Overtopped
- Also Simulate Without Failure

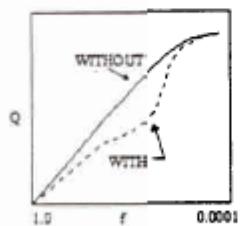
## Period of Record - Existing System

### ■ Saylorville Gage

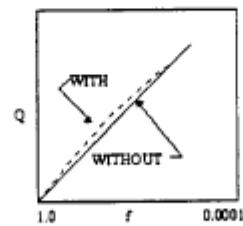


## Possible Impacts of Existing Conditions on the Flow Frequency Curve

EFFECT OF FLOOD CONTROL RESERVOIR

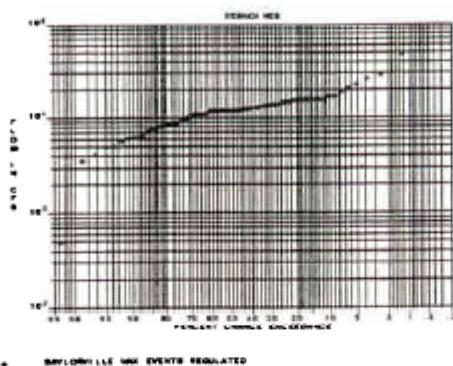


EFFECT OF LEVEE AND FLOODWALL



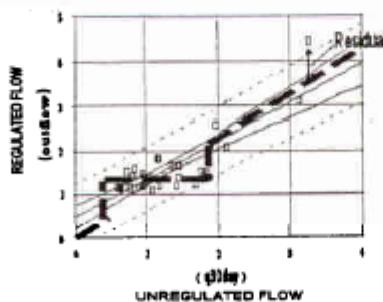
## Frequency Plot - Existing System

### ■ Plotting Positions



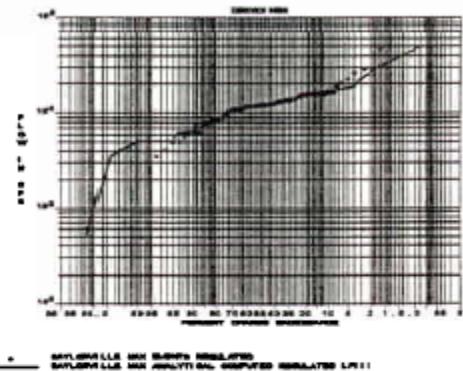
## Relation between Regulated and Unregulated Flow

Plot of Fitted Model



- **Important Question:** How to Handle Large Floods Not in the Period of Record?

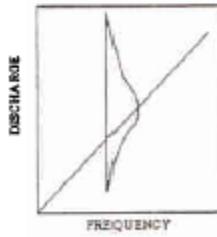
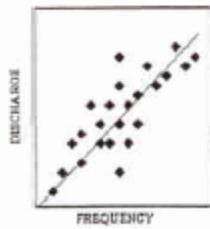
## Regulated Flow Frequency Curve



- Important Question: How to Extrapolate?

## Risk and Uncertainty

- Limited Sample of Mother Nature
- Correct Distribution?
- Climate Change?



## Questions/Problems

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- Levee Failure Criteria?
  - Fail When Overtopped
- Levee Certification?
  - Corps Study Produces H&H Information
  - Risk and Uncertainty
  - Case-by-case Basis When Requested
- Floodplain Maps?
  - Corps Study Produces Flood Profiles
  - UNET Smoothes Data at Confluences
  - FEMA to do Mapping Study

## Conclusion

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- Bulletin 17B Guidance Still Good
- Period of Record Simulation
  - Regulated Flow
  - River Hydraulics (Levees)
- Status
  - Have Most Unregulated Flow Records
  - Ready for Regulated Flow Data
  - Test Regulated-Unregulated Methods

**UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY**  
**(Upper Mississippi, Lower Missouri, & Illinois Rivers)**  
**CITIZENS' PUBLIC INVOLVEMENT GROUP MEETING**  
**December 1, 1999**

**Final Minutes (Approved 6/28/00)**

1. The Citizens' Public Involvement (P.I.) Group held its fourth meeting on December 1, 1999, in St. Louis, Missouri. A meeting agenda is attached. The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
2. The meeting began with Chairperson Paul Soyke (Corps of Engineers, Rock Island District) asking attendees to introduce themselves. An attendance list is attached.
3. There were no additions or corrections to the minutes (pending approval) of the April 1999 meeting. Bill Lay moved that the minutes be approved as final; Peggy Smart seconded the motion. The P.I. Group voted unanimously to approve the motion. A copy of the final minutes was mailed to each P.I. Group and Task Force member. The final minutes can also be viewed under "Flow Frequency Study" on the Corps of Engineers' web page (<http://www.mvr.usace.army.mil/>).
4. The P.I. Group began to discuss the upcoming public meetings, which are *tentatively* scheduled for the early spring of 2001. It is important that the P.I. Group members understand the study so they can explain it to the publics in their areas. There are several decisions that the Group will have to make about designing the public meetings. Some of those decisions include the following:
  - a. **What is the purpose of the public meetings?** Paul Soyke, P.I. Group Chairman, stated that the study is not proposing a project and that the public cannot influence the results of the study. However, the public must be educated on what was done during the study and how the study results will impact an area. We need to explain how the study was done, that the Public Involvement Group has had the opportunity to have input, and that the State and Federal agencies (Task Force) also have provided input. Although some P.I. Group members do not feel like they have provided input yet, Paul said that their attendance and comments at the P.I. Group meetings have been effective and will continue to be effective.
  - b. **What kind of information should be given to the public?** There is concern that the public will not understand the study. Information must be presented in understandable formats. The P.I. Group discussed information that the public will be interested in and suggested that the information provided at the meetings include the following topics:
    - (1) Graphics, examples, history, why the study/changes are being made and are important, and what the impacts may be.
    - (2) Information on what will happen as a result of the study, if and how the study results will affect their flood insurance/PL 84-99 levee designation, and what happens next.
    - (3) The public will want to see a comparison between the old and the new frequency curves. It was suggested that USGS maps are present so the public can indicate where their area of interest is and then look at the frequency curves for that area.
    - (4) Prepare a list of how study results can be used; e.g., what happens next? How will future policy be affected? How will FEMA use the results? How will the results affect PL 84-99 and wetlands determinations?
    - (5) The public needs to understand the assumptions that go into the flood flow/stage frequency curves. The facts that are based on the assumptions will affect people's livelihoods. For example, there is

concern that policy could change – depending upon the assumptions – and could affect the curves and the public – businesses, communities, farmers, etc.

(6) How are unregulated flows factored in? How are high and low flows factored in? How is it coming together?

c. **What is the best way to give that information to the public?** Meeting formats include:

(1) Formal presentation (slides), followed by small group (breakout) discussions, ending with summaries given by each small group to the entire group.

(2) Formal presentation, followed by questions and answers.

(3) Presentation, along with various tables with maps of the various study areas.

(4) Combination of the above or other formats.

d. **Where should the meetings be held?** The current plan allows for one meeting in each of the seven involved states. Is one meeting per state enough? If not, how many are enough? If the budget does not allow for more than seven meetings, then should the meetings be held in the areas where the study results will have the greatest impact (e.g., from the Quad-Cities on down)?

e. **When should the meetings be held?** Depending on intent of meeting, suggest that they be held:

(1) as soon as possible if the public can provide input into assumptions.

(2) at the end of the study if we're only going to give information and if decisions are already made.

5. The next few paragraphs highlight other public meeting discussion items. Many of the P.I. Group members feel that the public may have a lack of interest in this study, which could be translated into a lack of knowledge about the study. The public must be well informed about the meetings. Suggestions include:

a. Press releases with specific information about the study areas (e.g., what is considered a 100-year flood for each area?) should be sent well ahead of the public meetings.

b. In the meeting announcement, it would be helpful to send a comparison of profiles showing the levees with flood protection shown. (*NOTE: This may be too much information for an announcement given the large study area; however, possibly examples could be shown in the announcement and maps of the entire study area could be available at the public meetings.*)

c. Congressional staffers should be briefed before the public meetings take place so they understand the study and the study results.

6. The public will want to know what will happen as a result of the study and what the results will be used for. Study results will provide an economic evaluation of new/improved floodplain. Currently, we have good topographic data, but if the data are off 6 inches, farmers have lost crops.

7. There are 110+ levee districts in Missouri which will be affected by the study; public infrastructure will be involved.

8. If a levee is low, can it be raised so drainage districts can get the Government's help (through the PL 84-99 program)?

9. What will FEMA do with the results of the Flow Frequency Study?

- a. Update the flood rate inundation maps.
  - b. FEMA will be concerned with how the study will affect the public (flood insurance) and the implications of what flood level the land is (10-year, 50-year, etc.).
  - c. FEMA will map the stage frequency curves along the rivers. The curves will be given to FEMA for mapping the counties. FEMA is interested in Digital Terrain Models (DTMs). See paragraph 17.b. for a further explanation of DTMs.
  - d. FEMA *may* hold public meetings after ours, although those meetings would be a separate process. At those meetings, FEMA would address what the public has heard and the public would be given the chance to comment on floodplain maps.
10. The bottom line of the study: Flood profiles will be updated along studied rivers.
11. The P.I. Group requested that the Corps (Paul Soyke and Sue Simmons, with input from others) send a proposed public involvement plan for the public meetings to them and they will comment on and provide input to that plan. The plan will be sent to members before the next P.I. Group meeting and will be discussed at that meeting.
12. The discussion then switched to the assumptions used in the study. Arlen Feldman, Chief, Research Division, of the Corps of Engineers' Hydrologic Engineering Center in Davis, California, and advisor to the Citizens' P.I. Group, stated that the Technical Advisory Group and the Interagency Advisory Group are reviewing a report summarizing the assumptions to be used in the study
13. Arlen then discussed several components of the study: unregulated flow frequencies, regulated flows, terrain data, river hydraulics and levees, and stage frequencies and FEMA. A summary of these discussions is included in the following paragraphs.
14. Unregulated flows are those natural flows that are unregulated/without dams. Many issues are included when studying unimpaired flows:
- a. Climate change; i.e., have the meteorological forces producing the rain, snow, etc., changed? A study undertaken by the Corps of Engineers' Institute for Water Resources shows that there are some apparent trends in precipitation in parts of the basin, but we can't say that with enough confidence to warrant changing from current methods (Bulletin 17B). The study looked at trends in daily precipitation and streamflow data. For example, some precipitation gages in Iowa showed apparent trends, but those trends were not reflected at the streamflow gages.
  - b. Changes in flood frequency: No comparisons of old and new flood frequency curves have been made yet; preliminary analyses indicate there will be increases in some areas and decreases in others.
  - c. Historic floods: The Technical Advisory Group has made the decision not to use historic flood data because there is a long systematic record of gaged flows, and historic flood peaks are not as accurate as the gaged records. Also, the long systematic record greatly reduces the weighting given to the historic events in the frequency analysis procedure.
  - d. Mixed populations; i.e., floods used to compute the frequency curve should be from the same population. (Population is defined as the group of precipitation and runoff phenomena that produce the flood. Examples of populations used in prior studies are snowmelt floods, rain floods, ice-jam floods, and hurricane floods.) Arlen provided an example of a mixed population analysis on the Missouri River for summer (rain) and spring (snowmelt and rain) floods. (See attached Figure 1.0.) The Corps of Engineers is

finalizing this study now. The resulting mixed-population flood frequency curve is a best estimate using both curves; i.e., use the summer curve to where it crosses at spring and then use the spring curve.

e. Unregulated/natural flows are used in the flood frequency analysis to obtain an understanding of the basic underlying flood frequency relationship. Natural streamflows show good conformance to analytical (e.g., Log Pearson III) distributions, whereas regulated streamflows have discontinuities due to reservoir regulation which do not fit a regular analytical relationship. The parameters typically used to describe a flood frequency curve are the mean (average), standard deviation (slope), and skew (curvature). Because these parameters are not known (they are only estimated from the observed streamflows), the Corps performs a risk and uncertainty analysis to better estimate their variability.

f. Who performs quality control and who makes the decision if non-standard methods are used? The Federal Guidelines (Bulletin 17B) recommend the Log-Pearson Type III analytical distribution and provide for the use of mixed populations and historic-flood weighting. However, provision is made to use other methods if they can be shown to be appropriate. The initial review of the results will be by the Corps of Engineers office and then the results will go up the chain for review. The results will then be reviewed by an independent technical group, the Interagency Advisory Group (Task Force), the Technical Advisory Group, and ultimately released for public comment.

g. Distribution selection: The Technical Advisory Group (TAG) looked at several different analytical distributions, data sets, and parameter estimation methods in an effort to find the distribution which best fits the data. The data sets were divided up in different ways to analyze the suitability of different distributions; e.g., a 100-year record may be divided into half, thirds, etc. The TAG did not find differences significant enough to deviate from using existing guidance (17B). Arlen provided an example of distribution selection on the Missouri River. (See attached Figure 2.0.)

(S. K. Nanda, Task Force Chairman, joined the P.I. Group meeting for a few minutes. He reiterated that the study team has been looking at various distributions to fit analytical frequency curves. However, all the different distributions studied showed the results within 5 to 10 percent of the 17B procedure. He also stated that the present study shows that the reservoirs do not have as large an impact on the Mississippi River as assumed in the 1979 profiles, but they have a large impact on the Missouri River.)

h. Arlen reviewed a Memorandum for Record dated July 22, 1999, from Dr. David Goldman, a Hydraulic Engineer at the Hydrologic Engineering Center in Davis, California, and a Task Force member. Subject of the memorandum: "Summary of Technical and Interagency Advisory Group Recommendations for Upper Mississippi Flood Frequency Study." The memorandum (also introduced to the P.I. Group as Figure 3.0) is a summary of the assumptions that the Task Force is considering in the study and reads as follows:

1. The methods outlined in the federal guidelines for computing the likely annual flood, such as the 1/100 year flood, were found to be adequate.
2. Consistent estimates of likely annual flood values will be obtained by smoothing estimates between gages based on drainage area. For example, estimates of the (1/100) year flood will increase in a logical fashion between gages given the total drainage area to a river cross-section of interest.
3. Historic information will not be used in estimating the likely annual floods because; the observed period of record of over 100 years is sufficiently long to obtain reasonable estimates; the historic information has not been observed accurately or consistently throughout the study area, and this information is not relevant to current conditions given land use and channel changes over the period of record.
4. Unregulated daily flow will be simulated in the period of record analysis and analyzed to obtain the likely annual daily maximum flood values. The likely peak annual flows can be obtained from simple regression relationships between peak and daily flow values.

The Group was concerned about the word “smoothing” (paragraph h.14.2. on page 4). S. K. Nanda said that smoothing would be used to ensure regional consistency of logical relationships – like flows have to increase as they go downstream – and there would be no discontinuity at the District boundaries.

i. St. Louis District should have the study of the unregulated flow frequency curves completed by December 31, 1999. (Note: Subsequent to the December 1, 1999, meeting, the St. Louis completion date of the unregulated flow frequency curves has been changed to March 30, 2000.)

15. Arlen's next topic of discussion was regulated flows.

a. Reservoirs were added when looking at the regulated flows.

b. Arlen showed a graph of regulated vs. unregulated peak flows at Hannibal. (See attached Figure 4.0.) The regulated vs. unregulated relationship for a wide range of flows is necessary for use in converting an unregulated flow frequency curve to a regulated flow frequency curve.

c. Every applicable gage will be adjusted from unregulated to regulated flow frequencies.

16. Arlen and S. K. discussed climate and land use changes for regulated flows.

a. The study team looked at what changes occurred over a 100-year period and found that over that period there were no significant changes related to climate and land use. There is a misconception by the public that land use makes a significant change in the flows of large river basins like the Mississippi and Missouri Rivers. While land use changes do affect the runoff for the immediate area, land use changes are not a major factor on large river stations on the Mississippi and Missouri Rivers. This needs to be stressed at the public meetings.

b. S. K. commented on the impact of land use on hydrology. Are flows changing at gages as a result of land use? Urbanization has a localized impact. A report by the Corps of Engineers' Institute for Water Resources shows some small changes, but overall no big changes. This report will be made available to the P.I. Group.

c. S. K. discussed the impact of wetlands. There are two ways to determine flood frequencies for a watershed: deterministic and stochastic. The deterministic method of study needs to incorporate watershed characteristics such as land use, infiltration, etc., to compute the flood runoff for a given frequency storm. The statistical method looks at the past flood peaks in the period of record (over 100 years of events for the Mississippi River) and looks at the mean and standard deviation and skew coefficients to predict flood frequencies. We are using the latter for the Upper Mississippi River System Flow Frequency Study. A 1994 White House Task Force concluded that wetlands have an impact on 2-5-year floods, but a smaller impact with large floods (e.g., 100-year floods).

d. At the next P.I. Group meeting, S. K. will ask someone from the Omaha District to be present to show the difference between the actual 1993 flood and what it might have been with other reservoir operation plans and initial storages. (This is in response to a concern about the Missouri River Master Plan.)

17. Arlen then discussed terrain data.

a. The Corps is currently checking terrain data; e.g., elevations. The study team will use that information to cut cross sections for river hydraulics. The data for the Mississippi and Illinois Rivers will be completed by December 31, 1999, and for the Missouri River by March 2000. (Note: subsequent to the December 1, 1999 meeting, the terrain data contractor revised the Mississippi River delivery date to February 29, 2000.)

b. The Corps Districts are verifying Digital Terrain Models (DTMs). In 1998, a contractor flew the entire study area and is providing a DTM for each of the five involved Districts (St. Paul, Omaha, Rock Island, St. Louis, and Kansas City) showing a grid of elevation points (including levee, railroads, and roadways).

Although each District is responsible for handling the data as it wishes, Rock Island District plans to document each levee in the District and identify these levees in the DTMs. Other Districts are encouraged to do likewise. The data from the DTMs are incorporated into the UNET Models. St. Louis District has completed building its UNET Model with the new DTM data. All major and minor levee systems will be incorporated into the UNET Model(s).

NOTE: After the December P.I. Group meeting, a question was directed to Paul Soyke via email concerning the April 1999 minutes. The person asking the question was told: "...the accuracy of the ground data for the study was going to be based upon 4 foot contour mapping with an accuracy of plus or minus 2 feet. This is far less accuracy than the 0.6 feet promised by SK Nanda at the April 28, 1999, meeting...."

Paragraph 6.i. of the April 1999 minutes states: "Concern was expressed about the accuracy of topography. SK Nanda responded: 'The accuracy we will maintain is in inches. Data should be fairly accurate. Aerials taken after snow melt and before spring flooding maintain data within .6 foot accuracy. 90% of the time we should be within a foot.'"

The following is the response to the question, which reflects the April 1999 statement. "The data was designed and compiled so that **spot elevations** on well defined features would be **within 0.67 feet of the true position** (as determined by a higher order method of measurement) 67% of the time. The 0.67 feet comes from ASPRS Class 1 Standards as stated in the Corps EM on Photogrammetry. **It is approximately 1/6 of a contour (4 foot contour). Contours are not well defined features and they should be accurate to 1/3 of a contour** (approx. 1.33 feet). The data collected was designed for use in collecting cross section data for H&D design only. This was a decision at HQ. The level of detail in the elevation data was kept to the minimum for this purpose. **Mass points and breaklines to depict roads, railroads and levees were specified.** Other features may not be as detailed. This was done to maximize the data extent with the funding made available."

c. If a P.I. Group member has a particular levee that he/she wants to assure is included, he/she should notify the District within which the levee is located. This request also was included in the December 1999 newsletter.

d. If a P.I. Group member is interested in a particular Digital Terrain Model levee elevation or profile or in viewing the DTM data, he or she may contact Sue Simmons, Rock Island District, Corps of Engineers, by telephone at 309/794-5573, fax at 309/794-5883, or email at [suzanne.r.simmons@usace.army.mil](mailto:suzanne.r.simmons@usace.army.mil). Sue will coordinate requests with the appropriate District hydraulic modeler for the requested area. Additionally, local and regional planning authorities have Arc-View Spatial Analysis software, which may assist P.I. Group members in viewing DTM levee information.

18. Stating that the assumption for levee overtopping is important, Mike Klingner asked S.K. Nanda if we can assume that the levees will never be overtopped. This way, even if a levee District raises the levee system, then the flood profiles will not change. S. K. answered that levee overtopping assumptions will be discussed with the Interagency Group and the States and he will report at the next Task Force meeting.

19. The Corps of Engineers' Hydrologic Engineering Center in Davis, California, is conducting a wetlands-impacts study on floods and a report will be available when the study is completed. The Institute of Water Resources is conducting a study on impact of land use change on floods and a report will be available when the study is completed.

20. Arlen then discussed river hydraulics.

a. Cross sections, flows, and hydraulic parameters go into the UNET unsteady flow river model, which should be ready by the end of Fiscal Year 2000. The information will contain data on river lengths and

roughness across the width, not depth. Cross sections will be cut from the DTM data at about every half mile.

- b. The assumption is that levees fail at the top and no flood fighting is included in the levee height. This assumption was recommended by the Federal agencies and endorsed by the States
- c. Once the levees fail, water goes into storage only on the Mississippi River from Quincy, Illinois, on down. On the Missouri River, the water is treated as conveyed flow.
- d. Question: Can the study look at assuming no levees fail and then run another set of analyses? Answer: If funding is there and if the team can still meet the schedule, then it possibly can be done. However, this will be studied in the proposed Upper Mississippi River Basin Comprehensive Plan Study.
- e. Nicholas Pinter, a new member of the P.I. Group from the Geology Department of Southern Illinois University, asked that the following be included in the minutes of the meeting: trends in discharge and in stage should be looked at, as well as flows, as they relate to conveyance.
- f. **The P.I. Group's recommendation to the Task Force:** perform an analysis of frequency curves run with levees containing flows – no failure - on the Missouri and Mississippi Rivers.

21. The topic then changed to stage frequency. Arlen provided graphs (attached Figure 5) showing a river profile with regulated flow frequency and UNET-produced rating curve to determine the stage-frequency curve with uncertainty. The Flow Frequency Study produces stage frequencies along the rivers in the Upper Mississippi System.

- a. Flow and stage information for all floods at a location is used to develop a rating curve – this produces a fit best estimate rating curve. The best estimate rating curve is used with the regulated flow frequency curve to compute the regulated stage frequency curve. The regulated stage-frequency curve is used to determine the 1% value for FEMA maps.
- b. How many profiles will be developed? UNET will develop 2-, 5-, 10-, 25-, 100-, 200-, and 500-year floods. The Standard Project Flood (SPF) will not be developed or considered; however, the P.I. Group asked if the SPF could be included in this study. (Note: S.K. answered later that SPF profiles will not be developed in this study.)
- c. Several questions came up:
  - (1) Can there be an indication of the SPF between the lower valley vs. the upper valley?
  - (2) What is the equivalent of the SPF?
  - (3) What is FEMA going to do? Answer: A separate effort will be required to perform FEMA mapping; this is currently under discussion by the Corps of Engineers and FEMA.
  - (4) When you run a model and the existing Federal levee is shown overtopped, is it defined as a floodway? Answer: the area behind the levee is assumed to be a conveyance area on the Missouri River; and a storage area on the Mississippi River. If the levee is in the floodway now, nothing can be done. This study will not change the floodway. The UNET is modeling from bluff to bluff.
- d. Not moving the floodway boundary will raise/lower elevations if they change.

22. Many P.I. Group members prefer to meet in March rather than in April. If scheduling allows, we will try to do that. However, it is important to try to meet before the Task Force meetings. A P.I. Group member also expressed a concern that some members are not attending the P.I. Group meetings because the meetings are always held in St. Louis and traveling to St. Louis involves an expense on many members' parts. He suggested meeting Kansas City. S. K. suggested that we take a poll of the P.I. Group members to determine

the best location for our meetings to see if the meeting location was keeping members away. Paul Soyke brought up the concern that if members who have not participated since the study began coming to meetings, and if members who have participated since the study began stop coming to the meetings, all continuity of the group will stop. Although P.I. Group members who have not previously attended are welcome to attend all future meetings, it is important that those who have attended and who have an understanding of the study to date continue to attend the meetings. Later in the day we asked the P.I. Group members where they would prefer to meet – St. Louis or Kansas City. Of the seven members who responded to our location question, four stated that they preferred St. Louis; one preferred Kansas City (who was the gentleman making the initial request); and two said either location was acceptable. However, we will send out a questionnaire asking each P.I. Group member of his/her meeting location preference (St. Louis or Kansas City) and will discuss the results with the Task Force.

23. Since there was no Task Force meeting the day after the P.I. Group meeting, these draft minutes will be sent to the Task Force. (When the Task Force meets the day after the P.I. Group meets, then a meeting summary is given at the Task Force meeting and the Task Force does not receive a copy of the minutes until they are finalized.)

24. An agenda will be sent to the Citizens' Public Involvement Group members before the next meeting and the P.I. Group will be asked to comment on the agenda items. A proposed public meeting plan will be sent with the agenda.

/s/

SUZANNE R. SIMMONS  
Recording Secretary  
Citizens' Public Involvement Group

Attachments

**UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**  
**1 December 1999**  
**10 a.m - 5 p.m.**

**Agenda**

XI.	Welcome	Paul Soyke
XII.	April 1999 meeting minutes discussion/approval	Paul Soyke/P.I. Group
XIII.	Public meeting planning	Paul Soyke/P.I. Group
XIV.	Study progress	Arlen Feldman
	Assumptions	
	Federal/non-Federal levee inclusion	
	Potential impacts/issues	
XV.	Report to Task Force	Paul Soyke/P.I. Group
XVI.	Agenda for next meeting	Paul Soyke/P.I. Group
XVII.	Adjourn	Paul Soyke

Attachment 1

### **Attendance List**

Upper Mississippi River System Flow Frequency Study  
(Upper Mississippi, Lower Missouri, & Illinois Rivers)  
Citizens' Public Involvement Group Meeting  
December 1, 1999

Sue Simmons	US Army Corps of Engineers, Rock Island, IL
Paul Soyke	US Army Corps of Engineers, Rock Island, IL
Arlen Feldman	US Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
Peggy Smart	Tebbetts, MO
F. John Taylor	Virginia, IL
Nicholas Pinter	Geology Dept., Southern IL University, Carbondale, IL
Charles Kempf	Ameren/UE, Eldon, MO
Mike Klingner	Quincy, IL
Bill Lay	Fayette, MO
Joe Gibbs, P.E.	Columbia, MO
M. J. (Jim) Whiting	Retired Farmer, Whiting, IA
Mike Garvey	Greenway Network, Inc., St. Peters, MO

Attachment 2

1. The differences in flood quantiles obtained with different distribution estimation pairings does not warrant deviation from the basic Bulletin 17B methodology, i.e., the log-Pearson III distribution estimated using the method of moments applied to flow logarithms;
2. The expected moments algorithm (Cohn, et al., 1997) is superior to and should be used in place of the existing Bulletin 17B method for distribution estimation in the presence of low outliers or historical information;
3. An adopted skew value can be computed using the standard bulletin 17B weighting of station and regional skew values; where the regional skewness coefficient and mean square error for the regional skew is obtained from a generalized least squares analysis;
4. Regionally consistent flood quantiles will be obtained for gage sites by averaging, if necessary, skew values for river reaches between major confluences;
5. Flood distributions statistics between sites will be obtained by linearly interpolating the mean, standard deviation and skew coefficient for log-flows with drainage area;
6. Historical estimates of floods are likely to be significantly less accurate than the systematically observed floods, and the systematic record is over a hundred years in length. The consistency of flood distributions estimated from the systematic period of record with historical information needs to be evaluated. If the estimates are inconsistent, then some judgement will need to be made with regard to the potential of the historical data, given its limitations, for improving flood distribution estimates obtained from a systematic period of significant length.

The interagency advisory group concurred with these findings for the most part. This group had the following comments and concerns:

7. The key problem in estimating distributions given historical information and low outliers is in judging the worth of the historical information and the censoring level for the low outliers.

Other issues addressed by the technical advisory group:

8. Analysis of some maximum annual gage records reveal a statistically significant trend with time. The Corps needs to determine if these trends are an artifact of regulation, flow measurement corrections or some more fundamental cause (land use change, influence of climate). If the trends are real then additional thought needs to be given to the estimation of flood distributions.
9. The period of record simulations might be performed with no levee failures due to overtopping. Levee performance evaluated in this manner would remove the influence of failure timing on the estimate of regulated flood distributions. In addition, the value of this approach is in avoiding the need to redo the analysis whenever a levee is upgraded.
10. Conversion of daily to peak annual flood distributions is not likely to be a significant problem for the study. However, when necessary, the conversion should be based on a regression between ranked observed daily and peak flow values.

Memorandum for Record 7-22/1999

From: David Goldman

To: Paul Soyke

Subject: Summary of Technical and Interagency Advisory Group Recommendations for Upper Mississippi Flood Frequency Study

1. The methods outlined in the federal guidelines for computing the likely annual flood, such as the 1/100 year flood, were found to be adequate.
2. Consistent estimates of likely annual flood values will be obtained by smoothing estimates between gages based on drainage area. For example, estimates of the (1/100) year flood will increase in a logical fashion between gages given the total drainage area to a river cross-section of interest.
3. Historic information will not be used in estimating the likely annual floods because: the observed period of record of over 100-years is sufficiently long to obtain reasonable estimates; the historic information has not been observed accurately or consistently throughout the study area, and this information is not relevant to current conditions given land use and channel changes over the period of record.
4. Unregulated daily flow will be simulated in the period of record analysis and analyzed to obtain the likely annual daily maximum flood values. The likely peak annual flows can be obtained from simple regression relationships between peak and daily flow values.

**P.I. GROUP PLEASE NOTE:** This is a summary of the assumptions that the Task Force is considering in the study. The assumptions will be discussed in greater detail at the December 1<sup>st</sup> P.I. Group meeting.

**Summary of Study Progress:  
Assumptions, Federal/non-Federal Levee Inclusion, and  
Potential Impacts/Issues**

Arlen D. Feldman  
St. Louis, 1 Dec 99

Overview of discussion items

Unimpaired flow frequencies  
Regulated flows  
Terrain data  
River hydraulics and levees  
Stage frequencies and FEMA

1. Unimpaired (unregulated/without dams) flow frequencies (natural flow frequencies are explained well by analytical functions)
  - a. Climate change? (referred to IWR study – no significant impacts)
  - b. Land use changes? (discussed how land use changes can affect flow; but, the change has been small relative to the size of the overall river basin)
  - c. Use of historic events? (discussed decision not to use because there is a long systematic record of gaged flows and historic flood peaks are uncertain)
  - d. Mixed populations? (Fig. 1. Missouri R. Spring and summer flood series)
  - e. Flood frequency distribution sensitivity (Fig. 2. Example of prediction differences between different distributions and estimation techniques at Hermann)
  - f. TAG and IAG recommendations (Fig. 3.)
  - g. Status – complete by 31 Dec 99
2. Regulated flows

Irregularly-shaped regulated-flow-frequency relationship is not amenable to representation with an analytical frequency curve. Need regulated-vs-unregulated relationship for a wide range of flows for use in converting unregulated flow-frequency curve to a regulated flow frequency curve.

Fig. 4. Hannibal gage regulated-vs-unregulated flow relationship.

3. Terrain data

- a. Digital elevation models (x,y,z) and digital terrain models (x,y,z with break-lines)  
Mississippi and Illinois Rivers by 31 Dec 99  
Missouri R. by Mar 00
- b. Corps Districts verifying DTM's  
Spot checking  
Help locals review
- c. Cut cross sections for river hydraulics model ( verify again)

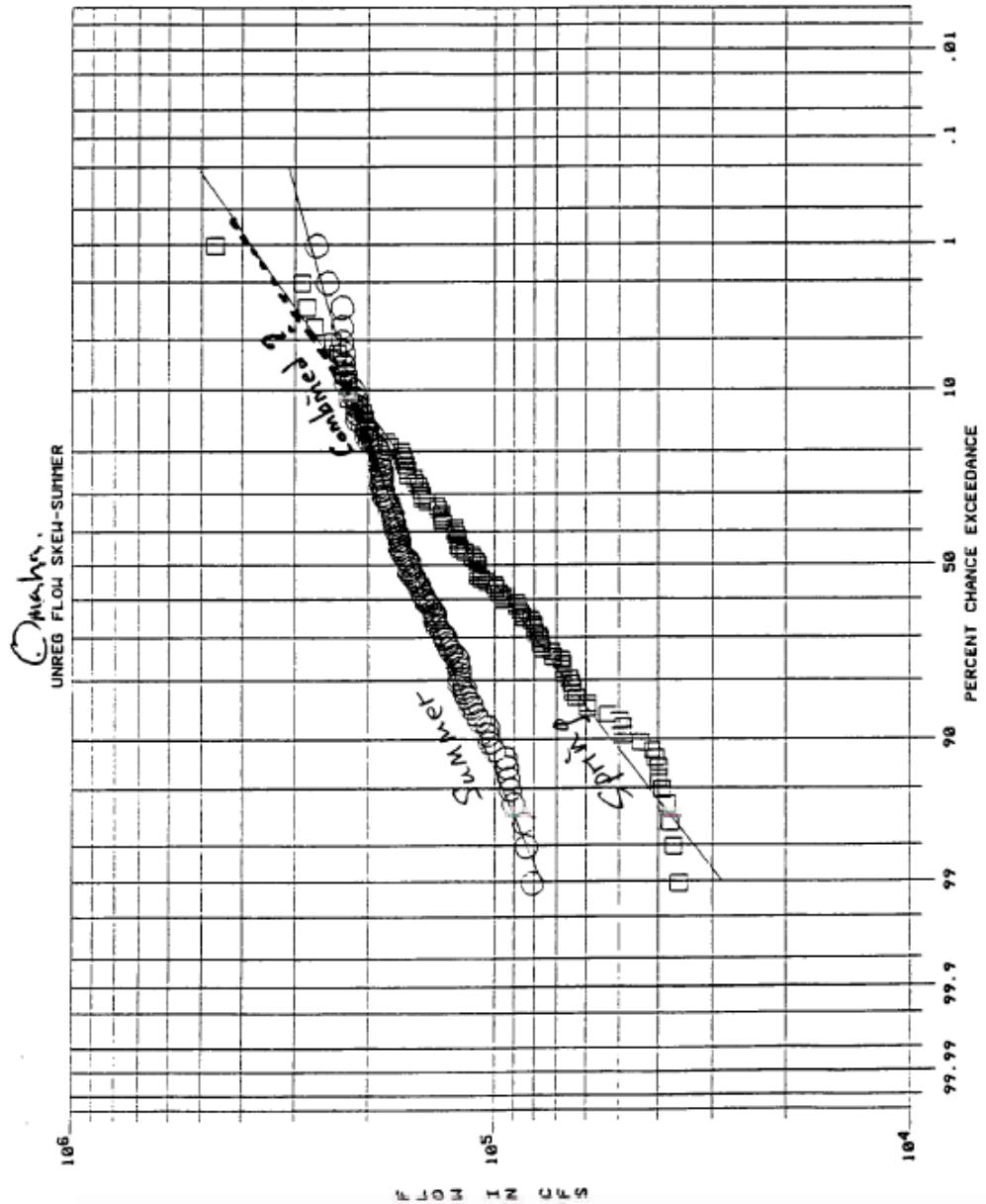
4. River Hydraulics

- a. Cross sections, flows, and hydraulic parameters go into UNET unsteady-flow river model
- b. Levees fail at top - no flood fighting will be assumed (recommended by Feds/States)
- c. Calibrated UNET model by 1 Oct 00

5. Stage frequencies

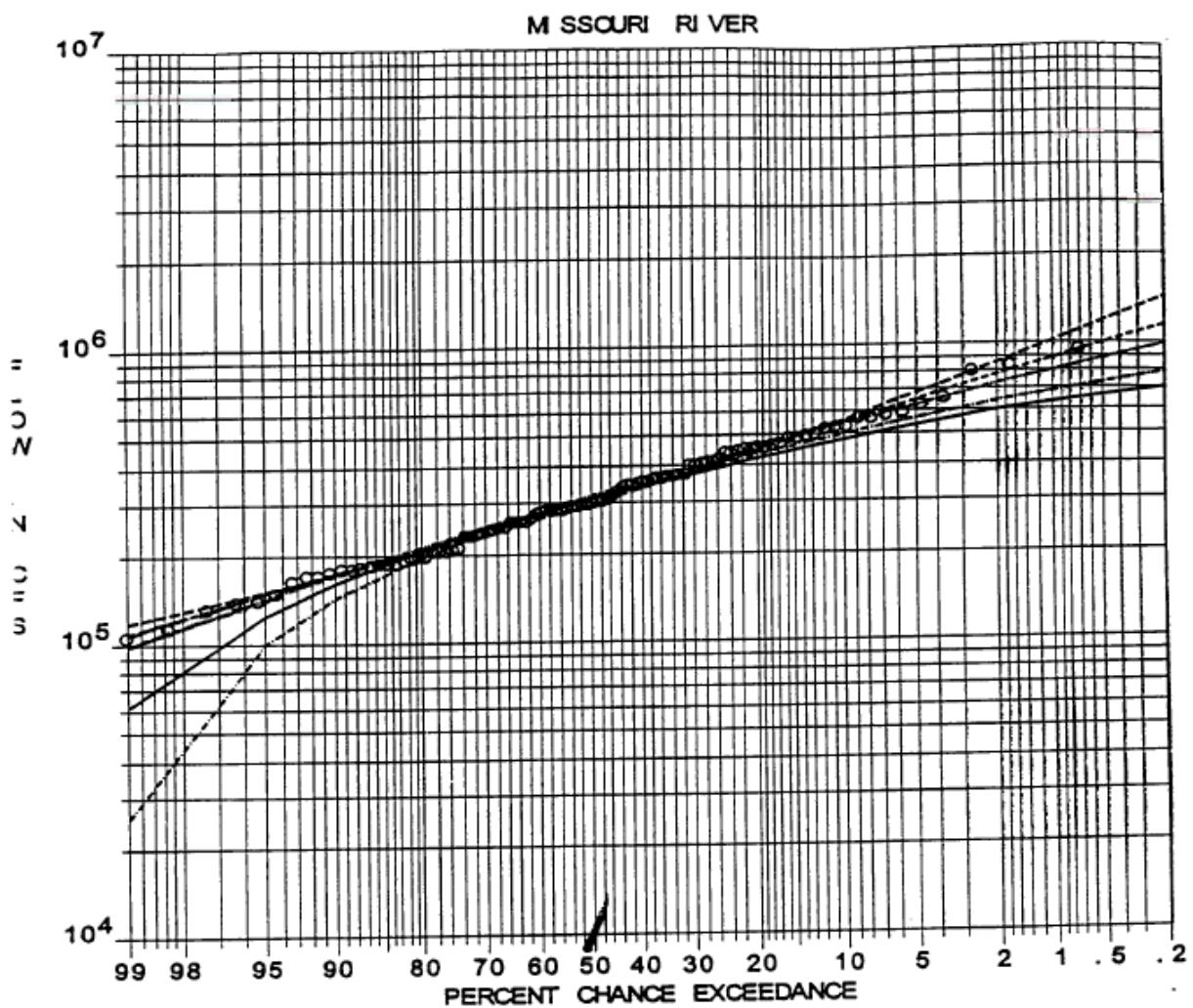
Fig. 5. River profile with regulated flow frequency and UNET-produced rating curve to determine stage-frequency curve with uncertainty

This study produces stage frequencies along the rivers in the Upper Mississippi System. A separate effort will be required to perform FEMA mapping; this is currently under discussion by the Corps and FEMA.



## Mixed Population Analysis

Figure 1.0 Missouri R. Summer CHART 12  
and Spring Flow Frequencies



—	HERMANN GEV REGIONAL K	—	HERMANN LPI II REGIONAL
—	HERMANN NORMAL REGIONAL K	○	HERMANN OBSERVED
—	HERMANN LPI II		
—	HERMANN LPI II EMA REGIONAL G		

## Distribution Selection

Figure 2.0 Alternative Flood Frequency Distributions at Hermann (Unimpaired Flow)

Memorandum for Record 7/22/1999

From: David Goldman

To: Paul Soyke

Subject: Summary of Technical and Interagency Advisory Group Recommendations for Upper Mississippi Flood Frequency Study

1. The methods outlined in the federal guidelines for computing the likely annual flood, such as the 1/100 year flood, were found to be adequate.
2. Consistent estimates of likely annual flood values will be obtained by smoothing estimates between gages based on drainage area. For example, estimates of the (1/100) year flood will increase in a logical fashion between gages given the total drainage area to a river cross-section of interest.
3. Historic information will not be used in estimating the likely annual floods because; the observed period of record of over 100-years is sufficiently long to obtain reasonable estimates; the historic information has not been observed accurately or consistently throughout the study area, and this information is not relevant to current conditions given land use and channel changes over the period of record.
4. Unregulated daily flow will be simulated in the period of record analysis and analyzed to obtain the likely annual daily maximum flood values. The likely peak annual flows can be obtained from simple regression relationships between peak and daily flow values.

P.I. GROUP PLEASE NOTE: This is a summary of the assumptions that the Task Force is considering in the study. The assumptions will be discussed in greater detail at the December 1<sup>st</sup> P.I. Group meeting.

Figure 3.0 TAG & IAG  
Recommendations

Hannibal MVR Flow and Barkau Flow Relationships

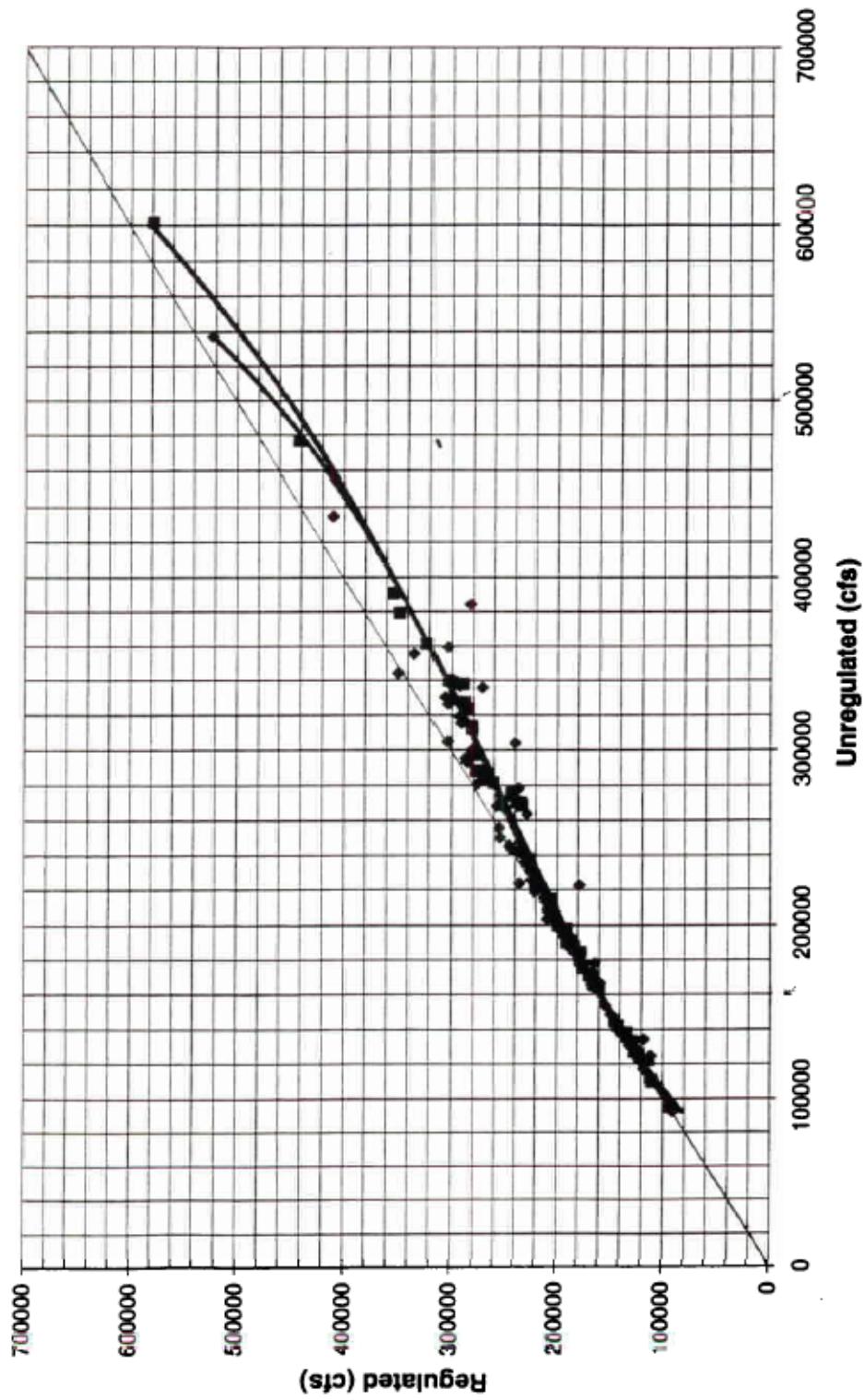
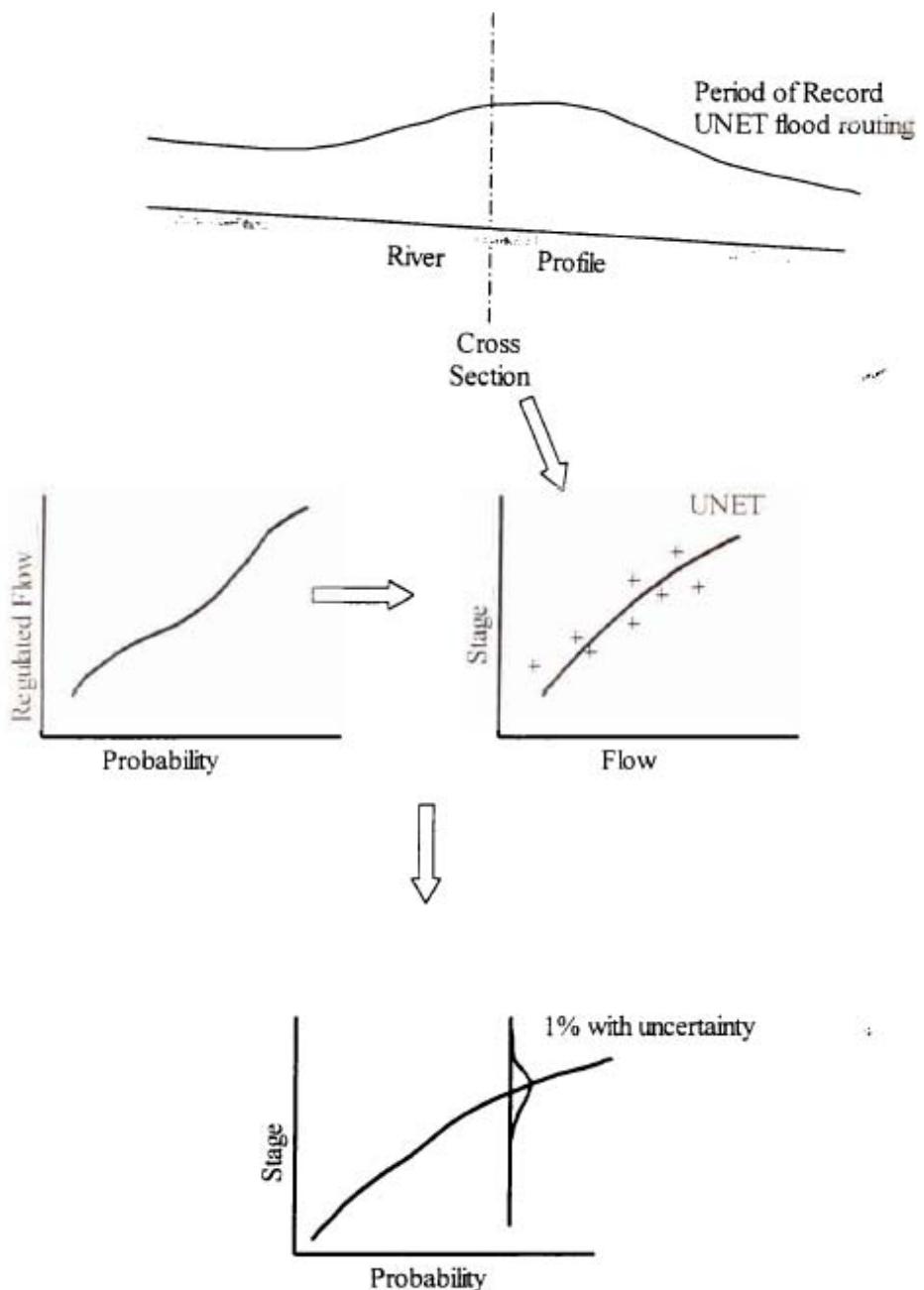


Figure 4.0 Regulated vs Unregulated Peak Flows at Hannibal

**Fig 5. Stage Frequency**



**Upper Mississippi System Flow Frequency Study  
(UPPER MISSISSIPPI, LOWER MISSOURI, & ILLINOIS RIVERS)  
CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING  
June 28, 2000**

Final Minutes (Approved 6/20/01)

1. The Citizens' Public Involvement (P.I.) Group held its fifth meeting on June 28, 2000, in St. Louis, Missouri. A meeting agenda is attached (attachment 1). The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
2. The meeting began with Chairperson Paul Soyke (Corps of Engineers, Rock Island District) asking attendees to introduce themselves. An attendance list is attached (attachment 2).
3. There were no additions or corrections to the minutes (pending approval) of the December 1, 1999 meeting. It was moved and seconded that the minutes be approved as final. The P.I. Group voted unanimously to approve the motion. A copy of the final minutes will be mailed to each P.I. Group and Task Force member. The final minutes can also be viewed under "Flow Frequency Study" on the Corps of Engineers' web page (<http://www.mvr.usace.army.mil/>).
4. Al Swoboda, (Corps of Engineers, Northwestern Division, Omaha, Nebraska), presented a program on the status of Missouri River Master Plan (see attachment 3), which included a discussion of the schedule for the Master Manual Study, what factors are currently affecting the schedule, a comparison of the 1993 flood flows for three scenarios to the historic operations, and a comparison of the current Northwestern Division's preferred alternative to a plan with a spring rise. Concerns about these issues raised by the P.I. Group were how the public was to be informed of the spring rise. The answer was that the Northwestern Division would notify the public with notices, mailings, meetings, etc. The Corps is in favor of a spring rise, if it is viable. Would the changes created by a spring rise impact viability of certain endangered species? Mr. Swoboda expounded that the Missouri River is basically a set river system and the Fish and Wildlife Service, along with other agencies, wants the Corps of Engineers to increase aquatic bird habitat along the river. How does it impact the Flow Frequency Study? The potential impacts on downstream minor flood events need to have a full analysis on the river's hydrology. The river used to have two naturally occurring rises; this proposal was designed to mimic that. Other concerns were that a lot of farm land would be flooded, and that we needed to look at impacts to schools, fire protection, etc. Bank erosion was an issue; land owners are not compensated for land erosion problems. See attached presentation information and graphs.
5. Jerry Skalak (Corps of Engineers, Rock Island District), was introduced as the Project Manager. We will publish Jerry Skalak's phone and email in the next newsletter.
6. Joe McCormick (Corps of Engineers, Mississippi Valley Division, Vicksburg, MS), gave a discussion on the Project Design Flood for the Mississippi River & Tributaries Project on the Lower Mississippi River. He showed the history and status of the Mississippi River's average annual precipitation. The common thought is that we have one major flood every seven years, but the reality is that we can have a flood at any time.
7. Arlen Feldman (Corps of Engineers, Institute of Water Resources, Davis, CA)  
Presentation at the Public Involvement Meeting, 6/28/00  
by Arlen D Feldman, Hydrologic Engineering Center, USACE

Assumptions being made for the Upper Miss Flood Frequency Study were summarized as follows.

#### Period of Record

The period 1898-1998 was chosen because: land use was relatively consistent, the period of record flows can be adequately adjusted for the effects of channelization by using hydraulic models, and the long period of record available greatly reduces the statistical significance of the historic floods in the flood frequency analysis.

#### Climate Change

The climate for the period of record, 1898-1998 is assumed to be stationary, i.e., not significantly changing. The analysis by the Institute for Water Resources (IWR) showed possible trends for some stations but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability. Consequently, standard flood frequency statistical analysis method will be used to capture the overall variability in the flood record which in fact may be influenced by some climate non-stationarity.

#### Unregulated Flow Frequency

The log-Pearson type 3 analytical frequency distribution will be used for the unregulated (without dams) flow-frequency analysis. Several new analytical distributions and parameter estimation methods were evaluated using the period of record. Significant differences between the application of the log-Pearson and other distributions were not found and hence it was decided to continue to use this standard distribution. The 'regional shape' factor, skew, is important and much analysis is going into determining areas of like shape.

#### Regulated Flow Frequency

The regulated flow frequency curve will be determined using a regulated vs. unregulated flow relationship (determined from UNET river-hydraulic flood routings) and the unregulated frequency curve. There are problems in obtaining the new channel and floodplain geometry; St. Louis District is working with the contracts to clear up the problems. In the UNET flood routings, the levees will be assumed to fail when water overtops the levee.

The Corps welcomes the assistance of the states and local governments, and landowners in performing quality control of the new floodplain digital elevation model data. Recommendations for points of contact should be submitted to the Corps.

#### Interpolation of Flow Statistics Between Gages

The Technical Advisory group recommended estimating the mean and standard deviation as a function of drainage area and the skew from regionally consistent values.

#### Regulated Stage Frequency

Risk and uncertainty will be used in the frequency analysis per current Corps requirements. Corps certification of levees for FEMA will be according to the existing procedure for certification where levee height has been determined by risk analysis.

8. Rolf Olsen (Corps of Engineers, Institute for Water Resources) did a presentation on Climate Changes and their effect on agriculture, forest vegetation, wetlands, and potholes using historical records and simulations in a computer program. They looked at particular watersheds in localized areas, and based the study on small watersheds. What they found was that there wasn't much correlation between weather and flooding. Trying to predict the weather over the next 100 years is highly unreliable; different studies had different results. The only thing that most of the studies agreed upon was that temperatures are going to climb somewhat by the end of the century.

9. Public Meeting Format Draft Plan for 2001. The P.I. Group discussed a proposed draft plan for upcoming public meetings. Closer to the meeting dates, the format may be modified and will be fine-tuned to best accomplish the purpose and goal of the meetings. A meeting announcement will be mailed to those on the Flow Frequency Study mailing list and will be announced via news releases well in advance of the meeting dates. The draft plan follows:

PURPOSE:

- The purpose of the public meetings is to explain the reason for and the results of the Flow Frequency Study to the general public who may be affected by the results.

GOAL:

- The goal of the meetings is to try to assure that the public understands the results and how they may be directly impacted by any changes.

LOCATIONS:

- The meetings will be held along the Mississippi, Missouri, and Illinois Rivers in several communities throughout the study area. The number and locations of meetings will be determined by the severity of the impacts to a particular region.

TIMEFRAME:

- Meetings are estimated to be held in early fall 2001 to December 2001.

FORMAT:

- The meetings will start with an open house at 6:30 p.m.
- There will be tables and displays with maps of the study area and profiles that can be easily related to the maps.
- The profiles will show the historic elevations and frequencies and the new ones. They will also show the modern record flood with that old and new frequency.
- People will be encouraged to look at the displays and to ask questions. They should be able to relate where they live to the maps and profiles.
- At 7:30 p.m., there will be a formal presentation about the study, its background, the assumptions, and the results. There should also be a discussion about what the results mean to each area and for flood insurance and other purposes.
- Following the presentation, there will be a question and answer period. It is expected that representatives from FEMA, the state the meeting is in, and some members of the PI Group will be present.
- PI Group representatives should be introduced at each meeting with a brief explanation of their function. Where possible and feasible, they should answer some of the questions.
- After the question and answers, the displays should be available for follow-up explanations.
- Questions and answers, and major comments should be documented.

The PI Group doesn't expect a great turn out from the public. It is suggested that we hold the meetings at locations about every 100 miles, so that people won't have to travel too far to attend a meeting. The funding is still in question and will be discussed at the next meeting. The following recommendations were made by the P.I. Group:

- a. Use a paper spread sheet rather than a computer simulation.
- b. Put together a generic table of definitions to help with public awareness, such things as what a "100 year event" means, etc.
- c. Make a graphical representation of impacts for 100-, 200-, and 500-year events.
- d. Have a list of questions that can be anticipated, such as: "Will my levee fail?" "Is there money available?" Have the answers to the public ahead of time.

10. Based on the results of a survey of the P.I. Group, it appears that the best location for the Citizens' Public Involvement Group meetings is in St. Louis.
11. S.K. Nanda (Corps of Engineers, Rock Island District) and Earl Eiker, (Corps of Engineers Headquarters, Washington, D.C.), as well as other members of the technical meeting, joined our meeting. S.K. gave an overview of the project to date. If a levee is damaged or breached, the Corps will rebuild it to its current specifications; we cannot improve upon it. Everyone is responsible for their own upgrades and must meet state requirements.
12. The P.I. Group's report to the Task Force: The Public Involvement Group would like to see an authorization to update the flow-frequency relationships after major flood events. The group concurred with the public meeting format and provided suggestions for enhanced information. They expressed concern about the availability of data disks. Would like a schedule of availability. They would also like basic contours for checking levees. They expressed concern about having a sufficient number of public meetings to reach the affected publics. UMIMRA is concerned about the "no overtop assumptions." The minimum should be no overtopping on convergence at U.S. Army and Interstate bridges where major infrastructure exists. Levees will not be allowed to overtop. They would like to have specific topographic data available on compact disc from each district. They would like to see public hearings or meetings, with enough of them to inform the general public, and that they be joint meetings with representatives from the Federal Emergency Management Agency available to answer questions.
13. The agenda for the next meeting will include public involvement question and answer session; a report about the review process; a definition of potential regulatory impacts, especially before we finish the comprehensive report; status of assumptions, what are the important elements; and P.I. Group suggestions for input to the newsletter.
14. An agenda will be sent to the Citizens' Public Involvement Group members before the next meeting and the P.I. Group will be asked to comment on the agenda items.

/s/

JACQUELINE E. CHANDLER  
Acting Recording Secretary

Attachments

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**  
**June 28, 2000**  
**1 p.m. - 5 p.m.**

**Agenda**

XVIII.	Welcome	Paul Soyke
XIX.	Discuss/approve December 1999 meeting minutes	Paul Soyke/P.I. Group
XX.	Introduction of Jerry Skalak, new Project Manager	Jerry Skalak
XXI.	Respond to unanswered April 1999 meeting questions/issues –	Paul Soyke
	A. Status of Missouri River Master Plan (including a discussion of the difference between the actual 1993 flood and what it might have been with other reservoir operation plans and initial storages)	RoyMcAllister Omaha District
	B. Project Design Flood for the Mississippi River & Tributaries Project on the Lower Mississippi River (comparison with the Upper Mississippi River 500-year discharge)	Joe McCormick Mississippi Valley Division
	C. What is the equivalent of the SPF?	Joe McCormick or Arlen Feldman
XXII.	Discuss public meeting proposal	Paul Soyke/P.I. Group
XXIII.	Discuss study assumptions	Arlen Feldman
XXIV.	Discuss February 2000 questionnaire	Paul Soyke
XXV.	Questions and answers w/S. K. Nanda	S. K. Nanda/P.I. Group
XXVI.	Discuss June 29 report to Task Force	Paul Soyke/P.I. Group
XXVII.	Develop agenda for next meeting	Paul Soyke/P.I. Group
XXVIII.	Adjourn	Paul Soyke

Attachment 1

### **Attendance List**

Upper Mississippi System Flow Frequency Study  
(Upper Mississippi, Lower Missouri, & Illinois Rivers)  
Citizens' Public Involvement (P.I.) Group Meeting  
June 28, 2000

Jacqueline Chandler, US Army Corps of Engineers  
Kay Carder, FEMA, Kansas City – Region 7  
Russ Elliott, US Army Corps of Engineers  
Arlen Feldman, US Army Corps of Engineers  
Mike Garvey, Greenway Network, Inc.  
Joe Gibbs  
Norman Haerr, Fabius River Drainage District  
Jane Hoover  
Mike Klingner, Klingner and Associates  
Bill Lay  
Joe McCormick, US Army Corps of Engineers  
David McMurray, Upper Mississippi, Illinois & Missouri Rivers Association  
Lanny Meng  
Rolf Olsen, US Army Corps of Engineers  
Peggy Smart, Smart Brothers Farms, Inc.  
Paul Soyke, US Army Corps of Engineers  
Holly Stoerker, Upper Mississippi River Basin Association  
Al Swoboda, US Army Corps of Engineers

Attachment 2



*Corps of Engineers*  
*Northwestern Division*

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*Missouri River Master Water Control  
Manual Review and Update Study EIS*

*Upper Mississippi System Flow Frequency Analysis  
Citizens' Public Involvement Group Meeting  
St. Louis, Missouri  
June 28, 2000*

*Missouri River Master Manual*

*attachment 3*



## Presentation Topics

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- Schedule for the Master Manual Study
- Factors currently affecting the schedule
- Comparison of 1993 flood flows for three scenarios to the actual (historic) operations
- Comparison of the current Northwestern Division's preferred alternative to a plan with a spring rise

*Missouri River Master Manual*



## **Current Approved Schedule**

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- ◆ *Receive USFWS Draft Biological Opinion including independent scientific review - May 2000*
  - ◆ *Revised Draft EIS (RDEIS) - Sep 2000*
  - ◆ *RDEIS Tribal & Public Comment Period - Mar 2001*
  - ◆ *Final EIS - December 2001*
  - ◆ *Washington Level Review - June 2002*
  - ◆ *Record of Decision (ROD) - August 2002*
  - ◆ *Revise Master Manual - August 2002*
  - ◆ *Develop AOP - January 2003*
  - ◆ *Implement Selected Plan - March 2003*
- Missouri River Master Manual*



## Schedule Issues

- ◆ *Contingent upon outcome of Section 7 Consultation Biological Opinion*
- ◆ *Extremely aggressive schedule as currently approved*
- ◆ *Objective remains Implementation by Water Year 2003*



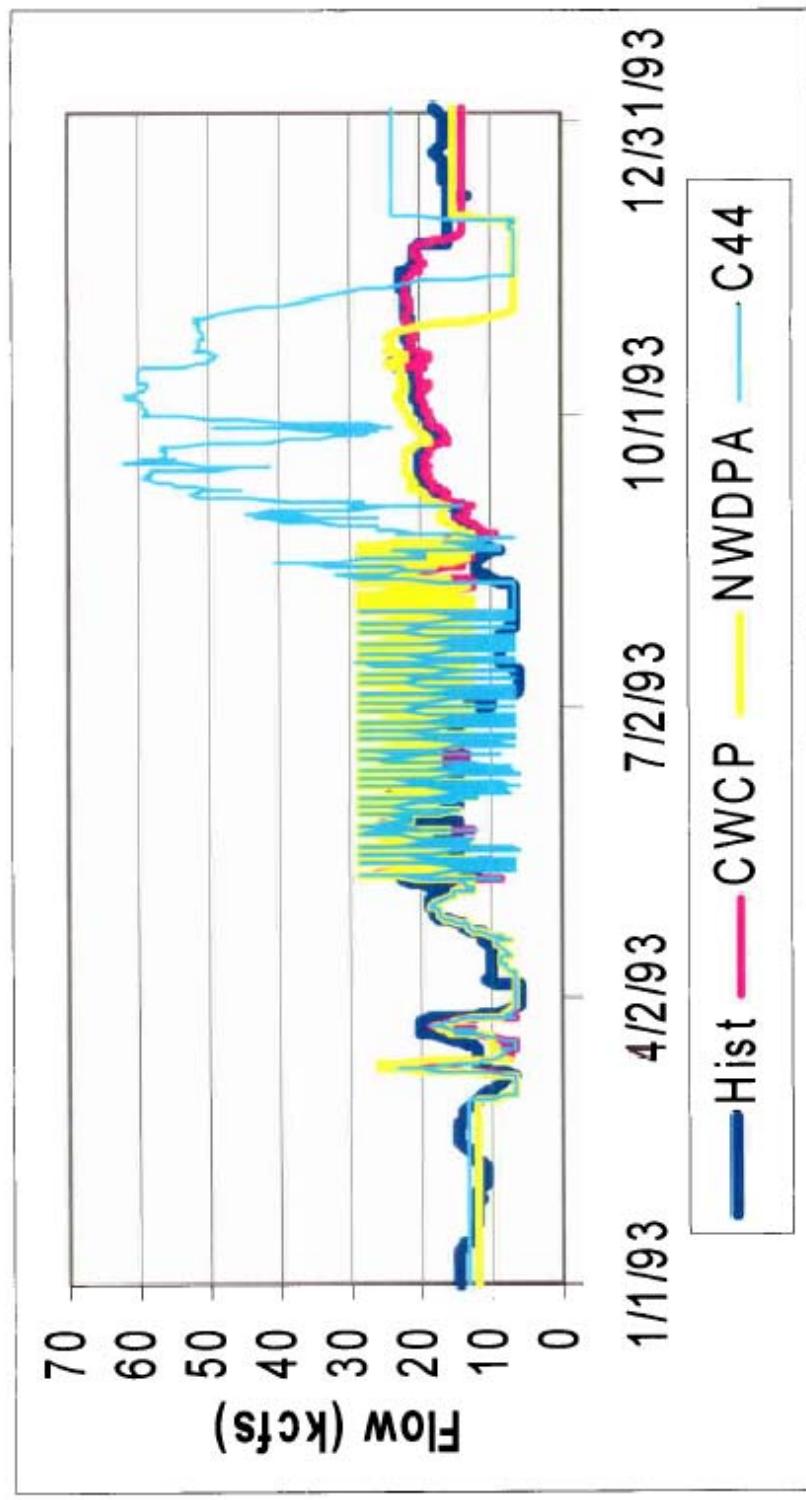
## 1993 Flood Comparison Alternatives

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- ◆ *Historic Data (min. storage = 41 MAF)*
- ◆ *Current Water Control Plan - provides lowest system storage in 88/93 drought of 39 MAF*
- ◆ *Northwestern Division Preferred Alternative (January 2000) - provides intermediate levels of system storage with minimum in 88/93 drought of 43 MAF*
- ◆ *C44 - provides higher levels of system storage with minimum in 88/93 drought of 48 MAF*



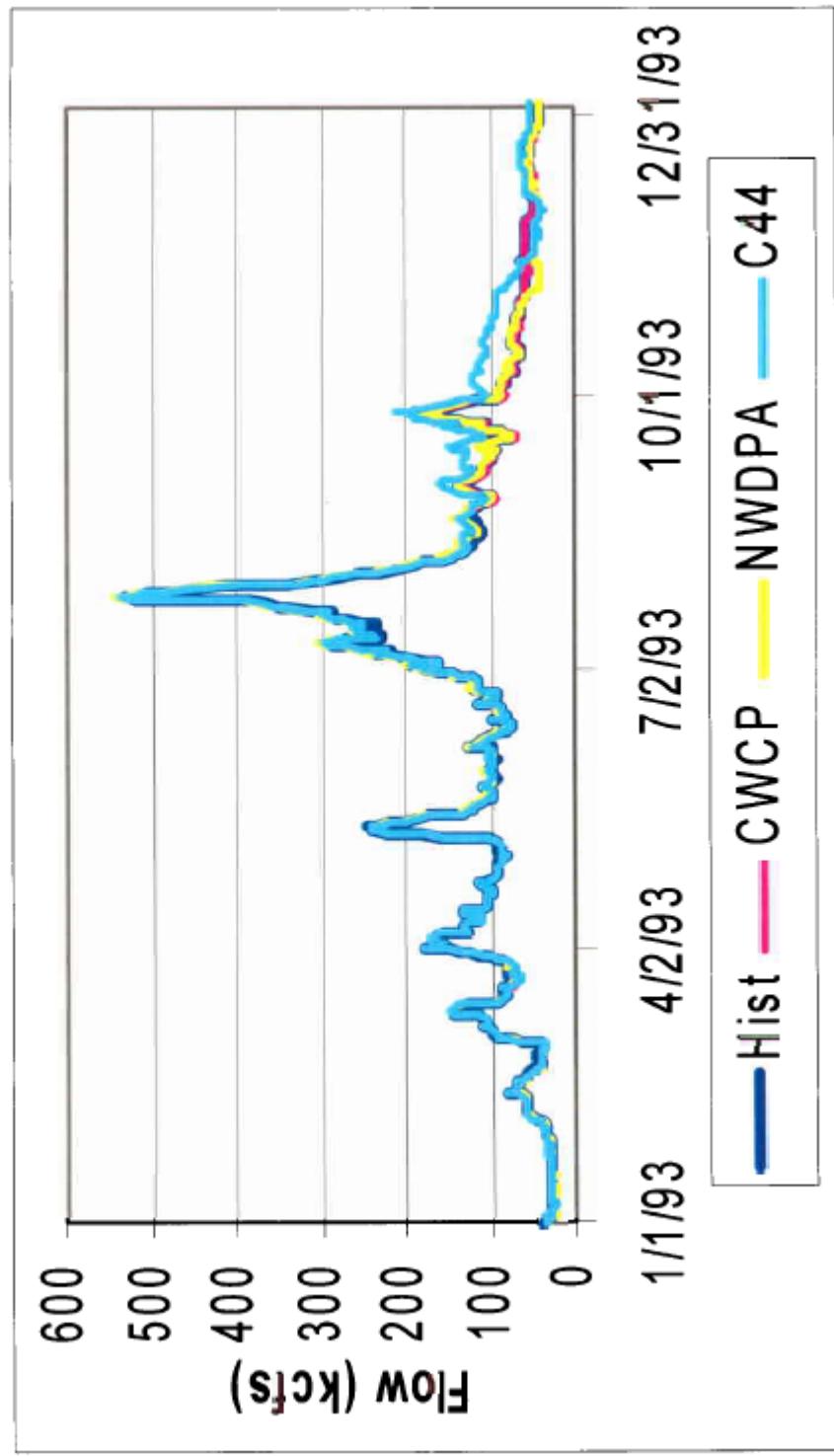
## Gavins Point Dam Releases - 1993



*Missouri River Master Manual*

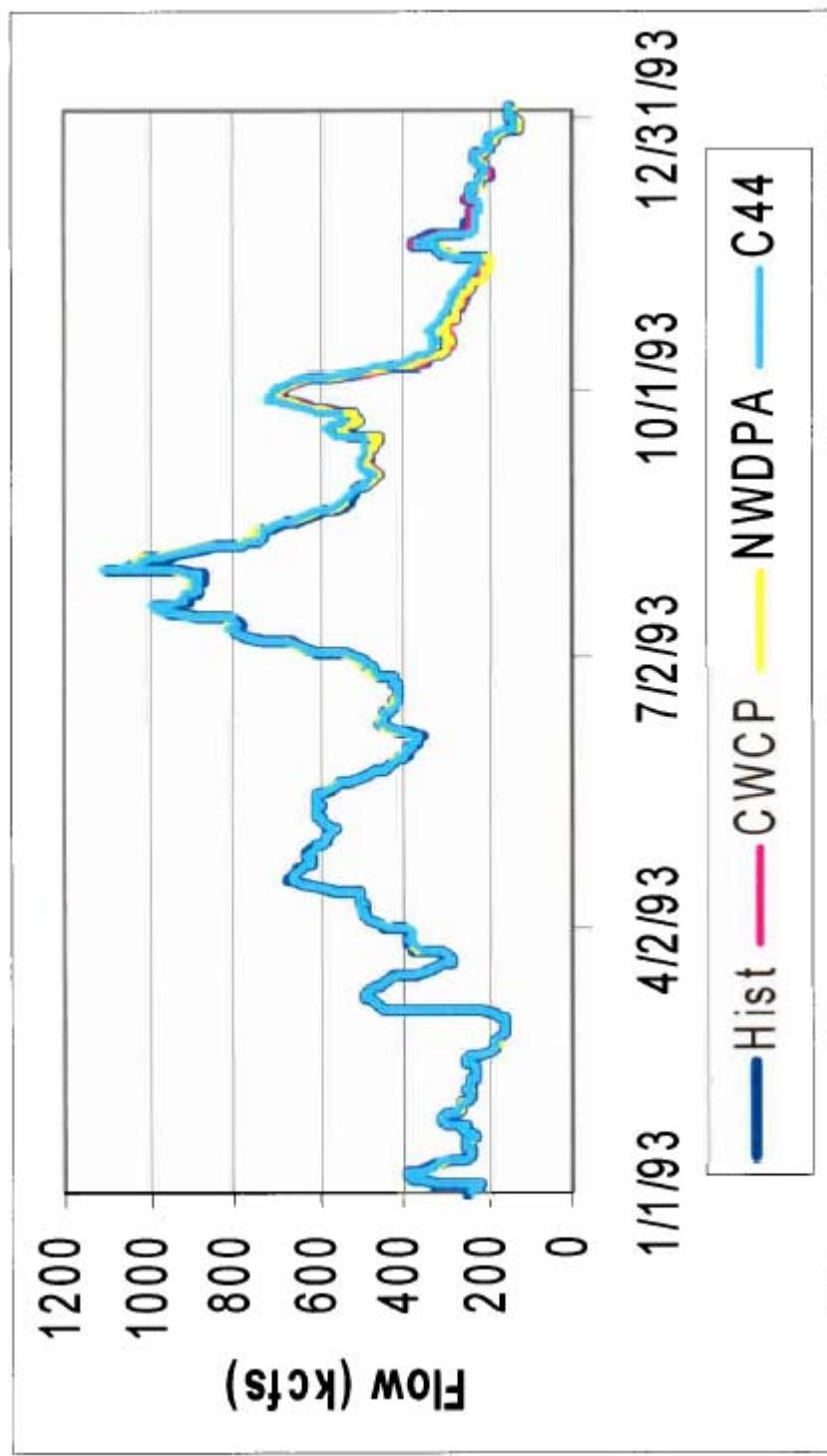


## Kansas City Flows - 1993



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## St. Louis Flows - 1993



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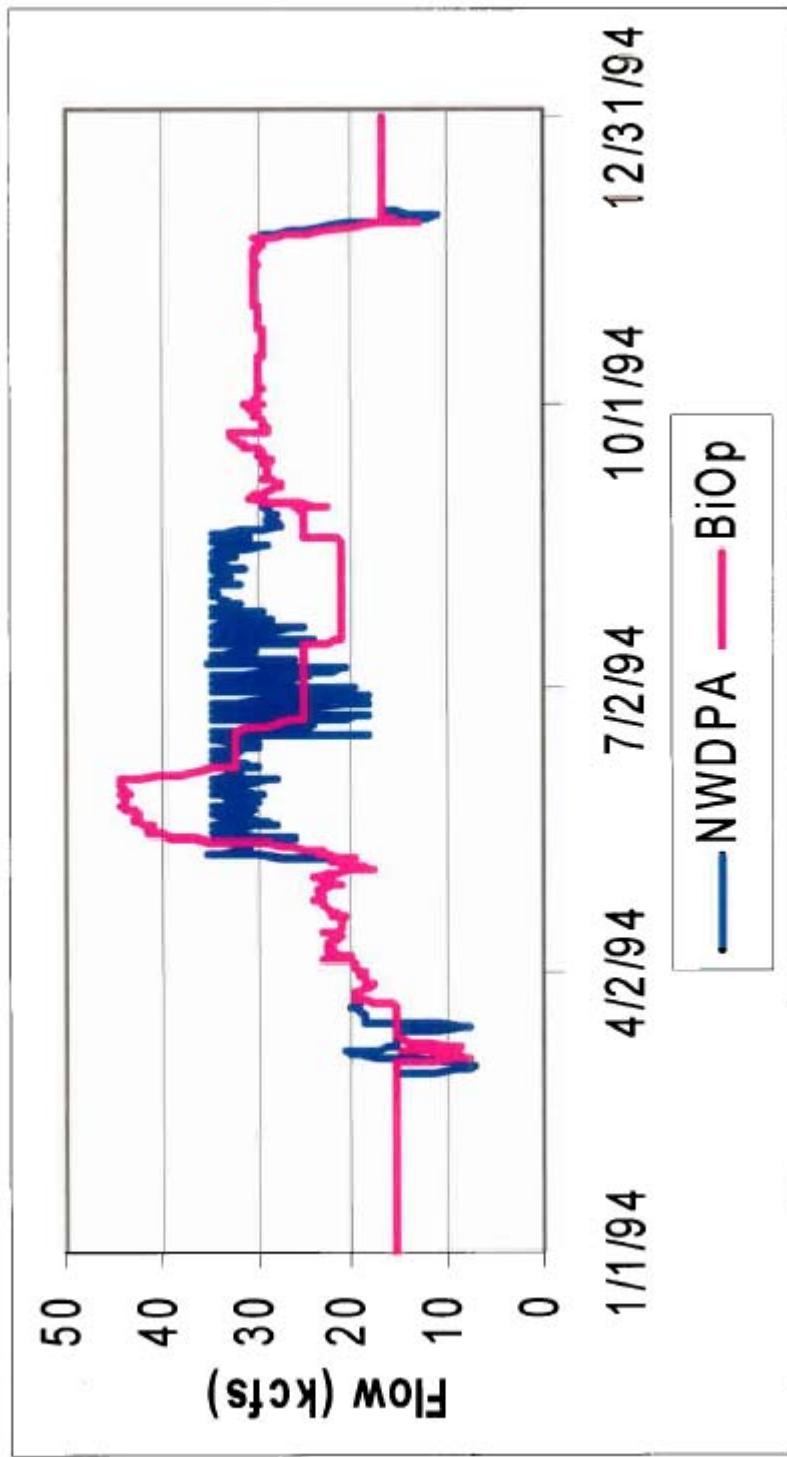
## NWDPA/BiOp Plan

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- ◆ NWD Preferred Alternative identified in January 2000 did not include any modifications to Gavins Point Dam releases for endangered species.
- ◆ USFWS Biological Opinion currently indicates the need for a spring rise and lower summer flows that would result in a split season
- ◆ These changes would have an impact on Lower Missouri River and Mississippi River hydrology



## Gavins Point Dam Releases - 1994

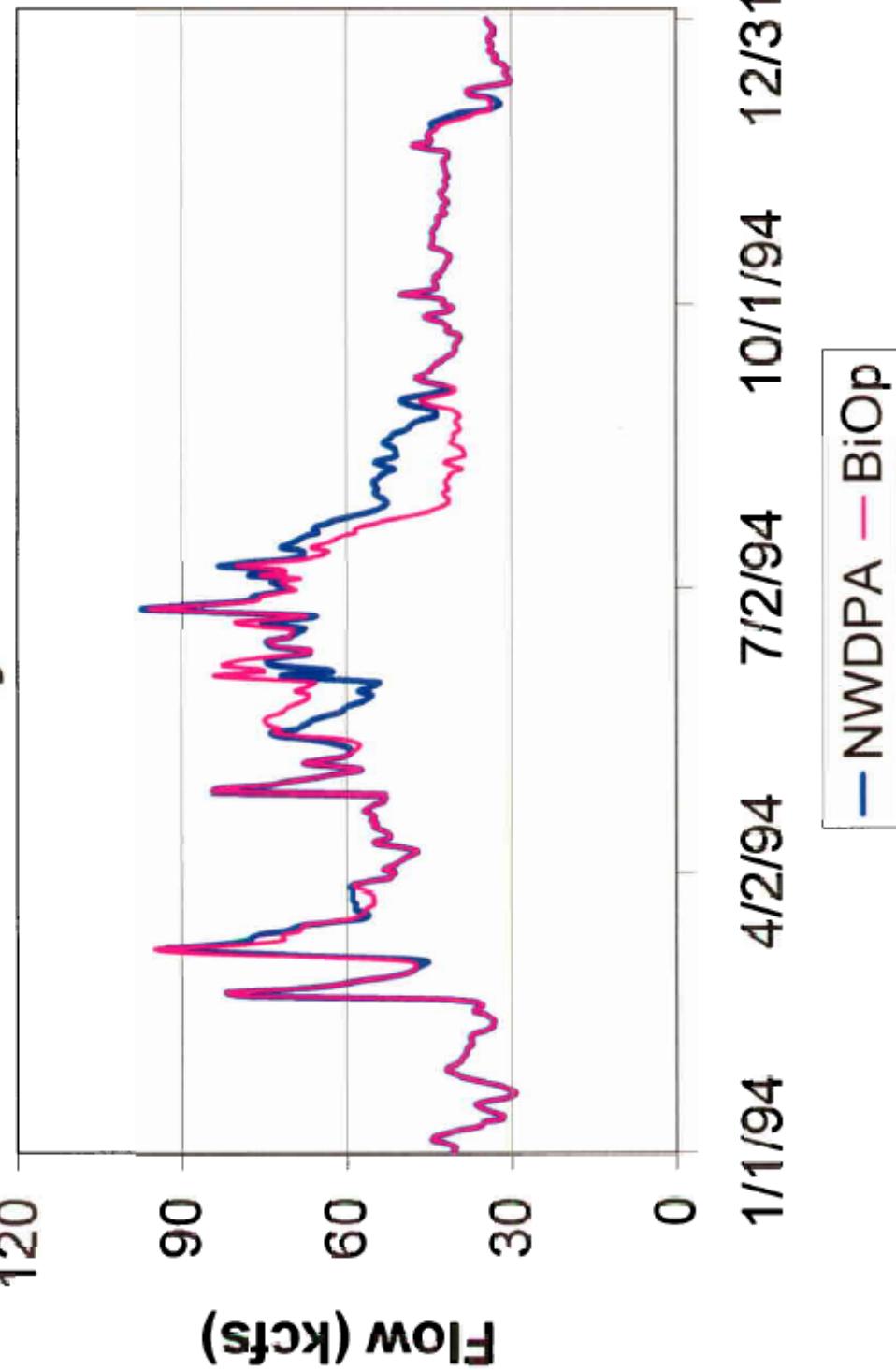


*Missouri River Master Manual*

## St. Louis Flows - 1994



## Kansas City Flows - 1994



**UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY**  
**(Upper Mississippi, Lower Missouri, & Illinois Rivers)**  
**CITIZENS' PUBLIC INVOLVEMENT GROUP MEETING**  
**June 20, 2001**

**Final Minutes (Approved October 9, 2002)**

1. The Citizens' Public Involvement (P.I.) Group held its sixth meeting on June 20, 2001, in St. Louis, Missouri. A meeting agenda is attached (attachment 1). The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
2. Ms. Laura Abney Corps of Engineers, Rock Island District, began the meeting by introducing herself as the new chairperson of the group. She has replaced Mr. Paul Soyke, who retired from the Corps of Engineers last December. Ms. Abney then asked attendees to introduce themselves. An attendance list is attached (attachment 2).
3. There were no additions or corrections to the minutes (pending approval) of the June 28, 2000, Citizens' P.I. Group meeting. Mr. Mike Klingner, Klingner & Associates, P.C., Quincy, IL, moved to accept the minutes as prepared; Ms. Peggy Smart, Smart Brothers Farms, Inc., Tebbetts, MO, seconded the motion. The P.I. Group voted unanimously to approve the motion. A copy of the final minutes was mailed to each P.I. Group member and to Task Force representatives. The final minutes also have been posted to the Flow Frequency Study's web page at <http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.
4. Mr. Jerry Skalak, Corps of Engineers, Rock Island District, the study's Regional Project Manager, spoke to the group about the study status, milestones, status of hydraulic modeling, proposed 2002 public open house schedule, and final report contents. Mr. Skalak also discussed how the study's findings will be provided to the Federal Emergency Management Agency (FEMA) for possible updating of the Digital Flood Insurance Rate Maps. Copies of some of the slides from Jerry's presentation are included in attachment 3.
5. Discussions after Mr. Skalak's presentation included the following:
  - a. In response to a question from Mr. Bill Lay, who farms in Fayette, MO, Mr. Skalak stated that the Standard Project Flood (SPF) is used to design levee height in urban or rural areas. The SPF is based on historic storms, not probability.
  - b. Mr. Mike Klingner would like the Standard Project Flood (SPF) expected in an area documented.
  - c. St. Louis District is using post Flood of 1993 elevation data for its modeling efforts which were developed by the Scientific Assessment and Strategy Team (SAST).
6. Mr. Arlen Feldman, Hydrologic Engineering Center, Corps of Engineers, Davis, CA, then discussed the status of the study's assumptions. Attached (attachment 4) are copies of the overhead slides Mr. Feldman used, and which are discussed in the following paragraphs. Many analyses were made (see referenced reports) in order to make these assumptions.
  - a. Slide 1 – Table 2.7: Comparison of Bulletin 17B estimated quantiles obtained from systematic period beginning in 1898 and historic period (“Investigation of Methods for Obtaining Regionally Consistent Flood Distributions, Upper Mississippi Flood Frequency Study - DRAFT,” Hydrologic Engineering Center, US Army Corps of Engineers, Davis, CA, September 2000). Historic records from 1861 in St. Louis were reviewed. Records from the period of 1898 to 1998 were determined to contain the necessary data on which to base the study's analyses.

b. Snowmelt, mixed snow/rain floods, and general rain floods all contribute to floods on the Missouri River. A mixed-distribution analysis was performed in this study area. Spring- and summer-flood distributions were combined to make the best estimate of the overall frequency curve. See example on slide 2:

Figure 4.1a: Missouri River, Yankton, SD, (DA 279500 sq mi, period 1898-1997) (Winter-Spring: January 1<sup>st</sup> – April 30<sup>th</sup>, Summer May 1 – December 31<sup>st</sup>), (“Investigation of Methods for Obtaining Regionally Consistent Flood Distributions, Upper Mississippi Flood Frequency Study - DRAFT,” Hydrologic Engineering Center, US Army Corps of Engineers, Davis, CA, September 2000).

c. One question addressed in the study is: Is the same (Bulletin 17b Federal standard) flow frequency distribution (Log Pearson III) applicable to large river basins? Much more data and computer power are now available and were used in this analysis. The report investigates many statistical distributions and methods to estimate their parameters. The range of the flow frequency curve at the 1% flood level in St. Louis (1,200,000 vs. 940,000) was shown as an example on slide 3: Figure C.7: Sensitivity analysis comparison at St. Louis, Missouri, Mississippi River. The Flow Frequency Study report will contain numerous examples of different distributions. Mr. Feldman also provided a sample graph of Hermann, MO, on Slide 4: Figure C.6: Sensitivity analysis comparison at Hermann, Missouri, Missouri River. The study team looked at gages throughout the system and looked at many ways of analyzing the data. They did not see enough of a difference or changes to use anything other than the standard Log Pearson III distribution. Figures C.7 and C.6 are both from “An Investigation of Flood Frequency Methods for the Upper Mississippi Basin - DRAFT,” Hydrologic Engineering Center, US Army Corps of Engineers, Davis, CA, September 2000.

d. Another question is: What is the impact of the distribution skew parameter? The Technical Advisory Group (TAG) recommends that regional shape factors (skews) be used rather than the at-gage skew. The regional skew would be representative of all the gages in the local region. The longer the record, the more chance the local statistics will agree with the regional skew. An example of skew variation at St. Louis is given in slide 5: Figure 5.7: Comparison of at-site and regional shape flood frequency distribution estimates, St. Louis, Mississippi River (regional skew = -0.1), annual maximum daily flows (“Investigation of Methods for Obtaining Regionally Consistent Flood Distributions, Upper Mississippi Flood Frequency Study - DRAFT,” Hydrologic Engineering Center, US Army Corps of Engineers, Davis, CA, September 2000).

e. In comparison to the 1993 flood, what would happen if levees were higher or if they were removed? The analyses from the report “Floodplain Management Assessment (FPMA),” US Army Corps of Engineers, June 1995, show:

(1) If levees were raised so all flow was contained, there would not have been much difference from the actual 1993 flood in the Keithsburg area (Henderson 3), see slide 6: Sheet 6 of 14; however, in the Hannibal area, the contained flows would have been 4 feet higher, see slide 7: Sheet 13 of 14.

(2) On the Illinois River (Meredosia), the contained flood was much larger (Mississippi River could have a bearing) than the 1993 flood. The contained flood was still slightly below the Meredosia levee, see slide 8: Sheet 2 of 14.

(3) Slide 9: Table SL-2: Peak Stage Difference from Computed 1993 Flood Event for the Mississippi River (FPMA Hydrology and Hydraulics Appendix), compares various scenarios – levee removed, flows contained, no reservoirs, and minimal flood fighting – and shows what would have happened in the flood of 1993. The “Levee Removed – Agricultural” condition listed in the table refers to flood flows without levees; i.e., not contained.

NOTE: The Hydraulics Appendixes from the FPMA report for Kansas City, Omaha, Rock Island, St. Louis, and St. Paul Districts will be made available soon for viewing on the Flow Frequency Study’s website at <http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.

7. Mr. Dennis Stephens, hydraulic engineer from the St. Louis District, Corps of Engineers, next gave a presentation.

a. Mr. Stephens discussed how cross sections were developed from the St. Louis District's Digital Terrain Model (DTM) that was taken after the 1993 flood. Cross sections were taken on a 300-mile reach of the Mississippi River, and a 43-mile reach of the Illinois River. The spacing of the cross sections was taken on an average of  $\frac{1}{2}$  mile from bluff to bluff. The Missouri River cross-sections were being developed this year.

b. He then described the St. Louis District's UNET model, which is an unsteady flow mathematical model, and the new cross sections used in the model.

c. Mr. Stephens discussed the rating curves of the St. Louis, Chester, and Thebes gages. He compared the USGS current rating curve with a rating curve developed from UNET. Plotting the annual peak discharges of each year for the simulated 100-year period of record developed the UNET model rating curve. He stated that if a person knows the discharge and has a rating curve, then he/she can determine the elevation (National Geodetic Vertical Datum – NGVD). The two curves for each gage were very similar. The St. Louis District's preliminary findings at the three gages showed that the 100-year flood elevations are similar to current elevations. The St. Louis District will develop a rating curve for each cross section using UNET to develop the stream frequency profile.

d. The UNET model was calibrated using the years of 1993 and 1988, a flood year and a drought year. The model was verified using the years of 1995 and 1989. The period of record from the years 1898 to 1997 was used to simulate the 100-year unregulated condition. The period of record from the years 1930 to 1997 was used to simulate the 100-year regulated condition because Missouri River flows at Hermann before 1930 were not reliable for simulating regulated conditions.

e. The UNET model can be updated in the future if need arises.

8. Mr. Ken Hinterlong from the Federal Emergency Management Agency's (FEMA) Region V in Chicago, IL, spoke next.

a. Mr. Hinterlong acknowledges that FEMA has a lot of work ahead of it and realizes the expectations are great. There are 2,000 miles of river, 8 states, and 130 counties in the study area. Data that FEMA will need include:

- (1) Digital information
- (2) Base maps
- (3) Good data for insurance
- (4) Discussion of which levees will be breached
- (5) Levee certification of levees near breach
- (6) Invite representatives of local government to meetings where floodway boundaries may be changed
- (7) Interior drainage information (FEMA will need good maps to provide to communities to help determine this)
- (8) Upper bluffs information
- (9) Transfer paper maps of 130 counties to digital maps

b. Last year, FEMA estimated the cost at \$30 million to use the results of the Flow Frequency Study for production of county-wide maps for the 130 counties. FEMA has not received appropriations of that magnitude. Mr. Hinterlong indicated that discussion with the Corps of Engineers Headquarters is taking place concerning the next 5 years' work. If additional funds become available, then FEMA can work with the States on a one-on-one basis to see what can be done. Mr. Hinterlong reiterated that the FEMA office in Washington, DC, is committed.

c. Mr. Mike Klingner stated that levees are critical. The Upper Mississippi, Illinois, and Missouri Rivers Association (UMIMRA) would like the sensitivity model used for the Flow Frequency Study to include a “no levee failure overtopping” assumption.

d. Mr. Mike Garvey, Greenway Network, Inc., St. Peters, MO, discussed the three-river confluence in St. Charles County, MO. He asked that the Flow Frequency Study look at the sensitivity analysis of actual profiles of levees and how they are changing, including the cumulative impact of the levee changes (e.g., raising/lowering the levees).

e. FEMA needs to see the “no levee failure overtopping” assumption, but it does not matter to that Agency whether that assumption is looked at in the Flow Frequency Study or after the study. Again, Mr. Hinterlong reiterated that a partnership between FEMA, the States, and the Corps is essential for further work to be done.

f. Mr. Klingner asked about the levee certification change. The Flow Frequency Study will not address levee certification. Mr. Hinterlong said that in the profiles established in the Flow Frequency Study report, if levee breaches are not discussed, then reevaluation of levee certifications will be discussed in the Corps/FEMA/States effort. Are you referring

9. The P.I. Group then discussed the draft plan for the November 2002 public open houses. The goal of the open houses will be to try to assure that the public understands the study results and how they may be directly impacted by any changes. (Although it is important that the public understands the results; the public cannot influence the study’s decision.) The suggested dates, locations, times, and format are shown below:

a. The open houses will be held in seven locations along the Mississippi, Missouri, and Illinois Rivers:

- (1) Tuesday, November 12, 2002 – St. Louis, MO
- (2) Wednesday, November 13, 2002 – Kansas City, MO
- (3) Thursday, November 14, 2002 – Omaha, NE
- (4) Monday, November 18, 2002 – Quincy, IL
- (5) Tuesday, November 19, 2002 – Peoria, IL
- (6) Wednesday, November 20, 2002 – Davenport, IA
- (7) Thursday, November 21, 2002 – La Crosse, WI

b. Two identical open house sessions will be held at each location from 1:00-4:00 p.m. and from 5:30-8:30 p.m. The beginning and ending hours of each session will be informal, where attendees can visit displays, meet with study personnel, and have specific questions answered on a one-on-one basis. The middle hour will consist of a formal presentation followed by general questions and answers. The public will be welcome to attend either open house session *at any time* during each session.

<u>1:00-4:00 p.m. session</u>	<u>5:30-8:30 p.m. session</u>
1:00-2:00 p.m. – informal portion	5:30-6:30 p.m. – informal portion
2:00-3:00 p.m. – formal presentation/Q’s&A’s	6:30-7:30 p.m. – formal presentation/ Q’s&A’s
3:00-4:00 p.m. – informal portion	7:30-8:30 p.m. – informal portion

10. The P.I. Group also discussed several ways to provide information to the public and to meet the public’s needs. Some ways may be feasible; some may not. The P.I. Group will meet one more time before the open houses to discuss them in further detail. For now, comments and suggestions are listed below.

a. The group has an interest in the assumptions and wants to assure that a complete disclosure of the study assumptions is available.

b. The group suggested having a copy machine at the meetings so the public can get a copy of a map of their area; or, put the maps on a CD so they can be printed out.

c. Another suggestion was to have all hydrology and hydraulics reports available at the open houses. However, each report would be labeled "Interim Report" so the public understands the analysis is not done.

d. Mr. Ken Hinterlong asked what the final document would be? Will it be a product of the Flow Frequency Study? An Interim Document/Report? He feels the Corps should represent the profiles as a product of the Study.

e. Mr. Mike Klingner thought that the data would be final with the release of the Flow Frequency Study Report and is concerned that there could be a difference on the sensitivity if the report is an Interim Report. Mr. Klingner feels we should continue to use the old curves. He asked how FEMA would receive certification requests. The response is that FEMA is tied to existing levee profiles. If a levee district would want improvements, they need to get the State involved.

f. Mr. Hinterlong stated that without sensitivity of levee breaching in the assumptions, FEMA may not be able to utilize the profiles from the Flow Frequency Study. He also indicated he may or may not be representing FEMA's opinion in this matter.

g. Mr. Bill Lay suggested putting the data on a computer before the open houses. He also is concerned that there are not enough open houses in Missouri and suggested holding an additional open house in Jefferson City.

h. Another suggestion was made to put our web address on postcards so those who have access to the Internet can view the report there. If an open house attendee does not have access to the Internet, then he/she can ask for a paper copy of the report. Methods of providing information can include CD's, web page, and by hard copy.

i. A suggestion was made to include information regarding the Comprehensive Plan at the end of the presentation if appropriate and hold a simultaneous Flow Frequency Study/Comprehensive Plan meeting if there's an overlap.

j. Discussion continued on what should be provided for the public at the open houses:

(1) Ms. Holly Stoerker, Director of the Upper Mississippi River Basin Association, St. Paul, MN, asked how the study results would be used by other agencies. She stated that the public will want to know, "What does it mean to me?" For example, will flood insurance or levee certification be affected?

(2) Mr. Hinterlong suggested that we discuss how levees are affected by the profiles.

(3) There will be no inundation maps at the open houses; only samples (per Corps of Engineers).

(4) Mr. Klingner suggesting showing basic graphics that show an elevation that is now lower or higher.

11. Mr. Hinterlong suggested that there be a levee appendix showing each levee district or group graphics of study impacts. What should FEMA consider as part of the flood fight? How can levee districts work together? What assumptions will each of the seven states use for flood fighting efforts?. Mr. S. K. Nanda,

Task Force Chairman (who joined the P.I. Group during the open house discussion), responded that there are various levees: Federal, Soil Conservation Service, and private. There are several uncertainties: hydrologic (what is the 100-year flood?); hydraulic (what is the stage?); geo-technical (can the levees withstand the flood?) which need to be determined for each levee. If built by the Federal Government or if it is a PL 84-99 levee, there will be no problem describing its capability to withstand floods. Private levees would have to be inspected, but it is not done. This inspection and assessment may be accomplished in the DFIRM (Flood Insurance Rate Map) follow-on study.

12. Mr. Nanda stated that the base flood would be defined by March 2003. The study will use the levee data that exists for profiles (stage – 100-year) and would use the assumption that levees will fail when water tops the levee.

13. In our Scope of Work we committed to:

- a. Define the base flow conditions.
- b. Determine the median flood profile; e.g., what is the 100-year flood?
- c. Determine uncertainty probabilities (in-house, not public).
- d. Compare FEMA – freeboard (in-house, not public).

14. Mr. Nicholas Pinter, Geology Department, Southern IL University, Carbondale, IL, referenced Mr. Dennis Stephens' presentation and wanted to know that, with so many major floods in the last 30 years, why is the profile lower instead of higher? Mr. Nanda stated that he could not answer the question with such a short period of record. Mr. Pinter asked what the model was doing and Mr. Nanda said that the reservoirs have an impact – flow reduction effects are in place.

15. The group discussed the sensitivity analysis. Mr. Nanda said the Corps would be willing to do further studies, such as sensitivities and flood fighting; however, they're not part of the existing funding and we are under time constraints. Mr. Klingner asked about expanding the sensitivity analysis, for example, flood fighting, and running other scenarios. Mr. Nanda would like to add more sensitivities, but is limited by the study's scope. In the Comprehensive Study, the Corps will look at additional sensitivities.

16. Discussion then turned to reliability bands for levee elevations for levee certification issues. Existing and proposed levees will be certified as capable of passing the FEMA base flood if the levees meet the FEMA criteria of 100-year flood elevation plus three feet of freeboard, with two exceptions, as follows. When the FEMA criteria results in a reliability of less than 90%, the minimum levee elevation for certification will be that elevation corresponding to 90% chance of non-exceedance. When the FEMA criteria results in a reliability of greater than 95%, the levee may be certified at the elevation corresponding to a 95% chance of non-exceedance. In 1997, the Corps of Engineers and FEMA developed a joint policy regarding levee certification criteria.

17. Rock Island and St. Paul Districts have no SAST (Scientific Assessment and Strategy Team) data like St. Louis does. They will have to gather new survey information using the same specifications as the SAST.

18. Mr. Dennis Morgan, civil engineer from the St. Louis District, Corps of Engineers, talked about the vertical accuracy of the well-defined points of levees. Sixty-seven percent of the time the location will be "nailed" at .67 foot. Contour accuracy or other points would be within 1/3 of the contour interval (4-foot contour - 1.33 foot).

19. Mr. S. K. Nanda asked each project manager to get the upstream and downstream elevation point where a levee would overtop – defined in tabular form – and send to all levee district representatives. We are looking for each levee in the 1,800-mile area. UMIMRA has offered its assistance and the Corps. will provide UMIMRA with a table to help them

NOTE: The process for assuring that the Flow Frequency Study team has the most accurate levee elevation information for each levee has changed. Rock Island District's Public Involvement Team will gather the levee information for each district. When a district is ready with its table showing the overtopping elevations of each levee district's upstream and downstream points, then the district will send the list to Rock Island. The P.I. Team will then send a copy of the table to each levee district representative and ask him/her to verify the information. Levee elevation information will be verified for St. Louis District first. As the other Districts' information becomes available, the tables will then be mailed to those levee districts.

20. In response to a question asking if the draft document will be available prior to or during the public open houses, Mr. Nanda answered that the profiles (marked DRAFT) will be available for each reach and will be available for the public to take at the open houses.

21. Mr. Dave McMurray, Burlington, IA, UMIMRA Chairman, is concerned about the band verses specific information. Mr. Nanda stated the band is arbitrary. Mr. Hinterlong said that it could be 3 feet; freeboard is 4 feet upstream and 3 feet downstream, but FEMA wants more science in defining the band.

22. Mr. Nanda's response to Mr. Klingner questions: The 2001 flood will not be added to the study period. There has to be a stopping point somewhere. The periods between 1898 through 1998 will be used because 1998 is when the study started. The study team looked at adding the 2001 flood, but found that there were no significant changes in the flow frequencies.

23. In response to another question from Mr. Klinger, Mr. Nanda stated that techniques and technologies, methods, and assumptions will be condensed for the public meeting in an attempt to make them understandable.

24. Ms. Laura Abney and the P.I. Group discussed the topics that they wanted her to present at the June 21 Task Force meeting. She will present the following:

- a. The proposed public open house dates, locations, format, and the suggested "core" attendees at each open house.
- b. The P.I. Group would like to see all the data used in the study be available for the public, including the assumptions, uncertainty bands, and other data used.
- c. A major topic of discussion took place regarding sensitivity analysis. The group felt there is a need to complete more sensitivity analysis and look at other scenarios such as total containment and flood fighting.
- d. The P.I. Group would like to have specific data of all levees available in a tabular form in the report. In addition, they would like to see that each levee district has the opportunity to confirm the accuracy of the information regarding their levees.
- e. Several members of the P.I. Group expressed a desire that the Corps release the data as soon as it is available to utilize the updated information in areas that need it now.
- f. The group would like to see the coordination with the Corps and FEMA to update the maps expedited as quickly as possible.

g. A discussion was held regarding the presentation by the St. Louis District that showed an example that the discharge in the current study results went down from the 1979 study results. The group would like an explanation as to how the flows can decrease, when since the last study was completed there have been several high water events.

h. The P.I. Group would encourage better communication between the Corps and FEMA to make sure the public concerns and questions can be adequately addressed at the public meetings proposed to be held in November 2002.

i. There also was some concern that all the agencies in the Task Force take ownership and have acceptance of the final product that comes out of this study.

j. UMIMRA would like to remain on record that a Standard Project Flood (SPF) be developed and made available to the public. They recognize this may be accomplished at a later date.

25. Mr. Mike Garvey asked that a letter from his organization, Greenway Network, Inc., be attached to these minutes. The letter is shown at attachment 5. (Note: The Corps of Engineers has responded to Mr. Garvey's letter.)

26. It is proposed that the Citizens' Public Involvement Group meet 30 days before the open house to discuss what is actually available to the public. An agenda will be sent to the P.I. Group members before the next meeting and the P.I. Group will be asked to comment on the agenda items.

/s/

SUZANNE R. SIMMONS  
Recording Secretary  
Citizens' Public Involvement Group

Attachments

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY**  
**(Upper Mississippi, Lower Missouri, and Illinois Rivers)**  
**CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**  
**June 20, 2001**  
**1 p.m. - 5 p.m.**  
**Agenda**

1:00-1:15	I.	Welcome/Introduction	Laura Abney
	II.	Discuss/approve June 2000 minutes	Laura Abney/P.I. Group
1:15-1:45	III.	Flow Frequency Study status report -Data accessibility -P.I. Group involvement in review process -Format of Final Report	Jerry Skalak/P.I. Group
1:45-2:15	IV.	Status of assumptions (emphasis on important elements)	Arlen Feldman
2:15-3:00	V.	Definition of potential regulatory impacts (especially before we finish the comprehensive report)	FEMA
3:00-3:15		Break	
3:15-4:15	VI.	Discuss public meeting proposal	L. Abney/Sue Simmons/P.I. Group
4:15-4:30	VII.	Discuss June 21 report to Task Force	Laura Abney/P.I. Group
	VIII.	Develop agenda for next meeting	Laura Abney/P.I. Group
4:30-5:00	IX.	Questions and answers w/S.K. Nanda, FEMA, Corps Headquarters	COE/FEMA/P.I. Group
5:00	X.	Adjourn	Laura Abney

Attachment 1

UPPER MISSISSIPPI RIVER SYSTEM  
FLOW FREQUENCY STUDY

Citizens' Public Involvement Group Meeting  
June 20, 2001

List of Attendees

NAME	AGENCY/AFFILIATION
Sue Simmons	U.S. Army Corps of Engineers, Rock Island
Laura Abney	U.S. Army Corps of Engineers, Rock Island
Jerry Skalak	U.S. Army Corps of Engineers, Rock Island
Bill Lay	Farmer, MO
Charles Kempf	Ameren/UE
Ted Heisel	MO Coalition for the Environment
Mike Garvey	Greenway Network, Inc.
Chad Sperry	Klingner & Associates
Mark C. Bross	Klingner & Associates, Hannibal, MO
Holly Stoerker	Upper Mississippi River Basin Association
Mike Klingner	Klingner & Associates, P.C.
David McMurray	Upper Mississippi, Illinois, & Missouri Rivers Assn. (UMIMRA)
Dennis Stephens	U.S. Army Corps of Engineers, St. Louis
Arlen Feldman	U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
Kay Carder	FEMA, Region VII, Kansas City, MO
Ken Hinterlong	FEMA, Region V, Chicago, IL
Mike DePue	PBS&J, Beltsville, MD
Clair Wilson	UMIMRA, Winchester, IL
Peggy Smart	Smart Bros. Farms, Inc., Tebbetts, MO
George Gitter	U.S. Army Corps of Engineers, Rock Island

Attachment 2

Mr. Jerry A. Skalak  
 UMRS Flow Frequency Study  
 Regional Senior Project Manager  
 Rock Island District  
 U.S. Army Corps of Engineers

Public Involvement Group Meeting  
 June 20, 2001



Project Management Branch  
 Rock Island District

Upper Mississippi River System Flow Frequency Study  
 Key Personnel Assignments  
 (June 2001)

S.K. Nanda	Chairman
Jerry Skalak	Regional Project Manager
Paul Soyle	Public Involvement Group Chairman
George Gitter	Study Coordinator

Upper Mississippi River System Flow Frequency Study  
 Key Personnel Assignments  
 (June 2001)

S.K. Nanda	Chairman
Jerry Skalak	Regional Project Manager
Paul Soyle	Public Involvement Group Chairman (Retired)
Laura Abney	Public Involvement Group Chairman
George Gitter	Study Coordinator
Heather Wiese	Study Coordinator
George Gitter	Performance Measures

### Upper Mississippi River System Flow Frequency Study

- Overall Project Status
- Schedule and Cost Changes
- Elevation Data  
 (DTMs and Cross Sections)
- Public Outreach
- Upcoming Milestones
- Report Format
- Future? (DFIRMs, Comp Plan)

### Upper Mississippi River System Flow Frequency Study Area

- Mississippi River  
 (St. Paul to Ohio River)
- Missouri River  
 (Below Gavin Point Dam)
- Illinois River



### Upper Mississippi River System Flow Frequency Study

- **Authority:**  
 Section 216 of the 1970  
 Flood Control Act
- **Study area:**  
 The Upper Mississippi  
 River (from St. Paul, MN,  
 to Cairo, IL); the Illinois  
 River; and the Missouri  
 River (from Gavin Point  
 Dam to its confluence with  
 the Mississippi River)
- **Primary Study  
 Objectives:**
  - Establish discharge  
 frequency relationships
  - Develop water surface  
 profiles for various  
 discharge frequencies
  - Compute maximum  
 discharge and stage  
 profiles for the 10-, 50-,  
 100- and 500-year flood  
 events

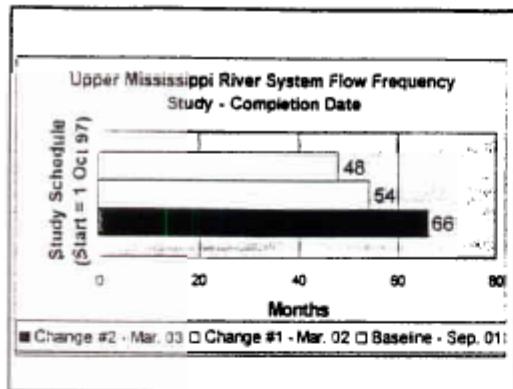
### Upper Mississippi River System Flow Frequency Study Budget

#### Funding:

- Allocations thru FY00: \$5,477,000
- FY01 Work Allowance: \$ 675,000
- FY02 President's Budget: \$1,200,000
- Balance to complete (FY03): \$ 489,500

**TOTAL: \$7,841,500**

if current approved total project cost

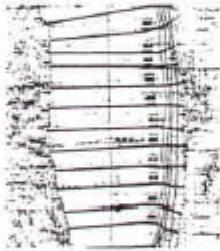


## Schedule & Cost Change Request

- Districts & Divisions Reviewed and Approved
- Project Completion Date Extended One Year (to March 03)
- Total (inflated) Project Cost Estimate Increased by \$1,439,000
- Cost Change Justification
  - Risk & Uncertainty
  - Hydraulic TAG
  - Sensitivity Studies
  - DEM/DTM Verification and Supplemental Data Acquisition
  - Adjustments to Certain Technical Work Items
  - Contingencies

## Status of DTMs and Data Access

- Final DTM (St. Paul District) scheduled to be delivered Sept '01
- DTM data POC for each District
- CRREL/USGS to support Internet access
- Review of Levee Elevations used in UNET



## Next Milestones

- Task Force Meeting (21 Jun '01)
- Complete District Hydrologic Appendix ITRs (Apr-Sep '01)
- Complete Overall Hydrologic Appendices QCP (Oct '01)
- Build UNET and HEC-RAS models (Nov '01-Apr '02)
- Calibrate UNET models (Feb-May '02)
- Develop Stage-Frequency Relationships (Jun-Aug '02)
- Hydraulic Report ITR (Oct '02)
- Public Open Houses (Nov '02)
- Final Report Preparation/Distribution (Dec '02-Mar '03)

## Status of Hydraulic Modeling

	DTM	Gross Sections	HEC-RAS	UNET	Stage Freq
St. Louis					
Omaha					
Kansas City					
Rock Island					
St. Paul					

## 2002 Public Open Houses

- Nov 12 St. Louis, MO
- Nov 13 Kansas City, MO
- Nov 14 Omaha, NE
- Nov 18 Quincy, IL
- Nov 19 Peoria, IL
- Nov 20 Davenport, IA
- Nov 21 La Crosse, WI

## UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY

### Executive Summary

Summarize flow frequency profile results  
and discuss changes from previous published studies.

1. Introduction
  2. Flood Distribution and Profile Estimates
  3. Quality Assurance/Quality Control
  4. Public Involvement
  5. Federal/State Study Team Coordination
- Upper Mississippi River System Profiles (Plates)

### Glossary

### APPENDICES (to be bound individually)

- A - HUC Hydrology (Goldman)
- B - MVP Hydrology / Hydraulics w/ QA/QC
- C - MVR Hydrology / Hydraulics w/ QA/QC
- D - MVS Hydrology / Hydraulics w/ QA/QC
- E - NWK Hydrology / Hydraulics w/ QA/QC
- F - NWO Hydrology / Hydraulics w/ QA/QC
- G - HUC/IWR Sensitivity Studies
- H - Public Involvement Newsletters
- I - Content Analysis of Public Comments
- J - Sample Inundation Mapping

### Risk and Uncertainty Analysis Report

<http://www.usace.army.mil>



### Digital Flood Insurance Rate Maps (DFIRMs)

- Estimated Project Cost: \$30 million +/-
- Approximate Time Frame: 6 years
- FEMA/Corps Memorandum of Understanding (MOU)
- HQUSACE POC?
- Funding???

### Goals:

- Modernize the FIRMs to a digital product
- Incorporate best available hydrologic/hydraulic data
- Provide more accurate flood hazards data

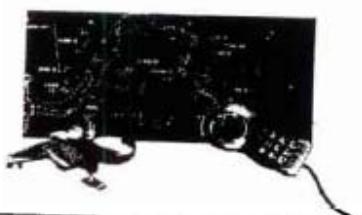


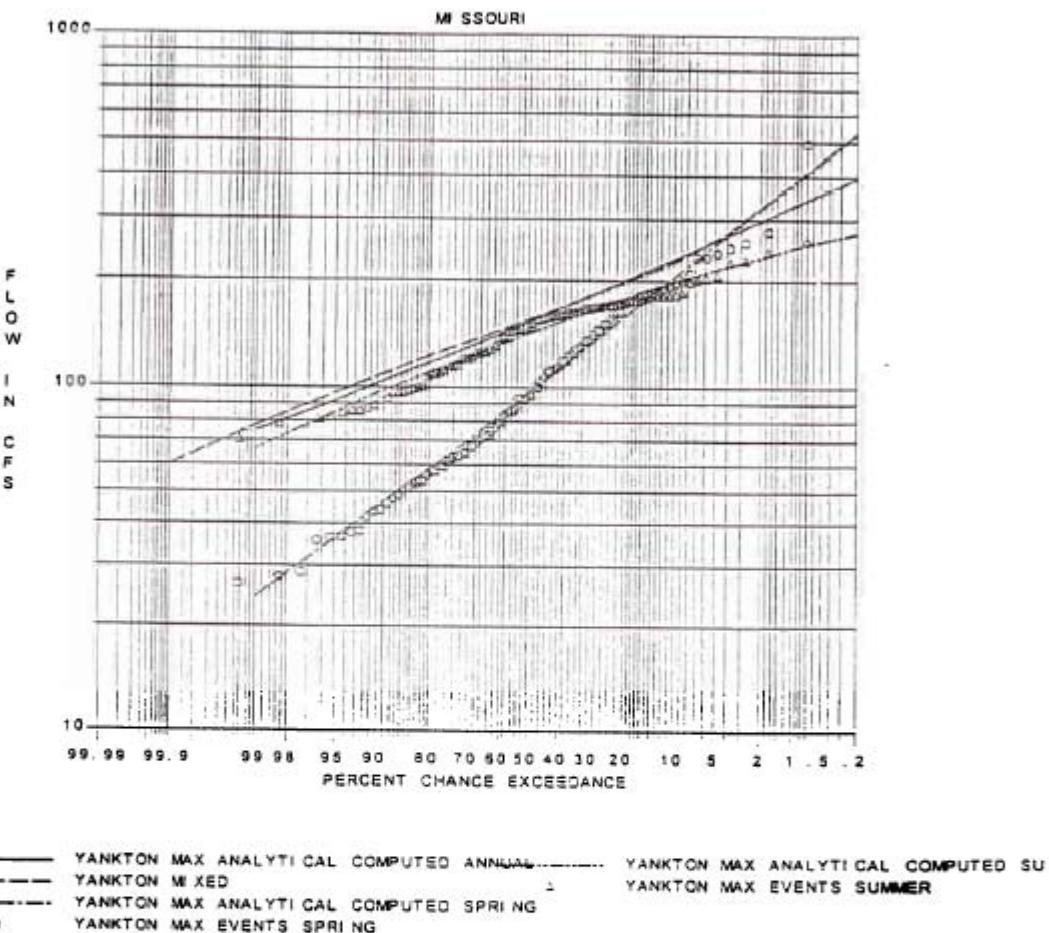
Table 2.6: Estimated flows used in sensitivity analysis

Location	Date	Estimated discharge
Clinton	1828	306000
Keokuk	1851	360000
St Paul	1785	1100000
	1844	1000000

Table 2.7: Comparison of Bulletin 17b estimated quantiles obtained from systematic period beginning in 1898 and historic period

location	area	1%quantile	1% historic	%diff	0.2% quantile	0.2% historic	%diff	years
St Paul	36800	134900	137936	2.25	172900	177872	2.88	132
Winona	59200	237700	231079	-2.79	297400	283627	-4.63	121
Dubuque	82000	281900	275873	-2.14	338900	322943	-4.71	125
Clinton	85600	274300	279252	1.81	322600	326147	1.1	171
Keokuk	119000	371700	374198	0.67	439400	441178	0.4	148
Hannibal	137000	465300	471144	1.26	551300	559264	1.44	120
St Louis	697000	1104800	1042080	-5.63	1318200	1222471	-7.26	163

Slide 1



**Figure 4.1a:** Missouri River, Yankton, SD, (DA 279500 sq mi, period 1898-1997)  
 (Winter-Spring: January 1<sup>st</sup> – April 30<sup>th</sup>, Summer May 1 – December 31<sup>st</sup>)

Slide 2

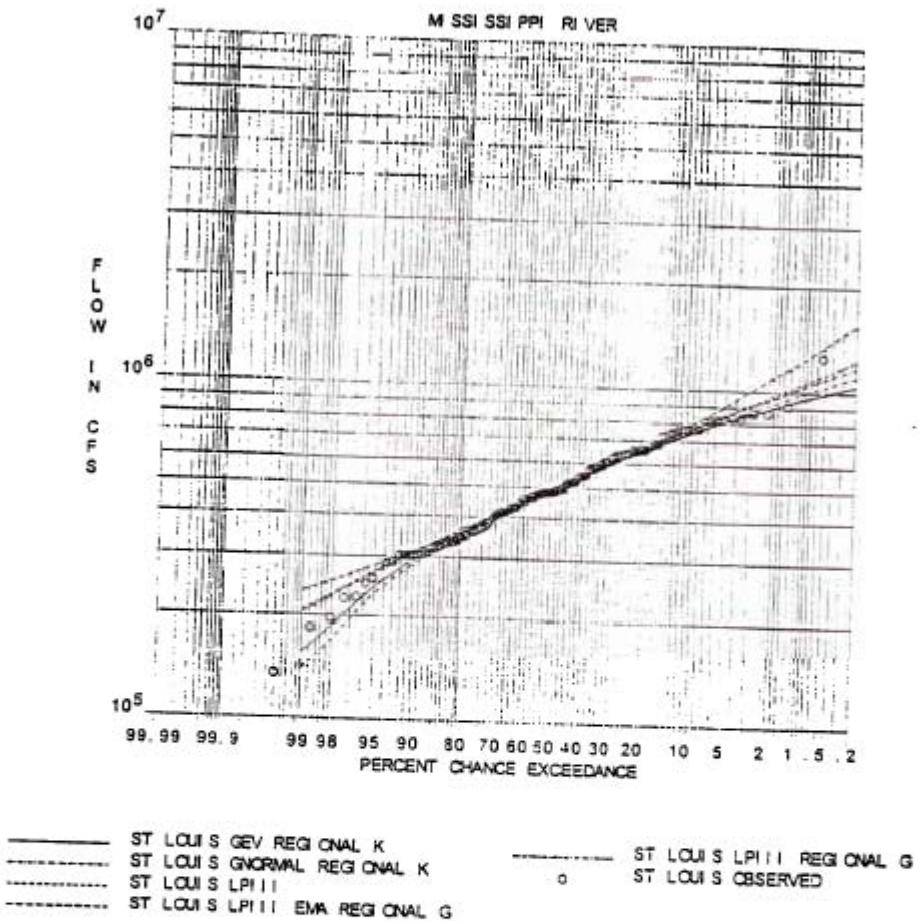


Figure C.7: Sensitivity analysis comparison at St. Louis, Missouri, Mississippi River

Slide 3

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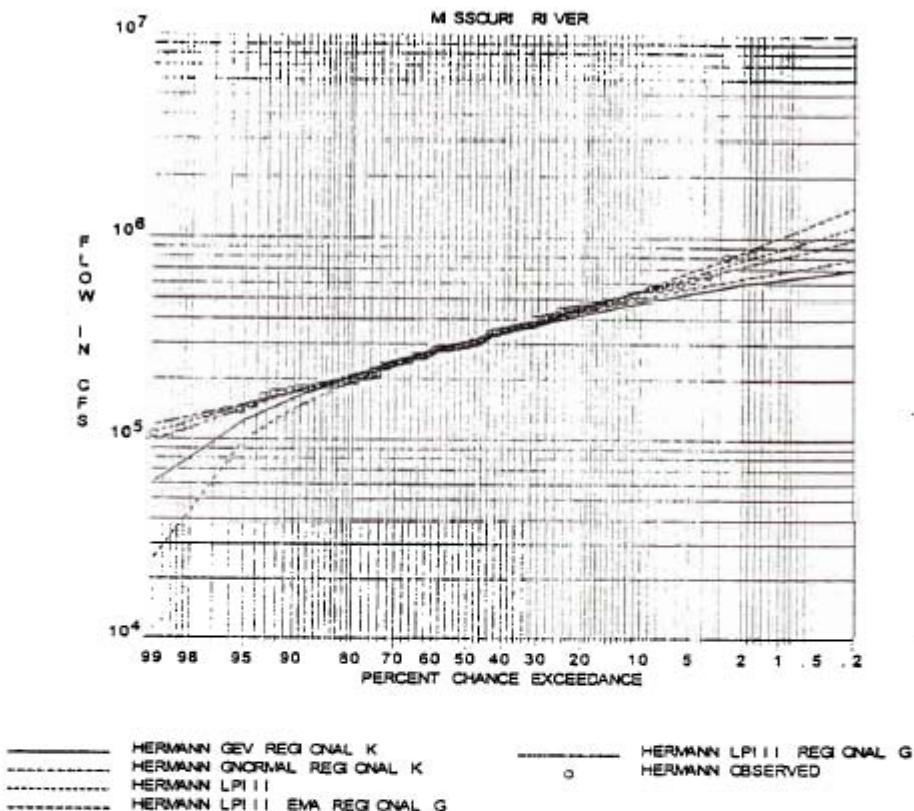
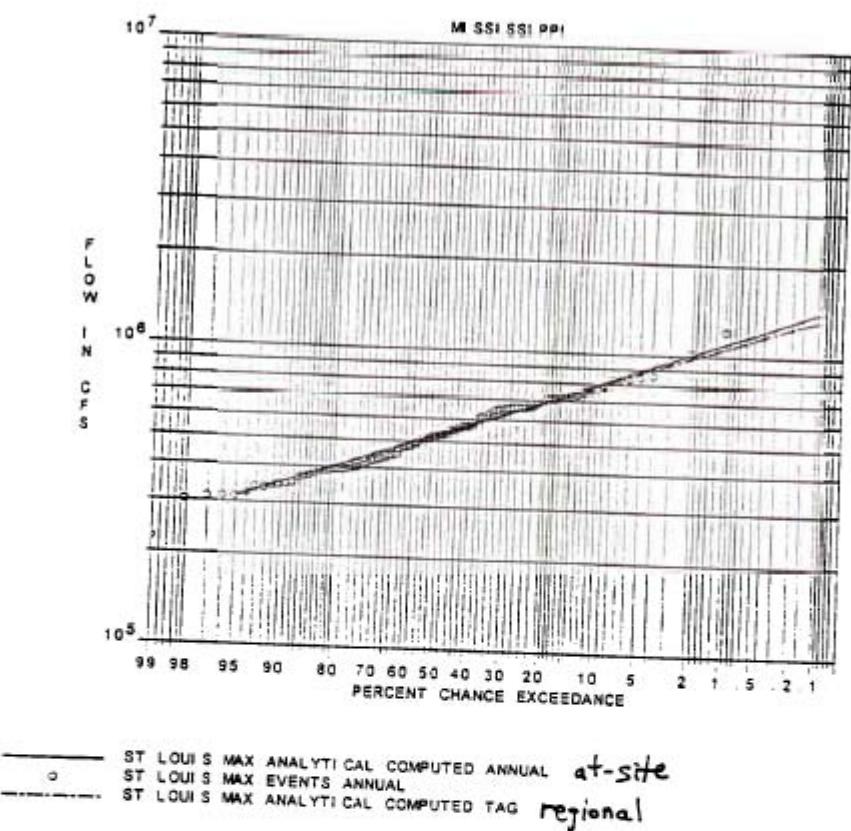


Figure C.6: Sensitivity analysis comparison at Hermann, Missouri, Missouri River

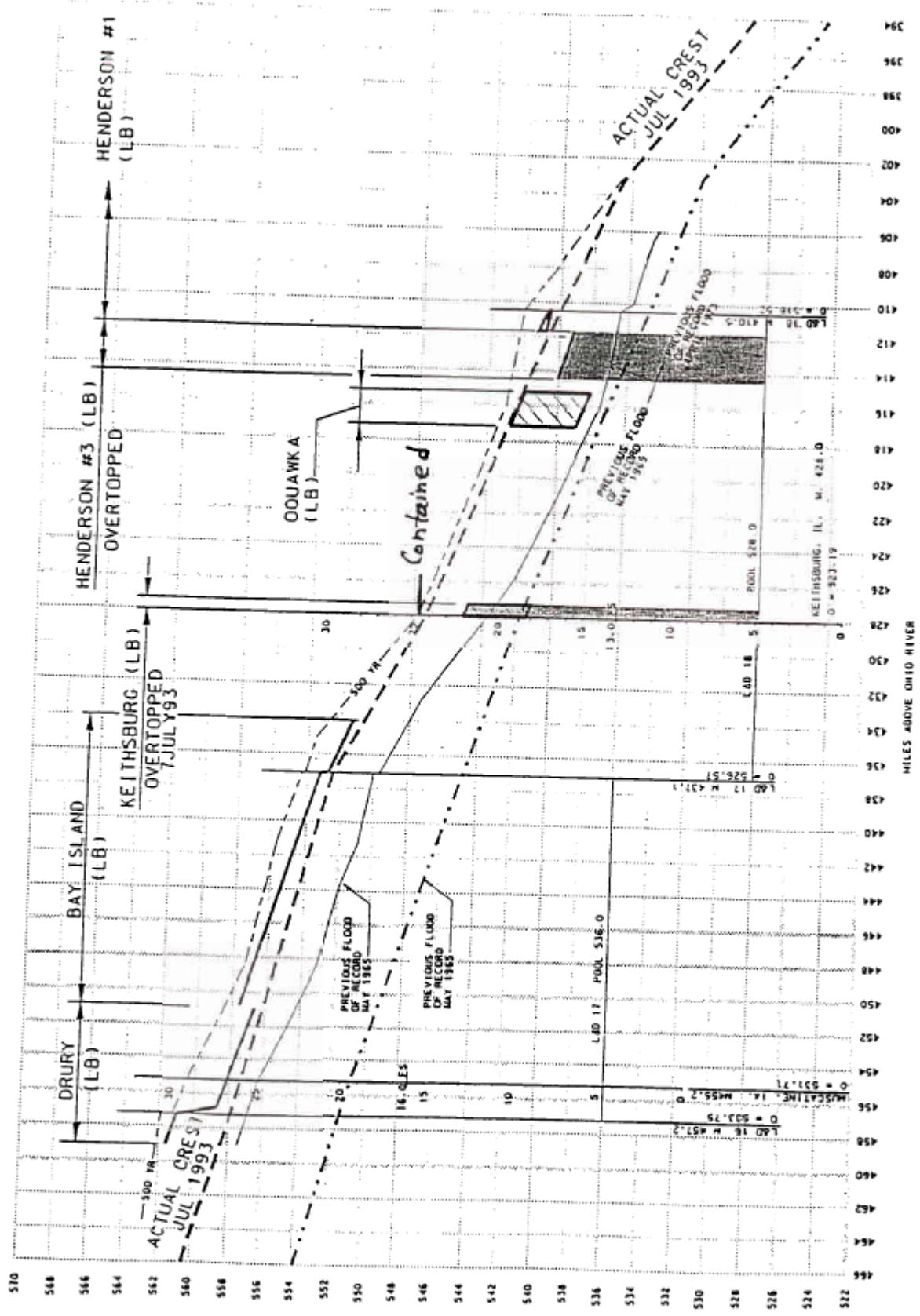
Slide 4

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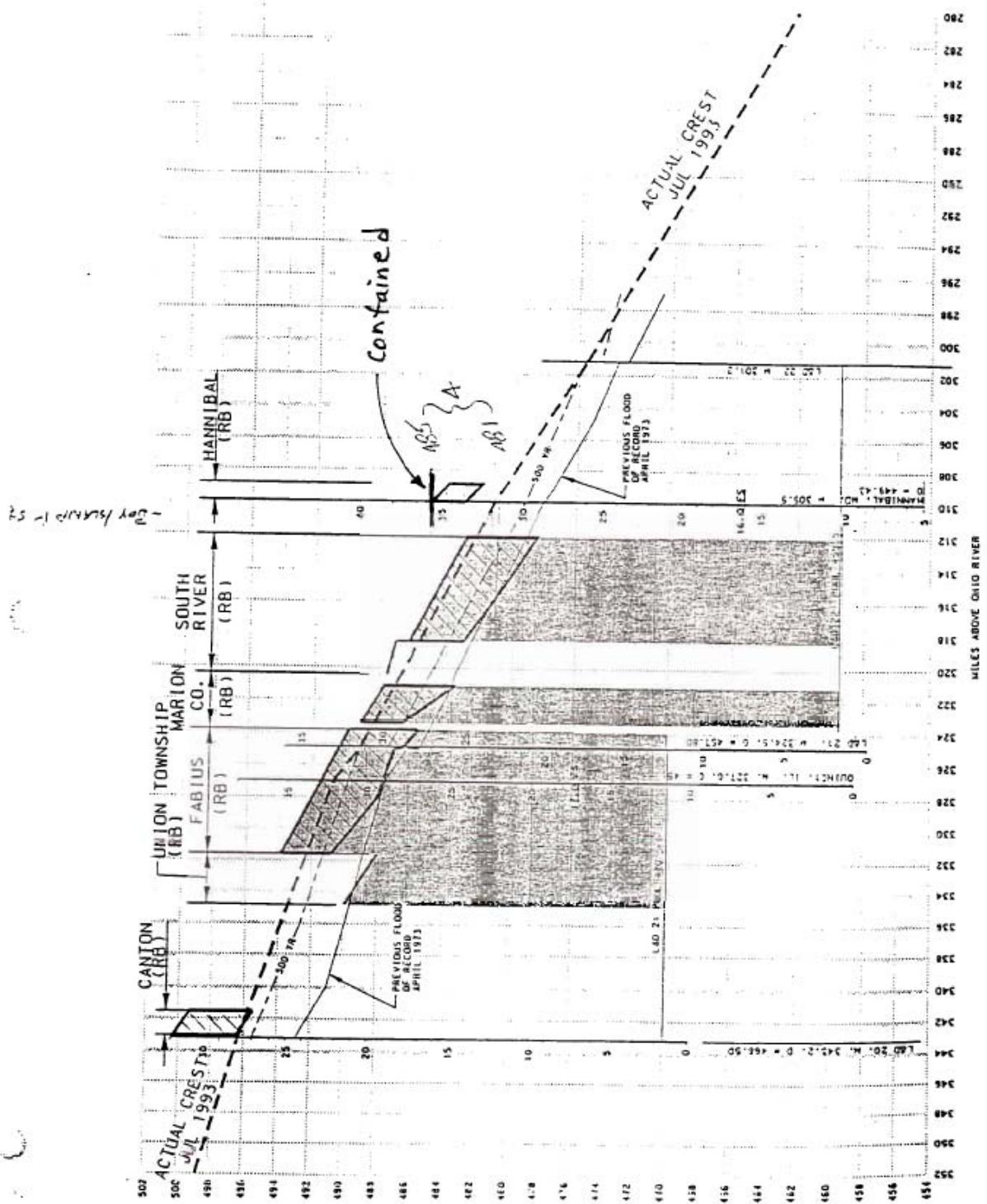
**Figure 5.7: Comparison of at-site and regional shape flood frequency distribution estimates, St. Louis, Mississippi River (regional skew = -0.1), annual maximum daily flows**

Slide 5



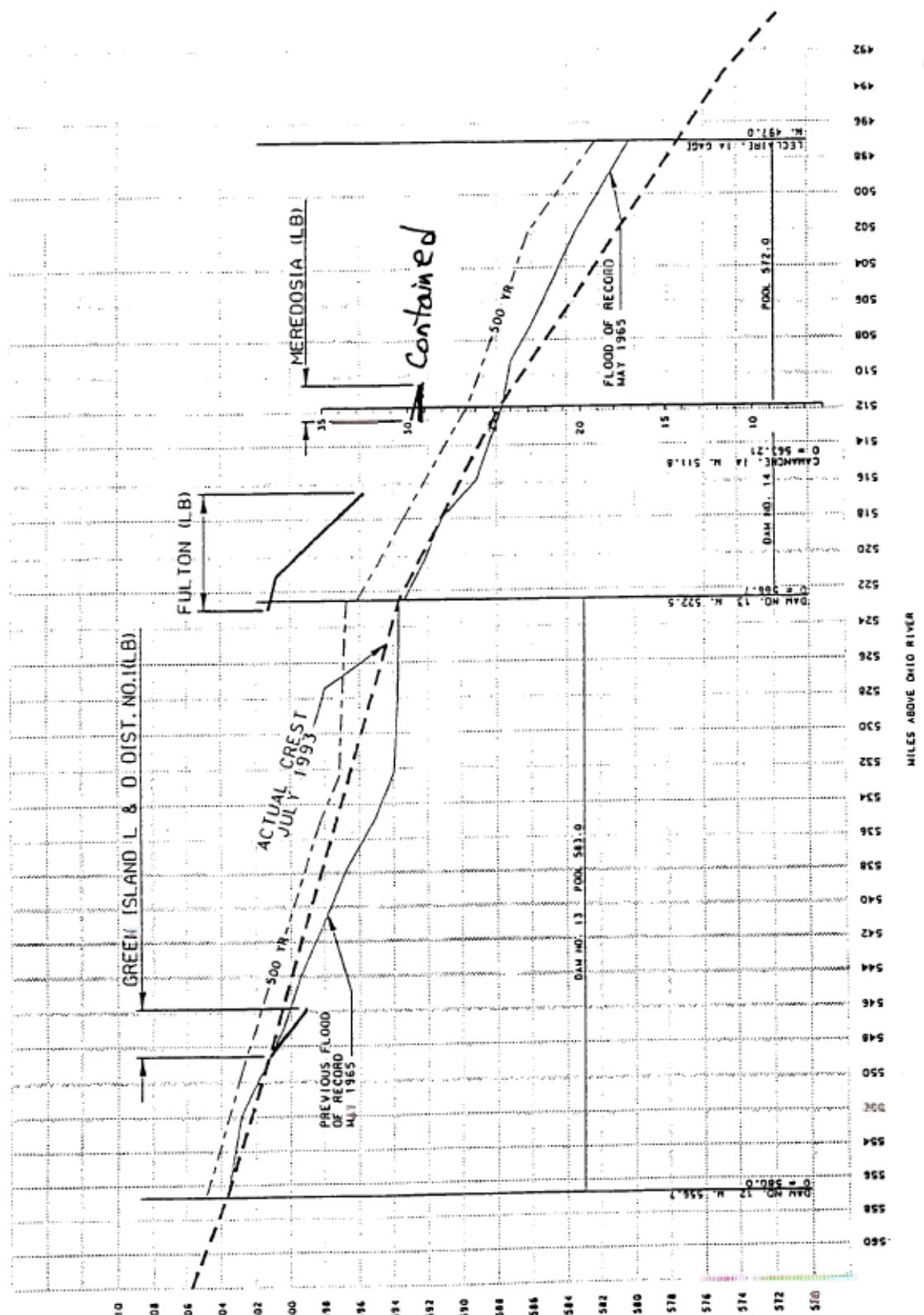
Slide 6

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Slide 7

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Slide 8

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TABLE SL-2  
PEAK STAGE DIFFERENCE FROM COMPUTED  
1993 FLOOD EVENT FOR THE MISSISSIPPI RIVER

MISSISSIPPI RIVER GAGE	RIVER MILE	LEVEE REMOVED AGRICULTURAL	LEVEE REMOVED NATURAL	CONTAINED	25-YEAR LEVEE	NO RESERVOIR	REDUCE RUNOFF BY 5%	REDUCE RUNOFF BY 10%
L&D 22 TW	301.1	-5.0	-1.0	3.5	-3.2	0.3	-0.7	-1.5
LOUISIANA	282.9	-3.8	-0.8	3.6	-3.9	0.1	-0.7	-1.6
L&D 24 TW	273.2	-2.7	-0.4	3.7	-3.4	0.4	-0.7	-1.5
MOZIER LANDING	260.3	-1.6	0.7	4.6	-2.6	1.0	-0.4	-1.3
STERLING LANDING	250.8	-1.9	1.0	4.3	-3.5	1.4	-0.2	-1.6
L&D 25 TW	241.2	-1.8	1.1	4.1	-4.0	1.0	-0.3	-1.9
DIXON LANDING	228.3	-1.0	1.2	4.6	-4.2	2.7	-0.3	-1.9
GRAFTON	218.3	+0.9	1.4	5.2	-4.3	3.3	-0.3	-1.8
L&D 26 TW	199.9	-0.5	1.5	6.0	-3.9	4.1	-0.7	-1.7
CHAIN OF ROCKS	190.4	-1.5	0.1	6.5	-4.0	4.2	-0.9	-1.7
ST. LOUIS	179.6	-2.7	0.3	6.3	-3.3	3.2	-1.1	-1.2
WATER'S POINT	158.5	-4.7	0.0	8.9	-2.9	3.0	-1.0	-0.8
SELMA	145.8	-4.1	0.1	8.9	-3.0	3.9	-1.2	-1.0
BRICKEYES	136.0	-3.9	0.2	8.3	-3.1	5.1	-0.8	-1.2
LITTLE ROCK LANDING	125.5	-4.8	0.1	7.0	-3.1	5.0	-0.7	-1.4
CHESTER	109.9	-7.2	-1.0	5.8	-3.4	4.0	-1.2	-1.8
BISHOP LANDING	100.8	-6.6	-0.6	5.0	-3.3	4.0	-1.0	-1.7
RED ROCK LANDING	94.1	-6.3	-0.5	5.9	-3.4	4.2	-0.9	-1.7
GRAND TOWER	811.9	-5.1	-0.5	5.2	-3.3	4.0	-0.9	-1.7
MOCCASIN SPRINGS	66.3	-4.2	0.5	5.0	-2.8	3.8	-0.8	-1.5
CAPE GIRARDEAU	52.0	-0.8	1.5	4.1	-2.3	3.2	-0.6	-1.2

SJQ



U.S. Army Corps of Engineers  
Laura Abney Chairperson Citizen's Public Involvement Group  
For distribution at June 20, 2001 Meeting

Re: Repeated request for Flow Frequency Evaluation

Dear Members of the Citizen P.I. Group,

I represent Greenway Network, Inc. which is a citizen non profit group from St. Charles County. Part of our mission as a citizen group is to improve communication in networking with public and private concerns regarding watershed issues. At the last two meeting of the P.I. Group I have asked the following assessment be done locally and nothing has been mentioned in the minutes of the meetings and no one from the Corps has responded. At our board meeting on June 18, 2001 Greenway Network, Inc. made a motion followed by discussion and a unanimous approval of the following:

**"The U.S. Army Corps perform an objective flow frequency analysis locally of the cumulative impact of all private and public proposed and present levee's."**

Please respond to Greenway Network, Inc. and acknowledge this request and see that the new hydraulic modeling asses a profile for an objective risk assessment of the Greater St. Louis & St. Charles region.

The increases of "500" year levees on the Missouri watershed both private public and proposed structures will **cumulatively** have a negative impact first on the Darsts Bottoms, Defiance, then on the Greens Bottoms , the North St. Charles Bottoms, St. Charles City and finally upon present infrastructure of St. Louis. Any new proposed 500 year levees plain. should be factored into the cumulative equation of both the Missouri and Mississippi flood

Further Greenway Network, Inc. discussed at this meeting the need for the U. S. Army Corps to communicate to the public a **realistic assessment** of "land use" as it will impact a major river system. "Land use" is relative regardless of the size of a watershed and the total **cumulative** impact needs to be **assessed** at each point along the watershed. We live at the confluence of three major watershed! The Corps should test the adequacy of modeling needs to communicate a realistic "no rise and no risk "assessment to the citizens who have or may consider having homes and businesses in these so called "500 year protected areas.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael V. Garvey". It is written over a curved line that starts under the "Dr." and ends under the "cc" in the list of signatures below.

Dr. Michael V. Garvey Greenway Network, Inc.  
cc Missouri Gov. Bob Holden  
cc St. Charles County Joe Ortweth  
cc St. Charles Patti York  
cc St. Louis City Francis Slay

P.O. Box 513, St. Charles, MO 63302-0513 • Phone: 636-947-0772 Fax: 636-947-0778  
E-Mail: [greenway@cdmnet.com](mailto:greenway@cdmnet.com)

Attachment 5

**UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY**  
**(Upper Mississippi, Lower Missouri, & Illinois Rivers)**  
**CITIZENS' PUBLIC INVOLVEMENT GROUP MEETING**  
**October 9, 2002**

**Final Minutes**

1. The Citizens' Public Involvement (P.I.) Group held its seventh meeting on October 9, 2002, in St. Louis, Missouri. A meeting agenda is attached (attachment 1). The minutes below are a summary of the discussions that occurred during the meeting and are not verbatim.
2. Ms. Laura Abney, Corps of Engineers, Rock Island District, began the meeting by welcoming the participants. An attendance list is attached (attachment 2).
3. There were no additions or corrections to the minutes (pending approval) of the June 20, 2001, Citizens' P.I. Group meeting. Mr. Bill Lay (Fayette, Missouri) moved that the minutes, as written, be accepted as final; Mr. Dave McMurray (Upper Mississippi, Illinois, and Missouri Rivers Association) seconded the motion. The P.I. Group voted unanimously to approve the motion. A copy of the final minutes will be mailed to each P.I. Group member and to Task Force representatives. The final minutes also have been posted to the Flow Frequency Study's website at  
<http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm>.
4. Levee District Letters. Ms. Abney updated the group on the status of levee elevation letters and accompanying spreadsheets that were sent to levee districts included in the study. The release of the letters was dependent upon when the Districts had their levee elevation information gathered and entered into the UNET model. The purpose of the letters was to verify the overtopping elevation of the levees included in the UNET model.
  - a. Ms. Abney provided a handout (attachment 3) that lists the dates that the letters were mailed. Dates are:

Kansas City District – Aug 3, 2002	Omaha District – Jul 30, 2002
Rock Island Dist (Illinois Rvr) – Jun 11, 2002	Rock Island Dist (Mississippi Rvr) – Jun 17, 2002
St. Paul District – Jul 30, 2002	St. Louis District – Oct 24, 2001
  - b. Levee district representatives were originally given 30 days from the date of their letters to notify the Corps of Engineers if there were changes to the elevations listed. The original letter stated that any changes had to be verified by a licensed land surveyor. The timeframe for providing information was extended to October 15, 2002, and it was determined that elevations could include verification by a licensed engineer or architect. Therefore, an Addendum to the letters was mailed on September 4, 2002. Letters, the Addendum, and levee elevation tables are available for viewing on the study's website (see address in paragraph 3 above).
  - c. Attachment 3 also lists the point of contact for each District if there are questions about levee elevation data. Mr. Roy McAllister from the Corps' Northwestern Division in Omaha noted that the address listed for Omaha District is incorrect because the District has temporarily moved to another building and will be there for about 3 years while their building is being renovated. The attachment has been updated to reflect the correct address.
  - d. Ms. Shirley Johnson, Rock Island District Hydrologist, reported that of the approximately 80 Mississippi River levee elevations the District provided to the public, 13 changes have been made; of the approximately 40 Illinois River levee elevations provided to the public, 15 changes have been made. Although Ms. Johnson could not report on the responses the other Districts have received, she acknowledged

that several responses have been reported. She, and the other District Hydrologists and Hydraulic Engineers, appreciated the input they received.

5. Mr. Arlen Feldman, Hydrologic Engineering Center, Corps of Engineers, Davis, CA, gave a presentation (copy of the slides used are shown in attachment 4) explaining the procedure for estimating regulated, existing-condition, stage-frequency relationships. Stage frequencies cannot be estimated directly from historical data because of the many changes in channel/floodplain geometry (both natural and man-made) and reservoir regulation that have occurred over the period of record. Such stage frequencies are not believed to follow a regular analytical distribution as the natural peak flows do (standard Water Resource Council Bulletin 17B procedure). Thus, regulated, existing condition stage-frequency curves are estimated using unregulated flow frequency from hydrologic studies at gages together with regulated vs. unregulated flow relationships and the existing-condition rating curve:

- Develop unregulated flow frequency at any location
    - Interpolate gage statistics (mean, standard deviation) with drainage area
    - Use regional shape factors (skew)
  - Develop regulated vs. unregulated relationships
    - Run UNET period of record for both unregulated and regulated conditions
    - Address situations where historic operation differs from rule curve
  - Develop existing-condition rating curves
    - Use period-of-record UNET existing-condition simulation and plot Q vs. stage
    - Need to extend rating curve to larger flows than in the historical record (especially for the 0.2% flood analysis for Federal Emergency Management Agency (FEMA))
    - Factor-up the hydrographs
  - Estimate uncertainty in rating curve
    - Extend observed uncertainty in stage
    - Assume uncertainty for extended flows is similar to uncertainty of the largest historical flows
  - Join the components to obtain stage-frequency with uncertainty
- a. Slide 1 – Procedure for Estimating Stage-Frequency Relationships. After reviewing unregulated flow frequencies from hydrologic studies at various gages along the rivers, the Technical Advisory Group agreed that the Log Pearson III standard for estimating flow frequencies was appropriate.
- b. Slide 2 – Develop Unregulated Flow Frequency at Any Location. At this step, an understanding of the analytical distribution of the natural flow at the river gages is needed. The hydrologist develops a relationship between gages based on the drainage area. The Technical Advisory Group and the Interagency Group stated that regional areas along the river should be consistent based on skew factors developed.
- c. Slide 3 – Develop Regulated vs. Unregulated Relationships. The UNET model takes into account river geometry, structures, and the hydrograph flow dynamics; a 6-hour simulation time interval was used. Unregulated and regulated (e.g., dams, reservoirs) period-of-record flows are routed. The relationship between the regulated and unregulated flows is developed.
- d. Slide 4 – Develop Rating Curves. A period-of-record, existing-conditions UNET simulation is made and maximum annual flow is plotted against maximum annual stage. (The maximum flow and stage need not occur simultaneously because the maximum flow is only being used as an estimator of maximum stage, not the exact one-to-one relationship.) The rating curve may need to be extended to larger flows than in the period of record (by taking ratios of historical flows).
- e. Slide 5 – Uncertainty in Rating Curve. Uncertainty in the rating curve can be evaluated by the spread in the maximum stage and flow values from the UNET simulation. However, the period of record may not have large enough flows to extend to the 100 (1%), 200 (0.5%), or 500 (0.2%) year floods. We are going to assume the same level of uncertainty as observed in the largest flows of record applies to flows larger than in the record.



f. Slide 6 – Join the Components to Obtain Stage-Frequency with Uncertainty. To obtain a stage/frequency relationship with uncertainty, the study performed a Monte Carlo simulation of: the unregulated flow frequency curve with the uncertainty, with the regulated flow vs. unregulated flow with uncertainty, and the stage vs. flow (rating) curve with uncertainty. A question was asked if there would be a study on the proposed spring rise (new reservoir regulation plan) on the Missouri River as a part of this study. The response was no.

6. The next agenda item was the upcoming November 2002 public open houses.

a. Mr. Jerry Skalak, Corps of Engineers, Rock Island District, joined the group to discuss the status of the open houses. Mr. Skalak is the Flow Frequency Study's Regional Project Manager. Mr. Skalak reported that there are scheduling and budgetary problems with the study. Therefore, the public open houses, originally scheduled for November 2002, are being postponed until early in 2003. The timeframe will depend on the readiness of each District. Also, the open houses will be held after an Independent Technical Review is held for each of the Districts' work.

b. Mr. Skalak further stated that we are doing what we can do to hold to the March 2003 completion schedule, but that may not be possible. The Public Involvement Group would like open house data provided to the public 30 days before the open houses. The Corps will post as much information as possible, but there are some security issues with some of the elevation data. Information will be posted on the study's website and the availability of the information will also be announced in the next study newsletter.

c. Currently, the Continuing Resolution Authority (CRA) that the Federal Government is operating under affects funding of some of our projects, which could affect the study schedule and budget. The delay in the schedule usually affects costs. Open houses are expensive to hold and are being looked at in relation to their costs. The Corps is not required by law to hold public open houses for this type of study; however, Mr. Skalak told the P.I. Group that he wants to hold the open houses and to assume that the open houses will be held.

d. Ms. Sue Simmons, Corps of Engineers, Rock Island District, gave an overview of the open house format that was previously discussed at the June 2001 P.I. Group meeting. The goal of the open houses will be to try to assure that the public understands the study results and how they may be directly impacted by any changes. (Although it is important that the public understands the results; the public cannot influence the study's decision.) The open houses will be held in seven locations along the Mississippi, Missouri, and Illinois Rivers: St. Louis, MO; Kansas City, MO; Omaha, NE; Quincy, IL; Peoria, IL; Davenport, IA; and La Crosse, WI. Two identical open house sessions will be held at each location from 1:00-4:00 p.m. and from 5:30-8:30 p.m. The beginning and ending hours of each session will be informal, where attendees can visit displays, meet with study personnel, and have specific questions answered on a one-on-one basis. The middle hour will consist of a formal presentation followed by general questions and answers. The public will be welcome to attend either open house session *at any time* during each session.

e. Ms. Shirley Johnson then showed the P.I. Group the draft PowerPoint presentation that was created for the open houses. The presentation explains the work that has been done throughout the study and shows examples of some of the displays that will be available. The Group wants to see the following discussed further in the presentation: the reason for the study, what the study is not, any conclusions that can be drawn from what we're seeing between the 1979 and the new profiles, what kinds of changes, what we learned, and what effects the information we learned have. Discussion then focused on some of the displays:

(1) One of the displays will be a “look-up table,” where the public can find the elevation of their property and see if the profile for that elevation has changed or not. The Group would like to see the new profiles at elevations for the 2 (50%), 5 (20%), 10 (10%), 25 (4%), 50 (2%), 100 (1%), 200 (0.5%), and 500 (0.2%) year floods. River charts will be available for the public to find their elevation. On the look-up tables

the Group would like to include the differences between the profiles, add the stage as well as the elevation, and change the terminology of the flood events to percentages; e.g., 100-year flood would be listed as the 1% flood event. However, the existing base flood elevation on the Missouri River is in 100-year terminology so a determination will have to be made on how the elevations are presented.

(2) Elevations and cross-sections will be shown for every ½ mile and at every gage (there are 650 cross-sections for the Mississippi River). The Group was concerned with how the elevation is listed; e.g., 1929 datum, 1912 datum, msl (datum is District-specific) and urged the Corps to explain the data so the public has the same reference point.

(3) Many persons attending the open houses will have questions that will need to be answered by FEMA. The Corps has requested that a FEMA representative be present at all open houses.

(4) P.I. Group members were asked to email questions about the study to the Corps. These questions could be included in a new Frequently Asked Questions sheet that would be available at the open houses (and some could be answered in the next study newsletter).

7. Messrs. S. K. Nanda (Flow Frequency Study Chairman, Corps of Engineers, Rock Island District), Robert Occhipinti (Corps of Engineers, Mississippi Valley Division), Darryl Carattini (Corps of Engineers, Rock Island District), David Wingerd (Corps of Engineers Headquarters, Washington, D.C.), Rolf Olsen (Corps of Engineers, Institute for Water Resources), Al Swoboda (Corps of Engineers, Northwestern Division), Danny Fread (Consultant for the Corps of Engineers), Tim Pangburn (Corps of Engineers, Remote Sensing/GIS Center), Albert Schulz (FEMA – Region VII), Michael Gee (Corps of Engineers, Hydrologic Engineering Center), and

Dr. David Goldman (Corps of Engineers, Hydrologic Engineering Center) joined the meeting. A summary of the questions and answers are below. (Because this is not a verbatim transcript and to assure that the answers provided are technically correct, the questions asked were routed to the appropriate individuals and their answers are provided below).

a. Q: Will the profiles be available to the public prior to the open houses? Is it possible to get the information 1 month prior to the open houses? How will the public get the information?

A: (S. K. Nanda, Corps of Engineers) The Corps of Engineers will try to provide the updated draft profiles to the public 1 month before the public open houses. The information will be posted on the study's website; however, the Corps will mail the information if a member of the public requests it.

b. Q: The open houses were postponed because of technical difficulties. What is the technical challenge?

A: (S. K. Nanda, Corps of Engineers) The UNET model is very complex. In some reaches they have not been able to calibrate the model. The author of the UNET model has been working on the problem. There are river characteristics that are unique to certain areas, such as backwater areas or tributaries into the main stem. The Corps is trying to eliminate the "bumps" in the flows at those areas and is encountering major problems. Study team members are trying their best to fix the problems.

c. Q: Mike Klinger, from UMIMRA, stated that many levees were designed for the 50-year flood to comply with the mandate in the 1954 Flood Control Act. Mr. Klinger indicated this law mandated a minimum level of protection to the 50-year event and that these levees are part of the Public Law 84-99 Program. What happens to those levees if the profiles are raised, for example, 1½ feet? Will it take a congressional mandate to determine if the levees are still part of the Public Law 84-99 Program or will the Corps of Engineers have the authority? Will the Upper Mississippi River have funds to maintain the required level of protection?

A: Mr. Nanda told the Group that we would post the answer on the web after HQ responds [*and will be available on the study's website by the time the final report is completed*].

d. Q: Will the Flow Frequency Study results be used to “kick” levees out of the Public Law 84-99 Program? If the levees would no longer be part of the Public Law 84-99 Program, what would the levee owners have to do to make the levees part of the Program again?

A: (Dave Wingerd, HQ, Corps of Engineers) Policy for this question is under review by Headquarters [*and will be available on the study's website by the time the final report is completed*].

e. Q: Will the Flow Frequency Study results be used to “kick” levees out of FEMA Program?

A: (Al Schulz, FEMA) From FEMA’s perspective, it is only concerned with 100-year levees. FEMA is coordinating with the Corps of Engineers. The Corps is developing the floodway on the Mississippi River in Fiscal Year 2003/2004 (work has been funded).

f. Q: Will there be a grace period to make improvements?

A: (Al Schulz, FEMA) Due to FEMA’s publication process, there may be several years before leveed areas are re-mapped. For currently certified levees to maintain certification, FEMA will work with communities and levee districts to allow time for re-certification.

g.. Q. What happens if a levee can not be re-certified?

A. (Al Schulz, FEMA) If a levee is decertified, studies show an economic feasibility to bring the levees up to certification level. FEMA will work with private levee districts and will delay publishing maps until their improvements are finished. FEMA will try to avoid and minimize hardships.

h. Q: How will FEMA use the results of the study?

A: (Al Schulz FEMA) FEMA is only concerned with the 100-year (1%) profile.

i. Q: How accurate are the levee elevation data used in the UNET model?

A: (S. K. Nanda, Corps of Engineers) Each District was required to check the data and went through a laborious process doing so. There could be some error, but the floodplain contractor assured that there is no more than a .67 root mean square error. Letters were sent to the levee districts, as well as posted on the study’s website, asking for verification of the elevation data. Cross sections include all levees in the system. If errors are not reported, the study assumes that the information is accurate. Rock Island District did a sensitivity study to determine if levee failure elevation is critical and discovered that one foot higher or lower did not make substantial difference in the profiles. Dr. David Goldman, Corps of Engineers Hydrologic Engineering Center, verified that the profiles probably will not change unless there is a drastic change in the levee elevation.

Mr. Nanda stated that the quality of the data should not be a question when this study is completed.

j. Q: For example, if a 10-year levee is determined to be an 8-year levee, how will be cost-benefit be addressed?

A: (Al Swoboda, Corps of Engineers) Flood damages would be calculated on the levee based on the new (8-year) level of protection. If a positive benefit/cost ratio is determined, the levee would be eligible for Federal participation in repairs assuming all other conditions are met.

k. Q: Why weren’t floodplain conveyances used in the study?

A. (S.K. Nanda, Corps of Engineers). Where levees do not exist or where they are not used for flood control (i.e., environmental levees which are purposely filled prior to overtopping flood events), floodplain conveyance is simulated, as appropriate. For flood control levees, there are two levee overtopping alternatives. In the first, an overtopped leveed area acts solely as floodplain storage unless the water surface exceeds the levee crown elevation at multiple locations. At that point, flow through the storage area is

estimated using a dynamic process incorporating the storage area volume and the computed flow passing each breach/overtopping location. In the second alternative, commonly called the “Kansas City Levee Algorithm,” the same process occurs as the first alternative until the flow rate rises to an empirical target. Then the levee is considered non-obstructive and the cross section conveyance is full-width.

l. Q: Last year, articles in scientific literature showed flood heights on the Lower Mississippi River were higher. Is ours consistent?

A: (Al Swoboda, Corps of Engineers) An analysis of Missouri River stage trends has indicated that at a number of locations stages for some of the higher discharges have increased as much as 5 feet from stages experienced in 1930 for the same discharge.

m. Q: With the band of uncertainty, some area’s flood of record may be at the 50-year level and another area’s may be at the 500-year level. How will the band of uncertainty be shown?

A: (S. K. Nanda, Corps of Engineers) We have not finalized the uncertainties such as due to reservoir levels (full, half), operations, and the upper range of the frequency curve. Once these are defined, all uncertainties will be resolved. It has not been determined how the uncertainties will be shown. The results of uncertainty data (each cross-section) will be kept in the District offices.

n. Q: The fact that different Districts used different datum. How will that be resolved?

A: (S. K. Nanda, Corps of Engineers) In 1979, the Corps structures were built to 1912 datum. Rock Island District felt it was wise to stay with the same datum. However, other Districts used datum from other years. Datum can be put in NGVD (National Geodetic Vertical Datum) for consistency.

o. Q: Is there any reason that a disclaimer should be issued with the new profiles? For example, should a standard error or error band be identified or should a notation be made that the data we used are the best with the money available for the study?

A: (S. K. Nanda, Corps of Engineers/Al Schulz, FEMA) FEMA indicated that they would accept the base flood and not a range of values. Their regulatory requirement is that it be an absolute.

p. Future scenario: It is now 2 years down the road, the study is complete, and the model is in place. A flood has come. Will there be funds appropriated to look at the quality of the data then?

A: (S. K. Nanda, Corps of Engineers) We will not have a flood line, but locus of elevations and our best estimate of the 100-year stage at particular cross-sections. If something can be changed, to improve the accuracy, we will do so now in this study. But it is a tremendous task to change a profile. Unless we have money, the profiles will stay as determined by the study.

8. Mr. Jerry Skalak then discussed the Upper Mississippi River Comprehensive Plan Study. This study will be a systemic look at flood reduction on the Upper Mississippi and Illinois Rivers. The results of the Flow Frequency Study will be used as a basis for the Comprehensive Plan Study. Many of the same “players” on the Flow Frequency Study are also involved in the Comprehensive Plan Study. The study team includes members from the economics (will look at national and regional economics,) hydrology and hydraulics, recreation, and environmental disciplines. A Collaboration Team consisting of Federal, State, and non-governmental organizations has been established and has met twice. Also, four Regional Focus Groups will be set up.

9. The Public Involvement Appendix for the Flow Frequency Study Report was discussed. A draft outline of items to be included in the P.I. Appendix is shown as attachment 5.

10. The P.I. Group then discussed the topics that they wanted Ms. Abney, as the Group’s Chairperson, to present to the Task Force as their October 10 meeting. She will present the following:

- a. The Public Involvement Group would like to see published in the Flow Frequency Study report the uncertainty bands around the profiles. They feel this is important if these new profiles will be used for other purposes such as levee certifications and Corps studies and programs that use the results as absolute.
- b. They feel it is important to have answers to questions that the public will have in regards to how the new profiles will directly affect them. Examples are requirement of maintaining a certain level of protection, FEMA certifications and eligibility in the Public 84-99 Program.
- c. The Group was informed at the P.I. Group meeting that the November open houses would not be held and the reasons why. The Group supports holding open houses to present the results of the study. They stressed having good communication and explanation as to the impacts of using the results, especially by the Corps and other agencies.
- d. They ask that all Districts report the results in current datum and the recommendation is that it be listed in NGVD and have a local stage reference for those who are familiar with the reference.
- e. In addition to open houses for the public, they recommend holding a series of technical workshops for agencies that will be using the new profiles so that everyone understands how they were developed and what assumptions and error bands were used.
- f. The P.I. Group would like to see consistency between the states on regulatory use of the floodplain.
- g. They would like to see a section in the report on lessons learned about the various characteristics of the rivers while completing the study.
- h. The Group would like the updated draft profiles provided to the public 1 month before the public open houses.
- i. Lastly, the P.I. Group would like to publicly thank Mr. Arlen Feldman for all of his support and help in working with them throughout the study.

11. Since this is the last P.I. Group meeting, the Group determined that the following process will be used for finalizing the minutes: (1) The draft minutes will be sent to each member who attended the October 9<sup>th</sup> P.I. Group meeting, with a date in which to send revisions. (2) If revisions are received, they will be incorporated into the minutes and a revised draft will be sent again with a date listed in which to respond to the minutes. (3) If we do not receive a response by the designated date(s), then it will be assumed that the minutes are acceptable as written and the minutes will be considered final. (4) Final minutes will be mailed to all P.I. Group members and posted on the study's website.

12. In closing the meeting, Ms. Abney thanked the P.I. Group members for their time and commitment to the Flow Frequency Study.

/s/

SUZANNE R. SIMMONS  
Recording Secretary  
Citizens' Public Involvement Group

Attachments

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**CITIZENS' PUBLIC INVOLVEMENT (P.I.) GROUP MEETING**  
**October 9, 2002**  
**1 p.m. - 5 p.m.**

**Agenda**

1:00-1:10 p.m. Welcome/Introductions	Laura Abney
1:10-1:15 p.m. Discuss/approve June 2001 meeting minutes	Laura Abney/P.I. Group
1:15-1:45 p.m. Status of Levee District letters/comments/spreadsheet information used in the UNET model	Laura Abney/Shirley Johnson
1:45-2:15 p.m. Profile procedures	Arlen Feldman
2:15-3:00 p.m. Discuss November 2002 public open houses	Sue Simmons/Laura Abney/Jerry Skalak/Shirley Johnson/ P.I. Group
3:00-3:15 p.m. Break	
3:15-4:00 p.m. Questions and answers . FEMA . Corps of Engineers	FEMA Rep/P.I. Group S. K. Nanda/Corps HQ Rep/ P.I. Group
4:00-4:15 p.m. UMR Comprehensive Plan Study update	Jerry Skalak
4:15-4:30 p.m. Discuss PI Appendix for Flow Frequency Study Report	Laura Abney/P.I. Group
4:30-4:45 p.m. Discuss October 10 report to Task Force	Laura Abney/P.I. Group
4:45-5:00 p.m. Closing comments/adjourn	Laura Abney

Attachment 1

UPPER MISSISSIPPI RIVER SYSTEM  
FLOW FREQUENCY STUDY

Citizens' Public Involvement Group Meeting  
October 9, 2002

List of Attendees

NAME	AGENCY/AFFILIATION
Sue Simmons	U.S. Army Corps of Engineers, Rock Island, IL
Laura Abney	U.S. Army Corps of Engineers, Rock Island, IL
Kevin Long	FEMA HQ, Washington, DC
Bill Blanton	FEMA HQ, Washington, DC
David McMurray	Upper Mississippi, Illinois, & Missouri Rivers Assn. (UMIMRA)
Mike Klingner	Upper Mississippi, Illinois, & Missouri Rivers Assn. (UMIMRA)
Joe Gibbs	Upper Mississippi, Illinois, & Missouri Rivers Assn. (UMIMRA)/Missouri Levee Drainage District Assn. (MLDDA)
Charles Kempf	Ameren/UE
Jerry Skalak	U.S. Army Corps of Engineers, Rock Island, IL
Gary Dyhouse	Consultant
Tonya Leibold	FEMA, Region VII, Kansas City, MO
Bill Lay	Farmer, Fayette, MO
Julie L. Grauer	KS Department of Agriculture, Division of Water Resources
Ted Heisel	MO Coalition for the Environment
Roy McAllister	U.S. Army Corps of Engineers, Northwestern Division, Omaha, NE
Holly Stoerker	Upper Mississippi River Basin Association
Hugh Edwards	U.S. Geological Survey, WRD
Arlen Feldman	U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
Shirley Johnson	U.S. Army Corps of Engineers, Rock Island, IL
Robert Occhipinti	U.S. Army Engineer Division, Mississippi Valley, Vicksburg, MS
Darryl Carattini	U.S. Army Corps of Engineers, Rock Island, IL
S. K. Nanda	U.S. Army Corps of Engineers, Rock Island, IL
David Wingerd	U.S. Army Corps of Engineers, HQ, Washington, DC
Rolf Olsen`	U.S. Army Corps of Engineers, Institute for Water Resources, Alexandria, VA

<b>NAME</b>	<b>AGENCY/AFFILIATION</b>
Rolf Olsen`	U.S. Army Corps of Engineers, Institute for Water Resources, Alexandria, VA
Al Swoboda	U.S. Army Corps of Engineers, Northwestern Division, Omaha, NE
Danny Fread	Consultant for Corps
Tim Pangburn	U.S. Army Corps of Engineers, Remote Sensing/GIS Center, Hanover, NH
Albert Schulz	FEMA, Region VII, Kansas City, MO
Michael Gee	U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA
David Goldman	U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA

Attachment 2

**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**DATE SENT AND POC FOR LEVEE DISTRICT LETTERS**

Kansas City District – August 30, 2002

Rebecca Allison  
601 East 12th Street  
Kansas City, Missouri 64106-2896  
816-983-3126

Omaha District – July 30, 2002

Dan Pridal  
106 South 15<sup>th</sup> Street  
Omaha, Nebraska 68102  
402-221-4419

Rock Island District (Illinois River) – June 11, 2002

Dave Martin  
Clock Tower Building – PO Box 2004  
Rock Island, Illinois 61204-2004  
309-794-5361

Rock Island District (Mississippi River) – June 17,

John Burant  
Clock Tower Building – PO Box 2004  
Rock Island, Illinois 61204-2004  
309-794-5803

St. Paul District – July 30, 2002

Stuart Dobberpuhl  
190 – 5<sup>th</sup> Street East  
St. Paul, Minnesota 55101-1638  
651-290-5638

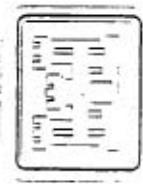
St. Louis District – October 24, 2001

Dennis Stephens  
1222 Spruce Street  
St. Louis, Missouri 63103-2833  
314-331-8359

An Addendum to the letters was mailed on September 4, 2002.

Letters, Addendum, and levee elevation tables are available for viewing on the study's website:  
[www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm](http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm)

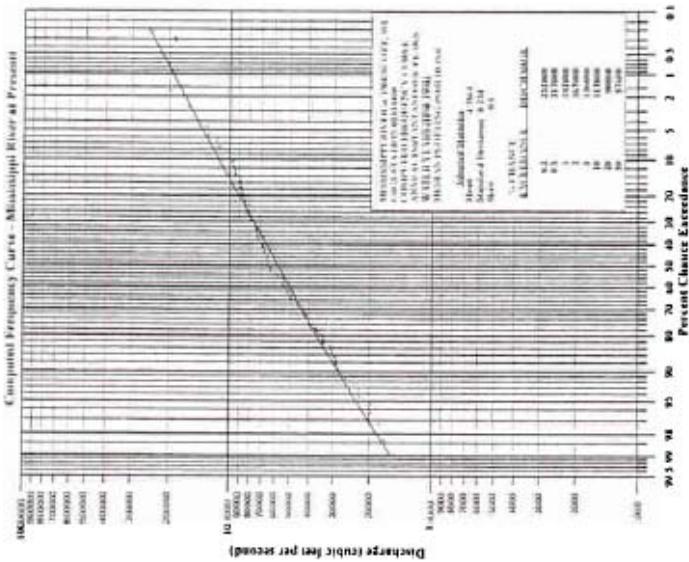
Attachment 3



US Army Corps  
of Engineers  
Hydrologic Engineering Center

- Procedure for Estimating Stage-Frequency Relationships
- Unregulated Flow Frequency from Hydrologic Studies at Gages

- Unregulated Flow Frequency from Hydrologic Studies at Gages



**Figure B-4**

Attachment 4

# Develop Unregulated Flow Frequency at Any Location

- Interpolate Statistics (mean, std. dev.) with Drainage Area
- Use Regional Shape Factors (skew)

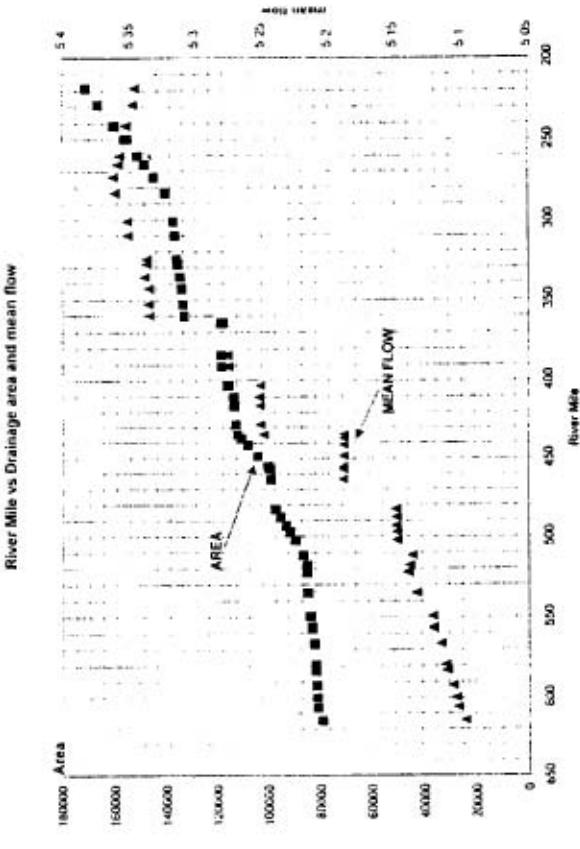
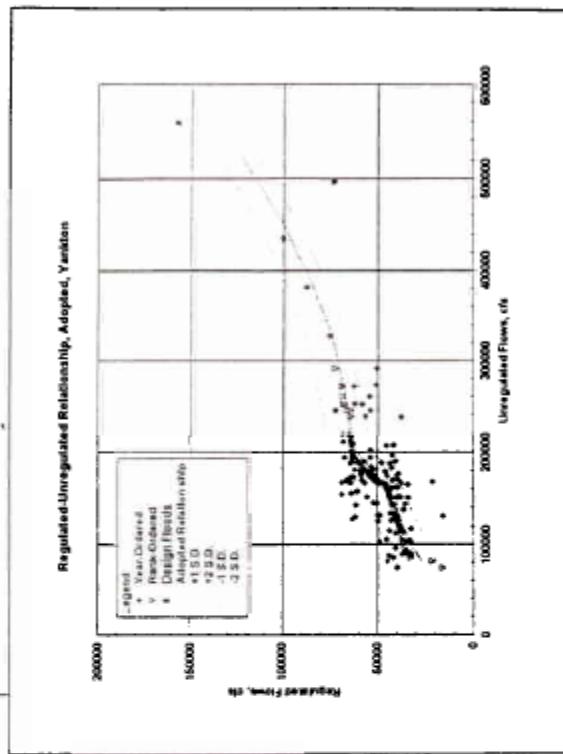
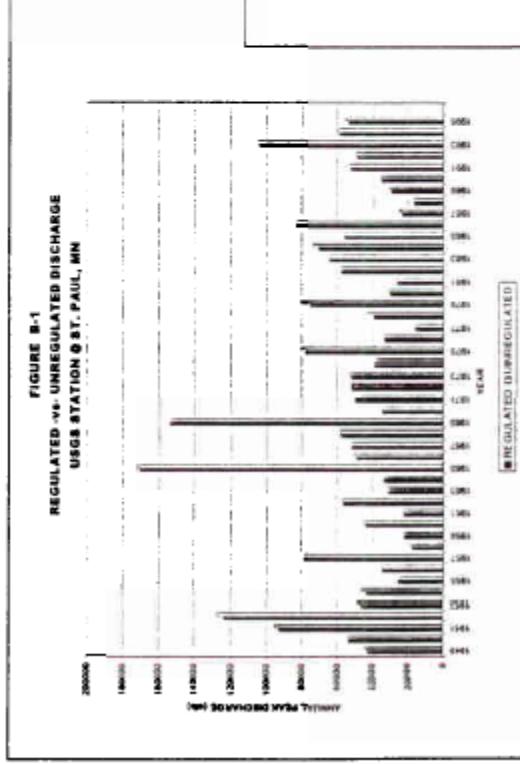


Figure 5.12: UNET simulated mean flow (period 1941-1996) and drainage area versus river mile  
Rock Island District reach of Mississippi River (approximately Dubuque, IA to Gratiot, IL)

# Develop Regulated vs. Unregulated Relationships

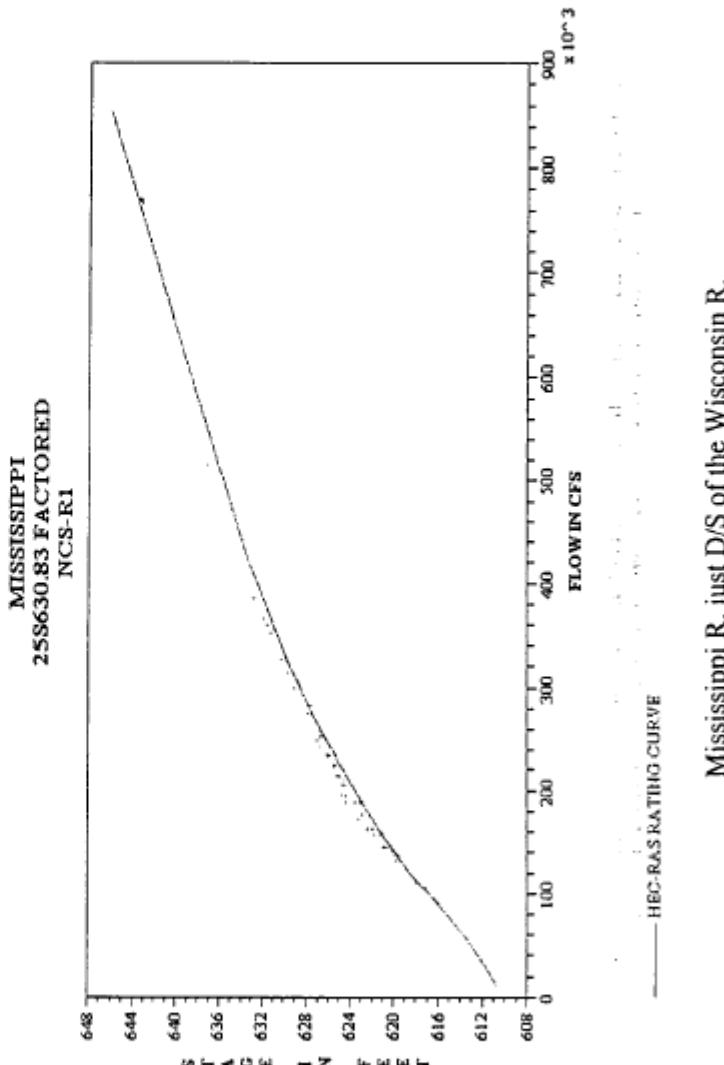
- Run UNET period of record for both unreg & reg
- Address situations where historic operation differs from rule curve



St. Paul Gage

## Develop Rating Curves

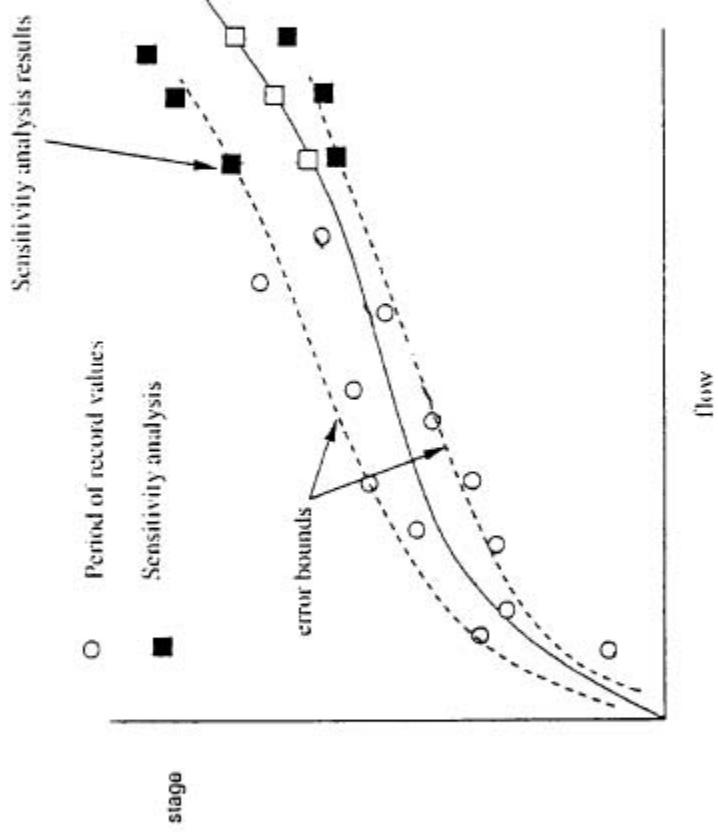
- Use period-of-record UNET simulation  $\rightarrow Q$  vs Stage
- Need to extend rating to larger flows
- Factor-up the hydrographs



Mississippi R. just D/S of the Wisconsin R.

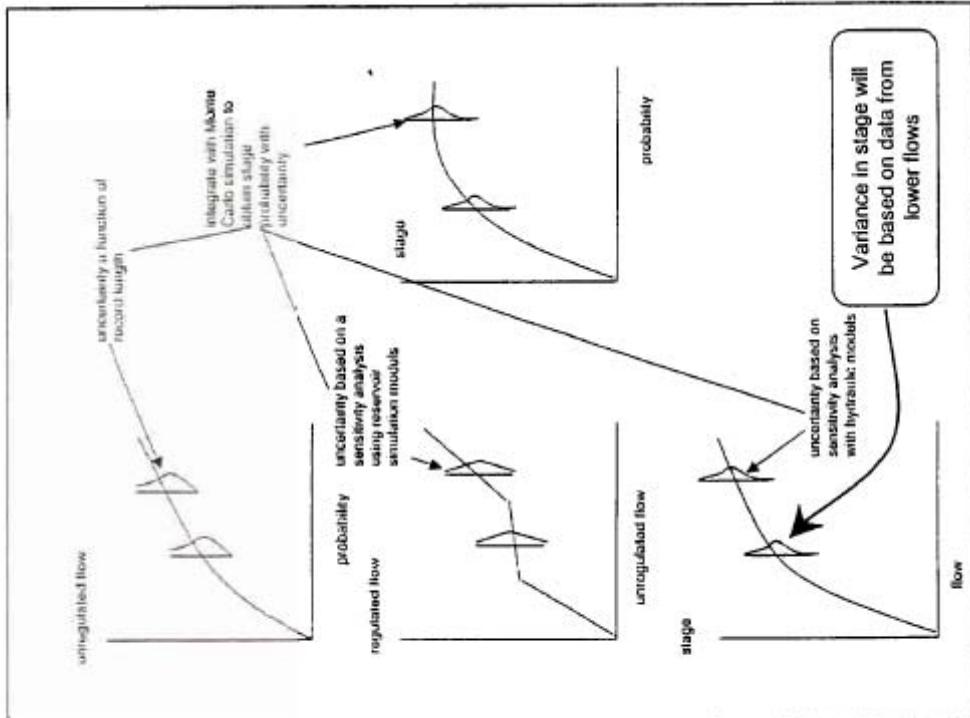
# Uncertainty in Rating Curve

- Extend observed uncertainty in stage



# Join the Components to Obtain Stage-Frequency with Uncertainty

US Army Corps  
of Engineers  
Hydrologic Engineering Center



**UPPER MISSISSIPPI SYSTEM FLOW FREQUENCY STUDY  
(Upper Mississippi, Lower Missouri, and Illinois Rivers)**

**PUBLIC INVOLVEMENT APPENDIX OUTLINE**

1. Summary of newsletters – 5 newsletters including the FAQ newsletter (newsletters will be attached to the appendix):  
December 1997  
February 1999  
November 1999  
December 2000  
November 2001 (Special Edition – Frequently Asked Questions)
2. Purpose/Corps of Engineers Guidelines for the Operation of the Citizens' Public Involvement Group (Guidelines will be attached to the appendix)
3. Number of times PI Group met – 7 meetings including the October 9, 2002, meeting (minutes will be attached to the appendix):  
March 25, 1008  
November 17, 1998  
April 28, 1999  
December 1, 1999  
June 28, 2000  
June 20, 2001  
October 9, 2002
4. Levee elevation letters & addendum to the letters – will include a brief explanation on how the results helped each District refine its UNET model (letters and tables will be attached to the appendix)
5. Public Involvement Group's role in formatting the public open houses
6. Summary of public open houses:  
Dates  
Times  
Locations  
Format  
Summary of the comments received at the open houses  
PowerPoint presentation (will be attached to the appendix)
7. Summary of entire public involvement program

*Attachment 5*



**US Army Corps  
of Engineers®**

# News Release

03-04-16

**Release No.**

Immediate

**For Release**

**Public Affairs Office  
Contact: Justine Barati  
Phone: (309) 794-5204**

## **REVISED RIVER FLOOD LEVELS PRESENTED AT OPEN HOUSES**

**ROCK ISLAND, ILL.** – The public is invited to join the U.S. Army Corps of Engineers at a series of open houses taking place in eight locations along the Mississippi, Missouri, and Illinois Rivers.

Participants will learn about and discuss the findings of the Upper Mississippi, Lower Missouri, and Illinois Rivers System Flow Frequency Study. The Study, initiated in October 1997, partnered the Corps with state and federal agencies to develop revised flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers.

Study findings will be provided to the Federal Emergency Management Agency for possible updating of the Digital Flood Insurance Rate Maps. Public comments received at the open houses will be summarized on the study's website and will become part of the final report. The final report will be published in June 2003.

The open houses take place at the following dates and locations:

**May 6**

St. Louis, Mo.  
Spazio Banquet and Conference Center in Westport  
12031 Lackland Rd.

**May 7**

Kansas City, Mo.  
Hyatt Regency Crown Center, 2345 McGee St.

**May 8**

Omaha, Neb.  
Holiday Inn Omaha-Central-I-80, 3321 South 72nd St.

--more--

## FLOOD LEVELS 2/2/2

### May 19

Quincy, Ill.

Holiday Inn Quincy, 201 South 3rd St.

### May 20

Peoria, Ill.

Holiday Inn City Centre, 500 Hamilton Blvd.

### May 21

Davenport, Iowa

Holiday Inn, 5202 Brady St.

### May 22

La Crosse, Wis.

La Crosse Center, 300 Harborview Plaza

### May 28

St. Paul, Minn.

U.S. Army Corps of Engineers, Conference Rooms 5A and 5B, 190 5th St. E.

Open houses take place from 1 to 4 p.m. and 5:30 to 8:30 p.m. Each session begins and ends informally where attendees can come and go, visit displays, meet with study personnel, and ask questions on a one-on-one basis. Displays include maps of the study area, new draft river profiles (the profiles will not be considered final until the report is released in June), and cross-section information. A formal presentation describing the study and its findings will take place at 2 and 6:30 p.m., followed by general questions and answers.

Only one open house will take place on May 28, in St. Paul, Minn., from 1 to 4 p.m., with the formal presentation at 2 p.m. The format will be identical to the other sessions. The open house is located in the Corps' office building in downtown St. Paul. Building security requires attendees to be escorted from the 2<sup>nd</sup> to the 5<sup>th</sup> floor. Signs at all publicly accessible elevators will direct attendees to gather on the 2nd floor where they will be escorted to the meeting.

For more information, please visit the Flow Frequency website at

[www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm](http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/flowfreq.htm) or call Andrew Leichty at 309-794-5399 or e-mail him at [Andrew.L.Leichty@usace.army.mil](mailto:Andrew.L.Leichty@usace.army.mil).

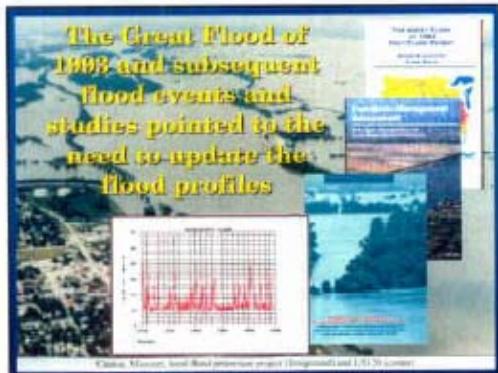
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Welcome to the  
Upper Mississippi River System  
Flow Frequency Study

The goal of this open house is to explain why and how the Flow Frequency Study was accomplished and to share the Study results with the general public.

This presentation will address:

- Study Purpose, Geography, and Schedule
- Collaboration and Public Involvement Efforts
- Assumptions
- Hydrology, Hydraulics, and Modeling
- Results and Products
- Policy Issues and Other Concerns
- FEMA Perspectives and Plans



#### Flow Frequency Study purposes:

- Update Flow-Frequency Relationships
  - 29 to nearly 40 additional years of record
- Update Water Surface Profiles for Various Flood Events
  - New tools for producing flood profile information
- Improve hydrologic and hydraulic data and information
  - High resolution floodplain elevation data and cross sections
  - Systemic unregulated and regulated flow models



#### STUDY COMPLETION SCHEDULE

Final Review	<b>MAY 1 – 30</b>
Public Open Houses	<b>MAY 6 – 28</b>
– May 6 St. Louis	
– May 7 Kansas City	
– May 8 Omaha	
– May 19 Quincy	
– May 20 Peoria	
– May 21 Davenport	
– May 22 La Crosse	
– May 23 St. Paul (afternoon session only)	
Final Corps/Interagency Task Force Coordination	<b>JUNE 5</b>
Prepare Final Report & Appendices	<b>JUNE 6 – 29</b>
Post/Distribute Final Report & Appendices	<b>JUNE 30</b>

**Upper Mississippi River System  
Flow Frequency Study**

**Collaboration and Coordination**

- Interagency Task Force
- Citizens' Public Involvement Group
- Technical Advisory Groups

**Federal and State Partnership**

**Interagency Task Force members:**

- |  |             |
|--|-------------|
| ■ Corps of Engineers                     | ■ Illinois  |
| ■ Federal Emergency Management Agency    | ■ Iowa      |
| ■ United States Geological Survey        | ■ Kansas    |
| ■ National Weather Service               | ■ Minnesota |
| ■ Bureau of Reclamation                  | ■ Missouri  |
| ■ Natural Resources Conservation Service | ■ Nebraska  |
| ■ Tennessee Valley Authority             | ■ Wisconsin |

***Public Involvement***

■ 7 Citizens' Public Involvement

**Group Meetings**

- Effects of land-use and climate
- Accuracy of elevation data
- Strategy for presenting Study results to the public

■ 6 Newsletters

■ Current Open Houses (8 total)

**The Study: Hydrology and Hydraulics**



**Hydrology.....**

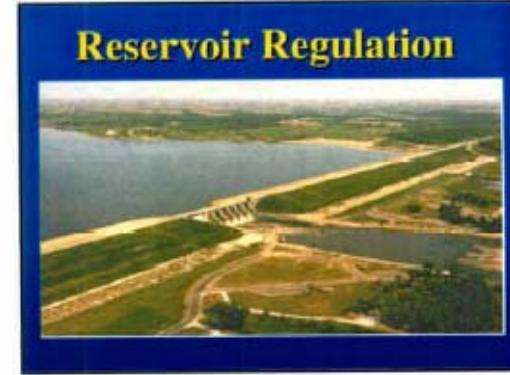
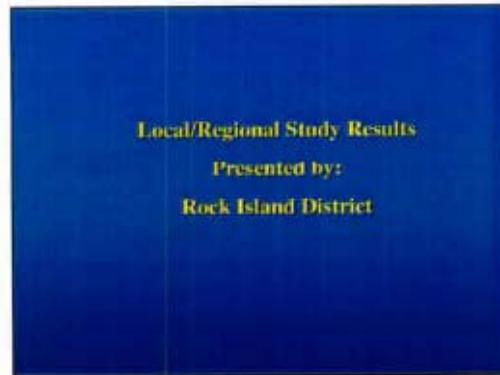
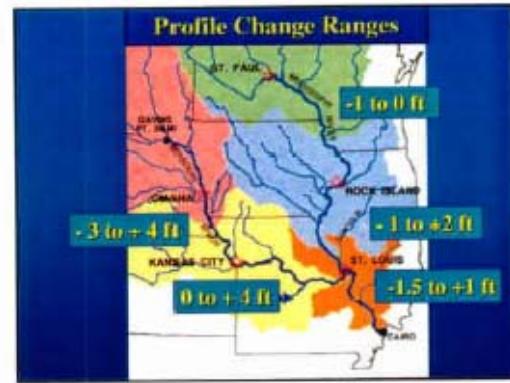
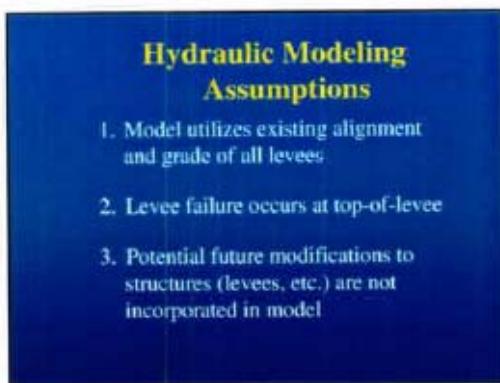
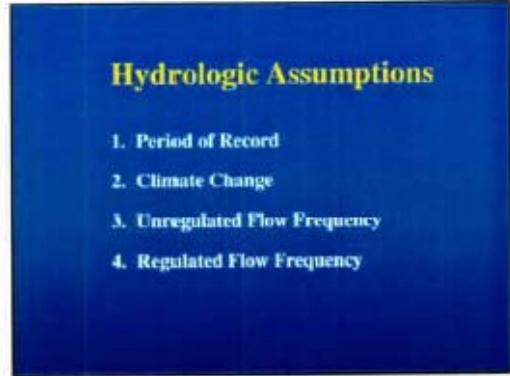
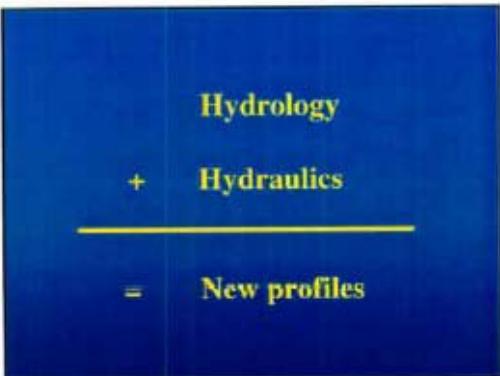
How much water [Flow] ?

Cubic Feet per Second [CFS]

**Hydraulics.....**

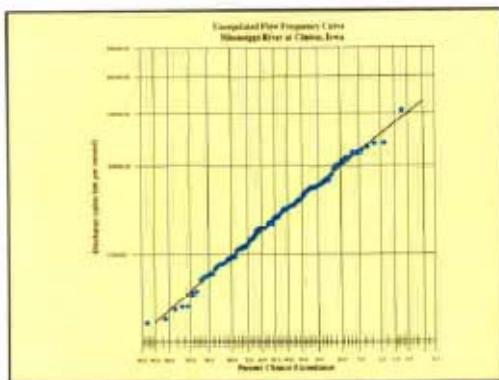
How high is the water ? [Stage]

Elevation [Feet]



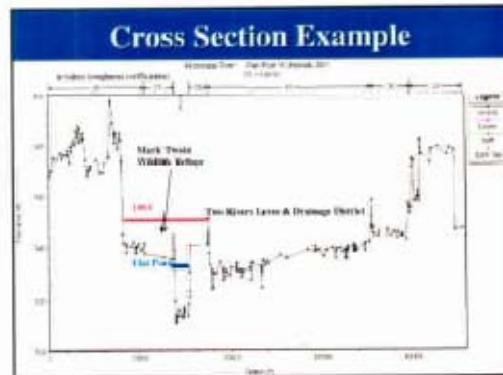
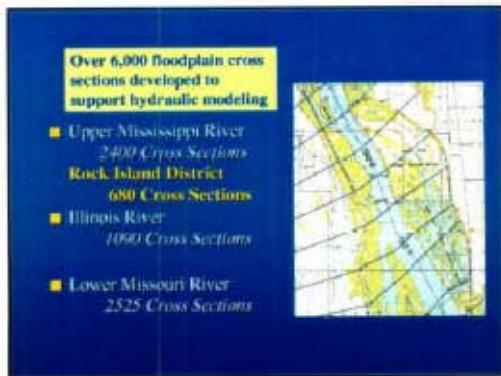


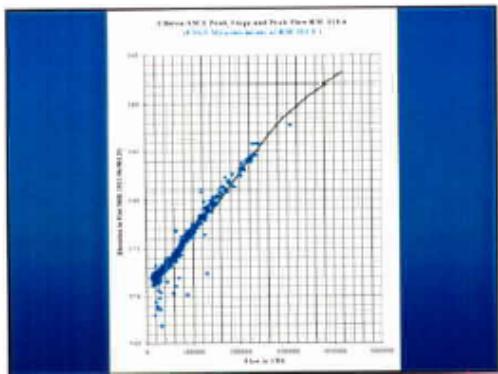
Mississippi River Gage Location	Drainage Area (sq.mi)
101 Years of Record	
Dubuque (unregulated)	82,100
Clinton (unregulated)	85,600
Keokuk (regulated)	119,000
Hannibal (regulated)	137,000



**Comparison "Old vs New"  
100-year Flood Event**

	1979	2003
<b>Mississippi River</b>	Existing	New
<b>Location</b>	100-year	<b>100-year</b>
	Flow	Flow
	CFS	CFS
	Regulated	Regulated
<b>Keokuk, Iowa</b>	351,000	<b>366,000</b>
<b>Hannibal, Missouri</b>	374,000	<b>440,000</b>





Comparison "Old vs New" 100-year Flood Event				
Mississippi River Location	River Mile	1979		2003
		Existing	New	100-year Elevation
		Regulated	Regulated	Regulated
Keokuk, Iowa	364.2	501.2	<b>501.6</b>	
Hannibal, Missouri	309	475.7	<b>477.5</b>	
		309.9	476	<b>477.8</b>

Comparison "Old vs New" 100-year Flood Event					
Mississippi River Location	River Mile	1979	1979	2003	2003
		Existing	Existing	New	New
		100-year Elevation	100-year Flow	100-year Elevation	100-year Flow
		OS	OS		
		Regulated	Regulated	Regulated	Regulated
Keokuk, Iowa	364.2	351.000		366.000	
		501.2		<b>501.6</b>	
Hannibal, Missouri	309	374.000		440.000	
		475.7		<b>477.5</b>	
		309.9		476	<b>477.8</b>

Sample "Look-up" Table					
Mississippi River Comparison "Old" vs "New"					
100-year (1% Chance) Water Surface Elevations					
		OLD	NEW		
		(1% chance)	(1% chance)		
Location	River Mile	1% old msl	1% new msl	Difference <sup>a</sup>	(in feet)
Dubuque, Iowa	576.0	561.9	561	-6.0	
Dam 13 Pool (Clinton, Iowa Vicinity)	512.5	504.1	503.0	-1	
Cassville, Iowa	487	487.4	488.1	0.7	
Dam 14 Pool (Luther, Iowa Vicinity)	494.0	517	517.8	0.8	
Dam 15 Pool (Quad Cities Vicinity)	482.0	500	504.0	0.0	



**Some Frequently Asked Questions about...**

- Corps P.L. 84-99 Program eligibility
- Elevation data availability
- UMR Comprehensive Plan
- Missouri River Master Manual
- FEMA Flood Insurance Program

## FFS and Public Law 84-99



### Public Law 84-99

#### Rehabilitation and Inspection Program

- Existing Flood Control Works (FCW), currently active in the program, will not be immediately affected by the publication of new flood profiles.
- Any changes to program eligibility will only occur after a review of the eligibility criteria and an assessment of the impacts to existing eligible FCW is accomplished.

### Program Review Process

#### Rehabilitation and Inspection Program

- Identify potentially impacted FCW that fall below the minimum level of protection for eligibility in the program
- Conduct further risk & uncertainty (R&U) analysis of those levees that are potentially impacted
- In coordination with sponsors, State and Federal agencies, develop updated minimum protection level program eligibility criteria and policy based the flood frequency study results and the impact analysis on active FCW
- Publish proposed eligibility criteria in Federal Register for public review and comment
- The process review duration is being determined

### Availability of FFS elevation data

Study elevation data will be available this June via the Corps of Engineers' web site:

<http://corpsgeo1.usace.army.mil>

Initially this data will be served to the public through a web page containing a tabular listing of the data locations and hot links to download the data and its associated metadata.

### UMR Comprehensive Plan

*The Upper Mississippi River Comprehensive Plan is utilizing the new profiles in the development and evaluation of alternatives for systemic flood damage reduction and flood protection along the Upper Mississippi and Illinois Rivers.*

### Missouri River Master Manual

*The potential changes being considered for the water control plan for the Missouri River Mainstem Reservoir System affect the relatively more frequent (i.e. less major) flood events. Based on this factor, there should be relatively little effect of the new profiles on the Master Manual and vice versa.*

**FEMA Flood Insurance Program**

*FEMA will make a presentation immediately following this one that addresses the relationships between the FFS and FEMA programs. In addition a FEMA representative will be here for the duration of the open house to further address your questions or concerns.*

Please visit with any of the Corps of Engineers, FEMA, and State agency staff that are present to ask questions about or discuss any aspects of the Study.

*Additional Study information is available at...*

**UMRS Flow Frequency Study web site:**

<http://www.mr.usace.army.mil/gwml/FlowFrequencyWebSite.htm>

**FEDERAL EMERGENCY  
MANAGEMENT AGENCY**

## Frequently Asked Questions

### **1. What actions has the Corps taken to assure Study results that are scientifically sound and uniformly accepted?**

The Study was carried out using best available data and advanced modeling technologies. Nationally and internationally recognized scientists in the fields of hydrology and hydraulics provided direct guidance to the study via two technical advisory committees. Additional technical and floodplain management expertise was brought to bear through a standing Federal and State Interagency task force. Study results have undergone two independent technical reviews. A final Interagency review is currently underway.

Participants and review agencies include: Federal Agencies - Bureau of Reclamation, Federal Emergency Management Agency, National Weather Service, Natural Resources Conservation Service, Tennessee Valley Authority, U.S. Geological Survey, and the U.S. Army Corps of Engineers; the States of - Wisconsin, Minnesota, Illinois, Iowa, Missouri, Kansas, and Nebraska; as well as the Corps. The Mississippi Valley Division represented the Corps (St. Paul District, Rock Island District, and St. Louis District) and the Northwestern Division Missouri River Region (Omaha District and Kansas City District).

Multiple levels of review support the accuracy of the results. These included independent review by each Corps district and each division. The Corps laboratories (Hydrologic Engineering Center, Cold Regions Research and Engineer Laboratory, and the Institute of Water Resources) also reviewed the report and results. Following these reviews the federal agencies and states listed above reviewed the report and results concurrently. In addition, technical advisory groups participated throughout the process by advising and critiquing methods and results.

The Federal Interagency Technical Experts consisted of:

Dr. Kenn Bullard, Bureau of Reclamation  
Dr. David Goldman, Corps of Engineers  
Dr. Leslie Julian, National Weather Service  
Dr. William Kirby, U.S. Geological Service  
Dr. Frank Tsai, Federal Emergency Management Agency  
Mr. Don Woodward, National Resources Conservation Service

The hydrology group consisted of:

Dr. Jon Hoskings, IBM Watson Research Center  
Dr. William Lane, Bureau of Reclamation, retired  
Dr. David Maidment, Professor, University of Texas  
Dr. Kenneth Potter, University of Wisconsin  
Dr. Jerry Stedinger, Cornell University

Mr. Wilbert Thomas, U.S. Geological Service, retired, consultant with Michael Baker, Jr., Inc. (Dr. Kenneth Potter and Dr. Jery Stedinger have served as members of committees for the National Research Council for the National Academy of Sciences)

The hydraulics group consisted of:

Mr. Tony Thomas, US Corps of Engineers, retired  
Dr. Danny Fread, President, Mobile Boundary Hydraulics, PLLC.

A public involvement group made up of concerned citizens and representatives of Levee and Drainage Districts was also assembled to voice opinions, verify data, and help develop report requirements.

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## **2. What is the purpose of the Flow Frequency Study?**

The purpose of the Upper Mississippi River System Flood Frequency Study is to update the discharge frequency relationships and water surface elevations for the Mississippi River and Illinois River above Cairo, Illinois, and the Missouri River downstream from Gavin's Point Dam. Five Corps Districts are participating in this study effort—Omaha, Kansas City, St. Paul, Rock Island, and St. Louis. Existing flow frequency data for the upper and middle reaches of the Mississippi River were prepared by the Corps in 1979. Existing flow frequency relationships for the Missouri River were developed in 1962. Once the water surface elevations are published they will be used by government agencies, local communities and private citizens for purposes of land use planning, floodplain regulation and mapping, etc.

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## **3. What are the study's assumptions?**

### **Hydrology Assumptions**

(The assumptions listed below have been approved by the Flow Frequency Study Technical Advisory Group and the Federal Interagency Advisory Group.)

#### **1. Period of Record**

The period 1898-1998 has been chosen as the period of record for this study because: land use was relatively consistent, the period of record flows can be adequately adjusted for the affects of channelization by using hydraulic models, and the long period of record improves the reliability of the statistical analysis.

#### **2. Climate Change**

The climate for the period of record, 1898-1998 is assumed to be stationary, i.e., not significantly changing. The analysis by the Institute for Water Resources (IWR) showed possible trends for some stations but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability.

#### **3. Statistical Methodology (Unregulated Flow Frequency)**

In general, "Guidelines for Determining Flood Flow Frequency, Bulletin 17B" was used for flow frequency analysis which incorporates currently accepted technical methods with sufficient detail to promote uniform application. The log-Pearson Type III analytical frequency distribution was selected for the unregulated (without dams) flow-frequency analysis. Several new analytical

distributions and estimation methods were evaluated. Significant differences between the application of the log-Pearson and other distributions were not found and hence it was decided to continue to use this standard distribution. The ‘regional shape’ factor, skew, was obtained by taking a best average estimate from gages situated in similar hydrologic and meteorological conditions.

#### 4. Regulated Flow Frequency

The regulated flow frequency curve was developed using the unregulated frequency curve and a regulated versus unregulated flow relationship.

#### 5. Interpolation of Flow Statistics Between Gages

The Technical Advisory group recommended estimating the mean and standard deviation as a function of drainage area and the skew from regionally consistent values.

### **Hydraulic Assumptions**

1. The UMRS Flow Frequency Study has developed flood profiles for the 2-, 5-, 10-, 50-, 100-, 200- and 500-year flood events. Water surface elevations for the Flow Frequency Study were computed using the hydraulic model (UNET). The UNET model is based on the assumption that the levees “fail” when water overtops the levee. The consensus of the Flood Insurance Rate Map subtask force (Corps, FEMA, IL, IA, KS, MN, MO, NE, & WI) is that the current flood profiles should be based on existing conditions.

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#### **4. What is the Corps' policy for the levees that become ineligible due to the change in water surface profiles?**

The Army Corps of Engineers is responsible for administering the PL 84-99 Program. The program authorizes the Corps to supplement a levee system owner’s efforts to fight floods and to rehabilitate eligible levees if damaged by a flood event. The Corps determines which levees are eligible for PL 84-99 rehabilitation. PL 84-99 does *not* provide authority to provide federal funds for the raising of a levee to provide a desired level of flood protection. Raising existing non-federal levees is the responsibility of the levee owners and must meet the State requirements. Congress has provided no general authority for the Corps to fund maintenance or improvements for non-PL 84-99 levees due to changes in flow frequency profiles.

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#### **5. How will changes in flood frequency profiles be implemented by the Federal Emergency Management Agency (FEMA) ?**

Questions regarding the implementation of any changes to the Flood Insurance Program resulting from the Upper Mississippi River System (UMRS) Flow Frequency Study should be addressed to FEMA, the appropriate agency to address these questions.

FEMA Region V	FEMA Region VII
Eric Berman	Richard Leonard
312-408-5543	816-283-7009
<a href="mailto:eric.berman@fema.gov">eric.berman@fema.gov</a>	<a href="mailto:Richard.Leonard@fema.gov">Richard.Leonard@fema.gov</a>

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#### **6. Can levee districts review draft levee elevations prior to data entry in hydraulic models?**

Levee elevations used within the hydraulic models were provided to the Public Involvement Group Chairman, prior to stage-frequency development. Certified corrections in elevation data were provided to the Corp’s by some levee districts. These corrections were updated in the database prior to entry of the data into the hydraulic models.

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## **7. Will digital elevation data be made available to the public?**

Digital elevation data will be made available to the public. Presently plans are being made for hosting these data at the Cold Regions Research and Engineering Laboratory (CRREL). These data will be available by June 2003. Initially this data will be served to the public through a web page containing a tabular listing of the data locations and hot links to download the data and its associated metadata. The initial data offerings will be ASCII point files as they were delivered for use in the study. This data will be accessed through a link from the USACE NSDI Clearing House Node (<http://corpsgeo1.usace.army.mil>). It is possible that this data set could be served with other geospatial data sets developed by the Corps. These data sets could be linked to the National Spatial Data Infrastructure site at <http://www.geo-one-stop.gov>. Funding permits, this data set would be enhanced to include the conversion of the ASCII files to contiguous DTM data delivered through a GIS interface that would allow both viewing and geospatial searching of the elevation data.

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## **8. Will a Standard Project Flood (SPF) profile be included?**

The Standard Project Flood (SPF) and SPF profiles will not be developed as part of the UMRS Flow Frequency Study. The UMRS Flow Frequency Study will develop flood profiles for the 2-, 5-, 10-, 50-, 100-, 200- and 500-year flood events. The Floodplain Management Assessment of the Upper Mississippi River and Lower Missouri Rivers and Tributaries, U.S. Army Corps of Engineers, June 1995, (Appendix A) summarizes a range of additional levee scenarios, assumptions, and results.

<http://www.mvr.usace.army.mil/UMRCP/Documents/FloodplainManagementAssessment.pdf>

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## **9. Will "no levee over topping" scenarios be considered in this study?**

Computation of flow profiles based on assumption of no levee overtopping is unrealistic. At this time, the consensus of the Flood Insurance Rate Map subtask force (Corps, FEMA, IL, IA, KS, MN, MO, NE, & WI) is that the current flood profiles should be based on existing conditions. Further evaluation of the “no levee overtopping” condition may be considered in the UMRS Comprehensive Plan to develop an integrated flood control strategy for the UMR.

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## **10. How will these new profiles affect the present Flood Insurance Program?**

There will be no impact until the (Flood Insurance Rate Map)FIRM is revised by FEMA. Presently, FEMA is working with the Corps and the States to develop a Scope of Work and funding for this effort. The revisions may take several years.

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## **11. How will these new profiles affect PL 84-99 program eligibility?**

There will be no immediate impact until the Corps is able to assess extent of impacts to eligible levees, develop a risk based policy on PL 84-99 program eligibility and develop a plan of action collaboratively with all stakeholders.

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**12. How will the publication of new profiles affect the Missouri River Master Manual? Or how will the new profiles be affect by the implementation of the Master Manual?**

The potential changes being considered for the water control plan for the Missouri River Mainstem Reservoir System affect the relatively more frequent (less major) flood events. The primary concern regarding the water control plan criteria is the potential effect a "spring rise" may have on flooding. Detailed analyses of the spring rise period has determined that the spring rise had a major impact on flood damages in only 1 year in the reach from Kansas City to the mouth. Whether a spring rise occurs is controlled by flood control constraints at three downstream locations (Omaha, Nebraska City, and Kansas City), just as they do under the current water control plan. These flood control constraints are essentially just as effective under any alternative as they are under the current water control plan, which limits any increase in damaging flood events. Based on this factor, there should be relatively little effect of the new profiles on the Master Manual and vice versa.

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**13. If the results of this study are higher profiles, will the Corps upgrade levees constructed under the 1954 Flood Control Act so they remain at a 50-year level of protection?**

No. The 1954 Flood Control Act does not provide a continuing authority to raise levees.

## FACT SHEET

### UPPER MISSISSIPPI, LOWER MISSOURI, AND ILLINOIS RIVERS FLOW FREQUENCY STUDY IL, IA, KS, MN, MO, NE & WI

**BACKGROUND:** Authority for conducting this investigation is contained in Section 216 of the 1970 Flood Control Act. The study area includes the Upper Mississippi River from Prescott, WI, to Cairo, IL; the Illinois River from its confluence with the Mississippi River at Grafton, IL, to Lockport Lock and Dam at Lockport, IL; and the Missouri River from its confluence with the Mississippi River at St. Louis, MO, to Gavins Point Dam near Yankton, SD. Flood profiles for the Upper Mississippi River were first developed in 1966. In 1971, impacts of tributary reservoirs were incorporated into the 1966 profiles. These profiles were used until 1979 by the Rock Island and St. Paul Districts. The St. Louis District developed new hydraulic profiles following the 1973 flood. In 1979, the Upper Mississippi River Basin Commission's Interagency Technical Flood Plain Management Task Force published a new set of flood profiles. To date, these profiles have been the official flood profiles for management of the floodplains and design of flood control projects along the Upper Mississippi River. Missouri River profiles date back to the mid-1960's. In 1997, the Secretary of the Army for Civil Works directed the Corps of Engineers to conduct a study to review and revise, as appropriate, the existing flood frequency data for the study area. The study was scoped to include: a review of the methodology used in determining flood-flow frequency, selection and application of the appropriate flow frequency analysis method, analysis of the effects of reductions in flood runoff attributable to flood control reservoirs, consideration of the potential effects of levee overtopping and/or failure, and determination and selection of the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface elevations for a range of flow frequencies and development of those profiles. The development of enhanced elevation data for this study was funded out of Corps of Engineers Operations & Maintenance (O&M) appropriations.

Rock Island District has overall project management responsibility for this 5-District (St. Paul, Rock Island, St. Louis, Omaha, Kansas City), 2-Division (Mississippi Valley and Northwestern), 7-state (IL, IA, KS, MN, MO, NE, WI) study. The Corps' Headquarters (HQUSACE), Hydrologic Engineering Center (HEC), Cold Regions Research and Engineering Laboratory (CRREL), and Institute for Water Resources (IWR) are also playing significant roles in the execution of this study. Internal and external study oversight and coordination primarily is accomplished via an interagency task force, technical advisory groups, and a public involvement group.

In addition to the Corps, other task force members include: representatives from the 7 States, National Weather Service (NWS), Natural Resources Conservation Service (NRCS), Bureau of Reclamation (BOR), United States Geological Survey (USGS), Federal Emergency Management Agency (FEMA), and Tennessee Valley Authority (TVA).

#### SCHEDULE:

Reconnaissance phase – March 1997 - September 1997  
Feasibility phase – October 1997 - June 2003 (subject to funding)

**MAJOR WORK ITEMS:** Pending availability of funds, all remaining work, including final UNET modeling, risk and uncertainty analysis, quality reviews, public presentation of results, and publication/posting of final products, is to be completed in Fiscal Year 2003.

**CONGRESSIONAL DISTRICTS:** IL 11-13, 16-19; IA 1-2, 4-5; KS 2-3; MN 1-5; MO 1-6, 8-9; NE 1-3; WI-3.

**REGIONAL PROJECT MANAGER:** Mr. Jerry Skalak, Project Management Branch, Planning, Programs, and Project Management Division, Rock Island District; telephone 309/794-5605; email: [jerry.a.skalak@usace.army.mil](mailto:jerry.a.skalak@usace.army.mil)

**INTERAGENCY TASK FORCE CHAIRPERSON:** Mr. S. K. Nanda, Chief, Hydrology & Hydraulics Branch, Engineering Division, Rock Island District; telephone 309/794-5310; email: [s.k.nanda@usace.army.mil](mailto:s.k.nanda@usace.army.mil)