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IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF SNOHOMISH

LEONARD and JEANNE HALVERSON, husband and wife, et al., Plaintiffs,
vs.
SKAGIT COUNTY, a municipal corporation, Defendant.

SKAGIT COUNTY, a municipal corporation, Third-Party Plaintiff,
vs.
STATE OF WASHINGTON, Third-Party Defendant.

No. 93-2-05201-2

DEPOSITION UPON ORAL EXAMINATION OF
D. GERALD MUTTER

October 12, 1995 9:50 a.m.
1201 Third Avenue, Seattle, Washington

MARK HOVILA, Court Reporter, CSR No. HO-VI-LM-*493PD

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A P P E A R A N C E S

FOR PLAINTIFFS:	CARL H. HAGENS, ESQ. Hagens & Berman 1301 Fifth Avenue, Suite 2929 Seattle, Washington 98101
FOR THE DEFENDANT SKAGIT COUNTY:	WILLIAM C. SMART, ESQ. DAVID R. MAJOR, ESQ. Keller Rohrback 1201 Third Avenue, Suite 3200 Seattle, Washington 98101
FOR THE STATE OF WASHINGTON:	GLEN A. ANDERSON, ESQ. Assistant Attorney General Attorney General of Washington 629 Woodland Square Loop S.E. P.O. Box 40126 Olympia, WA 98504-0126

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D. GERALD MUTTER,
having been first duly sworn, was examined and testified as follows:

E X A M I N A T I O N

BY MR. SMART:

Q. Mr. Mutter, my name is William Smart, you and I have just been introduced. We're here to take your pretrial deposition testimony in the case of Halverson versus Skagit County. Could you state your full name and address for the record, please, sir?

A. Yes. Douglas Gerald Mutter, 336 Southwest 293rd Street, Federal Way, Washington.

Q. Your occupation is what, sir?

A. I'm a civil engineer.

Q. How long have you been a civil engineer?

A. 26 years.

Q. And your assignment in this case was what?

A. I was retained by plaintiffs' attorneys to give them a technical opinion as to the potential impact on occupants of the Nookachamps area of levy construction along the Skagit River.

Q. When you say the impact of levy construction

along the Skagit River, levy construction during what years?

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A. There were no constraints placed on the time frame that I was to look at.
Q. Did you formulate a protocol for how you were to study this particular problem?
A. Not sure I understand your question.
Q. Well, were you given a particular written assignment?
A. Not initially.
Q. Did you subsequently come up with a scope of services?
A. Yes. Initially we were asked to review available information pertaining to the case and offer guidance, and subsequently we wrote a proposal which became the scope of work to do numerical modeling activities to support our opinions.
Q. Do you have a copy of the proposal that you wrote that became the scope of work?
MR. HAGENS: Well, it's part of the deposition exhibits yesterday.
Q. Showing you Exhibit Number 7 to the Regan deposition, does that constitute the scope of work that forms the basis for your project?
A. Well, as I say, that's a partial scope of work for a specific component of what we were to do.
Q. So you're saying Exhibit Number 7 is a partial

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scope of work?
A. Yes. And the remainder of the scope was essentially unwritten.
Q. What was the remainder of the scope of work that is not contained in Exhibit 7?
A. The initial request to review the flood history and condition of the Nookachamps and Skagit River area and provide guidance in our area of technical specialty.
Q. Other than reviewing the flood history and providing guidance, is there anything that you have done that is not contained in Exhibit Number 7 by way of a scope of work?
A. Well, we've -- I guess reviewing flood history is broader than it sounds. We actually performed analysis of our own to make sense of the data and to help us formulate general conclusions about the flood potential in the Nookachamps area.
Q. Is that contained in the scope of work, Exhibit Number 7 to the Regan --
A. No.
Q. -- deposition, or not?

A. No.
Q. All right. So would you tell me, then, each other item that constitutes a scope of work that's not contained in Exhibit Number 7?

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MR. HAGENS: You mean other than he's testified to?
MR. SMART: He said he's performed analyses, and he hasn't told me what he's done or what he's reviewed.
A. Well as I mentioned, the scope was unwritten and it was a request to do whatever was necessary based on our experience and knowledge and available information to come to some opinion about the causes of flooding in the Nookachamps area. Our scope of work wasn't any more specific than that at the beginning.
Q. Have you ever given deposition testimony before, sir?
A. Yes, I have.
Q. On how many occasions?
A. I don't recall. Perhaps half a dozen.
Q. What kinds of cases?
A. Cases related to flood control, erosion control, sedimentation.
Q. Can you tell me what cases you have testified in relating to flood control?
A. I'll have to reach back here. One of the more recent ones had to do with Washington State Department of Transportation in Kelso, Washington.
MR. HAGENS: Can you give him the caption

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of the case, Jerry?
A. I'm afraid I can't offhand.
Q. Tell me who you worked for and what the issues in the case were.
A. Who the attorney was?
Q. Yes.
A. Attorney was Anne E. Salay, S A L A Y.
Q. Who does she work for?
A. The Attorney General's office.
Q. Okay. And what was the issue?
A. Flooding of private property, a bowling alley in Kelso which was alleged to have been caused by drainage improvements constructed by WSDOT.
MR. HAGENS: Who?
A. Washington State Department of Transportation.
Q. And your opinion was what, sir?
A. My opinion was that WSDOT had not been responsible for the flooding that occurred in the case.
Q. And was the case tried?

A. It was.
Q. Where was it tried?
A. In Kelso.
Q. When was that?
A. Three or four years ago.
Q. With what outcome?

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A. I believe the state won their case.
Q. What other cases have you been involved in with respect to flood control?
A. They're a little hard to categorize. I was involved in another case also with the Attorney General's office on behalf of WSDOT dealing with diversion of the Naches River into a materials mining pit in the flood plain near Gleed, Washington.
Q. When was that?
A. That must have been ten years ago.
Q. What was the issue in the case?
A. As I recall, WSDOT had obtained materials from a pit adjacent to the main channel of the Naches River, for highway construction purposes, and at some point after that, during a flood event, the Naches River changed its course through the materials pit and followed a different course back to the Naches River. And the landowner on whose property the material site resided claimed loss of land and other things.
Q. What happened in the case?
A. I believe there was a settlement, pretrial settlement.
Q. But you did give a deposition in that case?
A. Yes, I did.
Q. Who was the plaintiffs' attorney?

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A. I don't know.
Q. Any other cases relating to flooding or flood control?
A. I know there are a number. They just don't come to mind at the moment. Oh. There was another that I recall also for WSDOT, on the east fork of Issaquah Creek, east of Issaquah. The attorney was John Huff.
Q. With the Attorney General's office?
A. Yes.
Q. What was the issue in that case?
A. In that case, a contractor was in the process of building a replacement bridge on I-90, and lost a temporary crossing during a flood and was unable to complete construction for some length of time after that. He alleged the problem was the design of a culvert through the temporary road which had been designed by WSDOT.
Q. Were you deposed in that case?

A. I was.
Q. And your opinion was what?
A. My opinion was that the design was not negligent and that there were other causes.
Q. What became of the case?
A. I'm not entirely certain. I believe the state won its case, but there were many facets to it. I wasn't involved in all of them.

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Q. Have you testified in any cases involving dikes or diking systems in the past?
A. Well, diking systems have been components of some of the cases I've mentioned.
Q. Which cases that you've mentioned?
A. The one in Kelso with the bowling alley, for example. Part of that, the lower end of that system was levied.
Q. Any other cases involving dikes or diking systems?
A. I was involved in a case, I'm not sure whether I gave a deposition or not, but I was involved in a case on McCorkle Creek in the Castle Rock area of Washington.
Q. When was that?
A. That would have been in the late '80s.
Q. And who did you works for?
A. I don't recall.
Q. Who was the opponent?
A. I believe it was a pump manufacturer or an electrical contractor, or both.
Q. Do you remember any of the attorneys involved in the case?
A. I'm sorry, I don't.
Q. What was the issue in the case?
A. During a flood event in the mid '80s, oh a

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number of things occurred, but one was the failure of a pump station which emptied water out of a drainage system, levy drainage system into the Cowlitz River and when the pump failed, the water levels in the drainage channel, levy channel rose to the point that they overtopped the levies and there were failures and general flooding in the area.
Q. And your opinion was what?
A. I don't recall the specifics, to be honest.
Q. Have you been involved in any other cases involving dikes or diking systems?
A. I was involved about two years ago with a case with the U.S. Department of Justice on the Hoh River.
Q. Where was that?
A. On the Pacific coast of the Olympic Peninsula.

Q. I know where the Hoh River is, but where was the case filed?
A. Right on the boundary between the park and private property.
Q. I take it that's where the problem occurred?
A. Yes.
Q. Where was the case filed?
A. I'm sorry. In Seattle, I believe.
Q. Who did you work for?
A. Margaret Sweeney.

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Q. Who is she with?
A. The Justice Department.
Q. U.S. Attorney's office?
A. Yes.
Q. And how were dikes involved in that case?
A. In that case the Park Service, I believe, had built.
Q. Bank, erosion protection revetment and a dike to protect its road through the park and to prevent the diversion of high discharges in the Hoh River through a high water channel. The levy failed, dike failed in a high flood event, and flow went through the high water channel, ultimately changed its course so that the main thread of the flow went through that location and a landowner adjacent to the high water channel claimed for loss of property. What was your opinion?
A. It was my opinion that the cutoff and erosion was not a consequence of the construction or maintenance of the levy, of the dike.
Q. And what happened to the case?
A. It settled before trial.
Q. And were you deposed?
A. No. I made declarations, I believe, but I was not deposed.
Q. Have you kept deposition transcripts from the

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four cases in which you've so far indicated that you were deposed?
A. I'm sure if I received them I still have them, yes.
Q. Have you ever worked as a consultant for any county?
A. Yes.
Q. What county is that?
A. Well, I'll answer on behalf of my company, if that's acceptable. The projects I've been involved in we've worked for King County, Snohomish County, Whatcom County, Clallam County.
Q. Okay. I'll get to those in a second. Are there

any other cases you have been involved in involving dikes or diking systems?
A. I think there might be, but I don't recall, sorry.
Q. What projects were you involved in with respect to King County?
A. Well, we've performed quite a bit of work for the county over a period of ten or fifteen years. Some of the bigger projects include the investigation of flood control works in the Green River Valley between Kent and Auburn and the development of schematic designs for flood control works.

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Q. Have you been involved in any cases involving flood control works in the Green River Valley, or has your firm?
A. No, I don't think so.
Q. Who was your contact at King County with respect to the work that your firm has done in the Green River Valley?
A. Generally it would be Dave Clark, in the surface water management division. Department of Public Works.
Q. What work have you done for Snohomish County?
A. We have reviewed erosion hazard along the Skykomish River and helped them to develop plans and regulations to regulate land development at risk of erosion hazard.
Q. Have you done anything else with respect to Snohomish County?
A. Well, we reviewed on behalf of the Corps of Engineers, actually, a numerical model constructed by Snohomish County on the lower Snohomish River to determine its reliability for predicting flood levels and the performance of a levy system along the lower Snohomish River.
Q. When did you do that?
A. Probably four or five years ago.
Q. Who was principally in charge of that project?

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A. I was.
Q. Who was your contact at the Corps of Engineers?
A. I believe it was Jim Lencioni,
L E N C I O N I.
Q. Have you worked with Snohomish County in any respect on problems stemming from flooding in 1990?
A. The work I just described, the review of their modeling effort, included a review of the 1990 flood event on the Snohomish River.
Q. Did you produce a report that dealt with the flooding in 1990 on the Snohomish River?

A. We produced a report that did two things. It provided an overview of available numerical models suitable for that application, and an opinion as to the reliability of Snohomish County's model. But we didn't investigate the 1990 flood event specifically on behalf of the county.
Q. What was your opinion with respect to the reliability of Snohomish County's numerical model?
A. It was our opinion that they had chosen a good basic model to work with, but that there were some serious shortcomings in the calibration of the model. And that we weren't convinced that it was in fact suitable for its intended purpose.
Q. Have you done any other work for or in

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Snohomish County?
MR. SMART: Off the record just a second.
(Discussion off the record)
BY MR. SMART:
Q. I think the question, sir, was whether you'd done any other work either in or for Snohomish County.
A. I'm sure that I have. I'm again having difficulties recalling specifics, but I do recall designing a river crossing for the City of Everett water supply pipeline system on the Pilchuck River.
Q. Have you done any other projects in Snohomish County that related to dikes or diking systems?
A. Oh, sure. We were retained by Snohomish County by Rick Robertson to investigate flooding implications along the Stillaguamish River in Stanwood.
Q. When was that?
A. Probably two, three years ago.
Q. Did that involve a legal case?
A. Yes, it did.
Q. And what was the case about?
A. The City of Stanwood operates a sewage treatment lagoon in the flood plain of the Stillaguamish River, which is levied, and during a major flood event, flow escaped at a point upstream, got into the floodplain, and was confined then between the valley wall and the levy, it

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flowed down through the floodplain, inundated the sewage treatment plant, and dispersed sewage everywhere.
Q. Is that what's known as a free empty in the flood business?
A. Promise me you won't do that very often. The County's involvement was that they had replaced a bridge across a small channel in the vicinity of the sewage treatment plant, and it was alleged by the plaintiffs that that was the cause of inundation of the sewage treatment

plant and subsequent damages.
Q. And what was your participation in that case?
A. I reviewed all of the flood history and did some analysis and concluded that the County's drainage channel and its bridge played no role in the flood event.
Q. Were you deposed in that case?
A. No.
Q. Any other work for Snohomish County?
A. Not that I recall.
Q. What work have you performed for Whatcom County?
A. We developed a numerical model of the Nooksack River from its mouth to Deming, about 35 miles, to provide the County with a tool to describe the flow of water and sediment so that they could develop a plan to regulate gravel mining in the river, and ultimately to use it as a tool to help them develop a comprehensive basin plan.

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Q. And was the lower Nooksack diked?
A. Parts of it are, yes.
Q. Were they diked by diking districts?
A. For the most part, I think so.
Q. Is that also true of the Stillaguamish River?
A. I don't know. The Corps of Engineers might have had a project on the lower Stillaguamish, I don't recall.
Q. How about the Snohomish River, is that diked by diking districts?
A. Yes, it is.
Q. How about the Green River?
A. No, for the most part that's a Corps of Engineers project and a King County project.
Q. Any other work for Whatcom County?
A. No, I don't think so.
Q. What has your work been for Clallam County?
A. Clallam County historically has had a problem with flooding on the Dungeness River in the vicinity of Sequim. And they retained to us look at the possibility of removing coarse sediment, gravel mining, essentially, in the middle reaches of the river to both provide a sort of construction material and to reduce flood risk in the Lower Dungeness River. Our work on that project was also incorporated ultimately in a basin comprehensive plan.
Q. And when was the basin comprehensive plan

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published?
A. Several years ago. I don't recall exactly.
Q. Is that the only work that you've performed for Clallam County?
A. No, we also investigated the river engineering aspects of several bridges on the Olympic Peninsula. Part of the Quilayute River system.

Q. Have you worked on any dikes or diking systems in Clallam County?
A. The Dungeness River is levied.
Q. Levied by diking districts?
A. Actually, I don't know who constructed those.
Q. Have you ever performed any work for diking districts?
A. No.
Q. Other than as it relates to this case, have you ever worked on any projects involving the Skagit River before?
A. I don't believe so.
Q. In the project that you worked with with Rick Robertson for Snohomish County, you indicated that the bridge and the channel had no role in the flood event that was the issue in that case, is that correct?
A. Yes.
Q. What was the basis of your opinion?

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A. In a nutshell, it was my opinion that the bridge happened to be in the wrong place at the wrong time. But it wasn't a factor in creating the flood risk, which primarily stemmed from the Stillaguamish River itself.
Q. What were the causes of the flood there?
A. The flood inundation was caused by the escape of flow from the main stem of the Stillaguamish River into its right floodplain at a point upstream from the sewage treatment plant and it was retained in the vicinity of the sewage treatment plant by the levies and not allowed to drain away.
Q. So in that case, as I understand it, even though the levies retained the water, since the water had escaped upstream of where the levies were, it was your opinion that the cause of the flooding was the escape of the water from the banks, not its retention by the levies, is that correct?
A. It involved both elements. The escape of the water and the retention by the levies. Ultimately the levies were blown out so that the water could drain back into the main stem of the river. I alleged -- it was my opinion that the presence of the County's bridge in the midst of all this was irrelevant.
Q. Were those diking district levies?
A. I believe so.

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Q. Other than what we have discussed, have you participated in any other projects relating to dikes or diking systems?
A. Well, I'm sure there are many more, but I don't --

Q. On which river systems?
A. I don't recall. Are you interested just in the Pacific Northwest, say, or --
Q. Not necessarily. If you've participated in work on other dikes and diking systems in other rivers in other parts of the country, I'd appreciate your telling me what those are.
MR. HAGENS: Or the world?
MR. SMART: Yes. Or the world.
A. One of the larger projects I worked on that included dikes was the Alyeska pipeline project in Alaska. Our company was responsible for the river engineering design of 800 miles of pipeline between Prudhoe Bay and Valdez, and we designed works to protect the pipeline where it was in the river environment, and works associated with haul roads, and so on. I worked for three years on that project alone.
I did conceptual design of flood and erosion control levies for the Corps of Engineers on the Lower Elwha River and the Yakima and Naches Rivers near Yakima.

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The Grays Harbor flood control project in Aberdeen.
Q. What was that project?
A. The Corps of Engineers designed a tidal flood control levy system ringing Grays Harbor to protect the small cities there, Aberdeen, Cosmopolis, Hoquiam, South Aberdeen, I guess it is. We investigated the hydrology of the basin in order to model flood hydraulics in Grays Harbor, which was subject to both flow in the Chehalis River and tidal effects. We set the profiles for the top of levies based on our findings, and modeled local runoff between levy systems and did conceptual design of drainage works for that interior runoff behind the levies and we made a cursory investigation of sedimentation aspects of a dredging project in the Chehalis River main stem as it pertained to the flood control project.
Q. Have we covered the diking, dike related projects that you've worked on? At least those that you can remember?
A. Those I remember, yes.
Q. As a civil engineer, do you consider yourself to be an expert in geotechnical subjects?
A. No, I don't.
Q. Do you have any practical experience in geotechnical subjects relating to flood control?
A. No, I don't.

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Q. You mentioned that you studied sedimentation in the Grays Harbor County project with respect to the -- I can't even remember the name of the river. The Elwha --

A. Chehalis.
Q. Chehalis River?
A. Yes.
Q. Is sedimentation often a problem with respect to analyzing flooding and flood control projects?
MR. HAGENS: Objection as to form.
Q. Well, is sedimentation a factor that you often study?
A. It's often a consideration, yes.
Q. Okay. What is the problem that generally presents itself respecting sedimentation?
MR. HAGENS: I'm going to object to the form, but go ahead and answer.
A. I don't know that I would characterize sedimentation as a problem necessarily. It's part of the process of how rivers move water and sediment through their systems.
Q. Did you bring with you any documents today?
A. I have a folder of documents, yes.
Q. Can I see what you brought?
MR. SMART: Let's mark these, if we could.
MR. HAGENS: One of them's already an

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exhibit. Is there a necessity to do that? Maybe both of them are, I'm not sure.
MR. SMART: Which one's the exhibit?
MR. HAGENS: The declaration is in here. There it is. This has the attachments to it.
MR. SMART: Let's mark it, then, might as well. Let's mark them all.
(Exhibits 1 through 6 marked.)
(Recess)
BY MR. SMART:
Q. Showing you Exhibit Number 6 to your deposition, sir.
MR. HAGENS: Not to his deposition, you mean --
MR. SMART: To his deposition. I'd like him to take a look at that.
MR. HAGENS: Okay, I'm sorry.
Q. That constitutes the plaintiffs' Rule 26(b)(4) statement regarding expected opinions of plaintiffs' expert witnesses, in particular your expert opinions. I'd like you to review that if you would, please, sir.
Does that document accurately identify the opinions that you expect to give in the trial of this matter?
A. It does.

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Q. Does it provide the bases for those opinions?

A. Yes.
Q. Are there any opinions that you've come to in your work on this case that are not identified in Exhibit Number 6?
A. Not that I recall.
Q. Showing you Exhibits Number 1 through 5 to your deposition, these are the documents that you've brought with you here today, is that correct?
A. That's correct.
Q. Do those documents constitute your complete file in this case?
A. No, they don't.
Q. What other file do you have that you've maintained on this case?
A. I've got working documents and basic data.
Q. And what are the working documents that you have?
A. Just notes, analysis, summaries, and graphical materials.
Q. And is that basic data, the notes, analyses, summaries, graphics, is that information that you relied none coming to your opinions?
A. Yes.
Q. And is it information that, some of which you

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produced in coming to your opinions?
A. Yes, I suppose so.
Q. And what is the reason that you didn't bring it with you here today?
A. As a matter of fact, I brought it, there were a couple of cartons and I got it as far as the attorney's office, and we were late coming down so I didn't bring it with us to save time. I do have it.
MR. SMART: Well, how are we going to get that, Carl?
MR. HAGENS: My thought was we'd break at lunch and bring it back and get it copied, stuff that he relied on. We're not going to produce stuff that he didn't rely on.
MR. SMART: We're entitled to see his entire file.
MR. HAGENS: No, you're not. We got into this yesterday, and I'm not going to produce stuff that he didn't rely on. But --
MR. SMART: Well, do you agree we're entitled to --
MR. HAGENS: Certainty stuff --
MR. SMART: -- to see everything that he produced?
MR. HAGENS: You're entitled to see

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everything that he relied on in arriving at his opinions, that's absolutely correct.

Q. What notes do you have in your file that you didn't bring with you?

A. Well, I undoubtedly have notes that I've written to myself as I've analyzed each of the issues on which I have opinions, and some trial, preliminary calculations of a few things.

Q. What analyses do you have that you didn't bring with you?

A. I performed an analysis to estimate the range of flooding in the Nookachamps area, which in my opinion has been created by the construction of the levy system. We looked at the historical record of annual maximum discharges in the Skagit River at Concrete, Sedro Woolley, Mount Vernon --

Q. Do you have an analysis of that that you didn't bring with you?

MR. HAGENS: Objection as to form.

Q. Well, in what form are those annual maximum discharges?

A. I might have created some plots, for example, to look at, in visual form. I don't think I manipulated the data very much. I'm sure I made comments interpreting the topography and the location and extent of the diking

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system, and so on, and how we needed to account for that in analyzing flood impacts.

Q. What else do you have in your two boxes of file materials that you haven't brought here today?

A. Well, to be honest, I don't recall the specifics. It's been a couple of years since I went through it in any detail. It's mostly background.

Q. What was the source of your information with regard to the historical floods levels?

A. There were several sources. U.S. Geological Survey publishes, maintains and publishes a database of stream flow data.

Q. Is that what you used?

A. Primarily.

Q. Anything else?

A. Well, I was concerned about flood levels as well as flow rates. There were several sources of high water mark information, including the Corps of Engineers, and observations made by plaintiffs, some of which we surveyed.

Q. So you have notes of your own surveys, is that correct?

A. Yes, I'm sure we do.

Q. Why didn't you bring that with you?

MR. HAGENS: Wait a minute. Somebody's

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survey notes are in this exhibit to Mr. Regan's declaration.
MR. SMART: Well, as you recall, counsel, Mr. Regan testified he kept a separate file and Mr. Mutter a much more comprehensive file, which in fact he deferred many questions to Mr. Mutter and his file.
MR. HAGENS: As to the computer model, not as to some of the underlying data.
MR. SMART: As to everything, he said Mr. Mutter had his own file.
MR. HAGENS: All I'm saying is, there is data that has been produced that shows the, with the computer and the observations by Mr. Regan --
MR. SMART: Mr. Regan --
MR. HAGENS: Let me finish, please. Are you through? It does reflect some of the underlying data that --
MR. SMART: That's just the point, Mr. Hagens.
MR. HAGENS: Again you're interrupting me.
MR. SMART: It reflects some of it and it doesn't reflect all of it. We're entitled to see all of it.
MR. HAGENS: I didn't say you weren't. Anything he's relying on you're entitled to see, and we'll

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have it to you this afternoon. We figured that there would be more than ample enough to do this morning in getting his background and a good start at his opinions and on what they're based. But the underlying data, if you want the underlying data, the raw data for the numbers and stuff, we're going to have that down to you. But I will tell that you it's stuff that you guys already have and is identified in our Rule 26 statement.
Q. Which high water marks have been surveyed, Mr. Mutter?
A. I don't recall.
Q. What form did you keep that information in?
A. I'm sure we have survey notes, and occasionally photographs of the site.
Q. Did you do that with your own company employees, or did you order that from someone else?
A. No, we produced that ourselves.
Q. And it's in the form of notes and photographs?
A. Yes, I believe so.
Q. And is that in your two bankers' boxes?
A. I'm sure it would be.
Q. Did you do any other survey other than surveying the high water marks?

A. Again, it's been a a long time. I'm not sure -- I believe we made some very cursory surveys of the channel

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dimensions on Gage's Slough and perhaps took profiles along the Burlington Northern Railway embankments at SR 20 in the Lafayette area.

Q. When was this work performed? You indicated you hadn't reviewed it for a number of years.

A. It might be two years old.

Q. Has any of the work that you have performed on this case been within the last two years, or did you do all your work two years ago and you're just now testifying about it today?

A. None of it we're talking about now was performed in the last two years, no.

Q. Has there been any work that has been performed by you within the last two years?

A. Yes.

Q. What was that?

A. It's been primarily a review of declarations made by defendants' expert, Dr. Melone, and in providing a response from our point of view.

Q. But you haven't done any computations or calculations or surveys or that kind of work in the last two years?

A. Well, in the course of formulating an opinion about Dr. Malone's conclusions, we have I think done some analysis. We have not done any data collection or field

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survey work in the past two years, however.

Q. And those analyses of Dr. Melone's opinions, are they contained in your two bankers' boxes?

A. They should be.

Q. What summaries are contained in the bankers' boxes?

A. Those would primarily be summaries of basic data, either relating to high water marks or flow rates or things of that nature.

Q. What form are they kept in?

A. A variety of forms. I think some of them were tabulated. Some of them would be graphical. Some might just be notes.

Q. And you also mentioned that they were graphics that you kept in the bankers' boxes.

A. Primarily plots.

Q. What kinds of plots are these?

A. Just a visual presentation of the basic data, for example the relationship between the flow rate and the water surface elevation at Mount Vernon gauge.

Q. Is there anything else that we have not

mentioned that you keep in those two boxes?
A. I'm sure there is, but I don't recall.
Q. It's my understanding that you had created a numerical model with respect to the Skagit River and its

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flow rates. Is that in there?
A. Yes, it is. It's in there in digital form.
Q. Is it kept somewhere else in a different form?
A. I guess I'm not quite sure what you're getting at. I'm sure we have hard copy listings of it, or we could produce those. It's generally kept in digital form because that's the most efficient way to do it.
Q. And are there notes that you have kept with respect to the development of this numerical model?
A. I'm sure there are some.
Q. Referring to Exhibit Number 7 to the Regan deposition which has been previously testified to as the scope of work for your project, I'd like you to refer to page 1, which says as follows, and I quote. "Residents of the study area assert that general development of the lower Skagit Valley has increased their flood risk. Such development may include but is not limited to levy construction and modifications, road fill and railroad embankments, bridges and general urbanization of the valley." End quote. Did I read that correctly?
A. May I see the document, please? Yes, that's correct.
Q. As I understand it, the work that you performed in order to come to the conclusions that are outlined in Exhibit Number 6 was done two years or more ago, is that

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correct?
A. The majority of it, certainly.
Q. Was it done prior to your executing the June 18th, 1993, declaration that is Exhibit Number 2 to your deposition?
A. I believe so, yes.
Q. And was the model that you have developed developed prior to your execution of your declaration dated June 18th, 1993?
A. I'm sorry, would you repeat that?
Q. Was the model that you developed developed prior to June 18th, 1993?
A. It was partially completed.
Q. Did you change any of the approaches that you were taking with respect to the development of the model after June 18th, 1993?
A. No.
Q. Your principal assignment, as I understand it, was to study the levy system between Mount Vernon and

Sedro Woolley to determine what its effects on the Nookachamps area was during flood events, is that correct?
A. That was a major element of what we were supposed to do.
Q. And as you used the term levy system -- let me ask the question that way. On page 2 of Exhibit Number 2,

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you state in your declaration, quote, "Our principal assignment by plaintiffs' counsel is to analyze how the levee system between Mount Vernon and Sedro Woolley affects the Nookachamps area during flood events." End quote. Did I read that correctly?
A. I believe so.
Q. And was that in fact your principal assignment?
A. As I mentioned a moment ago, that was a major element of our assignment, yes.
Q. Was that your principal assignment?
MR. HAGENS: Object. You don't have to accept his characterization of the facts.
MR. SMART: It's his term, it's not a characterization.
MR. HAGENS: Go ahead.
A. Well, I guess I'm defining principal in my own words to mean that that was the major element of the work we were to do.
Q. Okay.
A. I don't know if there's another connotation to that words, but that's my definition.
Q. The second sentence of paragraph 2 on page 2 of your declaration says, I quote, "The term `levee system' used herein includes all manmade barriers to natural river flow between Mount Vernon and Sedro Woolley and

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necessarily includes all levees, bridges and highways, including Highway 20 north of Mount Vernon, which act, are used as, or constitute a part of the levee system." End quote. Did I read that correctly?
A. Yes.
Q. And is that the definition of the term levee system that you have used throughout your investigation of this project?
A. It is.
Q. All right. What are the barriers to natural river flow that constitutes the levee system as you've used that term throughout this project?
MR. HAGENS: I'm going to object to the form of that. Under what circumstances? I'll object to the form of the question.
Q. You can ahead and answer the question, sir.
A. For a given flow condition, barriers would be

anything that would prevent flow from being conveyed along its preferred path.
Q. And what I'm asking you to do is list all of those things for me so that I can get a list of them.
MR. HAGENS: Objection as to form. Under what circumstances? Under the 1990 flood events, under what?
Q. Under any circumstances.

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MR. HAGENS: Under any circumstances, then we'll be here ten years, because there's probably an infinite number of circumstances. So I object to the form of the question. I think it's too broad. Go ahead and answer it if you've got an answer, Dr. Mutter.
Q. Let me rephrase the question this way. As you use the term barriers to natural river flow, what are those barriers?
A. Well, one of the major focuses of our investigation was the flow conditions in the 1990 flood event, during flow conditions like that, again, anything that would have prevented flow through the floodplain would be a barrier. So that would include the levees themselves and anything to which they're tied.
Q. Would that include the railroad grade, for instance?
A. Yes.
Q. Would it include Highway 20?
A. Effectively, yes.
Q. Would it include the Burlington Northern bridge?
A. At least a portion of it. The abutment, certainly.
Q. Would it include the I-5 bridge?
A. Perhaps yes, perhaps no. I'm not sure which scenario again we're talking about here, whether the

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levees are there or not.
Q. Would it include the buildings and roads in the town of Burlington?
A. As a practical matter, no.
Q. It is your testimony that the town buildings and roads in the city of Burlington do not constitute a barrier to the natural flow of the Skagit River?
MR. HAGENS: Under what circumstances?
Q. Flood conditions.
MR. HAGENS: What flood conditions?
Q. Go ahead.
MR. HAGENS: Objection to the form of the question.
A. For the most part, buildings and streets in Mount Vernon and Burlington don't prevent flow through the

cities. They might resist flow to some degree, but they don't prevent it.
Q. Well, if they resist flow are they then barriers to the natural flow, or not?
A. No, they're not.
Q. Is there anything else other than the things that I mentioned, which are the levees, the railroad grades, Highway 20, Burlington Northern bridge abutment and I-5 bridge?
MR. HAGENS: Objection as to form.

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Under what circumstances? Go ahead and answer it if you've got an answer.
A. Those would be the primary elements of the levee system as I see it.
Q. In paragraph 3 of your declaration you say as follows. Quote, "To determine how the Nookachamps area is affected by the diking system during times of flooding, we have thoroughly familiarized ourselves with the topographical or physical characteristics of the entire lower Skagit River floodplain." End quote. Did I read that correctly?
A. I'm sure you did.
Q. And how did you familiarize yourself with that topographical and physical information?
A. We did so by reviewing topographic maps, actually performing a reconnaissance of the area on the ground.
Q. Did you incorporate the topographical and physical characteristics of the entire lower Skagit River floodplain into your computer model?
A. We incorporated a significant amount of it. I wouldn't say we incorporated the entire valley, no. But a significant amount.
Q. Which portions of the topographical and physical characteristics of the Skagit River floodplain did you

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incorporate into your model?
A. We incorporated information about any of those areas where we anticipated flow might potentially go during a major flood event, even in the absence of a levee system.
Q. And how did you do that?
A. I'm sorry, I don't understand your question.
Q. Well, where did you take the data from in order to incorporate the topographical or physical characteristics of the lower Skagit River floodplain into your computer model?
A. Well, we had several sources of basic data, including USGS topographical maps,

Q. Did you use the USGS topographical maps?
A. Yes, we did.
Q. Which version?
A. Which version?
Q. Yes. Which series?
A. Oh, I don't recall. Probably 7 and a half minute maps.
Q. Which publication date?
A. I don't recall. The latest that were available, I'm sure.
Q. Do you know when those were printed?
A. No.

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Q. Did it make any difference to you whether or not you used an up-to-date map or not?
A. Not to the use to which we put them, no. We weren't looking at those maps for topical features as to when the levee was constructed or how high it might be. We were looking at them more for describing the physical characteristics of the ground surface, and we wouldn't have expected that to change in recent history. We also relied on topo mapping from the Corps of Engineers. And I believe, I can't recall whether we got it directly or indirectly, but surveys from the County.
Q. Which topographical information did you get from the Corps of Engineers?
A. They had several series of topo maps that they created during the course of investigations for floods control projects in the Skagit Valley.
Q. Did you take that information out of the general design memorandum for the 1979 project?
A. No, I believe we had full size plots of topo maps.
Q. And you got those from the Army Corps of Engineers?
A. Yes.
Q. Which surveys from the County did you use?
A. As I recall, they were a cross section and

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profile of portions of the levee system at various points in time.
Q. During your investigation, sir, did you determine that the dikes in the Skagit River Valley were built by citizens and diking districts starting in approximately 1890?
MR. HAGENS: Objection as to form. Citizens in diking districts, what does that mean? Objection as to form.
Q. Did you learn that or did you not?
A. The history of the contraction of the dikes

isn't something that I'm too aware of.
Q. Is that because your investigation did not stem toward determining who originally built the dikes?
A. I'm not sure I understand your question.
Q. Well, did you ever learn who originally built the dikes?
A. I recall reviewing the history, but I guess it wasn't an important factor in what I was doing at the time, so I don't recall.
Q. Would it be correct to state, then, that even as you sit here today, you're not aware that the dikes were originally built by citizens and diking districts starting in approximately 1890?
MR. HAGENS: I'm going to object to the

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form. Is that a factual representation by counsel?
Q. Go ahead and answer the question.
MR. HAGENS: Object to the form of the question. I take that under the ethical requirements to be a factual representation by counsel, so you go ahead and answer on that basis.
A. I'm aware that there's been diking activity in the lower Skagit Valley for a long time, since the turn of the century. But a lot of it's been done by landowners to protect their personal property.
Q. Did you learn of diking, dike building, diking activity performed by diking districts during any time of the course of your investigation?
A. Again, I think there was undoubtedly a history of that activity, but it wasn't particularly relevant to what I was doing. Most of the early construction were very small scale works which, you know, bore no resemblance to what's there today.
Q. When you say small scale bearing no resemblance to what's there today, in your opinion, when were the dikes constructed to essentially reflect their length and configuration as they exist today?
A. I don't have a good idea, as good an idea as I would like to have. I know that they were constructed far before 1975, or before the early '70s. I guess we've

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asked the question when various elements of the system were constructed, but I don't have that information.
Q. Who did you ask that of?
A. Our client, plaintiffs' attorney.
Q. Did they not tell you?
MR. HAGENS: Objection as to form. Assumes we knew.
Q. Did they not tell you when the dikes were constructed to essentially their current configuration?

MR. HAGENS: Objection as to form.
A. They provided us with some information over the years about what activities were ongoing, but that didn't satisfy me with regard to when exactly in time the levees as they appear today were completed.
Q. Is that information that you want to know in performing an analysis of what effect any recent activity has had with respect to increasing flood levels in the Nookachamps?
MR. HAGENS: Objection as to form, the use of the word "recent" without definition. Go ahead and answer.
A. Well, let me say that defendants' position seems to be that there hasn't been any change since the early '70s that would affect flood risk in the Nookachamps. And there hasn't been any statement of what change there might

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have been prior to 1975 or the early '70s. And I'm interested in that, but I haven't seen an opinion from defendants or defendants or any information about that, so to that extent, I would like to see something in that time frame prior to the early '70s.
Q. Is it correct that you have never been told by the plaintiffs' attorneys that the last major change in the diking system was the change in Dike District 12's dike in approximately 1955, moving that dike closer to the river?
A. I was informed about that change. Whether that was the only information I received or not, I doubt.
Q. Do you know of any change in location of dikes along the Skagit River after the 1955 change in Dike District 12's location?
A. I can't say for sure, no.
Q. Would the answer to my question be that you don't know of any as you sit here today?
A. I don't recall any, as of today.
Q. Did you perform any analysis of what expected flood levels would be in the Nookachamps area as of the configuration of dikes that existed in 1955 after the completion of that change in Dike District 12's dike?
MR. HAGENS: Objection as to form. You can go ahead.

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A. No, I did not. at least not yet.
Q. And why didn't you perform any analysis in that regard?
MR. HAGENS: Objection as to form. Go ahead and answer, Dr. Mutter.
A. Well, I'll repeat that the defense position seems to be that no significant change has occurred since

the early '70s, and there are studies and data offered by them to support that position. I've never seen any significant investigation by them of the levee condition at an earlier point in time when it was less developed than it is at present, in order to see what the impact on Nookachamps flood risk might be for an earlier condition. So we've never had reason to pick any particular configuration, 1955 or any other, to analyze to offer our own opinion.

Q. Did you perform an analysis of the water depth at any particular points in the Nookachamps Valley during any flood preceding 1990?

A. In our model development, we did look at 1975 data.

Q. How did you do that?

A. By actually attempting to simulate that flood event.

Q. Showing you Exhibit Number 4-H to Mr. Reagan's

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deposition, does that diagram show the flood levels that you determined to exist at particular points during the 1975 flood?

MR. HAGENS: Objection as to form of the question. It's a mischaracterization of the testimony. Go ahead and answer the question. Counsel knows it to be, but go ahead and answer the question.

A. This appears to be our estimate of water surface elevations for the 1975 events, based on our modeling activities.

Q. And is Exhibit Number 4-H to Mr. Reagan's deposition a diagram that was produced from your numerical model that you've created in this case?

A. Yes, that's correct.

Q. And is there only one numerical model that you've created?

A. I'm not sure how to answer that. Strictly speaking, there is one model, but it can be modified to represent different conditions and it can be -- it can have different boundary conditions imposed on it to represent different flood events. So it can be used in a variety of ways. But there is one basic model.

Q. Okay. Did you use one set of boundary conditions for the purpose of generating your opinions in this case?

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MR. HAGENS: Objection as to form. Go ahead and answer the question.

A. No. For example, there would have been a different set of boundary conditions for the 1990 event than there would have been for the 1975 event. There were

physical differences in the flood events, and those would be represented in the simulation.
Q. Okay. Do I understand correctly, then, that the diagram produced in Exhibit 4-H to the Regan deposition would have had a different set of assumptions that were inputted into the computer than the diagram produced as Exhibit 4-G to the Regan deposition?
A. Not a different set of assumptions, no. A different set of input conditions, let's call it, describing the rate at which water flowed from upstream into this portion of the river.
Q. Well, is that the one variable that differs, is the amount of water flowing into, or through the river into the Nookachamps area that differs between 4-G and 4-H?
A. Primarily, yes. The other boundary condition would be downstream, at the downstream limit of the model, where I believe we used a normal depth calculation to start up each simulation, which is a standard practice.
Q. Well, let me ask you this. What is the

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difference in the downstream assumptions for 4-H, which is the 1975 flood, and 4-G, which is the 1990 flood?
A. The difference would be that at the startup of the simulation, the flow rates at the downstream end were different in the two events, and we would have employed different water surface elevations corresponding to those two different flowing at the downstream boundary.
Q. Are there any other differences in assumptions that were made between the model results that you get in 4-H and 4-G?
MR. HAGENS: Objection to the form of the question. There was no description of a differing assumption, there was a description of differing data put into the computer model.
Q. You see my confusion, Mr. Mutter, you initially told me that you had a differing set of boundary conditions for each flood. Are boundary conditions and assumptions different?
A. Yes.
Q. What is a boundary condition?
A. A boundary condition is something imposed on the model, for example, at the downstream limit of the model, which is a known condition, or thought to be a known condition. If the flow rate at the downstream boundary is 100,000 CFS, the water surface elevation is known to be a

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certain level. That is different from making an assumption about topography, say, within the model. It is a matter of judgment.

Q. Topography is?
A. In the modeling process, the objective is to create a model which is reliable, produces reliable results, for a known event, such as 1990. And with the confidence that the model can reproduce an event like that, we then changed boundary conditions, such as how much water is flowing in at the upstream end, make that single change, and see what and how the simulation proceeds.
Q. Does the topography remain the same?
A. Yes.
Q. And you earlier indicated that I think it was a matter of judgment as to what topographical conditions you imposed on the model, is that correct?
A. No.
Q. Well, who decides what topographical conditions to impose on the model?
A. Well, sure, I see your point. It's a matter of experience to decide what is important and to what degree of precision, not whether or not to reproduce the topography.
Q. In this case it was a matter relating to your

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judgment as to what topographical input to give the model, is that correct?
A. That's correct.
Q. How did you determine what topographical information to give the model?
A. Essentially we used the highest quality topographic data available. We've already discussed the sources. We had fairly high resolution contour mapping, and basically used the best information we had. So essentially there were no assumptions made about topography.
Q. And tell me how you input the topography into the computer model.
A. The topographic information is reduced to digital form and XYZ coordinates, which are put in the model in that form.
Q. Okay. For instance, when you were studying the 1975 flood, did you put in as topographical information into the computer the existence of the levees, the roads, and the bridges that existed in 1975?
A. That isn't quite how the model development proceeded. We calibrated the model based on the 1990 event, so that given the flow rates we know occurred, given the high water marks that we know occurred, the model could be made to represent what was observed

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historically. Just to enhance our confidence in the

model's performance, we looked at the 1975 event without any significant changes to any of the civil features, to see if it could also simulate the '75 event acceptably. And we made no effort to exactly reproduce the civil and physical features in the '75. If they had been different than '90, it wasn't that important, particularly in view of the magnitudes of the events.

Q. When you say it wasn't that important, what wasn't that important?

A. We didn't identify any changes in physical features in the time frame of '75 to '90 that were in our judgment important enough to change in the model in order to satisfy ourselves that the model could do an adequate job of simulating the '75 events.

Q. Would it be correct to state, then, that the topographical assumptions that are imposed on the model for the '75 flood are identical with the topographical assumptions that are imposed on the model for the 1990 flood?

MR. HAGENS: I object to the form of the question. He didn't say they were assumptions, he said that they were topographical information obtained from the various data that he identified.

Q. Let me rephrase the question. Is it correct to

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say that the topographical input into the computer model for the 1975 flood is identical with the topographical input that was put in the model for the 1990 flood?

A. As far as I recollect, that's the case.

Q. And it is your earlier testimony that you took the topographical information from maps but you don't know what years the maps were produced, is that correct?

MR. HAGENS: Objection as to form.

A. I don't recall the years they were produced, but they were most recently obtained.

Q. Did the topographical information that you put into the computer model include the levees themselves?

A. Yes.

Q. Does it include the roads that exist, I-5, Highway 20, Highway 9, the roads in and around Burlington and Mount Vernon?

A. Only to the extent that they're integrated in the levee system. In other words, if there were a piece of railroad embankment landward of the levee system, we didn't concern ourselves with that at this stage.

Q. Why not?

A. In the first instance we were trying to determine what the effect of the levees themselves would be. That was our primary focus.

Q. Did you at any time input topographical

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information into your computer model to simulate the existence of the roads in Burlington, Mount Vernon, the buildings, the things that were not connected to the levees themselves?
A. We might have. I don't recall, to be honest, at this point in time.
Q. Have you produced any graphics or documents that show output from the computer model with any such changed topographical input?
A. I don't remember.
Q. According to your computer model, does Exhibit 4-H to the Regan deposition show the areas of flooding and the level of flood waters during the 1975 flood?
A. Well, it certainly shows water surface elevations that we computed as well as some high water marks. I'm not confident that this is a precise representation of areas, however.
Q. Do you have any more precise maps or graphic depiction of where the areas of flooding were in the 1975 flood?
A. Not at this point in time, no.
Q. Have you ever generated any?
A. Not that I recall.
Q. Would it be correct to state, then, that Exhibit 4-H to the Regan deposition is as detailed a depiction of

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the areas of flooding and water surface levels as your computer model has currently produced?
A. There might well be some topographic mapping in specific areas that we used to interpret the results of the simulation, but in terms of the results themselves, I think this is representative of what we did in the analysis.
Q. Would it be correct to say, then, that the Exhibit 4-G to the Regan deposition constitutes a similar depiction of the areas of flooding and the water surface levels during the 1990 flood?
MR. HAGENS: Objection to form. You mean as generated by the computer model?
MR. SMART: Correct.
A. Yes, with the same reservation about the depiction of areas flooded.
Q. Well, you earlier indicated that you actually calibrated the model so that the model produced correct results when those results generated by the computer model were compared with actual historical observations of flood levels, correct?
A. I did.
Q. And it's my understanding from Mr. Regan's testimony that the actual historical observations levels of flooding are written in there in hand and highlighted

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with a yellow pencil on Exhibit 4-G, is that right?
A. That's correct.
Q. Your qualifications, I'm trying to get a handle on what they are. Are you just saying that the map isn't big enough to show all of the detail?
A. The primary purpose of these figures was to show water surface elevation information and how well the computer model was able to fit to observed historical flood data, which it did very well. The lateral extent of the inundation, however, was not -- let me back up. These figures were not produced with a view to accurately representing the area of flooding. The primary focus here was water surface elevation. That's my only reservation about your question about flooded areas.
Q. Well, as I understand your testimony correctly, the water surface elevations that are depicted on Exhibits 4-G and 4-H to the Regan deposition are correct as proven by your calibration, are they not?
A. Yes.
Q. So you're not saying that there's any qualifications about the water surface levels that are listed there on either document, are you?
A. No.
Q. Have you ever performed any analysis of flood levels during the 1975 flood that are different than those

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depicted on Exhibit 4-H?
MR. HAGENS: Objection to form. Different in what sense? Go ahead and answer the question.
Q. Different results or --
A. I don't recall.
Q. Did you take more than one try at analyzing the 1975 flood?
A. In the process of model development, there was a lot of adjusting going on in terms of developing the model and tuning the model so that it would fit the 1990 events.
Q. Did you keep notes of what adjustments were made?
A. I don't know that we did. I can't answer that.
Q. Did you keep the results of the trial runs upon which the adjustments were determined to be necessary?
A. That's possible.
Q. Are those notes in your two boxes?
A. If they exist, that's where they would be. My point was going to be that we might well have looked at the 1975 event while we were still in the process of calibrating the model with the '90 event. So I don't know that this is the only simulation of the '75 event that was

made.
Q. Why do you say that the topographical

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information as it existed in 1990 was the correct topographical information to use in the computer model for the 1975 flood?
MR. HAGENS: That's been asked and answered, object to the form of the question. Go ahead and answer it a second time.
A. In our judgment, the topographic basis of the model in 1990 was adequate to test the model as to its performance for '75 flow conditions. And it was our conclusion that any variations in the '75 simulation wouldn't be significantly affected by topographic changes in that 15-year period.
Q. Is that because they weren't sufficiently great to have caused a material effect, given the huge nature of the flood?
MR. HAGENS: Objection to the form of the question.
A. I would agree with what you say, at least with respect to testing the model performance. By far the bigger variable was the flood event itself, the flow discharges themselves.
Q. Now, you indicated that those variables for flow discharges had to be put into the model by the operator of the model, correct?
A. Yes.

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Q. And you put in two different flows, you put in a flow coming in, you put in a flow going out, correct?
A. In essence.
Q. For Exhibit 4-G, what flow did you use for the input flow?
A. I'm not sure I can answer that just from this figure. We did simulations both for steady flow conditions and for unsteady conditions. In other words, we actually simulated the flow continuously through the 1990 flood event hydrograph. I think, however, that the inflow for this simulation was steady state and that the inflow was 152,000 CFS.
Q. Is there some reason why Exhibit 4-G has on it 150,000 instead of 152,000 if in fact 152,000 was the input?
A. The difference isn't significant in terms of variability of the results.
Q. And that was the outflow figure used for Exhibit 4-G?
A. If I'm correct that this was the steady state simulation, it would also have been 152,000 CFS.

Q. If you had an identical input and outflow, you wouldn't get any change in water level over time, would you?
A. Well, you wouldn't be simulating time. It would

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be a snapshot in time.
MR. HAGENS: It's a steady flow.
Q. At what point, then, are you taking the snapshot?
A. The snapshot would be at the peak of the flood hydrograph at the maximum inflow rate. Actually, I guess you could define it as the maximum outflow rate, or the maximum rate at any point in the system that we model. The flood statistics were derived for Mount Vernon, so I guess technically we applied it to the downstream boundary.
Q. Okay. And then your input and output of 130,000 cubic feet per second applied to Exhibit 4-H is the same process, simply using a different flow, is that correct?
A. I believe so.
Q. Would it be correct to state, then, that the only difference in the operation of the computer model would be the difference in flow rates, as between the two diagrams?
A. Essentially, yes.
Q. Would it be correct to state, then, that according to your computer model and its generation of flood levels, that if you had a flow of 152,000 cubic feet per second in 1975, you would have seen the identical flood levels as are shown in Exhibit 4-G, the graphic

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depiction of the 1990 flood?
A. I think that's a fair assessment. I'd like you to keep in mind that the '75 simulation we did do was kind of a quick check, was our intention. But I think in overall terms, I would agree with your assessment.
Q. Would another way to put it be this, that if the 1990 flow rates had been experienced in 1975, the water would have been the same depth in 1975 as it was in 1990?
MR. HAGENS: At maximum peak --
MR. SMART: Yes.
MR. HAGENS: -- flow.
A. I think so.
MR. SMART: I'd like him to go get those documents, because I don't know how big a job it's going to be to sift through those things. It would be nice to have lunch to do that, but at least we can assess the nature of the --
MR. HAGENS: First of all, you're not going to get through them today. In fact, you're not going to

get through what you have to get through today. But we're going to go get them at the lunch break, and bearing in mind that they weren't subpoenaed, but we're producing only what he relied upon, which isn't everything that he has. So that's what we're doing. That's what we agreed to yesterday, and we're not deviating from that course.

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MR. SMART: Carl, they were subpoenaed, and you agreed we didn't have to serve him with a subpoena yesterday.

MR. HAGENS: Well, I'll have to go back and check our records, but whatever it is, we are agreeing to produce what they have relied upon. The universe beyond that is almost inexhaustible, so we're not going to -- we will produce everything he's relying upon.

MR. SMART: Let's go see what you're going to produce.

MR. HAGENS: And see whether we have a problem after that. Okay.

(Lunch recess taken at 12:10 p.m.)

00064

AFTERNOON SESSION
1:15 p.m.

BY MR. SMART:

Q. You brought the following documents with you this morning, Mr. Mudder. Exhibit Number 1 being your expected expert opinions, correct?

A. Yes.

Q. Exhibit Number 2 being declaration and exhibits signed by you on June 18th, 1993, correct?

A. Yes, that's correct.

Q. Exhibit Number 3 being another declaration signed by you on June 18th, 1993, correct?

A. That's correct.

Q. What is Exhibit 4, a one-page document with pencil handwritten calculations?

A. This is my estimate of the additional depth of

water that would be experienced in the Nookachamps area as a result of the presence of the levee system for a flood of the order of magnitude of the 1990 event.
Q. That would be the levee system as defined in Exhibits Number 1 through 4, is that right?
A. Yes.
Q. 1 through 3, rather. What is Exhibit Number 5?
A. It's a memo from Dave Brookings, flood control

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engineer, to the Board of County Commissioners, Skagit County Public Works Department.
Q. And what was its importance to you?
A. This is a record of the minutes of a meeting attended by several officials of Diking District 12, Burlington fire chief and others,
MR. HAGENS: Date?
A. Dated 23 December '91. And I just noticed comments in the minutes that were relevant to what I was working on.
Q. Which comments are those? Can you point them out to me? You're talking about comments related to the temporary diking of highway 20?
A. Those are among them, yes. I marked several things, I don't recall what they all were.
Q. Well, the discussion generally was about the temporary diking of Highway 20 during the flood of November of 1990, is that correct?
MR. HAGENS: Objection as to form.
A. Well, it goes beyond that. Some of it had to do with the flood fighting effort, whether to put water back in the basin or not, and if so, how much effect it had on the Nookachamps, four to six inches.
Q. And do you use that document in formulating an opinion as to whether or not the temporary diking efforts

00066
along Highway 20 put any amount of water onto the plaintiffs' properties in the Nookachamps?
A. No, it didn't.
Q. Is it consistent with any opinions that you have developed?
A. Well, it is to the extent that given the levees were in place, I think the flood fighting effort probably did have an incremental effect on the Nookachamps area. I don't know whether this degree, four to six inches, is accurate or not, but --
Q. The person who made the statement concerning how much the flood fighting efforts contributed to the water level in the Nookachamps is who?
MR. HAGENS: What was your question? I'm sorry.

Tom Shehan was Director of Emergency Management.

Q. Who made that statement?
A. Tom Shahan I guess it is, director of emergency services.
Q. And did you perform any calculation to determine what effect and how much there was from the temporary diking and flood fighting efforts during the 1990 floods on water levels in the Nookachamps?
A. No, I don't recall that we did.
Q. I take it it's your opinion that it had some effect?

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A. I would expect it to, yes.
Q. Now, while you were answering those last questions, your documents have been delivered here to the office, and I'm wondering if you can identify what these documents are and how you used them, if at all.
Let me ask you one question before we get to the documents with respect to the water, additional water experienced by the owners in the Nookachamps as a result as a result of flood fighting during the floods themselves. Did you use any other information from any other source other than Exhibit Number 5 to determine that the temporary diking and other flood fighting efforts had such an effects in the Nookachamps?
MR. ANDERSON: Object to the form of the question.
MR. HAGENS: Object to the form of the question too. He didn't say he used Exhibit 5.
MR. SMART: I'm asking if he used anything other than 5.
MR. HAGENS: But he didn't say that he did use 5, that's the problem.
MR. SMART: He said he had an opinion that the emergency work and the flood fighting efforts, including the temporary diking on Highway 20, would have added water to the water levels experienced in the

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Nookachamps.
Q. Am I correct in that, sir?
A. Yes.
Q. Did you use any documents in order to come to that opinion? By documents I'm including depositions, for instance, of any of the plaintiffs that you've reviewed in this case.
A. I'm sure I saw written records of some sort describing the flood fight activities. I couldn't cite them today. And I recall being on site in the Lafayette area during a version of what took place described to me.
Q. What was described to you and by whom?
A. I believe I was in the company of the

plaintiffs' attorneys, is one. And there was just a general discussion of the location and extent of the sandbagging operation and the fact that there had been overtopping and failure of the temporary embankments during the course of the flood.
Q. And do you remember who related that to you?
A. I think it was Jeffrey Thomas.
Q. One of the plaintiffs' attorneys?
A. Yes.
Q. Okay. Did you rely on anything other than the statement of Mr. Thomas, who apparently described what occurred during the flood fighting efforts, in order to

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come to the opinion that there would be additional water experienced during 1990 by the Nookachamps property owners as a result of the temporary diking activities along Highway 20?
MR. ANDERSON: Object to the form of the question.
A. Well, I know that I did rely on other documents, because there were written accounts of the flood fighting activities. I don't recall at the moment whether they came from the County, the Corps, or the state. But there were descriptions of the activities carried out by emergency services people.
Q. And how did you get from the description of the activities carried out by the emergency services people to a determination that that added additional water to the level experienced by the property owners in the Nookachamps during the 1990 flood?
MR. ANDERSON: Object to the form of the question.
A. The net result of the information I had was that it was clear that the level of the lowest points along Lafayette Road vicinity had been raised by placement of sandbags and other embankment material, which necessarily precluded water from escaping to the north across State Route 20 at that point. Net result would be an increase

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in water surface elevations at that location and points upstream, which would include the Nookachamps area to the south.
Q. And would the increase be the difference between whatever the sandbags were placed on and the top of the sandbags?
A. That would be a decent approximation, it would be on that order, yes.
Q. Have you ever sought to calculate how high the sandbags were along Highway 20?
A. No.

Q. Do you have pictures of the temporary diking work along Highway 20 and in the materials that you've got here today?
A. I don't know that I do. Certainly we didn't take any. We weren't on site during the flood.
Q. Just so I'm clear on your testimony, although you have not calculated the difference in the water level experienced by the Nookachamps residents as a result of the temporary dike work along Highway 20, if you were to do so, you would measure the elevation difference between the top of the sandbags and whatever they were placed on, be it railroad tracks or road, and then that would be the difference in the water level experienced by the Nookachamps residents to the south, is that correct?

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MR. HAGENS: Objection as to form.
MR. ANDERSON: Object to the form.
MR. HAGENS: That is not what he testified to. Go ahead and answer the question.
A. As a first approximation, I think the rise between whatever the lowest point in the Lafayette area was and what it was raised to by means of sandbagging would be a decent estimate of the rise in the water surface elevations experienced at the Nookachamps.
MR. HAGENS: That assumes the water rose to that level.
A. Well, it's my understanding that in fact whatever was constructed was over top. So presumably it did rise to that level.
Q. Lafayette Road is the road that runs parallel to the tracks just to the south of it, is that correct?
A. I believe that's correct. I believe the term Lafayette is used in reference to the communities in that whole area.
Q. Just so we're clear, what I'd like you to do is draw me a diagram as to how you would measure the approximate rise in water level as a result of those emergency activities. And if you can do it just a diagrammatic fashion, taking the sandbags and the road that you're measuring from, it be Lafayette Road or

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whatever other road, and just give me a diagram as to what you would measure in order to get that increase in water level.
MR. HAGENS: Are you through, Mr. Mudder?
A. Yes.
Q. Can I see what you've got there, please, sir?
MR. SMART: Let's mark that as Exhibit Number 7 to your deposition, please.
(Exhibit 7 marked.)

Q. Okay, showing you Exhibit Number 7 to your deposition, sir, you've identified a couple of things. The first thing you've identified is the profile of the low area near SR 20, is that correct?
A. Yes.
Q. And then you have a straight line that's somewhat above that, identified as embankment fill and/or sandbags, correct?
A. Actually, the line, that horizon is not labeled, it's the area between those two lines that I've labeled as embankment fill.
Q. The line is indicative of the top of the sandbags or fill?
A. Yes, that's correct.
Q. And then in order to figure the amount of increased water level that you say contributed to the

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Nookachamps area as a result of that embankment or sandbags, you would measure the difference between that top line and the low area, is that correct?
A. Yes.
Q. Now, we can go fairly quickly through these documents. The first document that you have got is a 1979 general design memorandum, is that correct?
MR. HAGENS: And related material. I think it's maybe broader than that.
MR. SMART: Is that what this is?
MR. HAGENS: Yeah. It is the same stuff that Dick Regan had here yesterday. I guess he's asking you generically, is that correct?
A. It relates to the Skagit GDM, that's correct.
Q. Okay.
A. I believe there's an extra copy of the second volume. It might be confusing.
Q. Then you have six aerial photographs that are approximately one foot by one foot, is that correct?
A. Yes.
Q. Where did you get those?
A. I think from the Corps of Engineers. May I see the back, please? Yes. Seattle district of the Corps.
Q. What did you use those for?
A. Just background information about the lay of the

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land and the nature of the river, its alignment, and so on, in 1992.
MR. SMART: What I'm going to do, Carl, is I'm going to mark with these yellow Post-its what we want copies of.
MR. HAGENS: That's fine.
Q. Okay, the third thing you have is a blue

notebook that has a list of the plaintiffs, is that correct?
A. I believe so.
Q. What is the document I'm handing you now?
A. I believe this is a summary of our written scope of work for the modeling task, which I provided to a person working for me.
Q. Is there some reason why that was left out of Exhibit Number 7 to the Regan deposition?
MR. HAGENS: Objection as to form.
Q. Why was that left out --
MR. HAGENS: Objection as to form, you assume it's an integral part of Exhibit 7.
Q. There's been testimony on two different occasions now, Mr. Hagens, that Exhibit 7 was the scope of work, and now we've got some additional scope of work that was kept in this blue notebook?
A. I -- excuse me. I think this is a collection of

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materials that I furnished to a person working for me. This is an internal document in which I recast the firm's scope of work into activities for him to perform.
Q. Let's mark this --
MR. HAGENS: Why don't you leave it in the three-ring binder and mark it so --
MR. SMART: I may want it right now.
MR. HAGENS: Then put an X on it or something.
Q. You have a copy of the deposition of Patricia May Howell, is that correct?
A. Yes.
Q. And for what purposes did you use that?
A. I don't recall. I'm sure I read it for background information.
MR. HAGENS: Off the record.
(Discussion off the record)
BY MR. SMART:
Q. You have a copy of Exhibit Number 12 to the Gilbrough deposition, is that correct?
A. Yes.
Q. And for what purpose did you use that document?
A. Again, for background information.
Q. You have a particular portion of it marked there, and your marker says historical flood flows across,

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and I can't read the last word.
A. Delta.
Q. Across delta. What was the reason for your wanting to know what the historical flood flows across the delta were?

A. The description in this document is a flow, overflowing the river banks, inundating a large portion of the delta through sloughs and channels and across the flats. I guess that's the point, that if there's a barrier in the form of levees, that historical kind of flow pattern can't take place anymore.
MR. HAGENS: You guys are starting to get me a little nervous. This stuff is all organized in terms of --
Q. The deposition of Larry Kunzler --
MR. HAGENS: I hadn't finished, Will. I would appreciate it if you'd try to keep it in the order in which it has been produced. Thank you very much, but I see the state's attorney also going through this stuff simultaneously and I'm starting to get very nervous.
MR. ANDERSON: Carl, I'll try to keep it in order, too. I just want to go through it as Will goes through it, because if he's going to going to mark or not mark something that I want --
MR. HAGENS: That's fair, I'm not

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objecting. You're working very efficiently here this afternoon and I'm proud of you guys.
MR. MAJOR: We feel good now.
A. That is the Kunzler deposition.
Q. You have copies of the depositions of Rodney Archer and Gerald Mapes. Rodney Archer --
MR. HAGENS: We accept your representations on that.
Q. Rodney Archer and Ronald Mattox, Noel Gilbrough --
MR. HAGENS: I think there are multiple volumes to that as well.
Q. -- Pete Walker, Howard Miller, Gerald Mapes, is that correct?
MR. HAGENS: We accept your representations of that, counsel.
Q. And you also have Exhibits Number 10 and 11 to the --
MR. HAGENS: Gilbrough?
Q. -- to the Gilbrough depositions. Correct?
MR. HAGENS: I'm sure we accept your representations on those.
Q. Is that right?
A. That's 11. Did he say 10 also?
MR. HAGENS: 10 is in his other hand.

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A. Yes.
MR. SMART: Off the record.
(Discussion off the record)

MR. HAGENS: Why don't you ask him what the whole thing contains. He might be able to tell you.
BY MR. SMART:
Q. Showing you this bucket folder, can you tell me what these documents are in here, sir?
A. These are stream flow data for the Skagit River from U.S. Geological Survey.
Q. Did you get those directly from the U.S. Geological Survey?
A. I believe so.
Q. Do you know if anyone else keeps that particular data?
A. These are copies of USGS's stream flow measurement forms that actually have their agency name printed on them, and I'm sure we just got photo reproductions from GS.
Q. My question was, do you know if anybody else keeps that data other than the USGS?
MR. HAGENS: You mean somebody other than the --
Q. Does anybody else keep those measurements for various floods other than the USGS?

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MR. HAGENS: I understand that question.
A. The reason I hesitate is the word "keep" that you used.
Q. Does anybody else maintain that kind of records as original documents other than the USGS?
A. No. I understand, no.
Q. So that's the only place you could get that information, although other agencies may have photocopies such as you have?
A. Yes, that's correct.
Q. Showing you a bucket file that is labeled Skagit R20653, can you tell me what this bucket file contains?
A. These are as a group, primarily my declarations, after the, and responses to declarations by Tony Melone.
Q. You have in your files copies of the declaration of --
MR. HAGENS: You took it out of order, counsel, that is not -- that's what I'm trying avoid here.
Q. You have a copy of the declaration of Tony Melone dated May 27th, 1993, together with his attached maps thereto, do you not?
A. Yes, that's correct.
Q. And those maps that attach to that declaration are the same as Exhibit --
MR. HAGENS: We so represent.

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Q. Exhibit 2-A through 2-G to the Regan deposition,

are they not?
A. They look somewhat familiar. Let me check. Well, that's the sheet 7 of 7, and I show that I have 5 -- I see. Exhibits to his declaration weren't numbered consecutively. Yes, those look the same.
Q. When did you receive the maps of the approximate flood inundations of the various years that are shown in Exhibit 2-A through 2-G of the Regan deposition?
MR. HAGENS: Can you tell from this one?
A. 1993.
Q. And did you review the Melone --
A. Yes, I did.
Q. -- declaration and the maps?
A. Yes, I did.
Q. Did you perform any analysis on the maps?
A. Depends what you mean by analysis, I suppose.
Q. Well, did you study them?
A. Yes, I did.
Q. Do you agree or disagree that they are accurate in representing the approximately areas of inundation during the floods indicated?
MR. HAGENS: Objection as to form.
A. I stated in writing previously that I thought that presentation of information was misleading in that it

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didn't relate any information about the depth of inundation for any given flood condition at any given site.
Q. Do you agree or disagree that there was water where water is shown to be indicated on the maps Exhibit 2-A through 2-G to the Regan deposition?
MR. HAGENS: Objection as to form. Water at what depth? A hundredth of an inch?
Q. Any depth.
MR. HAGENS: Any depth? Dew? We're talking dew now?
Q. We're talking flood water during the flood events indicated.
MR. HAGENS: I'll object to the form of the question, go ahead.
A. I expressed I think in my written statement also some concern for the accuracy of the mapping, and indicated that I felt there were probably some areas on the map that were probably quite sensitive to inundation. That is, they'd either be wet or not wet, depending on the care of the mapping. I wasn't satisfied this was totally reliable for that purpose.
Q. I take it, then, you disagreed with the accuracy of the maps, is that correct?
A. I questioned the accuracy of the maps in some

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locations.
Q. That wasn't my question. My question was did you disagree with it?
MR. HAGENS: Objection as to form. You're entitled to use your words to answer your questions in any fashion you see fit, you're not required to accept the characterization of a fact or circumstance that counsel might ask you to do.
A. I disagreed with the use of the information on the presentation for the intended purpose.
Q. I'll move to strike as being nonresponsive. Did you disagree with the accuracy of the maps?
A. There wasn't sufficient information provided with the mapping to determine how accurate it was.
Q. Did you investigate whether or not the maps themselves were accurate to show where the water was, for instance, as a result of the 1856 flood on Exhibit 2-G?
A. I did not.
Q. Did you investigate to determine whether the area of inundation as shown on January 16th, 1961, flood map was accurate?
A. I had no reason to.
MR. HAGENS: Counsel, ask with respect to all of them.
Q. Did you do it for any of the maps which are

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between Exhibit 2-A through 2-G to the Regan deposition?
A. I had no reason to.
Q. Do you agree or disagree that in 1856 the Nookachamps Valley was flooded by a flood that took place in that year?
MR. HAGENS: Objection as to form.
A. Large portions of the Nookachamps Valley were inundated during that flood event.
Q. Did you make any effort to determine how deep the water was at any points in the Nookachamps Valley during the 1856 flood?
A. No.
Q. Did you do so for any of the floods indicated in Regan Exhibits 2-A through 2-G?
A. No.
Q. I'd like to make this one an exhibit. You've got two copies of it here. I propose separating this, making it an exhibit and then asking my questions and getting copies put together back --
MR. HAGENS: Let me see what it is. You can -- well, do what you want in terms of making it an exhibit, Will? I'm not here to interrupt in that regard.
(Exhibit 8 marked.)
Q. Showing you Exhibit Number 8 to your deposition, that is one of your copies of Dr. Malone's declaration

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dated May 27th, 1993, is it not?
A. Yes.
Q. You have some notes on the fourth page of Exhibit Number 8. Could you read them for me, please?
A. I say consider, number 1, the effect of dams, number 2, confidence limits on analysis, and there are subheadings beneath that, USGS estimates, rating curves/stage records, method of flood limit mapping, profile, et cetera, and number 3, relationship between damage and stage as opposed to area. And a subheading, how much worse with levees?
Q. Now, taking your first comment, "consider the effect of dams," is that something you did?
A. It was my conclusion that you would have to consider the effect of adding levees to whatever situation we analyzed. So the effect of upstream storage or none wasn't relevant.
Q. What do you mean the effect of upstream storage wasn't relevant?
A. If there were storage or were not storage, that's the status quo, we still had to determine what was the effect of adding levees.
Q. Well --
A. Whether or not there was storage.
Q. Well, you would agree that if there were no dams

00085
upstream in the Skagit during any given flood event, there would be a chance for the Nookachamps residents to experience more water than if there are dams that maintain upstream storage, wouldn't you?
MR. HAGENS: Objection as to form, incomplete hypothetical question. Go ahead and answer if you've got an opinion on that.
A. I agree that Nookachamps residents benefit from upstream flood storage.
Q. And the flood storage that we're talking about are the dams, the Ross Dam and the Diablo Dam and the Baker River Dam?
A. Yes.
Q. Okay. And when were those dams built?
A. I don't know the age and history of them, but they've been there for decades.
Q. Were they there before or after the levees first were built?
MR. HAGENS: Object to the form, go ahead.
A. Depends on which levees we're talking about and in what stage. I suspect that levee construction began before flood control.
Q. Did you investigate whether or not the levees as

they currently exist were in essentially the same configuration before or after those dams were built?

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MR. HAGENS: I'm going to object to the form of the question.

Q. Go ahead and answer the question.

A. We sought information about when it was that the existing levees reached their present state, and how they changed incrementally before that, but the record is not very clear. At least I don't have that information.

Q. Would it be correct to state that the best that you determined was that they had reached their present state, at least the state that you used for the purpose of your computer model, sometime before 1975?

A. In terms of their height, yes.

Q. Okay. And your computer model doesn't have in it any topographical or geographical information that measures anything other than their height and location, does it?

MR. HAGENS: Objection as to form. "Their" being what?

MR. SMART: The levees.

A. That's essentially correct, yes.

Q. So for answering my question, you have assumed that the levees that existed when you did your work in 1993 on this system were essentially the same as the levees that existed prior to 1975?

A. No, I knew that in 1975, I knew with some

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confidence that the levee was more or less the same as it was modern day, with respect to its profile. I had no information predating 1975 or at least the early '70s, so I didn't know what to simulate.

Q. So you used the condition as it existed in 1990, is that right?

A. For what purpose?

MR. HAGENS: Object to form.

Q. For any purpose related to your computer model.

A. I used the 1990 condition to simulate 1990.

Q. You also used it to simulate 1975, correct?

A. As a rough check to see if changing the hydrology affected the results dramatically. In other words, how robust the model was.

Q. And you never put any other topographical or geographical information into your model concerning the location and height of the levee, is that --

A. That's correct.

Q. Okay. And you have never sought to determine whether or not those levees were built before or after the dams, have you?

MR. HAGENS: Objection to form.
A. I've sought information about the history of the development of levees, but I've never received anything very credible.

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Q. Did you perform any investigation to determine whether or not the levees were built before or after the dams that maintain the upstream storage?
A. I did not.
Q. Your second comment on Mr. Melone's declaration is "confidence limits on analysis?" Is that correct?
A. Yes.
Q. And then under that you have a dash USGS something or other, and I can't read that.
A. Estimates.
Q. Okay. And what are you talking about with USGS estimates?
A. Well, Mr. Melone labels his maps with discharge quantities for each event, and no one measured those. They've been estimated by someone, but we weren't there and the technology wasn't developed at the time to actually measure those. So my question was, how did he estimate what those numbers were.
Q. Well, they're estimated by the U.S. Army Corps of Engineers, were they?
A. I don't know that. He didn't state that.
Q. Well --
A. There were many sources and many estimates, some of which I believe, some of which I don't.
Q. Did you perform any investigation to determine

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whether the discharge estimates were accurate or inaccurate as they were reflected on Exhibits 2-A through 2-G of the Regan deposition?
A. I really had no reason to.
Q. I take it you didn't do it, then?
A. That's correct.
Q. Okay. Your second comment under subhead note 2 is "rating curves/stage records." Is that correct?
A. Yes.
Q. What is a rating curve?
A. Rating curve is a mathematical relationship between discharge rate and water surface elevation that corresponds to it.
Q. Have you calculated any rating curves with respect to your work on this diking system?
A. I'm sure we did.
Q. And can you show me where those are?
MR. MAJOR: We're going to have them back in a second. It's being copied. Let's see if we have any

extra copies.
A. Well, we sometimes have several copies of information like that in different places in the file, but I don't -- here's an example of the Skagit near Sedro Woolley. This happens to be in logarithmic coordinates, but it's essentially a relationship between stage or water

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surface elevation and discharge.
Q. Okay. And can you tell me what the purpose of calculation of rating curves is?
A. To establish the link between the flow rate and how high the water gets.
Q. Is that essentially what you did via computer model in Exhibits 4-G and 4-H, is to show where the water went when you had a particular level of flow? If I remember them correctly, 4-H was 130,000 cubic feet and 4-G was 150,000 cubic feet per second.
A. Generally, rating curves are developed for sections of the river where flow conditions are very uniform and there is a unique relationship between the flow rate and water surface elevation. If there is a particular flow rate, then there is only one water surface elevation, more or less, which matches it. In the reach upstream from the Burlington Northern bridge, the channel is not uniform, and in general there isn't a single unique relationship like that. That's one of the reasons why we undertook numerical modeling of the larger reach.
Q. Are the rating curves that you calculated for this case in this packet that you've just handed me?
MR. HAGENS: You mean all of them? Because we just had representation from your co-counsel that some of them have been sent out.

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A. I'm sure they're not all in this folder. These primarily relate to Sedro Woolley, so I expect the Mount Vernon ones are in a different folder.
Q. Can you find those for me, please?
A. I suspect they're the ones being copied.
Q. I think what was sent out was the contents of that.
MR. MAJOR: Rating curves were included in this package. Those are being copied.
Q. We'll wait until we get those back, then. Okay, your third subhead note under number 2 of your notes to the Melone declaration is "method of flood-limit mapping - profile etc." Do you see that?
A. Yes.
Q. What does that mean?
A. This goes to the point I was making earlier about Dr. Melone not having described how he mapped the

limits for the various floods. At that point in time, I couldn't tell whether he'd used a very simplistic technique to compute the water surface profile, streamwise, and then a crude technique to map it laterally to see what the extent of the condition would be, or whether he'd done extensive two dimensional numerical modeling, or something in between. So that was the question, what was the approach. What were the data.

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Q. Did you ever figure that out?
A. No.
Q. So you don't know what he used at this point as you sit here today, is that correct?
A. That's correct.
Q. Okay. Your third point is the relationship between damage and stage as opposed to area. Is that correct?
A. Yes.
Q. What does that mean?
A. We discussed that this afternoon, also. As I mentioned, the Melone exhibits portray what he would like us to perceive as a constant area of flooding for a variety of historical events, and then implies that that means it's always been wet for virtually anything over 100,000 CFS. What he didn't tell us was how deep was it. And I think that's a crucial point, perhaps the point, in terms of determining impacts on the people who live in the floodplain.
Q. Have you ever determined how deep the water was on any particular individual in any particular historical event other than the 1990 flood?
A. In this project?
Q. Yeah.
A. Yes, I guess I have.

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Q. Okay. What have you done in that regard and which properties have you determined water levels for during a previous historical event?
A. I made an estimate of the incremental rise, let's call it, which I would attribute to the presence of the levees for the 1990 discharge, throughout the reach from downstream of I-5 to Sedro Woolley, and determined that on average, I would expect that water surface elevation would be as much as four feet deeper, given that the levees are there, than if they were not there, and I would expect that to apply fairly broadly throughout the area.
Q. I'll move to strike as being non-responsive. But let me ask you a question based on your recent comment. Does that mean --

MR. HAGENS: You can't strike it and then ask him a question on it.
Q. Sure I can. Does that mean that you believe that the water in 1975 was four feet higher than it otherwise would have been if there had been no levees in 1975?
A. I think we're talking about 1990.
MR. HAGENS: But he's asking about '75 now.
Q. My question was, do you believe that the water was four feet higher because of the levees in 1975 than it

00094
would have been otherwise?
A. Yes.
Q. Okay. The reason I moved to strike your answer to the question was because you gave me something about the 1990 floods when I had asked you about floods prior to 1990. My question was this. Did you make any determination as to what the level of inundation was as a result of any historical flood prior to 1990?
MR. HAGENS: I'm going to object to the form of the characterization of what your question was.
Q. You can go ahead.
MR. HAGENS: The earlier question was, because I don't believe you're accurate.
MR. SMART: It's just because you're getting old, you can't remember.
MR. HAGENS: What did you say?
MR. SMART: It's because you're getting old and you can't remember.
MR. HAGENS: I have much better memory than anybody in this room, except the good doctor has a much better memory than I do.
Q. Do you have the question in mind?
A. What I did was estimate the incremental effects of the levees for a discharge on the order of 150,000 CFS, which does not necessarily apply to any point in time, but

00095
it happens to coincide with the peak discharge in 1990.
Q. I understand that's what you did. My question is, did you calculate for any particular previous flood the water level that would have been experienced on any of the plaintiffs' properties? I'm talking previous to 1990.
A. Not yet.
Q. Based on your analysis and your computer model, would the water be four feet higher for any given flood on the order of 130 to 150,000 cubic feet per second for any flood that occurred after the dikes were in essentially their current location?
MR. HAGENS: Objection as to form.
A. That's a very long question. Could you repeat

that?
Q. Yes. You indicated that it was your opinion that the water level in 1975 would be approximately four feet higher than it would have been without the levees, correct?
A. Yes.
Q. Okay. Would that also be true for any flood of approximately the same order, which is 130,000 to 150,000 cubic feet per second, that took place before 1975 up back until the time the dikes were placed in their current locations?
MR. HAGENS: Objection as to form. Go

00096
ahead and answer the question if you can.
A. Well, the incremental amount is a function of levee height as well as placement. That's an extra degree of freedom. When you go back beyond 1975, I guess I don't know which levee profile we're talking about then.
Q. Well, we're agreed, are we not, that the levees didn't overtop in the 130,000 cubic feet per second flood, aren't we?
A. In 1975.
Q. Right.
A. You were asking about pre-'75?
Q. Yes, assuming that you had the dikes in there, essentially their same location and essentially their same height, would you expect the same incremental four feet of water in the Nookachamps?
MR. HAGENS: Object to the form of the question. If the question is, if the conditions that existed in 1975 existed earlier than that and the 130 CFS came through would you expect the same height, I would have no objections with that.
Q. Let's take his question, then. Answer Mr. Hagens' question.
A. If the conditions that existed in 1975 were to exist at some earlier points in time, I would expect the same result.

00097
Q. Okay. And have you made any determination as to how much prior to 1975 it was that there was a material change in the height and location of the dikes?
MR. HAGENS: Objection as to form. Go ahead and answer.
A. I haven't been able to do that.
Q. The next is a document that's dated February 5th, 1973. Can you tell me what that is?
A. These are just some notes from a conversation I had with personnel at the hydraulics -- hydrology branch at the Corps of Engineers in Seattle.

Q. Can you tell me, what it was that you learned in that conversation?
A. Some of these are questions I think I was using to prompt myself, and some are answers. I'll just give you the answers. I believe the Corps of Engineers had created something called a UNET, U N E T, model with 75 cross sections of the lower Skagit, that appeared to have in channel geometry that would be useful for us, was available to us. They had recently revised their frequency curves, flood frequency curves at Concrete and Mount Vernon a little bit, nothing significant. They had high water mark data available for the 1990 flood. They described how they got a boundary condition for their modeling effort at Sedro Woolley by transposing it from an

00098

upstream site at Concrete.
Then they described how they performed some sort of geotechnical analysis which seemed to indicate that the level of what he called probable failure point was raised by rehabilitation work performed by the County, that they had analyzed this reach by reach, they were proceeding to do frequency analysis with the results of their UNET modeling, and he identified a couple of people at the Corps who might have information about emergency operations. Paul Komerosky was someone who had information about sandbagging on State Route 20. He identified the flood engineer for the Skagit, Ernie Sabo, and Noel Gilbrough was the flood engineer for the Nookachamps area.
Q. Is it part of your concept in this case that the dikes should fail?
A. No.
Q. Do you agree with the proposition that if you're going to have a dike, it ought to work?
A. That would be sensible, I think.
Q. And have you ever advocated having a dike that failed?
A. On occasion, one actually does design levees that do fail at a certain point in their operation, and in certain places which are least prone to damage. And the

00099

Corps of Engineers has developed a systematic process to do that.
Q. Is it your contention in this case that because of repair work on the dikes that occurred after 1975, that caused them to be less likely to fail, that Skagit County in some way raised water levels in the Nookachamps?
A. No, I haven't stated that.
Q. And in fact, your model, your computer model and the opinions that you've given today are premised upon

dikes that actually work as opposed to dikes that fail, are they not?
A. I'm not sure what you mean by premised upon. We've made the assumption that the dikes are there.
Q. And the topographical information that you inputted into your computer model is topographical information based on the dikes actually being there as opposed to failing, correct?
A. That's correct.
Q. So you assume for the purposes of your analysis that the dikes remain and don't fail? Is that right?
A. For the analysis done to date, yes. Correct.
Q. Have you studied the propensity of the Burlington Northern bridge piers to accumulate debris during times of high water?
A. I've had no reason to make a study of the

00100

Burlington Northern bridge. I'm aware that all the bridges on the Skagit collect debris from time to time.
Q. Well, in specific answer -- Let me ask the question again. Do you agree or disagree that during times of high water, the Burlington Northern bridge accumulates debris?
A. I know that it does on occasion. I don't know that it does all the time.
Q. Have you studied that question to determine whether it routinely accumulates debris during times of high water?
A. Again, I've had no reason to do that, so I haven't, no.
Q. Have you studied the question of whether or not it accumulated debris during the 1990 flood?
A. I've seen reports that it had accumulated some debris.
Q. Have you made any attempt to estimate the amount of debris that it accumulated?
A. No.
Q. Have you made any calculation as to the effect, if any, that the accumulations of debris on the Burlington Northern bridge had on water levels upstream of the bridge during the 1990 flood?
A. Again, I had no reason to undertake that study.

00101

Q. I take it then that you didn't?
A. That's correct.
Q. Do you agree or disagree the Burlington Northern bridge has 13 piers that extend down into the river channel?
A. That sounds about right.
Q. Do you agree that those 13 piers form an

impediment to the flow of water downstream from the Nookachamps area to Puget Sound?
A. The piers provide resistance to flow in the Skagit River channel.
Q. So they operate as an impediment to the downstream flow, is that correct?
A. Yes, that's correct.
Q. And if those piers have debris accumulations on them, it essentially makes them bigger and therefore gives them a more significant impeding effect, is that right?
A. Well, there's always a tendency to think --
MR. HAGENS: I'm going to object to the form of the question. Greater effect where? I object to the form of the question. Go ahead and answer the question.
Q. The question is this. Do you agree or disagree, sir, that accumulations of debris on the Burlington Northern bridge would impede the downstream flow of water?

00102
MR. HAGENS: He's already answered that. Have you got another question?
Q. Go ahead and answer the question.
A. I think there's no conclusive evidence one way or the other.
Q. Well, it's your position, then, that even though the piers themselves impede the flow of water, that debris which increased the width and breadth of the solid material on the piers would not also increase the impedance?
MR. HAGENS: Object as to the form of the question. How deep is this debris, how widespread? It's an incomplete hypothetical question.
Q. You can go ahead and answer the question, sir.
A. Well, the reason that there is no deterministic answer is that rivers have a way of adjusting themselves, and if debris were to collect on piers resulting in acceleration of flow through the bridge opening, between the piers, one result of that is that scour will take place around the piers, enlarging the opening again by lowering the river beds and compensating for whatever blockage effects might be taking place at the surface.
Q. Did you make a study of that alleged phenomenon to determine whether or not it in fact occurs at the Burlington Northern bridge?

00103
MR. HAGENS: Objection as to form. It assumes it doesn't occur at every bridge. Go ahead and answer the question.
A. Well, in fact, this is a generally known phenomenon, and I have been involved in both physical

model studies and field studies that confirm that it does occur.
Q. Have you performed any studies for the Burlington Northern bridge?
MR. HAGENS: Same objection.
A. No.
Q. Have you performed any study to determine whether or not the bridge and/or debris accumulations caught on the bridge cause a decrease in velocity of the river at that point?
MR. HAGENS: At what point? Object to the form.
MR. SMART: The point of the bridge, Carl.
MR. HAGENS: You mean right at the bridge?
MR. SMART: Yes, right at the bridge.
MR. HAGENS: Go ahead and answer that question. I still think it's objectionable as to form because he doesn't tell you where at the bridge. But if you understand the question, go ahead and try to answer it, doctor.

00104
A. Well, again, there's no clear-cut answer.
Q. The question is whether or not you performed any study.
A. Oh. I did not.
Q. Have you performed any study to determine whether or not a decrease in velocity causes water at the bridge to lose its sediment load to any degree?
MR. HAGENS: Objection as to form of the question. Go ahead and answer the question.
A. What sediment load is it that we're talking about?
Q. The sediment load in the water.
MR. HAGENS: Objection as to form. He hasn't told what you the decrease in velocity is as well. So I'll object to the form of the question. And where it is, its extent. So go ahead and answer the question if you can, but I have an objection to the form of the question.
A. I haven't performed any specific sediment transport analyses at the bridge itself.
Q. Have you performed any studies to determine whether over time, say between 1975 and 1990, there has been any filling in of the river at the bridge that would affect the rate at which water escaped the bridge?
MR. HAGENS: Objection as to form. Where

00105
at the bridge?
MR. SMART: At the bridge, Carl.
MR. HAGENS: But that is too vague and

broad a term to use in a question, so I object to the form of the question.
MR. SMART: If he's studied it he can tell us what he found out for every foot across the river, but right now I'm just asking him if he performed any such study.
MR. HAGENS: Same objection. Go ahead and answer the question.
A. I guess we've analyzed it indirectly in that the rating curve at the Mount Vernon gauge appears to be stable. I think the defendants' position also is that it's stable, for a given flood magnitude. The defense is arguing that water surface elevations are not rising because of the levees or any other reason, they've been stable since 1975. I think you can't have your cake and eat it too. It's either stable or it's not. If it's not rising, then there's no impacts from sedimentation.
MR. SMART: Let's take a short break while we mark these things, if we could.
(Recess)
(Exhibit 9 marked.)

00106
BY MR. SMART:
Q. Showing you Exhibit Number 9 to your deposition, sir, can you tell me what that is?
A. This is an analysis of flood frequency for the Skagit River near Mount Vernon.
Q. Is it also a rating curve?
A. No.
Q. Tell me what the top page of Exhibit Number 9 shows.
A. The curve is visual representation of the probability of occurrence, the likelihood, if you will, that the maximum flow in any given year will be a certain amount. So for example, there is approximately a 10 percent chance that a flow of 100,000 CFS or larger might be the maximum instantaneous discharge for the Skagit River at Mount Vernon.
Q. Why do you say there's a 10 percent chance of a 100,000 cubic feet per second discharge? It looks to me like the curve on 10 percent reads approximately 40,000.
A. You actually need to look at the .9 value. This is plotted as cumulative probability, which is percent less than or equal to. So values greater than or equal to are at the other end of the chart. They're in excess of .9, in other words.
Q. Say that again.

00107
MR. HAGENS: I was going to ask you if you

could maybe put that in lay terms for the less sophisticated of us. And that wouldn't be me, but somebody else around here maybe.

MR. MAJOR: Maybe the jury.

A. Well, let's focus on that same example. This shows that there's a 90 percent chance of the flow being less than or equal to 100,000 CFS, which means that there's a 10 percent chance, then, that it would be greater. Equal to or greater. It's not labeled very clearly.

MR. HAGENS: That's in any given year?

THE WITNESS: That's correct.

Q. In the upper left-hand corner of the chart where it says Q100 equals 169,000 cubic feet per second, what does that mean?

A. Using this curve, this relationship, we've estimated what the hundred year discharge would be in terms of annual peak flow. It would be about 169,000 cfs.

Q. Why is it, then, that when you have your recurrence interval of 100 on the top of the graph, it appears to fall at approximately the 100,000 cubic feet per second level?

A. Well, fortunately or unfortunately, the access at the left side is in logarithmic scale. The next is actually 200,000 cfs, not 110.

00108

Q. So there's not a uniform scale on this chart, is what you're telling me?

A. I guess that's a good way to state it, yes. If you look at the bottom part of the scale, it varies from 10,000 to 100,000 in increments that are not the same length on the page.

Q. Now, you have determined that the peak discharge for a 100-year storm is 169,000 cubic feet per second?

MR. HAGENS: Storm, or --

Q. Hundred year flood. Is that correct?

A. This is an estimate, yes.

Q. Is that the generally accepted estimate of the peak discharge flow in the Skagit for a 100-year flood?

MR. HAGENS: Objection as to form.

Q. Go ahead and answer the question.

A. This is one that we've done on our own, and it's not published.

Q. Is it different than the published estimates of peak discharge flows for hundred year floods in the Skagit?

A. Well, a couple of pages farther back, a similar analysis by the Corps of Engineers dated 6 November '92, with a bunch of notes on it, they seem to put the hundred year at between 180 and 185,000 cfs.

Q. But you think it's substantially lower than

00109
that?
A. Oh, this one analysis by itself doesn't convince me that the Corps is right. I think we were just looking to see if the numbers were reasonable, that the data were reliable, and so on. There are a number of techniques for estimating flood frequency and we've used one, I expect the Corps has used a different one.
Q. You said the Corps's estimate was 185,000, is that right?
A. Yes, I think so.
Q. So you're as much below the Corps as the peak discharge in the 1990 flood is below your estimate of what the hundred year flood is, approximately?
MR. HAGENS: I don't understand that question. I object to the form.
Q. The actual peak discharge in the 1990 flood is 154,000 cubic feet per second, correct?
A. It's in that neighborhood. It's perhaps 152.
Q. And so your estimate of what the hundred year flood is at 169,000 is only 15,000 cubic feet per second above what occurred in 1990, correct?
A. Yes.
Q. And your estimate of a 500 year flood, per Exhibit Number 9, is 216,106 cubic feet per second, unless that's an 8?

00110
A. It could be an 8.
Q. Okay. 216,108 cubic feet per second, correct?
A. Yes.
Q. Is that different than the Army Corps's?
A. I would put their estimate at about 245.
Q. Would it be correct to say then that based on your estimate as reflected in Exhibit Number 5, the 1990 flood on the Skagit River was substantially closer to a 100 year event than it would be if you used the Corps's system?
MR. HAGENS: Objection as to form.
A. Well, we weren't making an in depth analysis of the frequency of the '90 event or any other event. I think we were just applying a test and a check on the data more than anything.
Q. You used the data to come up with your estimate of flood flow frequency on Exhibit 9, didn't you?
A. But as I say, that's only one possible way to make that estimate, and if we had been assigned the responsibility of making a flood frequency estimate, I think we probably would have made several.
Q. But you only made one, right?
A. And perhaps deferred to the Corps's number in the end result. I don't know that we just made one. This is just a piece of paper we found in the file.

00111
Q. Well, this isn't a piece of paper you found in the file, this is a piece of paper you made and generated, right?
A. Yes. I'm saying that there might be additional analyses. I don't know that this is the only one.
Q. Using Exhibit Number 9, the flood flow frequency determination that you made, what year flood was the 1990 flood?
A. I'm not going to be able to scale that off this plot. We don't have enough information on the scale between 100,000 and 200,000 to do that.
Q. Well, approximately what would it be?
A. Well, I think I'm not willing to guess. I think that's what it would amount to. If I make an eighth of an inch error in measuring somewhere on the axis I'm going to be off by 25 years on the return period.
Q. Have you ever made a determination as to what return period this particular flood was?
A. I can't recall. I recall the Corps characterizing as a 25 year event or something of that order. But I don't know whether we performed our own independent estimate or not.
Q. On the last page of Exhibit 9, there are some questions and answers. Do you see those?
A. I'm not sure that I do.

00112
Q. Question number 1 --
A. I'm sorry, yes.
Q. All right. Do you know where those came from?
A. The heading on this indicates that it's a Corps of Engineers memo.
Q. This is a letter for Mr. and Mrs. Donald Austin, is that correct?
A. Yes.
Q. And the Corps of Engineers determined that the water surface level of their area for a 50 year flood would be 41.8 feet, is that correct?
MR. HAGENS: Well, I'm going to object to the form of the question. Object to the form of the question.
Q. Isn't that what it says in the last page of Exhibit Number 9?
A. As I understand the information here, it was their estimate as of May of 1979, using their then current analyses, I guess, that without the project, the 50 year level would be 41.8 feet.
Q. And as we have just seen, based on your own determination of flood frequencies, that depending on how they are calculated, you can come up with a substantially

different assessment of what peak flow equals what period event, isn't that right?

00113

A. There is some engineering judgment involved.
Q. So a 50 year flood, using your analysis as reflected in Exhibit 9, would indicate what peak discharge?
A. Well, you're asking me to do the reverse of what I declined to do earlier. I think I can't scale it off here with sufficient accuracy to give you a decent answer.
Q. In other words, you can't tell me using your own analysis in Exhibit Number 9 what the peak flow for a 50 year flood is?
A. Not without some calculations. I can't tell you directly from this graph, no, not within acceptable limits.
Q. What would you need to do to calculate that peak flow?
A. Well, let's see. Well, on the next page of this exhibit there's a tabulation of frequency data at the bottom, which --
Q. Are you talking about page 2 of Exhibit Number 9?
A. Yes. It doesn't seem to match what's written on the handwritten notes, however. I'd have to do some calculations. The long and short of it is that we didn't really use this information in our analysis. This goes to what kind of label do we put on a particular water surface

00114

elevation for or discharge, and we didn't bother to place labels.
Q. You would agree, though, that the last page of Exhibit 9, which is the Army Corps of Engineers' answer to questions posed by Mr. and Mrs. Donald Austin, is that using their estimates, the 50 year flood event would cause a water level of 41.8 feet in the Austins' area?
A. That's what the memo states, in 1979.
Q. How much water would that put on the Austin's property, a 50 year event?
A. I have no idea.
Q. Is that because you didn't calculate that?
MR. HAGENS: Objection as to form.
A. I had no reason to utilize the Corps's information to determine flood impact at this property, or any other property.
Q. As of 1979, did the dikes exist in the same configuration as used in your computer model, which provided the graphic information on Exhibits 4-G and 4-H to the Regan deposition?
A. I think so. Substantially.

Q. For what purpose did you use the last page of Exhibit Number 9, which is the Army Corps of Engineers' memorandum regarding the Austin property and the answer to the Austins' questions?

00115

A. I'm not aware that we made any direct use of it at all. I think we might have used it for background information.

Q. The handwritten notes on page 9, one saying Johnson Dairy Farm and one saying Clear Lake, do you see those?

A. Yes.

Q. Are those notes that were placed there by you or by the Army Corps of Engineers?

A. I think neither. I think those are comments from my assistant.

Q. And your assistant is who?

A. Robert Elliott.

Q. When you say they're comments by your assistant Robert Elliott, do you mean that those are calculations by Robert Elliott of what the water levels would be at those particular places with and without the building of the 1979 proposed Army Corps project?

A. I'm not interpreting what they are. They're not my comments. I'm not sure what Bob's intention was here.

Q. Did you use those figures for any purpose?

A. No.

Q. Do you disagree with them?

MR. HAGENS: Objection as to form.

A. I neither agree nor disagree.

00116

Q. At what discharge level does the Skagit overtop its banks in the Nookachamps area?

A. It depends how you define banks.

MR. HAGENS: And where?

Q. Let's say just below the Highway 9 bridge.

A. What do you define as the top of the bank?

Q. Well --

A. It's rather ill defined.

Q. There aren't any levees right along the river, just downstream of the Highway 9 bridge, are there?

A. No, that's correct.

Q. Don't you use the term overtopping its banks to mean the river coming up and starting to go over land and flooding the land?

A. I think it's difficult to generalize there because there's a lot of variability in the banks profile, there are little low spots and high water channels, and so on.

Q. Well, can you give me a range of discharges at

which somewhere in the range it's going to be out of its banks, below the Highway 9 bridge?
A. Rather than relying on memory -- I don't recall precisely for the Nookachamps area what might be a threshold discharge for overbank flows, but in general terms, probably something on the order of 100,000 cfs

00117
would result in flow in floodplains, or beginning to head in that direction.
Q. Would you agree or disagree that the Nookachamps basin is substantially lower than the banks of the Skagit River as those banks exist just below the Highway 9 bridge?
MR. HAGENS: Objection as to form.
A. Would you define for me what you mean by Nookachamps basin?
Q. Okay. Let me ask it this way. Do you agree that once the Skagit overtops its banks downstream of the Highway 9 bridge that the water runs downhill into the Nookachamps basin?
MR. HAGENS: Objection as to form. Go ahead and answer the question.
A. Well, again, I'd ask that you define Nookachamps basin for me.
Q. Let's say the area over towards Clear Lake.
MR. HAGENS: Objection as vague in the extreme.
A. I'm not sure what you're getting at. I can say that there are lower corridors, portions of old, remnants of old channels, for example, that first receive water that flows from the Skagit, and essentially is marshy, but I'm not -- it's not characteristic of the entire

00118
Nookachamps basin.
Q. Discharge of 100,000 cfs implies what period event, according to your calculated system that's demonstrated on Exhibit 9?
A. That would be on the order of a ten-year event, according to our crude estimate.
Q. It would be correct to say, then, would it not, that you would expect at least some flooding of the Nookachamps basin area from overbank Skagit River water, at least every ten years?
MR. HAGENS: Objection as to form. Where? It's also broad, vague. Go ahead and answer if you can.
A. I would expect some flooding in some parts of the Nookachamps basin with that kind of frequency, sure.
Q. Showing you Exhibit Number 10, you can you tell me what that is? Off the record.
(Exhibit 10 marked.)

A. Exhibit Number 10 is a discharge rating curve for the Skagit River at Mount Vernon.
Q. Okay. And what does the discharge rating curve that's the top page of Exhibit Number 10 show?
A. It indicates the water surface elevation or stage which would be reached by the river for a given flow rate.
MR. HAGENS: But where? Stage where?

00119
A. At the gauging station, Mount Vernon gauging station.
MR. MAJOR: On the river side of the bridge?
THE WITNESS: Close to it. 150 feet downstream or so.
Q. Okay. Would this rating curve, which is the top page of Exhibit 10, indicate that there had been no change in the ability of the river at that location to pass water between the 1975 and 1990 floods?
MR. HAGENS: Ability of the river to pass water. Well, I'm going to object to the form of the question. Go ahead and answer if you can.
A. It illustrates somewhat indirectly that no significant change in water surface elevation as a function of discharge.
Q. Between the 1975 and the 1990 floods?
MR. HAGENS: Objection.
A. Well, over any time frame. Time is not indicated explicitly in this plot, but the fact that there's not a lot of scatter around the fit indicates that it's been relatively stable over time.
Q. And the points on the rating curve, those little boxes, are particular flood flow events, are they not?
A. I believe that's the case. They might be actual

00120
measurements -- no, that's correct. They're flood flow events, that's correct.
Q. They're flood flow events from different years, correct?
A. Yes.
Q. And the fact that they are on the same rating curve without a lot of scatter indicates that there's basically been no difference in the ability of the river at that point where these are measured to pass the water given a particular flow, is that right?
MR. HAGENS: I'm going to object to the form of the question.
A. Well, you can see there's a stray point that's pretty far off the curve.
Q. The one that says 45?

A. Right.
Q. When did that come? When was that measurement taken?
A. In 1945, I presume.
Q. So at least with one exception of a 1945 data point that doesn't seem to fit on the rating curve, everything else seems to indicate no change in the ability of the river to pass water at that point?
MR. HAGENS: I'm going to object to the form of the question. Go ahead and answer.

00121
A. Well, I'm not comfortable with the characterization everything else seems to indicate. I'm not sure how far back in time these tabulations go.
Q. You've got one that says '51, correct?
A. Yes.
Q. And that's right on the rating curve, correct?
A. On the upper end of the curve, that's true.
Q. And '75 is right on the rating curve too, correct?
A. Yes.
Q. And '90, you've got one that's just above and one that's just below, right?
A. Yes.
Q. Both of them touch the curve, correct?
A. Well, the symbols do, at least.
Q. Let's get back to my original question. Would this rating curve indicate that there's been no change in the ability of that river to pass water at the points where these data points have been collected during these flood flows?
MR. HAGENS: Objection as to the form of the question.
A. Over what period of time?
Q. You just earlier indicated that it wasn't something that measured time, it just measured events

00122
during particular flood events, correct?
MR. HAGENS: But he's asked you --
Q. And you've identified that one of the data points is 1951, and three of the data points are 1990. Correct?
A. Uh-huh.
Q. Okay. So between 1951 and 1990, this rating curve would indicate that there's been no change in the ability of the river to pass water at that spot, would it?
MR. HAGENS: Objection as to the form of the question.
A. What it really says is that within some acceptable degree of precision, the 1951 observation and

the two 1990 ones fit the same relationship. Whether that implies stability between 1951 and 1990, we don't know. We don't know whether it went up and down and came back to the same relationship or not.
Q. Well, these are peak flows that you have identified here, are they not?
A. Yes.
Q. And so all you're measuring is peak flow and the ability of the river to discharge the water at a particular point, correct?
A. Yes.
Q. And so what the rating curve tells you, if the

00123
data points are on the curve, is that the ability of the river to pass water for this data point in 1951 is the same as it was in 1990, correct?
MR. HAGENS: Objection as to form of the question. You mean throughout the entire year 1990 or the date --
Q. During the flood, Carl.
MR. HAGENS: Your question didn't say that, of course.
A. Well, let me point out that this is a semi-log scale, and as in my previous comment, I'd indicate that a very small distance on paper could represent a pretty large number, a large deviation of the '51 event from the curve, for example. So I'm not sure what to conclude from the fact that these three points seem to be in the same general vicinity of each other.
Q. Is it your testimony here today, sir, that you cannot tell us what this rating curve, which is the top page of Exhibit 10, means with respect to the ability of the river to pass water during the peak flood flow discharges during the 1951, 1975, and 1990 floods?
A. I am perfectly capable of telling you what stage discharge curve means. But I'm saying that one has to interpret what these points mean before generalizing a result.

00124
Q. Well, and that that's what I'm asking you to do. Doesn't it mean that the river is passing the same amount of water for similar peak discharge flows in 1951, 1975, and 1990?
A. Well, within the limits of our ability to measure on this graph, we know that the heights reached by the water surface elevation for those discharges was described by a common relationship.
Q. Meaning it's the same?
A. Meaning what is the same?
Q. For a given flow you've got the same height.

A. That's the tendency. But --
Q. Well that's what your curve shows, doesn't it?
A. It doesn't allow for any other changes that might have taken place, such as in '51, for example, it's conceivable is that levees were lower when flow took place outside beyond the levees in certain places.
Q. Do you know that that occurred?
A. I don't know that it didn't.
Q. Did you study that?
A. Had no reason to.
Q. Unless you want an answer the question of whether or not there was some other factor that explained the similarity in the data points on the rating curve.

00125

A. I've already accepted in writing that this indicates a relatively insignificant change in the period 1975 to date. In fact, I believe there are other indications that that is the case also. I didn't put very great emphasis on this figure to draw that conclusion, however.
Q. All right. So that we're in agreement, I'll leave out 1951 and ask my question. Isn't it true that Exhibit Number 10, the top page, shows that because of the similarity of position of the data points on the rating curve, that the ability of the river to pass water at the gauge just downstream from the Burlington Northern bridge hasn't changed significantly between 1975 and 1990?
MR. HAGENS: Objection as to form of the question.
A. Given that I know that the levee configurations were similar, at least for my purposes, during the time period '75 and '90, I can accept that statement.
Q. Okay. What are the other sources of information that confirm that conclusion that you alluded to just a few minutes ago?
A. Which conclusion? I'm sorry.
Q. That there hadn't been any substantial change in the ability of the river to pass water between 1975 and 1990.

00126

A. I have somewhat of a recollection of looking at the history of the water surface elevation for a particular discharge. I don't recall what that was, but it would have been on the order of 100,000 cfs, say, over a period of time as measured by USGS, and as I recall, it was reasonably steady.
Q. Take that a little slower, if you would, please, and tell me what it is that you reviewed. Some USGS document, correct?

A. I'm stretching, it's been a couple of years again, but I believe we investigated the USGS data in the hydrology folder and looked at stream flow measurements, not just references to historical rating curves, but on occasions when GS actually went out and measured the flow and recorded the water surface elevation, and it seemed for whatever the index discharge was that I was interested in, there was a fair degree of stability over the last couple of decades.

I see we've also plotted soundings from the USGS current metering notes, and while there's a lot of noise in the cross section plot, there's no indication here that there's a consistent upward or downward change in the bed level over the period roughly 1970 to 1990.

Q. Is what you're telling me that the Skagit River bed level has essentially remained the same between 1975

00127

and 1990?

MR. HAGENS: Objection as to form.

Q. Is that the information that you're telling me?

A. At the location of the gauging station, within reason, that's correct.

Q. Did you make any determination whether there was any material change in the bed at any other location that might affect water levels in the Nookachamps?

A. We didn't have this same kind of data available at other locations to be able to do that, so no, we didn't examine it in the same way.

Q. I take it the answer to my question is that you did not make a determination that there was any change in the bed level of the Skagit River at any other location that would be material to water levels experienced in the Nookachamps during the 1990 flood, is that right?

MR. HAGENS: I object to the form of the that question. He said the data wasn't available. Go ahead and answer the question.

Q. Do you have the question firmly in mind?

A. Give it again. I'm not sure.

MR. SMART: Would you read it back to him, please?

(Record read as requested)

MR. HAGENS: Same objection. Go ahead and

00128

answer it.

A. We certainly considered information about sedimentation, and there have been opinions offered by the Corps, and I think Dr. Melone, amongst others, but we didn't perform any specific analysis at locations other than at Mount Vernon gauge.

Q. Since you didn't perform any other analysis at

any other points, I take it that you did not make any determination that there was a change in the river bed at any other place that might cause increased water levels in the Nookachamps during the 1990 flood, isn't that right?
MR. HAGENS: Object to the form of the question.
A. I think we determined we were satisfied there was no deterministic trend that we needed to account for in terms of determining the impacts at the Nookachamps area, that if there were any sedimentation processes going on, they tended to balance out over the long haul, and -- but that wasn't the explanation for the flooding at the Nookachamps.
Q. Did you perform any river cross section surveys?
A. No, we didn't. I don't believe so.
Q. Okay. You have the USGS documents here in front of you, correct?
A. Yes.

00129
Q. And can you give me what documents you referred to that confirmed that there had been no material change between 1975 and 1990 with respect to river changes that might affect flood levels in the Nookachamps?
A. I guess the answer is no, I observed thumbing through the data that I haven't marked them in any way and I don't have notes in there, so if there's an analysis, it's in some other location in the files here.
Q. I take it, then, that you remember that there was other information confirming your conclusion that there had been no significant change in the river between 1970 and 1990 that would have affected flood levels in the Nookachamps, but you can't tell me what that information is other than that it's somewhere in the USGS documents which are in this file folder right here, is that correct?
MR. HAGENS: Objection as to the form of the question. Go ahead.
A. I think the time frame is more like 1975 to date, and I think I used, investigated the information in that folder, I think that was the basic data, but the analysis of it, if I performed one, I didn't find, and I'm not sure whether we have it here today or not.
Q. What analyses did you perform of the USGS documents to make the determination that there had been no material change in the river that affected flood levels in

00130
the Nookachamps between 1975 and the present?
A. I described it earlier, but I'll repeat it. As I recall, we looked for occasions when USGS is actually measured in the field at the Mount Vernon gauge, stream flow in a certain range, say 100,000 cfs. We looked at

those records for a period of several years and plotted those up to see if there was any fluctuation in water surface elevation for those measured flows at say 100,000 cfs. As I recall, it was relatively constant over that period of time.
Q. And I take it that you measured those flows and compared them to water levels in the Nookachamps, is that right?
A. No, this analysis was performed at the Mount Vernon gauge.
Q. Did you perform any analysis comparing the flows measured at the Mount Vernon gauge and actual water levels measured anywhere in the Nookachamps?
A. I'm sorry, would you pose that question again?
Q. Did you compare the measurements of the flows in the water surface levels at the Mount Vernon gauge with any measured water surface levels in the Nookachamps?
A. For any particular conditions?
MR. HAGENS: At any particular time? What are you talking about?

00131
Q. For any time between 1975 and 1990.
MR. HAGENS: For what purpose? I object to the form of the question. Go ahead and answer the question.
A. Well, that was the basic purpose of formulating our numerical model to begin with, was to be able to bridge that gap and be able to compare, to begin at the Mount Vernon data as a known, model our way up to the Nookachamps area, and then compare it to observe 1990 high water marks. So in that sense we made a fairly careful comparison.
Q. Where is your written analysis of the USGS data?
MR. HAGENS: Written analysis? Objection to the form. Go ahead.
A. As I mentioned, I'm not sure it exists. I just have a recollection of having considered that issue and having satisfied myself that the rating curve was relatively stable. So I don't know that it's anywhere else.
Q. You said that you plotted it.
A. Well, that was -- that would be part of the analysis if I performed it. It's generally how it's done.
Q. Well, if you plotted it, where did you plot it? I assume on a piece of paper, correct?
A. Yes.

00132
Q. And so where is that piece of paper?
A. I don't know. It's been two years or more since we archived the file.

Q. Would that plot have been kept on any computer disk?
A. I don't know, again, that it does exist. But if it does, I think it must be here today on the diskettes in the box.
Q. Can you show me which ones?
A. No. I think they're all labeled, but I don't know which it would be.
MR. HAGENS: Now, you're not touching this.
MR. MAJOR: Yes, we are.
MR. HAGENS: You're not, either.
MR. MAJOR: Why not?
MR. HAGENS: Because they get too easily destroyed, by the time you turn stuff over to defendants and get it back blank --
MR. SMART: We would like copies of those diskettes, Carl.
MR. HAGENS: I propose we send them to a third party, independent party and have them do it.
MR. SMART: That's fine.
MR. HAGENS: You tell me who you want to do it and all I want is assurances that they're not going to

00133
destroy the stuff on them.
MR. MAJOR: How about Bill Gates?
MR. HAGENS: I don't think he's going to do it.
MR. SMART: How many have we got there?
THE WITNESS: A couple dozen.
MR. SMART: Let's count them, just because Carl's such a stickler for precision.
MR. HAGENS: You count them. You're the doctor.
THE WITNESS: 26.
MR. SMART: 26 diskettes?
THE WITNESS: Yes.
MR. SMART: We're agreed that we'll send them to a third party for copying.
MR. HAGENS: No, we'll send them. You tell us who the party is you want to copy them.
MR. SMART: We'll each hang onto half of them, Carl.
MR. HAGENS: No, we're not doing that.
MR. MAJOR: He wants us to pay for them.
MR. HAGENS: Sure, you're paying for them. I'm not paying for your diskettes. Does the state wants a copy, too?
MR. ANDERSON: You bet. Off the record.

00134
(Discussion off the record)

BY MR. SMART:
Q. Mr. Mutter, just so I understand the way in which you use this information for inputting into your computer model, is it correct to say that based on the analysis that you did of the rating curve which is Exhibit Number 10, you determined that there had been no changes downstream of the Burlington Northern bridge that would affect water levels in the Nookachamps that took place between 1975 and 1990 and therefore you didn't put any such changes into your computer model?
MR. HAGENS: Object as to form.
A. Let me answer that by saying I'm not sure that the boundary conditions, downstream boundary conditions for the simulations came directly from the curve, they might have come, and probably came, from USGS observations. They have continuous stage recorders, and I suspect we used the actual observed value there.
Q. But you left that value constant in your computer model rather than providing for any changes that might have taken place between 1975 and 1990 because you didn't determine that there were any material changes based on your analysis of the rating curve, is that right?
A. That might not be correct. If we used the actual values, the actual values might have been plus or

00135
minus the rating curve, they might have been above or below. The rating curve is not perfect. We would have used the observed values, I suspect.
Q. Okay. Based on your analysis of the observed values, did you make a determination that there was anything that changed between 1975 and 1990 that would have affected water levels in the Nookachamps?
MR. HAGENS: Objection as to form of the question. Go ahead and answer.
A. I'm sorry, ask me that again, please.
Q. Based on your analysis of the observed values, did you determine that there had been no material change in the river downstream of the Burlington Northern bridge between 1975 and 1990 that would have affected water levels in the Nookachamps?
MR. HAGENS: Object to the form of the question. Go ahead and answer the question.
A. Which observed values?
Q. The ones that you say you used in the model.
A. I think maybe we have some confusion between using information to provide a known condition at the downstream end of the model and using that information to prove the stability of this rating curve at the points. They're different exercises. So I'm agreeing for the most part with you that since '75, there's been relative

00136
stability of the rating curve at Mount Vernon, but I'm saying rather than using this curve to determine the starting elevation for the modeling we would have gone to the recorded -- the strip chart recorder from USGS and used the actual value for that day, which might be higher or lower, slightly, than the rating curve. Maybe it's a fine point.
Q. Whether you used the rating curve or the actual value from the USGS observed level, you still came up with the same conclusion that there had been no change between 1975 and 1990 that would have affected water levels of the Nookachamps for a given flow?
MR. HAGENS: Objection as to the form of the question.
A. I don't mean to seem dense, but would you repeat that, please?
MR. SMART: Would you read it back?
(Record read back)
MR. HAGENS: Same objection. Go ahead, if you've got an answer.
A. I agree.
Q. What is page 2 of Exhibit 10?
A. It's the same information without a line drawn through the points.
Q. And what is page 3 of Exhibit 10?

00137
A. The same information drawn to a log scale.
Q. And page 4 of Exhibit 10?
A. It's the same as page 3 without a line drawn through -- a fit drawn through the points.
Q. I take it the purpose of making four different exhibits with the same information is to really tie down the point that there had been no change?
MR. HAGENS: Object to the form of the question. Go ahead and answer.
A. I don't know that there was there was any particular point -- it was just a change in the format of presentation.
Q. Okay. And the fifth page of Exhibit 10 is what?
A. This is stage/discharge curve for the Skagit River near Sedro Woolley.
Q. The left-hand axis is what?
A. Water surface elevation.
Q. And that's the water surface elevation at Sedro Woolley?
A. At the gauge at that location, yes.
Q. Did you make any comparisons between the water surface elevation at the gauge at Sedro Woolley and the water surface elevation in the Nookachamps for any particular event?
A. Not that I recall.

00138
Q. How can we tell what the events are, or are the numbers to the left of 1856 just the last digit of the year in which the flood occurred?
MR. HAGENS: What page are you on, if I might ask?
MR. SMART: Fifth page of Exhibit 10.
A. It's been a long time. I would guess that --
MR. HAGENS: If you're guessing, you shouldn't be testifying.
THE WITNESS: Touche.
MR. HAGENS: I'm just reminding you that reasonable approximations are fine, or estimates.
MR. SMART: Is that a stipulation that Mr. Mudder's not going to be a witness in this case?
MR. HAGENS: He understands the point I'm making, is that we shouldn't be guessing. If you have some knowledge on this particular exhibit, you should give it.
A. To the best of my recollection, these numbers represent the last two digits of the date, and those events that occurred in 1800 have a two-digit prefix to indicate that. The 1800s.
Q. For what purpose did you use the fifth page of Exhibit 10?
A. This was used to develop upstream boundary

00139
conditions for the numerical model.
Q. And how did you use it?
A. For a particular flow rate. Again, this relationship would tell us what the water surface elevation would be corresponding to that flow rate. And that would be imposed at the upstream boundary of the model. The downstream boundary would have water surface imposed there and then the model solved to determine the water surface elevation in between the two.
Q. What year event was the 1856 flood?
A. I don't know at this point.
MR. HAGENS: What year? I'm sorry, counsel, 1850?
MR. SMART: 1856.
Q. Let me ask this question, because I'm kind of confused. It's my understanding that the 1815 flood was a 500 year event. Do you agree with that?
MR. HAGENS: Well, I object to the form. What your understanding is is not something --
Q. Let me ask you, what year event was the 1815 flood?
A. We really didn't make any rigorous analysis of the frequencies of the labels to put on these events. It

served no purpose for our investigations, so we didn't do it.

00140

Q. Well, it does serve a purpose for trying to predict with what frequency you would have a similar event, that's the purpose of labeling, isn't it?
A. I don't need to be able to do that in order to assess the impact of the levee system on the Nookachamps.
Q. What is the sixth page of Exhibit 10?
A. It's the same as the fifth page, with no fit line.
Q. And the seventh page of Exhibit 10?
A. Same as the fifth page with logarithmic axis.
Q. And the eighth page of Exhibit 10?
A. The same as the seventh page with a fit line.
Q. And the ninth page of Exhibit 10?
A. This is similar to the seventh page, except that it's in log log coordinates. And I believe it includes just flows measured by USGS rather than estimates.
Q. There's not a lot of scatter on that rating curve, is there?
MR. HAGENS: Objection to form.
MR. SMART: Pardon?
MR. HAGENS: Objection as to form.
MR. SMART: Overruled.
A. It's not a bad fit.
Q. What did you use the ninth page of Exhibit 10 for?

00141

A. It could be used to develop a mathematical relationship, which in fact was shown on the page. That then can be utilized in the numerical model for the upstream boundary condition.
Q. What is the mathematical relationship that was developed and which is shown on the ninth page of Exhibit 10?
A. What is it?
Q. Yes.
A. It is an expression in mathematical terms of the rate of the water surface elevation which corresponds to a particular flow rate in the Skagit River near Sedro Woolley.
Q. Okay. And height is represented by Y?
A. That's actually log Y. But yes. I'm sorry, Y represents the log of the discharge.
Q. Okay. Y equals log of discharge, and X equals what?
A. I have that backwards, sorry. X is log of the discharge and Y is log of water surface stage elevation.
Q. What you're telling us, then, is that you have

determined by this formula that the surface elevation of the river at Sedro Woolley during flood events is a function of the discharge level of the water at peak discharge, is that right?

00142

A. That's correct.
Q. Will you describe all the physical boundary conditions that are used in your model?
MR. HAGENS: What, his model?
MR. SMART: Yes.
A. There aren't very many boundary conditions that at the upstream end of the model would impose a mathematical relationships such as the one we just looked at on the seventh page, I believe it is.
Q. Well, is this the one you imposed?
A. I believe so.
Q. Could you impose another one?
A. Certainly.
Q. Why would you use this one as opposed to another one?
A. This would be our best estimate of the correct one.
Q. How did you make the determination that this was the best estimate? When you say this, I take it you're referring to the one on page 9 of Exhibit 10, correct?
A. Yes. Using engineering judgment, there would be a boundary condition at the downstream end --
Q. Let me interrupt you.
A. I'm sorry.
Q. I'm sorry for doing it. Is that the only basis

00143

upon which you chose this relationship on page 9 of Exhibit 10, was engineering judgment?
A. As opposed to what else? I'm not sure I understand your question.
Q. Well, did you, for instance, consult with any other engineers to determine whether it was the right one?
MR. HAGENS: Which would still be engineering judgment.
MR. SMART: Well, just somebody else's, not his.
MR. HAGENS: Go ahead and answer the question.
A. No, we relied upon the engineering judgment of our own staff.
Q. And who actually came up with the formula expressed on page 9 of Exhibit 10?
A. That would be Bob Elliott.
Q. All right. So Mr. Elliott was the one that derived the formula, correct?

A. Yes.
Q. Okay. Any other boundary conditions?
A. Yes, there would be a boundary condition at the downstream end of the model represented by the rating curve at the Mount Vernon gauge, which we've discussed quite a bit.

00144
Q. Is that expressed in a formula?
A. I think it was, but it's not written on these pages.
Q. Can you tell me what it was?
A. No.
Q. Can anybody?
MR. HAGENS: Well, I object to the form of the question. You're getting tired, Will. I suppose who did it would be able to tell you, and it may be in these documents.
MR. SMART: My point is this, Carl. Mr. Mudder is the expert witness that you have identified as being the one who can testify as to water surface levels in the Nookachamps. It's my understanding that he has developed a computer model. He's now telling me what's going into this model, and the upstream boundary condition is a formula that's on page 9 of Exhibit 10. He says that there's a downstream formula, but now nobody's going to tell me what it is.
MR. HAGENS: No, that wasn't what I was objecting to. Your question asked can anybody tell me who did it, which was a sarcastic remark and really not a question.
Q. I apologize, let me rephrase the question. How do I find out what it is?

00145
A. Well, it would certainly be contained in the model which you're apparently going to get a digital copy of, and --
Q. Where is the digital copy of the model that I'm going to get?
A. The floppy disks.
Q. Which one?
MR. HAGENS: Come on, Will. You're getting tired. Because there's 26 of them. You want us to take the time to go find which one it is?
Q. Let me ask this question. What are contained on the 26 floppy disks?
A. The floppy disks contain ASCII data files for input to the FESWMS numerical model. They tell the model everything it needs to know about topography and physical features as well as boundary conditions and flow rate. So everything that the model needs to operate, essentially,

is contained in these files. The files are configured in different ways, depending on what it is that's being simulated. I believe the files are labeled in such a way that one can identify which flood event and which configuration is contained in each file.
Q. Let me ask a question here. It is my understanding from your earlier testimony that there was only one configuration that you had put into the computer

00146
model. Are you now saying that there are different geographical configurations that you put into the model?
A. There's only one version of the model that has been used to simulate the 1990 and 1975 events. However, it was developed through a process of adding and modifying pieces, and there might well be preliminary versions of it also in the records. I suspect there are.
Q. How are we to know which is the final one and which are the preliminary versions?
A. I can't tell you offhand, but we could probably identify those for you in short order.
Q. Would you do that for me, please?
A. No, I can't do that here without actually getting the directories off the floppy disks and identifying what contains what.
MR. SMART: Well, Carl, my concern is that you've got 26 floppy disks with an unknown number of the model, and it would be a little bit like wading through rough drafts of one of your voluminous briefs to get to the hidden prize.
MR. HAGENS: First of all, our briefs are never voluminous, and there's nothing but golden wisdom in them, no hidden prizes. As you've experienced, by the way.
MR. MAJOR: The mother lode.

00147
MR. HAGENS: The mother lode.
MR. SMART: How are we going to solve this problem?
MR. HAGENS: Don't these things typically carry --
MR. SMART: Let's go off the record.
(Discussion off the record)
MR. HAGENS: Let me tell what you we're going to do. The witness is going to prepare an index to the magnetic disks that, the floppy disks that we have here. And then I'm going to have copies made. Do you want copies of all the disks or do you want me to get the index first and then you decide about what disks you want? They are expensive, has been my experience. But you guys decide.

MR. MAJOR: Why don't we take a look at the index first.
MR. SMART: Let's look at the index. But we'd like to get that as soon as we can. It's just a couple day process?
THE WITNESS: Right.
BY MR. SMART:
Q. Okay. Let's go back to my question, which is, a complete description of the boundary conditions in the model.

00148
A. Okay. We covered the upstream and downstream boundary conditions. We also had a boundary condition for inflows in Nookachamps Creek, which were gauged.
Q. How did you determine what the inflows to the Nookachamps Creek would be?
A. I believe they were from gauge recordings directly, so we didn't process that at all.
Q. From gauge recordings where?
MR. HAGENS: The question was gauge crossings where.
Q. Gauge recordings.
MR. HAGENS: Gauge recordings where, I'm sorry.
A. I believe there's a recording gauge at the lower Nookachamps.
Q. Yeah, but where is it?
A. I can't tell you precisely today where it is. It's close enough to the main stem of the Skagit to represent total basin influence for Nookachamps Creek. As it is, they're very small contributions, but we knew you'd be interested, so we included it in the model.
Q. Well, is it located downstream of Francis Road?
A. Do you have Regan's --
MR. HAGENS: Calculations, Exhibit 4?
MR. SMART: That's it right there.

00149
A. Well, at some points on the boundary, we would have imposed Nookachamps Creek inflows.
Q. I know, but what I'm asking you is where you got them and from what gauge they were taken and at what time.
MR. HAGENS: He understands that. Do you know where the vicinity of the gauge is? Do you have a recollection as you sit here today?
A. I don't recall exactly where it was located.
Q. What kind of gauge was it?
A. I believe it's a recording, continuous recording gauge.
Q. What does it record?
A. Stage, water surface elevation.

Q. Well, it was my understanding of your testimony earlier that relatively early in any flood, water would rise in the Nookachamps to a point where there wouldn't be any flow in the Nookachamps Creek itself.
MR. HAGENS: Object to the form of the question. I don't recall that topic being discussed. You might have him confused with Mr. Regan.
Q. Let me ask you this. Is the input that you have in your model for the Nookachamps Creek, is that input taken at the peak discharge point of the flood?
MR. HAGENS: Discharge -- well, if you understand the question. I'm going to object to the form

00150
of the question. Because what is discharging? Is the Skagit discharging into the Nookachamps, or is the Nookachamps discharging into something else?
MR. SMART: If you'll listen to the testimony, Carl, you'll understand that the first boundary condition is the discharge at the upper end of the model.
MR. HAGENS: Right, I understand that.
MR. SMART: And the second boundary condition is the discharge at the lower end.
Q. But both of those are peak discharges, are they not?
MR. HAGENS: On the Skagit River?
Q. Isn't that right?
A. In the steady state simulation of the 1990 event, yes.
Q. Okay. And so my point is, if that's the point at which you are measuring the flow of Nookachamps Creek, how are you doing that?
A. We would have had a choice to make regarding the flow rate in Nookachamps Creek as to whether to include its peak rate or the actual flow at the time of the peak in the Skagit, and I don't recall offhand exactly which route it took. I do recall that the inflows from the Nookachamps made no difference to the results, but it was a detail we knew we'd be asked about, so we left it in.

00151
MR. HAGENS: Why don't we break, because we've got these documents to round up and get back to our offices, unless you've got some pressing questions here, Will.
MR. SMART: Carl, you're cutting me to the quick. They're all pressing, Carl.
MR. HAGENS: Well, that's for sure. I understand that.
Q. Let me just finish up on this one area. Is it correct, sir, as you sit here today that you cannot tell me how the inflow from Nookachamps Creek was measured, or

at what points it was measured?
MR. HAGENS: The inflow from Nookachamps Creek into what?
Q. Into the model.
MR. HAGENS: Into the model.
A. I'm not sure how it's been represented in the model.
Q. And similarly, you don't know how it was measured at the gauge or by what type of gauge, is that correct?
A. Similarly, I don't recall. It's been a while.
Q. And in addition to that, you don't remember whether you used the peak flow rate or the flow rate at the peak discharge point of the Skagit?

00152

A. That's true.
Q. Okay. Were there any other boundary conditions in the model other than those three that you've given me?
A. Not that I recall.
MR. SMART: Okay. I'm satisfied, if we break now, and we're going to have to talk about when we resume.
MR. HAGENS: But I'm most concerned about these documents, okay? Let's go off the record.
(Deposition concluded at 4:50 p.m.)

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S I G N A T U R E P A G E

STATE OF WASHINGTON)
COUNTY OF KING)

I have read my within deposition, and the same is true and accurate, save and except for changes and/or corrections, if any, as indicated by me on the correction

sheet hereof.

_____
D. GERALD MUTTER
Taken October 12, 1995

SUBSCRIBED TO before me this _____ day of _____ 19____.

_____
Notary Public in and for the State of _____, residing at _____

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C E R T I F I C A T E

STATE OF WASHINGTON)
COUNTY OF KING)

I, the undersigned Notary Public in and for the State of Washington, do hereby certify;

That the annexed and foregoing deposition of each witness named herein was taken stenographically before me and transcribed under my direction;

I further certify that the deposition was submitted to each said witness for examination, transcribed, unless indicated in the record that the parties and each witness waive the signing;

I further certify that all objections made at the time of said examination to my qualifications or the manner of taking the deposition, or to the conduct of any party, have been noted by me upon said deposition;

I further certify that I am not a relative or employee of any such attorney or counsel, and that I am not financially interested in the said action or the outcome thereof;

I further certify that each witness before examination was by me duly sworn to testify to the truth, the whole truth and nothing but the truth;

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I further certify that the deposition as transcribed is a full and correct transcript of the testimony, including questions and answers and all objections, motions, and exceptions of counsel made and taken at the time of the foregoing examination;

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal this 17th day of October

1995.

_____
Mark Hovila
Notary Public in and for the
State of Washington, residing
at Seattle