BEFORE THE FEDERAL EMERGENCY MANAGEMENT AGENCY
FLOOD INSURANCE RATE MAP APPEAL RESOLUTION
CONGAREE RIVER, RICHLAND AND LEXINGTON COUNTIES, S.C.

REPLY OF CITIZEN APPELLANTS

SUBMITTED JULY 20, 2001

I. THE EQUAL CONVEYANCE AND NO-LEVEE FLOODWAY MAPPING METHODS ARE NOT ONLY REQUIRED, THEY ARE FAR MORE DEFENSIBLE THAN CV'S NOVEL "1-FOOT-PER-SECOND/PARALLEL-TO-THE-CHANNEL" PROPOSAL.

A. FEMA Regulations Prohibit the Agency From Recognizing Uncertified Agricultural Levees In Flood Hazard Mapping.

Federal regulations clearly prohibit FEMA from recognizing uncertified agricultural levees in its flood hazard mapping. FEMA may recognize only "those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards." 44 CFR 65.10(a). All parties concede that Manning's agricultural levees fall short of the applicable requirements; FEMA therefore may not consider the levees in its mapping of flood elevations and floodway boundaries in Richland County. FEMA's Flood Insurance Study Guidelines ("FIS Guidelines") recognize this prohibition by requiring that "floodway widths will be computed for the 'without levee' condition if the levees do not meet the requirements of 44 CFR 65.10."[1]

Columbia Venture ("CV") responds to this outright ban by claiming that the prohibition is somehow limited to "simple floodway determinations where it is technically appropriate to consider only 'with or without' levee scenarios."[2] Yet CV cites nothing in the regulations or FEMA's guidance that would support ignoring the clear regulatory imperative. CV's intimation that text on Page 5-5 of FIS Guidelines (mistakenly cited as being on page 5-6) de-activates page 7-4's command to compute a "without levee" condition is unconvincing. The quoted portion of Chapter 5 addresses the optional use of 2-D models, is not mandatory and centers on flood elevations rather than floodway delineation. More important, the sentence quoted by CV is followed by a sentence that bluntly requires that floodways "<u>must be based on equal conveyance reduction</u>."[3]

B. FEMA Must Use the Equal Conveyance Reduction Method to Delineate Floodway.

This FIS Guidelines clearly require that when "the stream forms the border between contiguous communities, and the floodway designation affects both of them, equal reduction of conveyance <u>must</u> be used."[4] The equal conveyance requirement was pointed out by Lexington County, which has an interest in shouldering no more than its fair share of the floodway burden. CV proposes to map more floodway onto Lexington County by eliminating the nationally applied equal conveyance method and replacing it with a new method that masks the actual flow of destructive floodwaters behind the uncertified levees. Specifically, CV wants FEMA to limit its flooding mapping to only those flows which are (1) one-foot-per second; (2) parallel to the main river channel; and (3) part of a contiguous 1 foot-per-second loop that comes from and returns to the river (the proposed standard is referred to hereinafter as "1FPS/PTC/CF").

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[1] <u>Flood Insurance Study Guidelines and Specifications for Study Contractors</u>, 7-4 (FEMA, 1999 ed.).
[2] Columbia Venture Summary, at 5 (July 6, 2001).
[3] <u>FIS Guidelines</u>, at 5-5 (emphasis added).
[4] <u>FIS Guidelines</u>, at 5-3 (emphasis in original).

It is now clear that CV has no regulatory basis whatsoever to support its new 1FPS/PTC/CF standard. Indeed, the best that CV can muster is finding a "notion" that this new definition is "implicit" in FEMA's regulations.[5] While Appellants would agree that this definition is not explicit in the regulations, it is plainly *not* implicit in, nor consistent with, FEMA's floodway definitions or the agency's flood insurance mapping practice. FEMA defines "regulatory floodway" as that area reserved to "provide for the discharge of the base flood so the cumulative increase in water surface elevation is no more than a designated amount". 44 C.F.R § 9.4.[6] *Under FEMA's definitio, the key feature of a floodway is that it have sufficient conyeyance capacity to prevent area flood elevations from increasing during a 100-Year flood.* The plain and defensible object of FEMA's floodway definition is preserving sufficient discharge capacity to ensure that floodwaters do not back up and rise on to adjacent areas.

CV seeks to add new factors and features to the floodway definition. In CVs' view, a floodway must be consistently parallel to the river; must have a contiguous 1fps "velocity corridor"; must have "a coherent flow pattern in the context of a 100 year flood, which pattern must have a beginning and an end"; must allow all of the base flood discharge to return to the river; and must serve as a completely unobstructed waterway that "has historically and customarily conveyed part or all of a base flood discharge."[7] This proposed definition poses many more areas for disagreement than the current definition, which focuses on the comparitively simple matter of discharge capacity. These workability complications, moreover, are unjustified from any legitimate policy perspective. If the keystone of the floodway is that it have sufficient capacity so that surrounding flood elevations don't rise, what would FEMA gain by having to show that all floodways demonstrate a "coherent" flow pattern "in the context of a 100 year flood" that "must have a beginning and an end"?

Indeed, rather than offer any gain for the flood management program, CV's 1FPS/PTC/CF definition willfully disregards dangerous known flood hazards. As discussed below, CV's mapping technique using the 1FPS/PTC/CF method shows little floodway coverage on its land. When the artificial 1FPS/PTC/CF filter is taken off, however, it becomes clear that even using CV's own model, the area landward of the levees will experience tremendous flows, with large volumes of water moving at significant velocities. That water, which has historically and repeatedly flowed in Richland County, would otherwise back up onto other areas and increase area flood elevations. The water, it should be noted, returns to the Congaree River.

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[5] CV Summary, at 6-7.

[6] See also 44 C.F.R. 59.1 ("'Regulatory floodway' means the channel of a river or other watercourse and the adjacent land areas that *must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation* more than a designated height")(emphasis added).

[7] CV Summary, at 7.

II. DURING THE MINOR FLOOD OF 1976, THE CONGAREE RIVER BREACHED CV'S LEVEES IN AT LEAST THREE PLACES AND CAUSED MILLIONS OF DOLLARS OF DAMAGE.

CV claims that there has been only one breach of the Manning dike: a single 120 foot breach in 1976. In truth there were at least three breaches in 1976 and at least one breach in 1964. Attachment 1 contains pages from the November 1987 trial concerning the 1976 flooding and the damage caused to CV partner Burwell Manning's land by multiple levee blowouts. The trial evidence clearly shows that two large breaches occurred on ring levee one at Congaree River flows lower than 155,000 cfs. We have attached photographs of those breaches (north breach and south breach) as Attachment 2. These photographs illustrate that significant breaches will happen during even minor flood events and also illustrate the uncertified construction techniques used to construct the dikes. The trial testimony also shows that Manning's levees breached in other places as well, from overtopping. Photos of this breach, which occurred near the intersection of Gills Creek and the Congaree, are contained as Attachment 3. Appellants have also provided FEMA with video footage of breaches of the Manning dikes in 1964.

The trial testimony, photographs and historical accounts all demonstrate that the Richland County bank of the Congaree River has suffered repeated high-energy flood events throughout history despite extensive flood control projects including levees, ditches and dams. The existence of levee repair projects throughout the years; the presence of agricultural rather than commercial and residential development; the repeated accounts of dangerous floods; the 1976 breaches and subsequent $4.8 million in damages – all support the conclusion Richland County has experienced, and will continue to experience, repeated losses due to substantial floodwater flows.

III. CV's RMA-2 MODEL IS UNCALIBRATED, UNTESTED, UNREVIEWED AND INCOMPLETE.

A. CV's RMA-2 Output is Uncalibrated, Untested and Unreviewed.

Columbia Venture's RMA-2/SMS output, as far as these Appellants are aware, has never been tested against historical floods to measure the degree of fit with known historical data. Nor has CV's output been presented with various breach scenarios or showing different likely historical flows. At base, FEMA has been asked to accept a colorful model that the agency has been given no reason to believe is in any way more accurate or more reasonable than the standard HEC-2 models used to determine flood elevations in 2000. CV has simply run the model, presented the output and said "trust us, our are data more complicated." To bolster its own outputs, it has presented a letter from a highway department employee. That letter, according to CV, confirms that the USGS map "should not be used" to determine floodway conditions. In fact, the letter, whose author provided no credentials and who does not appear to be a certified professional engineer, states only that the model could be improved with more data. There is absolutely no indication that this highway department employee has ever reviewed Columbia Venture's data and modeling techniques to see if they fit the known historical record.

B. CV's Model Ignores 40% of the Water Expected to Flow In the Subject Area.

Not only has the Columbia Venture model not been tested and reviewed to determine its degree of fit with known data, the model plainly excludes major tributaries of the subject study area. The 100-Year flows for these tributaries are found in the table below, taken from FEMA's August 1999 Flood Insurance Study, Richland County, South Carolina and Incorporated Areas. G-1 is a small tributary upstream of Gills Creek (historically called Poplar Branch). Because Garners Ferry Road is upstream of Bluff Road, the actual flows of Gills Creek in the study area will be higher than indicated. Mill Creek crosses Caughman Road before joining its tributary, meaning that the 3000 cfs figure is too low.

Gills Creek at Garners Ferry Road	10,234 cfs
Tributary G-1 at Bluff Road	1,150 cfs
Mill Creek at Caughman Road	3,000 cfs
Reeder Point Branch at mouth	4,938 cfs
Tributary MC-1 at mouth	2,870 cfs

Adding these figures up (except MC-1), results in a conservative flow estimate of 19,000 cfs. The 2-D models generated by FEMA and CV predict approximately 26,820 cfs of the Congaree flowing behind the levees. Given the well-documented history of concurrent flooding as well as the well documented history of the Gills Creek levees failing, floodway mapping for Richland County must include Gills Creek and CV's model, which fails to include these tributaries, grossly underestimates the likely BFEs and floodway conveyances in Richland County.

C. A More Complicated (But Untested) Model Will Not Be More Accurate Than a Simpler (But Tested) One.

CV asserts that their model is more accurate than FEMA's model, in part, because it is more complex. However, increased complexity does not, a priori, mean greater correspondence with the behavior of the natural system a model is simulating (Wolpert et al. 1993; Perrin 2001).[8] Simplifications and errors in model parameters lead to errors in the results (Wolpert et al. 1993; Reichert and Omlin 1997; Omlin and Reichert 1999). As models become more complex, the opportunity for errors of this type increases, including questions of parameter covariance and prediction uncertainty.

The modeling work done for CV ignores uncertainty in all but a superficial sense. Perhaps the primary weakness is the absence of meaningful calibration and verification. In addition to the uncertainty directly associated with their implementation of RMA-2, there is the added dimension from the use of UNET for estimating the downstream water elevation in the RMA-2 model. Even assuming the stage results obtained from UNET are acceptable (which Appellants cannot assess because the UNET model parameters used by CV are unavailable), stage readings for historical floods should be used as tests of the RMA-2 parameterization.

[8] Full reference citations can be found at Attachment 4.

While it is likely that floodplain morphology (topography) has changed over 100-years or more, we know that an extensive network of levees have existed since at least the early years of the 20th century. Thus significant flow obstructions have been part of the environment during many of the floods that, according to eyewitness accounts, caused significant flow on the floodplain. Calibration using this information is needed to test the credibility to the parameterization done by Exponent, Inc. Notably, FEMA conducted a similar verification of their model in preparation for their September 2000 maps.

IV. EVEN CV'S FLAWED RMA-2 OUTPUT DEMONSTRATES THAT RICHLAND COUNTY WILL CONTINUE TO EXPERIENCE DEEP, DESTRUCTIVE FLOWS.

While all parties concede that the uncertified levees will breach during the 100-year event, there is no certainty as to: where, exactly, the breaches will occur; how many breaches will occur; how massive the breaches will be; or how the levees will fail, be it by piping, sheering or overtopping. Due to this inherent variability of possible break scenarios, it follows that flow could occur virtually anywhere behind the levees. FEMA's September 2000 floodway takes into account this variability and does not try to map a specific breach flow area as if the location and mode of the breach were a certainty. CV, on the other hand, does just that, taking but one of many possible of levee breach scenarios and applying artificial filters to produce a map that supposedly shows little of the area landward of the levees are floodway.

As discussed above, it is completely inappropriate to ignore all flows, regardless of depth, that do not meet CV's artificial 1FPS/PTC/CF definition. When the 1FPS/PTC/CF limitation is taken off, CV's own model output shows that significant flow, with significant volumes, will occur behind the levees and throughout the Richland County side of the Congaree River. An overlay of CV's "100-Year Flow" output onto FEMA's September 26, 2000 map shows that FEMA's equal conveyance method actually did a very good job at estimating the area of flow behind the levees. This overlay is shown as Attachment 5. Attachment 6 shows CV's map with a .5 fps cutoff (rather than 1fps), showing that the majority of the Richland County area is covered with moving water. Attachment 7 shows water depths on the land. The end result is that CV's own modeling work concedes that a tremendous amount of moving water will come behind the levees, thereby conyeying waters from the 100-Year flood that, if displaced, would cause area BFEs to increase.

Given the substantial flows, depths and variability associated with levee breaching by the Congaree River and Gills Creek, FEMA's equal conveyance floodway of September 2000 is the most defensible, most reasonable and historically most accurate way to map conveyance in Richland and Lexington Counties, South Carolina.

Attachment 1

Testimony from November 1987 trial concerning 1976 levee breaks.
(Full transcript already in administrative record)

pp. 35-65 [redacted]

pp. 79-80 [redacted]

pp. 107-134 [redacted]

pp. 153-154 [redacted]

pp. 175-214 [redacted]

pp. 220-221 [redacted]

1 A. In my opinion, no. I never saw anything done on it.

2 Q. In how many years?

3 A. '67 to '76. I think they may have even been notified

4 they needed to have a maintenance - ongoing maintenance program

5 Q. What happened in October of 1976? Were you still working

6 on that farm?

7 A. Yes, I was.

8 Q. What happened?

9 A. Basically, had a very large flood. The flood, I think

10 it was the highest in forty years. Severed the levy in two

11 places on the City of Columbia tract, flooding the area we

12 have described, 1800 acres.

13 Q. How many breaks were there?

14 A. Two.

15 Q. Would you go ahead and put this arrow on the break, the

16 northernmost break? Did you see that break?

17 A. Yes, I did.

18 Q. Where was that break?

19 A. It was basically at the 42 inch pipe that led from - went

20 through the levy on the City of Columbia property, the north-

21 ernmost pipe on the property.

22 Q. On which portion of the dike was it?

23 A. What portion?

24 Q. Yes. The portion you were maintaining or --

25 A. No, that was the portion that belonged to the City of

1 Columbia. That was their responsibility.

2 Q. Was there another break in that same flood?

3 A. Yes, there was.

4 Q. Where was that?

5 A. Just below the northern break, approximately right in

6 here.

7 Q. Would you go ahead and put this arrow on where that one

8 was. And explain to the jury what happened. What happened

9 on that October 11 day as best you remember?

10 A. Well, we got a phoen call very early in the morning.

11 It had been indicated that the water was coming into the prop-

12 erty. We went out to check it. There was large amounts of

13 water running up this way to the north, turning and going

14 back down the canal that was on the Heathwood Hall school

15 property. We sent a large amount of equipment to the site

16 to try to stop anything because we weren't sure where it

17 actually was taking place or I wasn't at the time. Later

18 that morning found it had broken on the City of Columbia site.

19 Basically there was so much water in there at the time that

20 I couldn't get around to it. The only way I saw it was from

21 a helicopter. I got in a helicopter and flew over it.

22 Q. What did you see when you flew over it with a helicopter?

23 A. High water, water coming in both breaks and basically

24 this was all flooded at that time.

25 Q. What did you have out in there on that land at that time?

1 A. Little more than a thousand acres of soy beans.

2 Q. And what happened to the soy beans?

3 A. They were ruined.

4 Q. I am going to show you some pictures and see if you can

5 identify these pictures as to what happened on that day?

6 A. Well, some of these are after the water receded, but most

7 of it did happen out there during the flood.

8 Q. Let's look at them then. Let me show them to [redacted]

9 first.

10 [redacted]: No objection.

11 Q. Seven and I will give you the last, 7-A, B, C, D, E, I

12 think, A, B, C, D, E and I will give you the next one. Looking

13 at 7-A, we offer 7-A, Your Honor.

14 COURT: 7-A in evidence without objection.

15 Q. What does 7-A show?

16 A. Basically two breaks in the levy on the City of Columbia

17 tract of land coming in on the property.

18 Q. KInd of orient them on that document. Where does that

19 picture show the breaks to be and what is that pond-looking

20 thing on the document?

21 A. Th epond tha tyou see on the picture is this right here

22 and that is waste water treatment plant, the breaks being

23 behind.

24 Q. What happened to tshe plant and sewage when the break

25 and floor happened?

1 A. That would be a shot of the northern break, this break,
2 shows the 42 inch pipe that went through the levy for drainage
3 purposes and there again it shows that there was no maintenance
4 on that levy.
5 Q. On that levy, that meaning the city's portion?
6 A. Yes.
7 Q. [redacted], we were talking about some breaks on the
8 dike during flood on the city portion of the dike. When was
9 that flood, what date, do you remember?
10 A. October 10th or 11th, 1976.
11 Q. And we have gone through where it broke. I"d like to
12 see if you can recognize pictures 9-A through 9-G as represent-
13 ing the aftermath of the break in the dikes. Just look through
14 them as a group. Do you recognize those?
15 A. Yes, sir, I do.
16 Q. Are they representative of the aftermath of the flood?
17 A. Different points in time during the flood it represents
18 different phases of the flood.
19 [redacted] No objection.
20 COURT: Plaintiff's 9-A through 9-G in evidence now with-
21 out objection. You may proceed.
22 Q. And in these represent what happened to what property?
23 Just look at them as a whole.
24 A. Basically that represents different stages and elevations
25 of the water during that flood which was caused by the break

1 in the city levy. I think you will see in the pictures there
2 the Heathwood Hall school which at that time was partly flooded
3 You will also see some aerials that show the old area under
4 water.
5 Q. How high did it get in there, different places?
6 A. Different places five to six, seven feet deep. Some may
7 have even been deeper than that, but it varied, depending
8 on the contour of the various locations.
9 Q. Where did you have your beans planted, the beans that
10 were going to be sold for seed?
11 A. From this point all up into here there was approximately
12 1,077 acres planted in there of the 1800. There was some
13 fields that weren't planted at that time, but basically it
14 went all the way from the southern boundary up north.
15 Q. Was the area above up north flooded, too?
16 A. Yes, it was.
17 Q. Was any portion of that property not flooded?
18 A. Not to my knowledge.
19 Q. How long was it flooded? Does a flood like that have
20 to go in and come out in days, hours or minutes?
21 A. To get it completely out, I can't recall how many days,
22 but I am sure it could have been as many as four or five days
23 to get it. At that point you may have had some low spots
24 that weren't completely out. The majority of it three days
25 probably.

1 Q. What happened - was there any discussions with banks with
2 reference to getting money for the development of this parti-
3 cular project like is shown on Exhibit 14?
4 [redacted]: Objection. I object. It is hearsay and
5 irrelevant.
6 [redacted]: Your Honor, all I am asking is negotiations.
7 I haven't asked him what the bank said. All I have asked
8 is negotiations. He can testify of his own knowledge whether
9 there were negotiations with reference to getting money.
10 COURT: Objection overruled to this query.
11 Q. Were there negotiations?
12 A. Yes, sir.
13 Q. What happened in those negotiations when the flood came?
14 A. They were stymied.
15 Q. What happened to the interest in this development of this
16 property after the flood?
17 A. In my opinion it ceased. What happened basically is the
18 property was perceived in a different manner. All the input
19 that was - all the knowledge that was gained over this period
20 from the '60's into the '70's, all the planning, all the work
21 was basically thrown out the window in one night when the
22 levies broke and the property flooded. It basically tainted
23 the property so perception of it was it was always going to
24 continue to be flood property. I don't know that you can
25 ever recoup the momentum that was there at the time.

1 Q. Take your seat.

2 ([redacted] stated Defendant's Exhibit #5, but he was

3 referring to Plaintiff's Exhibit #5.)

4 Q. You say that flood on October 10 and 11 in 1976 was the

5 highest flood in forty years, correct?

6 A. To my knowledge, yes.

7 Q. Not only were there breaks here and here, but there were

8 breaks down in section two and section three?

9 A. That is correct.

10 Q. One of them was at another one of these flap-gate type

11 pipes, was it not?

12 A. Not to my knowledge.

13 Q. Not to your knowledge?

14 A. No.

15 Q. Is it your testimony that it was not at one of these pipes

16 or you don't recall?

17 A. I don't recall it being at one of these pipes.

18 Q. Now you had crops planted down in this area, also, behind

19 levies two and three?

20 A. Yes, I did.

21 Q. You sustained substantial crop losses down in that area?

22 A. Also.

23 Q. And I believe your testimony yesterday was that these

24 sections two and three levies are built - what was your testi-

25 mony - I think you said the primary difference between one

1 and two is the size?

2 A. Basically what I was saying that the size and the purpose

3 was totally different; that the section one was created for

4 future development, section two and three were basically for

5 agricultural purposes. Two is larger than three, three being

6 the most southern section, but it was important that my father

7 put all the levies in, even if he felt like at a later date

8 he could come back and update two and three, he felt like

9 it was important to get them in and establish the system at

10 that time all at one time, so he wouldn't be dealing with

11 governmental regulations and so on and so forth. Things change.

12 That was a long time ago, but I think he had the insight to

13 put them all in up front.

14 Q. You weren't involved in the construction of this section,

15 section one, were you?

16 A. No, sir.

17 Q. Were you involved in the construction of section two and

18 three?

19 A. No, sir.

20 Q. There was some photographs that we looked at yesterday.

21 One or two of them you indicated was a cross section shot,

22 I believe. You indicated that you could see the core?

23 A. Yes, sir.

24 Q. In fact, I believe that was Plaintiff's Exhibit 8-A?

25 A. Okay.

1 are you looking for, agriculture value or after the flood
2 or before?
3 Q. I am asking before the flood in terms of the development,
4 the highest and best use of this tract.
5 A. Because of the amount of land, I would guess that it would
6 have been worth ten or twelve thousand dollars an acre. Mine
7 was better than the other because it had the river frontage.
8 We sold land that same time for that same purpose for I think
9 $20,000 with water and sewer.
10 Q. Where did you sell that land?
11 A. In the Dentsville area, sold for $12,000. I didn't pay
12 more than I thought it was worth.
13 Q. For development potential?
14 A. No, what I got. I lost money, so it was a real thing
15 for me. It wasn't a wishful thing in the future. The dollar
16 I paid would run $12,000 and something per acre.
17 Q. The value before the flood was $12,000 an acre?
18 A. That is correct.
19 Q. The flood occurred in October 10 and 11, 1976. Would
20 you have an opinion as to the value of that tract, green tract
21 after that flood?
22 A. Whatever farm land was going for at the time is what it
23 was worth.
24 Q. Farm land?
25 A. I had no use for it.

1 Q. What was the value of farm land for that 600 acre tract
2 A. I suppose $1,000 or $2,000 an acre for good farm land.
3 I am not an expert on the value of farm land.
4 Q. And that drop would be as a result of the flood?
5 A. Once the dike broke, the water was on the land and perhaps
6 ten or fifteen years from now the mind change will reoccur and
7 the public will accept the land again. It is flood land now.
8 Q. Public reception of what this property would be as a result
9 of flooding?
10 A. That is right.
11 Q. Thank you, [redacted].
12 CROSS EXAMINATION
13 Q. (By [redacted]) [redacted], the dike was absoultely an essen-
14 tial in the development plan?
15 A. Yes.
16 Q. All these improvements would be in at ground level, grade?
17 A. [redacted], no. We had in doing this and understanding
18 that this is flat land, in Los Angeles you have flash rains
19 and you have flash floods created by the rains and you have
20 rivers to catch these floods and you don't want to build right
21 on the ground for the purpose of three inch rain. So we had
22 planned to have about two or three foot rise off the ground
23 for that particular purpose. But it didn't have to do with
24 the dikes what we were talking about.
25 Q. Would your structures be flood proof? Do you know what

1 over cab on it. I got way up on top of it and I looked over
2 and I could see two breaches in the levy on the city property.
3 ONe was almost behind the lagoon, another one was approximately
4 the area I couldn't tell at the time. I later found out it
5 to be in the area of the 42 inch, but it was not too wide
6 at that time, it was probably very small.
7 Q. Two breaks you saw shown by the two arrows on Exhibit
8 5?
9 A. That is approximately where they were located, yes, sir.
10 Q. No other breaks on the levy system one?
11 A. At that time we weren't able to particularly tell whether
12 there were any or not because we were more concerned with
13 the school situation about the way of school and what have
14 you because of this water. We later determined there were
15 no other breaks on levy section one or breaches as I term
16 them and that everything was functioning the way it should
17 have.
18 Q. How long was the property under water?
19 A. Let's see, that was on MOnday. On Tuesday it reached
20 what I call still pool, because then everything was just pretty
21 well flooded. It went to about 133.7 elevation and then it
22 began to recede some time later on Tuesday and probably took
23 it until, I'll say some time in the weekend before it got
24 out of there.
25 Q. Weekend following that Monday?

1 first unit was built, the outfall extension line was built
2 through here and sanitary sewer.
3 Q. [redacted], I understand that sewer lines and water lines
4 were built, and perhaps the school building permit had already
5 been issued before the Planning Commission took its action.
6 What I want to know is was anything built down below the 50
7 year flood level on that property after February, 1974?
8 A. There would have been some building at the school, yes,
9 sir.
10 Q. Off the school property, off the sewer plant site, had
11 there been any building, any construction of building, not
12 water lines or sewer lines, not plowing the roads or paving
13 roads, but buildings?
14 A. I don't remember exactly when we built the school plant
15 property. That would have been -- no activity in here other
16 than utility preliminary to the other construction.
17 Q. [redacted], you weren't out at the plant the night the
18 dike failed, were you?
19 A. I couldn't hear you for the thing. Repeat the question,
20 please.
21 Q. I am sorry. You weren't out here on October 10, 11 when
22 these two breaches occurred, were you?
23 A. No, sir, I arrived at the site approximately 7:00 o'clock
24 the morning of the 11th and at that time I was informed that
25 the property was already experiencing some flooding problems

1 and when I arrived at the school site some time around 7:3
2 probably, I could see two breaches in the levy on the city
3 property, so they had already occurred. Later I was informed
4 by city personnel that they had occurred some time during
5 the night of the 10th or 11th. They never were specific as
6 to exactly what time.
7 Q. And there is no question but there were breaches down
8 here on section two?
9 A. There was some breaches, some overtopping on section two
10 which was lower levies.
11 Q. And this was the highest flood in forth years?
12 A. As to being th ehighest flood, I believe it was, may have
13 been. I am not sure about that point. I do know that it
14 was rated between an eight and ten year flood, by the
15 authorities who do that at the geological services and weather
16 bureau people and so forth. It had a final discharge of about
17 155,000 cubic feet per second, but that did not come until
18 about midday of Monday, October 11th, evidently when the -
19 Q. When the crest hit?
20 A. When the crest hit and that was crest at Gervais St. bridge
21 The crest obviously did not get down to [redacted] property until
22 some time late that evening.
23 Q. How do you know all that?
24 A. How do I know all that? Time span. How do I know what
25 time the crest was?

1 Q. Did you see the break in the dike?

2 A. Yes, I did.

3 Q. Looking at Exhibit #5, the two red arrows appear to be

4 in the right place for the breaks?

5 A. Approximately, yes.

6 Q. Did you see any breaks on any portion of [redacted]

7 property?

8 A. No, I did not. If I may elaborate a little bit, the dike

9 apparently broke at night. I received a call, I think it

10 was around 10:00 or 11:00 o'clock at night from the operator

11 in charge of the plant and he was very upset and said I don't

12 know what is going on, but there is an awful lot of water

13 between the plant and the ash pond.

14 Q. Who was the operator?

15 A. The operator was a [redacted]. And I asked him,

16 he said I think the dike is broke. I said, [redacted] surely

17 the dike hasn't broke. He said I think it has. You better

18 get down here. When I tried to get in the plant I could not

19 drive my car all the way in. And I was in a city car. I

20 called the plant by radio and they came out, we had a four

21 wheel Blazer, I think it was, some type four wheel drive

22 vehicle, and he brought me on to the plant. And between the

23 plant and the ash pond, all this was on city property, the

24 area was totally flooded and the water was running pretty

25 fast through that area. Matter of fact, it made a very loud

1 rumbling sound, almost like an engine or something. So
2 took a boat and got across to the ash pond, because I still
3 did not know where the water was coming from, and walked the
4 top of the ash pond, which runs parallel with the levy in
5 question. And it was obviously at night and it was somewhat
6 foggy, but with the use of high beam spot lights, you could
7 see that there was two large breaks in the dike and it was
8 trees and everything else that you could see being washed
9 out through the fields and over our fence around the plant
10 and flooding into the soy bean fields and so forth that was
11 around the plant.
12 Q. Will you tell me what happened to the water in the waste
13 treatment plant?
14 A. The waste treatment plant is on a piece of property, 120
15 acres. On that 120 acres there is an ash pond I think some-
16 thing like maybe forty or fifty acre pond. Then between the
17 dike on that pond and the physical structure of the plant
18 there is a large open area which is, the elevation is a little
19 lower than the ground around the plant. The plant elevation
20 apparently is up. So what you had basically formed was a
21 kind of a ditch, I guess you would say, between the ash pond
22 and the plant building. So all of the water when the dike
23 broke, the majority of the water would kind of split. I know
24 it went around the ash pond in a ditch. Th eother channel
25 between the ash pond and the plant property. So the plant

1 dike? Did you ever mention it to them?

2 A. I talked frequently with [redacted] about the lack of their

3 ability to live up to their word, do the job they were supposed

4 to do.

5 Q. Did it ever make any difference?

6 A. Didn't effect a thing.

7 Q. Now, what happened in your --- On October 11, 1976,

8 give us what happened. Where were you and what happened?

9 A. Well, what had happened is, when the river reports they

10 are going to have high water, they frequently miss the height

11 it is going to be and we knew we were going to have a pretty

12 good water. So we went down to the southern end on the small

13 levies trying to protect the soy beans and we sandbagged all

14 Sunday. Went home and went to sleep and about 2:30 they said

15 the big levy is gone. We didn't anticipate having any trouble

16 with the big levy. At this area, even though it wasn't 150

17 feet, there was I'll say eight to ten feet of free board.

18 Q. What does that mean, free board?

19 A. That is the area up to top of the dike from the water

20 level. How it blew it out, I don't understand. I just don't

21 understand. Lack of maintenance, lack of inspection. A big

22 tree - of course, I don't think the trees were that big.

23 I can't tell you why it blew out.

24 Q. What does maintenance have to do with protecting a dike?

25 A. If you had been walking the levy and had seen a washout

1 which was leading teribly, I think that is probably what hap
2 pened, had a washout on the slope. Because you had differences
3 in elevation. Some of them were 150 and then went down to
4 142. You had a downhill run. So you could have a worse wash-
5 out than we might think.
6 Q. Did your dike blow out anywhere along there where you kept
7 it maintained?
8 A. My levy from here down to the city's site here, around
9 to Bluff Road, by Metro Lane, I can ride it in my truck any
10 time I want to.
11 Q. Prior to the flood in October of 1976 did you attempt
12 to go in there under the provision and raise that dike?
13 A. In 1974, two years before the flood, is when we went in
14 there and cleaned the levy and they told us to leave.
15 Q. In your opinion, would that have made a difference if
16 they had let you fix that dike?
17 A. I don't think we would be in court today.
18 Q. After the flood happened, what happened to your crops
19 and your beans and so forth in there?
20 A. Well, it completely ruined the beans. They were gone.
21 In fact, I don't mind telling you I was so made about it,
22 the sewer plant right here and we had a load of beans that
23 stank so bad, I dumped them out there at the city. I probably
24 shouldn't have done it. I was so mad.
25 Q. How much did you spend on doing those roads for the de-

1 A. This is the 1806 acres planned for development. This
2 is the tentative layout that [redacted] did. I think it
3 is exactly right on the multi-family. We wanted to put high
4 rise and multi-family looking over the river. One thing I
5 might mention, some aspects that [redacted] had. Sounds a little
6 odd, but it is not. The new levy is elevation of 150 feet.
7 The old levy which was built by [redacted] about 1920
8 the elevation was 140 and there was a strip through here that
9 was low. So I have a letter of agreement that I can either
10 flood or fill that. We can put in a lake there and have the
11 units looking over the lake and the river. I just mention
12 that.
13 Q. And what happened to these plans as being on Exhibit 14
14 after the flood?
15 A. Basically it is going to take years to recover the situ-
16 tion. The school is continuing to grow. Few roads going
17 in. The city needs access to get to the sewer plant, that
18 kind of thing.
19 Q. What happened to all your negotiations and your plans?
20 A. Those negotiations are dead. We have not heard and I
21 don't think we will have them back.
22 Q. Based upon all the information you have, give your opinion.
23 A. Let me say it this way. I think the property -- let me
24 just pull this over for a second. I think the property in
25 the northern area ---

1 of organic matter or logs and stumps in there, would you?

2 A. No, sir.

3 Q. That would indicate you didn't do a very good job in the

4 core?

5 A. I think that would be right.

6 Q. What does impervious mean, do you know, [redacted]?

7 A. When it is hard for water to penetrate, I think is the

8 correct understanding of it.

9 Q. And soils are classified by varying degrees of permeability

10 A. Yes, sir.

11 Q. Is sand impervious?

12 A. No, sir.

13 Q. You weren't out there the day these two breaches occurred,

14 were you?

15 A. No, sir, I received a phone call at about 4:30, I"d say,

16 and I was there by 5:15. Still dark.

17 Q. And there were other breaches down on two and three?

18 A. Yes, sir. The breaches on two and three were really not

19 to be concerned with because that is not the main levy system.

20 I hated to lose the beans. We didn't apply any of those losses

21 in section and three against the city. We only talked about

22 the city's obligation.

23 Q. And you have used the property every year since you pur-

24 chased it for agriculture?

25 A. Yes, sir. As I told you, as I said earlier, it was a

1 temporary use of the thing. We thought it was temporary.
2 Looks like we are going to have to keep on farming for a while.
3 Q. And your father's farm was down here in the bend area?
4 A. Yes, sir.
5 Q. Part of the property around this Aligator Lake?
6 A. Aligator Lake is the property line between the [redacted]
7 [redacted] property and [redacted] property. I Own half of
8 the lake and then I own around this area. There is 400 acres
9 or so in the middle that I don't own in this block that goes
10 down the river.
11 Q. All right. Go ahead and take your seat. Up here you
12 have got a high bluff, correct?
13 A. That is correct.
14 Q. Gills Creek down here coming around?
15 A. That is correct.
16 Q. Gills Creek is a major floodway, isn't it?
17 A. That is correct.
18 Q. And then obviously the Congaree River is a major flood
19 way?
20 A. Correct.
21 Q. So you created here with these dikes a big bowl?
22 A. I am puzzled by that to a degree. All of this type prop-
23 erty has been levied for years with different types of levies.
24 I wouldn't necessarily say we create a bowl. We were just
25 protecting our property.

1 Q. What type land have you determined this to be?

2 A. Today?

3 Q. Yes, sir, after the flood.

4 A. Farm property.

5 Q. How much is farm property worth?

6 A. Farm property is going down every day.

7 Q. What was it worth?

8 A. In 1976, based on what I know about agriculture, I think

9 it was worth $2,000 to 2,500, give or take. That is why I

10 put it at $2,250.

11 Q. [redacted] wants to talk about the levy that broke down

12 here, two and three. Were they maintained?

13 A. Very minimally. We basically have known they would break

14 from time to time.

15 Q. I just asked were they maintained.

16 A. Very slightly.

17 Q. How was the maintenance of these dikes compared to the

18 way the city maintained their dikes?

19 A. We may have done a little more than they did, which was

20 nothing.

21 Q. What happened to your dikes down here?

22 A. Went over the top.

23 Q. Did some of them break?

24 A. Yes, sir.

25 Q. What happened to the city's dikes that were maintained

1 like that?

2 A. They blew out twice.

3 Q. [redacted] asked you about [redacted]

4 A. Yes, sir.

5 Q. What did [redacted] tell you before the flood about

6 this land being developable land?

7 A. Everybody realized the prospects of development were there.

8 Q. Did that study indicate that?

9 A. Yes.

10 Q. [redacted] talked to you about other ideas, [redacted].

11 Do you know of a study about your property and an [redacted]

12 property prepared for Richland County?

13 A. I certainly do.

14 Q. Would you look at this and tell me what that is?

15 A. This was a study that was done and prepared for Richland

16 County, South Carolina, on the reuse and marketability of

17 [redacted] property.

18 Q. What is the date of that?

19 A. December 13, 1968.

20 Q. And who was it made for?

21 A. It was made for Richland County. The county owns the

22 air field.

23 Q. Does this study show that your land would be a good air

24 field location?

25 A. Yes, sir, it has an air field plan in here.

1 A. Come down Bluff Road to White House Road.

2 Q. Where would White House Road be on this map? Is it de-

3 picted on this map? Would this be White House Road coming

4 in here?

5 A. Yes.

6 Q. This is the Coker Seed plant. So you would come down Bluff

7 Road coming from Columbia?

8 A. Yes.

9 Q. Normally you would turn in here on White Horse Road?

10 A. White House Road.

11 Q. Is that the way you went that day?

12 A. No. Gills Creek was flooded and I couldn't get down that

13 way. I had to come down this road.

14 Q. Up here Gills Creek was flooded?

15 A. Yes.

16 Q. Was there any flood water where you came in?

17 A. Right there in that swamp right off Bluff Road.

18 Q. And when you got through there was there any flood water

19 out in the field?

20 A. Water in the ditch on each side of the road coming into

21 the waste water treatment plant.

22 Q. Go ahead and take your seat. You got to the plant about

23 3:45?

24 A. 3:45.

25 Q. Were you there to relieve another shift?

1 A. Yes, I was.

2 Q. Do you remember events of the night of October 10?

3 A. Yes, sir, I do.

4 Q. Tell the jury what happened after you came on the shift

5 there at the plant at 4:00 o'clock that afternoon. What

6 happened?

7 A. Water was backing up, flooding. Every time we have a

8 big storm Gills Creek will flood up. The river was rising.

9 I checked my fan every day, but during this particular time

10 I had to go out to the river bank because we have an outflow

11 of water that goes to the river, called effluence. We check

12 the flap gate because if the river rise too far, then every-

13 thing in the plant back up and nowhere for it to go and we

14 have to shut down the plant.

15 Q. This would be a pipe connected to the plant?

16 A. Right.

17 Q. This pipe would be down in this vicinity looking at Plain-

18 tiff's Exhibit #5?

19 A. Yes, it is.

20 Q. So you were keeping an eye on the effluent pipe. What

21 happened later on that evening?

22 A. About 8:00 o'clock one of the men left to go home and

23 came back to the plant and told us that our access road over

24 at Heathwood Hall school was flooding and we should get our

25 cars out. So we took our cars over to the fire station, what

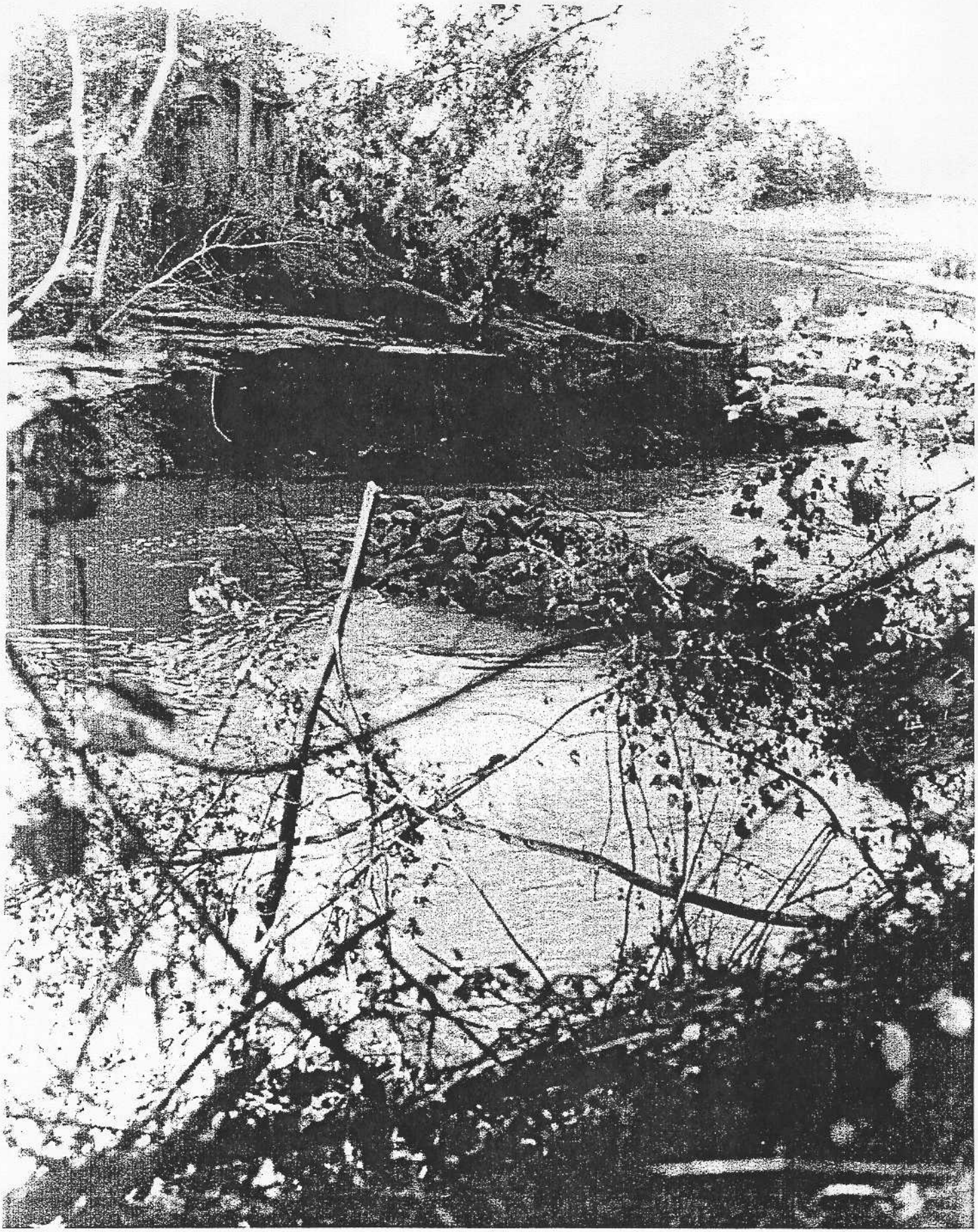
Attachment 2

1976 Breaches -- Ring 1

South looking W

North looking W

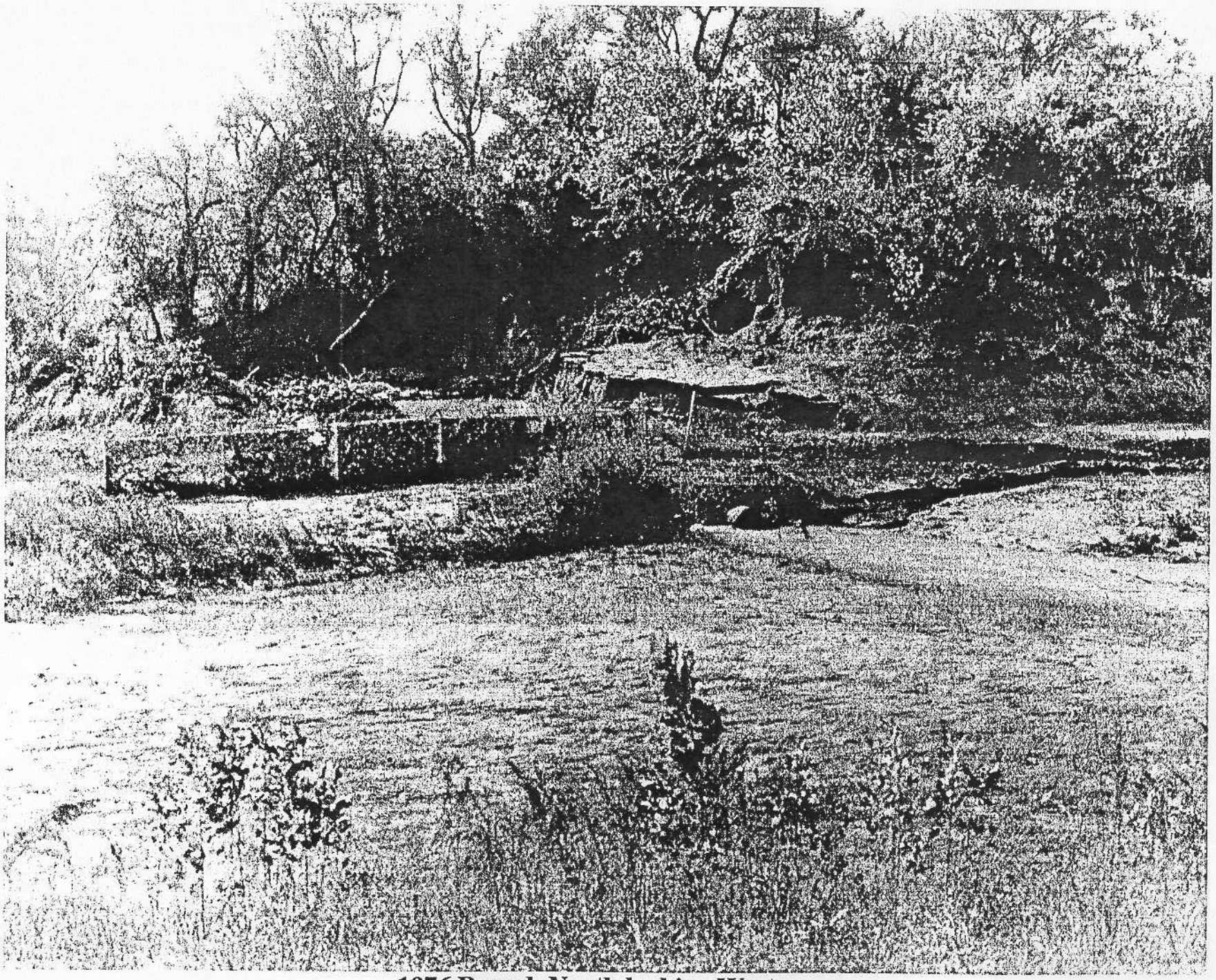
1976 Levee Break



1976 Ring 1 Breach (North) looking East

1976 Breach Ring 1 (North) looking East

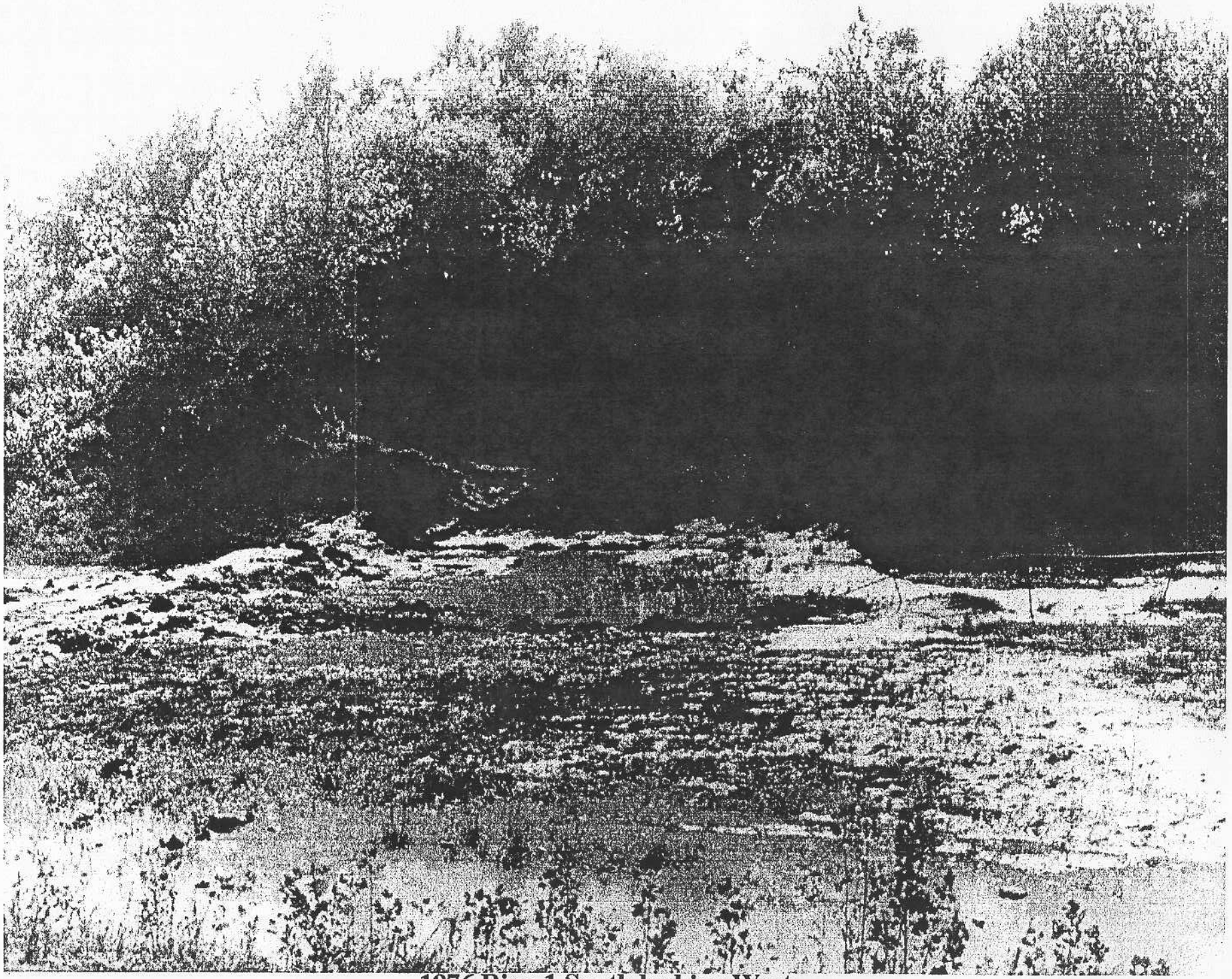
1976 Ring 1 Breach (North) looking South



1976 Breach North looking West

1976 Breach Ring 1 (South) looking W

1976 Ring 1 Breach (North) looking West to Congaree

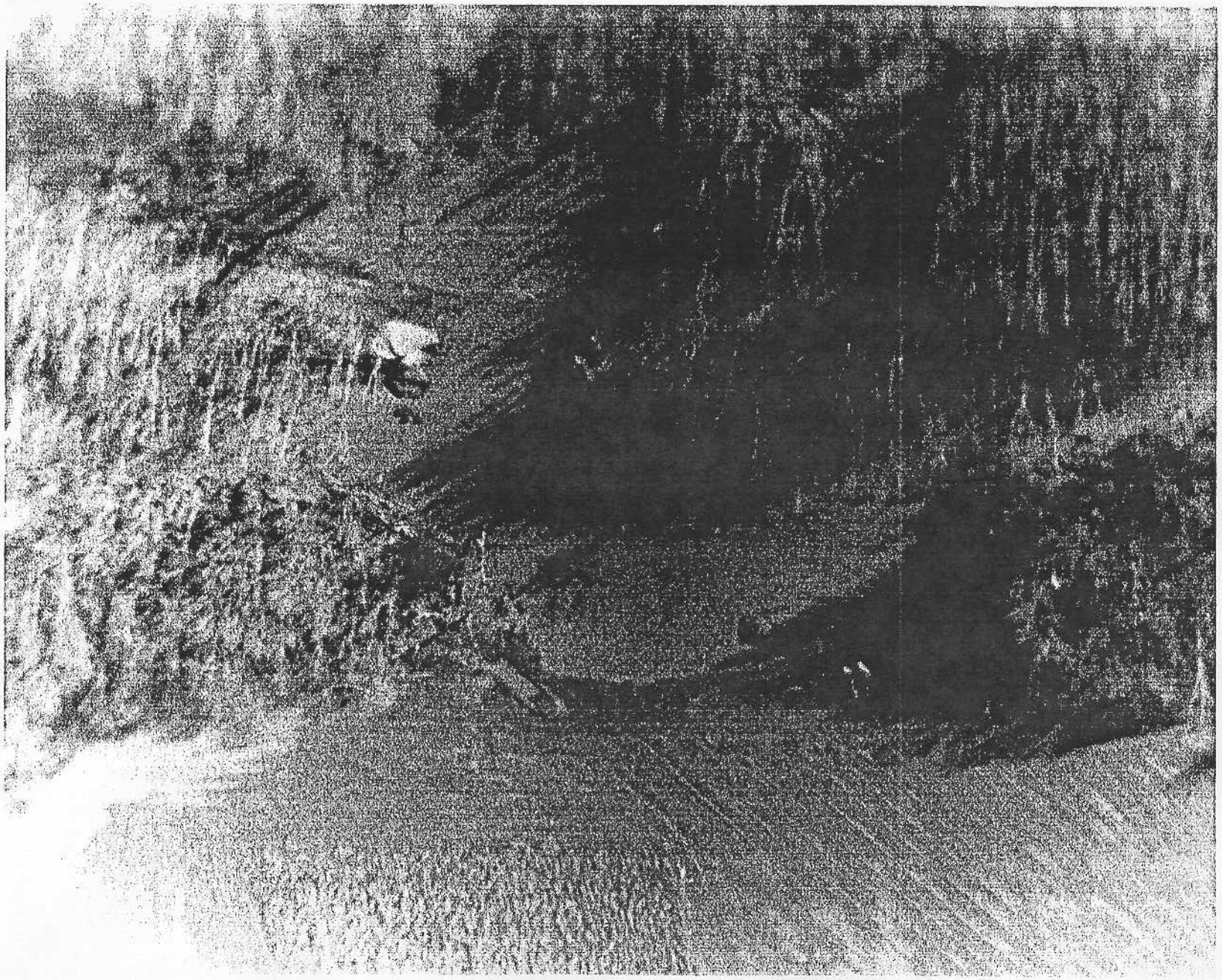


1976 Ring 1 South looking West

Attachment 3

1976 Breaches – Ring 2

1976 Breach Ring 2 at Gill's Creek looking NE
Manning pp. 198, 213, 214



1976 Levee Break Ring 2, Gill's Creek looking South

Attachment 4

References for Modeling Accuracy and Calibration Discussion

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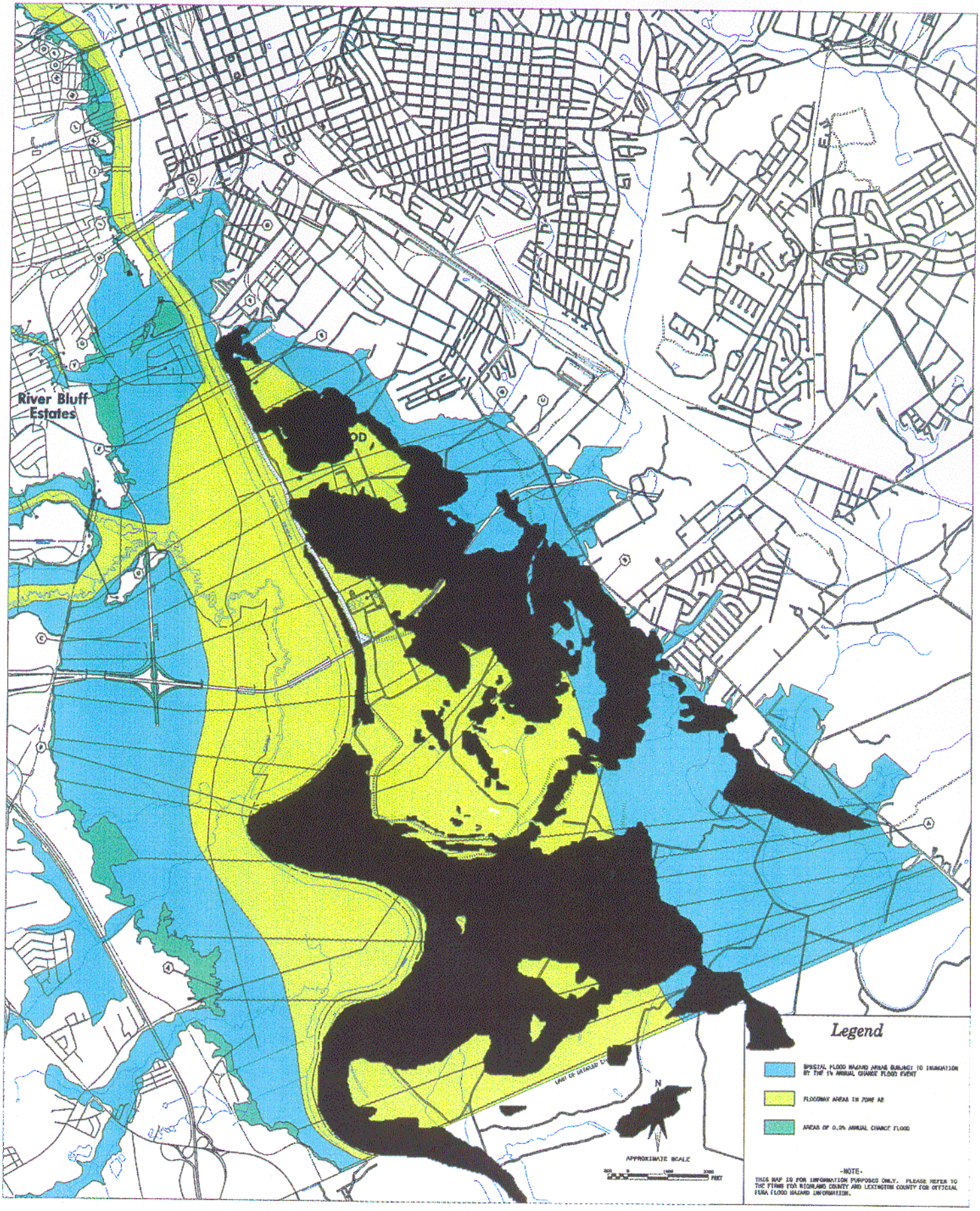
Attachment 5

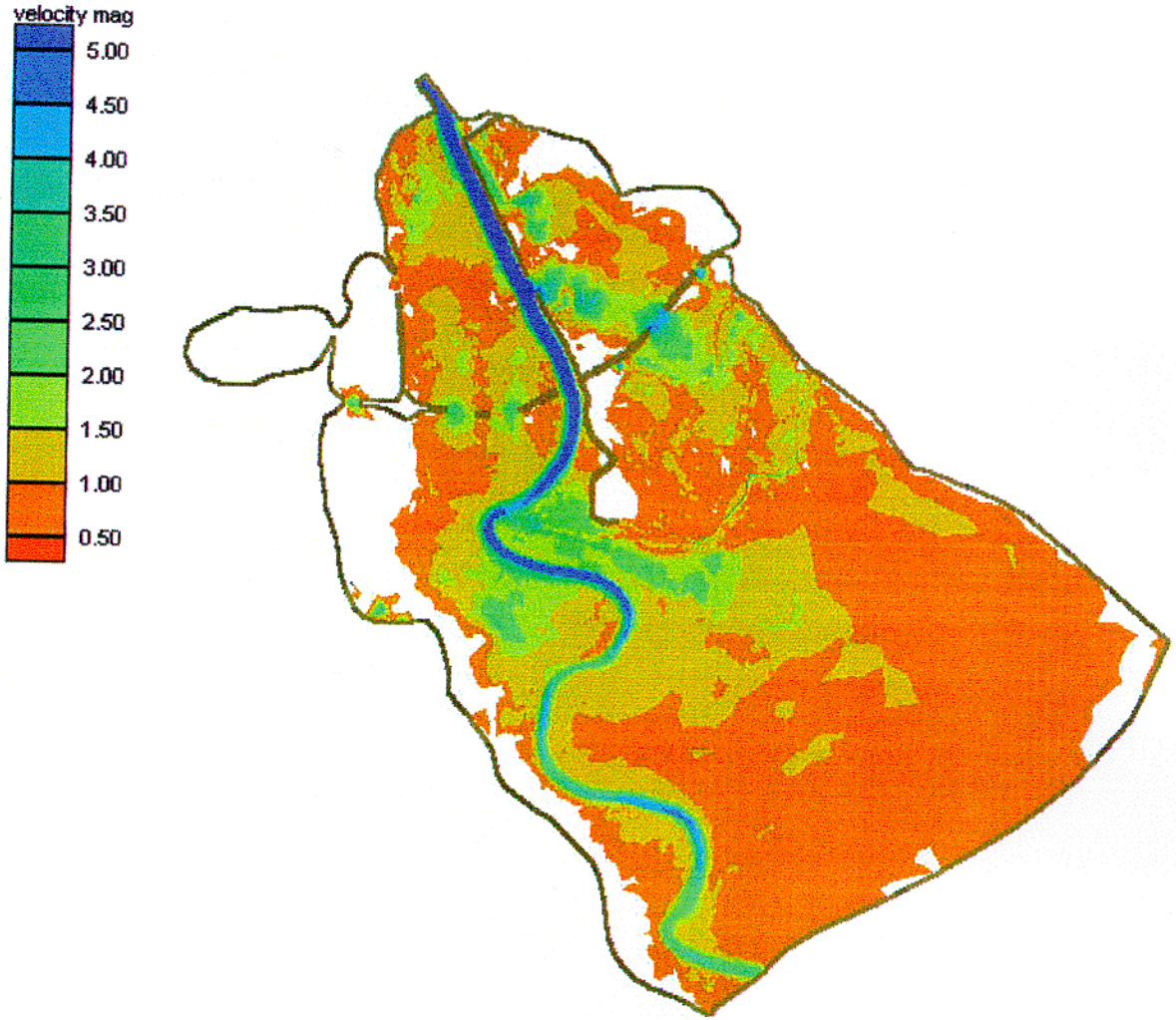
Overlay of RMA-2 100-year flow and
FEMA's September 2000 Revised Preliminary FIRM

September 26, 2000 Revised Preliminary



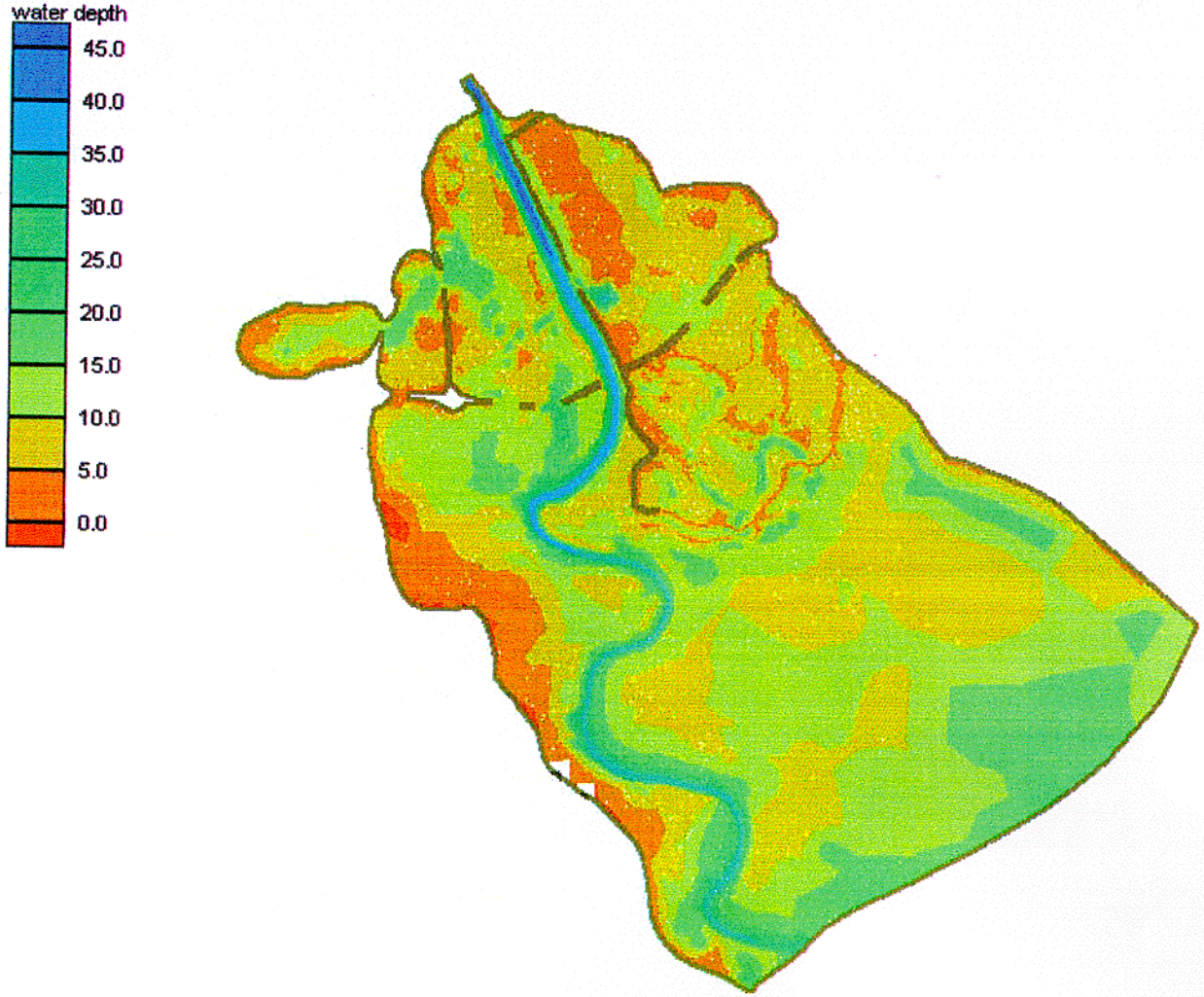
Attachment 6

April 27, 2001 RMA-2 Output
Velocity - 0.5 FPS


velocity mag
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50

Attachment 7

April 27, 2001 RMA-2 Output
Depth of Water


water depth
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0