

Lincoln DeVore

1000 West Fillmore St.
Colorado Springs, Colorado 80907
(303) 632-3593
Home Office

August 7, 1979

Director of Public Works and
Drainage Board of the City of Colorado Springs
101 West Costilla Street
Colorado Springs, Colorado

Re: ENGINEERING STUDY
of
COTTONWOOD CREEK DRAINAGE BASIN
COLORADO SPRINGS, COLORADO

Gentlemen:

Enclosed herewith is the report concerning the engineering study of the Cottonwood Creek Drainage Basin, authorized by the City Council of the City of Colorado Springs, the Colorado Springs Drainage Board, and the Public Works Department of the City of Colorado Springs.

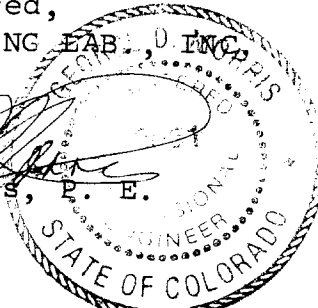
This study includes an overview of basin geology, rainfall/runoff characteristics, hydrologic history and of the channel improvements existing in the basin. Additions to existing drainage improvements are recommended in this study, together with rating and some upgrading of the existing structures.

The study may be used as a master guide for drainage improvements within the basin. The included recommendations should be used as a guide, not as an inflexible design.

Respectfully submitted,
LINCOLN-DEVORE TESTING LAB., INC.

By:  George D. Morris, P. E.

GDM/heh/jah



602 East 8th Street
Pueblo, Colo 81001
(303) 546-1150

P.O. Box 1427
Glenwood Springs, Colo 81601
(303) 945-6020

109 Rosemont Plaza
Montrose, Colo 81401
(303) 249-7838

P.O. Box 1882
Grand Junction, Colo 81501
(303) 242-8968

P.O. Box 1643
Rock Springs, Wyo 82901
(307) 382-2649

6wB

CITY OF COLORADO SPRINGS

The "America the Beautiful" City

DEPARTMENT OF PUBLIC WORKS

CITY ENGINEERING DIVISION (303) 578-6606

30 S. NEVADA

SUITE 403

P.O. BOX 1575

COLORADO SPRINGS, COLORADO 80901

June 15, 1983

Broderick Engineering & Associates, Inc.
791 Chambers Road, Suite 211
Aurora, Colorado 80011

Attn: Mr. William P. Kennedy

Re: Drainage Report for Direct Sales Tire Company
6730 North Academy Blvd

Dear Mr. Kennedy:

We have received the above referenced drainage report. After review of the drainage report, we have the following comments:

1. We cannot accept the proposed 200' radius for the alignment of Cottonwood Creek. The Cottonwood Creek Master Drainage Study, as well as the drainage report for the adjacent subdivision to the south, utilize a 500' centerline radius for the channel direction change. Two errors have been utilized in the calculation of the superelevation. First, the actual top width of the channel water surface should be utilized in lieu of the average between the top and bottom width. Second, with supercritical flow, Delta Y in lieu of $\frac{1}{2}$ Delta Y more accurately approximates the actual water surface depth at the wave peak. Based upon the magnitude of the superelevation calculated, and the resultant waves not only in the curve but downstream, every effort should be made to utilize as large a radius as possible. The minimum 500' radius is desirable; however, based upon the building location, it appears that the largest radius possible is 400'.

2. As stated in your report, enlargement of the existing bridge structure at Academy Blvd will be required to convey the 100 year flow safely under Academy, and prevent overtopping of the structure and the resultant flooding of the site. The Cottonwood Creek Master Drainage Study proposes adding an additional 7 x 20 barrel on the south side of the existing box culvert structure. Please show the proposed culvert addition on your drainage plan and readjust the centerline of the channel based upon the total width of the future structure. Also, channel lining proposed downstream of the bridge structure should be so aligned to accommodate the future construction without realignment and reconstruction of the proposed channel slope protection.

Based upon the above two comments, it appears that reworking of the building or utilization of a vertical retaining wall type

treatment along the south bank of Cottonwood Creek will be necessary to utilize this site as proposed. Elimination of the most northerly car wash bays may be necessary to accommodate circulation and access into the remaining car wash bays. Additionally, it should be pointed out that as plotted the building already encroaches into the existing sanitary sewer easement.

3. In addition to the on-site flow computations, the flow projected in Academy Boulevard should also be addressed. The drainage report for the subdivision south of this site indicated a flow of 5.3 cfs in Academy Boulevard at the property line. This flow, along with any additional flow, needs to be determined and the proper inlet or drainage structure must be provided to convey these flows to Cottonwood Creek and accommodate future curb and gutter construction. Also, to correctly depict future improvements on the drainage plan itself, it should be noted that 8" curb and gutter will be required along the west side of Academy Boulevard and that the sidewalk should be detached except where it must be transitioned to the existing attached walk across the bridge structure. It may be necessary to grant additional right-of-way for Academy Boulevard to accommodate the detached walk, as well as a deacceleration lane for the curb cut as required by the State Highway Department.

4. The cost estimate as proposed in the drainage study is far too low. Currently, the City of Colorado Springs standards utilize extension of the rip-rap below the proposed sand channel bed approximately 5' in lieu of constructing the concrete curb at the toe of the rip-rap slope. Additionally, because of the higher velocities directly downstream from the box structure, a fully rip-rapped cross section for some length, a grade control cut-off wall structure and larger rock would be required. Utilizing current cost for this type of work, cost estimate on the order of \$50,000 to \$60,000 seems to be more appropriate. Additionally, the report must specifically certify that improvement of the south side of Cottonwood Creek and that portion directly downstream of the box culvert can be constructed without adversely affecting the north and west sides of the channel. If additional erosion will not occur on the north and west sides of the channel, and this can be so certified, improvements of primarily the south and east sides should be sufficient. If not, however, improvement of both sides of the channel may be required. Also, if utilizing of a vertical retaining wall type structure is proposed in lieu of the rip-rap slope protection, the drainage plan and cost estimate will need to be changed accordingly. Once the inlet structure needed at Academy Blvd and the main channel configuration is finalized, a letter of credit will need to be posted for assurances that the facilities will be constructed and the facilities

should be complete and in place prior to issuance of a certificate of occupancy for the new building.

5. The actual drainage proposed for the final channel configuration should be shown on the drainage plan along with all the other necessary changes and additional facilities noted above.

6. Finally, the engineer needs to sign the engineer's statement and attach his seal. Additionally, the developer needs to also sign the developer's statement.

Upon review of these comments, please make the necessary corrections and additions and resubmit five copies for final review. If you have any questions concerning these matters, please feel free to contact this office.

Sincerely,


Gary R. Haynes
City Engineer

GRH/GWB/ro

cc: Bev Dustin, Land Development Technician
Ted Gesling, Regional Building
Direct Sales Tire Co./Duff & Rick, Architects, 3460 W. 38th Ave,
Denver, CO 80211
Kim Headley, County Land Use

October 15, 1981 Drainage Board Meeting

Item #7 Cottonwood Creek Fee Update

Chapel Hill Shopping Center has been platted in the County but will be annexed into the City. To allow reimbursement of the drainage facilities which were originally not in the Cottonwood Creek Fee, a revised fee is required which includes the structures' costs and the additional acreage.

In computing an update fee, the structures indicated eligible for reimbursement in the approved Chapel Hills Shopping Center Drainage Report and the site acreage were considered. Additionally, other annexations since the 1979 Report and their related structures were also taken into consideration. Subdivision drainage reports for the areas which have been platted since the 1979 Report were reviewed and the actual or proposed facilities costs were compared to those estimated in the 1979 Report. Changes in the estimated costs were compared with the updated contingency and the excess was determined. Structures not yet constructed or proposed in subdivision drainage reports were also updated using a 32% increase over the original estimates used in the 1979 Report.

Utilizing these revised costs and the updated acreage, the new Cottonwood Creek drainage fee was computed. A summary of the revised costs, updated acreage and fee computation are shown on the attached sheet. The 1981 fee is \$1,758/acre and the new fee is \$2,526/acre which is a 43.7% increase.

Cottonwood Creek Fee Update

Cost of facilities constructed or proposed per approved subdivision drainage reports which were not in the original fee determination or for which more detailed cost figures are now available, less contingency

$$1,489,987 - 184,805 = \$1,305,182$$

Updated costs (1979 to 1982) of facilities originally in Master Drainage Report but not yet in place or not yet included in subdivision drainage report's cost estimates

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Total Costs \$6,282,633

Original Area Unplatted (1979 Report)	2,420.7 acres
Areas Platted since 1979 Report	- 364.97 acres
Additional Annexations since 1979 Report	+ 817.29 acres
	<u> </u>
Remaining Private Land	2,873.02 acres

Improvements Cost	\$6,282,633
5% construction contingency	314,132
Sub Total	\$6,596,765
10% Engineering	659,676
	<u> </u>
Total	\$7,256,441

$$\text{Fee} = \frac{\$7,256,441}{2,873.02 \text{ acres}} = \$2,525.72/\text{acre} \text{ -- } \underline{\underline{\$2,526/\text{acre}}}$$

STATE OF COLORADO

COLORADO WATER CONSERVATION BOARD

Department of Natural Resources

823 State Centennial Building
1313 Sherman Street
Denver, Colorado 80203
Phone: (303) 866-3441



Richard D. Lamm
Governor
J. William McDonald
Director
David Walker
Deputy Director

May 18, 1981

Mr. Gerald J. Gromko, P.E.
City Engineer
P. O. Box 1575
Colorado Springs, Colorado 80901

Dear Mr. Gromko:

The staff of the Water Conservation Board has made a technical review of the floodplain information available on Cottonwood Creek as requested. This information includes the following documents:

1. Flood Plain Information, Cottonwood Creek, El Paso County, Colorado by Albuquerque District, Corps of Engineers, September 1976.
2. Report on Hydrologic Investigations, Flood Insurance Study, Colorado Springs and El Paso County, Colorado by Albuquerque District, Corps of Engineers, December 1976.
3. Engineering Study of Cottonwood Creek Drainage Basin, Colorado Springs, Colorado by Lincoln-DeVore, August 1979.

Our specific findings have been made in detail on separate sheets and are attached to this letter.

Briefly, our comments are as follows:

1. The Corps report prepared for floodplain management purposes is most representative of ultimate fully developed conditions in the basin.
2. The Lincoln-DeVore report was prepared for construction of drainage improvements, and the estimated discharges are in better (but not complete) agreement with the latest projections.

RECEIVED

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**PUBLIC WORKS
ENGINEERING**

COLORADO WATER CONSERVATION BOARD, Frederick V. Kroeger, Chairman
Robert A. Jackson, Vice Chairman • John R. Fetcher, Steamboat Springs
C.M. Furneaux, Walden • Floyd L. Getz, Monte Vista • Patrick A. Gormley, Grand Junction
Richard W. Johnston, Montrose • David W. Robbins, Denver • Herbert H. Vandemoer, Sterling


Mr. Gerald J. Gromko, P.E.
May 18, 1981
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3. Since the two studies were prepared for different purposes, the design storm does not necessarily have to be the same as the standard (100-year flood) used for floodplain management.
4. Unless the city has or can establish a policy where developers must limit the peak runoff from their projects to historic (existing) amounts, flood control and drainage improvements should be designed for the optimum design frequency under fully developed basin conditions.
5. The Lincoln-DeVore report does not establish the optimum design frequency based on an assessment of potential damages.
6. The discharges in the Lincoln-DeVore report are based on about year 2000 land use conditions and, if the trend according to the COG projections continues, fully developed conditions in the basin could be reached by year 2030.
7. The Lincoln-DeVore report is not suitable for floodplain management purposes since there are no water surface profiles or flooded area maps.
8. A flood insurance study being prepared for the city will be suitable for floodplain management purposes and will be based on discharges similar to the discharges computed by Lincoln-DeVore.
9. As soon as the FIS is through the appeal process, the city can write us a simple letter asking us to redesignate the FIS as the official information, and we will place the report on the agenda for board action. If this happens, the Corps 1977 study will become invalid.
10. Until the FIS can be designated by the CWCB, we recommend the city use the currently designated Corps 1976 study for floodplain management purposes.

Mr. Gerald J. Gromko, P.E.
May 18, 1981
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We hope our comments will help sort out the differences in the Cottonwood Creek Studies and that the current controversy may be satisfactorily resolved.

Sincerely,

A handwritten signature in black ink, reading "William P. Stanton". The signature is written in a cursive style with a large, prominent "W" and "S".

William P. Stanton, P.E.
Senior Water Resource Specialist

WPS/jw
Attachment

cc: John Liou, FIA
Rich Wray, CDM
Robert A. Jackson, CWCB,
Pueblo

COLORADO WATER CONSERVATION BOARD
823 Centennial Building
1313 Sherman Street
Denver, Colorado 80203

COMMENTS ON
FLOODPLAIN INFORMATION
FOR
COTTONWOOD CREEK, COLORADO SPRINGS, COLORADO
May 1981

Corps 1976 Flood Plain Information Report

In September 1976, the Albuquerque District Corps of Engineers published a Flood Plain Information Report for Cottonwood Creek. The hydrology was determined using computer program HEC-1 and future basin development conditions from the "Pikes Peak Regional Land Use Plan 1990" prepared by the Pikes Peak Area Council of Governments (PPACOG) in March 1970. The use of future developed conditions was made at the request of the county at a coordination meeting held June 26, 1974. The report includes water surface profiles for the intermediate regional (100-year) flood and the standard project flood. Topographic base maps were compiled from aerial photographs taken April 1975.

This report was officially designated and approved at the state level by the Colorado Water Conservation Board (CWCB) on January 19, 1978 at the request of El Paso County

pursuant to Section 30-28-111(2) CRS, 1973. This law makes the floodplain information available to local governments for zoning purposes, but the report has never been accepted by the City of Colorado Springs.

A comparison of the Corps discharges with discharges computed for other streams in the Arkansas River basin in Pueblo and El Paso Counties show the magnitude of the Cottonwood Creek 100-year flood discharges (20,350 cfs at the mouth) to be at the high range for acceptable discharges for its size drainage area (about 18 square miles at the mouth). The high discharges have been attributed to the Corps methodology (HEC-1) and the use of future basin development conditions.

In 1977, a revision to the earlier land use projections was prepared by the PPACOG. The revised projections made the Corps 1976 discharges appear unrealistic to city officials. However, from a review of the trends indicated in the 1977 PPACOG projections, it appears the Cottonwood Creek basin could be fully developed by about the year 2030, only 50 years from 1980. El Paso County argued in March 1978 that discharges for floodplain management purposes should be based on future development conditions and that the 1977 projections of impending growth for map zones 58, 59, 60, and 9 justify this position. Thus, a controversy has developed between the City and the County over a difference in philosophy on the hydrologic criteria to be used for

floodplain management along Cottonwood Creek.

It is the opinion of CWCB staff that the hydrology in the 1976 Flood Plain Information report is most representative of the ultimate fully developed conditions in the basin. The Corps 1976 Flood Plain Information report is presently the best tool available for floodplain management purposes on Cottonwood Creek, and we support its use by FHA and other agencies.

Lincoln-DeVore Study

The stated purpose of the Lincoln-DeVore study, prepared in August 1979, was "to determine the probable runoff flow throughout the basin as determined by existing city rainfall/runoff criteria" and "to survey the existing drainage structures in the basin and to recommend changes or the placing of new structures" The report was intended "to determine the adequacy of existing drainage structures and drainageways and to recommend general improvements and changes required for reasonably safe disposal of runoff." In short, the Lincoln-DeVore study was offered as a "master guide for drainage improvements" and does not appear to be related to floodplain management purposes.

A review of the runoff curve numbers used in the Lincoln-DeVore study shows that the projected land use for the Cottonwood Creek basin corresponds to approximately $\frac{1}{2}$ to 1 acre per site over the entire upper basin (sub areas 1-12)

and from $\frac{1}{4}$ to $\frac{1}{3}$ acres per site in the lower basin (sub-areas 13-22). The land use estimated by Lincoln-DeVore compares well with year 2000 projections of residential land absorption in the 1977 PPACOG projections (see figure 29). However, according to the projections, in year 2000 the upper basin (area 9) will be only about 10 percent developed and the lower basin (areas 58, 59 and 60) will be about 60 percent developed.

From a graph of projections of percent developed land that is developed versus time based on data in Figure 28, it appears fully developed conditions for both the upper and lower Cottonwood Creek basins may be reached as early as year 2030 if the projected trends continue. This is only 50 years from 1980. Slightly more intensive land use than estimated by Lincoln-DeVore is implied in the PPACOG projections for fully developed conditions in the lower basin and considerably more in the upper basin. Therefore, we are of the opinion that the Lincoln-DeVore discharges, which are about half as much as the Corps, are most representative of existing or near future basin development conditions and are not in agreement with fully developed basin conditions implied in the 1977 PPACOG projections.

In the flood control and drainage master plans prepared for the Urban Drainage and Flood Control District in the Denver metropolitan region, it is customary to show the impact of any proposed flood control improvements by comparing

water surface profiles and corresponding flooded areas for the design flood with and without the project. Then, by computing and comparing the average annual flood damages with and without the project, the economic feasibility of the proposal can be intelligently evaluated. In some cases, the 100-year flood may not be the most cost effective design frequency for construction of drainage or flood control structures. The determination of the design frequency for drainage and flood control projects is primarily governed by an evaluation of economic factors. Such an evaluation or a comparison of water surface profiles was not made in the Lincoln-DeVore study.

Nevertheless, a comparison of the Lincoln-DeVore discharges for Cottonwood Creek below station 200+00 with other discharges in the region shows good agreement, and the results of their study appear very reasonable for existing or near future conditions. However, we feel the study is poorly organized and lacks adequate documentation of the hydrologic analysis. Furthermore, there was no hydraulic flood routing performed (or intended). Without water surface profiles and flooded area maps, the Lincoln-DeVore study is not acceptable for floodplain management purposes.

Flood Insurance Study (FIS)

The Corps of Engineers prepared a "Report on Hydrologic Investigations" in December 1976 as part of its work for the Federal Insurance Administration (FIA). In computing discharges for Cottonwood Creek, the Corps used Technical Manual No. 1 entitled "Manual For Estimating Flood Characteristics of Natural Flow Streams in Colorado," prepared by the USGS in cooperation with the CWCB. Since urbanization is one of the limitations of TM-1, it appears that the developed areas in the lower Cottonwood Creek basin existing in 1976 were considered insignificant in the Corps analysis. Compared to other basins in the region for which discharges were computed by the Corps using unit hydrographs, the Cottonwood discharges computed by TM-1 appear reasonable and are in good agreement with the results obtained by Lincoln-DeVore for Cottonwood Creek using the SCS rainfall/runoff method.

For some reason, the Corps work on the FIS was terminated by FIA in favor of using a private engineering consultant. In August 1980, the firm of Camp, Dresser & McKee Inc. (CDM) of Denver, Colorado, was selected to finish the Colorado Springs Flood Insurance Study. A review of the previous hydrology developed for the basin is included as part of CDM's contract, and this was initiated in March of this year.

CDM's review indicated that hydrology based on future development conditions would be unacceptable to the FIA and

recommended use of the Corps December 1976 hydrology using TM-1. It was noted in its review that the difference between the Lincoln-DeVore and Corps discharges is less than 5 percent.

It is our understanding that CDM recommends and intends to use the following discharges for Cottonwood Creek in their study subject to receiving approval from the FIA.

<u>LOCATION</u>	<u>DISCHARGE (CFS)</u>			
	<u>10</u>	<u>50</u>	<u>100</u>	<u>500</u>
At Colo. Springs Corp. limit	2,400	5,700	7,800	15,800
At confluence with Fountain Cr.	3,100	7,300	10,000	20,200

However, it has been pointed out on numerous occasions in the past by officials from FIA that for certain portions of the state, the use of TM-1 can yield poor results and that the method should not be used indiscriminately for drainage areas less than 50 square miles. Quoting from a letter by the Government Technical Monitor dated September 16, 1977:

"Only one gage in the 1 to 10 square mile drainage area size, and four in the 10 to 100 square mile drainage area size were used in developing the flood discharge equations whereas, twenty were in the 100 to 1,000 square mile size and eleven were in the 1,000 to 10,000 square mile size. The equations for estimating flood peaks in the Plains region of Colorado appear to be valid when the basin is greater than 300 square miles. The equations appear to lose accuracy as the drainage area drops below this point and we do not believe that the method should be used when the drainage area drops below 50 square miles. As most (58%) of the gages used in developing the equations

had drainage areas of between 300 and 1,400 square miles, the equations are most valid in the middle of this range. To extend this to areas of less than 50 square miles (through more than one log cycle) can result in substantial error."

Since the drainage area for Cottonwood Creek is only 18 square miles, it is not clear how FIA will advise its consultant and if it will reconcile its previous position with respect to the use of TM-1.

When it is completed, the FIS will include new water surface profiles and flooded area maps intended to show the 100-year floodplain under existing conditions. The report will also include computation of a floodway based on a 1.0 foot rise criteria. The mapping for the FIS will be based on aerial photographs taken in March 1981.

A reasonable schedule for the completion of the Colorado Springs FIS is given below.

<u>TASK</u>	<u>COMPLETION DATE</u>
Hydrology Review	May 1981
Hydraulic Analysis	September 1981
Preliminary Draft	March 1982
90-day Appeal Period Over	July 1982

Some of this material may become available sooner in preliminary form from Camp Dresser McKee, Inc. CDM's telephone number is 758-4351, and the project engineer is Mr. Richard N. Wray.

Summary

Our review indicates that the Lincoln-DeVore report was intended for different purposes than the Corps' Floodplain Information report. The Corps report and the Flood Insurance Study, to be completed by the Federal Insurance Administration, are intended for floodplain management. The Lincoln-DeVore report was intended for construction of drainage improvements but, as we all know, is based on different hydrology.

It is important to know, however, that the design storm for construction of drainage improvements does not necessarily have to be the same as the 100-year frequency used as a standard for floodplain management purposes. It is our opinion that the design of drainage and flood control structures should be based on a careful study of potential damages to determine the optimum design frequency by balancing the economic value of benefits derived from a reduction in potential damages with the costs of the project. The design frequency may change for different reaches on the same stream. Therefore, the design storm does not necessarily have to be the 100-year flood.

Although this might resolve any conflict between discharges used in the two reports, it appears the Lincoln-DeVore report did not attempt to determine the optimum design frequency based on an assessment of potential damages. Furthermore, we feel that unless a sound policy is established whereby developers must limit the peak runoff from their

projects to historic amounts, flood control and drainage improvements should be designed for the optimum design frequencies under fully developed basin conditions.

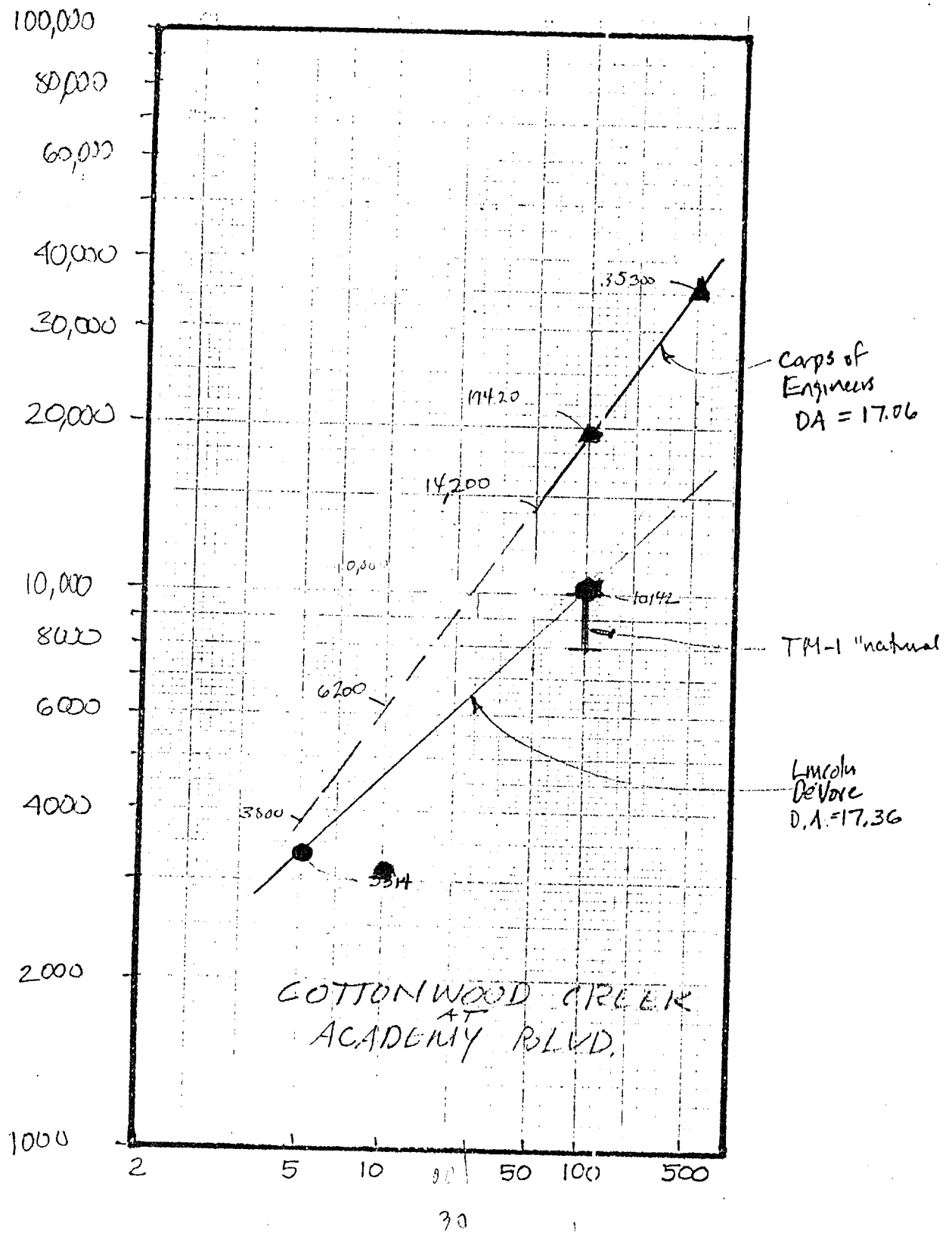
A careful comparison of the PPACOG projections with estimates used by Lincoln-DeVore show that the discharges computed by Lincoln-DeVore are based on about year 2000 land use conditions (20-years) and that fully developed conditions, according to the PPACOG study, could be more intense and may be reached by year 2030 (50 years from 1980). Therefore, we are of the opinion that the Lincoln-DeVore report is, in fact, not in complete agreement with fully developed conditions projected by the PPACOG.

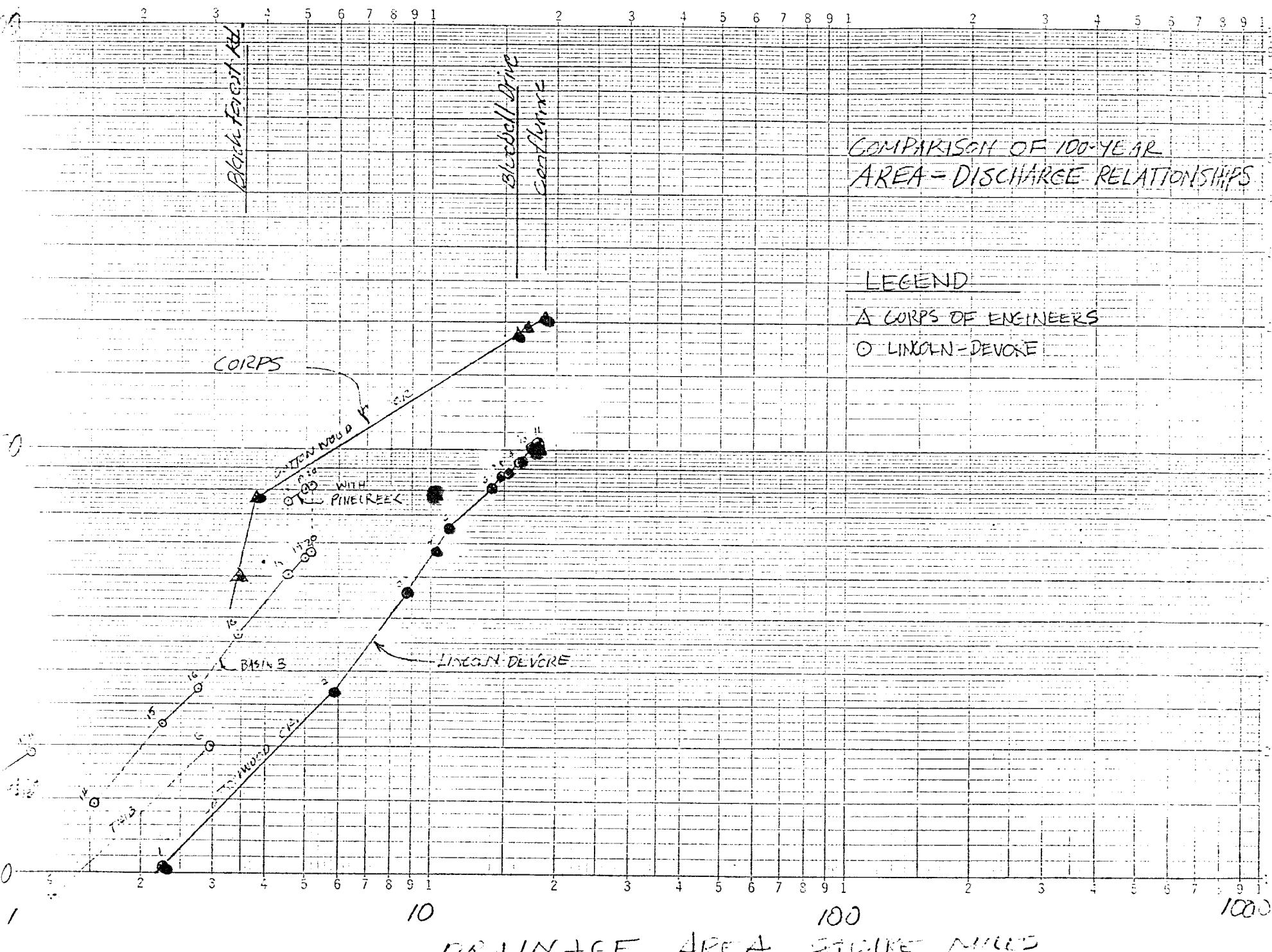
The FIA, through its engineer CDM, is also preparing a Flood Insurance Study for El Paso County which will include the upper reaches of Cottonwood Creek outside the City limits. Each entity will then have its own FIS with which to manage the floodplain in its respective jurisdiction.

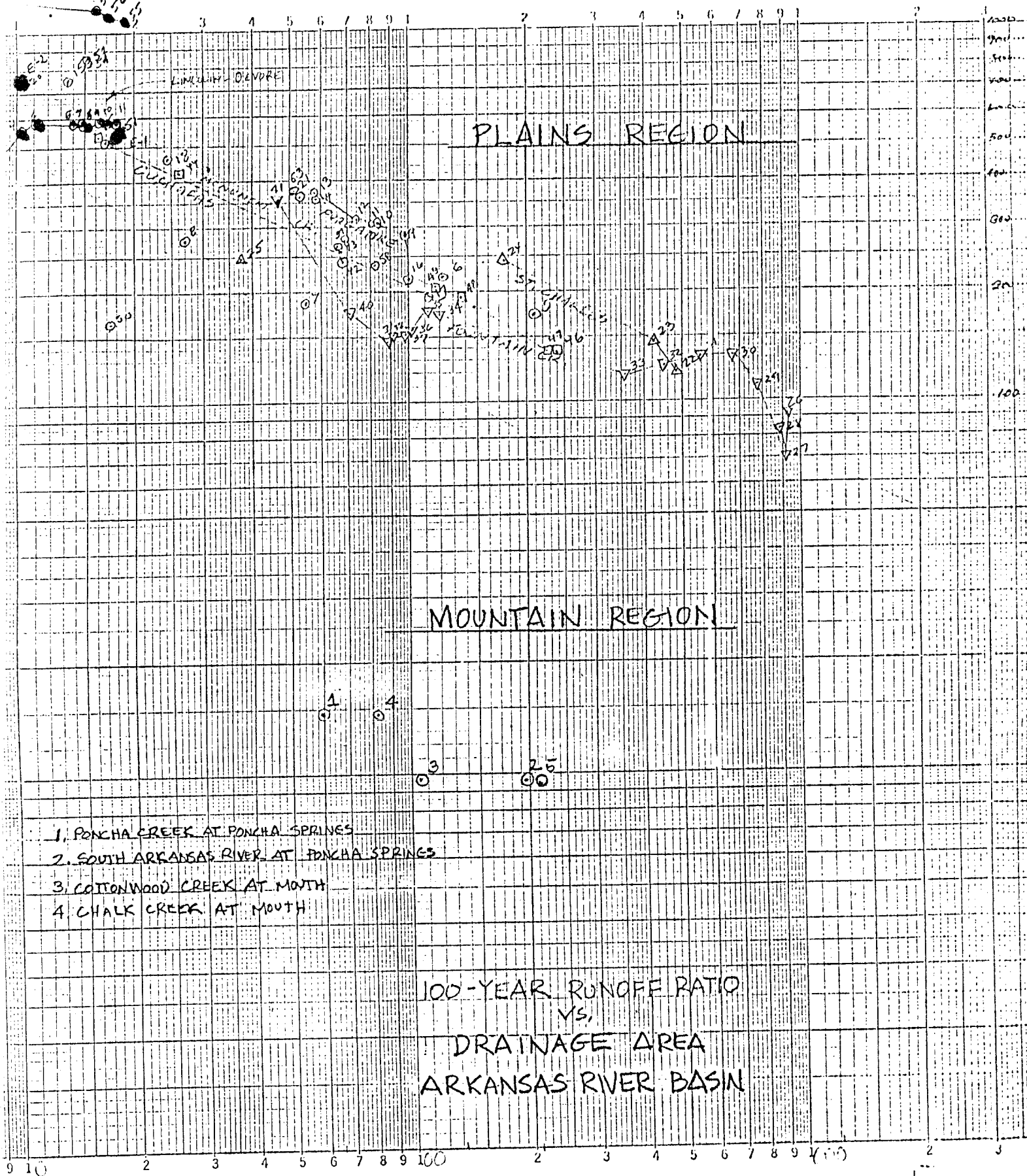
If the County still insists on regulating with the Corps higher discharges, the Cottonwood Creek portion of the County FIS will probably be rejected. If the County so requests, the CWCB would probably not designate that portion of the FIS in favor of using the supposedly higher profile based on the ultimate discharges in the Corps report. The controversy will come down to a discontinuity in the water surface profile and in the flooded area maps at the City's upstream corporate limit. However, there should not be a problem to the City of

accepting existing development in the floodplain if and when annexation occurs since the county's requirement will be more stringent. In fact, the floodplain issue may become an incentive for some citizens in the upper Cottonwood basin to petition the City for annexation.

Due to the long amount of time that will pass before the Federal Insurance Administration completes its Flood Insurance Study for the City, we recommend that the City accept and utilize the Corps' published floodplain information report for floodplain management purposes. The FIS will include revised water surface profiles and flooded areas for Cottonwood Creek based on existing development. Sometime after July 1982 when the appeal period is over, the City can simply write us a letter asking us to redesignate the City's FIS for Cottonwood Creek from the upstream corporate limits to the mouth as the official information, and we will place the report on the agenda for board action.







UNIT PRICE SUMMARY

THE FOLLOWING UNIT PRICES WERE USED IN ESTIMATING CONSTRUCTION COSTS FOR THIS STUDY. NO ENGINEERING OR CONTINGENCIES ARE INCLUDED IN THESE UNIT PRICES.

DESCRIPTION	UNIT	UNIT PRICE
Channel Excavation	C.Y.	Varies \$1 to \$2
Concrete Channel (6" w/Reinforcing)	S.F.	\$ 2.50
Rock Riprap Channel (Size Varies)	C.Y.	Varies \$20-\$25
Gunite Channel	S.Y.	\$ 17.50
Rock Riprap Check Dams	C.Y.	\$ 20.00
Structure Excavation	C.Y.	\$ 6.50
Structure Backfill	C.Y.	\$ 8.50
Structure Concrete	C.Y.	\$ 190.00
Structure Steel	LB.	\$.40
18" R.C.P.	L.F.	\$ 19.00
21" R.C.P.	L.F.	\$ 22.25
24" R.C.P.	L.F.	\$ 26.50
27" R.C.P.	L.F.	\$ 29.50
30" R.C.P.	L.F.	\$ 34.00
36" R.C.P.	L.F.	\$ 51.00
42" R.C.P.	L.F.	\$ 62.50
48" R.C.P.	L.F.	\$ 73.50
54" R.C.P.	L.F.	\$ 110.00
Manhole (5' I.D.)	EA.	\$1,750.00
Catch Basin - 4'	EA.	\$1,500.00
Catch Basin - 6'	EA.	\$1,800.00
Catch Basin - 8'	EA.	\$2,200.00
Catch Basin - 10'	EA.	\$2,700.00
Catch Basin - 12'	EA.	\$3,000.00
Catch Basin - 10' RAD.	EA.	\$2,500.00
Guardrail (Type 5)	L.F.	\$ 25.50
Asphalt Repair/Replace	S.Y.	\$ 5.00
Utility Adjustments		Varies w/situation

October 15, 1981 Drainage Board Meeting

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5% construction contingency	314,132
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October 15, 1981 Drainage Board Meeting

Item #7 Cottonwood Creek Fee Update

Chapel Hill Shopping Center has been platted in the County but will be annexed into the City. To allow reimbursement of the drainage facilities which were originally not in the Cottonwood Creek Fee, a revised fee is required which includes the structures' costs and the additional acreage.

In computing an update fee, the structures indicated eligible for reimbursement in the approved Chapel Hills Shopping Center Drainage Report and the site acreage were considered. Additionally, other annexations since the 1979 Report and their related structures were also taken into consideration. Subdivision drainage reports for the areas which have been platted since the 1979 Report were reviewed and the actual or proposed facilities costs were compared to those estimated in the 1979 Report. Changes in the estimated costs were compared with the updated contingency and the excess was determined. Structures not yet constructed or proposed in subdivision drainage reports were also updated using a 32% increase over the original estimates used in the 1979 Report.

Utilizing these revised costs and the updated acreage, the new Cottonwood Creek drainage fee was computed. A summary of the revised costs, updated acreage and fee computation are shown on the attached sheet. The 1981 fee is \$1,758/acre and the new fee is \$2,526/acre which is a 43.7% increase.

Cottonwood Creek Fee Update

Cost of facilities constructed or proposed per approved subdivision drainage reports which were not in the original fee determination or for which more detailed cost figures are now available, less contingency

$$1,489,987 - 184,805 = \$1,305,182$$

Updated costs (1979 to 1982) of facilities originally in Master Drainage Report but not yet in place or not yet included in subdivision drainage report's cost estimates

\$4,977,451

Total Costs \$6,282,633

Original Area Unplatted (1979 Report)	2,420.7 acres
Areas Platted since 1979 Report	- 364.97 acres
Additional Annexations since 1979 Report	+ <u>817.29 acres</u>
Remaining Private Land	2,873.02 acres

Improvements Cost	\$6,282,633
5% construction contingency	314,132
Sub Total	\$6,596,765
10% Engineering	<u>659,676</u>
Total	\$7,256,441

$$\text{Fee} = \frac{\$7,256,441}{2,873.02 \text{ acres}} = \$2,525.72/\text{acre} \text{ -- } \underline{\underline{\$2,526/\text{acre}}}$$

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\$64,372.50 to outfall
386,686 channel