



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

June 2, 1993

RE:

Federal Emergency Management Agency Case No.: 92-06-061R (S. Piedras Marcadas
Federal Insurance Administration Arroyo)

Office of Risk Assessment
500 C Street, S.W., Room 422
Washington, DC 20472

Community: City of Albuquerque,
Bernalillo County,
New Mexico
Community No.: 350002

Attention: Mr. William R. Locke
Chief, Risk Studies Division

Dear Mr. Locke:

This submittal is in response to the letter from the Federal Emergency Management Agency (FEMA) to the City of Albuquerque dated April 26, 1993, requesting additional data in order for FEMA to prepare a Letter of Map Revision (LOMR) for the above referenced project. FEMA's letter requested the following information:

As-built plans, certified by a registered professional engineer, of all proposed project elements

The appropriate initial fee (currently \$200) as required by section 72.3 of the National Flood Insurance Program (NFIP) regulations.

As requested, enclosed are the as-builts, and a check for \$200. Your prompt response and approval for this LOMR would greatly be appreciated. If you should have any questions concerning this submittal, please do not hesitate to call me at (505) 768-2650.

Cordially,

Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator

xc: Mr. Bob Hendrix, Branch Chief, Region VI
Mr. Cleve Matthews, Sandia Peak Tram Co.
Mr. Howard Stone, Bohannon-Huston
Mr. Clifford E. Anderson, AMAFCA

File

PUBLIC WORKS DEPARTMENT

wp+1596

May 24, 1993

Mr. Gilbert Aldaz, P.E.
City/County Floodplain Administrator
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: LOMR for the South Branch of the Piedras Marcadas Arroyo
Case No. (65-DR-100) 6-91-178

Dear Mr. Aldaz:

On April 26, 1993 we received the approval of the CLOMR we had submitted on the referenced project. As stated in the FEMA letter, we are enclosing the as-built drawings with respect to the drainage facilities that are a part of this LOMR.

There are a few changes since the CLOMR request was submitted, which were mostly a result of construction changes due to changed conditions in the field. In addition, there are two small basins that have been developed in the watershed between the time the CLOMR was originally submitted and the time the CLOMR was approved. The changed conditions were analyzed to assure that the system still functioned as originally intended and that the floodplain as detailed in the CLOMR request was not affected.

The following discusses the minor changes that have occurred since submittal of the CLOMR:

Watershed Changes

1. The CLOMR request in Exhibit 2 identified all of the basins in the project area, and page 2 of the report identified the basins that were a part of the CLOMR request. Since the request, two additional basins are currently being developed—Basins 402.03 and A-9. The following table shows the changes in the 100-yr flows due to the development of these two basins. Also enclosed is an updated copy of the AHYMO computer run that documents the changed development scenario for the two basins. The flow increases due to development are minor and have no impact on the floodplain widths delineated in the CLOMR (see following discussion on Riverview Park Detention Pond).

Hydro/9120020 Aldaz Jlr-May 24, 1993

PRINCIPALS

LARRY W. HUSTON, C.P.
MICHAEL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.

KERRY L. DAVIS, P.E.
ROBERT G. KLETZLI
LARRY A. LARRAÑAGA, P.E.

HOWARD C. STONE, P.E.
WILLIAM L. VREEKE, P.E.
GORDON A. WALHOOD JR., P.E.



Table 1
100-yr Flowrate Differences

Flow Location	Scenario at CLOMR	Present Scenario
Flow from Basin 402.03	10.9	25.9
Flow from Basin A-9	2.8	6.7
Flow entering Piedras Marcadas Dam	732 ¹	802 ¹

¹Also includes effect of changes in Riverview Park Detention Pond - see following discussion.

2. During construction of the Riverview Park Detention Pond, a significant basalt outcrop was encountered. Due to the density and soundness of the basalt, it was decided it was more economical to reconfigure the dam rather than to attempt to remove the basalt. The changed pond grading plan (which was approved by the City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority) is documented in the supplied as-built sheet and is included in the supplied AHYMO output mentioned above. The reconfigured pond ends up providing more freeboard than the original pond and, therefore, provides a higher level of protection. Also supplied is the changed hydraulic gradeline analysis that was presented on page 90 of Appendix A. An inspection of the new hydraulic gradeline analysis shows:

- The flowrate in the 72" pipe downstream of the dam is now 209 cfs, which is less than the original flow of 241 cfs.
- The peak flow in the pipe flowing into the dam is 312 cfs at 1.55 hours. The original analysis showed the water surface in the dam was 5101.25. However, in review, it was discovered that the HGL of 5101.25 does not occur until the 2.0 hour point. The HGL now shown is 5097.10, which corresponds to a time of 1.55 hours. The maximum water surface is now 5101.8 in the pond. At the peak HGL in the pond (time at 2.0 hours), the flow entering from the pipe is 133 cfs. Both scenarios were analyzed and the peak flow in the pipe of 312 cfs produced the highest HGL in the storm drain upstream of the dam.

The end result is that the HGL now shown in the pipe is less than the original analysis.

Mr. Gilbert Aldaz, P.E.
May 24, 1993
Page 3

The as-builts for Basins 402.03 and A-9 are not supplied with this submittal since they are presently under construction. However, for both basins the flow difference between undeveloped and developed have negligible impact on the hydraulic gradeline in the 60"-72" storm drain. In fact, the hydraulic gradeline in the 60"-72" pipe is lower than shown in the CLOMR request. Therefore, we feel the as-builts for these two small basins are not essential to the LOMR approval.

Should you require additional information or have any questions, please contact me at your earliest convenience.

Sincerely,



Howard C. Stone, P.E.
Water Resources Manager

HCS/rkl
Enclosures

- AHYMO printout - replaces page 90 of Appendix of CLOMR request
- Updated hydraulic gradeline calculations - replaces page 5A-89 of Appendix of CLOMR request
- As-built drawings of Riverview Estates subdivision (Basins A-2, A-3 and a portion of A-4)
- As-built drawings of Riverton subdivision (Basins A-6 and A-7 of Exhibit 2 of CLOMR request)
- As-built drawings of Riverview Crossing subdivision (Basin A-8 of Exhibit 2 of CLOMR request)

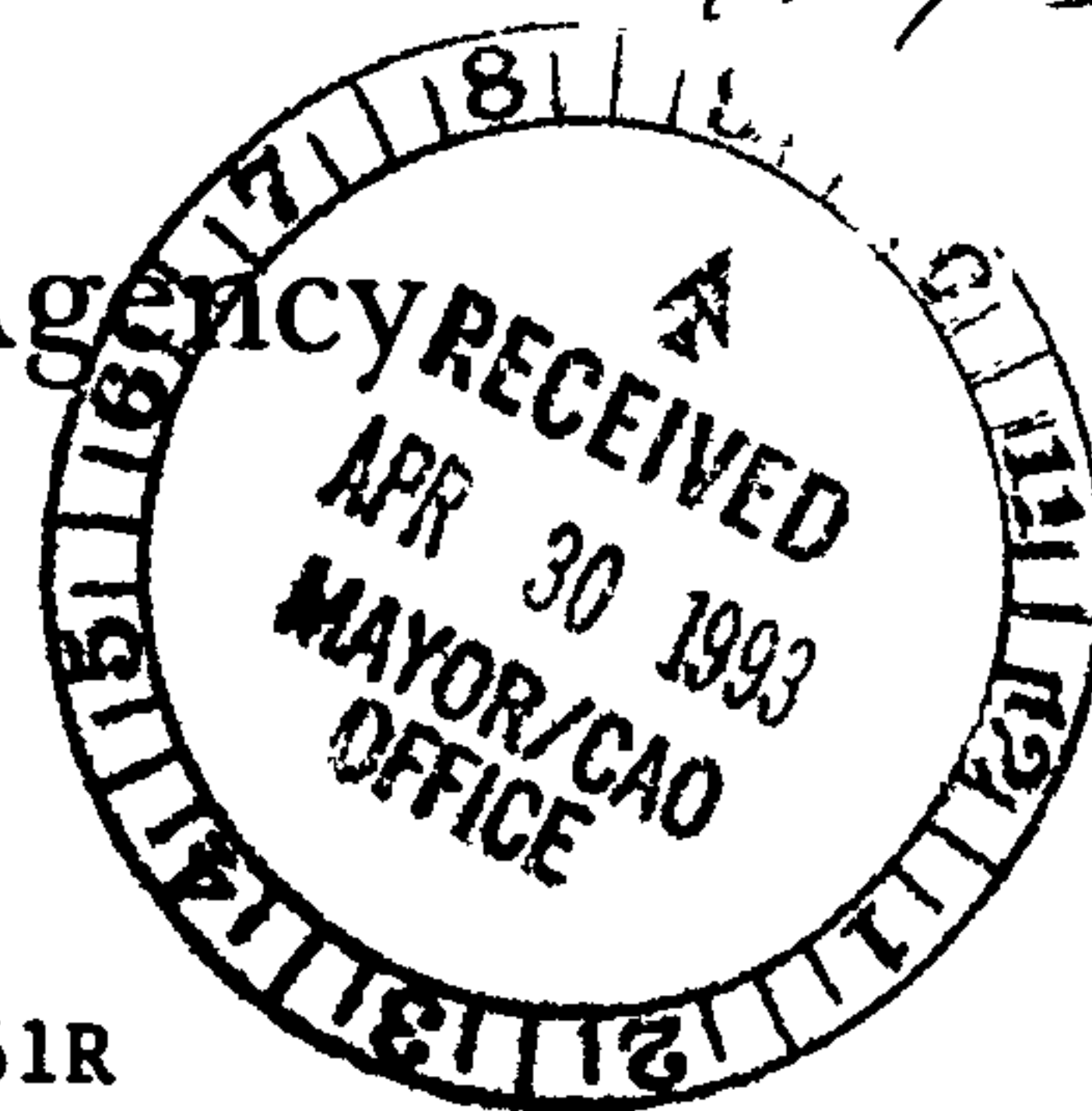
cc: Cleve Matthews
Cliff Anderson



Federal Emergency Management Agency

Washington, D.C. 20472

APR 26 1993



CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Louis Saavedra
Mayor, City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:
Case No.: 92-06-061R

Community: City of Albuquerque,
New Mexico
Community No.: 350002

104

Dear Mayor Saavedra:

This is in response to a letter dated August 31, 1992, from Mr. Gilbert Aldaz, P.E., L.S., City/County Floodplain Administrator, to the Federal Emergency Management Agency (FEMA) regarding the Flood Insurance Study (FIS), Flood Insurance Rate Map (FIRM), and Flood Boundary and Floodway Map (FBFM) for the City of Albuquerque. Mr. Aldaz requested that FEMA evaluate the effects of the proposed construction of the Riverview-Estates-Subdivision and the Riverton-Subdivision, the incorporation of the previously constructed Shenandoah-Units-I-and-II-Subdivisions and Prairie-Ridge-Subdivisions, and the effects that the proposed and "as-built" modifications of a storm-drain system associated with these four subdivisions along the South Branch of the Piedras-Marcadas-Arroyo would have on the effective FIS, FIRM, and FBFM.

All data required by FEMA to evaluate this request were submitted by Mr. Aldaz with his August 31 letter. In addition, Mr. Howard C. Stone, P.E., Water Resources Manager, Bohannon-Houston, Inc., submitted data with his letters dated October 12, October 20, December 2, and December 12, 1992. In his letter dated January 11, 1993, Mr. Stone gave authorization to proceed with this review to a limit of \$2,800. All fees necessary to process this Conditional Letter of Map Revision (CLOMR) (a total of \$2,800) have been received.

We have reviewed the data submitted with respect to the data used to prepare the effective FIRM and FBFM for the City of Albuquerque. We believe that if the proposed projects are constructed as described in the report entitled "South Branch of Piedras Marcadas Arroyo," prepared by Bohannon-Houston, Inc., dated August 20, 1992, and as shown on the plan sheets entitled "South Branch-Piedras-Marcadas-Arroyo," Sheets B-3 through B-12, prepared by the City of Albuquerque Public Works Department, dated July 2, 1992, then the 100-year floodplain will be delineated as shown on the topographic work map entitled "Exhibit 1, Orthophoto/Topographic Map of Piedras Marcadas Arroyo," dated April 1991, prepared by Molzen-Corbin and Associates.

Upon completion of the project and receipt of the data listed below, we will make a final determination on revising the FIS report, FIRM, and FBFM.

- As-built plans, certified by a registered professional engineer, of all proposed project elements
- The appropriate initial fee (currently \$200) as required by Section 72.3 of the National Flood Insurance Program (NFIP) regulations

MAY - 5

This CLOMR pertains to the Special Flood Hazard Area shown on the FIRM upstream of the proposed Piedras Marcadas Dam. Please note that before we can revise the FIRM to reflect the flood protection afforded by the dam, additional information regarding the structure itself must be submitted. For your convenience, we have enclosed a copy of Form 11 (Dam Form) of our Application/Certification Forms package, which describes the additional information required.

After receiving appropriate documentation to show that the project has been completed, FEMA may initiate a revision to the FIS report, FIRM, and FBFM.

The basis of this CLOMR is a proposed channel-modification project. Paragraph 60.3(b)(7) of the NFIP regulations requires that communities "assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained." This provision is incorporated into your community's existing floodplain management regulations. Consequently, your community must agree to accept responsibility for the maintenance of the modified channel before allowing its construction.

This response to Mr. Aldaz's request is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all proposed floodplain development, including this request, and for assuring that the necessary permits required by Federal or State law have been received. State and community officials, based on knowledge of local conditions and in the interest of human safety, may set higher standards for construction or may limit development in floodplain areas. If the State of New Mexico or the City of Albuquerque has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

Should you have any questions regarding this matter, please contact the Chief, Natural and Technological Hazards Division of FEMA in Denton, Texas, at (817) 898-5127, or Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,



William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: Mr. Gilbert Aldaz, P.E., L.S.
City/County Floodplain Administrator
Public Works Department
Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Houston, Inc.
Mr. Clifford E. Anderson
AMAFCA
Mr. Cleve Matthews
Sandia Peak Tram Company



Federal Emergency Management Agency

Washington, D.C. 20472

APR 20 1993

Mr. Howard C. Stone
Water Resources Manager
Bohannon-Huston, Inc.
Courtyard I
7500 Jefferson Street, NE.
Albuquerque, New Mexico 87109

IN REPLY REFER TO:
Case No.: 92-06-061R
Community: City of Albuquerque,
New Mexico
Community No.: 350002

316-I

Dear Mr. Stone:

The Federal Emergency Management Agency has completed its review of your request for a Conditional Letter of Map Revision (CLOMR) for the South Branch of the Piedras Marcadas Arroyo in the above-referenced community. Prior to commencement of our review, we received the required initial fees of \$560. Due to the extent of this revision, review and processing costs exceeded \$1,500. You were notified of the additional costs on January 12, 1993, and you replied with your written authorization to proceed with our review in a letter dated January 11, 1993.

Review and processing costs associated with this request total \$2,800.

Please forward payment of \$2,240, representing the additional costs, to:

Federal Emergency Management Agency
Revisions Fee-Collection System Administrator
P.O. Box 3173
Merrifield, Virginia 22116

Please note that the initial fees of \$560 will only be applied to this request if we receive the required fees within 90 days of the date of this letter. After 90 days, the request will be treated as an original submittal and the total review and processing fees of \$2,800 will be required before the requested CLOMR will be issued.

Payment must be in the form of a check or money order made payable to the National Flood Insurance Program. For identification purposes, the case number referenced above must be included on your check or money order. Please note that we will not issue our determination until this payment is received.

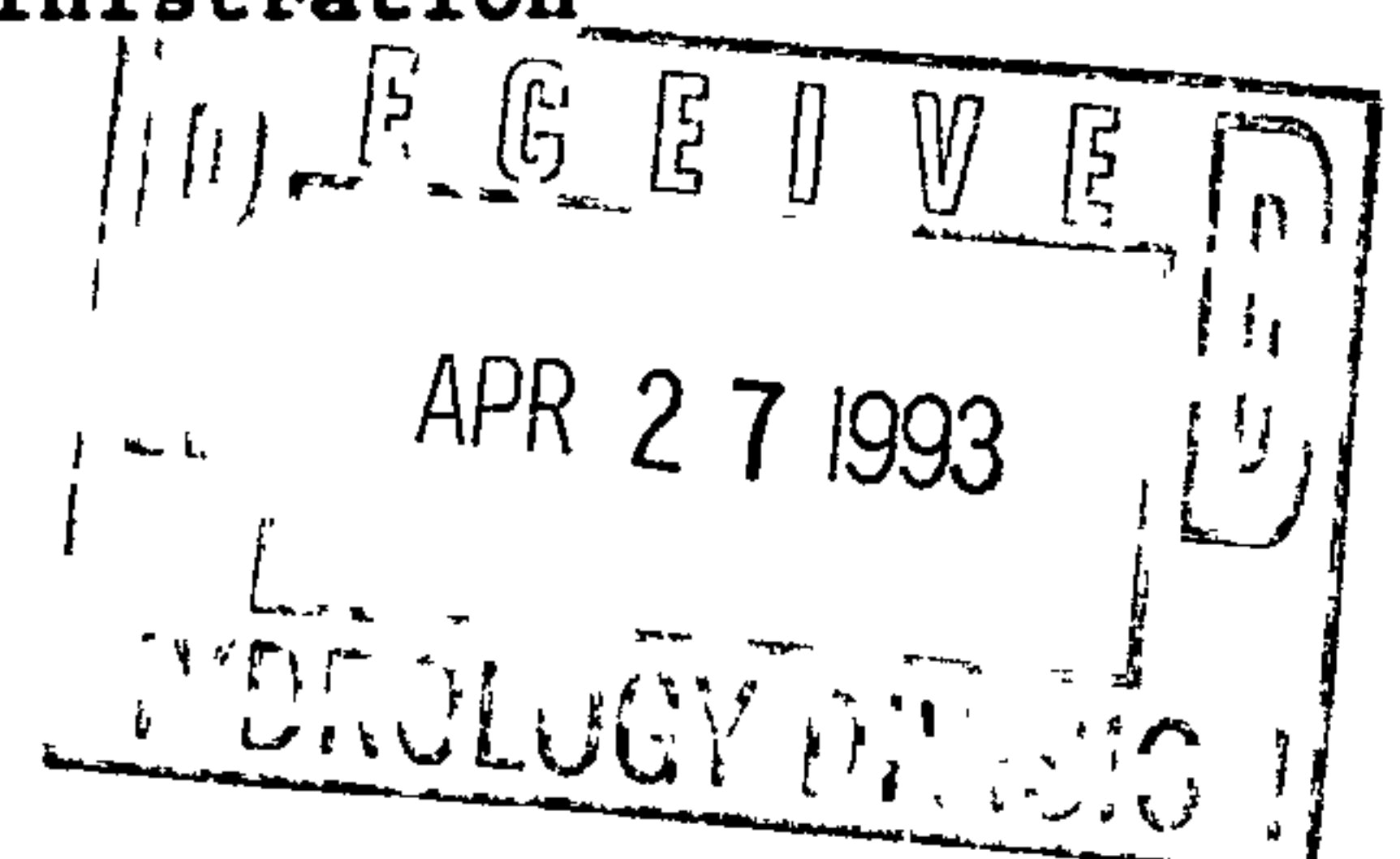
If you have any questions regarding this matter, please contact Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,

William R. Locke

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque
-Mr. Gilbert Aldaz, P.E., L.S.-
City/County Floodplain Administrator
Public Works Department



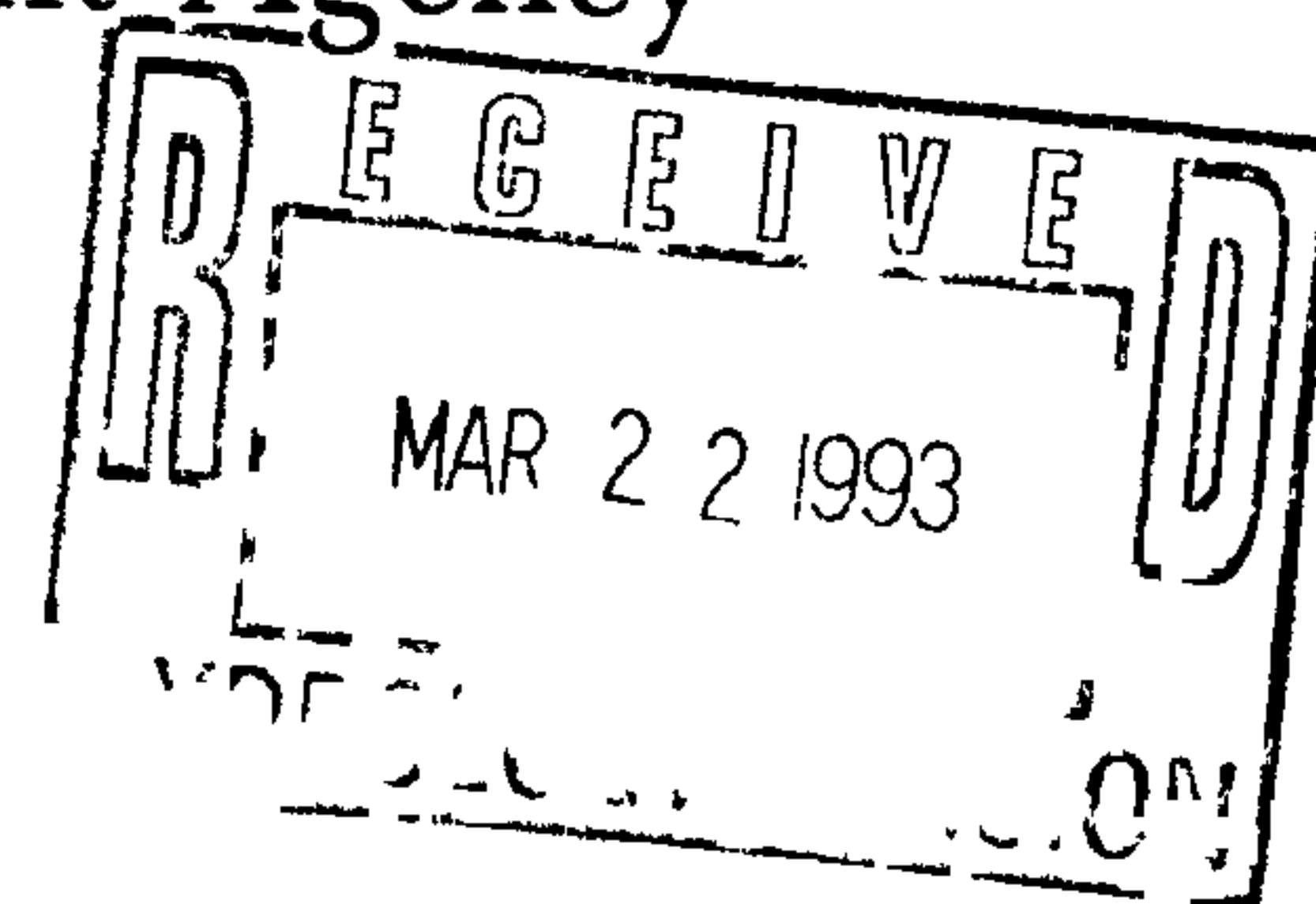


Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

MAR 18 1993



Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.
Courtyard I
7500 Jefferson Street, NE.
Albuquerque, New Mexico 87109

IN REPLY REFER TO:
Case No.: 92-06-061R
Date: March 18, 1993
Community: City of Albuquerque,
New Mexico
Community No.: 350002

316-INTb

Dear Mr. Stone:

This is in regard to your letter dated August 31, 1992, in which you requested a conditional Letter of Map Revision for the referenced project. Our letter to you dated February 18, 1993, stated that we were reviewing the data submitted in support of your request and, within 30 days of the date of that letter, would notify you if we needed additional data or encountered delays. However, because of the complexity of the proposed project, we will need additional time to complete our review. Therefore, we will inform you of our findings within 30 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions regarding this matter, please contact Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

✓ Mr. Gilbert Aldaz, P.E., L.S.
City/County Floodplain Administrator
Public Works Department

Mr. Clifford E. Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
316-INTb

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.
Courtyard I
7500 Jefferson Street, NE.
Albuquerque, New Mexico 87109

Date: February 18, 1993
Case No.: 92-06-061R
RE: South Branch Piedras Marcadas
Arroyo
Community: City of Albuquerque,
New Mexico
Community No.: 350002

Dear Mr. Stone:

This is in regard to your letter dated August 31, 1992, in which you requested a conditional Letter of Map Revision for the referenced project. Our letter to you dated January 20, 1993, stated that we were reviewing the data submitted in support of your request and, within 30 days of the date of that letter, would notify you if we needed additional data or encountered delays. However, because of the complexity of the proposed project, we will need additional time to complete our review. Therefore, we will inform you of our findings within 30 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions regarding this matter, please contact Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,

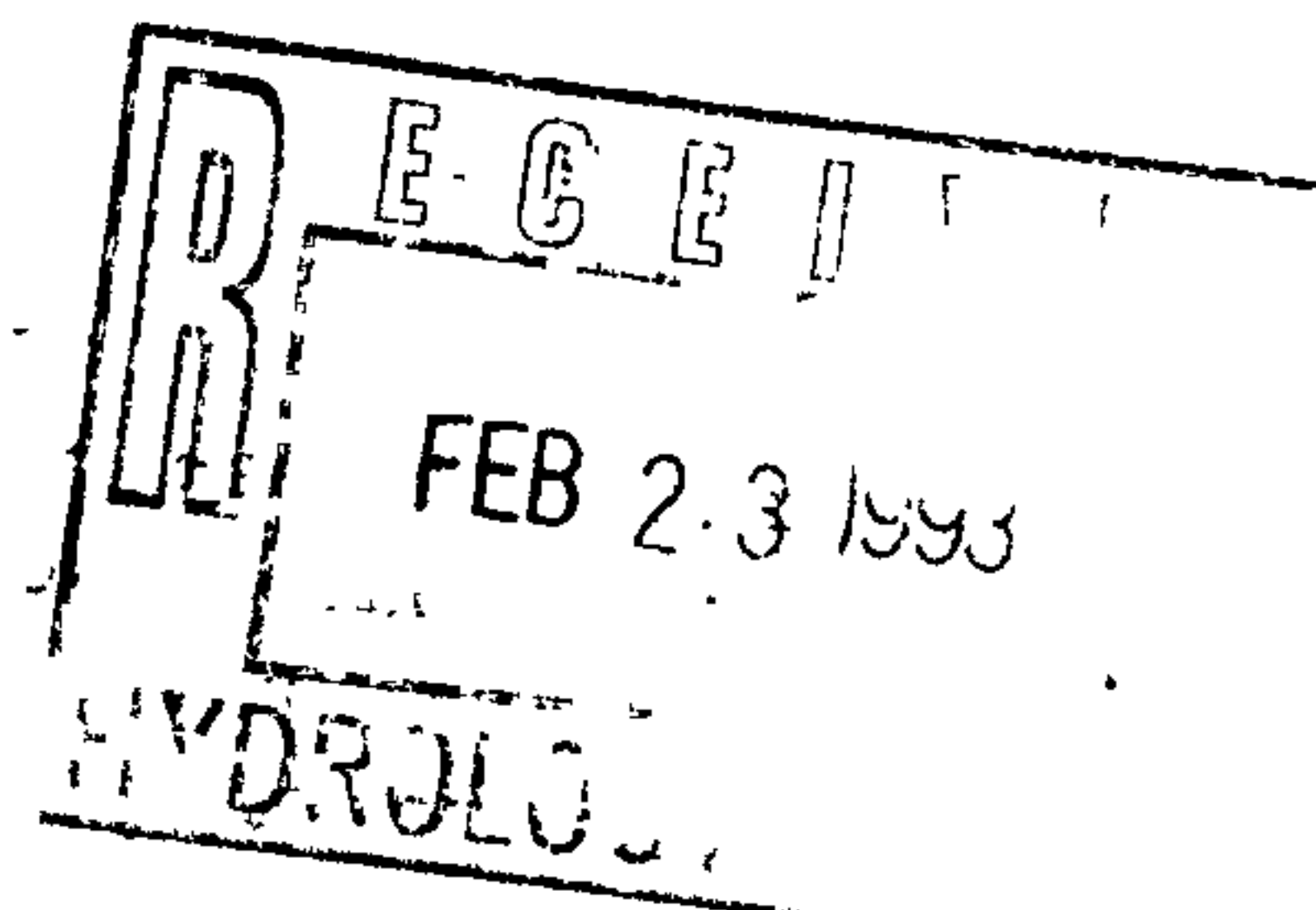
William R. Locke

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

Mr. Clifford E. Anderson
AMAFCA

Mr. Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator
Public Works Department





Federal Emergency Management Agency

Washington, D.C. 20472

JAN 12 1993

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.
Courtyard I
7500 Jefferson Street, N.E.
Albuquerque, New Mexico 87109

IN REPLY REFER TO:
Case No.: 92-06-061R

Community: City of Albuquerque,
New Mexico
Community No.: 350002

316-AC

Dear Mr. Stone:

This is in reference to your August 31, 1992, request for a conditional Letter of Map Revision for the above-referenced community.

The application form submitted with your initial request stated that, should the total processing costs exceed \$1,500, you would be notified prior to our continued processing of the request. Due to engineering and sedimentation review of the project, we anticipate that total processing costs will be approximately \$2,800.

Please send written authorization for the continuance of our review to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Suite 600
Alexandria, Virginia 22304
(703) 960-8800

Attention: Mr. David P. Preusch, P.E.

For identification purposes, the case number referenced above must be included on your correspondence. Further action on this request has been suspended pending our receipt of the written authorization.

Also, please note that the initial fees of \$560 already submitted will only be applied to this request if we receive the required authorization within 90 days of the date of this letter. After 90 days, the request will be treated as an original submittal and will be subject to all submittal/payment procedures, including the initial fees.

If you have any questions regarding this matter, please contact Mr. Alan Johnson of our staff at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,

A handwritten signature in dark ink, appearing to read "William R. Locke", is written over the typed name.

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque
~~Mr. Gilbert Aldaz~~, P.E. & L.S.
City/County Floodplain Administrator
Public Works Department
Mr. Clifford Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:
316-INTa

Date: December 15, 1992
Case No.: 92-06-061R
RE: South Branch Piedras
Marcadas Arroyo
Community: City of Albuquerque,
New Mexico
Community No.: 350002

Dear Mr. Aldaz:

This is in regard to your letter dated August 31, 1992, in which you requested a conditional Letter of Map Revision for the referenced project. Our letter to you dated December 9, 1992, stated that we were reviewing the data submitted in support of your request and, within 30 days of the date of that letter, would notify you if we needed additional data or if we encountered delays. However, with a letter dated December 10, 1992, from Mr. Howard C. Stone, P.E., we received the following additional data: Revised hydraulic grade line calculations and revised hydraulic computations for inlets in sump area. In addition, documentation for the 100-year 24-hour rainfall was provided.

We will review the additional data and will inform you of our findings within 30 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions regarding this matter, please contact Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,

William R. Locke

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.

Mr. Clifford E. Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Gilbert Aldaz, P.E., L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:
316-ACK

Date: December 8, 1992
Case No.: 92-06-061R
Re: South Branch Piedras
Marcadas Arroyo
Community: Albuquerque, New
Mexico
Community No.: 350002

Dear Mr. Aldaz:

This is to acknowledge acceptance of your request for a conditional Letter of Map Revision (LOMR) for the referenced project. Our preacceptance review of the request indicates that we have the minimum data and the correct initial fee or fee waiver we need to begin our evaluation. If we need additional data to complete our evaluation, or if delays are encountered, we will notify you in writing within 30 days of the date of this letter.

The initial fee, if applicable, is the minimum charge for a review of this type; additional costs could be incurred during the course of our review. If additional fees are required, we will notify you in writing. Any additional fees required must be submitted before we can issue our determination concerning the request for a conditional LOMR.

If fees are to be reimbursed and, during our review, we determine that the total processing costs will exceed \$1,500, we will notify you in writing of the estimated total costs. In such cases, we cannot complete our review until we receive your written authorization to proceed.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions about the status of your request, please contact Michael Baker Jr., Inc., our Technical Evaluation Contractor, at (703) 960-8800, and ask for the Revisions Coordinator for your state.

Sincerely,



William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.

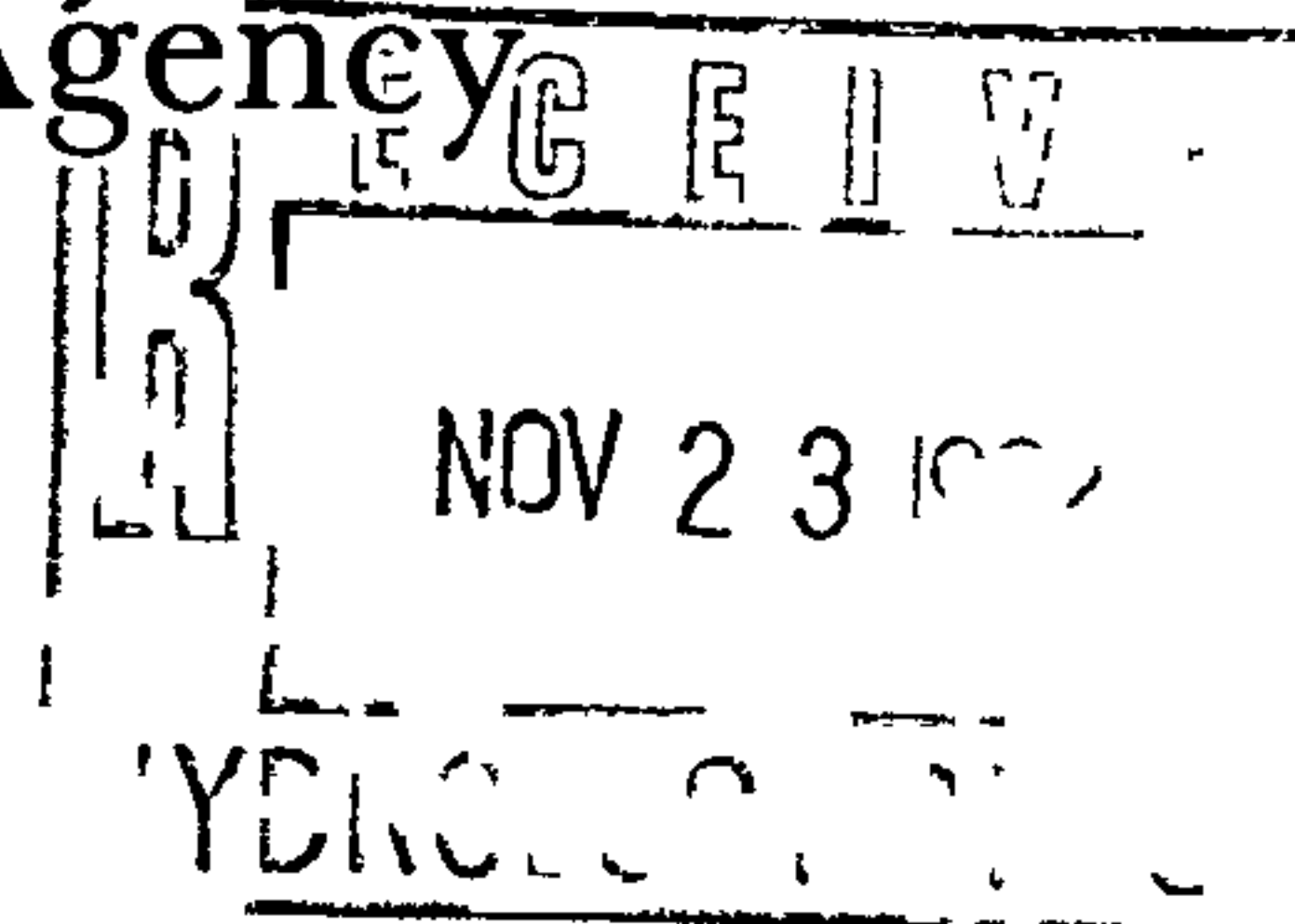
Mr. Clifford Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

#75



CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
316 AD

Mr. Gilbert Aldaz, P.E., L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

Date: **NOV 16 1992**
Case No.: 92-06-061R
RE: South Branch Piedras
Marcadas Arroyo
Community: City of Albuquerque,
New Mexico
Community No.: 350002

Dear Mr. Aldaz:

This is in response to the request for a conditional Letter of Map Revision (LOMR) for South Branch Piedras Marcadas Arroyo in the City of Albuquerque, New Mexico, dated August 31, 1992. Our October 16, 1992, letter to you regarding this request indicated that additional data might be required to complete our review of the request. The data required to complete our review are listed on the enclosure.

The required data are to be submitted to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Mr. David P. Preusch, P.E.

The case number referenced above should be included on any correspondence regarding the request. Further action on the request has been suspended pending receipt of the additional data.

Please note that the initial fees already submitted are the minimum charge for a review of this type. Additional costs could be required upon completion of our review and prior to issuance of a conditional LOMR, depending on the complexity of the required review. You will be notified of the estimated total processing costs if it is anticipated that, due to the extent of the review required, the total costs will exceed \$1,500. In that situation, our review would be suspended pending our receipt of written authorization from you to proceed.

Also note that the initial fees of \$560 already submitted will only be applied to this request if we receive the required additional data within 90 days of the date of this letter. After 90 days, the request will be treated as a new original submittal and will be subject to all submittal/payment procedures, including the initial fees.

If you have any questions concerning Federal Emergency Management Agency policy, or the National Flood Insurance Program in general, please call Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403, or by facsimile at (202) 646-3445.

Sincerely,



William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

Enclosure

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.

Mr. Clifford Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

Case No.: 92-06-061R
Community: City of Albuquerque,
New Mexico
Community No.: 350002

Additional Data Required to Support a Conditional Letter of Map Revision Request

Requester: Mr. Gilbert Aldaz, P.E., L.S.

Date: **NOV 16 1992**

The items below must be submitted in order to complete the review of the request for a conditional Letter of Map Revision.

1. Please submit a topographic work map that shows the revised 100-year floodplain, and the location and alignments of all cross sections used in the hydraulic calculations. The scale and topographic definition of the map must be sufficient to provide reasonable accuracy, and the map must be certified by a registered professional engineer.
2. Please provide the source for the 24-hour rainfall depth used in the hydrologic analysis.
3. Please submit a copy of the Development Process Manual for the City of Albuquerque, New Mexico (referenced in your hydraulic analysis).
4. For the design of all grate inlets at sump locations (specifically, the intersections of Firewheel/Sunrose Roads and Golf Course/Butterfield Trail Roads), please provide for a factor of safety against clogging, or provide evidence that the design criteria used includes a factor of safety in regard to clogging.
5. Please provide documentation for the program used to compute the hydraulic grade line for the storm drain system.

The required data should be submitted to the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

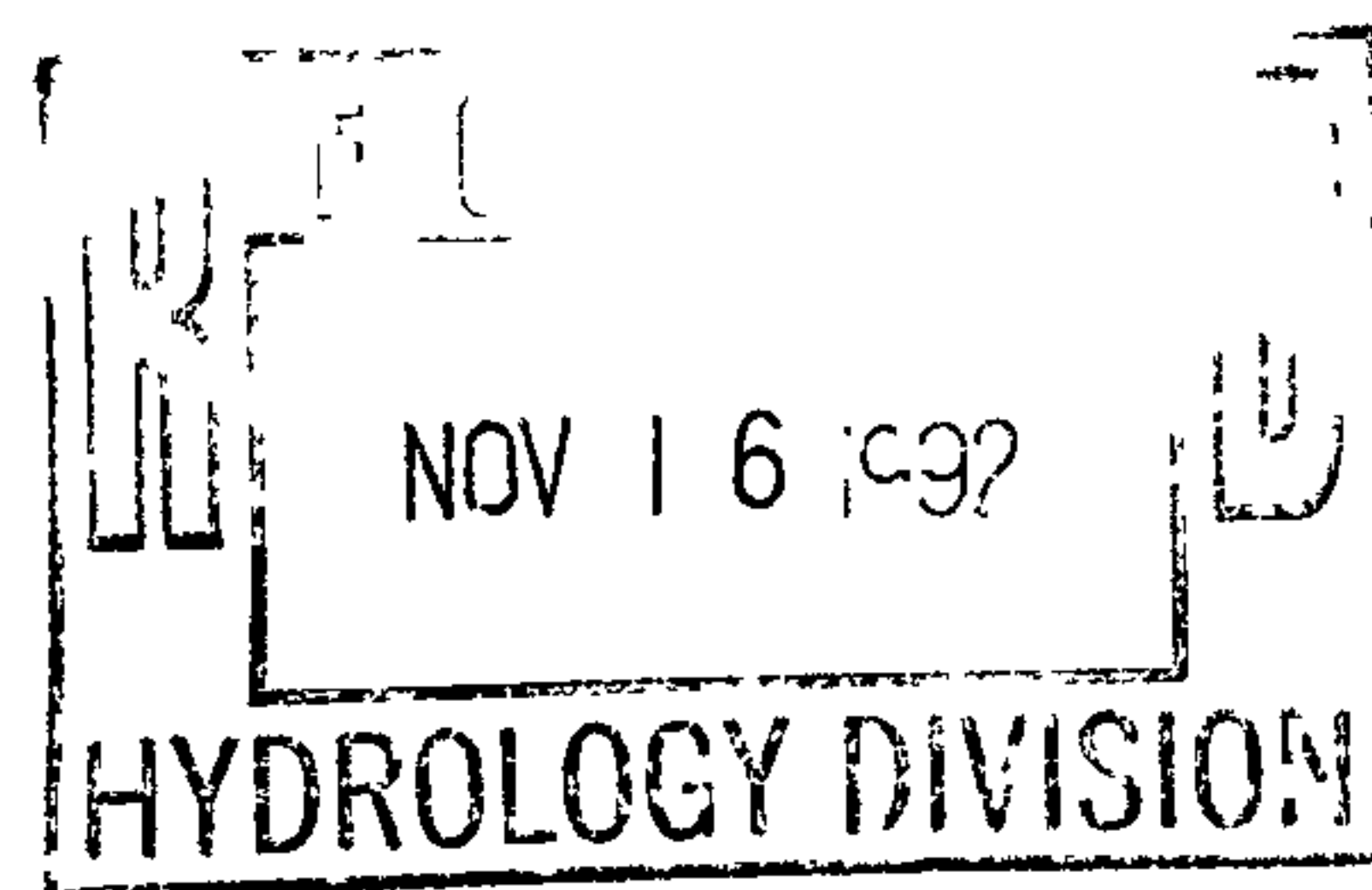
Attention: Mr. David P. Preusch, P.E.



#10 TRAMWAY LOOP, N E / SANDIA HEIGHTS / ALBUQUERQUE, N.M. 87122

REAL ESTATE DEVELOPMENT / PROPERTY MANAGEMENT

(505) 296-0736 • Fax (505) 299-8024



November 13, 1992

Mr. Gilbert Aldez
City/County Floodplain Administrator
City of Albuquerque
PO Box 1293
Albuquerque, NM 87103

Re: Piedras Marcadas Arroyo, South Branch Floodplain Amendment

Dear Mr. Aldez:

Reference request for Conditional Letter of Map Revision for the Piedras Marcadas South Branch Arroyo, Case #92-06-061R that was submitted to the Federal Emergency Management Agency (FEMA) on August 31, 1992 with follow up information and data as requested by FEMA provided on October 27, 1992.

Our consultant, Bohannon-Huston, Inc. has advised us that you have requested that a revision to the August 31, 1992 study be submitted to FEMA prior to FEMA reaching a decision on the August 31, 1992 submittal is based on the following issues:

- 1.) The geometry of the detention pond within the Riverview Park has been changed to accommodate subsurface rock conditions discovered on site during construction. Although the pond size and hydraulic performance has not been adversely affected by the reconfiguration.
- 2.) Bohannon-Huston, Inc., in review of the August 31, 1992 study and change in pond geometry discovered an error in the analysis of the pond outfall structure, in the report submitted to FEMA that would slightly reduce the downstream hydraulic constraints upon the existing storm sewer in Butterfield Trail.
- 3.) There have been additional subdivisions within the area which have received preliminary plat approval by the City of Albuquerque which affect the assumptions that were made in the August 31, 1992 study regarding development conditions within the basin.

Mr. Gilbert Aldez
November 13, 1992
Page 2

We have instructed Bohannon-Huston, Inc. not to prepare a revision to the submittal to FEMA until such time as the drainage infrastructure proposed in the August 31, 1992 study has been completed with as-built plans and revised calculations taking into consideration the change in geometry of the pond and correction of the analysis error.

The basis for this decision is that the net effect of the change in the pond geometry and the error in Bohannon-Huston's analysis is that the hydraulic capacity of the downstream facilities is not adversely affected.

The fact that there have been other subdivisions approved by the City of Albuquerque in that immediate area, does not affect FEMA's determination of the appropriateness of the floodplain modification. The drainage issues for individual subdivisions solely affect the City's review of detailed drainage reports for those subdivisions within the basin. All such subdivision submittals currently under review by the City or those to be submitted in the future, are to reflect and address those appropriate drainage issues.

Submitting revised data which does not adversely affect the August 31, 1992 report would seem to cloud the issue and could result in FEMA's review and approval being unnecessarily delayed.

Based on FEMA's letter of October 27, 1992, we anticipate their response by November 27, 1992. Should that response require additional information and data, at that time it may be appropriate to include changes in the detention pond geometrics and correct the error in the analysis. On the other hand, if the response is an approved conditional letter of map revision all the information including as-built plans would be submitted to secure a Letter of Map Revision (LOMR).

If you have any questions, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "Cleve Matthews", is written over the typed name.

Cleve Matthews, Vice President
Alvarado Realty Company
Agent for Paseo Del Norte Joint Venture

CM/lk

pc: Cliff Anderson, AMAFCA
Mike Emery, Bohannon-Huston, Inc.



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

#75

10-2-92
OCT - 2 -
VDROLCC, DIV.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
316-INTa

Mr. Gilbert Aldaz, P.E., L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

Date: October 27, 1992
Case No.: 92-06-061R
RE: South Branch Piedras
Marcada Arroyo
Community: City of Albuquerque,
New Mexico
Community No.: 035002

Dear Mr. Aldaz:

This is in regard to your letter dated August 31, 1992, in which you requested a conditional Letter of Map Revision for the referenced project. Our letter to you dated October 16, 1992, stated that we were reviewing the data submitted in support of your request and, within 30 days of the date of that letter, would notify you if we needed additional data or if we encountered delays. However, with a letter dated October 20, 1992, from Mr. Howard C. Stone, P.E., we received the following additional data: Map showing Drainage Basins 403 and 404 on an enlarged scale.

We will review the additional data and will inform you of our findings within 30 days of the date of this letter.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions regarding this matter, please call Mr. Alan Johnson of my staff in Washington, DC, at (202) 646-3403.

Sincerely,

William R. Locke

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque

Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.

Mr. Clifford E. Anderson
AMAFCA



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403

#75

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:
316-ACK

Date: October 16, 1992
Case No.: 92-06-061R
RE: South Branch Piedras
Marcado Arroyo
Community: Albuquerque, New
Mexico
Community No.: 035002

Dear Mr. Aldaz:

This is to acknowledge acceptance of your request for a conditional Letter of Map Revision (LOMR) for the referenced project. Our preacceptance review of the request indicates that we have the minimum data and the correct initial fee or fee waiver we need to begin our evaluation. If we need additional data to complete our evaluation, or if delays are encountered, we will notify you in writing within 30 days of the date of this letter.

The initial fee, if applicable, is the minimum charge for a review of this type; additional costs could be incurred during the course of our review. If additional fees are required, we will notify you in writing. Any additional fees required must be submitted before we can issue our determination concerning the request for a conditional LOMR.

If fees are to be reimbursed and, during our review, we determine that the total processing costs will exceed \$1,500, we will notify you in writing of the estimated total costs. In such cases, we cannot complete our review until we receive your written authorization to proceed.

If you write to us about your request, please include the case number shown above in your letter. If you have any questions about the status of your request, please call Michael Baker Jr., Inc., our Technical Evaluation Contractor, at (703) 960-8800, and ask for the Revisions Coordinator for your state.

Sincerely,

A handwritten signature in cursive script that reads "William R. Locke".

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

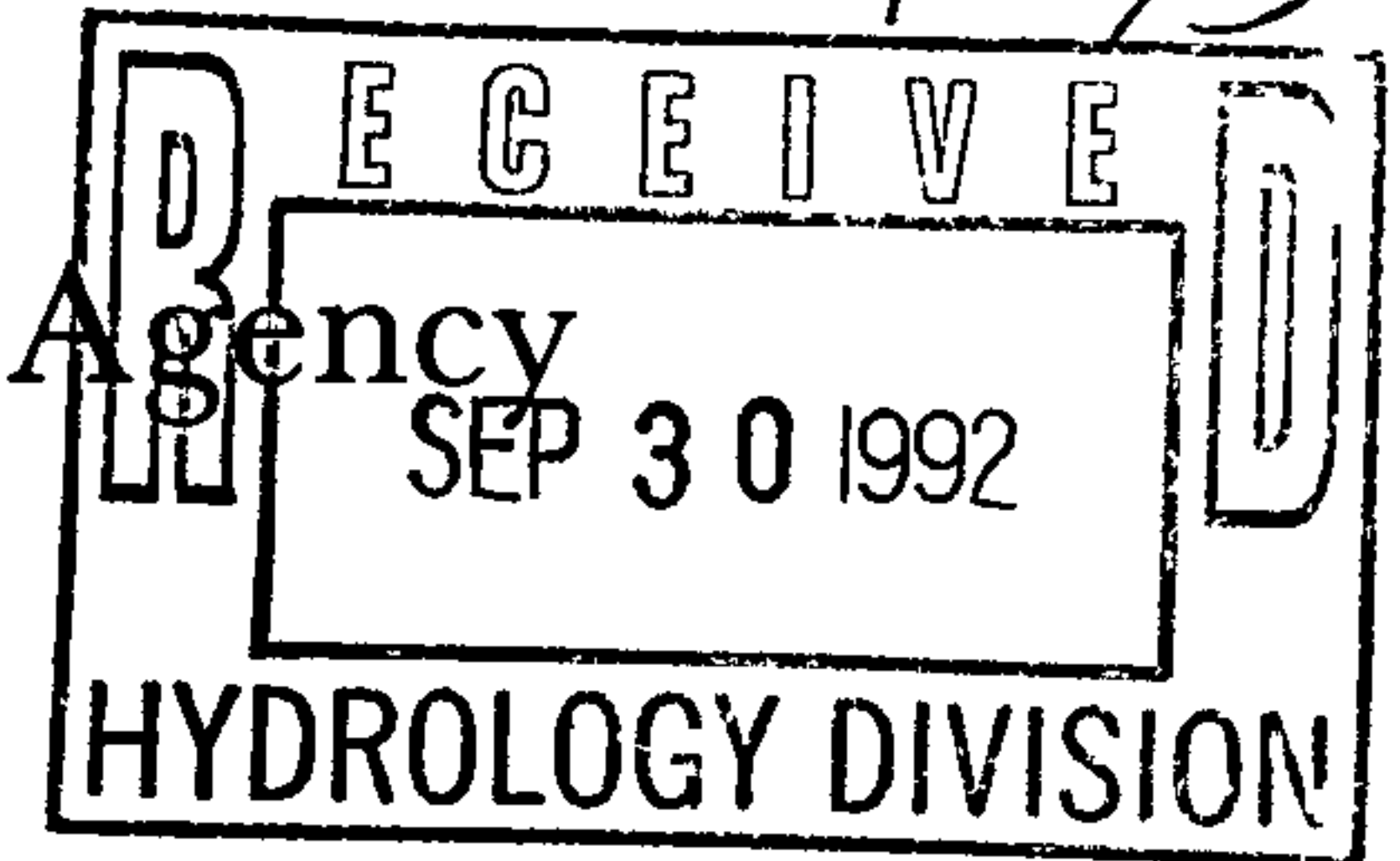
cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque
Mr. Howard C. Stone, P.E.
Water Resources Manager
Bohannon-Huston, Inc.
Mr. Clifford E. Anderson
AMAFACA
Molzen-Corbin & Associates



Federal Emergency Management Agency

Washington, D.C. 20472

(202) 646-3403



CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:
316-PRE

Date: September 23, 1992
Case No.: 92-06-061R
RE: South Branch-Piedras
Marcadas Arroyo
Community: City of Albuquerque,
New Mexico
Community No.: 350002

Dear Mr. Aldaz:

This is in regard to your request for a conditional Letter of Map Revision (LOMR) for the referenced project. Our preacceptance review indicates that we do not have the minimum data and/or fee we need to begin our evaluation of your request. The required data and/or fee are described on the enclosed checklist and must be submitted before we can accept your request. Unless otherwise directed by you in writing, the submitted data and/or fee will not be returned. We will not begin a detailed review of the submitted data until we receive the requested data and/or fee.

We have established a reimbursement procedure to allow for the recovery of costs associated with the review of conditional LOMRs, thereby reducing the expenses to the general taxpayer. The initial fee for this type of request is indicated on the enclosed checklist. Federal, State, and local governments shall be exempt from the fee requirement for projects that they sponsor if written certification is submitted that the project is for public benefit and primarily intended for flood loss reduction to existing development, as opposed to planned development, in identified flood hazard areas.

When you write to us about your request, please include the case number (shown above) in your letter. If you have any questions about the requested data, please call Michael Baker, Jr., Inc., our Technical Evaluation Contractor, at (703) 960-8800, and ask for the Revisions Coordinator for your state.

Sincerely,

William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

Enclosure

cc: The Honorable Louis Saavedra
Mayor, City of Albuquerque
Mr. Clifford E. Anderson
AMFACA
Ms. Lynn Mazur
Bohannon-Huston, Inc.
Molzen-Corbin & Associates
RE: Piedras Marcadas Arroyo



Federal Emergency Management Agency

Washington, D.C. 20472

DATA REQUEST CHECKLIST FOR CONDITIONAL LETTER OF MAP REVISION

Requester: Mr. Gilbert Aldaz, P.E. & L.S. Case No.: 92-06-061R

Community: City of Albuquerque, New Mexico Date: September 23, 1992

Re: South Branch Piedras Marcadas Arroyo

The items checked below in Column 1 are required to process your request for a conditional Letter of Map Revision (LOMR). Items checked in Column 2 have been received and should not be resubmitted unless specifically requested.

<u>(1)</u> <u>Required</u>	<u>(2)</u> <u>Received</u>	
<u> </u>	<u> X </u>	1. Written description of the scope of the proposed project and the methodology used to analyze the project's effects.
<u> </u>	<u> </u>	2. Hydraulic backwater models of the 100-year flood for the following:
<u> X </u>	<u> </u>	a. Existing conditions (cross sections to reflect conditions prior to construction of the project).
<u> </u>	<u> X </u>	b. Proposed conditions (same cross sections as the existing conditions model, reflecting the proposed project).
<u> </u>	<u> </u>	3. Hydraulic backwater models of the 10-, 50-, 100-, and 500-year floods for the following:
<u> N/A </u>	<u> </u>	a. Duplicate of the effective Flood Insurance Study (FIS) model.
<u> N/A </u>	<u> </u>	b. Existing conditions (effective FIS model including cross sections through the project site; cross sections should reflect conditions prior to construction of project).
<u> N/A </u>	<u> </u>	c. Proposed conditions (existing conditions model reflecting the proposed project).
<u> </u>	<u> </u>	4. Floodway hydraulic backwater models of the following:
<u> N/A </u>	<u> </u>	a. Duplicate of effective.
<u> N/A </u>	<u> </u>	b. Existing conditions.
<u> N/A </u>	<u> </u>	c. Proposed conditions.

<u>(1)</u> <u>Required</u>	<u>(2)</u> <u>Received</u>	
<u> </u>	<u> X </u>	5. Copy of the Flood Insurance Rate Map with the project area indicated.
<u> </u>	<u> X </u>	6. Topographic mapping of the entire area covered by the proposed conditions model, indicating the locations of all cross sections used in the hydraulic model and delineating the proposed 100-year floodplain boundary.
		7. Topographic mapping of the entire area covered by the proposed conditions model, indicating the locations of all cross sections used in the hydraulic model and delineating:
<u> N/A </u>	<u> </u>	a. The proposed 100- and 500-year floodplain boundaries.
<u> N/A </u>	<u> </u>	b. The proposed floodway boundary.
<u> </u>	<u> X </u>	8. A concise description of the nature and extent of the requested revision.
<u> </u>	<u> X </u>	9. Evidence that the Chief Executive Officer (CEO) of the affected community, or an official designated by the CEO, was asked to submit the request. (See Section 65.4 of the NFIP regulations.)
<u> </u>	<u> X </u>	10. A general description of the proposed hydrologic conditions on which the conditional revision request is based. (See Paragraph 65.6(c)(1)(i) of the NFIP regulations.)
<u> </u>	<u> X </u>	11. A general description of the proposed hydraulic conditions, including channel modifications or other projects, on which the conditional revision request is based. (See Paragraph 65.6(c)(2)(i) of the NFIP regulations.)
<u> </u>	<u> X </u>	12. New hydrologic analysis, including a brief description of the methodology used, for the 100-year flood(s) for South Branch Piedras Marcadas Arroyo. (See Paragraph 65.6(a)(7) of the NFIP regulations.)

(1) <u>Required</u>	(2) <u>Received</u>	
<u>N/A</u>	_____	13. Evidence that the appropriate local, State, or Federal agency (i.e., _____) has approved the new hydrologic analysis, including the resulting peak discharge values.
<u>N/A</u>	_____	14. Printouts (including full input and output listings) from a calibration model, produced by the requestor, that duplicates the hydraulic computer model used to determine the _____-year water-surface elevations shown for _____ in the effective FIS report and on the effective FIRM. (See Paragraph 65.6(a)(8) of the NFIP regulations.) The calibration model may be either the FIS model, reproduced on the requestor's equipment, or a model that yields computed water-surface profiles that duplicate the flood profiles shown for _____ in the effective FIS report. (If available, the model should be provided on floppy diskette.)
<u>N/A</u>	_____	15. Printouts (including full input and output listings) from a calibration model, produced by the requestor, that duplicates the hydraulic computer model used to determine the limits of the 100-year floodway shown for _____ on the effective Flood Boundary and Floodway Map (FBFM)/FIRM. (See Paragraph 65.6(a)(8) of the NFIP regulations.) The calibration model may be either the FIS floodway model, reproduced on the requestor's equipment, or a model that yields the computed floodway widths and water-surface elevations presented in the Floodway Data Table for _____ in the effective FIS report. (If available, the model should be provided on floppy diskette.)

(1) Required	(2) Received	
<u>N/A</u>	<u> </u>	16. Printouts (including full input and output listings) from a revised hydraulic model for the _____-year water-surface elevations on _____. The revised model must be created from the calibration model (Item 14) and must meet the requirement(s) listed below. _____ The model must be based on the same peak discharge values used in the calibration model (Item 14). _____ The model must be based on the peak discharge values determined in the new hydrologic analysis (Item 12). _____ The model must account for the effects of the proposed hydraulic conditions on which the conditional revision request is based. In addition, the revised model must account for the effects of any encroachments that have occurred in the 100-year floodplain since the FIS hydraulic model was developed and must cover a sufficient length of _____ so that the water-surface elevations computed at cross sections upstream and downstream of the revised reach will match those shown at the same cross sections on the Flood Profiles in the effective FIS report within approximately 0.5 foot. All changes to the input data in the calibration model (Item 14) must be highlighted on the printouts. (See Paragraph 65.6(a)(8) of the NFIP regulations.) (If available, the model should be provided on floppy diskette.)
<u> </u>	<u> X </u>	17. A hydraulic analysis, including a brief description of the methodology used, for the proposed 100-year flood on South Branch Piedras Marcadas Arroyo. (See Paragraph 65.6(a)(9) of the NFIP regulations.)

(1)
Required

(2)
Received

N/A

18. Printouts (including full input and output listings) from a revised hydraulic model for the 100-year floodway on _____.

The revised model must be created from the calibration model (Item 15) and must meet the requirements listed below.

_____ The model must be based on the 100-year peak discharge value(s) used in the calibration model (Item 15).

_____ The model must be based on the 100-year peak discharge value(s) determined in the new hydrologic analysis (Item 12).

_____ The model must account for the effects of the proposed hydraulic conditions on which the conditional revision request is based.

In addition, the revised model must account for the effects of any encroachments that have occurred in the 100-year floodplain since the FIS floodway model was developed and must cover a sufficient length of _____ so that the water-surface elevations and floodway widths computed at cross sections upstream and downstream of the revised reach will match those shown at the same cross sections on the Flood Profiles and Floodway Data Table in the effective FIS report. The revised model must be based on the equal conveyance reduction method unless agreements have been made with affected property owners that an alternative method would be used. The net effect of the proposed hydraulic conditions, the encroachments that have occurred since the FIS floodway model was developed, and the revised floodway limits must not increase the computed 100-year water-surface

(1) <u>Required</u>	(2) <u>Received</u>	elevations by more than 1.0 foot above those computed in the calibration model (Item 14) or those computed in the revised model (Item 16), whichever are lower. (See Paragraph 65.7(b)(4) of the NFIP regulations.) (If available, the model should be provided on floppy diskette.)
<u>N/A</u>		19. A statement from the community (or State, as appropriate) that it is aware of the proposed floodway and has no objections.
	<u>X</u>	20. Corporate limit map and/or annexation ordinances that reflect the current community boundaries.
<u>N/A</u>		21. A topographic map that shows the proposed _____ and _____ boundaries, the locations and alignments of all cross sections used in the revised hydraulic models (Items 16 and 18), stream alignments, road alignments, and the community boundaries. The revised _____ and _____ boundaries must tie into those shown on the effective FIRM and FBFM upstream and downstream of the revised reach. The scale and topographic definition of the map must be sufficient to provide reasonable accuracy, and the map must be certified by a registered professional engineer. (See Paragraphs 65.6(a)(11) and 65.7(b)(5) of the NFIP regulations.)
	<u>X</u>	22. Construction plans, certified by a registered professional engineer, for all project elements, specifically roadway and inlet design for the South Branch Piedras Marcadas Arroyo area and River View Estates.



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

August 31, 1992

Federal Emergency Management Agency
Federal Insurance Administration
Office of Risk Assessment
500 C Street, S.W., Room 422
Washington, DC 20472

RE: (65-DR1-100)
Case No.: 6-91-178
Community: City of Albuquerque,
Bernalillo County,
New Mexico
Community No.: 350002

Attention: Mr. William R. Locke
Chief, Risk Studies Division

Dear Mr. Locke:

This submittal is in response to the letter from the Federal Emergency Management Agency (FEMA) to the City of Albuquerque dated September 24, 1991 requesting additional data in order to continue the review of the Letter of Map Revision request listed below. A copy of that letter is attached for your reference.

Flooding Source(s): South Branch of the Piedras Marcadas Arroyo

Project name or area of revision: South Branch of the Piedras Marcadas Arroyo

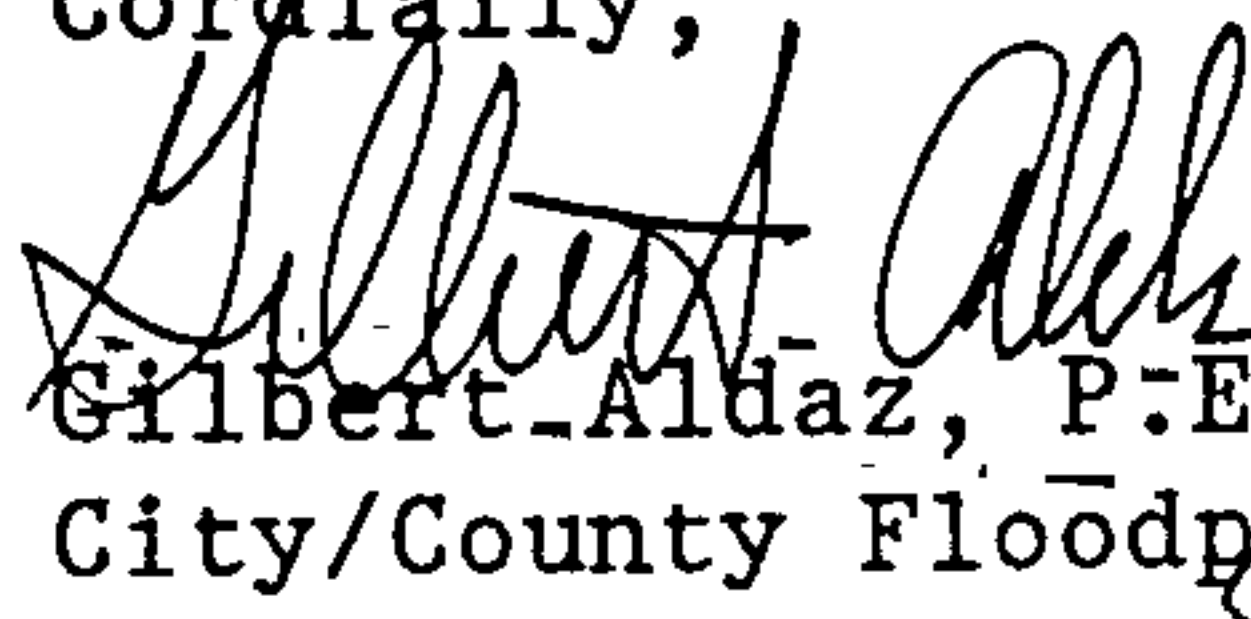
Map Panel(s) affected: Flood Insurance Rate Map Number 350002, panels 0007 C and 0008 C dated October 14, 1983

The letter requested additional analysis due to the changes in criteria by which the Federal Emergency Management Agency reviews revision requests in the City of Albuquerque, FEMA now requires revised hydrologic and hydraulic computations for the entire South Branch of the Piedras Marcadas Arroyo.

As required, enclosed is the requested information prepared by Bohannon-Huston Inc., with the exception of the revision reflecting the Piedras Marcadas Dam. I have attached a letter by AMAFCA, the agency responsible for the Piedras Marcadas Dam revision. In the letter AMAFCA request that the CLOMR (65-DR-100) for the South Branch be allowed to proceed in advance of the LOMR for the Piedras Marcadas Dam, please allow this request to proceed.

If you should have any questions concerning this submittal, please do not hesitate to call me at (505) 768-2666.

Cordially,


Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator

xc: Clifford E. Anderson, AMFACA
Lynn Mazur, Bohannon-Huston, Inc.
Cleve Matthews, Paseo Del Norte Joint Venture
PUBLIC WORKS DEPARTMENT

GA

October 14, 1991

OCT 18 1991

Mr. Cliff Anderson
 AMAFCA
 2600 Prospect N.E.
 Albuquerque, New Mexico 87108

Re: Floodplain Modification for the South Branch of the Piedras Marcados Arroyo through the Shenandoah and Prairie Ridge Subdivisions

Dear Cliff:

As you know, we have been working with the Paseo del Norte Joint Venture to pursue a flood map amendment for the referenced project. The request for letter of map revision (LOMR) was previously submitted to the Federal Emergency Management Agency (FEMA). A conditional LOMR was approved on June 17, 1988 by FEMA, subject to the provision of as-built drawings for the storm sewer and channel improvements within the subdivisions indicating that the improvements had been constructed as designed.

Attached is a letter from FEMA dated September 24, 1991 which requires that the entire arroyo and dam be analyzed in accordance with the newly approved and adopted hydrologic methods. As we discussed on October 7, 1991, AMAFCA is willing to incorporate this analysis into the ongoing study that AMAFCA has commissioned for the entire Piedras Marcados Arroyo System under the following circumstances:

- o All materials previously submitted to FEMA would be made available to AMAFCA and their consultant for use in the analysis.
- o The responsibility for any possible improvement requirements to the arroyo system that may be recommended as a result to the analysis will be determined in the future, however,
- o The Paseo del Norte Joint Venture will make available land within or adjacent to the proposed park at the corner of Butterfield and Golf Course Road for the purpose of a surface drainage or detention facility, if required.

In addition, AMAFCA will allow the final plat for the Prairie Park Subdivision to be filed without a specific reference to the floodplain, under the following conditions:

- o A separate document be prepared by AMAFCA to Paseo del Norte Joint Venture identifying the affected lots as being encumbered with 100-year flood hazard, until such time as further analysis or improvements within the arroyo system are shown to remove such flood hazards and the request for map revision is approved by FEMA.
- o The drainage report approved by the City for the Prairie Park Subdivision, be provided by this office to AMAFCA for use in the analysis, and

PRINCIPALS

LARRY W. HUSTON

MICHAEL M. EMERY, P.E.

BRIAN G. BURNETT, P.E.

BOHANNAN-HUSTON INC.



7109

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE,
 TEL (505) 823-1000 FAX (505) 821-0892

Mr. Cliff Anderson
October 14, 1991
Page -2-

- o All improvements required by that report for Prairie Park Subdivision are completed and accepted for maintenance or are financially guaranteed to be constructed.

In accordance with our discussions, transmitted herewith are the following materials:

- o Two copies of the original drainage report for the Prairie Ridge Development prepared by Community Sciences in May, 1987.
- o One set of prints of the as-built drawings for the storm drainage improvements through the development area.
- o Prints of the final plat along with two copies of the approved drainage report for the Prairie Park Subdivision.
- o A copy of relevant correspondence from FEMA dealing with the LOMR request and subsequent responses.

We hope that this letter accurately and completely summarizes our discussions of October 7, 1991 and that the materials submitted are sufficient to fulfill the initial data supply obligations of the developer in this matter. Please don't hesitate to call me if we can be of further assistance by answering any questions you may have or by supplying any further information that you may require.

Sincerely,



Kerry L. Davis, P.E.
Vice President
Community Development and Planning

Enclosures

cc: Mr. Cleve Matthews
Mr. Gilbert Aldaz

KLD/mls
Job No. 91200.02



Federal Emergency Management Agency

Washington, D.C. 20472

SEP 24 1991

SEP 30 1991

IN REPLY REFER TO:
(65-DR1-100)

Case No.: 6-91-178

Community: City of Albuquerque,
Bernalillo County,
New Mexico

Community No.: 350002

The Honorable Louis Saavedra
Mayor of the City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Dear Mayor Saavedra:

This is in reference to a July 31, 1991 request for a revision to the National Flood Insurance Program maps for your community. A copy of the incoming request is enclosed; information pertinent to the revision request is listed below.

Requestor: Mr. Gilbert Aldaz, P.E., L.S., City of Albuquerque Flood-plain Administrator

Flooding source(s): South Branch of the Piedras Marcadas Arroyo

Project name or area of revision: Shenandoah Units II and III and
Prairie Ridge Units 4 and 5

Map Panel(s) affected: Flood Insurance Rate Map (FIRM) number 350002,
panels 0007 C and 0008 C, dated October 14, 1983

Please note that due to the changes in criteria by which the Federal Emergency Management Agency reviews revision requests in the City of Albuquerque, we require revised hydrologic and hydraulic computations for the entire South Branch of the Piedras Marcadas Arroyo. These computations should conform to the guidelines set forth in our letters of October 29, 1990, February 7, 1991, and June 5, 1991 (copies enclosed), and to the January 1991 version of the City of Albuquerque's Development Process Manual. In addition, because of the direct relation between the channelization of the South Branch of the Piedras Marcadas Arroyo and the Piedras Marcadas Dam, we require all data necessary to perform a revision reflecting the construction of the Piedras Marcadas Dam. This data should also conform to the guidelines stated above. The additional data required are specified on the enclosed checklist. To provide assistance in preparing the required data, we have enclosed a copy of Part 65 of the National Flood Insurance Program and Related Regulations and a document entitled Guide for the Submittal of Requests to Revise National Flood Insurance Program Maps. The procedures and guidelines outlined in these documents should be followed.

Before we revise your community's FIRM to reflect the effects of the above-referenced projects on South Branch of the Piedras Marcadas Arroyo, we must receive the information specified on the enclosed checklist. The required information should be provided by the requestor to the following address:

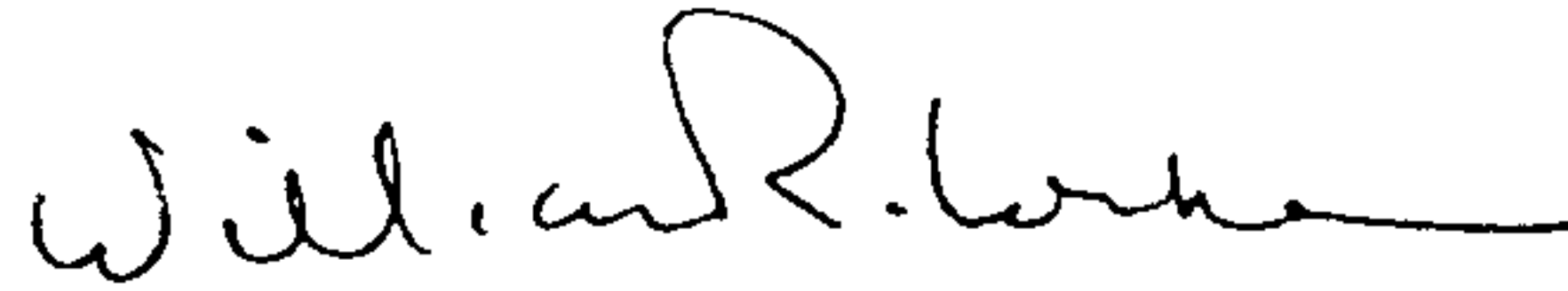
Federal Emergency Management Agency
Federal Insurance Administration
Office of Risk Assessment
500 C Street, S.W., Room 422
Washington, DC 20472

Attention: Mr. William R. Locke
Chief, Risk Studies Division

The case number referenced above should be included on any further correspondence regarding this request. Further action on this request has been suspended pending receipt of the specified additional data. After receiving the required data as indicated on the enclosed checklist, we will continue our evaluation of the request. If additional information is required to complete our evaluation, we will inform you.

Should you have any questions or if additional time is required to provide the requested information, please contact Matthew B. Miller of my staff at (202) 646-3461.

Sincerely,



William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

Enclosures

cc: Mr. Gilbert Aldaz, P.E., L.S. ✓
Mr. Kerry L. Davis, P.E., Bohannon-Huston, Inc.



Federal Emergency Management Agency

Washington, D.C. 20472

Case No.: 6-91-178
Community: City of Albuquerque,
Bernalillo County,
New Mexico

DATA REQUEST CHECKLIST FOR REVISIONS TO NATIONAL FLOOD INSURANCE PROGRAM MAPS

Requestor: Mr. Gilbert Aldaz, P.E., L.S.

Date: SEP 24 1991

The items checked below in Column 1 are required to process the request for a revision to the National Flood Insurance Program (NFIP) maps. Items checked in Column 2 have been received and should not be resubmitted unless specifically requested.

(1) Required	(2) Received
-----------------	-----------------

- | | | |
|---------------|---------------|---|
| <u>X</u> | <u> </u> | 1. A description of the nature and extent of the revision request. |
| <u> </u> | <u>X</u> | 2. Community approval of the revision request. |
| <u>X</u> | <u> </u> | 3. A brief statement describing the methodology used to determine the hydrologic and/or hydraulic parameters. |
| <u>X</u> | <u> </u> | 4. Hydrologic computations for the 100-year flood reflecting the completed project, from Shenandoah Units II and III to the Piedras Marcadas Dam. |
| | | 5. Hydraulic computations for the 100-year flood for the following: |
| <u>--</u> | <u>--</u> | a. Floodplain conditions prior to construction of the project |
| <u>X</u> | <u> </u> | b. Floodplain conditions after construction of the project, from Shenandoah Units II and III to the Piedras Marcadas Dam. |
| <u>--</u> | <u>--</u> | 6. Map of the community's current corporate limits. |
| <u>X</u> | <u> </u> | 7. Topographic mapping of the entire area covered by the post-construction conditions computations, indicating the locations of all cross sections used in the hydraulic computations and delineating the 100-year floodplain boundary. |
| <u>X</u> | <u> </u> | 8. Annotated NFIP maps delineating the 100-year floodplain boundary, stream alignment, roads and road names, and corporate limits. |

(1) Required	(2) Received	
<u> X </u>	<u> </u>	9. "As-built" plans, certified by a registered professional engineer, for the channel modifications in Shenandoah Units II and III.
<u> -- </u>	<u> -- </u>	10. Certification by a registered professional engineer or soils engineer that fill placed meets the requirements for 95% compaction.
<u> X </u>	<u> </u>	11. Certification from a Federal agency or registered professional engineer indicating the Piedras Marcadas Dam is adequately designed and will be maintained to withstand a 100-year flood event.
<u> X </u>	<u> </u>	12. An operation and maintenance plan for the Piedras Marcadas Dam.
<u> X </u>	<u> </u>	13. Written statement from the community indicating that they will accept ultimate responsibility for maintenance of the Piedras Marcadas Dam.
<u> -- </u>	<u> -- </u>	14. A study that addresses interior drainage for any area protected by a levee or dike system.
<u> X </u>	<u> </u>	15. Other: The items referenced in our October 1, 1987 letter (copy enclosed) regarding the Piedras Marcadas Dam.



Log 91-08-33 *ALL* *Diane*

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

July 31, 1991

Diane Leatherwood
Emergency Management Specialist
Region VI, Federal Center
800 North Loop 288
Denton, Texas 76201-3698

RE: REQUEST FOR LETTER OF MAP REVISION FOR THE SOUTH BRANCH OF THE
PIEDRAS MARCADAS ARROYO

Dear Ms. Leatherwood:

This submittal is in response to the letter from the Federal Emergency Management Agency (FEMA) to the City of Albuquerque dated June 17, 1988 regarding a Conditional Letter of Map Revision (LOMR) along the Piedras Marcadas Arroyo. A copy of that letter is attached for reference, which states that the Conditional LOMR is approved by FEMA and that the Final LOMR will be issued pending receipt of the "as-built" plans for the channel modification projects. The other two items that were required by FEMA, which includes the hydrologic calculations and the topographic mapping representing as-built conditions are indicated to have already been received and approved.

As required, enclosed are the revised "as-built" plans of the completed channel modifications, consisting of two storm sewer projects through this reach of the arroyo. The reason that this information had not been submitted previously was that a change in the land ownership had occurred. Could you please proceed to issue the Letter of Map Revision.

If you should have any questions concerning this submittal, please do not hesitate to call me at (505) 768-2650.

Cordially,

RECEIVED

AUG 16 1991

DEPT. OF PUBLIC WORKS

Gilbert Aldaz
Gilbert Aldaz, P.E. & L.S.

City/County Floodplain Administrator

xc: Kerry L. Davis, P.E.

GA

PUBLIC WORKS DEPARTMENT

(WP+1596)

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

APPLICATION FOR
CONDITIONAL LETTER OF MAP REVISION
FOR

THE SOUTH BRANCH OF THE PIEDRAS MARCADAS ARROYO

August 20, 1992

PREPARED BY:

BOHANNAN-HUSTON, INC.
7500 JEFFERSON NE
COURTYARD I
ALBUQUERQUE, NM 87109

JOB NO. 91200.20

I CERTIFY THAT I AM A REGISTERED PROFESSIONAL ENGINEER
IN THE STATE OF NEW MEXICO AND THAT THIS REPORT WAS
PREPARED BY ME OR UNDER MY SUPERVISION.



HOWARD C. STONE, P.E.

E:\HYDRO\9120020\PIEDRAS.RPT



**DATA REQUEST CHECKLIST
FOR CONDITIONAL LETTER OF MAP REVISION**

Requestor: Mr. Gilbert Aldaz, P.E., L.S. Case No.: (65-DR-100) 6-91-178
City of Albuquerque
 Community: City of Albuquerque Date: 7/6/92
New Mexico
 Re: South Branch Piedras Marcadas Arroyo

The items checked below in Column 1 are required to process your request for a conditional Letter of Map Revision (LOMR). Items checked in Column 2 have been received and should not be resubmitted unless specifically requested.

<u>(1)</u> <u>Required</u>	<u>(2)</u> <u>Received</u>	
<u>X</u>	<u> </u>	1. Written description of the scope of the proposed project and the methodology used to analyze the project's effects. (Pg. 1-4)
		2. Hydraulic backwater models of the 100-year flood for the following:
<u>N/A</u>	<u> </u>	a. Existing conditions (cross sections to reflect conditions prior to construction of the project).
<u>X</u>	<u> </u>	b. Proposed conditions (same cross sections as the existing conditions model, reflecting the proposed project). (Pg. 92-107)
		3. Hydraulic backwater models of the 10-, 50-, 100-, and 500-year floods for the following:
<u>N/A</u>	<u> </u>	a. Duplicate of the effective Flood Insurance Study (FIS) model.
<u>N/A</u>	<u> </u>	b. Existing conditions (effective FIS model including cross sections through the project site; cross sections should reflect conditions prior to construction of project).
<u>N/A</u>	<u> </u>	c. Proposed conditions (existing conditions model reflecting the proposed project).
		4. Floodway hydraulic backwater models of the following:
<u>N/A</u>	<u> </u>	a. Duplicate of effective.
<u> </u>	<u> </u>	b. Existing conditions.
<u> </u>	<u> </u>	c. Proposed conditions.

(1) Required	(2) Received	
<u>X</u>	<u> </u>	5. Copy of the Flood Insurance Rate Map with the project area indicated. (Exhibit 1)
<u>X</u>	<u> </u>	6. Topographic mapping of the entire area covered by the proposed conditions model, indicating the locations of all cross sections used in the hydraulic model and delineating the proposed 100-year floodplain boundary. (Exhibits 2 & 3)
		7. Topographic mapping of the entire area covered by the proposed conditions model, indicating the locations of all cross sections used in the hydraulic model and delineating:
<u>N/A</u>	<u> </u>	a. The proposed 100- and 500-year floodplain boundaries.
<u>N/A</u>	<u> </u>	b. The proposed floodway boundary.
<u>X</u>	<u> </u>	8. A concise description of the nature and extent of the requested revision. (Pg. 1)
<u>X</u>	<u> </u>	9. Evidence that the Chief Executive Officer (CEO) of the affected community, or an official designated by the CEO, was asked to submit the request. (See Section 65.4 of the NFIP regulations.) (Pg. 120)
<u>X</u>	<u> </u>	10. A general description of the proposed hydrologic conditions on which the conditional revision request is based. (See Paragraph 65.6(c)(1)(i) of the NFIP regulations.) (Pg. 2-3, 120)
<u>X</u>	<u> </u>	11. A general description of the proposed hydraulic conditions, including channel modifications or other projects, on which the conditional revision request is based. (See Paragraph 65.6(c)(2)(i) of the NFIP regulations.) (Pg. 3,4)
<u>X</u>	<u> </u>	12. New hydrologic analysis, including a brief description of the methodology used, for the <u>100-year flood(s) for South Branch Piedras Marcadas</u> . (See Paragraph 65.6(a)(7) of the NFIP regulations.) (Pg. 2)

(1)
Required

(2)
Received

X

13. Evidence that the appropriate local, State, or Federal agency (i.e., City of Albuquerque) has approved the new hydrologic analysis, including the resulting peak discharge values. (Pg. 123)

N/A

14. Printouts (including full input and output listings) from a calibration model, produced by the requestor, that duplicates the hydraulic computer model used to determine the -year water-surface elevations shown for in the effective FIS report and on the effective FIRM. (See Paragraph 65.6(a)(8) of the NFIP regulations.) The calibration model may be either the FIS model, reproduced on the requestor's equipment, or a model that yields computed water-surface profiles that duplicate the flood profiles shown for in the effective FIS report.

N/A

15. Printouts (including full input and output listings) from a calibration model, produced by the requestor, that duplicates the hydraulic computer model used to determine the limits of the 100-year floodway shown for on the effective Flood Boundary and Floodway Map (FBFM)/FIRM. (See Paragraph 65.6(a)(8) of the NFIP regulations.) The calibration model may be either the FIS floodway model, reproduced on the requestor's equipment, or a model that yields the computed floodway widths and water-surface elevations presented in the Floodway Data Table for in the effective FIS report.

(1)
Required

(2)
Received

N/A

16. Printouts (including full input and output listings) from a revised hydraulic model for the _____-year water-surface elevations on _____. The revised model must be created from the calibration model (Item 14) and must meet the requirement(s) listed below.

_____ The model must be based on the same peak discharge values used in the calibration model (Item 14).

_____ The model must be based on the peak discharge values determined in the new hydrologic analysis (Item 12).

_____ The model must account for the effects of the proposed hydraulic conditions on which the conditional revision request is based.

In addition, the revised model must account for the effects of any encroachments that have occurred in the 100-year floodplain since the FIS hydraulic model was developed and must cover a sufficient length of _____

_____ so that the water-surface elevations computed at cross sections upstream and downstream of the revised reach will match those shown at the same cross sections on the Flood Profiles in the effective FIS report within approximately 0.5 foot. All changes to the input data in the calibration model (Item 14) must be highlighted on the printouts. (See Paragraph 65.6(a)(8) of the NFIP regulations.)

X

17. A hydraulic analysis, including a brief description of the methodology used, for the 100-year flood on _____. (See Paragraph 65.6(a)(9) of the NFIP regulations.) (Pg. 3,4 & 90)

(1)
Required

(2)
Received

N/A

18. Printouts (including full input and output listings) from a revised hydraulic model for the 100-year floodway on _____.

The revised model must be created from the calibration model (Item 15) and must meet the requirements listed below.

_____ The model must be based on the 100-year peak discharge value(s) used in the calibration model (Item 15).

_____ The model must be based on the 100-year peak discharge value(s) determined in the new hydrologic analysis (Item 12).

_____ The model must account for the effects of the proposed hydraulic conditions on which the conditional revision request is based.

In addition, the revised model must account for the effects of any encroachments that have occurred in the 100-year floodplain since the FIS floodway model was developed and must cover a sufficient length of _____ so that the water-surface elevations and floodway widths computed at cross sections upstream and downstream of the revised reach will match those shown at the same cross sections on the Flood Profiles and Floodway Data Table in the effective FIS report. The revised model must be based on the equal conveyance reduction method unless agreements have been made with affected property owners that an alternative method would be used. The net effect of the proposed hydraulic conditions, the encroachments that have occurred since the FIS floodway model was developed, and the revised floodway limits must not increase the computed 100-year water-surface

(1)
Required

(2)
Received

elevations by more than 1.0 foot above those computed in the calibration model (Item 14) or those computed in the revised model (Item 16), whichever are lower. (See Paragraph 65.7(b)(4) of the NFIP regulations.)

19. Documentation, as shown below, concerning the approval of the revised floodway. (See Paragraphs 65.7(b)(1), (2), and (3) of the NFIP regulations.)

N/A

- a. Copy of the public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

N/A

- b. Copy of a letter notifying the appropriate State agency of the floodway revision.

N/A

- c. Documentation of the approval of the revised floodway by the appropriate State agency.

X

20. Corporate limit map and/or annexation ordinances that reflect the current community boundaries. (Exhibit 4)

N/A

21. A topographic map that shows the proposed _____ and _____ boundaries, the locations and alignments of all cross sections used in the revised hydraulic models (Items 16 and 18), stream alignments, road alignments, and the community boundaries. The revised _____ and _____ boundaries must tie into those shown on the effective FIRM and FBFM upstream and downstream of the revised reach. The scale and topographic definition of the map must be sufficient to provide reasonable accuracy, and the map must be certified by a registered professional engineer. (See Paragraphs 65.6(a)(11) and 65.7(b)(5) of the NFIP regulations.)

(1)
Required

(2)
Received

X

22. Construction plans, certified by a registered professional engineer, for all project elements, specifically roadway and inlet design and Riverview Park detention pond (Appendix B)

23. The following data concerning the ability of the
proposed to be built along

to meet the minimum design and maintenance requirements established for levee systems in Section 65.10 of the NFIP regulations:

N/A

a. Freeboard -- Evidence which shows that the levee(s) will meet the minimum freeboard requirements set forth in Paragraph 65.10(b)(1) of the NFIP regulations.

N/A

b. Closures -- Evidence which show that all drainage structures that will penetrate the levee(s) will be fitted with closure devices that (1) will be structural parts of the levee(s) during operation and (2) are designed according to sound engineering practice, as set forth in Paragraph 65.10(b)(2) of the NFIP regulations.

N/A

c. Embankment Protection -- An engineering analysis which demonstrates that no appreciable erosion of the levee embankment(s) can be expected during the 100-year flood. The analysis must be performed according to the guidelines set forth in Section 65.10(b)(3) of the NFIP regulations.

N/A

d. Stability -- An engineering analysis that evaluates the stability of the levee embankment(s) and foundation(s). The analysis must be performed according to the guidelines set forth in Paragraph 65.10(b)(4) of the NFIP regulations.

(1) Required	(2) Received
-----------------	-----------------

N/A	
-----	--

e. **Settlement** -- An engineering analysis that assesses the potential for and magnitude of losses of freeboard that may result from settlement of the levee(s) and that demonstrates that the minimum required freeboard will be maintained. The analysis must be performed according to the guidelines set forth in Paragraph 65.10(b)(5) of the NFIP regulations.

N/A	
-----	--

f. **Interior Drainage** -- An engineering analysis of the potential hazards associated with floodwaters that originate on the landward side of the levee(s) and that would be prevented by the levee(s) from flowing into _____. The analysis must be performed according to the guidelines set forth in Paragraph 65.10(b)(6) of the NFIP regulations.

N/A	
-----	--

24. **Other:** _____

 _____.

N/A	
-----	--

25. **Community acknowledgment of the conditional LOMR request (form enclosed for community's use, if desired).**

<u>(1)</u> <u>Required</u>	<u>(2)</u> <u>Received</u>		
		26. Initial fee for conditional LOMR	
_____	_____	a. Review of new hydrology	\$245
_____	_____	b. New bridge or culvert (no channelization)	\$490
_____	_____	c. Channel modifications only	\$560
_____	_____	d. Channel modification and new bridge or culvert	\$735
_____	_____	e. Levees, berms, or other structural measures	\$945
_____	_____	f. Structural measures on alluvial fans	\$2,800
_____	_____	g. Fee exemption certification in compliance with Section 72.5 of National Flood Insurance Program regulations	
_____	_____	h. Additional initial fee	_____

The items checked in Column 1 should be sent to the following address:

Federal Emergency Management Agency
Federal Insurance Administration
Office of Risk Assessment
500 C Street, SW., Room 422
Washington, D.C. 20472

Attention: Mr. Charles A. Lindsey

Any initial fee for the request, in the form of a check or money order made payable to the National Flood Insurance Program, should be sent by Registered Mail, Return Receipt Requested. The case number referenced above should be included on the check or money order for identification purposes.

CLOMR CHECKLIST ADDENDUM

(1)
Required

(2)
Received

N/A

27. Data which show that any primary frontal dune (as defined in Section 59.1 of the NFIP regulations) that is to be considered an effective barrier to the 100-year flood surge and associated wave action is either a natural dune or an artificial (designed and constructed) dune that is well established and has long standing vegetative cover. It must also be shown that the cross sectional area of the portion of the dune seaward of the dune crest, measured perpendicular to the shoreline above the 100-year stillwater elevation, is greater than 540 square feet. As an alternative to the data described above, authoritative historical documentation may be submitted which shows that the primary frontal dune at a specific site has withstood previous 100-year storm surges and associated wave action. (See Section 65.11 of the NFIP regulations.)

28. The following data concerning the proposed placement of fill in the [100-year floodplain of _____, where no regulatory floodway has been established/regulatory floodway of _____], which we have determined could cause a rise in the computed 100-year water-surface elevations greater than that allowed by Section 60.3[(c)(10)/(d)(3)]. (See Section 65.12 of the NFIP regulations.):

N/A

a. **Community Request** -- A request from the affected community for the Federal Emergency Management Agency's conditional approval of the proposed change, accompanied by the appropriate initial fee or a request for an exemption from the fee, whichever is appropriate. (See Item _____ of this checklist.)

N/A

b. **Evaluation of Alternatives** -- An evaluation of alternative actions would not result in a rise in the computed 100-year water-surface elevations greater than

(1) Required	(2) Received
-----------------	-----------------

that allowed by Section 60.3[(c)(10)/(d)(3)]. The evaluation must demonstrate that the alternatives are not feasible.

N/A	
-----	--

c. Legal Notice -- Documentation of individual legal notice to all property owners affected by the proposed action, both within and outside the community, that explains the effect of the proposed action on their properties.

N/A	
-----	--

d. Concurrence of Other Communities -- Evidence that the CEOs of other communities affected by the proposed action concur in that action.

N/A	
-----	--

e. Certification Concerning Structures -- Certification that no structures are in the areas that will be affected by the increased 100-year water-surface elevations.

N/A	
-----	--

f. Flood Elevation Revision Request -- A request for a revision to the existing computed 100-year water-surface elevations, submitted according to the procedures outlined in Section 65.6 of the NFIP regulations. The required technical supporting data are listed as Items _____ of this checklist.

N/A	
-----	--

g. Floodway Revision Request -- A request for a revision to the regulatory floodway, submitted according to the procedures outlined in Section 65.7 of the NFIP regulations. The required technical supporting data are listed as Items _____ of this checklist.

(1) Required	(2) Received
-----------------	-----------------

29. The following data concerning the effect of _____ on the alluvial fan Special Flood Hazard Area:

N/A

a. Engineering analyses that quantify the design discharges and the volumes of water, debris, and sediment associated with the 100-year flood at the apex of the fan under current watershed conditions and under potential adverse conditions (e.g., deforestation of the watershed by fire). The potential for debris flow and sediment movement must be assessed with an engineering method acceptable to the Federal Emergency Management Agency. The assessment should consider the characteristics and availability of sediment in the drainage basin above the apex and on the alluvial fan.

N/A

b. Engineering analyses which show that _____ will accommodate the estimated 100-year peak discharge, consisting of the total volume of water, debris, and sediment determined in Item a. above, and the associated hydrodynamic and hydrostatic forces.

N/A

c. Engineering analyses which show that _____ has/have been designed to withstand the potential erosion and scour forces.

N/A

d. Engineering analyses or evidence which shows that _____ will provide protection against flows that migrate or suddenly move to the project site from other portions of the fan.

(1) Required	(2) Received
-----------------	-----------------

<u>N/A</u>	_____
------------	-------

e. Engineering analyses that assess the methods by which concentrated floodwater and the associated sediment load will be disposed of and the effect of those methods on adjacent properties.

<u>N/A</u>	_____
------------	-------

f. Engineering analyses which demonstrate that flooding from local runoff, or sources other than the fan apex, will be insignificant or will otherwise be accommodated by appropriate flood control or drainage measures.

<u>N/A</u>	_____
------------	-------

g. Evidence that the effect of _____ on flood hazards in all areas of the fan (including those not protected by _____) and the design and maintenance requirements for the various elements of _____ were reviewed and approved by the community, State, or local agency that has jurisdiction over flood control activities in the community.

<u>N/A</u>	_____
------------	-------

30. An engineering analysis that demonstrates that the proposed fill slope protection will be adequate to protect against the impact of floodwaters moving at velocities expected to occur during the 100-year flood.

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Appendix B (Bound Separately)

STORM DRAIN PLAN AND PROFILE SHEETS
RIVERVIEW ESTATES SUBDIVISION PLANS
RIVERVIEW ESTATES POND DESIGN

Appendix C

SEDIMENT BULKING FACTORS FOR SOUTH BRANCH
COPY OF "SEDIMENT ISSUES IN THE PIEDRAS MARCADAS WATERSHED"

EXHIBITS

1991 ORTHOPHOTO TOPOGRAPHIC MAP WITH PROPOSED FLOODPLAIN	EXHIBIT 1
DRAINAGE BASIN MAP	EXHIBIT 2
FIRM WITH PROJECT AREA	EXHIBIT 3
COA CORPORATE LIMITS MAP	EXHIBIT 4
PANEL 7 - FIRM MAP WITH NEW FLOODPLAIN BOUNDARY	EXHIBIT 5
PANEL 8 - FIRM MAP WITH NEW FLOODPLAIN BOUNDARY	EXHIBIT 6

INTRODUCTION

This report serves as a response to a letter received from the Federal Emergency Management Agency (FEMA) requesting additional information before a Letter of Map Revision (LOMR) is issued for the South Branch Piedras Marcadas Arroyo. The reference case number is (65-DR1-100)6-91-178. The South Branch watershed is in the northwest section of Albuquerque, New Mexico. Calle Nortena is to the north, Coors Road (State Road 448) is to the east, an existing subdivision of Taylor Ranch is to the south, and an undeveloped area is to the west. It drains an area of approximately 0.76 square miles.

As shown on Exhibit 1, the area in the western part of the watershed has been previously developed. An earthen channel and storm drain system were constructed to convey the discharge to the Piedras Marcadas Dam, a facility maintained by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) (see Exhibit 6). The proposed construction along with the storm drain constructed in 1988 have channelized storm runoff and will remove the 100-year floodplain from the area.

BACKGROUND

Basin 404 is the westernmost area of the watershed. It is in an undeveloped area known as the Volcano Cliffs Subdivision. Approximately one-third of the discharge from the basin flows down Roanoke Avenue in basin 404.1. Two-thirds is diverted by a constructed earthen swale which carries 30 cubic feet per second (cfs) of discharge out of the watershed. The remainder flows down Chesapeake Road in basin 404.1 and with the previous discharge flows into an earthen channel maintained by the City of Albuquerque (COA). This channel outfalls into an inlet structure for the storm drain. Basins 403.2 and 403.3 discharge directly into the inlet structure through concrete rundowns. The remaining basins that have been previously developed, 402, 403, and 403.1, discharge into the storm drain through inlets.

The South Branch Piedras Marcadas storm drain was constructed from the inlet structure at the intersection of Primrose Drive and Firewheel Road down the Butterfield Trail right-of-way to the outfall at the Piedras Marcadas Dam, a distance of approximately 4200 feet (see Appendix B). It was completed after the floodplain maps of 1983 were prepared. When this storm drain was constructed, the floodplain was effectively removed. At the time of its construction, application for a LOMR had been made to FEMA and was granted as a Conditional LOMR (Case No. 88-06-28R) in a letter to Mayor Ken Schultz dated June 17, 1988. The Conditional LOMR would have become an unconditional LOMR and would have resulted in a map revision upon the routine submission of as-built plans to FEMA. However, as-built plans were not submitted to FEMA until July 31, 1991. During the interim period, the hydrologic criteria used for analyzing potential map revisions was changed. After the as-built plans were finally submitted, FEMA responded that the analysis which had previously been performed in support of the LOMR request would need to be redone in accordance with the new hydrologic methods identified in the DPM Update. (Please refer to the correspondence included in Appendix A). This submittal includes the revised analysis for the existing subdivisions and two proposed subdivisions that were not included in the original submittal for a Conditional LOMR.

Basin 401 is the easternmost area of the watershed and is undeveloped. However, a portion of the basin is currently being developed for residential use. It has been further subdivided into smaller basins to reflect this development (See Exhibit 2). Some of this development lies within the area addressed by the Riverview Master Drainage Plan prepared by Community Sciences in 1985. Because runoff calculations in this prior report were made using the old SCS method and not the initial abstraction-infiltration method identified within the proposed DPM Update, FEMA has

indicated that the runoff quantities calculated in that report are not acceptable for issuance of a LOMR for the South Branch. In addition, the land development has followed a different pattern from that which had been established in 1985. Therefore, the previously approved 1985 report has not been used to establish drainage criteria for the present submittal.

Basins A-1, A-2, A-3, a portion of A-4, and A-8 within basin 401 comprise the section of the Riverview Subdivision that will soon be developed. The drainage report and construction plans for the Riverview Estates Subdivision have been prepared by this office and have been approved by AMAFCA and the City. This subdivision includes basins A-1, A-2, A-3, and the portion of A-4 that will not remain open space. Design plans are being prepared for basin A-8, and construction will begin later this year. A HYMO model put together by another engineering consultant, Molzen-Corbin & Associates, for a study of the Piedras Marcadas Dam was revised to model ultimate development in the South Branch watershed for this report. The drainage basins were modified to model the existing and proposed storm drain inlet conditions in greater detail.

A development plan is also being prepared by Community Sciences for the Riverton Subdivision basins A-6 and A-7, which is being developed by Sivage Thomas Homes (see Exhibit 2). It has been proposed by the Community Sciences report that a storm drain connection be made to the Piedras Marcadas storm drain to convey developed runoff from basins A-6 and A-7 to Butterfield Trail. With this in mind, the present plan has made allowances for the runoff into a new manhole within Butterfield Trail.

As mentioned previously, Molzen-Corbin & Associates is presently preparing a report for AMAFCA which will analyze the entire Piedras Marcadas watershed in order to determine the effects of upstream development on the existing dam. They are using the updated computerized HYMO model to determine runoff rates. The Letter of Map Revision for the Piedras Marcadas Dam will be submitted by AMAFCA under separate cover and will incorporate this analysis of the South Branch watershed (see Appendix A, page 123).

ANALYSIS METHODS

The hydrologic calculations which appear herein analyze the proposed developed discharge for the 100-year, 24-hour rainfall event. The peak discharge of runoff has been calculated using the computerized hydrologic model HYMO (Problem-Oriented Computer Language for Hydrologic Modeling, by J.R. Williams and R.W. Hann Jr., ARS-S-9, 1973) with subsequent modifications by AMAFCA. This program utilizes the initial abstraction/uniform infiltration method as identified within the proposed COA Development Process Manual (DPM) Update. Another modification is computing hydrographs by the split watershed method. A hydrograph is computed for the impervious portion and a separate one for the pervious portion. The two hydrographs are then added to compute the basin hydrograph.

The 100-year floodplain widths were determined from the hydraulic calculations which appear herein. Street and channel capacities were computed using Manning's equation with Manning's roughness coefficients as identified within the latest edition of the DPM. The capacities of streets were computed using the full street right-of-way section. The cross-sections (taken from Exhibit 8) used for the hydraulic analyses are shown on Exhibit 1, Exhibit 5 and Exhibit 6. The normal depth and top width were calculated for each cross-section. The top width is the 100-year floodplain which is also shown on Exhibit 1, Exhibit 5 and Exhibit 6. These calculations are included in Appendix A.

A few areas warranted the use of weir analysis to estimate the limits of the floodplain. It was used at the intersection of Roanoke Avenue and Chesapeake Road in basin 404 and at the

location where flow from Roanoke enters the channel. This analysis indicates some flooding in these areas.

Another location where the weir equation was used was the storm drain inlet structure at Primrose Drive and Firewheel Road. The flow into the storm drain was determined from a nomograph for pipe culverts with inlet control. The remainder flows down a concrete emergency spillway. A cross-section was then taken at the spillway crest, and the depth of flow was calculated using the weir equation. This depth indicates the spread of the floodplain. A similar method was used for the location where the overflow divides into street and channel flow. In this case, a double weir was used to model the street and channel.

The divided flow into the channel is conveyed to a proposed detention pond at the Riverview Park site (basin 403.03, see Exhibit 2). The 100-year floodplain at this location is the 100-year water surface elevation in the pond. Since all overland flow west of the park enters either the storm drain or the pond, there is no floodplain from the pond to Golf Course Road.

Another area for which the weir equation was used was at the intersection of Butterfield Trail and Golf Course Road. The overflow that does not enter the storm drain inlets (approximately 90 cfs) was used to calculate the weir depth for a section on Butterfield Trail just east of Golf Course Road. This analysis produced a flow depth of one foot which will cause some ponding in the intersection. The flow is maintained within the Butterfield Trail right-of-way from the intersection to the dam where Manning's equation applies.

Hydraulic grade line calculations were made in accordance with DPM guidelines with a starting water surface elevation of 5032 feet (100-year water surface) at the dam. The hydraulic grade line is shown in red on the attached set of plan and profile sheets. As shown, it is below the tops of manholes and inlet throats. Computations of inlet capacities in sumps were made using the orifice equation and the weir equation. Rating curves for inlets in sumps have been included in the appendix. Where an inlet in a sump was acting in tandem with an overflow weir, a rating curve was made for the combined system. Capacities of inlets on grade were computed using the appropriate DPM Plates.

RIVERVIEW PARK DETENTION POND HYDRAULICS AND HYDROLOGY

The storm drain discharge into the detention pond required analysis of the hydraulics and hydrology at this location. The following is an explanation of how pond, pipe, and diversion manhole were modeled in the HYMO computer program (see Appendix A):

1. The initial rising limb of the hydrograph entering the orifice manhole via the pipe, up to a flow of 200 cfs, continues straight through the manhole without entering the detention pond.
2. The rest of the hydrograph (beginning where inflow into the diversion manhole exceeds 200 cfs) is routed into the pond, i.e., for flows greater than 200 cfs, the water hits the orifice plate, goes through a hydraulic jump, and is controlled by inlet conditions.
3. The outflow from the pond is described and controlled by the orifices on the downstream side of the manhole. Orifice flows were computed on the downstream side of the manhole. Orifice flows were computed based on a rating curve of pond depth vs. orifice flow.

4. The initial flows described in item 1 (above) are then added back to the outflow hydrograph from the pond. This composite hydrograph is routed downstream of the diversion manhole through the downstream portion of the storm drain.

DRAINAGE PATTERNS

For this analysis, the Piedras Marcadas South Branch watershed was modeled with the proposed development in basin 401. This development includes the Riverview Subdivision (basins A-1, A-2, A-3, a portion of A-4, and A-8) for which the Conditional LOMR is being submitted and basins A-6 and A-7 which are part of another development. A 2% bulking factor for sediment runoff was added for these areas and the other developed areas in the watershed. The remainder of basin 401 is left as undeveloped. A 12% bulking factor was added for this area and another upstream area, basin 404, that is also undeveloped. Basin 404 is zoned for residential use. These factors were derived from a report entitled "Sediment Issues in the Piedras Marcadas Watershed" written by Dr. Richard Heggen. It contains an extensive analysis of sediment yield and transport for this watershed and has been included in Appendix C of this report.

The flows presented in this report represent developed conditions, which will occur once the subdivisions described in the "Analysis Methods" are completed. The flows upstream of the development are based on existing conditions.

In its current condition, the South Branch storm drain does not have the capacity to discharge all of the runoff from the developed South Branch watershed. Therefore, a detention pond has been designed in the only "upstream" location available, an undeveloped tract west of Golf Course Road known as Riverview Park. The detention pond will be constructed with the Riverview Estates Subdivision and deeded to the City. As-built plans will be submitted for roads and drainage facilities constructed within the subdivision and for the detention pond upon completion of this project. The construction plans have been included as a supplement to this report.

A manhole with a restricting plate will be built on the existing 60" storm drain adjacent to Riverview Park. The bottom of the plate has been located so that the 10-year pipe flows (approximately 200 cfs) will continue unimpeded through the pipe. Whenever flows appreciably greater than the 10-year runoff enter the pipe, the water surface will hit the plate, and a hydraulic jump will occur. The rate of runoff conveyed downstream past the plate will decrease as the flow goes from supercritical to subcritical, and storm water will begin to back up into the pond. A 1.1 acre ponding area has been provided in the park and is compatible with the development of the park site. The 100-year ponding elevation is 5101.3 feet with a storage volume of 5.74 acre-feet. Ponding will occur in this area for a short duration only during storm events greater than the 10-year event.

Developed runoff from the Riverview Subdivision and undeveloped runoff from the portion of basin A-4 that will remain as open space will be collected on the proposed street sections. The runoff will be conveyed from west to east through the development. The subdivision's runoff will discharge to the intersection of Calle Nortena and Butterfield Trail at the subdivision's southeast corner. From that point, the overland runoff will be conveyed to the dam basin via the proposed extension of Butterfield Trail. A proposed 10-foot wide concrete rundown will deliver runoff collected at the end of the Butterfield Trail cul-de-sac into the dam basin. Four new storm inlets will discharge a portion of basin A-2 runoff into the storm drain. See the roadway plan and profile sheets included as part of this submittal.

CONCLUSIONS

The proposed development will result in an increase in runoff generated by the site. Provision has been made to safely convey the increased onsite runoff to the Piedras Marcadas Dam via paved surfaces, new storm inlets, and a new channel. The new construction will also result in a decrease in the 100-year discharge of the storm drain due to the construction of the detention pond. The construction of these facilities will limit the 100-year floodplain to the pond and to the paved Butterfield Trail and Golf Course Road rights-of-way downstream of the site and will meet the hydrologic criteria necessary to implement a Flood Hazard Map amendment. The construction of these facilities does not have any effect on possible flood areas upstream of the pond. The proposed development will in effect decrease sediment load due to construction of impervious areas (roads, driveways, roofs, etc.) and general anticipated formal landscaping by future owners.

The proposed development includes the following:

- Riverview Subdivision, Basins A-1, A-2, A-3, portion of A-4, and A-8
- Riverton Subdivision, Basins A-6 and A-7

Construction will begin shortly on these subdivisions. As-built plans will be submitted later in the year to complete the Conditional LOMR process.

This report contains the hydrologic model, hydraulic calculation for the 100-year floodplain and hydraulic grade line, topographic map with the 100-year floodplain shown (Exhibit 1 and Exhibit 5, scales: 1"=500'), and a detail map of the project area showing discharge in the storm drain and streets (Exhibit 2, scale: 1"=200'). These items are required for the application for a Conditional LOMR for the South Branch Piedras Marcadas Arroyo. To help expedite the review, we are also sending as supplemental material:

- Data Request Checklist for Conditional Letter of Map Revision - in front of this report
- Report "Sediment Issues in the Piedras Marcadas Watershed" by Dr. Richard Heggen - Appendix C
- Construction plans for Riverview Estates Subdivision for streets, drainage, facilities, and the Riverview Park detention pond - Appendix B (bound separately)
- Construction plans for the earthen swale in basin 404 - Appendix B (bound separately)
- Hydraulic grade line drawn in red on storm drain plan and profile sheets - Appendix B (bound separately)
- 1991 Orthophoto/Topographical Map with proposed floodplain - Exhibit 1
- Map showing drainage basins - Exhibit 2
- Firm with project area - Exhibit 3
- Map showing the corporate limits for the City of Albuquerque - Exhibit 4
- Flood Insurance Rate Maps, Panels 350002-0007C and 350002-0008C for the South Branch Watershed - Exhibit 5 and Exhibit 6

APPENDIX A

APPENDIX

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*****          BOHANNAN-HUSTON, INC.          *****
***** MODIFIED HYMO MODEL DEVELOPED BY MOLZEN-CORBIN *****
***** Piedras Marcadas Arroyo Analysis JUNE 17, 1992 *****
***** Proposed Developed Conditions *****
***** 100 YEAR 24-HOUR STORM *****
*****
***** Note: File has been modified to add 2% sediment bulking
***** factor to all developed areas and 12% factor to
***** all undeveloped areas. Modified to also
***** decrease pipe flow to lower hydraulic grade line.
***** File name: FEMFA PROP.DAT
*****
SUMMARY          1
START           0.00
*****
RAINFALL        TYPE=2 RAIN QUARTER=0.0 RAIN ONE=1.87
                RAIN SIX=2.20 RAIN DAY=2.66 DT=0.05

```

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COMPUTED 24-HOUR RAINFALL DISTRIBUTION BASED ON NOAA AT
DT = 0.050000 HOURS          END TIME = 24.000002 HOU
0.0000  0.0025  0.0050  0.0076  0.0103  0.0131  0.016
0.0190  0.0222  0.0254  0.0289  0.0324  0.0362  0.040
0.0443  0.0487  0.0534  0.0584  0.0637  0.0695  0.075
0.0837  0.0924  0.1176  0.1773  0.2798  0.4384  0.666
0.9790  1.2253  1.3366  1.4295  1.5109  1.5836  1.649
1.7096  1.7648  1.8156  1.8624  1.9057  1.9458  1.954
1.9631  1.9708  1.9780  1.9848  1.9912  1.9973  2.003
2.0087  2.0140  2.0191  2.0240  2.0287  2.0333  2.037
2.0420  2.0462  2.0502  2.0542  2.0580  2.0617  2.065
2.0689  2.0724  2.0757  2.0791  2.0823  2.0855  2.088
2.0916  2.0946  2.0976  2.1005  2.1033  2.1061  2.108
2.1115  2.1142  2.1168  2.1193  2.1219  2.1244  2.126
2.1293  2.1316  2.1340  2.1363  2.1386  2.1409  2.143
2.1453  2.1475  2.1497  2.1518  2.1539  2.1560  2.158
2.1601  2.1621  2.1641  2.1660  2.1680  2.1699  2.171
2.1737  2.1756  2.1774  2.1793  2.1811  2.1829  2.184
2.1864  2.1882  2.1899  2.1916  2.1933  2.1950  2.196
2.1984  2.2000  2.2020  2.2039  2.2059  2.2078  2.209
2.2117  2.2136  2.2155  2.2174  2.2193  2.2212  2.223
2.2249  2.2268  2.2287  2.2305  2.2324  2.2342  2.236
2.2379  2.2398  2.2416  2.2434  2.2452  2.2470  2.248
2.2506  2.2524  2.2542  2.2559  2.2577  2.2595  2.261
2.2630  2.2647  2.2665  2.2682  2.2700  2.2717  2.273
2.2751  2.2768  2.2785  2.2802  2.2819  2.2836  2.285
2.2870  2.2887  2.2903  2.2920  2.2937  2.2953  2.297
2.2986  2.3002  2.3019  2.3035  2.3051  2.3068  2.308
2.3100  2.3116  2.3132  2.3148  2.3164  2.3180  2.319
2.3212  2.3227  2.3243  2.3259  2.3274  2.3290  2.330
2.3321  2.3336  2.3352  2.3367  2.3383  2.3398  2.341
2.3428  2.3444  2.3459  2.3474  2.3489  2.3504  2.351
2.3534  2.3549  2.3563  2.3578  2.3593  2.3608  2.362
2.3637  2.3652  2.3666  2.3681  2.3695  2.3710  2.372
2.3739  2.3753  2.3767  2.3782  2.3796  2.3810  2.382
2.3839  2.3853  2.3867  2.3881  2.3895  2.3909  2.392
2.3937  2.3951  2.3965  2.3978  2.3992  2.4006  2.402
2.4033  2.4047  2.4061  2.4074  2.4088  2.4101  2.411
2.4128  2.4142  2.4155  2.4168  2.4182  2.4195  2.420
2.4222  2.4235  2.4248  2.4261  2.4274  2.4287  2.430
2.4314  2.4327  2.4340  2.4352  2.4365  2.4378  2.439
2.4404  2.4417  2.4430  2.4442  2.4455  2.4468  2.448
2.4493  2.4506  2.4518  2.4531  2.4543  2.4556  2.456

```

2.4581	2.4593	2.4606	2.4618	2.4630	2.4643	2.465
2.4667	2.4680	2.4692	2.4704	2.4716	2.4728	2.474
2.4753	2.4765	2.4777	2.4789	2.4801	2.4813	2.482
2.4837	2.4849	2.4860	2.4872	2.4884	2.4896	2.490
2.4919	2.4931	2.4943	2.4955	2.4966	2.4978	2.499
2.5001	2.5013	2.5024	2.5036	2.5047	2.5059	2.507
2.5082	2.5093	2.5105	2.5116	2.5127	2.5139	2.515
2.5161	2.5172	2.5184	2.5195	2.5206	2.5217	2.522
2.5240	2.5251	2.5262	2.5273	2.5284	2.5295	2.530
2.5317	2.5328	2.5339	2.5350	2.5361	2.5372	2.538
2.5394	2.5404	2.5415	2.5426	2.5437	2.5448	2.545
2.5469	2.5480	2.5490	2.5501	2.5512	2.5522	2.553
2.5544	2.5554	2.5565	2.5575	2.5586	2.5596	2.560
2.5617	2.5628	2.5638	2.5649	2.5659	2.5669	2.568
2.5690	2.5700	2.5711	2.5721	2.5731	2.5741	2.575
2.5762	2.5772	2.5782	2.5792	2.5803	2.5813	2.582
2.5833	2.5843	2.5853	2.5863	2.5873	2.5883	2.589
2.5903	2.5913	2.5923	2.5933	2.5943	2.5953	2.596
2.5973	2.5982	2.5992	2.6002	2.6012	2.6022	2.603
2.6041	2.6051	2.6061	2.6070	2.6080	2.6090	2.609
2.6109	2.6119	2.6128	2.6138	2.6148	2.6157	2.616
2.6176	2.6186	2.6195	2.6205	2.6214	2.6224	2.623
2.6243	2.6252	2.6261	2.6271	2.6280	2.6290	2.629
2.6308	2.6318	2.6327	2.6336	2.6346	2.6355	2.636
2.6373	2.6383	2.6392	2.6401	2.6410	2.6419	2.642
2.6438	2.6447	2.6456	2.6465	2.6474	2.6483	2.649
2.6501	2.6510	2.6519	2.6528	2.6537	2.6546	2.655
2.6564	2.6573	2.6582	2.6591	2.6600		

 ***** SOUTH BRANCH DEVELOPED *****

 ***** CALCULATE BASIN 404 *****
 * NOTE: BASIN 404 LEFT AS UNDEVELOPED *****
 COMPUTE NM HYD ID=2 HYD NO=404 DA=.195
 PER A=85 PER B=5 PER C=10 PER D=0
 TP=-.15 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.150	0.160	1.068	3.31	397.6	305.88	0.195	0.6	1.56
PRINT HYD			ID=2	CODE=0					

OUTFLOW HYDROGRAPH RESERVOIR 404.

RUNOFF VOLUME = 5.081 ACRE-FT
 PEAK DISCHARGE RATE = 173.7 CFS
 PEAK OCCURRED AT 1.55 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING
 DIVIDE HYD ID=2 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 5.691 ACRE-FT
PEAK DISCHARGE RATE = 194.5 CFS
PEAK OCCURRED AT 1.55 HRS.

** DIVIDE OUT 30 CFS THAT DRAINS THROUGH SWALE TO CALLE NORTENA
DIVIDE HYD ID=2 Q=30 ID=1 HYD=CALLENOR
ID=2 HYD=404.1
PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 404.1

RUNOFF VOLUME = 3.436 ACRE-FT
PEAK DISCHARGE RATE = 164.5 CFS
PEAK OCCURRED AT 1.55 HRS.

***** ROUTE THIS FLOW THRU 404.1 *****
***** STREET FLOW PLUS YARDS *****
COMPUTE RATING CURVE CID=1 VS NO=1 SEG=1 MIN EL=0 MAX EL=2.5
CH SLP=.017 FP SLP=.017 N=.02 DIST=60

DIST	ELEV
0	2.5
12	.5
12.1	0
28	.33
44	0
44.1	.5
60	2.5

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.13	0.8	1.3	1.6
0.26	3.4	8.3	2.5
0.39	7.4	26.4	3.6
0.53	11.6	55.5	4.8
0.66	16.0	91.5	5.7
0.79	20.6	135.2	6.6
0.92	25.5	186.4	7.3
1.05	30.6	245.1	8.0
1.18	36.0	311.4	8.7
1.32	41.6	385.2	9.3
1.45	47.4	466.7	9.8
1.58	53.5	555.9	10.4
1.71	59.8	653.1	10.9
1.84	66.4	758.3	11.4
1.97	73.2	871.6	11.9
2.11	80.2	993.2	12.4
2.24	87.5	1123.3	12.8
2.37	95.1	1261.9	13.3
2.50	102.8	1409.3	13.7

COMPUTE TRAVEL TIME ID=1 REACH=1 VS NO=1 L=2400 SLP=.017

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.13	1.	0.4271	1.6
0.26	8.	0.2690	2.5
0.39	26.	0.1860	3.6
0.53	56.	0.1391	4.8
0.66	92.	0.1164	5.7
0.79	135.	0.1017	6.6
0.92	186.	0.0912	7.3
1.05	245.	0.0832	8.0
1.18	311.	0.0770	8.7
1.32	385.	0.0719	9.3
1.45	467.	0.0677	9.8
1.58	556.	0.0641	10.4
1.71	653.	0.0611	10.9
1.84	758.	0.0584	11.4
1.97	872.	0.0560	11.9
2.11	993.	0.0539	12.4
2.24	1123.	0.0519	12.8
2.37	1262.	0.0502	13.3
2.50	1409.	0.0486	13.7

ROUTE ID=1 HYD=404.01 INFLOW ID=2 DT=0.05
PRINT HYD ID=1 CODE=0

HYDROGRAPH NUMBER 404.01

RUNOFF VOLUME = 3.420 ACRE-FT
PEAK DISCHARGE RATE = 132.3 CFS
PEAK OCCURRED AT 1.60 HRS.

***** CALCULATE BASIN 404.1 *****
COMPUTE NM HYD ID=2 HYD NO=404.1 DA=.115
PER A=8 PER B=15 PER C=20 PER D=57
TP=-.24 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.240	0.132	0.552	7.00	142.3	521.09	0.066	0.1	0.04
Pervious	0.240	0.222	0.924	3.83	70.8	343.57	0.049	0.5	1.13

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 404.

RUNOFF VOLUME = 10.455 ACRE-FT
PEAK DISCHARGE RATE = 182.3 CFS
PEAK OCCURRED AT 1.60 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
DIVIDE HYD ID=2 Q=-1.02

DIVIDE HYD
 PRINT HYD

ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 10.664 ACRE-FT
 PEAK DISCHARGE RATE = 185.9 CFS
 PEAK OCCURRED AT 1.60 HRS.

***** ADD 404.1 AND 404 ROUTE *****
 ADD HYD ID=3 HYD=404.02 ID I=1 II=2
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER 404.02

RUNOFF VOLUME = 14.083 ACRE-FT
 PEAK DISCHARGE RATE = 318.2 CFS
 PEAK OCCURRED AT 1.60 HRS.

***** ROUTE THIS FLOW THRU 403.3 LARGE CHANNEL *****
 COMPUTE RATING CURVE CID=1 VS NO=1 SEG=1 MIN EL=0 MAX EL=4.5
 CH SLP=.025 FP SLP=.025 N=.03 DIST=95

DIST	ELEV
0	4.5
15	4
20	2
50	0
80	2
95	4

RATING CURVE VALLEY SECTION			1.0
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.24	0.8	1.6	1.9
0.47	3.4	10.1	3.0
0.71	7.6	29.7	3.9
0.95	13.5	64.0	4.8
1.18	21.0	116.0	5.5
1.42	30.3	188.6	6.2
1.66	41.2	284.5	6.9
1.89	53.9	406.2	7.5
2.13	68.0	569.3	8.4
2.37	82.8	770.4	9.3
2.61	98.1	998.0	10.2
2.84	114.1	1251.9	11.0
3.08	130.6	1531.8	11.7
3.32	147.6	1837.9	12.5
3.55	165.2	2170.2	13.1
3.79	183.4	2528.7	13.8
4.03	202.1	2901.6	14.4
4.26	222.1	3210.9	14.5

4.50 243.8 3561.4 14.6
 COMPUTE TRAVEL TIME ID=1 REACH=1 VS NO=1 L=950 SLP=.025

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.24	2.	0.1399	1.9
0.47	10.	0.0882	3.0
0.71	30.	0.0673	3.9
0.95	64.	0.0555	4.8
1.18	116.	0.0479	5.5
1.42	189.	0.0424	6.2
1.66	285.	0.0382	6.9
1.89	406.	0.0350	7.5
2.13	569.	0.0315	8.4
2.37	770.	0.0284	9.3
2.61	998.	0.0260	10.2
2.84	1252.	0.0240	11.0
3.08	1532.	0.0225	11.7
3.32	1838.	0.0212	12.5
3.55	2170.	0.0201	13.1
3.79	2529.	0.0191	13.8
4.03	2902.	0.0184	14.4
4.26	3211.	0.0183	14.5
4.50	3561.	0.0181	14.6

ROUTE ID=1 HYD=403.01 INFLOW ID=3 DT=0.05
 PRINT HYD ID=1 CODE=0

HYDROGRAPH NUMBER 403.01

RUNOFF VOLUME = 14.073 ACRE-FT
 PEAK DISCHARGE RATE = 312.6 CFS
 PEAK OCCURRED AT 1.65 HRS.

***** CALCULATE BASIN 403.3 *****
 COMPUTE NM HYD ID=2 HYD NO=403.3 DA=.037
 PER A=8 PER B=32 PER C=4 PER D=56
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	83.9	526.28	0.021	0.1	0.04
Pervious	0.130	0.131	1.010	3.49	40.1	319.93	0.016	0.5	1.29

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 3.240 ACRE-FT
 PEAK DISCHARGE RATE = 78.0 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=2 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 3.304 ACRE-FT
 PEAK DISCHARGE RATE = 79.5 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** ROUTE THIS FLOW THRU 10' CONCRETE CHANNEL *****

COMPUTE RATING CURVE CID=1 VS NO=1 SEG=1 MIN EL=0 MAX EL=2.0

CH SLP=.039 FP SLP=.039 N=.015 DIST=10

DIST	ELEV
0	2.0
.2	0
9.8	0
10	2.0

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.11	1.0	4.4	4.3
0.21	2.0	13.6	6.7
0.32	3.0	26.5	8.7
0.42	4.1	42.3	10.4
0.53	5.1	60.7	11.9
0.63	6.1	81.3	13.3
0.74	7.1	103.9	14.6
0.84	8.2	128.4	15.7
0.95	9.2	154.6	16.8
1.05	10.2	182.4	17.9
1.16	11.2	211.7	18.8
1.26	12.3	242.3	19.7
1.37	13.3	274.2	20.6
1.47	14.4	307.3	21.4
1.58	15.4	341.6	22.2
1.68	16.5	376.9	22.9
1.79	17.5	413.2	23.6
1.89	18.5	450.5	24.3
2.00	19.6	488.8	24.9

COMPUTE TRAVEL TIME ID=3 REACH=1 VS NO=1 L=180 SLP=.039

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.11	4.	0.0116	4.3
0.21	14.	0.0074	6.7

0.32	26.	0.0057	8.7
0.42	42.	0.0048	0.0
0.53	61.	0.0042	0.0
0.63	81.	0.0038	0.0
0.74	104.	0.0034	0.0
0.84	128.	0.0032	0.0
0.95	155.	0.0030	0.0
1.05	182.	0.0028	0.0
1.16	212.	0.0027	0.0
1.26	242.	0.0025	0.0
1.37	274.	0.0024	0.0
1.47	307.	0.0023	0.0
1.58	342.	0.0023	0.0
1.68	377.	0.0022	0.0
1.79	413.	0.0021	0.0
1.89	451.	0.0021	0.0
2.00	489.	0.0020	0.0

ROUTE ID=3 HYD=403.02 INFLOW ID=2 DT=0.05
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER 403.02

RUNOFF VOLUME = 2.700 ACRE-FT
 PEAK DISCHARGE RATE = 79.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** ADD 403.3R AND TOTAL ROUTE *****
 ADD HYD ID=4 HYD=403.03 ID I=3 II=1
 PRINT HYD ID=4 CODE=0

HYDROGRAPH NUMBER 403.03

RUNOFF VOLUME = 16.773 ACRE-FT
 PEAK DISCHARGE RATE = 355.8 CFS
 PEAK OCCURRED AT 1.65 HRS.

***** CALCULATE BASIN 403.2 *****
 COMPUTE NM HYD ID=2 HYD NO=403.2 DA=.014
 PER A=0 PER B=35 PER C=5 PER D=60
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	34.0	526.28	0.008	0.1	0.04
Pervious	0.130	0.125	0.959	3.68	14.4	333.52	0.006	0.5	1.20

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 1.297 ACRE-FT
 PEAK DISCHARGE RATE = 31.0 CFS
 PEAK OCCURRED AT 1.50 HRS.

```

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
DIVIDE HYD      ID=2      Q=-1.02
                  ID=47    HYD=SEDTEMP
                  ID=48    HYD=NOVALUE
DIVIDE HYD      ID=47    Q=-1.0
                  ID=2      HYD=101.3
                  ID=48    HYD=NOVALUE
PRINT HYD       ID=2 CODE=0

```

HYDROGRAPH NUMBER 101.3

```

RUNOFF VOLUME =      1.323 ACRE-FT
PEAK DISCHARGE RATE =      31.7 CFS
PEAK OCCURRED AT  1.50 HRS.

```

***** ROUTE THIS FLOW THRU 10' CONCRETE CHANNEL (S.)*****
 COMPUTE RATING CURVE CID=1 VS NO=1 SEG=1 MIN EL=0 MAX EL=2.0

```

CH SLP=.028 FP SLP=.028 N=.015 DIST=10
DIST      ELEV
0          2.0
.2         0.
9.8        0
10         2.0

```

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.11	1.0	3.7	3.6
0.21	2.0	11.6	5.7
0.32	3.0	22.5	7.4
0.42	4.1	35.8	8.8
0.53	5.1	51.4	10.1
0.63	6.1	68.9	11.3
0.74	7.1	88.1	12.4
0.84	8.2	108.8	13.3
0.95	9.2	131.0	14.3
1.05	10.2	154.6	15.1
1.16	11.2	179.4	15.9
1.26	12.3	205.3	16.7
1.37	13.3	232.3	17.4
1.47	14.4	260.4	18.1
1.58	15.4	289.4	18.8
1.68	16.5	319.3	19.4
1.79	17.5	350.1	20.0
1.89	18.5	381.7	20.6
2.00	19.6	414.1	21.1

COMPUTE TRAVEL TIME ID=3 REACH=1 VS NO=1 L=250 SLP=.028

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.11	4.	0.0191	3.6

0.21	12.	0.0122	5.7
0.32	22.	0.0094	7.4
0.42	36.	0.0079	8.8
0.53	51.	0.0069	10.1
0.63	69.	0.0062	11.3
0.74	88.	0.0056	12.4
0.84	109.	0.0052	13.3
0.95	131.	0.0049	0.0
1.05	155.	0.0046	0.0
1.16	179.	0.0044	0.0
1.26	205.	0.0042	0.0
1.37	232.	0.0040	0.0
1.47	260.	0.0038	0.0
1.58	289.	0.0037	0.0
1.68	319.	0.0036	0.0
1.79	350.	0.0035	0.0
1.89	382.	0.0034	0.0
2.00	414.	0.0033	0.0

ROUTE ID=3 HYD=403.21 INFLOW ID=2 DT=0.05
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER 403.21

RUNOFF VOLUME = 1.063 ACRE-FT
 PEAK DISCHARGE RATE = 32.0 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** ADD 403.2R AND TOTAL ROUTE IN LARGE CHANNEL (ID=4)*****
 ADD HYD ID=1 HYD=403.22 ID I=3 II=4
 PRINT HYD ID=1 CODE=0

HYDROGRAPH NUMBER 403.22

RUNOFF VOLUME = 17.835 ACRE-FT
 PEAK DISCHARGE RATE = 373.0 CFS
 PEAK OCCURRED AT 1.65 HRS.

** ROUTE THRU SMALL ENTRANCE POND PIPE AT FIREWHEEL FOR PRESSURIZED FL
 ** DIVIDE TOTAL INFLOW; PIPE CAP. W/8-9' HEAD IS 259 CFS, REST IS OVERF
 ** DIVIDE HYD BETWEEN PIPE CAPACITY AND STREET FLOW***
 DIVIDE HYD ID=1 Q=259 ID I=3 HYD I=403.11
 ID II=7 HYD II=403.12
 PRINT HYD ID=7 CODE=0

HYDROGRAPH NUMBER NOVALUE

RUNOFF VOLUME = 1.616 ACRE-FT
 PEAK DISCHARGE RATE = 114.0 CFS
 PEAK OCCURRED AT 1.65 HRS.

** ROUTE PIPE FLOW THRU 403 STORM DRAIN TO MANHOLE @ FIREWHEEL AND SUN
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.015

DIA=60 IN N=.013

0.00	0.0	0.0	0.0
0.26	0.4	1.7	4.3
0.53	1.1	7.5	6.8
0.79	2.0	17.3	8.7
1.05	3.0	30.8	10.3
1.32	4.1	48.7	11.7
1.58	5.3	69.0	13.0
1.84	6.6	92.1	14.1
2.11	7.9	118.5	15.0
2.37	9.2	145.5	15.9
2.63	10.5	173.7	16.6
2.89	11.8	202.2	17.2
3.16	13.1	231.7	17.7
3.42	14.3	259.0	18.1
3.68	15.5	284.4	18.4
3.95	16.6	307.9	18.5
4.21	17.6	326.3	18.5
4.47	18.5	339.0	18.3
4.74	19.2	342.9	17.8
5.00	19.6	342.9	17.5

COMPUTE TRAVEL TIME ID=5 REACH=1 VS NO=1 L=474 SLP=.015

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.26	2.	0.0308	4.3
0.53	8.	0.0195	6.8
0.79	17.	0.0152	8.7
1.05	31.	0.0128	10.3
1.32	49.	0.0112	11.7
1.58	69.	0.0102	13.0
1.84	92.	0.0094	14.1
2.11	118.	0.0088	15.0
2.37	146.	0.0083	15.9
2.63	174.	0.0079	16.6
2.89	202.	0.0077	17.2
3.16	232.	0.0074	17.7
3.42	259.	0.0073	18.1
3.68	284.	0.0072	18.4
3.95	308.	0.0071	18.5
4.21	326.	0.0071	18.5
4.47	339.	0.0072	18.3
4.74	343.	0.0074	17.8
4.74	343.	0.0074	17.8

ROUTE ID=5 HYD=403.19 INFLOW ID=3 DT=0.05
 PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER 403.19

RUNOFF VOLUME = 16.220 ACRE-FT
 PEAK DISCHARGE RATE = 262.5 CFS
 PEAK OCCURRED AT 1.55 HRS.

***** ROUTE OVERFLOW DOWN FIREWHEEL TO SUNROSE *****
 COMPUTE RATING CURVE CID=1 VS NO=1 SEG=1 MIN EL=0 MAX EL=1.0
 CH SLP=.015 FP SLP=.015 N=.016 DIST=32

DIST	ELEV
0	1.0
4	.5
4.1	0
16	.24
28	0
28.1	.5
32	1.0

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.05	0.1	0.1	1.0
0.11	0.6	0.9	1.6
0.16	1.2	2.6	2.1
0.21	2.2	5.6	2.5
0.26	3.4	10.6	3.1
0.32	4.7	17.8	3.8
0.37	6.0	26.3	4.4
0.42	7.2	36.2	5.0
0.47	8.5	47.2	5.6
0.53	9.8	58.9	6.0
0.58	11.1	71.1	6.4
0.63	12.4	84.4	6.8
0.68	13.8	98.7	7.1
0.74	15.3	114.2	7.5
0.79	16.8	130.8	7.8
0.84	18.3	148.5	8.1
0.89	19.9	167.3	8.4
0.95	21.5	187.3	8.7
1.00	23.2	208.5	9.0

COMPUTE TRAVEL TIME ID=6 REACH=1 VS NO=1 L=350 SLP=.013

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.05	0.	0.0977	1.0
0.11	1.	0.0615	1.6
0.16	3.	0.0470	2.1
0.21	6.	0.0388	2.5
0.26	11.	0.0316	3.1
0.32	18.	0.0257	3.8
0.37	26.	0.0220	4.4
0.42	36.	0.0194	5.0
0.47	47.	0.0175	5.6
0.53	59.	0.0161	6.0
0.58	71.	0.0152	6.4
0.63	84.	0.0143	6.8
0.68	99.	0.0136	7.1
0.74	114.	0.0130	7.5
0.79	131.	0.0125	7.8
0.84	149.	0.0120	8.1

	0.89	167.	0.0115	8.4
	0.95	187.	0.0112	8.7
	1.00	208.	0.0108	9.0

ROUTE ID=6 HYD=403.21 INFLOW ID=7 DT=0.05
 PRINT HYD ID=6 CODE=0

HYDROGRAPH NUMBER 403.21

RUNOFF VOLUME = 1.615 ACRE-FT
 PEAK DISCHARGE RATE = 124.3 CFS
 PEAK OCCURRED AT 1.65 HRS.

* NOTE: DRAINAGE AREA 403 WAS DIVIDED TO REFLECT CURRENT EXISTING CON
 * NEW DRAINAGE AREAS ARE 403.01, 403.02, 403.03 AND 403.04
 ***** CALCULATE BASIN 403.01 *****
 COMPUTE NM HYD ID=2 HYD NO=403.01 DA=0.03
 PER A=0 PER B=40 PER C=5 PER D=55
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	66.8	526.28	0.017	0.1	0.04
Pervious	0.130	0.125	0.962	3.67	34.6	332.79	0.014	0.5	1.20

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 2.638 ACRE-FT
 PEAK DISCHARGE RATE = 64.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
 DIVIDE HYD ID=2 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 2.690 ACRE-FT
 PEAK DISCHARGE RATE = 65.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 403.02 *****
 COMPUTE NM HYD ID=25 HYD NO=403.02 DA=.032
 PER A=0 PER B=35 PER C=5 PER D=60
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	77.7	526.28	0.019	0.1	0.04
Pervious	0.130	0.125	0.959	3.68	32.8	333.52	0.013	0.5	1.20

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=25 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 2.964 ACRE-FT
 PEAK DISCHARGE RATE = 70.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
 DIVIDE HYD ID=25 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=25 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=25 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 3.023 ACRE-FT
 PEAK DISCHARGE RATE = 72.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 403.03 (POND) *****
 COMPUTE NM HYD ID=26 HYD NO=403.03 DA=.014
 PER A=0 PER B=90 PER C=5 PER D=5
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	2.8	526.28	0.001	0.1	0.04
Pervious	0.130	0.126	0.973	3.63	33.7	329.76	0.013	0.5	1.23

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=26 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 0.573 ACRE-FT
 PEAK DISCHARGE RATE = 19.8 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
 DIVIDE HYD ID=26 Q=-1.02
 ID=47 HYD=SEDTEMP

DIVIDE HYD ID=48 HYD=NOVALUE
 ID=47 Q=-1.0
 ID=26 HYD=101.3
 PRINT HYD ID=48 HYD=NOVALUE
 ID=26 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.585 ACRE-FT
 PEAK DISCHARGE RATE = 20.2 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 403.04 (PARK AREA) *****
 COMPUTE NM HYD ID=27 HYD NO=403.04 DA=.003
 PER A=0 PER B=90 PER C=5 PER D=5
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	0.6	526.28	0.000	0.1	0.04
Pervious	0.130	0.126	0.973	3.63	7.2	329.76	0.003	0.5	1.23

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=27 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 0.123 ACRE-FT
 PEAK DISCHARGE RATE = 4.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=27 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=27 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=27 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.125 ACRE-FT
 PEAK DISCHARGE RATE = 4.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** ADD BASIN 403.01 RUNOFF TO STREET FLOW AT SUNROSE *****
 ADD HYD ID=6 HYD=403STRT ID I=6 ID II=2
 PRINT HYD ID=6 CODE=0

HYDROGRAPH NUMBER 403STRT

RUNOFF VOLUME = 4.305 ACRE-FT
 PEAK DISCHARGE RATE = 160.2 CFS
 PEAK OCCURRED AT 1.60 HRS.

***** DIVIDE RUNOFF AT SUNROSE INTO PIPE AND STREET FLOW ****
 DIVIDE HYD ID=6 QMAX=50 ID=20 HYD I=PIPE20 PIPE FLOW
 ID=21 HYD II=STRT21 STREET FLOW
 PRINT HYD ID=21 CODE=0

HYDROGRAPH NUMBER NOVALUE

RUNOFF VOLUME = 1.430 ACRE-FT
 PEAK DISCHARGE RATE = 110.2 CFS
 PEAK OCCURRED AT 1.60 HRS.

***** ADD PIPE FLOWS AT SUNROSE INTERSECTION *****
 ADD HYD ID=5 HYD=403PIPE ID I=5 II=20
 PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER 403PIPE

RUNOFF VOLUME = 19.095 ACRE-FT
 PEAK DISCHARGE RATE = 312.5 CFS
 PEAK OCCURRED AT 1.55 HRS.

***** ROUTE PIPE FLOW TO ORIFICE MANHOLE AT POND *****
 COMPUTE RATING CURVE ID=1 VS NO=1 CODE=-1 SLP=.015
 DIA=60 IN N=.013

0.00	0.0	0.0	0.0
0.26	0.4	1.7	4.3
0.53	1.1	7.5	6.8
0.79	2.0	17.3	8.7
1.05	3.0	30.8	10.3
1.32	4.1	48.7	11.7
1.58	5.3	69.0	13.0
1.84	6.6	92.1	14.1
2.11	7.9	118.5	15.0
2.37	9.2	145.5	15.9
2.63	10.5	173.7	16.6
2.89	11.8	202.2	17.2
3.16	13.1	231.7	17.7
3.42	14.3	259.0	18.1
3.68	15.5	284.4	18.4
3.95	16.6	307.9	18.5
4.21	17.6	326.3	18.5
4.47	18.5	339.0	18.3
4.74	19.2	342.9	17.8
5.00	19.6	342.9	17.5

COMPUTE TRAVEL TIME ID=15 REACH=1 VS NO=1 L=651 SLP=.015

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
------------------------	---------------------	-----------------------	--------------------

0.26	2.	0.0422	4.3
0.53	8.	0.0267	6.8
0.79	17.	0.0209	8.7
1.05	31.	0.0176	10.3
1.32	49.	0.0154	11.7
1.58	69.	0.0139	13.0
1.84	92.	0.0129	14.1
2.11	118.	0.0120	15.0
2.37	146.	0.0114	15.9
2.63	174.	0.0109	16.6
2.89	202.	0.0105	17.2
3.16	232.	0.0102	17.7
3.42	259.	0.0100	18.1
3.68	284.	0.0098	18.4
3.95	308.	0.0098	18.5
4.21	326.	0.0098	18.5
4.47	339.	0.0099	18.3
4.74	343.	0.0102	17.8
4.74	343.	0.0102	17.8

ROUTE ID=15 HYD=403.15 INFLOW=5 DT=.05

*

* HYDROGRAPH IN PIPE JUST UPSTREAM OF ORIFICE MANHOLE

*

PRINT HYD ID=15 CODE=1

HYDROGRAPH NUMBER 403.15

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.	8.200	2.	16.400	1.
0.050	0.	8.250	2.	16.450	1.
0.100	0.	8.300	2.	16.500	1.
0.150	0.	8.350	2.	16.550	1.
0.200	0.	8.400	2.	16.600	1.
0.250	0.	8.450	2.	16.650	1.
0.300	0.	8.500	2.	16.700	1.
0.350	0.	8.550	2.	16.750	1.
0.400	0.	8.600	2.	16.800	1.
0.450	0.	8.650	2.	16.850	1.
0.500	0.	8.700	2.	16.900	1.
0.550	0.	8.750	2.	16.950	1.
0.600	0.	8.800	2.	17.000	1.
0.650	0.	8.850	2.	17.050	1.
0.700	0.	8.900	2.	17.100	1.
0.750	0.	8.950	2.	17.150	1.
0.800	0.	9.000	2.	17.200	1.
0.850	0.	9.050	2.	17.250	1.
0.900	0.	9.100	2.	17.300	1.
0.950	0.	9.150	2.	17.350	1.
1.000	0.	9.200	2.	17.400	1.
1.050	0.	9.250	2.	17.450	1.
1.100	0.	9.300	2.	17.500	1.
1.150	0.	9.350	2.	17.550	1.
1.200	1.	9.400	2.	17.600	1.
1.250	5.	9.450	2.	17.650	1.
1.300	20.	9.500	2.	17.700	1.
1.350	51.	9.550	2.	17.750	1.
1.400	104.	9.600	2.	17.800	1.
1.450	182.	9.650	2.	17.850	1.
1.500	266.	9.700	2.	17.900	1.
1.550	312.	9.750	2.	17.950	1.

1.600	309.	9.800	2.	18.000	1.
1.650	308.	9.850	2.	18.050	1.
1.700	310.	9.900	2.	18.100	1.
1.750	309.	9.950	2.	18.150	1.
1.800	278.	10.000	2.	18.200	1.
1.850	226.	10.050	2.	18.250	1.
1.900	185.	10.100	2.	18.300	1.
1.950	154.	10.150	2.	18.350	1.
2.000	133.	10.200	2.	18.400	1.
2.050	117.	10.250	2.	18.450	1.
2.100	103.	10.300	2.	18.500	1.
2.150	87.	10.350	2.	18.550	1.
2.200	73.	10.400	2.	18.600	1.
2.250	61.	10.450	2.	18.650	1.
2.300	52.	10.500	2.	18.700	1.
2.350	44.	10.550	2.	18.750	1.
2.400	37.	10.600	2.	18.800	1.
2.450	32.	10.650	2.	18.850	1.
2.500	28.	10.700	2.	18.900	1.
2.550	24.	10.750	2.	18.950	1.
2.600	22.	10.800	2.	19.000	1.
2.650	20.	10.850	2.	19.050	1.
2.700	18.	10.900	2.	19.100	1.
2.750	16.	10.950	2.	19.150	1.
2.800	15.	11.000	2.	19.200	1.
2.850	13.	11.050	2.	19.250	1.
2.900	12.	11.100	2.	19.300	1.
2.950	11.	11.150	2.	19.350	1.
3.000	10.	11.200	2.	19.400	1.
3.050	9.	11.250	2.	19.450	1.
3.100	8.	11.300	2.	19.500	1.
3.150	8.	11.350	2.	19.550	1.
3.200	7.	11.400	2.	19.600	1.
3.250	6.	11.450	2.	19.650	1.
3.300	6.	11.500	2.	19.700	1.
3.350	5.	11.550	2.	19.750	1.
3.400	5.	11.600	2.	19.800	1.
3.450	5.	11.650	2.	19.850	1.
3.500	4.	11.700	2.	19.900	1.
3.550	4.	11.750	2.	19.950	1.
3.600	4.	11.800	2.	20.000	1.
3.650	3.	11.850	2.	20.050	1.
3.700	3.	11.900	2.	20.100	1.
3.750	3.	11.950	2.	20.150	1.
3.800	3.	12.000	2.	20.200	1.
3.850	3.	12.050	2.	20.250	1.
3.900	3.	12.100	2.	20.300	1.
3.950	2.	12.150	2.	20.350	1.
4.000	2.	12.200	2.	20.400	1.
4.050	2.	12.250	2.	20.450	1.
4.100	2.	12.300	2.	20.500	1.
4.150	2.	12.350	2.	20.550	1.
4.200	2.	12.400	2.	20.600	1.
4.250	2.	12.450	1.	20.650	1.
4.300	2.	12.500	1.	20.700	1.
4.350	2.	12.550	1.	20.750	1.
4.400	2.	12.600	1.	20.800	1.
4.450	2.	12.650	1.	20.850	1.
4.500	2.	12.700	1.	20.900	1.
4.550	2.	12.750	1.	20.950	1.
4.600	2.	12.800	1.	21.000	1.

4.650	2.	12.850	1.	21.050	1.
4.700	2.	12.900	1.	21.100	1.
4.750	2.	12.950	1.	21.150	1.
4.800	2.	13.000	1.	21.200	1.
4.850	2.	13.050	1.	21.250	1.
4.900	2.	13.100	1.	21.300	1.
4.950	2.	13.150	1.	21.350	1.
5.000	2.	13.200	1.	21.400	1.
5.050	2.	13.250	1.	21.450	1.
5.100	2.	13.300	1.	21.500	1.
5.150	2.	13.350	1.	21.550	1.
5.200	2.	13.400	1.	21.600	1.
5.250	2.	13.450	1.	21.650	1.
5.300	2.	13.500	1.	21.700	1.
5.350	2.	13.550	1.	21.750	1.
5.400	2.	13.600	1.	21.800	1.
5.450	2.	13.650	1.	21.850	1.
5.500	2.	13.700	1.	21.900	1.
5.550	2.	13.750	1.	21.950	1.
5.600	2.	13.800	1.	22.000	1.
5.650	2.	13.850	1.	22.050	1.
5.700	2.	13.900	1.	22.100	1.
5.750	2.	13.950	1.	22.150	1.
5.800	2.	14.000	1.	22.200	1.
5.850	2.	14.050	1.	22.250	1.
5.900	2.	14.100	1.	22.300	1.
5.950	2.	14.150	1.	22.350	1.
6.000	2.	14.200	1.	22.400	1.
6.050	2.	14.250	1.	22.450	1.
6.100	2.	14.300	1.	22.500	1.
6.150	2.	14.350	1.	22.550	1.
6.200	2.	14.400	1.	22.600	1.
6.250	2.	14.450	1.	22.650	1.
6.300	2.	14.500	1.	22.700	1.
6.350	2.	14.550	1.	22.750	1.
6.400	2.	14.600	1.	22.800	1.
6.450	2.	14.650	1.	22.850	1.
6.500	2.	14.700	1.	22.900	1.
6.550	2.	14.750	1.	22.950	1.
6.600	2.	14.800	1.	23.000	1.
6.650	2.	14.850	1.	23.050	1.
6.700	2.	14.900	1.	23.100	1.
6.750	2.	14.950	1.	23.150	1.
6.800	2.	15.000	1.	23.200	1.
6.850	2.	15.050	1.	23.250	1.
6.900	2.	15.100	1.	23.300	1.
6.950	2.	15.150	1.	23.350	1.
7.000	2.	15.200	1.	23.400	1.
7.050	2.	15.250	1.	23.450	1.
7.100	2.	15.300	1.	23.500	1.
7.150	2.	15.350	1.	23.550	1.
7.200	2.	15.400	1.	23.600	1.
7.250	2.	15.450	1.	23.650	1.
7.300	2.	15.500	1.	23.700	1.
7.350	2.	15.550	1.	23.750	1.
7.400	2.	15.600	1.	23.800	1.
7.450	2.	15.650	1.	23.850	1.
7.500	2.	15.700	1.	23.900	1.
7.550	2.	15.750	1.	23.950	1.
7.600	2.	15.800	1.	24.000	1.
7.650	2.	15.850	1.	24.050	1.

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RUNOFF VOLUME =      19.095  ACRE-FT
PEAK DISCHARGE RATE =      311.6  CFS
PEAK OCCURRED AT  1.55  HRS.

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[illegible]

0.74	9.0	37.8	4.2
0.84	10.5	47.8	4.5
0.95	12.2	58.9	4.8
1.05	13.9	71.2	5.1
1.16	15.6	84.6	5.4
1.26	17.4	99.1	5.7
1.37	19.3	114.8	5.9
1.47	21.3	131.7	6.2
1.58	23.3	149.7	6.4
1.68	25.4	169.0	6.7
1.79	27.5	189.5	6.9
1.89	29.7	211.2	7.1
2.00	32.0	234.2	7.3

COMPUTE TRAVEL TIME ID=16 REACH=1 VS NO=1 L750 SLP=.013

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.11	1.	0.1644	1.3
0.21	4.	0.1057	2.0
0.32	9.	0.0821	2.5
0.42	14.	0.0690	3.0
0.53	21.	0.0604	3.5
0.63	29.	0.0543	3.8
0.74	38.	0.0496	4.2
0.84	48.	0.0460	4.5
0.95	59.	0.0430	4.8
1.05	71.	0.0405	5.1
1.16	85.	0.0384	5.4
1.26	99.	0.0366	5.7
1.37	115.	0.0350	5.9
1.47	132.	0.0336	6.2
1.58	150.	0.0324	6.4
1.68	169.	0.0313	6.7
1.79	189.	0.0302	6.9
1.89	211.	0.0293	7.1
2.00	234.	0.0285	7.3

ROUTE ID=16 HYD=403.16 INFLOW=21 DT=.05
PRINT HYD ID=16 CODE=0

HYDROGRAPH NUMBER 403.16

RUNOFF VOLUME = 1.425 ACRE-FT
PEAK DISCHARGE RATE = 110.3 CFS
PEAK OCCURRED AT 1.65 HRS.

** ADD POND AREA (BASIN 403.03) TO OVERLAND FLOW HYDROGRAPH **
** THIS YIELDS THE TOTAL OVERLAND FLOW INTO THE POND *****
ADD HYD ID=16 HYD=LANDFLO ID I=26 II=16
PRINT HYD ID=16 CODE=0

HYDROGRAPH NUMBER LANDFLO

RUNOFF VOLUME = 2.010 ACRE-FT
PEAK DISCHARGE RATE = 121.6 CFS

PEAK OCCURRED AT 1.65 HRS.

* ADD THE TOTAL PIPE FLOW TO THE OVERLAND FLOW TO DETERMINE THE TOTAL
* COMBINED FLOW UPSTREAM OF THE ORIFICE MANHOLE.

ADD HYD ID=16 HYD=INTOPOND ID=16 ID=15
PRINT HYD ID=16 CODE=10

HYDROGRAPH NUMBER INTOPOND

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.	8.500	2.	17.000	1.
0.500	0.	9.000	2.	17.500	1.
1.000	0.	9.500	2.	18.000	1.
1.500	86.	10.000	2.	18.500	1.
2.000	134.	10.500	2.	19.000	1.
2.500	27.	11.000	2.	19.500	1.
3.000	10.	11.500	2.	20.000	1.
3.500	4.	12.000	2.	20.500	1.
4.000	2.	12.500	1.	21.000	1.
4.500	2.	13.000	1.	21.500	1.
5.000	2.	13.500	1.	22.000	1.
5.500	2.	14.000	1.	22.500	1.
6.000	2.	14.500	1.	23.000	1.
6.500	2.	15.000	1.	23.500	1.
7.000	2.	15.500	1.	24.000	1.
7.500	2.	16.000	1.		
8.000	2.	16.500	1.		

RUNOFF VOLUME = 18.596 ACRE-FT
PEAK DISCHARGE RATE = 429.6 CFS
PEAK OCCURRED AT 1.65 HRS.

* NOW DISCHARGE THE TOTAL FLOW THROUGH THE ORIFICE MANHOLE USING A
* STAGE-STORAGE-DISCHARGE CURVE BASED ON THE ORIFICE EQUATION. THIS
* HYDROGRAPH WILL RESULT IN THE TOTAL REQUIRED POND VOLUME.

ROUTE RESERVOIR ID=49 HYD=CLEVPOND1 INF ID=16
CODE = 2

FLOW	VOL	ELEV
0	0	95.8
85	0.2	96.0
90.1	0.46	97.0
110.0	1.19	98.0
143.0	2.00	99.0
162.7	3.10	100.0
180.0	4.90	101.0
184.1	5.6	101.25
203.0	7.7	102

* * * * *

TIME (HRS)	INFLOW DISCHARGE (CFS)	WATER ELEV (FT)	WATER VOLUME (A-F)	TOTAL OUTFLOW (CFS)
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0.0	0.0	95.8	0.0	
0.1	0.0	95.8	0.0	0.0
0.2	0.0	95.8	0.0	0.0
0.3	0.0	95.8	0.0	0.0
0.4	0.0	95.8	0.0	0.0
0.5	0.0	95.8	0.0	0.0
0.6	0.0	95.8	0.0	0.0
0.7	0.0	95.8	0.0	0.0
0.8	0.0	95.8	0.0	0.0
0.9	0.0	95.8	0.0	0.0
1.0	0.0	95.8	0.0	0.0
1.1	0.0	95.8	0.0	0.0
1.2	0.1	95.8	0.0	0.0
1.3	0.5	95.8	0.0	0.3
1.4	8.8	95.8	0.0	5.5
1.5	85.7	95.9	0.1	49.2
1.6	379.5	98.7	1.7	131.6
1.7	409.7	100.4	3.9	169.9
1.8	292.6	101.1	5.3	182.4
1.9	189.0	101.3	5.7	185.4
2.0	134.4	101.2	5.5	183.7
2.1	104.2	101.0	5.0	180.6
2.2	73.5	100.7	4.3	174.0
2.3	51.8	100.2	3.4	165.4
2.4	37.6	99.4	2.4	150.8
2.5	27.5	98.4	1.6	124.7
2.6	22.4	97.5	0.8	100.4
2.7	18.3	96.2	0.2	85.8
2.8	15.2	95.8	0.0	16.7
2.9	12.2	95.8	0.0	12.8
3.0	10.1	95.8	0.0	10.7
3.1	8.1	95.8	0.0	8.7
3.2	7.1	95.8	0.0	7.1
3.3	6.1	95.8	0.0	6.1
3.4	5.1	95.8	0.0	5.1
3.5	4.0	95.8	0.0	4.6
3.6	3.0	95.8	0.0	3.6
3.7	3.0	95.8	0.0	3.0
3.8	3.0	95.8	0.0	3.0
3.9	3.0	95.8	0.0	3.0
4.0	2.0	95.8	0.0	2.1
4.1	2.0	95.8	0.0	2.0
4.2	2.0	95.8	0.0	2.0
4.3	2.0	95.8	0.0	2.0
4.4	2.0	95.8	0.0	2.0
4.5	2.0	95.8	0.0	2.0
4.6	2.0	95.8	0.0	2.0
4.7	2.0	95.8	0.0	2.0
4.8	2.0	95.8	0.0	2.0
4.9	2.0	95.8	0.0	2.0
5.0	2.0	95.8	0.0	2.0
5.1	1.0	95.8	0.0	1.5
5.2	1.0	95.8	0.0	1.0
5.3	1.0	95.8	0.0	1.0
5.4	2.0	95.8	0.0	1.5
5.5	2.0	95.8	0.0	2.0
5.6	2.0	95.8	0.0	2.0
5.7	2.0	95.8	0.0	2.0
5.8	2.0	95.8	0.0	2.0
5.9	2.0	95.8	0.0	2.0
6.0	2.0	95.8	0.0	2.0

6.1	2.0	95.8	0.0	2.0
6.2	2.0	95.8	0.0	2.0
6.3	2.0	95.8	0.0	2.0
6.4	2.0	95.8	0.0	2.0
6.5	2.0	95.8	0.0	2.0
6.6	2.0	95.8	0.0	2.0
6.7	2.0	95.8	0.0	2.0
6.8	2.0	95.8	0.0	2.0
6.9	2.0	95.8	0.0	2.0
7.0	2.0	95.8	0.0	2.0
7.1	2.0	95.8	0.0	2.0
7.2	2.0	95.8	0.0	2.0
7.3	2.0	95.8	0.0	2.0
7.4	2.0	95.8	0.0	2.0
7.5	2.0	95.8	0.0	2.0
7.6	2.0	95.8	0.0	2.0
7.7	2.0	95.8	0.0	2.0
7.8	2.0	95.8	0.0	2.0
7.9	2.0	95.8	0.0	2.0
8.0	2.0	95.8	0.0	2.0
8.1	2.0	95.8	0.0	2.0
8.2	2.0	95.8	0.0	2.0
8.3	2.0	95.8	0.0	2.0
8.4	2.0	95.8	0.0	2.0
8.5	2.0	95.8	0.0	2.0
8.6	2.0	95.8	0.0	2.0
8.7	2.0	95.8	0.0	2.0
8.8	2.0	95.8	0.0	2.0
8.9	2.0	95.8	0.0	2.0
9.0	2.0	95.8	0.0	2.0
9.1	2.0	95.8	0.0	2.0
9.2	2.0	95.8	0.0	2.0
9.3	2.0	95.8	0.0	2.0
9.4	2.0	95.8	0.0	2.0
9.5	2.0	95.8	0.0	2.0
9.6	2.0	95.8	0.0	2.0
9.7	2.0	95.8	0.0	2.0
9.8	2.0	95.8	0.0	2.0
9.9	2.0	95.8	0.0	2.0
10.0	2.0	95.8	0.0	2.0
10.1	2.0	95.8	0.0	2.0
10.2	2.0	95.8	0.0	2.0
10.3	2.0	95.8	0.0	2.0
10.4	2.0	95.8	0.0	2.0
10.5	2.0	95.8	0.0	2.0
10.6	2.0	95.8	0.0	2.0
10.7	2.0	95.8	0.0	2.0
10.8	2.0	95.8	0.0	2.0
10.9	2.0	95.8	0.0	2.0
11.0	2.0	95.8	0.0	2.0
11.1	2.0	95.8	0.0	2.0
11.2	2.0	95.8	0.0	2.0
11.3	2.0	95.8	0.0	2.0
11.4	2.0	95.8	0.0	2.0
11.5	2.0	95.8	0.0	2.0
11.6	2.0	95.8	0.0	2.0
11.7	2.0	95.8	0.0	2.0
11.8	2.0	95.8	0.0	2.0
11.9	2.0	95.8	0.0	2.0
12.0	2.0	95.8	0.0	2.0
12.1	1.0	95.8	0.0	1.5

12.2	1.0	95.8	0.0	1.0
12.3	1.0	95.8	0.0	1.0
12.4	1.0	95.8	0.0	1.0
12.5	1.0	95.8	0.0	1.0
12.6	1.0	95.8	0.0	1.0
12.7	1.0	95.8	0.0	1.0
12.8	1.0	95.8	0.0	1.0
12.9	1.0	95.8	0.0	1.0
13.0	1.0	95.8	0.0	1.0
13.1	1.0	95.8	0.0	1.0
13.2	1.0	95.8	0.0	1.0
13.3	1.0	95.8	0.0	1.0
13.4	1.0	95.8	0.0	1.0
13.5	1.0	95.8	0.0	1.0
13.6	1.0	95.8	0.0	1.0
13.7	1.0	95.8	0.0	1.0
13.8	1.0	95.8	0.0	1.0
13.9	1.0	95.8	0.0	1.0
14.0	1.0	95.8	0.0	1.0
14.1	1.0	95.8	0.0	1.0
14.2	1.0	95.8	0.0	1.0
14.3	1.0	95.8	0.0	1.0
14.4	1.0	95.8	0.0	1.0
14.5	1.0	95.8	0.0	1.0
14.6	1.0	95.8	0.0	1.0
14.7	1.0	95.8	0.0	1.0
14.8	1.0	95.8	0.0	1.0
14.9	1.0	95.8	0.0	1.0
15.0	1.0	95.8	0.0	1.0
15.1	1.0	95.8	0.0	1.0
15.2	1.0	95.8	0.0	1.0
15.3	1.0	95.8	0.0	1.0
15.4	1.0	95.8	0.0	1.0
15.5	1.0	95.8	0.0	1.0
15.6	1.0	95.8	0.0	1.0
15.7	1.0	95.8	0.0	1.0
15.8	1.0	95.8	0.0	1.0
15.9	1.0	95.8	0.0	1.0
16.0	1.0	95.8	0.0	1.0
16.1	1.0	95.8	0.0	1.0
16.2	1.0	95.8	0.0	1.0
16.3	1.0	95.8	0.0	1.0
16.4	1.0	95.8	0.0	1.0
16.5	1.0	95.8	0.0	1.0
16.6	1.0	95.8	0.0	1.0
16.7	1.0	95.8	0.0	1.0
16.8	1.0	95.8	0.0	1.0
16.9	1.0	95.8	0.0	1.0
17.0	1.0	95.8	0.0	1.0
17.1	1.0	95.8	0.0	1.0
17.2	1.0	95.8	0.0	1.0
17.3	1.0	95.8	0.0	1.0
17.4	1.0	95.8	0.0	1.0
17.5	1.0	95.8	0.0	1.0
17.6	1.0	95.8	0.0	1.0
17.7	1.0	95.8	0.0	1.0
17.8	1.0	95.8	0.0	1.0
17.9	1.0	95.8	0.0	1.0
18.0	1.0	95.8	0.0	1.0
18.1	1.0	95.8	0.0	1.0
18.2	1.0	95.8	0.0	1.0

18.3	1.0	95.8	0.0	1.0
18.4	1.0	95.8	0.0	1.0
18.5	1.0	95.8	0.0	1.0
18.6	1.0	95.8	0.0	1.0
18.7	1.0	95.8	0.0	1.0
18.8	1.0	95.8	0.0	1.0
18.9	1.0	95.8	0.0	1.0
19.0	1.0	95.8	0.0	1.0
19.1	1.0	95.8	0.0	1.0
19.2	1.0	95.8	0.0	1.0
19.3	1.0	95.8	0.0	1.0
19.4	1.0	95.8	0.0	1.0
19.5	1.0	95.8	0.0	1.0
19.6	1.0	95.8	0.0	1.0
19.7	1.0	95.8	0.0	1.0
19.8	1.0	95.8	0.0	1.0
19.9	1.0	95.8	0.0	1.0
20.0	1.0	95.8	0.0	1.0
20.1	1.0	95.8	0.0	1.0
20.2	1.0	95.8	0.0	1.0
20.3	1.0	95.8	0.0	1.0
20.4	1.0	95.8	0.0	1.0
20.5	1.0	95.8	0.0	1.0
20.6	1.0	95.8	0.0	1.0
20.7	1.0	95.8	0.0	1.0
20.8	1.0	95.8	0.0	1.0
20.9	1.0	95.8	0.0	1.0
21.0	1.0	95.8	0.0	1.0
21.1	1.0	95.8	0.0	1.0
21.2	1.0	95.8	0.0	1.0
21.3	1.0	95.8	0.0	1.0
21.4	1.0	95.8	0.0	1.0
21.5	1.0	95.8	0.0	1.0
21.6	1.0	95.8	0.0	1.0
21.7	1.0	95.8	0.0	1.0
21.8	1.0	95.8	0.0	1.0
21.9	1.0	95.8	0.0	1.0
22.0	1.0	95.8	0.0	1.0
22.1	1.0	95.8	0.0	1.0
22.2	1.0	95.8	0.0	1.0
22.3	1.0	95.8	0.0	1.0
22.4	1.0	95.8	0.0	1.0
22.5	1.0	95.8	0.0	1.0
22.6	1.0	95.8	0.0	1.0
22.7	1.0	95.8	0.0	1.0
22.8	1.0	95.8	0.0	1.0
22.9	1.0	95.8	0.0	1.0
23.0	1.0	95.8	0.0	1.0
23.1	1.0	95.8	0.0	1.0
23.2	1.0	95.8	0.0	1.0
23.3	1.0	95.8	0.0	1.0
23.4	1.0	95.8	0.0	1.0
23.5	1.0	95.8	0.0	1.0
23.6	1.0	95.8	0.0	1.0
23.7	1.0	95.8	0.0	1.0
23.8	1.0	95.8	0.0	1.0
23.9	1.0	95.8	0.0	1.0
24.0	1.0	95.8	0.0	1.0
24.1	1.0	95.8	0.0	1.0
24.2	1.0	95.8	0.0	1.0
24.3	1.0	95.8	0.0	1.0

24.4 1.0 95.8 0.0 1.0
 PEAK DISCHARGE = 185.36 CFS.
 MAXIMUM WATER ELEVATION = 101.3 FT.
 MAXIMUM RESERVOIR STORAGE = 5.74 ACRE-FT.
 PRINT HYD ID=49 CODE =1

HYDROGRAPH NUMBER		CLEVPOND			
TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.	8.200	2.	16.400	1.
0.050	0.	8.250	2.	16.450	1.
0.100	0.	8.300	2.	16.500	1.
0.150	0.	8.350	2.	16.550	1.
0.200	0.	8.400	2.	16.600	1.
0.250	0.	8.450	2.	16.650	1.
0.300	0.	8.500	2.	16.700	1.
0.350	0.	8.550	2.	16.750	1.
0.400	0.	8.600	2.	16.800	1.
0.450	0.	8.650	2.	16.850	1.
0.500	0.	8.700	2.	16.900	1.
0.550	0.	8.750	2.	16.950	1.
0.600	0.	8.800	2.	17.000	1.
0.650	0.	8.850	2.	17.050	1.
0.700	0.	8.900	2.	17.100	1.
0.750	0.	8.950	2.	17.150	1.
0.800	0.	9.000	2.	17.200	1.
0.850	0.	9.050	2.	17.250	1.
0.900	0.	9.100	2.	17.300	1.
0.950	0.	9.150	2.	17.350	1.
1.000	0.	9.200	2.	17.400	1.
1.050	0.	9.250	2.	17.450	1.
1.100	0.	9.300	2.	17.500	1.
1.150	0.	9.350	2.	17.550	1.
1.200	0.	9.400	2.	17.600	1.
1.250	0.	9.450	2.	17.650	1.
1.300	0.	9.500	2.	17.700	1.
1.350	1.	9.550	2.	17.750	1.
1.400	5.	9.600	2.	17.800	1.
1.450	13.	9.650	2.	17.850	1.
1.500	49.	9.700	2.	17.900	1.
1.550	97.	9.750	2.	17.950	1.
1.600	132.	9.800	2.	18.000	1.
1.650	157.	9.850	2.	18.050	1.
1.700	170.	9.900	2.	18.100	1.
1.750	178.	9.950	2.	18.150	1.
1.800	182.	10.000	2.	18.200	1.
1.850	184.	10.050	2.	18.250	1.
1.900	185.	10.100	2.	18.300	1.
1.950	185.	10.150	2.	18.350	1.
2.000	184.	10.200	2.	18.400	1.
2.050	182.	10.250	2.	18.450	1.
2.100	181.	10.300	2.	18.500	1.
2.150	178.	10.350	2.	18.550	1.
2.200	174.	10.400	2.	18.600	1.
2.250	170.	10.450	2.	18.650	1.
2.300	165.	10.500	2.	18.700	1.
2.350	159.	10.550	2.	18.750	1.
2.400	151.	10.600	2.	18.800	1.
2.450	142.	10.650	2.	18.850	1.
2.500	125.	10.700	2.	18.900	1.

2.550	110.	10.750	2.	18.950	1.
2.600	100.	10.800	2.	19.000	1.
2.650	92.	10.850	2.	19.050	1.
2.700	86.	10.900	2.	19.100	1.
2.750	30.	10.950	2.	19.150	1.
2.800	17.	11.000	2.	19.200	1.
2.850	14.	11.050	2.	19.250	1.
2.900	13.	11.100	2.	19.300	1.
2.950	12.	11.150	2.	19.350	1.
3.000	11.	11.200	2.	19.400	1.
3.050	10.	11.250	2.	19.450	1.
3.100	9.	11.300	2.	19.500	1.
3.150	8.	11.350	2.	19.550	1.
3.200	7.	11.400	2.	19.600	1.
3.250	7.	11.450	2.	19.650	1.
3.300	6.	11.500	2.	19.700	1.
3.350	6.	11.550	2.	19.750	1.
3.400	5.	11.600	2.	19.800	1.
3.450	5.	11.650	2.	19.850	1.
3.500	5.	11.700	2.	19.900	1.
3.550	4.	11.750	2.	19.950	1.
3.600	4.	11.800	2.	20.000	1.
3.650	3.	11.850	2.	20.050	1.
3.700	3.	11.900	2.	20.100	1.
3.750	3.	11.950	2.	20.150	1.
3.800	3.	12.000	2.	20.200	1.
3.850	3.	12.050	2.	20.250	1.
3.900	3.	12.100	2.	20.300	1.
3.950	3.	12.150	1.	20.350	1.
4.000	2.	12.200	1.	20.400	1.
4.050	2.	12.250	1.	20.450	1.
4.100	2.	12.300	1.	20.500	1.
4.150	2.	12.350	1.	20.550	1.
4.200	2.	12.400	1.	20.600	1.
4.250	2.	12.450	1.	20.650	1.
4.300	2.	12.500	1.	20.700	1.
4.350	2.	12.550	1.	20.750	1.
4.400	2.	12.600	1.	20.800	1.
4.450	2.	12.650	1.	20.850	1.
4.500	2.	12.700	1.	20.900	1.
4.550	2.	12.750	1.	20.950	1.
4.600	2.	12.800	1.	21.000	1.
4.650	2.	12.850	1.	21.050	1.
4.700	2.	12.900	1.	21.100	1.
4.750	2.	12.950	1.	21.150	1.
4.800	2.	13.000	1.	21.200	1.
4.850	2.	13.050	1.	21.250	1.
4.900	2.	13.100	1.	21.300	1.
4.950	2.	13.150	1.	21.350	1.
5.000	2.	13.200	1.	21.400	1.
5.050	2.	13.250	1.	21.450	1.
5.100	2.	13.300	1.	21.500	1.
5.150	1.	13.350	1.	21.550	1.
5.200	1.	13.400	1.	21.600	1.
5.250	1.	13.450	1.	21.650	1.
5.300	1.	13.500	1.	21.700	1.
5.350	1.	13.550	1.	21.750	1.
5.400	1.	13.600	1.	21.800	1.
5.450	2.	13.650	1.	21.850	1.
5.500	2.	13.700	1.	21.900	1.
5.550	2.	13.750	1.	21.950	1.

5.600	2.	13.800	1.	22.000	1.
5.650	2.	13.850	1.	22.050	1.
5.700	2.	13.900	1.	22.100	1.
5.750	2.	13.950	1.	22.150	1.
5.800	2.	14.000	1.	22.200	1.
5.850	2.	14.050	1.	22.250	1.
5.900	2.	14.100	1.	22.300	1.
5.950	2.	14.150	1.	22.350	1.
6.000	2.	14.200	1.	22.400	1.
6.050	2.	14.250	1.	22.450	1.
6.100	2.	14.300	1.	22.500	1.
6.150	2.	14.350	1.	22.550	1.
6.200	2.	14.400	1.	22.600	1.
6.250	2.	14.450	1.	22.650	1.
6.300	2.	14.500	1.	22.700	1.
6.350	2.	14.550	1.	22.750	1.
6.400	2.	14.600	1.	22.800	1.
6.450	2.	14.650	1.	22.850	1.
6.500	2.	14.700	1.	22.900	1.
6.550	2.	14.750	1.	22.950	1.
6.600	2.	14.800	1.	23.000	1.
6.650	2.	14.850	1.	23.050	1.
6.700	2.	14.900	1.	23.100	1.
6.750	2.	14.950	1.	23.150	1.
6.800	2.	15.000	1.	23.200	1.
6.850	2.	15.050	1.	23.250	1.
6.900	2.	15.100	1.	23.300	1.
6.950	2.	15.150	1.	23.350	1.
7.000	2.	15.200	1.	23.400	1.
7.050	2.	15.250	1.	23.450	1.
7.100	2.	15.300	1.	23.500	1.
7.150	2.	15.350	1.	23.550	1.
7.200	2.	15.400	1.	23.600	1.
7.250	2.	15.450	1.	23.650	1.
7.300	2.	15.500	1.	23.700	1.
7.350	2.	15.550	1.	23.750	1.
7.400	2.	15.600	1.	23.800	1.
7.450	2.	15.650	1.	23.850	1.
7.500	2.	15.700	1.	23.900	1.
7.550	2.	15.750	1.	23.950	1.
7.600	2.	15.800	1.	24.000	1.
7.650	2.	15.850	1.	24.050	1.
7.700	2.	15.900	1.	24.100	1.
7.750	2.	15.950	1.	24.150	1.
7.800	2.	16.000	1.	24.200	1.
7.850	2.	16.050	1.	24.250	1.
7.900	2.	16.100	1.	24.300	1.
7.950	2.	16.150	1.	24.350	1.
8.000	2.	16.200	1.	24.400	1.
8.050	2.	16.250	1.	24.450	1.
8.100	2.	16.300	1.		
8.150	2.	16.350	1.		

RUNOFF VOLUME = 18.596 ACRE-FT
 PEAK DISCHARGE RATE = 185.4 CFS
 PEAK OCCURRED AT 1.90 HRS.

- * RECALL A SYNTHETIC HYDROGRAPH COMPRISED OF THE POND OUTFLOW
- * HYDROGRAPH, WITH THE FRONT PORTION OF THE PIPE OUTFLOW HYDROGRAPH


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* PRINT HYD ID=49 CODE=1
** ROUTE PIPE FLOW TO 24" WYE **
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.015
DIA=60 IN N=.013
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0.00	0.0	0.0	0.0
0.26	0.4	1.7	4.3
0.53	1.1	7.5	6.8
0.79	2.0	17.3	8.7
1.05	3.0	30.8	10.3
1.32	4.1	48.7	11.7
1.58	5.3	69.0	13.0
1.84	6.6	92.1	14.1
2.11	7.9	118.5	15.0
2.37	9.2	145.5	15.9
2.63	10.5	173.7	16.6
2.89	11.8	202.2	17.2
3.16	13.1	231.7	17.7
3.42	14.3	259.0	18.1
3.68	15.5	284.4	18.4
3.95	16.6	307.9	18.5
4.21	17.6	326.3	18.5
4.47	18.5	339.0	18.3
4.74	19.2	342.9	17.8
5.00	19.6	342.9	17.5

COMPUTE TRAVEL TIME ID=16 REACH=1 VS NO=1 L=527 SLP=.015

TRAVEL TIME TABLE
REACH 1.0

35

2.63	174.	0.0088	16.6
2.89	202.	0.0085	17.2
3.16	232.	0.0083	17.7
3.42	259.	0.0081	18.1
3.68	284.	0.0080	18.4
3.95	308.	0.0079	18.5
4.21	326.	0.0079	18.5
4.47	339.	0.0080	18.3
4.74	343.	0.0082	17.8
4.74	343.	0.0082	17.8

ROUTE
PRINT HYD

ID=16 HYD=PIPEFLO INFLOW ID=49 DT=0.05
ID=16 CODE=1

HYDROGRAPH NUMBER PIPEFLO

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.	8.300	2.	16.600	1.
0.050	0.	8.350	2.	16.650	1.
0.100	0.	8.400	2.	16.700	1.
0.150	0.	8.450	2.	16.750	1.
0.200	0.	8.500	2.	16.800	1.
0.250	0.	8.550	2.	16.850	1.
0.300	0.	8.600	2.	16.900	1.
0.350	0.	8.650	2.	16.950	1.
0.400	0.	8.700	2.	17.000	1.
0.450	0.	8.750	2.	17.050	1.
0.500	0.	8.800	2.	17.100	1.
0.550	0.	8.850	2.	17.150	1.
0.600	0.	8.900	2.	17.200	1.
0.650	0.	8.950	2.	17.250	1.
0.700	0.	9.000	2.	17.300	1.
0.750	0.	9.050	2.	17.350	1.
0.800	0.	9.100	2.	17.400	1.
0.850	0.	9.150	2.	17.450	1.
0.900	0.	9.200	2.	17.500	1.
0.950	0.	9.250	2.	17.550	1.
1.000	0.	9.300	2.	17.600	1.
1.050	0.	9.350	2.	17.650	1.
1.100	0.	9.400	2.	17.700	1.
1.150	0.	9.450	2.	17.750	1.
1.200	0.	9.500	2.	17.800	1.
1.250	3.	9.550	2.	17.850	1.
1.300	12.	9.600	2.	17.900	1.
1.350	42.	9.650	2.	17.950	1.
1.400	95.	9.700	2.	18.000	1.
1.450	175.	9.750	2.	18.050	1.
1.500	241.	9.800	2.	18.100	1.
1.550	132.	9.850	2.	18.150	1.
1.600	103.	9.900	2.	18.200	1.
1.650	164.	9.950	2.	18.250	1.
1.700	165.	10.000	2.	18.300	1.
1.750	178.	10.050	2.	18.350	1.
1.800	181.	10.100	2.	18.400	1.
1.850	185.	10.150	2.	18.450	1.
1.900	186.	10.200	2.	18.500	1.
1.950	185.	10.250	2.	18.550	1.
2.000	184.	10.300	2.	18.600	1.
2.050	182.	10.350	2.	18.650	1.
2.100	180.	10.400	2.	18.700	1.
2.150	178.	10.450	2.	18.750	1.

2.200	174.	10.500	2.	18.800	1.
2.250	170.	10.550	2.	18.850	1.
2.300	165.	10.600	2.	18.900	1.
2.350	158.	10.650	2.	18.950	1.
2.400	150.	10.700	2.	19.000	1.
2.450	141.	10.750	2.	19.050	1.
2.500	125.	10.800	2.	19.100	1.
2.550	109.	10.850	2.	19.150	1.
2.600	100.	10.900	2.	19.200	1.
2.650	92.	10.950	2.	19.250	1.
2.700	85.	11.000	2.	19.300	1.
2.750	38.	11.050	2.	19.350	1.
2.800	12.	11.100	2.	19.400	1.
2.850	15.	11.150	2.	19.450	1.
2.900	13.	11.200	2.	19.500	1.
2.950	12.	11.250	2.	19.550	1.
3.000	11.	11.300	2.	19.600	1.
3.050	10.	11.350	2.	19.650	1.
3.100	9.	11.400	2.	19.700	1.
3.150	8.	11.450	2.	19.750	1.
3.200	7.	11.500	2.	19.800	1.
3.250	7.	11.550	2.	19.850	1.
3.300	6.	11.600	2.	19.900	1.
3.350	6.	11.650	2.	19.950	1.
3.400	5.	11.700	2.	20.000	1.
3.450	5.	11.750	2.	20.050	1.
3.500	5.	11.800	2.	20.100	1.
3.550	4.	11.850	2.	20.150	1.
3.600	4.	11.900	2.	20.200	1.
3.650	3.	11.950	2.	20.250	1.
3.700	3.	12.000	2.	20.300	1.
3.750	3.	12.050	2.	20.350	1.
3.800	3.	12.100	2.	20.400	1.
3.850	3.	12.150	2.	20.450	1.
3.900	3.	12.200	1.	20.500	1.
3.950	3.	12.250	1.	20.550	1.
4.000	3.	12.300	1.	20.600	1.
4.050	2.	12.350	1.	20.650	1.
4.100	2.	12.400	1.	20.700	1.
4.150	2.	12.450	1.	20.750	1.
4.200	2.	12.500	1.	20.800	1.
4.250	2.	12.550	1.	20.850	1.
4.300	2.	12.600	1.	20.900	1.
4.350	2.	12.650	1.	20.950	1.
4.400	2.	12.700	1.	21.000	1.
4.450	2.	12.750	1.	21.050	1.
4.500	2.	12.800	1.	21.100	1.
4.550	2.	12.850	1.	21.150	1.
4.600	2.	12.900	1.	21.200	1.
4.650	2.	12.950	1.	21.250	1.
4.700	2.	13.000	1.	21.300	1.
4.750	2.	13.050	1.	21.350	1.
4.800	2.	13.100	1.	21.400	1.
4.850	2.	13.150	1.	21.450	1.
4.900	2.	13.200	1.	21.500	1.
4.950	2.	13.250	1.	21.550	1.
5.000	2.	13.300	1.	21.600	1.
5.050	2.	13.350	1.	21.650	1.
5.100	2.	13.400	1.	21.700	1.
5.150	2.	13.450	1.	21.750	1.
5.200	1.	13.500	1.	21.800	1.

5.250	1.	13.550	1.	21.850	1.
5.300	1.	13.600	1.	21.900	1.
5.350	1.	13.650	1.	21.950	1.
5.400	1.	13.700	1.	22.000	1.
5.450	1.	13.750	1.	22.050	1.
5.500	2.	13.800	1.	22.100	1.
5.550	2.	13.850	1.	22.150	1.
5.600	2.	13.900	1.	22.200	1.
5.650	2.	13.950	1.	22.250	1.
5.700	2.	14.000	1.	22.300	1.
5.750	2.	14.050	1.	22.350	1.
5.800	2.	14.100	1.	22.400	1.
5.850	2.	14.150	1.	22.450	1.
5.900	2.	14.200	1.	22.500	1.
5.950	2.	14.250	1.	22.550	1.
6.000	2.	14.300	1.	22.600	1.
6.050	2.	14.350	1.	22.650	1.
6.100	2.	14.400	1.	22.700	1.
6.150	2.	14.450	1.	22.750	1.
6.200	2.	14.500	1.	22.800	1.
6.250	2.	14.550	1.	22.850	1.
6.300	2.	14.600	1.	22.900	1.
6.350	2.	14.650	1.	22.950	1.
6.400	2.	14.700	1.	23.000	1.
6.450	2.	14.750	1.	23.050	1.
6.500	2.	14.800	1.	23.100	1.
6.550	2.	14.850	1.	23.150	1.
6.600	2.	14.900	1.	23.200	1.
6.650	2.	14.950	1.	23.250	1.
6.700	2.	15.000	1.	23.300	1.
6.750	2.	15.050	1.	23.350	1.
6.800	2.	15.100	1.	23.400	1.
6.850	2.	15.150	1.	23.450	1.
6.900	2.	15.200	1.	23.500	1.
6.950	2.	15.250	1.	23.550	1.
7.000	2.	15.300	1.	23.600	1.
7.050	2.	15.350	1.	23.650	1.
7.100	2.	15.400	1.	23.700	1.
7.150	2.	15.450	1.	23.750	1.
7.200	2.	15.500	1.	23.800	1.
7.250	2.	15.550	1.	23.850	1.
7.300	2.	15.600	1.	23.900	1.
7.350	2.	15.650	1.	23.950	1.
7.400	2.	15.700	1.	24.000	1.
7.450	2.	15.750	1.	24.050	1.
7.500	2.	15.800	1.	24.100	1.
7.550	2.	15.850	1.	24.150	1.
7.600	2.	15.900	1.	24.200	1.
7.650	2.	15.950	1.	24.250	1.
7.700	2.	16.000	1.	24.300	1.
7.750	2.	16.050	1.	24.350	1.
7.800	2.	16.100	1.	24.400	1.
7.850	2.	16.150	1.	24.450	1.
7.900	2.	16.200	1.	24.500	1.
7.950	2.	16.250	1.	24.550	1.
8.000	2.	16.300	1.	24.600	1.
8.050	2.	16.350	1.	24.650	1.
8.100	2.	16.400	1.	24.700	1.
8.150	2.	16.450	1.	24.750	1.
8.200	2.	16.500	1.	24.800	1.
8.250	2.	16.550	1.	24.850	0.

RUNOFF VOLUME = 20.722 ACRE-FT
 PEAK DISCHARGE RATE = 241.4 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN 403.02 TO PIPE FLOW THROUGH THE 24" WYE WEST OF **
 ** GOLF COURSE AT STA 18+12 **
 ADD HYD ID=16 HYD=403.40 ID I=16 II=25
 PRINT HYD ID=16 CODE=0

HYDROGRAPH NUMBER 403.40

RUNOFF VOLUME = 23.746 ACRE-FT
 PEAK DISCHARGE RATE = 313.7 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW THRU 66" TO 30" WYE IN GOLF COURSE RD. **
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.015

DIA=66 IN N=.013

0.00	0.0	0.0	0.0
0.29	0.5	2.2	4.6
0.58	1.3	9.6	7.2
0.87	2.4	22.3	9.2
1.16	3.6	40.1	11.0
1.45	5.0	62.6	12.5
1.74	6.5	89.2	13.8
2.03	8.0	119.5	15.0
2.32	9.5	152.6	16.0
2.61	11.1	188.0	16.9
2.89	12.6	223.5	17.7
3.18	14.2	260.9	18.3
3.47	15.8	297.9	18.9
3.76	17.3	333.7	19.3
4.05	18.8	367.0	19.6
4.34	20.1	396.5	19.7
4.63	21.3	420.7	19.7
4.92	22.4	437.2	19.5
5.21	23.3	442.1	19.0
5.50	23.8	442.1	18.6

COMPUTE TRAVEL TIME ID=21 REACH=1 VS NO=1 L=105 SLP=.015

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.29	2.	0.0063	4.6
0.58	10.	0.0041	0.0
0.87	22.	0.0032	0.0
1.16	40.	0.0027	0.0
1.45	63.	0.0023	0.0
1.74	89.	0.0021	0.0
2.03	119.	0.0019	0.0
2.32	153.	0.0018	0.0
2.61	188.	0.0017	0.0
2.89	224.	0.0017	0.0
3.18	261.	0.0016	0.0

3.47	298.	0.0015	0.0
3.76	334.	0.0015	0.0
4.05	367.	0.0015	0.0
4.34	397.	0.0015	0.0
4.63	421.	0.0015	0.0
4.92	437.	0.0015	0.0
5.21	442.	0.0015	0.0
5.21	442.	0.0015	0.0

ROUTE ID=21 HYD=21.1 INFLOW ID=16 DT=0.05
 PRINT HYD ID=21 CODE=0

HYDROGRAPH NUMBER 21.1

RUNOFF VOLUME = 23.745 ACRE-FT
 PEAK DISCHARGE RATE = 313.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 403.1 *****
 COMPUTE NM HYD ID=3 HYD NO=403.1 DA=.019
 PER A=0 PER B=35 PER C=5 PER D=60
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	46.2	526.28	0.011	0.1	0.04
Pervious	0.130	0.125	0.959	3.68	19.5	333.52	0.008	0.5	1.20

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=3 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 403.

RUNOFF VOLUME = 1.760 ACRE-FT
 PEAK DISCHARGE RATE = 42.1 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=3 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE

DIVIDE HYD ID=47 Q=-1.0
 ID=3 HYD=101.3
 ID=48 HYD=NOVALUE

PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 1.795 ACRE-FT
 PEAK DISCHARGE RATE = 43.0 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE 403.1 PIPE FLOW THRU PIPE TO BUTTERFIELD **
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.015

DIA=30 IN N=.013

0.00	0.0	0.0	0.0
0.13	0.1	0.3	2.7
0.26	0.3	1.1	4.2
0.39	0.5	2.6	5.4
0.53	0.8	4.9	6.5
0.66	1.0	7.7	7.4
0.79	1.3	10.9	8.2
0.92	1.6	14.5	8.9
1.05	2.0	18.5	9.5
1.18	2.3	22.8	10.0
1.32	2.6	27.5	10.5
1.45	3.0	32.0	10.8
1.58	3.3	36.5	11.2
1.71	3.6	40.8	11.4
1.84	3.9	44.8	11.6
1.97	4.1	48.4	11.7
2.11	4.4	51.5	11.6
2.24	4.6	53.4	11.5
2.37	4.8	54.0	11.2
2.50	4.9	54.0	11.0

COMPUTE TRAVEL TIME ID=19 REACH=1 VS NO=1 L=1284 SLP=.015

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.13	0.	0.1323	2.7
0.26	1.	0.0847	4.2
0.39	3.	0.0658	5.4
0.53	5.	0.0547	6.5
0.66	8.	0.0482	7.4
0.79	11.	0.0437	8.2
0.92	15.	0.0403	8.9
1.05	18.	0.0377	9.5
1.18	23.	0.0357	10.0
1.32	28.	0.0341	10.5
1.45	32.	0.0329	10.8
1.58	36.	0.0320	11.2
1.71	41.	0.0313	11.4
1.84	45.	0.0308	11.6
1.97	48.	0.0306	11.7
2.11	51.	0.0306	11.6
2.24	53.	0.0310	11.5
2.37	54.	0.0318	11.2
2.37	54.	0.0318	11.2

ROUTE
PRINT HYD

ID=19 HYD=403PIP INFLOW ID=3 DT=0.05
ID=19 CODE=0

HYDROGRAPH NUMBER 403PIP

RUNOFF VOLUME = 1.448 ACRE-FT
PEAK DISCHARGE RATE = 40.6 CFS
PEAK OCCURRED AT 1.50 HRS.

** ADD PIPE FLOW FROM 403.1 FOR TOTAL PIPE FLOW AT
** GOLF COURSE AND BUTTERFIELD*****

ADD HYD
PRINT HYD

ID=36 HYD=PIPEFLO ID I=21 II=19
ID=36 CODE=0

HYDROGRAPH NUMBER PIPEFLO

RUNOFF VOLUME = 25.194 ACRE-FT
PEAK DISCHARGE RATE = 353.9 CFS
PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW THRU 66" TO JUNCTION BOX EAST OF GOLF COURSE RD. **
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.0285

DIA=66 IN N=.013

0.00	0.0	0.0	0.0
0.29	0.5	3.0	6.3
0.58	1.3	13.2	9.9
0.87	2.4	30.7	12.7
1.16	3.6	55.3	15.1
1.45	5.0	86.3	17.2
1.74	6.5	123.0	19.1
2.03	8.0	164.7	20.7
2.32	9.5	210.4	22.1
2.61	11.1	259.1	23.3
2.89	12.6	308.1	24.4
3.18	14.2	359.6	25.3
3.47	15.8	410.7	26.0
3.76	17.3	460.0	26.6
4.05	18.8	505.8	27.0
4.34	20.1	546.6	27.2
4.63	21.3	579.8	27.2
4.92	22.4	602.6	26.9
5.21	23.3	609.4	26.2
5.50	23.8	609.4	25.7

COMPUTE TRAVEL TIME ID=21 REACH=1 VS NO=1 L=133 SLP=.0285

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.29	3.	0.0058	6.3
0.58	13.	0.0037	0.0
0.87	31.	0.0029	0.0
1.16	55.	0.0024	0.0
1.45	86.	0.0021	0.0
1.74	123.	0.0019	0.0
2.03	165.	0.0018	0.0
2.32	210.	0.0017	0.0
2.61	259.	0.0016	0.0
2.89	308.	0.0015	0.0
3.18	360.	0.0015	0.0
3.47	411.	0.0014	0.0
3.76	460.	0.0014	0.0
4.05	506.	0.0014	0.0
4.34	547.	0.0014	0.0
4.63	580.	0.0014	0.0
4.92	603.	0.0014	0.0
5.21	609.	0.0014	0.0
5.21	609.	0.0014	0.0

ROUTE ID=21 HYD=21.1 INFLOW ID=36 DT=0.05
 PRINT HYD ID=21 CODE=0

HYDROGRAPH NUMBER 21.1

RUNOFF VOLUME = 25.193 ACRE-FT
 PEAK DISCHARGE RATE = 353.2 CFS
 PEAK OCCURRED AT 1.50 HRS.

** MOLZEN-CORBIN'S BASIN 402 WILL BE DIVIDED INTO THREE BASINS TO MORE
 ** CLOSELY REPRESENT THE ACTUAL HYDROLOGICAL CONDITIONS

***** CALCULATE BASIN 402.02 *****
 COMPUTE NM HYD ID=2 HYD NO=402.02 DA=.0160
 PER A=7 PER B=14 PER C=20 PER D=59
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.071	0.545	7.11	38.2	526.28	0.009	0.1	0.04
Pervious	0.130	0.121	0.933	3.79	17.2	341.11	0.007	0.5	1.12

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 402.

RUNOFF VOLUME = 1.487 ACRE-FT
 PEAK DISCHARGE RATE = 35.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=2 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 1.517 ACRE-FT
 PEAK DISCHARGE RATE = 36.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE BASIN 402.02 TO THE FIRST BATTERY OF INLETS ON BUTTERFIELD **
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.04

DIA=24 IN N=.013

0.00	0.0	0.0	0.0
0.11	0.1	0.3	3.9
0.21	0.2	1.0	6.0
0.32	0.3	2.5	7.7
0.42	0.5	4.4	9.1

0.53	0.7	7.0	10.4
0.63	0.8	9.7	11.5
0.74	1.1	13.2	12.5
0.84	1.3	16.7	13.3
0.95	1.5	20.7	14.1
1.05	1.7	24.6	14.7
1.16	1.9	28.8	15.3
1.26	2.1	32.7	15.7
1.37	2.3	36.8	16.0
1.47	2.5	40.3	16.3
1.58	2.7	43.7	16.4
1.68	2.8	46.2	16.4
1.79	3.0	48.1	16.2
1.89	3.1	48.7	15.8
2.00	3.1	48.7	15.5

COMPUTE TRAVEL TIME ID=31 REACH=1 VS NO=1 L=420 SLP=.04

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.11	0.	0.0296	3.9
0.21	1.	0.0196	6.0
0.32	3.	0.0151	7.7
0.42	4.	0.0128	9.1
0.53	7.	0.0112	10.4
0.63	10.	0.0102	11.5
0.74	13.	0.0093	12.5
0.84	17.	0.0088	13.3
0.95	21.	0.0083	14.1
1.05	25.	0.0079	14.7
1.16	29.	0.0076	15.3
1.26	33.	0.0074	15.7
1.37	37.	0.0073	16.0
1.47	40.	0.0072	16.3
1.58	44.	0.0071	16.4
1.68	46.	0.0071	16.4
1.79	48.	0.0072	16.2
1.89	49.	0.0074	15.8
1.89	49.	0.0074	15.8

ROUTE ID=31 HYD=PIPE INFLOW ID=2 DT=0.05
PRINT HYD ID=31 CODE=0

HYDROGRAPH NUMBER PIPE

RUNOFF VOLUME = 1.226 ACRE-FT
PEAK DISCHARGE RATE = 36.7 CFS
PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 402.01 *****
COMPUTE NM HYD ID=2 HYD NO=402.01 DA=.0657
PER A=7 PER B=14 PER C=20 PER D=59
TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
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mpervious	0.130	0.071	0.545	7.10	156.8	525.96	0.039	0.1	0.04
Pervious	0.130	0.121	0.932	3.80	70.7	341.39	0.027	0.5	1.12

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 402.

RUNOFF VOLUME = 6.107 ACRE-FT
 PEAK DISCHARGE RATE = 147.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=2 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 6.229 ACRE-FT
 PEAK DISCHARGE RATE = 150.2 CFS
 PEAK OCCURRED AT 1.50 HRS.

** THIS UPSTREAM BASIN DISCHARGES INTO EXISTING INLETS ON GRADE IN
 ** BUTTERFIELD. DIVIDE 64 CFS INTO EXISTING STORM DRAIN
 ** ON BUTTERFIELD PER INLET CAPACITY CALCULATIONS.

DIVIDE HYD ID=2 QMAX=64 ID=10 HYD=402.PIP PIPE FLOW
 ID=20 HYD=402.STRT STREET FLOW
 PRINT HYD ID=20 CODE=0

HYDROGRAPH NUMBER 402.STRT

RUNOFF VOLUME = 1.247 ACRE-FT
 PEAK DISCHARGE RATE = 86.2 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD PIPE FLOWS IN BUTTERFIELD UPSTREAM OF GOLF COURSE
 ADD HYD ID=35 HYD=BFDPIPE ID I=31 ID II=10
 PRINT HYD ID=35 CODE=0

HYDROGRAPH NUMBER BFDPIPE

RUNOFF VOLUME = 6.209 ACRE-FT
 PEAK DISCHARGE RATE = 100.7 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE THESE FLOWS THROUGH THE 48" SD TO GOLF COURSE *****
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.0385

DIA=48 IN N=.013

0.00	0.0	0.0	0.0
0.21	0.3	1.5	5.9
0.42	0.7	6.5	9.3
0.63	1.3	15.2	11.9
0.84	1.9	27.2	14.2
1.05	2.6	42.5	16.2
1.26	3.4	60.6	17.9
1.47	4.2	81.2	19.4
1.68	5.0	103.8	20.7
1.89	5.8	127.9	21.9
2.11	6.7	154.2	22.9
2.32	7.6	179.7	23.8
2.53	8.4	204.9	24.5
2.74	9.2	229.3	25.0
2.95	9.9	252.0	25.4
3.16	10.6	272.0	25.5
3.37	11.3	288.5	25.5
3.58	11.9	299.7	25.3
3.79	12.3	303.0	24.6
4.00	12.6	303.0	24.1

COMPUTE TRAVEL TIME ID=31 REACH=1 VS NO=1 L=165 SLP=.0385

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.21	2.	0.0077	5.9
0.42	7.	0.0049	0.0
0.63	15.	0.0038	0.0
0.84	27.	0.0032	0.0
1.05	43.	0.0028	0.0
1.26	61.	0.0026	0.0
1.47	81.	0.0024	0.0
1.68	104.	0.0022	0.0
1.89	128.	0.0021	0.0
2.11	154.	0.0020	0.0
2.32	180.	0.0019	0.0
2.53	205.	0.0019	0.0
2.74	229.	0.0018	0.0
2.95	252.	0.0018	0.0
3.16	272.	0.0018	0.0
3.37	288.	0.0018	0.0
3.58	300.	0.0018	0.0
3.79	303.	0.0019	0.0
3.79	303.	0.0019	0.0

ROUTE ID=31 HYD=PIPE INFLOW ID=35 DT=0.05
PRINT HYD ID=31 CODE=0

HYDROGRAPH NUMBER PIPE

RUNOFF VOLUME = 6.074 ACRE-FT
PEAK DISCHARGE RATE = 100.9 CFS
PEAK OCCURRED AT 1.50 HRS.

** CALCULATE BASIN 402.03.
COMPUTE NM HYD ID=2 HYD NO=402.03 DA=.0113

PER A=98 PER B=0 PER C=2 PER D=0
 TP=-.13 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.130	0.159	1.219	2.92	23.9	275.11	0.011	0.6	1.65

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 402.

RUNOFF VOLUME = 0.269 ACRE-FT
 PEAK DISCHARGE RATE = 9.7 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING
 DIVIDE HYD ID=2 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.301 ACRE-FT
 PEAK DISCHARGE RATE = 10.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

** SUM UP ALL THE STREET RUNOFF AT GOLF COURSE AND BUTTERFIELD, THEN
 ** INPUT A PORTION OF THE RUNOFF INTO THE INLETS AT THAT INTERSECTION
 ** ADD BASIN 403.04 (PARK RUNOFF) TO BASIN 402 STREET OVERFLOW **
 ADD HYD ID=18 HYD=STRTFLO ID I=20 II=27
 PRINT HYD ID=18 CODE=0

HYDROGRAPH NUMBER STRTFLO

RUNOFF VOLUME = 1.372 ACRE-FT
 PEAK DISCHARGE RATE = 90.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

* COMPUTE HYDROGRAPH FOR BASIN C (GOLF COURSE ROAD R/W) *****
 COMPUTE NM HYD ID=3 HYD=BASINC DA=0.0088
 %A=40.0 %B=0.0 %C=0.0 %D=60 TP=0.133333
 MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	20.8	526.28	0.005	0.1	0.04
Pervious	0.133	0.164	1.228	2.90	7.2	273.54	0.004	0.6	1.67

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD

ID=3 CODE=0

HYDROGRAPH NUMBER

BASINC

RUNOFF VOLUME = 0.766 ACRE-FT
PEAK DISCHARGE RATE = 17.4 CFS
PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN C RUNOFF TO STREET FLOW **

ADD HYD ID=18 HYD=GLF-CRS ID I=18 ID II=3
PRINT HYD ID=18 CODE=0

HYDROGRAPH NUMBER

GLF-CRS

RUNOFF VOLUME = 2.138 ACRE-FT
PEAK DISCHARGE RATE = 108.0 CFS
PEAK OCCURRED AT 1.50 HRS.

** 20 CFS WILL BE DISCHARGED BY THE INLET AT NW CORNER OF BUTTERFIELD/
** COURSE. THE REMAINDER WILL OVERFLOW THE ROADWAY CENTERLINE.

DIVIDE HYD ID=18 QMAX=20 ID=32 HYD=PIPE PIPE FLOW
ID=33 HYD=OVRSTRT STREET FLOW
PRINT HYD ID=33 CODE=0

HYDROGRAPH NUMBER

OVRSTRT

RUNOFF VOLUME = 1.154 ACRE-FT
PEAK DISCHARGE RATE = 88.0 CFS
PEAK OCCURRED AT 1.50 HRS.

** 8 CFS WILL BE DISCHARGED BY THE INLET AT NE CORNER OF GOLF COURSE/
** BUTTERFIELD. THE REMAINDER CONTINUES AS STREET FLOW EAST ON
** BUTTERFIELD. *****

DIVIDE HYD ID=33 QMAX=8 ID=8 HYD=INLET PIPE FLOW
ID=33 HYD=BTR.OVR STREET FLOW
PRINT HYD ID=33 CODE=0

HYDROGRAPH NUMBER

BTR.OVR

RUNOFF VOLUME = 0.956 ACRE-FT
PEAK DISCHARGE RATE = 80.0 CFS
PEAK OCCURRED AT 1.50 HRS.

** SUM THE RUNOFF INTO THE INLET AT THE NW CORNER BUTTERFIELD/GOLF COU
ADD HYD ID=2 HYD=BFDPIPE ID I=32 ID II=2

PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER

BFDPIPE

RUNOFF VOLUME = 1.285 ACRE-FT
PEAK DISCHARGE RATE = 30.9 CFS

PEAK OCCURRED AT 1.50 HRS.

** ROUTE TO THE MANHOLE AT STA 52+36 IN GOLF COURSE
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.0284

DIA=36 IN N=.013

0.00	0.0	0.0	0.0
0.16	0.1	0.6	4.3
0.32	0.4	2.7	6.6
0.47	0.7	6.0	8.4
0.63	1.1	10.9	10.1
0.79	1.5	17.1	11.5
0.95	1.9	24.4	12.7
1.11	2.4	32.8	13.8
1.26	2.8	41.4	14.7
1.42	3.3	51.2	15.5
1.58	3.8	61.3	16.2
1.74	4.3	71.7	16.9
1.89	4.7	81.3	17.3
2.05	5.1	91.1	17.7
2.21	5.6	100.3	18.0
2.37	6.0	108.5	18.1
2.53	6.4	115.1	18.1
2.68	6.7	119.4	17.9
2.84	6.9	120.8	17.5
3.00	7.1	120.8	17.1

COMPUTE TRAVEL TIME ID=32 REACH=1 VS NO=1 L=56 SLP=.0284

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.16	1.	0.0037	0.0
0.32	3.	0.0023	0.0
0.47	6.	0.0018	0.0
0.63	11.	0.0015	0.0
0.79	17.	0.0014	0.0
0.95	24.	0.0012	0.0
1.11	33.	0.0011	0.0
1.26	41.	0.0011	0.0
1.42	51.	0.0010	0.0
1.58	61.	0.0010	0.0
1.74	72.	0.0009	0.0
1.89	81.	0.0009	0.0
2.05	91.	0.0009	0.0
2.21	100.	0.0009	0.0
2.37	108.	0.0009	0.0
2.53	115.	0.0009	0.0
2.68	119.	0.0009	0.0
2.84	121.	0.0009	0.0
2.84	121.	0.0009	0.0

ROUTE ID=32 HYD=PIPE INFLOW ID=2 DT=0.05
PRINT HYD ID=32 CODE=0

HYDROGRAPH NUMBER

PIPE

RUNOFF VOLUME = 1.115 ACRE-FT
PEAK DISCHARGE RATE = 31.1 CFS

PEAK OCCURRED AT 1.55 HRS.

** SUM THE RUNOFF INTO THE MANHOLE AT STATION 52+36 ON GOLF COURSE
ADD HYD ID=2 HYD=BFDPIPE ID I=32 ID II=8
PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER BFDPIPE

RUNOFF VOLUME = 1.313 ACRE-FT
PEAK DISCHARGE RATE = 39.1 CFS
PEAK OCCURRED AT 1.55 HRS.

** ROUTE TO THE MANHOLE AT STA 52+04 IN GOLF COURSE
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.0428
DIA=36 IN N=.013

0.00	0.0	0.0	0.0
0.16	0.1	0.8	5.2
0.32	0.4	3.3	8.2
0.47	0.7	7.3	10.4
0.63	1.1	13.3	12.4
0.79	1.5	20.9	14.1
0.95	1.9	30.0	15.6
1.11	2.4	40.3	16.9
1.26	2.8	50.8	18.0
1.42	3.3	62.8	19.1
1.58	3.8	75.3	19.9
1.74	4.3	88.0	20.7
1.89	4.7	99.8	21.3
2.05	5.1	111.9	21.7
2.21	5.6	123.2	22.1
2.37	6.0	133.2	22.2
2.53	6.4	141.3	22.2
2.68	6.7	146.6	22.0
2.84	6.9	148.3	21.4
3.00	7.1	148.3	21.0

COMPUTE TRAVEL TIME ID=32 REACH=1 VS NO=1 L=26 SLP=.0428

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.16	1.	0.0014	0.0
0.32	3.	0.0009	0.0
0.47	7.	0.0007	0.0
0.63	13.	0.0006	0.0
0.79	21.	0.0005	0.0
0.95	30.	0.0005	0.0
1.11	40.	0.0004	0.0
1.26	51.	0.0004	0.0
1.42	63.	0.0004	0.0
1.58	75.	0.0004	0.0
1.74	88.	0.0003	0.0
1.89	100.	0.0003	0.0
2.05	112.	0.0003	0.0
2.21	123.	0.0003	0.0
2.37	133.	0.0003	0.0

	2.53	141.	0.0003	0.0
	2.68	147.	0.0003	0.0
	2.84	148.	0.0003	0.0
	2.84	148.	0.0003	0.0

ROUTE ID=32 HYD=PIPE INFLOW ID=2 DT=0.05
 PRINT HYD ID=32 CODE=0

HYDROGRAPH NUMBER PIPE

RUNOFF VOLUME = 1.313 ACRE-FT
 PEAK DISCHARGE RATE = 39.6 CFS
 PEAK OCCURRED AT 1.55 HRS.

** SUM THE FLOWS AT THAT MANHOLE
 ADD HYD ID=32 HYD=INTO54 ID I=32 ID II=31
 PRINT HYD ID=32 CODE=0

HYDROGRAPH NUMBER INTO54

RUNOFF VOLUME = 7.387 ACRE-FT
 PEAK DISCHARGE RATE = 138.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW TO JUNCTION BOX EAST OF GOLF COURSE **
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.0219
 DIA=54 IN N=.013

0.00	0.0	0.0	0.0
0.24	0.3	1.6	4.9
0.47	0.9	6.7	7.5
0.71	1.6	15.7	9.8
0.95	2.4	28.4	11.6
1.18	3.3	43.8	13.2
1.42	4.3	62.8	14.6
1.66	5.3	84.4	15.8
1.89	6.3	107.2	16.9
2.13	7.4	132.4	17.9
2.37	8.5	158.8	18.7
2.61	9.6	185.5	19.4
2.84	10.6	210.9	19.9
3.08	11.6	236.5	20.4
3.32	12.6	260.3	20.7
3.55	13.5	280.5	20.8
3.79	14.3	297.8	20.8
4.03	15.0	309.5	20.6
4.26	15.6	312.9	20.1
4.50	15.9	312.9	19.7

COMPUTE TRAVEL TIME ID=8 REACH=1 VS NO=1 L=186 SLP=.0219

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.24	2.	0.0105	4.9
0.47	7.	0.0068	7.5
0.71	16.	0.0053	9.8

0.95	28.	0.0044	0.0
1.18	44.	0.0039	0.0
1.42	63.	0.0035	0.0
1.66	84.	0.0033	0.0
1.89	107.	0.0031	0.0
2.13	132.	0.0029	0.0
2.37	159.	0.0028	0.0
2.61	186.	0.0027	0.0
2.84	211.	0.0026	0.0
3.08	236.	0.0025	0.0
3.32	260.	0.0025	0.0
3.55	280.	0.0025	0.0
3.79	298.	0.0025	0.0
4.03	310.	0.0025	0.0
4.26	313.	0.0026	0.0
4.26	313.	0.0026	0.0

ROUTE ID=8 HYD=402.1 INFLOW ID=32 DT=0.05
 PRINT HYD ID=8 CODE=0

HYDROGRAPH NUMBER 402.1

RUNOFF VOLUME = 7.389 ACRE-FT
 PEAK DISCHARGE RATE = 138.1 CFS
 PEAK OCCURRED AT 1.55 HRS.

** ADD FLOWS AT JUNCTION BOX **

ADD HYD ID=36 HYD=PIPE ID I=21 II=8
 PRINT HYD ID=36 CODE=0

HYDROGRAPH NUMBER PIPE

RUNOFF VOLUME = 32.582 ACRE-FT
 PEAK DISCHARGE RATE = 490.4 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW THRU 72" TO FUTURE MANHOLE AT RIO SALADO (A.P. 11)
 ** STORM DRAIN STATION 24+60

COMPUTE RATING CURVE CID=22 VS NO=1 CODE=-1 SLP=.0227
 DIA=72 IN N=.013

0.00	0.0	0.0	0.0
0.32	0.6	3.5	6.0
0.63	1.6	14.8	9.3
0.95	2.9	34.7	12.1
1.26	4.3	61.7	14.3
1.58	5.9	96.9	16.3
1.89	7.6	137.3	18.0
2.21	9.5	184.6	19.5
2.53	11.3	236.6	20.9
2.84	13.2	290.4	22.0
3.16	15.1	348.1	23.1
3.47	16.9	404.9	23.9
3.79	18.8	463.1	24.6
4.11	20.6	519.1	25.1
4.42	22.3	569.6	25.5
4.74	24.0	615.9	25.7
5.05	25.4	652.5	25.7
5.37	26.7	678.4	25.4

5.68 27.7 686.0 24.8
 6.00 28.3 686.0 24.3
 COMPUTE TRAVEL TIME ID=22 REACH=1 VS NO=1 L=410 SLP=.0227

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.32	4.	0.0188	6.0
0.63	15.	0.0122	9.3
0.95	35.	0.0094	12.1
1.26	62.	0.0080	14.3
1.58	97.	0.0070	16.3
1.89	137.	0.0063	18.0
2.21	185.	0.0058	19.5
2.53	237.	0.0055	20.9
2.84	290.	0.0052	22.0
3.16	348.	0.0049	0.0
3.47	405.	0.0048	0.0
3.79	463.	0.0046	0.0
4.11	519.	0.0045	0.0
4.42	570.	0.0045	0.0
4.74	616.	0.0044	0.0
5.05	653.	0.0044	0.0
5.37	678.	0.0045	0.0
5.68	686.	0.0046	0.0
5.68	686.	0.0046	0.0

ROUTE ID=22 HYD=22.1 INFLOW ID=36 DT=0.05
 PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER 22.1

RUNOFF VOLUME = 32.581 ACRE-FT
 PEAK DISCHARGE RATE = 485.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

** COMPUTE HYDROGRAPH FOR BASIN A-6 *****
 ** DATA FOR BASIN A-6 IS PER CSI'S REPORT *****
 COMPUTE NM HYD ID=6 HYD=A-6 DA=0.01081
 %A=0.0 %B=28.5 %C=28.5 %D=43.0 TP=0.14000
 MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.140	0.076	0.545	7.11	17.5	526.28	0.005	0.1	0.04
Pervious	0.140	0.124	0.888	3.99	15.6	354.67	0.006	0.4	1.04

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=6 CODE=0

HYDROGRAPH NUMBER A-6

RUNOFF VOLUME = 0.870 ACRE-FT
 PEAK DISCHARGE RATE = 21.8 CFS

PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
DIVIDE HYD ID=6 Q=-1.02
ID=47 HYD=SEDTEMP
ID=48 HYD=NOVALUE
DIVIDE HYD ID=47 Q=-1.0
ID=6 HYD=101.3
ID=48 HYD=NOVALUE
PRINT HYD ID=6 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.887 ACRE-FT
PEAK DISCHARGE RATE = 22.2 CFS
PEAK OCCURRED AT 1.50 HRS.

** COMPUTE HYDROGRAPH FOR BASIN A-7 *****
** DATA FOR BASIN A-7 IS PER CSI'S REPORT *****
** NOTE ONE CHANGE FROM CSI'S DATA: TP=0.13333 INSTEAD OF 0.1000 AS I
** REPORT *****
COMPUTE NM HYD ID=7 HYD=A-7 DA=0.00858
%A=0.0 %B=28.5 %C=28.5 %D=43.0 TP=0.133333
MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	14.6	526.28	0.004	0.1	0.04
Pervious	0.133	0.118	0.888	3.99	13.0	354.67	0.005	0.4	1.04

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=7 CODE=0

HYDROGRAPH NUMBER A-7

RUNOFF VOLUME = 0.690 ACRE-FT
PEAK DISCHARGE RATE = 17.8 CFS
PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
DIVIDE HYD ID=7 Q=-1.02
ID=47 HYD=SEDTEMP
ID=48 HYD=NOVALUE
DIVIDE HYD ID=47 Q=-1.0
ID=7 HYD=101.3
ID=48 HYD=NOVALUE
PRINT HYD ID=7 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.704 ACRE-FT
PEAK DISCHARGE RATE = 18.1 CFS
PEAK OCCURRED AT 1.50 HRS.

** BASINS A-6 AND A-7 ARE A DEVELOPMENT THAT WILL OUTFALL TO PIPE ON
 ** BUTTERFIELD. ADD HYDROGRAPHS FOR THESE AREAS.
 ADD HYD ID=20 HYD=H24A
 ID I=6 ID II=7
 PRINT HYD ID=20 CODE=0

HYDROGRAPH NUMBER H24A

RUNOFF VOLUME = 1.591 ACRE-FT
 PEAK DISCHARGE RATE = 40.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

* ADD THE BASIN A-6 AND A-7 RUNOFF INTO STORM DRAIN AT NEW MANHOLE
 ADD HYD ID=22 HYD=PIPE
 ID I=20 ID II=22
 PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER PIPE

RUNOFF VOLUME = 34.172 ACRE-FT
 PEAK DISCHARGE RATE = 525.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE FLOW THRU 72" PIPE AND 66" PIPE TO NEW INLET IN BUTTERFIELD *
 ** FIRST, FROM FUTURE MANHOLE AT RIO SALADO TO
 ** STORM DRAIN STATION 25+96 REDUCER **
 COMPUTE RATING CURVE CID=23 VS NO=1 CODE=-1 SLP=.0227

DIA=72 IN N=.013			
0.00	0.0	0.0	0.0
0.32	0.6	3.5	6.0
0.63	1.6	14.8	9.3
0.95	2.9	34.7	12.1
1.26	4.3	61.7	14.3
1.58	5.9	96.9	16.3
1.89	7.6	137.3	18.0
2.21	9.5	184.6	19.5
2.53	11.3	236.6	20.9
2.84	13.2	290.4	22.0
3.16	15.1	348.1	23.1
3.47	16.9	404.9	23.9
3.79	18.8	463.1	24.6
4.11	20.6	519.1	25.1
4.42	22.3	569.6	25.5
4.74	24.0	615.9	25.7
5.05	25.4	652.5	25.7
5.37	26.7	678.4	25.4
5.68	27.7	686.0	24.8
6.00	28.3	686.0	24.3

COMPUTE TRAVEL TIME ID=23 REACH=1 VS NO=1 L=135 SLP=.0227

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH	FLOW RATE	TRAVEL TIME	FLOW VEL
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FEET	CFS	HRS	FPS
0.32	4.	0.0062	6.0
0.63	15.	0.0040	0.0
0.95	35.	0.0031	0.0
1.26	62.	0.0026	0.0
1.58	97.	0.0023	0.0
1.89	137.	0.0021	0.0
2.21	185.	0.0019	0.0
2.53	237.	0.0018	0.0
2.84	290.	0.0017	0.0
3.16	348.	0.0016	0.0
3.47	405.	0.0016	0.0
3.79	463.	0.0015	0.0
4.11	519.	0.0015	0.0
4.42	570.	0.0015	0.0
4.74	616.	0.0015	0.0
5.05	653.	0.0015	0.0
5.37	678.	0.0015	0.0
5.68	686.	0.0015	0.0
5.68	686.	0.0015	0.0

ROUTE ID=23 HYD=22.1 INFLOW ID=22 DT=0.05
 PRINT HYD ID=23 CODE=0

HYDROGRAPH NUMBER 22.1

RUNOFF VOLUME = 34.174 ACRE-FT
 PEAK DISCHARGE RATE = 524.4 CFS
 PEAK OCCURRED AT 1.50 HRS.

** FROM STATION 25+96 REDUCER TO STATION 28+47. STORM DRAIN STATION
 ** 28+47 = BUTTERFIELD STATION 25+64 WHERE A NEW DOUBLE A INLET WILL
 ** BE BUILT.

COMPUTE RATING CURVE CID=22 VS NO=1 CODE=-1 SLP=.0371
 DIA=66 IN N=.013

0.00	0.0	0.0	0.0
0.29	0.5	3.5	7.2
0.58	1.3	15.1	11.3
0.87	2.4	35.1	14.5
1.16	3.6	63.1	17.3
1.45	5.0	98.4	19.7
1.74	6.5	140.3	21.7
2.03	8.0	187.9	23.6
2.32	9.5	240.0	25.2
2.61	11.1	295.7	26.6
2.89	12.6	351.5	27.8
3.18	14.2	410.3	28.8
3.47	15.8	468.6	29.7
3.76	17.3	524.8	30.3
4.05	18.8	577.1	30.8
4.34	20.1	623.6	31.0
4.63	21.3	661.6	31.0
4.92	22.4	687.6	30.7
5.21	23.3	695.3	29.9
5.50	23.8	695.3	29.3

COMPUTE TRAVEL TIME ID=22 REACH=1 VS NO=1 L=252 SLP=.0371

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.61	4.	0.0212	3.3
1.20	15.	0.0137	5.1
1.81	35.	0.0106	6.6
2.41	62.	0.0090	7.8
3.02	97.	0.0079	8.9
3.61	137.	0.0071	9.8
4.22	185.	0.0066	10.7
4.83	237.	0.0061	11.4
5.42	290.	0.0058	12.0
6.03	348.	0.0056	12.6
6.62	405.	0.0054	13.0
7.23	463.	0.0052	13.4
7.84	519.	0.0051	13.7
8.43	570.	0.0050	13.9
9.03	616.	0.0050	0.0
9.61	653.	0.0050	0.0
10.19	678.	0.0050	13.9
10.58	686.	0.0051	13.7
10.58	686.	0.0051	13.7

ROUTE ID=22 HYD=23.1 INFLOW ID=23 DT=0.05
 PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER 23.1

RUNOFF VOLUME = 34.173 ACRE-FT
 PEAK DISCHARGE RATE = 519.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE STREET FLOW DOWN BUTTERFIELD TO BUTTERFIELD/
 ** RIO SALADO INTERSECTION (A.P. 12)
 * COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 50' R.O.W. *
 COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1
 MIN ELEV=0.0 MAX ELEV=0.67
 CH SLP=0.0279 FP SLP=0.0279
 N=0.017 DIST=26
 DIST ELEV DIST ELEV
 0.0 0.67 0.0 0.0
 16.0 0.32 26.0 0.12
 26.0 0.67

RATING CURVE VALLEY SECTION			1.0
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.0	0.0	1.0
0.07	0.1	0.2	1.5
0.11	0.3	0.6	2.0
0.14	0.5	1.2	2.3
0.18	0.9	2.2	2.5
0.21	1.3	3.8	2.9
0.25	1.9	6.1	3.2
0.28	2.6	9.3	3.5
0.32	3.5	13.4	3.8
0.35	4.4	19.5	4.4
0.39	5.3	26.7	5.0

0.42	6.2	34.8	5.6
0.46	7.2	43.7	6.1
0.49	8.1	53.4	6.6
0.53	9.0	63.8	7.1
0.56	9.9	75.0	7.6
0.60	10.8	86.8	8.0
0.63	11.7	99.3	8.5
0.67	12.7	112.5	8.9

COMPUTE TRAVEL TIME ID=3 REACH=1 VS NO=1 L=500 SLP=.0279

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.1423	1.0
0.07	0.	0.0896	1.5
0.11	1.	0.0684	2.0
0.14	1.	0.0610	2.3
0.18	2.	0.0547	2.5
0.21	4.	0.0487	2.9
0.25	6.	0.0437	3.2
0.28	9.	0.0396	3.5
0.32	13.	0.0363	3.8
0.35	20.	0.0313	4.4
0.39	27.	0.0277	5.0
0.42	35.	0.0249	5.6
0.46	44.	0.0227	6.1
0.49	53.	0.0210	6.6
0.53	64.	0.0196	7.1
0.56	75.	0.0184	7.6
0.60	87.	0.0173	8.0
0.63	99.	0.0164	8.5
0.67	112.	0.0156	8.9

ROUTE ID=3 HYD=BTRFLD INFLOW ID=33 DT=0.05
PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER BTRFLD

RUNOFF VOLUME = 0.953 ACRE-FT
PEAK DISCHARGE RATE = 83.2 CFS
PEAK OCCURRED AT 1.50 HRS.

** COMPUTE HYDROGRAPH FOR BASIN A-8
COMPUTE NM HYD ID=8 HYD=A-8 DA=0.014
%A=0.0 %B=33.0 %C=9.0 %D=58.0 TP=0.1333
MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	32.1	526.28	0.008	0.1	0.04
Pervious	0.133	0.126	0.942	3.75	14.9	338.29	0.006	0.5	1.16

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=8 CODE=0

HYDROGRAPH NUMBER

A-8

RUNOFF VOLUME = 1.279 ACRE-FT
 PEAK DISCHARGE RATE = 30.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING
 DIVIDE HYD ID=8 Q=-1.02

ID=47 HYD=SEDTEMP

ID=48 HYD=NOVALUE

DIVIDE HYD

ID=47 Q=-1.0

ID=8 HYD=101.3

ID=48 HYD=NOVALUE

PRINT HYD

ID=8 CODE=0

HYDROGRAPH NUMBER

101.3

RUNOFF VOLUME = 1.305 ACRE-FT
 PEAK DISCHARGE RATE = 31.2 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD FLOW FROM BASIN A-8 TO STREET FLOW AT RIO SALADO **

ADD HYD ID=3 HYD=SALADO ID I=3 ID II=8

PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER

SALADO

RUNOFF VOLUME = 2.258 ACRE-FT
 PEAK DISCHARGE RATE = 114.4 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE STREET FLOW FROM RIO SALADO TO INLET AT STATION 25+64 **

** COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 50' R.O.W. *

** FULL R.O.W. WIDTH USED **

COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.85

CH SLP=0.0385 FP SLP=0.0385

N=0.017 DIST=50

DIST ELEV DIST ELEV

0.0 0.85 9.0 0.67

9.0 0.00 25.0 0.32

35.0 0.12 35.0 0.67

50.0 0.85

RATING CURVE VALLEY SECTION			1.0
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.1	0.1	1.3
0.09	0.2	0.4	2.1
0.13	0.5	1.2	2.6
0.18	0.9	2.7	3.0
0.22	1.5	5.3	3.5
0.27	2.4	9.3	4.0

0.31	3.4	15.0	4.4
0.36	4.5	24.0	5.3
0.40	5.7	35.0	6.1
0.45	6.9	47.6	6.9
0.49	8.0	61.6	7.7
0.54	9.2	77.0	8.4
0.58	10.4	93.7	9.0
0.63	11.5	111.7	9.7
0.67	12.7	130.8	10.3
0.72	14.0	134.5	9.6
0.76	15.6	143.9	9.2
0.81	17.4	157.7	9.1
0.85	19.5	175.7	9.0

COMPUTE TRAVEL TIME ID=19 REACH=1 VS NO=1 L=500 SLP=.0385

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.1034	1.3
0.09	0.	0.0651	2.1
0.13	1.	0.0528	2.6
0.18	3.	0.0463	3.0
0.22	5.	0.0400	3.5
0.27	9.	0.0351	4.0
0.31	15.	0.0314	4.4
0.36	24.	0.0263	5.3
0.40	35.	0.0226	6.1
0.45	48.	0.0201	6.9
0.49	62.	0.0181	7.7
0.54	77.	0.0166	8.4
0.58	94.	0.0154	9.0
0.63	112.	0.0143	9.7
0.67	131.	0.0135	10.3
0.72	135.	0.0144	9.6
0.76	144.	0.0150	9.2
0.81	158.	0.0153	9.1
0.85	176.	0.0154	9.0

ROUTE ID=19 HYD=401.21 INFLOW ID=3 DT=0.05
PRINT HYD ID=19 CODE=0

HYDROGRAPH NUMBER 401.21

RUNOFF VOLUME = 2.006 ACRE-FT
PEAK DISCHARGE RATE = 115.2 CFS
PEAK OCCURRED AT 1.55 HRS.

** DIVIDE 12.8 CFS INTO INLET AT STATION 25+64 **
DIVIDE HYD ID=19 QMAX=12.8 ID I=40 HYD=PIPE PIPE FLOW
ID II=3 HYD=STRT STREET FLOW
PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER STRT

RUNOFF VOLUME = 1.218 ACRE-FT
PEAK DISCHARGE RATE = 102.4 CFS

PEAK OCCURRED AT 1.55 HRS.

** ADD INLET FLOW TO STORM DRAIN FLOW **

ADD HYD ID=22 HYD=TOTLPIP ID I=22 ID II=40
PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 34.962 ACRE-FT
PEAK DISCHARGE RATE = 532.7 CFS
PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW FROM INLET TO REDUCER AT STATION 31+94
COMPUTE RATING CURVE CID=22 VS NO=1 CODE=-1 SLP=.0371

DIA=66 IN N=.013

0.00	0.0	0.0	0.0
0.29	0.5	3.5	7.2
0.58	1.3	15.1	11.3
0.87	2.4	35.1	14.5
1.16	3.6	63.1	17.3
1.45	5.0	98.4	19.7
1.74	6.5	140.3	21.7
2.03	8.0	187.9	23.6
2.32	9.5	240.0	25.2
2.61	11.1	295.7	26.6
2.89	12.6	351.5	27.8
3.18	14.2	410.3	28.8
3.47	15.8	468.6	29.7
3.76	17.3	524.8	30.3
4.05	18.8	577.1	30.8
4.34	20.1	623.6	31.0
4.63	21.3	661.6	31.0
4.92	22.4	687.6	30.7
5.21	23.3	695.3	29.9
5.50	23.8	695.3	29.3

COMPUTE TRAVEL TIME ID=22 REACH=1 VS NO=1 L=347 SLP=.0371

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.61	4.	0.0292	3.3
1.20	15.	0.0189	5.1
1.81	35.	0.0146	6.6
2.41	62.	0.0124	7.8
3.02	97.	0.0108	8.9
3.61	137.	0.0098	9.8
4.22	185.	0.0090	10.7
4.83	237.	0.0085	11.4
5.42	290.	0.0080	12.0
6.03	348.	0.0077	12.6
6.62	405.	0.0074	13.0
7.23	463.	0.0072	13.4
7.84	519.	0.0070	13.7
8.43	570.	0.0069	13.9
9.03	616.	0.0069	14.0

	9.61	653.	0.0069	14.0
	10.19	678.	0.0069	13.9
	10.58	686.	0.0070	13.7
	10.58	686.	0.0070	13.7

ROUTE ID=22 HYD=TOTLPIP INFLOW ID=22 DT=0.05
 PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 34.963 ACRE-FT
 PEAK DISCHARGE RATE = 526.1 CFS
 PEAK OCCURRED AT 1.50 HRS.

** FROM REDUCER TO STA 32+58 WYE IN BUTTERFIELD. STORM DRAIN STATION
 ** 32+58 = BUTTERFIELD STATION 29+72, WHERE A NEW DOUBLE C INLET WILL
 ** BE BUILT.

COMPUTE RATING CURVE CID=23 VS NO=1 CODE=-1 SLP=.0195
 DIA=72 IN N=.013

0.00	0.0	0.0	0.0
0.32	0.6	3.3	5.6
0.63	1.6	13.7	8.7
0.95	2.9	32.1	11.2
1.26	4.3	57.2	13.2
1.58	5.9	89.8	15.1
1.89	7.6	127.2	16.7
2.21	9.5	171.1	18.1
2.53	11.3	219.3	19.4
2.84	13.2	269.1	20.4
3.16	15.1	322.6	21.4
3.47	16.9	375.3	22.1
3.79	18.8	429.2	22.8
4.11	20.6	481.1	23.3
4.42	22.3	528.0	23.6
4.74	24.0	570.8	23.8
5.05	25.4	604.8	23.8
5.37	26.7	628.8	23.6
5.68	27.7	635.8	23.0
6.00	28.3	635.8	22.5

COMPUTE TRAVEL TIME ID=23 REACH=1 VS NO=1 L=64 SLP=.0195

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.32	3.	0.0032	0.0
0.63	14.	0.0021	0.0
0.95	32.	0.0016	0.0
1.26	57.	0.0013	0.0
1.58	90.	0.0012	0.0
1.89	127.	0.0011	0.0
2.21	171.	0.0010	0.0
2.53	219.	0.0009	0.0
2.84	269.	0.0009	0.0
3.16	323.	0.0008	0.0
3.47	375.	0.0008	0.0
3.79	429.	0.0008	0.0
4.11	481.	0.0008	0.0

4.42	528.	0.0008	0.0
4.74	571.	0.0007	0.0
5.05	605.	0.0007	0.0
5.37	629.	0.0008	0.0
5.68	636.	0.0008	0.0
5.68	636.	0.0008	0.0

ROUTE ID=23 HYD=TOTLPIP INFLOW ID=22 DT=0.05
 PRINT HYD ID=23 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 34.963 ACRE-FT
 PEAK DISCHARGE RATE = 525.4 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE STREET FLOW FROM STATION 25+64 TO INLET AT STATION 29+72
 ** COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 50' R.O.W. *
 ** FULL R.O.W. WIDTH USED **
 COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.85
 CH SLP=0.0218 FP SLP=0.0218
 N=0.017 DIST=50

DIST	ELEV	DIST	ELEV
0.0	0.85	9.0	0.67
9.0	0.00	25.0	0.32
35.0	0.12	35.0	0.67
50.0	0.85		

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.1	0.1	1.0
0.09	0.2	0.3	1.6
0.13	0.5	0.9	2.0
0.18	0.9	2.0	2.3
0.22	1.5	4.0	2.6
0.27	2.4	7.0	3.0
0.31	3.4	11.3	3.3
0.36	4.5	18.1	4.0
0.40	5.7	26.3	4.6
0.45	6.9	35.8	5.2
0.49	8.0	46.4	5.8
0.54	9.2	58.0	6.3
0.58	10.4	70.5	6.8
0.63	11.5	84.0	7.3
0.67	12.7	98.4	7.8
0.72	14.0	101.2	7.2
0.76	15.6	108.3	7.0
0.81	17.4	118.7	6.8
0.85	19.5	132.2	6.8

COMPUTE TRAVEL TIME ID=19 REACH=1 VS NO=1 L=400 SLP=.0218

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH	FLOW RATE	TRAVEL TIME	FLOW VEL
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FEET	CFS	HRS	FPS
0.04	0.	0.1099	1.0
0.09	0.	0.0692	1.6
0.13	1.	0.0561	2.0
0.18	2.	0.0492	2.3
0.22	4.	0.0426	2.6
0.27	7.	0.0374	3.0
0.31	11.	0.0334	3.3
0.36	18.	0.0280	4.0
0.40	26.	0.0241	4.6
0.45	36.	0.0213	5.2
0.49	46.	0.0193	5.8
0.54	58.	0.0176	6.3
0.58	71.	0.0163	6.8
0.63	84.	0.0152	7.3
0.67	98.	0.0143	7.8
0.72	101.	0.0154	7.2
0.76	108.	0.0160	7.0
0.81	119.	0.0163	6.8
0.85	132.	0.0164	6.8

ROUTE ID=19 HYD=401.22 INFLOW ID=3 DT=0.05
 PRINT HYD ID=19 CODE=0

HYDROGRAPH NUMBER 401.22

RUNOFF VOLUME = 1.216 ACRE-FT
 PEAK DISCHARGE RATE = 112.0 CFS
 PEAK OCCURRED AT 1.55 HRS.

** DIVIDE 13.5 CFS INTO INLET AT STATION 29+72 **
 DIVIDE HYD ID=19 QMAX=13.5 ID I=40 HYD=PIPE PIPE FLOW
 ID II=3 HYD=STRT STREET FLOW
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER STRT

RUNOFF VOLUME = 0.896 ACRE-FT
 PEAK DISCHARGE RATE = 98.5 CFS
 PEAK OCCURRED AT 1.55 HRS.

** ADD INLET FLOW TO STORM DRAIN FLOW **
 ADD HYD ID=22 HYD=TOTLPIP ID I=23 ID II=40
 PRINT HYD ID=22 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 35.282 ACRE-FT
 PEAK DISCHARGE RATE = 538.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW FROM NEW DOUBLE C INLET TO EXISTING MANHOLE AT
 ** STORM DRAIN STATION 37+18 = BUTTERFIELD STATION 34+82.65 ***
 COMPUTE RATING CURVE CID=24 VS NO=1 CODE=-1 SLP=.0195
 DIA=72 IN N=.013
 0.00 0.0 0.0 0.0

0.32	0.6	3.3	5.6
0.63	1.6	13.7	8.7
0.95	2.9	32.1	11.2
1.26	4.3	57.2	13.2
1.58	5.9	89.8	15.1
1.89	7.6	127.2	16.7
2.21	9.5	171.1	18.1
2.53	11.3	219.3	19.4
2.84	13.2	269.1	20.4
3.16	15.1	322.6	21.4
3.47	16.9	375.3	22.1
3.79	18.8	429.2	22.8
4.11	20.6	481.1	23.3
4.42	22.3	528.0	23.6
4.74	24.0	570.8	23.8
5.05	25.4	604.8	23.8
5.37	26.7	628.8	23.6
5.68	27.7	635.8	23.0
6.00	28.3	635.8	22.5

COMPUTE TRAVEL TIME ID=24 REACH=1 VS NO=1 L=460 SLP=.0195

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.32	3.	0.0228	5.6
0.63	14.	0.0148	8.7
0.95	32.	0.0114	11.2
1.26	57.	0.0096	13.2
1.58	90.	0.0085	15.1
1.89	127.	0.0077	16.7
2.21	171.	0.0071	18.1
2.53	219.	0.0066	19.4
2.84	269.	0.0063	20.4
3.16	323.	0.0060	21.4
3.47	375.	0.0058	22.1
3.79	429.	0.0056	22.8
4.11	481.	0.0055	23.3
4.42	528.	0.0054	23.6
4.74	571.	0.0054	23.8
5.05	605.	0.0054	23.8
5.37	629.	0.0054	23.6
5.68	636.	0.0056	23.0
5.68	636.	0.0056	23.0

ROUTE ID=24 HYD=TOTLPIP INFLOW ID=22 DT=0.05
PRINT HYD ID=24 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 35.281 ACRE-FT
PEAK DISCHARGE RATE = 534.2 CFS
PEAK OCCURRED AT 1.50 HRS.

** ROUTE STREET FLOW FROM STATION 29+81 INLET TO CALLE NORTENA **
** COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 50' R.O.W. *
** FULL R.O.W. WIDTH USED.
COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.85
 CH SLP=0.0215 FP SLP=0.0215
 N=0.017 DIST=50
 DIST ELEV DIST ELEV
 0.0 0.85 9.0 0.67
 9.0 0.00 25.0 0.32
 35.0 0.12 35.0 0.67
 50.0 0.85

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.1	0.1	1.0
0.09	0.2	0.3	1.6
0.13	0.5	0.9	2.0
0.18	0.9	2.0	2.2
0.22	1.5	3.9	2.6
0.27	2.4	6.9	3.0
0.31	3.4	11.2	3.3
0.36	4.5	17.9	3.9
0.40	5.7	26.2	4.6
0.45	6.9	35.6	5.2
0.49	8.0	46.1	5.7
0.54	9.2	57.6	6.3
0.58	10.4	70.0	6.8
0.63	11.5	83.4	7.2
0.67	12.7	97.7	7.7
0.72	14.0	100.5	7.2
0.76	15.6	107.5	6.9
0.81	17.4	117.9	6.8
0.85	19.5	131.3	6.7

COMPUTE TRAVEL TIME ID=19 REACH=1 VS NO=1 L=400 SLP=.0215

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.1107	1.0
0.09	0.	0.0697	1.6
0.13	1.	0.0565	2.0
0.18	2.	0.0496	2.2
0.22	4.	0.0428	2.6
0.27	7.	0.0376	3.0
0.31	11.	0.0336	3.3
0.36	18.	0.0282	3.9
0.40	26.	0.0242	4.6
0.45	36.	0.0215	5.2
0.49	46.	0.0194	5.7
0.54	58.	0.0178	6.3
0.58	70.	0.0164	6.8
0.63	83.	0.0153	7.2
0.67	98.	0.0144	7.7
0.72	101.	0.0155	7.2
0.76	108.	0.0161	6.9
0.81	118.	0.0164	6.8
0.85	131.	0.0165	6.7

ROUTE

ID=19 HYD=401.21 INFLOW ID=3 DT=0.05

PRINT HYD

ID=19 CODE=0

HYDROGRAPH NUMBER 401.21

RUNOFF VOLUME = 0.894 ACRE-FT
PEAK DISCHARGE RATE = 97.2 CFS
PEAK OCCURRED AT 1.55 HRS.

** SUM UP THE RUNOFF AT CALLE NORTENA/BUTTERFIELD JUST WEST
** OF INTERSECTION

** COMPUTE HYDROGRAPH FOR BASIN A-1 (BUTTERFIELD ROW) *****
COMPUTE NM HYD ID=1 HYD=A-1 DA=0.0030

%A=0.0 %B=38.0 %C=0.0 %D=62.0 TP=0.133333
MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	7.3	526.28	0.002	0.1	0.04
Pervious	0.133	0.131	0.983	3.59	2.8	327.09	0.001	0.5	1.25

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD

ID=1 CODE=0

HYDROGRAPH NUMBER A-1

RUNOFF VOLUME = 0.281 ACRE-FT
PEAK DISCHARGE RATE = 6.6 CFS
PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN A-1 AT INTERSECTION **
ADD HYD ID=19 HYD=BTRFLD
ID I=19 ID II=1
PRINT HYD ID=19 CODE=0

HYDROGRAPH NUMBER BTRFLD

RUNOFF VOLUME = 1.175 ACRE-FT
PEAK DISCHARGE RATE = 103.0 CFS
PEAK OCCURRED AT 1.55 HRS.

** COMPUTE HYDROGRAPH FOR BASIN A-5 *****
COMPUTE NM HYD ID=5 HYD=A-5 DA=0.006
%A=98 %B=0 %C=2 %D=0 TP=0.1333
MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.163	1.219	2.92	12.4	275.11	0.006	0.6	1.65

PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER A-5

RUNOFF VOLUME = 0.143 ACRE-FT
 PEAK DISCHARGE RATE = 5.0 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING
 DIVIDE HYD ID=5 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=5 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.160 ACRE-FT
 PEAK DISCHARGE RATE = 5.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN A-5 AT INTERSECTION **
 ADD HYD ID=19 HYD=BFLDWEST ID I=5 ID II=19
 PRINT HYD ID=19 CODE=0

HYDROGRAPH NUMBER BFLDWEST

RUNOFF VOLUME = 1.335 ACRE-FT
 PEAK DISCHARGE RATE = 108.5 CFS
 PEAK OCCURRED AT 1.55 HRS.

** BASIN A-4 IS AN OPEN SPACE AREA WHICH WILL NOT BE DEVELOPED, AND WH
 ** WILL BE ROUTED DOWN CALLE NORTENA **
 ** AREA WAS MODIFIED TO REFLECT THAT PORTION WHICH SHEET FLOWS TO
 ** PORTION OF CALLE NORTENA THAT WILL BE CONSTRUCTED WITH THE
 ** RIVERVIEW SUBDIVISION.

** COMPUTE HYDROGRAPH FOR BASIN A-4 *****
 COMPUTE NM HYD ID=4 HYD=A-4 DA=0.0197
 %A=64.4 %B=8.1 %C=8.1 %D=19.4 TP=0.133333
 MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	15.1	526.28	0.004	0.1	0.04
Pervious	0.133	0.155	1.160	3.06	34.1	286.39	0.016	0.6	1.54

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=4 code=0

HYDROGRAPH NUMBER A-4

RUNOFF VOLUME = 0.918 ACRE-FT
 PEAK DISCHARGE RATE = 25.5 CFS

PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 8% FOR SEDIMENT BULKING
* BULKING FACTOR WAS WEIGHTED TO INCLUDE PORTION OF SUBDIVISION
DIVIDE HYD ID=4 Q=-1.08
ID=47 HYD=SEDTEMP
ID=48 HYD=NOVALUE
DIVIDE HYD ID=47 Q=-1.0
ID=4 HYD=101.3
ID=48 HYD=NOVALUE
PRINT HYD ID=4 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.991 ACRE-FT
PEAK DISCHARGE RATE = 27.5 CFS
PEAK OCCURRED AT 1.50 HRS.

* COMPUTE TRAVEL TIME FOR BASIN A-4 RUNOFF DOWN CALLE NORTENA TO RIO
* COLORADO ***
* COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 54' R.O.W. *
COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.67
CH SLP=0.005 FP SLP=0.005
N=0.017 DIST=26
DIST ELEV DIST ELEV
0.0 0.67 0.0 0.0
18.0 0.36 26.0 0.20
26.0 0.67

RATING CURVE VALLEY SECTION				1.0
WATER	FLOW	FLOW	FLOW	
SURFACE	AREA	RATE	VEL	
ELEV	SQ FT	CFS	FPS	
0.00	0.0	0.0	0.0	
0.04	0.0	0.0	0.4	
0.07	0.1	0.1	0.7	
0.11	0.3	0.2	0.9	
0.14	0.5	0.5	1.0	
0.18	0.8	0.9	1.2	
0.21	1.1	1.5	1.3	
0.25	1.6	2.2	1.4	
0.28	2.2	3.2	1.5	
0.32	2.9	4.5	1.6	
0.35	3.7	6.3	1.7	
0.39	4.6	8.9	1.9	
0.42	5.5	12.0	2.2	
0.46	6.4	15.5	2.4	
0.49	7.4	19.3	2.6	
0.53	8.3	23.5	2.8	
0.56	9.2	28.0	3.0	
0.60	10.1	32.8	3.2	
0.63	11.0	37.8	3.4	
0.67	11.9	43.2	3.6	

COMPUTE TRAVEL TIME ID=11 REACH=1 VS NO=1
L=640 SLOPE=0.005

TRAVEL TIME TABLE

REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.4303	0.4
0.07	0.	0.2711	0.7
0.11	0.	0.2069	0.9
0.14	1.	0.1708	1.0
0.18	1.	0.1472	1.2
0.21	1.	0.1347	1.3
0.25	2.	0.1287	1.4
0.28	3.	0.1205	1.5
0.32	5.	0.1122	1.6
0.35	6.	0.1047	1.7
0.39	9.	0.0921	1.9
0.42	12.	0.0817	2.2
0.46	16.	0.0738	2.4
0.49	19.	0.0676	2.6
0.53	24.	0.0626	2.8
0.56	28.	0.0584	3.0
0.60	33.	0.0548	3.2
0.63	38.	0.0518	3.4
0.67	43.	0.0492	3.6

* ROUTE BASIN A-4 HYDROGRAPH TO A.P.7 AT RIO COLORADO *
ROUTE ID=11 HYD=BASINA4
INFLOW ID=4 DT=0.05
PRINT HYD ID=11 CODE=0

HYDROGRAPH NUMBER BASINA4

RUNOFF VOLUME = 0.854 ACRE-FT
PEAK DISCHARGE RATE = 25.7 CFS
PEAK OCCURRED AT 1.55 HRS.

** COMPUTE HYDROGRAPH FOR PROPOSED BASIN A-3 *****
COMPUTE NM HYD ID=3 HYD=BASINA3 DA=0.0012
%A=0.0 %B=38.0 %C=0.0 %D=62.0 TP=0.133333
MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	2.9	526.28	0.001	0.1	0.04
Pervious	0.133	0.131	0.983	3.59	1.1	327.09	0.000	0.5	1.25

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER BASINA3

RUNOFF VOLUME = 0.113 ACRE-FT
PEAK DISCHARGE RATE = 2.6 CFS
PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=3 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=3 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.115 ACRE-FT
 PEAK DISCHARGE RATE = 2.7 CFS
 PEAK OCCURRED AT 1.50 HRS.

* ADD BASIN A-3 HYDROGRAPH TO ROUTED BASIN A-4 AT A.P.7 *
 ADD HYD ID=11 HYD=CA/NORT
 ID I=3 ID II=11
 PRINT HYD ID=11 CODE=0

HYDROGRAPH NUMBER CA/NORT

RUNOFF VOLUME = 0.969 ACRE-FT
 PEAK DISCHARGE RATE = 28.1 CFS
 PEAK OCCURRED AT 1.55 HRS.

** DIVIDE 13.0 CFS INTO DBL A INLET ON CALLE NORTENA, NORTH OF RIO COL
 DIVIDE HYD ID=11 QMAX=13.0 ID=3 HYD=CNPIP PIPE FLOW
 ID=11 HYD=CNSTRT STREET FLOW
 PRINT HYD ID=11 CODE=0

HYDROGRAPH NUMBER CNSTRT

RUNOFF VOLUME = 0.214 ACRE-FT
 PEAK DISCHARGE RATE = 15.1 CFS
 PEAK OCCURRED AT 1.55 HRS.

** COMPUTE HYDROGRAPH FOR PROPOSED BASIN A-2 *****
 COMPUTE NM HYD ID=2 HYD=BASINA2 DA=0.0154
 %A=0.0 %B=33.0 %C=9.0 %D=58.0 TP=0.133333
 MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.073	0.545	7.11	35.3	526.28	0.009	0.1	0.04
Pervious	0.133	0.126	0.942	3.75	16.4	338.29	0.006	0.5	1.16

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER BASINA2

RUNOFF VOLUME = 1.407 ACRE-FT
 PEAK DISCHARGE RATE = 33.6 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 2% FOR SEDIMENT BULKING

DIVIDE HYD ID=2 Q=-1.02
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 1.435 ACRE-FT
 PEAK DISCHARGE RATE = 34.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

** DIVIDE 21 CFS INTO TWO DBL A INLETS ON RIO COLORADO JUST WEST OF CA
 ** NORTENA/RIO COLORADO AT A.P. 7

DIVIDE HYD ID=2 QMAX=21 ID=4 HYD=PIP PIPE FLOW
 ID=13 HYD=STRT STR FLOW
 PRINT HYD ID=13 CODE=0

HYDROGRAPH NUMBER STRT

RUNOFF VOLUME = 0.142 ACRE-FT
 PEAK DISCHARGE RATE = 13.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN A-2 PIPE FLOW TO BASIN A-3 PIPE FLOW AT A.P. 7

ADD HYD ID=5 HYD=PIPEAT7 ID I=4 II=3
 PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER PIPEAT7

RUNOFF VOLUME = 2.047 ACRE-FT
 PEAK DISCHARGE RATE = 34.0 CFS
 PEAK OCCURRED AT 1.45 HRS.

** ROUTE PIPE FLOW TO MANHOLE AT BUTTERFIELD
 COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=.02
 DIA=30 IN N=.013

0.00	0.0	0.0	0.0
0.13	0.1	0.3	3.1
0.26	0.3	1.3	4.9
0.39	0.5	3.1	6.3
0.53	0.8	5.7	7.5
0.66	1.0	8.8	8.5
0.79	1.3	12.6	9.4
0.92	1.6	16.8	10.2
1.05	2.0	21.4	10.9
1.18	2.3	26.3	11.5
1.32	2.6	31.8	12.1
1.45	3.0	37.0	12.5
1.58	3.3	42.1	12.9
1.71	3.6	47.1	13.2
1.84	3.9	51.7	13.4
1.97	4.1	55.8	13.5
2.11	4.4	59.5	13.5
2.24	4.6	61.7	13.3
2.37	4.8	62.4	13.0
2.50	4.9	62.4	12.7

COMPUTE TRAVEL TIME ID=14 REACH=1 VS NO=1 L=170 SLP=.02

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.13	0.	0.0152	3.1
0.26	1.	0.0097	4.9
0.39	3.	0.0075	6.3
0.53	6.	0.0063	7.5
0.66	9.	0.0055	8.5
0.79	13.	0.0050	9.4
0.92	17.	0.0046	0.0
1.05	21.	0.0043	0.0
1.18	26.	0.0041	0.0
1.32	32.	0.0039	0.0
1.45	37.	0.0038	0.0
1.58	42.	0.0037	0.0
1.71	47.	0.0036	0.0
1.84	52.	0.0035	0.0
1.97	56.	0.0035	0.0
2.11	59.	0.0035	0.0
2.24	62.	0.0035	0.0
2.37	62.	0.0036	0.0
2.37	62.	0.0036	0.0

ROUTE
 PRINT HYD

ID=14 HYD=4.1 INFLOW ID=5 DT=.05
 ID=14 CODE=0

HYDROGRAPH NUMBER 4.1

RUNOFF VOLUME = 1.755 ACRE-FT
 PEAK DISCHARGE RATE = 34.1 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD PIPE FLOWS TO MAIN PIPE AT CALLE NORTENA/BUTTERFIELD **
 ADD HYD ID=24 HYD=CNBFLD ID I=14 ID II=24
 PRINT HYD ID=24 CODE=0

HYDROGRAPH NUMBER CNBFLD

RUNOFF VOLUME = 37.036 ACRE-FT
 PEAK DISCHARGE RATE = 568.3 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ROUTE PIPE FLOW THRU 72" TO DAM **
 COMPUTE RATING CURVE CID=4 VS NO=1 CODE=-1 SLP=.0195
 DIA=72 IN N=.013

0.00	0.0	0.0	0.0
0.32	0.6	3.3	5.6
0.63	1.6	13.7	8.7
0.95	2.9	32.1	11.2
1.26	4.3	57.2	13.2
1.58	5.9	89.8	15.1
1.89	7.6	127.2	16.7
2.21	9.5	171.1	18.1
2.53	11.3	219.3	19.4
2.84	13.2	269.1	20.4
3.16	15.1	322.6	21.4
3.47	16.9	375.3	22.1
3.79	18.8	429.2	22.8
4.11	20.6	481.1	23.3
4.42	22.3	528.0	23.6
4.74	24.0	570.8	23.8
5.05	25.4	604.8	23.8
5.37	26.7	628.8	23.6
5.68	27.7	635.8	23.0
6.00	28.3	635.8	22.5

COMPUTE TRAVEL TIME ID=4 REACH=1 VS NO=1 L=687 SLP=.0195

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.32	3.	0.0341	5.6
0.63	14.	0.0221	8.7
0.95	32.	0.0171	11.2
1.26	57.	0.0144	13.2
1.58	90.	0.0126	15.1
1.89	127.	0.0114	16.7
2.21	171.	0.0105	18.1
2.53	219.	0.0099	19.4
2.84	269.	0.0093	20.4
3.16	323.	0.0089	21.4
3.47	375.	0.0086	22.1
3.79	429.	0.0084	22.8

4.11	481.	0.0082	23.3
4.42	528.	0.0081	23.6
4.74	571.	0.0080	23.8
5.05	605.	0.0080	23.8
5.37	629.	0.0081	23.6
5.68	636.	0.0083	23.0
5.68	636.	0.0083	23.0

ROUTE ID=4 HYD=TOTLPIP INFLOW ID=24 DT=0.05
 PRINT HYD ID=4 CODE=0

HYDROGRAPH NUMBER TOTLPIP

RUNOFF VOLUME = 37.036 ACRE-FT
 PEAK DISCHARGE RATE = 566.3 CFS
 PEAK OCCURRED AT 1.55 HRS.

** ADD STREET FLOWS AT CALLE NORTENA/RIO COLORADO (A.P. 7) *****
 ADD HYD ID=26 HYD=COLSTRT
 ID I=11 ID II=13
 PRINT HYD ID=26 CODE=0

HYDROGRAPH NUMBER COLSTRT

RUNOFF VOLUME = 0.357 ACRE-FT
 PEAK DISCHARGE RATE = 24.6 CFS
 PEAK OCCURRED AT 1.55 HRS.

** ROUTE STREET RUNOFF FROM RIO COLORADO TO BUTTERFIELD *****
 * COMPUTE RATING CURVE FOR 26' PAVEMENT SECTION IN 54' R.O.W. *
 COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.67
 CH SLP=0.005 FP SLP=0.005
 N=0.017 DIST=26
 DIST ELEV DIST ELEV
 0.0 0.67 0.0 0.0
 18.0 0.36 26.0 0.20
 26.0 0.67

RATING CURVE VALLEY SECTION			1.0
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.0	0.0	0.4
0.07	0.1	0.1	0.7
0.11	0.3	0.2	0.9
0.14	0.5	0.5	1.0
0.18	0.8	0.9	1.2
0.21	1.1	1.5	1.3
0.25	1.6	2.2	1.4
0.28	2.2	3.2	1.5
0.32	2.9	4.5	1.6
0.35	3.7	6.3	1.7
0.39	4.6	8.9	1.9
0.42	5.5	12.0	2.2
0.46	6.4	15.5	2.4
0.49	7.4	19.3	2.6

0.53	8.3	23.5	2.8
0.56	9.2	28.0	3.0
0.60	10.1	32.8	3.2
0.63	11.0	37.8	3.4
0.67	11.9	43.2	3.6

COMPUTE TRAVEL TIME ID=15 REACH=1 VS NO=1
L=170 SLOPE=0.005

TRAVEL TIME TABLE
REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.1143	0.4
0.07	0.	0.0720	0.7
0.11	0.	0.0549	0.9
0.14	1.	0.0454	1.0
0.18	1.	0.0391	1.2
0.21	1.	0.0358	1.3
0.25	2.	0.0342	1.4
0.28	3.	0.0320	1.5
0.32	5.	0.0298	1.6
0.35	6.	0.0278	1.7
0.39	9.	0.0245	1.9
0.42	12.	0.0217	2.2
0.46	16.	0.0196	2.4
0.49	19.	0.0180	2.6
0.53	24.	0.0166	2.8
0.56	28.	0.0155	3.0
0.60	33.	0.0146	3.2
0.63	38.	0.0138	3.4
0.67	43.	0.0131	3.6

ROUTE ID=15 HYD=CNNORTH
INFLOW ID=26 DT=0.05
PRINT HYD ID=15 CODE=0

HYDROGRAPH NUMBER CNNORTH

RUNOFF VOLUME = 0.355 ACRE-FT
PEAK DISCHARGE RATE = 27.6 CFS
PEAK OCCURRED AT 1.55 HRS.

** ADD BUTTERFIELD RUNOFF TO CALLE NORTENA RUNOFF FOR TOTAL RUNOFF
** IN BUTTERFIELD JUST EAST OF CALLE NORTENA *****
ADD HYD ID=16 HYD=BFDSTRT

ID I=15 ID II=19
PRINT HYD ID=16

HYDROGRAPH NUMBER BFDSTRT

RUNOFF VOLUME = 1.691 ACRE-FT
PEAK DISCHARGE RATE = 136.1 CFS
PEAK OCCURRED AT 1.55 HRS.

* COMPUTE STREET TRAVEL TIME FROM NODE 16 TO NODE 17 *
* THIS WILL TAKE THE RUNOFF TO THE END OF THE BUTTERFIELD CUL-DE-SAC *

* COMPUTE RATING CURVE FOR 32' PAVEMENT SECTION IN 50' R.O.W. *
 * WITH A 1.78% SLOPE. FULL R.O.W. WIDTH USED. **
 COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1

MIN ELEV=0.0 MAX ELEV=0.85
 CH SLP=0.0178 FP SLP=0.0178
 N=0.017 DIST=50
 DIST ELEV DIST ELEV
 0.0 0.85 9.0 0.67
 9.0 0.00 25.0 0.32
 41.0 0.00 41.0 0.67
 50.0 0.85

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.04	0.1	0.1	0.9
0.09	0.4	0.6	1.5
0.13	0.9	1.7	1.9
0.18	1.6	3.7	2.3
0.22	2.5	6.7	2.7
0.27	3.6	10.9	3.0
0.31	4.9	16.4	3.3
0.36	6.3	24.7	3.9
0.40	7.8	34.6	4.5
0.45	9.2	45.8	5.0
0.49	10.6	58.2	5.5
0.54	12.1	71.8	6.0
0.58	13.5	86.4	6.4
0.63	14.9	102.0	6.8
0.67	16.4	118.6	7.3
0.72	17.9	126.4	7.1
0.76	19.6	137.0	7.0
0.81	21.6	149.9	6.9
0.85	23.7	165.1	7.0

COMPUTE TRAVEL TIME ID=10 REACH=1 VS NO=1
 L=450 SLOPE=0.0178

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.04	0.	0.1368	0.9
0.09	1.	0.0862	1.5
0.13	2.	0.0658	1.9
0.18	4.	0.0543	2.3
0.22	7.	0.0468	2.7
0.27	11.	0.0414	3.0
0.31	16.	0.0374	3.3
0.36	25.	0.0320	3.9
0.40	35.	0.0280	4.5
0.45	46.	0.0251	5.0
0.49	58.	0.0228	5.5
0.54	72.	0.0210	6.0
0.58	86.	0.0195	6.4
0.63	102.	0.0183	6.8
0.67	119.	0.0172	7.3
0.72	126.	0.0177	7.1

	0.76	137.	0.0179	7.0
	0.81	150.	0.0180	6.9
	0.85	165.	0.0179	7.0

ROUTE ID=10 HYD=NOD17
 INFLOW ID=16 DT=0.05
 PRINT HYD ID=10 CODE=0

HYDROGRAPH NUMBER NOD17

RUNOFF VOLUME = 1.621 ACRE-FT
 PEAK DISCHARGE RATE = 137.7 CFS
 PEAK OCCURRED AT 1.60 HRS.

** COMPUTE HYDROGRAPH FOR PROPOSED BASIN A-9*****
 COMPUTE NM HYD ID=9 HYD=A9 DA=0.003
 %A=98 %B=0 %C=2 %D=0 TP=0.1333
 MASS RAINFALL=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.133	0.163	1.219	2.92	6.2	275.11	0.003	0.6	1.65

PRINT HYD ID=9 CODE=0

HYDROGRAPH NUMBER A9

RUNOFF VOLUME = 0.071 ACRE-FT
 PEAK DISCHARGE RATE = 2.5 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING
 DIVIDE HYD ID=9 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=9 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=9 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.080 ACRE-FT
 PEAK DISCHARGE RATE = 2.8 CFS
 PEAK OCCURRED AT 1.50 HRS.

** ADD BASIN A-9 HYDROGRAPH AT NODE 17
 ADD HYD ID=17 HYD=AP17
 ID I=10 ID II=9
 PRINT HYD ID=17 CODE=0

HYDROGRAPH NUMBER AP17

RUNOFF VOLUME = 1.701 ACRE-FT

PEAK DISCHARGE RATE = 139.9 CFS
 PEAK OCCURRED AT 1.60 HRS.

* ROUTE THE NODE 17 RUNOFF FROM THE END OF THE CUL-DE-SAC INTO THE
 * FINAL OUTFALL INTO THE PIEDRAS MARCADAS ARROYO (NODE 19) THROUGH A
 * CONCRETE- LINED CHANNEL *****

COMPUTE RATING CURVE ID=1 VS NO=1 NO SEGS=1
 MIN ELEV=0.0 MAX ELEV=2.33
 CH SLP=0.0145 FP SLP=0.0145
 N=0.013 DIST=10

DIST	ELEV	DIST	ELEV
0.0	2.33	0.0	0.33
5.0	0.0	10.0	0.33
10.0	2.33		

RATING CURVE VALLEY SECTION 1.0			
WATER SURFACE ELEV	FLOW AREA SQ FT	FLOW RATE CFS	FLOW VEL FPS
0.00	0.0	0.0	0.0
0.12	0.2	0.5	2.1
0.25	0.9	3.1	3.4
0.37	2.0	9.6	4.7
0.49	3.3	20.9	6.4
0.61	4.5	35.4	7.9
0.74	5.7	52.6	9.2
0.86	6.9	72.2	10.4
0.98	8.2	93.9	11.5
1.10	9.4	117.7	12.5
1.23	10.6	143.4	13.5
1.35	11.8	170.7	14.4
1.47	13.1	199.7	15.3
1.59	14.3	230.3	16.1
1.72	15.5	262.2	16.9
1.84	16.7	295.6	17.7
1.96	18.0	330.2	18.4
2.08	19.2	366.0	19.1
2.21	20.4	403.0	19.7
2.33	21.6	441.1	20.4

COMPUTE TRAVEL TIME ID=11 REACH=1 VS NO=1
 L=260 SLP=0.0145

TRAVEL TIME TABLE
 REACH 1.0

WATER DEPTH FEET	FLOW RATE CFS	TRAVEL TIME HRS	FLOW VEL FPS
0.12	0.	0.0338	2.1
0.25	3.	0.0213	3.4
0.37	10.	0.0153	4.7
0.49	21.	0.0112	6.4
0.61	35.	0.0091	7.9
0.74	53.	0.0078	9.2
0.86	72.	0.0069	10.4
0.98	94.	0.0063	11.5
1.10	118.	0.0058	12.5
1.23	143.	0.0053	13.5
1.35	171.	0.0050	14.4
1.47	200.	0.0047	0.0

1.59	230.	0.0045	0.0
1.72	262.	0.0043	0.0
1.84	296.	0.0041	0.0
1.96	330.	0.0039	0.0
2.08	366.	0.0038	0.0
2.21	403.	0.0037	0.0
2.33	441.	0.0035	0.0

ROUTE ID=11 HYD=AP19CHNL
 INFLOW ID=17 DT=0.05
 PRINT HYD ID=11 CODE=0

HYDROGRAPH NUMBER AP19CHNL

RUNOFF VOLUME = 1.698 ACRE-FT
 PEAK DISCHARGE RATE = 147.8 CFS
 PEAK OCCURRED AT 1.60 HRS.

** ADD OVERLAND AND PIPE ROUTES AT DAM **
 ADD HYD ID=5 HYD=401.99 ID I=11 II=4
 PRINT HYD ID=5 CODE=0

HYDROGRAPH NUMBER 401.99

RUNOFF VOLUME = 38.734 ACRE-FT
 PEAK DISCHARGE RATE = 658.5 CFS
 PEAK OCCURRED AT 1.55 HRS.

** COMPUTE HYDROGRAPH FOR BASIN B *****
 COMPUTE NM HYD ID=8 HYD=B DA=0.019
 %A=98 %B=0 %C=2 %D=0 TP=0.1333
 MASS RAINFALL=-1

Basin Type	TP	K	K/TP	N	Unit Peak	B	Area	IA	IF
	hr	hr			cfs		sq mi	in	in
mpervious	0.133	0.163	1.219	2.92	39.2	275.11	0.019	0.6	1.65

PRINT HYD ID=8 CODE=0

HYDROGRAPH NUMBER B

RUNOFF VOLUME = 0.453 ACRE-FT
 PEAK DISCHARGE RATE = 15.9 CFS
 PEAK OCCURRED AT 1.50 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING
 DIVIDE HYD ID=8 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=8 HYD=101.3
 ID=48 HYD=NOVALUE
 PRINT HYD ID=8 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 0.507 ACRE-FT
 PEAK DISCHARGE RATE = 17.8 CFS
 PEAK OCCURRED AT 1.50 HRS.

***** CALCULATE BASIN 401 *****
 COMPUTE NM HYD ID=2 HYD NO=401 DA=0.0951
 PER A=70 PER B=4 PER C=25 PER D=1
 TP=-.26 RAIN=-1

Basin Type	TP hr	K hr	K/TP	N	Unit Peak cfs	B	Area sq mi	IA in	IF in
mpervious	0.260	0.143	0.549	7.04	1.9	523.04	0.001	0.1	0.04
Pervious	0.260	0.283	1.087	3.25	109.2	301.66	0.094	0.6	1.44

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD

PRINT HYD ID=2 CODE=0

OUTFLOW HYDROGRAPH RESERVOIR 401.

RUNOFF VOLUME = 2.895 ACRE-FT
 PEAK DISCHARGE RATE = 59.3 CFS
 PEAK OCCURRED AT 1.65 HRS.

* INCREASE RUNOFF BY 12% FOR SEDIMENT BULKING

DIVIDE HYD ID=2 Q=-1.12
 ID=47 HYD=SEDTEMP
 ID=48 HYD=NOVALUE
 DIVIDE HYD ID=47 Q=-1.0
 ID=2 HYD=101.3
 ID=48 HYD=NOVALUE

PRINT HYD ID=2 CODE=0

HYDROGRAPH NUMBER 101.3

RUNOFF VOLUME = 3.242 ACRE-FT
 PEAK DISCHARGE RATE = 66.4 CFS
 PEAK OCCURRED AT 1.65 HRS.

***** ADD BASINS B & 401 TO TOTAL AT NODE 19 *****
 ***** TOTAL SOUTH BRANCH FLOW AT DAM *****
 ***** ID=3 IS SOUTH BRANCH FLOW *****
 ADD HYD ID=3 HYD=ATDAM ID I=8 II=5
 ADD HYD ID=3 HYD=TOTATDAM ID I=3 II=2
 PRINT HYD ID=3 CODE=0

HYDROGRAPH NUMBER TOTATDAM

RUNOFF VOLUME = 42.483 ACRE-FT
 PEAK DISCHARGE RATE = 732.0 CFS
 PEAK OCCURRED AT 1.55 HRS.

FINISH

HYMO SUMMARY TABLE

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
HYDROGRAPH AT	404.	2	-	0.1950	173.7	NA	1.55	1.39
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.1950	194.5		1.55	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.1950	194.5		1.55	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		2	1& 2					
	CALLENOR	1	-	0.0000	30.0		0.00	
	404.1	2	-	0.0000	164.5		1.55	
ROUTED		2	1					
	404.1	2		0.0000	164.5		1.55	
	404.01	1		0.0000	132.3		1.60	
HYDROGRAPH AT	404.	2	-	0.1150	182.3	NA	1.60	2.48
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.1150	185.9		1.60	
	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.1150	185.9		1.60	
	NOVALUE	48	-	0.0000	0.0		1.55	
COMBINED FLOW AT	404.02	1& 2	3	0.1150	318.2		1.60	
ROUTED		3	1					
	404.02	3		0.1150	318.2		1.60	
	403.01	1		0.1150	312.6		1.65	
HYDROGRAPH AT	403.	2	-	0.0370	78.0	NA	1.50	3.29
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.0370	79.5		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0370	79.5		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
ROUTED		2	3					
	101.3	2		0.0370	79.5		1.50	
	403.02	3		0.0370	79.9		1.50	
COMBINED FLOW AT	403.03	3& 1	4	0.1520	355.8		1.65	
HYDROGRAPH AT	403.	2	-	0.0140	31.0	NA	1.50	3.46
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.0140	31.7		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0140	31.7		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
ROUTED		2	3					
	101.3	2		0.0140	31.7		1.50	
	403.21	3		0.0140	32.0		1.50	
COMBINED FLOW AT	403.22	3& 4	1	0.1660	373.0		1.65	
DIVIDED FLOW AT		1	3& 7					

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
	403.22	3	-	0.1660	259.0		1.55	
	NOVALUE	7	-	0.0000	114.0		0.00	
ROUTED 60"		3	5					
	403.22	3		0.1660	259.0		1.75	
	403.19	5		0.1660	262.5		1.55	
ROUTED		7	6					
	NOVALUE	7		0.0000	114.0		1.65	
	403.21	6		0.0000	124.3		1.65	
HYDROGRAPH AT	403.	2	-	0.0300	64.3	NA	1.50	3.35
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.0300	65.6		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0300	65.6		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
HYDROGRAPH AT	403.	25	-	0.0320	70.9	NA	1.50	3.46
DIVIDED FLOW AT		25	47&48					
	SEDTEMP	47	-	0.0320	72.3		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	25&48					
	101.3	25	-	0.0320	72.3		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
HYDROGRAPH AT	403.	26	-	0.0140	19.8	NA	1.50	2.21
DIVIDED FLOW AT		26	47&48					
	SEDTEMP	47	-	0.0140	20.2		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	26&48					
	101.3	26	-	0.0140	20.2		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
HYDROGRAPH AT	403.	27	-	0.0030	4.3	NA	1.50	2.22
DIVIDED FLOW AT		27	47&48					
	SEDTEMP	47	-	0.0030	4.3		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	27&48					
	101.3	27	-	0.0030	4.3		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
COMBINED FLOW AT	403STRT	6& 2	6	0.0300	160.2		1.60	
DIVIDED FLOW AT		6	20&21					
	403STRT	20	-	0.0300	50.0		0.00	
	NOVALUE	21	-	0.0000	110.2		0.00	
COMBINED FLOW AT	403PIPE	5&20	5	0.1960	312.5		1.55	
ROUTED 60"		5	15					
	403PIPE	5		0.1960	312.5		1.55	
	403.15	15		0.1960	311.6		1.55	
RECALL HYD	403.15	15	-	0.1960	311.0		1.60	
ROUTED		21	16					
	NOVALUE	21		0.0000	110.2		1.60	
	403.16	16		0.0000	110.3		1.65	
COMBINED FLOW AT	LANDFLO	26&16	16	0.0140	121.6		1.65	
COMBINED FLOW AT	INTOPOND	16&15	16	0.2100	429.6		1.65	
RESERVOIR HYD	CLEVPOND	16	49	0.2100	185.4		1.90	
PUNCHED HYD	CLEVPOND	49	-	0.2100	185.4		1.90	
RECALL HYD	CLEVPOND	49	-	0.2100	244.0		1.50	

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
ROUTED 60"		49	16					
	CLEVPOND	49		0.2100	244.0		1.50	
	PIPEFLO	16		0.2100	241.4		1.50	
COMBINED FLOW AT ROUTED 66"	403.40	16&25	16	0.2420	313.7		1.50	
		16	21					
	403.40	16		0.2420	313.7		1.50	
	21.1	21		0.2420	313.3		1.50	
HYDROGRAPH AT DIVIDED FLOW AT	403.	3	-	0.0190	42.1	NA	1.50	3.46
		3	47&48					
	SEDTEMP	47	-	0.0190	43.0		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	3&48					
	101.3	3	-	0.0190	43.0		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
ROUTED 30"		3	19					
	101.3	3		0.0190	43.0		1.50	
	403PIP	19		0.0190	40.6		1.50	
COMBINED FLOW AT ROUTED 66"	PIPEFLO	21&19	36	0.2610	353.9		1.50	
		36	21					
	PIPEFLO	36		0.2610	353.9		1.50	
	21.1	21		0.2610	353.2		1.50	
HYDROGRAPH AT DIVIDED FLOW AT	402.	2	-	0.0160	35.9	NA	1.50	3.50
		2	47&48					
	SEDTEMP	47	-	0.0160	36.6		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0160	36.6		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
ROUTED 24"		2	31					
	101.3	2		0.0160	36.6		1.50	
	PIPE	31		0.0160	36.7		1.50	
HYDROGRAPH AT DIVIDED FLOW AT	402.	2	-	0.0657	147.3	NA	1.50	3.50
		2	47&48					
	SEDTEMP	47	-	0.0657	150.2		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0657	150.2		1.50	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		2	10&20					
	402.PIP	10	-	0.0657	64.0		0.00	
	402.STRT	20	-	0.0000	86.2		1.50	
COMBINED FLOW AT ROUTED 48"	BFDPIPE	31&10	35	0.0817	100.7		1.50	
		35	31					
	BFDPIPE	35		0.0817	100.7		1.50	
	PIPE	31		0.0817	100.9		1.50	
HYDROGRAPH AT DIVIDED FLOW AT	402.	2	-	0.0113	9.7	NA	1.50	1.34
		2	47&48					
	SEDTEMP	47	-	0.0113	10.9		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0113	10.9		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
COMBINED FLOW AT	STRTFLO	20&27	18	0.0030	90.6		1.50	

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
HYDROGRAPH AT	BASINC	3	-	0.0088	17.4	NA	1.50	3.09
COMBINED FLOW AT	GLF-CRS	18& 3	18	0.0118	108.0		1.50	
DIVIDED FLOW AT		18	32&33					
	PIPE	32	-	0.0118	20.0		0.00	
	OVRSTR	33	-	0.0000	88.0		0.00	
DIVIDED FLOW AT		33	8&33					
	INLET	8	-	0.0000	8.0		0.00	
	BTR.OVR	33	-	0.0000	80.0		1.50	
COMBINED FLOW AT	BFDPIPE	32& 2	2	0.0231	30.9		1.50	
ROUTED 36"		2	32					
	BFDPIPE	2		0.0231	30.9		1.50	
	PIPE	32		0.0231	31.1		1.55	
COMBINED FLOW AT	BFDPIPE	32& 8	2	0.0231	39.1		1.55	
ROUTED 36"		2	32					
	BFDPIPE	2		0.0231	39.1		1.55	
	PIPE	32		0.0231	39.6		1.55	
COMBINED FLOW AT	INTO54	32&31	32	0.1048	138.6		1.50	
ROUTED 54"		32	8					
	INTO54	32		0.1048	138.6		1.50	
	402.1	8		0.1048	138.1		1.55	
COMBINED FLOW AT	PIPE	21& 8	36	0.3658	490.4		1.50	
ROUTED 72"		36	22					
	PIPE	36		0.3658	490.4		1.50	
	22.1	22		0.3658	485.6		1.50	
HYDROGRAPH AT	A-6	6	-	0.0108	21.8	NA	1.50	3.15
DIVIDED FLOW AT		6	47&48					
	SEDTEMP	47	-	0.0108	22.2		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
DIVIDED FLOW AT		47	6&48					
	101.3	6	-	0.0108	22.2		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
HYDROGRAPH AT	A-7	7	-	0.0086	17.8	NA	1.50	3.24
DIVIDED FLOW AT		7	47&48					
	SEDTEMP	47	-	0.0086	18.1		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
DIVIDED FLOW AT		47	7&48					
	101.3	7	-	0.0086	18.1		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
COMBINED FLOW AT	H24A	6& 7	20	0.0194	40.3		1.50	
COMBINED FLOW AT	PIPE	20&22	22	0.3852	525.9		1.50	
ROUTED 72"		22	23					
	PIPE	22		0.3852	525.9		1.50	
	22.1	23		0.3852	524.4		1.50	
ROUTED 66"		23	22					
	22.1	23		0.3852	524.4		1.50	
	23.1	22		0.3852	519.9		1.50	
ROUTED		33	3					
	BTR.OVR	33		0.0000	80.0		1.50	
	BTRFLD	3		0.0000	83.2		1.50	
HYDROGRAPH AT	A-8	8	-	0.0140	30.6	NA	1.50	3.41
DIVIDED FLOW AT		8	47&48					
	SEDTEMP	47	-	0.0140	31.2		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
DIVIDED FLOW AT		47	8&48					
	101.3	8	-	0.0140	31.2		1.50	
	NOVALUE	48	-	0.0000	0.0		1.50	
COMBINED FLOW AT	SALADO	3& 8	3	0.0140	114.4		1.50	
ROUTED		3	19					
	SALADO	3		0.0140	114.4		1.50	
	401.21	19		0.0140	115.2		1.55	
DIVIDED FLOW AT		19	40& 3					
	PIPE	40	-	0.0140	12.8		0.00	
	STRT	3	-	0.0000	102.4		1.55	
COMBINED FLOW AT	TOTLPIP	22&40	22	0.3992	532.7		1.50	
ROUTED	66"	22	22					
	TOTLPIP	22		0.3992	526.1		1.50	
	TOTLPIP	22		0.3992	526.1		1.50	
ROUTED	72"	22	23					
	TOTLPIP	22		0.3992	526.1		1.50	
	TOTLPIP	23		0.3992	525.4		1.50	
ROUTED		3	19					
	STRT	3		0.0000	102.4		1.55	
	401.22	19		0.0000	112.0		1.55	
DIVIDED FLOW AT		19	40& 3					
	PIPE	40	-	0.0000	13.5		1.50	
	STRT	3	-	0.0000	98.5		1.55	
COMBINED FLOW AT	TOTLPIP	23&40	22	0.3992	538.9		1.50	
ROUTED	72"	22	24					
	TOTLPIP	22		0.3992	538.9		1.50	
	TOTLPIP	24		0.3992	534.2		1.50	
ROUTED		3	19					
	STRT	3		0.0000	98.5		1.55	
	401.21	19		0.0000	97.2		1.55	
HYDROGRAPH AT	A-1	1	-	0.0030	6.6	NA	1.50	3.44
COMBINED FLOW AT	BTRFLD	19& 1	19	0.0030	103.0		1.55	
HYDROGRAPH AT	A-5	5	-	0.0060	5.0	NA	1.50	1.31
DIVIDED FLOW AT		5	47&48					
	SEDTEMP	47	-	0.0060	5.6		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT		47	5&48					
	101.3	5	-	0.0060	5.6		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
COMBINED FLOW AT	BFLDWEST	5&19	19	0.0090	108.5		1.55	
HYDROGRAPH AT	A-4	4	-	0.0197	25.5	NA	1.50	2.02
DIVIDED FLOW AT		4	47&48					
	SEDTEMP	47	-	0.0197	27.5		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT		47	4&48					
	101.3	4	-	0.0197	27.5		1.50	
	NOVALUE	48	-	0.0000	0.0		1.55	
ROUTED		4	11					
	101.3	4		0.0197	27.5		1.50	
	BASINA4	11		0.0197	25.7		1.55	
HYDROGRAPH AT	BASINA3	3	-	0.0012	2.6	NA	1.50	3.45
DIVIDED FLOW AT		3	47&48					
	SEDTEMP	47	-	0.0012	2.7		1.50	

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
DIVIDED FLOW AT	NOVALUE	48	-	0.0000	0.0		1.55	
	101.3	47	3&48					
	NOVALUE	3	-	0.0012	2.7		1.50	
COMBINED FLOW AT	NOVALUE	48	-	0.0000	0.0		1.55	
DIVIDED FLOW AT	CA/NORT	3&11	11	0.0209	28.1		1.55	
	CNPIP	11	3&11					
	CNSTRT	3	-	0.0000	13.0		1.45	
HYDROGRAPH AT	BASINA2	11	-	0.0000	15.1		1.55	
DIVIDED FLOW AT		2	-	0.0154	33.6	NA	1.50	3.41
	SEDTEMP	2	47&48					
	NOVALUE	47	-	0.0154	34.3		1.50	
DIVIDED FLOW AT		48	-	0.0000	0.0		1.55	
	101.3	47	2&48					
	NOVALUE	2	-	0.0154	34.3		1.50	
DIVIDED FLOW AT		48	-	0.0000	0.0		1.55	
	PIP	2	4&13					
	STRT	4	-	0.0154	21.0		1.45	
COMBINED FLOW AT	PIPEAT7	13	-	0.0000	13.3		0.00	
ROUTED 30"		4& 3	5	0.0154	34.0		1.45	
	PIPEAT7	5	14					
	4.1	5		0.0154	34.0		1.60	
COMBINED FLOW AT	CNBFLD	14		0.0154	34.1		1.50	
ROUTED 72"		14&24	24	0.4146	568.3		1.50	
	CNBFLD	24	4					
	TOTLPIP	24		0.4146	568.3		1.50	
COMBINED FLOW AT	COLSTRT	4		0.4146	566.3		1.55	
ROUTED		11&13	26	0.0000	24.6		1.55	
	COLSTRT	26	15					
	CNNORTH	26		0.0000	24.6		1.55	
COMBINED FLOW AT	BFDSTRT	15		0.0000	27.6		1.55	
ROUTED		15&19	16	0.0090	136.1		1.55	
	BFDSTRT	16	10					
	NOD17	16		0.0090	136.1		1.55	
HYDROGRAPH AT	A9	10		0.0090	137.7		1.60	
DIVIDED FLOW AT		9	-	0.0030	2.5	NA	1.50	1.31
	SEDTEMP	9	47&48					
	NOVALUE	47	-	0.0030	2.8		1.50	
DIVIDED FLOW AT		48	-	0.0000	0.0		0.00	
	101.3	47	9&48					
	NOVALUE	9	-	0.0030	2.8		1.50	
COMBINED FLOW AT	AP17	48	-	0.0000	0.0		0.00	
ROUTED		10& 9	17	0.0120	139.9		1.60	
	AP17	17	11					
	AP19CHNL	17		0.0120	139.9		1.60	
COMBINED FLOW AT	401.99	11		0.0120	147.8		1.60	
HYDROGRAPH AT	B	11& 4	5	0.4266	658.5		1.55	
DIVIDED FLOW AT		8	-	0.0190	15.9	NA	1.50	1.31
	SEDTEMP	8	47&48					
	NOVALUE	47	-	0.0190	17.8		1.50	
DIVIDED FLOW AT		48	-	0.0000	0.0		0.00	
	101.3	47	8&48					
	NOVALUE	8	-	0.0190	17.8		1.50	
		48	-	0.0000	0.0		0.00	

DESCRIPTION	HYDROGRAPH LABEL	FROM ID NO	TO ID NO	AREA SQ MI	DISCHARGE CFS	CURVE NO	TIME TO PEAK HR	CFS PER ACRE
HYDROGRAPH AT	401.	2	-	0.0951	59.3	NA	1.65	0.97
DIVIDED FLOW AT		2	47&48					
	SEDTEMP	47	-	0.0951	66.4		1.65	
	NOVALUE	48	-	0.0000	0.0		0.00	
DIVIDED FLOW AT		47	2&48					
	101.3	2	-	0.0951	66.4		1.65	
	NOVALUE	48	-	0.0000	0.0		0.00	
COMBINED FLOW AT	ATDAM	8& 5	3	0.4456	675.9		1.55	
COMBINED FLOW AT	TOTATDAM	3& 2	3	0.5407	732.0		1.55	

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hrh	Ht	Total		Low		Dia. 3	JUNCTION			
																Losses	HGL(dn)	HGL(up)	Point		HV	HGL(dn)	HGL(up)	Dia. 1&2
PIEDRAS MARCADAS SOUTH BRANCH STORM DRAIN HYDRAULIC GRADE LINE																								
***** ULTIMATE CONDITIONS *****																								
44+05	DM											0.00	0.00	0.00	0.00	0.00		5032.00	5032.00	6.23	5038.23	5038.23	0.00	0.00
		72	566.3	28.27	20.03	4235	0.0179	260.00			4.65					4.65								
41+45	MH								4			0.00	0.00	0.31	0.00	0.31	5036.65	5036.96	5042.00	6.23	5042.88	5043.19	0.00	0.00
		72	566.3	28.27	20.03	4235	0.0179	427.00			7.63					7.63								
37+18	MH								4			0.00	0.43	0.29	0.00	0.73	5044.60	5046.01	5048.85	5.54	5050.82	5051.55	2.00	45.00
		72	534.2	28.27	18.89	4235	0.0159	460.00			7.32					7.32								
32+58	WE/INLET								4			0.00	0.16	0.27	0.00	0.43	5053.33	5053.94	5058.71	5.36	5058.87	5059.30	2.00	45.00
		72	525.4	28.27	18.58	4235	0.0154	64.00			0.98					0.98								
31+94	EXPN.											0.00	0.00	0.32	0.04	0.36	5054.93	5053.05	5060.20	7.59	5060.29	5060.65	0.00	0.00
		66	525.4	23.76	22.11	3358	0.0245	320.00			7.83					7.83								
28+74	MH								4			0.00	0.00	0.38	0.00	0.38	5062.96	5063.34	5067.60	7.59	5070.55	5070.93*	0.00	0.00
		66	525.4	23.76	22.11	3358	0.0245	27.00			0.66					0.66								
28+47	NEW INL.											0.00	0.15	0.38	0.00	0.52	5064.00	5064.68	5067.60	7.44	5071.59	5072.12	2.00	45.00
		66	519.9	23.76	21.88	3358	0.0240	252.00			6.04					6.04								
25+95	REDUC.											0.00	0.00	0.31	0.02	0.33	5073.18	5074.51	5077.50	5.25	5079.43	5079.76*	0.00	0.00
		72	519.9	28.27	18.39	4235	0.0151	13.00			0.20					0.20								
25+82	MH								4			0.00	0.00	0.26	0.00	0.26	5074.71	5074.97	5078.00	5.25	5079.96	5080.22	0.00	0.00
		72	519.9	28.27	18.39	4235	0.0151	8.00			0.12					0.12								
25+74	WE											0.00	0.00	0.26	0.00	0.26	5075.09	5075.35	5078.10	5.25	5080.34	5080.60	2.00	45.00
		72	519.9	28.27	18.39	4235	0.0151	114.00			1.72					1.72								
24+60	NEW MH								4			0.00	0.54	0.25	0.00	0.79	5077.07	5078.53	5080.70	4.58	5082.32	5083.11	3.00	45.00
		72	485.6	28.27	17.17	4235	0.0131	410.00			5.39					5.39								
20+50	JBCK								4	0		0.00	1.61	0.20	0.02	1.82	5085.54	5088.51	5094.50	3.43	5090.12	5091.94*	4.50	45.00
		66	353.2	23.76	14.87	3358	0.0111	133.00			1.47					1.47								
19+17	WE											0.00	0.43	0.15	0.00	0.58	5089.98	5091.30	5196.80	2.7	5093.41	5094.00	2.50	45.00
		66	313.3	23.76	13.19	3358	0.0087	105.00			0.91					0.91								
18+12	WE&EXP.											0.00	-0.35	0.13	0.00	-0.23	5092.21	5092.34	5198.00	2.35	5094.91	5094.69	2.00	45.00
		60	241.4	19.63	12.29	2604	0.0086	274.00			2.35					2.35								
15+38	MH								4	12		0.17	0.00	0.12	0.00	0.29	5094.69	5094.98	5107.00	2.35	5097.04	5097.33	0.00	0.00
		60	241.4	19.63	12.29	2604	0.0086	253.00			2.17					2.17								
DISCONTINUITY IN HGL AT THIS POINT. BEGIN HGL AT 100-YEAR W.S. ELEVATION OF 5101.25																								
12+85	MH								4	12		0.00	0.00	0.00	0.00	0.00		5101.25	5105.30	3.94		5105.19	0.00	0.00
		60	312.6	19.63	15.92	2604	0.0144	199.00			2.87					2.87								
10+86	MH								4			0.00	0.00	0.15	0.00	0.15	5104.12	5104.27	5111.00	3.94	5108.05	5108.21	0.00	0.00
		60	312.6	19.63	15.92	2604	0.0144	452.00			6.51					6.51								
6+34	MH								4			0.00	0.59	0.17	0.00	0.76	5110.78	5112.70	5113.55	2.78	5114.72	5115.47	2.50	45.00
		60	262.6	19.63	13.37	2604	0.0102	474.00			4.82					4.82								
1+60	INLET											0.00	0.00	0.03	0.56	0.59	5117.52	5120.88	5121.00	0	5120.29	5120.88	0.00	0.00

* HGL MANUALLY ADJUSTED TO COMPENSATE FOR PRESSURE FLOW.

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hrh	Ht	Total		Low		JUNCTION	
																Losses	HGL(ch)	HGL(up)	Point	HV	HGL(ch)

HYDRAULIC GRADE LINE CONTINUING FROM THE JUNCTION BOX (SECTION 20+50 ABOVE)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hrh	Ht	Total		Low		JUNCTION				
																Losses	HGL(ch)	HGL(up)	Point	HV	HGL(ch)	HGL(up)	Dia. 3 (hidden)	Angle
20+49	JBOX	54	138.1	15.90	8.68	1966	0.0049	185.00			0.91	0.00	0.00	0.00	0.00	0.00	5088.51	5094.50	1.17		5091.94	0.00	0.00	
16+16	MH	48	100.9	12.57	8.03	1436	0.0049	164.45	4	30	0.81	0.13	0.47	0.05	0.00	0.65	5091.68	5092.50	5095.19	1	5092.85	5093.50	3.00	60.00
14+63	MH	36	100.9	7.07	14.27	667	0.0229	35.50	3		0.81	0.00	0.17	0.10	0.12	0.39	5093.31	5091.53	5097.88	3.16	5094.31	5094.70	2.00	45.00
13+82	MH	24	36.7	3.14	11.68	226	0.0263	202.96	2		5.34	0.00	-0.54	0.13	0.02	-0.39	5092.35	5093.01	5100.49	2.12	5095.51	5095.12	2.00	45.00
Remarks:											Manning's 'n': .013**													

HYDRAULIC GRADE LINE CONTINUING FROM THE MANHOLE (SECTION 16+16 ABOVE)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hrh	Ht	Total		Low		JUNCTION				
																Losses	HGL(ch)	HGL(up)	Point	HV	HGL(ch)	HGL(up)	Dia. 3 (hidden)	Angle
52+04	MH	36	39.6	7.07	5.60	667	0.0035	26.00			0.09	0.00	0.00	0.00	0.00	0.00	5092.50	5094.50	0.49		5093.50	0.00	0.00	
52+35	MH	36	31.1	7.07	4.40	667	0.0022	56.00	3	45	0.12	0.05	0.10	0.02	0.00	0.17	5093.10	5093.46	5095.19	0.3	5093.59	5093.76	1.50	60.00
52+76	DEL C INLET																5093.58	5093.88	5094.17	0.00	5093.88	5093.88		
Remarks:											Manning's 'n': .013**													

FLOODPLAIN ANALYSIS FOR BASIN 404

1. FLOW DIVIDE

- FROM ORTHOPHOTO MAP + FIELD INSPECTION:

- 1) APPROX. $\frac{1}{3}$ TOTAL BASIN DISCHARGE GOES DOWN ROANOKE AV.
- 2) REMAINING $\frac{2}{3}$ GOES DOWN CHESAPEAKE RD. MINUS 30 CFS THAT GOES DOWN SWALE TO CALLE NORTENA.
- 3) $\frac{1}{2}$ FLOW ON CHESAPEAKE GOES DOWN DEERFIELD TO TAYLOR RANCH RD. + BACK TO CHANNEL.

- ADD $\frac{1}{2}$ OF BASIN 404.1 PEAK FLOW TO TOTAL FLOW IN ROANOKE DOWNSTREAM OF INTERSECTION WITH CHESAPEAKE

- SUMMARY OF FLOWS

ROANOKE (UPSTREAM)	= 55 CFS
CHESAPEAKE	= 110 CFS (BEFORE DEERFIELD DIVERSION)
DEERFIELD	= 55 CFS
ROANOKE (DOWNSTREAM)	= 203 CFS

2. FLOODPLAIN WIDTHS

		SECTION ON EXHIBIT 1
ROANOKE (UP)	= 32 FT.	A - A
CHESAPEAKE	= 32 FT.	B - B
DEERFIELD	= 32 FT.	C - C
ROANOKE (DOWN)	= 63 FT.	E - E

CHANNEL TO STORM DRAIN INLET

- ROUTED FLOW FROM BASIN 404 + PEAK FLOW BASIN 404.1
= 318.2 CFS (BASINS 403.2 + 403.3 DO NOT ENTER CHANNEL)
- FLOODPLAIN WIDTH = 64 FT. (SECTION G-G)



BOHANNAN-HUSTON INC.

PROJECT NAME: PIEDRAS MARCADAS

SHEET

1

OF

PROJECT NO. 91200.20

BY

LMM

DATE

6-30-92

SUBJECT FLOODPLAIN WIDTH ANALYSIS

CH

DATE

SECTION A-A

BASIN 404 - ROANOKE (UP)

MANNING'S N = .0170

SLOPE = .0170

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	1.00	4	41.00	0.32	7	67.00	1.00
2	25.00	0.67	5	57.00	0.00			
3	25.00	0.00	6	57.00	0.67			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.5	0.8	10.2	1.5	10.0
0.2	0.2	2.0	4.8	20.4	2.4	20.0
0.3	0.3	4.5	14.3	30.6	3.2	30.0
0.4	0.4	7.7	33.2	32.8	4.3	32.0
0.5	0.5	10.9	59.2	33.0	5.4	32.0
0.6	0.6	14.1	90.6	33.2	6.4	32.0
0.7	0.7	17.3	120.0	36.6	6.9	35.2
0.8	0.8	21.4	143.3	47.4	6.7	45.8
0.9	0.9	26.5	178.6	58.2	6.7	56.4
1.0	1.0	32.7	226.0	69.0	6.9	67.0

SECTION B-B

BASIN 404 - CHESAPEAKE RD

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	1.00	4	30.00	0.32	7	60.00	1.00
2	14.00	0.67	5	46.00	0.00			
3	14.00	0.00	6	46.00	0.67			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.5	1.2	10.2	2.3	10.0
0.2	0.2	2.0	7.4	20.4	3.7	20.0
0.3	0.3	4.5	21.9	30.6	4.9	30.0
0.4	0.4	7.7	51.0	32.8	6.6	32.0
0.5	0.5	10.9	90.8	33.0	8.3	32.0
0.6	0.6	14.1	138.9	33.2	9.9	32.0
0.7	0.7	17.3	186.0	36.0	10.7	34.5
0.8	0.8	21.2	225.5	44.6	10.6	43.0
0.9	0.9	25.9	280.2	53.3	10.8	51.5
1.0	1.0	31.5	350.6	62.0	11.1	60.0

SECTION C-C

BASIN 404 - DEERFIELD RD.

MANNING'S N = .0170

SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	1.00	4	25.00	0.32	7	50.00	1.00
2	9.00	0.67	5	41.00	0.00			
3	9.00	0.00	6	41.00	0.67			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.5	0.6	10.2	1.2	10.0
0.2	0.2	2.0	3.7	20.4	1.9	20.0
0.3	0.3	4.5	11.0	30.6	2.4	30.0
0.4	0.4	7.7	25.5	32.8	3.3	32.0
0.5	0.5	10.9	45.4	33.0	4.2	32.0
0.6	0.6	14.1	69.5	33.2	4.9	32.0
0.7	0.7	17.3	94.5	35.0	5.5	33.6
0.8	0.8	20.9	117.5	40.7	5.6	39.1
0.9	0.9	25.1	146.0	46.4	5.8	44.5
1.0	1.0	29.9	180.2	52.0	6.0	50.0

SECTION D-D

WEIR ANALYSIS - ROANOKE/CHESAPEAKE INTERSECTION

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	56.00	4	100.00	52.43	7	142.00	53.10
2	90.00	54.00	5	116.00	52.75	8	150.00	54.00
3	100.00	53.10	6	132.00	52.43	9	160.00	56.00

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
52.53	0.10	0.57	0.37	0.65	11.49
52.63	0.20	2.30	2.13	0.93	22.99
52.73	0.30	5.17	5.88	1.14	34.48
52.83	0.40	8.87	11.90	1.34	37.97
52.93	0.50	12.75	19.69	1.54	39.46
53.03	0.60	16.77	29.01	1.73	40.96
53.13	0.70	20.94	39.73	1.90	42.60
53.23	0.80	25.30	51.84	2.05	44.60
53.33	0.90	29.86	65.32	2.19	46.60
53.43	1.00	34.62	80.18	2.32	48.60
53.53	1.10	39.58	96.42	2.44	50.60
53.63	1.20	44.74	114.04	2.55	52.60
53.73	1.30	50.10	133.07	2.66	54.60
53.83	1.40	55.66	153.50	2.76	56.60
53.93	1.50	61.42	175.35	2.85	58.60
54.03	1.60	67.39	198.63	2.95	61.50
54.13	1.70	73.79	223.55	3.03	66.50
54.23	1.80	80.69	250.34	3.10	71.50
54.33	1.90	88.09	279.18	3.17	76.50
54.43	2.00	95.99	310.18	3.23	81.50
54.53	2.10	104.39	343.45	3.29	86.50
54.63	2.20	113.29	379.11	3.35	91.50
54.73	2.30	122.69	417.24	3.40	96.50
54.83	2.40	132.59	457.93	3.45	101.50
54.93	2.50	142.99	501.27	3.51	106.50
55.03	2.60	153.89	547.33	3.56	111.50
55.13	2.70	165.29	596.20	3.61	116.50
55.23	2.80	177.19	647.93	3.66	121.50
55.33	2.90	189.59	702.61	3.71	126.50
55.43	3.00	202.49	760.31	3.75	131.50
55.53	3.10	215.89	821.08	3.80	136.50
55.63	3.20	229.79	885.00	3.85	141.50
55.73	3.30	244.19	952.13	3.90	146.50
55.83	3.40	259.09	1022.52	3.95	151.50
55.93	3.50	274.49	1096.25	3.99	156.50
56.00	3.57	285.57	1149.86	4.03	160.00

SECTION E-E

BASIN 404 - ROANOKE AV. (DOWN)

MANNING'S N = .0170

SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.00	4	50.00	0.00	7	82.00	0.67
2	30.00	1.00	5	66.00	0.32	8	102.00	1.00
3	50.00	0.67	6	82.00	0.00	9	142.00	2.00

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.5	0.8	10.2	1.7	10.0
0.2	0.2	2.0	5.3	20.4	2.6	20.0
0.3	0.3	4.5	15.5	30.6	3.4	30.0
0.4	0.4	7.7	36.1	32.8	4.7	32.0
0.5	0.5	10.9	64.2	33.0	5.9	32.0
0.6	0.6	14.1	98.2	33.2	7.0	32.0
0.7	0.7	17.3	129.2	37.0	7.5	35.6
0.8	0.8	21.5	152.8	49.4	7.1	47.8
0.9	0.9	26.9	191.1	61.7	7.1	59.9
1.0	1.0	33.5	243.9	74.0	7.3	72.0
1.1	1.1	41.0	321.7	81.2	7.8	79.0
1.2	1.2	49.3	412.6	88.4	8.4	86.0
1.3	1.3	58.2	517.2	95.6	8.9	93.0
1.4	1.4	67.9	636.2	102.8	9.4	100.0
1.5	1.5	78.2	770.4	110.0	9.8	107.0
1.6	1.6	89.3	920.4	117.2	10.3	114.0
1.7	1.7	101.0	1087.0	124.4	10.8	121.0
1.8	1.8	113.5	1270.7	131.6	11.2	128.0
1.9	1.9	126.6	1472.2	138.8	11.6	135.0
2.0	2.0	140.5	1692.2	146.0	12.0	142.0

SECTION F-F

WEIR ANALYSIS - CHANNEL INLET AT ROANOKE

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	46.00	4	85.00	41.00	7	138.00	46.00
2	60.00	44.00	5	100.00	42.00			
3	70.00	42.00	6	108.00	44.00			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
41.10	0.10	0.15	0.10	0.63	3.00
41.20	0.20	0.60	0.55	0.92	6.00
41.30	0.30	1.35	1.53	1.13	9.00
41.40	0.40	2.40	3.14	1.31	12.00
41.50	0.50	3.75	5.50	1.47	15.00
41.60	0.60	5.40	8.68	1.61	18.00
41.70	0.70	7.35	12.78	1.74	21.00
41.80	0.80	9.60	17.84	1.86	24.00
41.90	0.90	12.15	23.96	1.97	27.00
42.00	1.00	15.00	31.18	2.08	30.00
42.10	1.10	18.05	39.51	2.19	30.90
42.20	1.20	21.18	48.79	2.30	31.80
42.30	1.30	24.41	59.01	2.42	32.70
42.40	1.40	27.72	70.10	2.53	33.60
42.50	1.50	31.13	82.07	2.64	34.50
42.60	1.60	34.62	94.89	2.74	35.40
42.70	1.70	38.21	108.56	2.84	36.30
42.80	1.80	41.88	123.06	2.94	37.20
42.90	1.90	45.65	138.41	3.03	38.10
43.00	2.00	49.50	154.58	3.12	39.00
43.10	2.10	53.45	171.61	3.21	39.90
43.20	2.20	57.48	189.45	3.30	40.80
43.30	2.30	61.61	208.15	3.38	41.70
43.40	2.40	65.82	227.68	3.46	42.60
43.50	2.50	70.12	248.05	3.54	43.50
43.60	2.60	74.52	269.28	3.61	44.40
43.70	2.70	79.00	291.36	3.69	45.30
43.80	2.80	83.58	314.28	3.76	46.20
43.90	2.90	88.24	338.07	3.83	47.10
44.00	3.00	93.00	362.71	3.90	48.00
44.10	3.10	98.02	388.36	3.96	52.50
44.20	3.20	103.50	415.31	4.01	57.00
44.30	3.30	109.42	443.77	4.06	61.50
44.40	3.40	115.80	473.87	4.09	66.00
44.50	3.50	122.62	505.74	4.12	70.50
44.60	3.60	129.90	539.51	4.15	75.00
44.70	3.70	137.62	575.25	4.18	79.50
44.80	3.80	145.80	613.08	4.20	84.00
44.90	3.90	154.42	653.07	4.23	88.50
45.00	4.00	163.50	695.31	4.25	93.00
45.10	4.10	173.02	739.88	4.28	97.50
45.20	4.20	183.00	786.84	4.30	102.00
45.30	4.30	193.42	836.28	4.32	106.50
45.40	4.40	204.30	888.25	4.35	111.00
45.50	4.50	215.62	942.83	4.37	115.50
45.60	4.60	227.40	1000.08	4.40	120.00
45.70	4.70	239.62	1060.06	4.42	124.50

SECTION G-G

CHANNEL TO SD INLET

MANNING'S N = .0300

SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	4.50	3	20.00	2.00	5	80.00	2.00
2	15.00	4.00	4	50.00	0.00	6	95.00	4.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.2	0.1	3.0	0.7	3.0
0.2	0.2	0.6	0.6	6.0	1.1	6.0
0.3	0.3	1.4	1.9	9.0	1.4	9.0
0.4	0.4	2.4	4.1	12.0	1.7	12.0
0.5	0.5	3.8	7.4	15.0	2.0	15.0
0.6	0.6	5.4	12.0	18.0	2.2	18.0
0.7	0.7	7.4	18.1	21.0	2.5	21.0
0.8	0.8	9.6	25.8	24.1	2.7	24.0
0.9	0.9	12.2	35.3	27.1	2.9	27.0
1.0	1.0	15.0	46.7	30.1	3.1	30.0
1.1	1.1	18.2	60.3	33.1	3.3	33.0
1.2	1.2	21.6	76.0	36.1	3.5	36.0
1.3	1.3	25.4	94.1	39.1	3.7	39.0
1.4	1.4	29.4	114.6	42.1	3.9	42.0
1.5	1.5	33.8	137.8	45.1	4.1	45.0
1.6	1.6	38.4	163.7	48.1	4.3	48.0
1.7	1.7	43.4	192.4	51.1	4.4	51.0
1.8	1.8	48.6	224.1	54.1	4.6	54.0
1.9	1.9	54.2	258.8	57.1	4.8	57.0
2.0	2.0	60.0	296.8	60.1	4.9	60.0
2.1	2.1	66.1	344.4	61.2	5.2	61.0
2.2	2.2	72.2	395.1	62.2	5.5	62.0
2.3	2.3	78.5	448.8	63.2	5.7	63.0
2.4	2.4	84.8	505.5	64.2	6.0	64.0
2.5	2.5	91.2	565.2	65.3	6.2	65.0
2.6	2.6	97.8	627.8	66.3	6.4	66.0
2.7	2.7	104.4	693.4	67.3	6.6	67.0
2.8	2.8	111.2	762.0	68.3	6.9	68.0
2.9	2.9	118.0	833.5	69.4	7.1	69.0
3.0	3.0	125.0	908.0	70.4	7.3	70.0
3.1	3.1	132.0	985.3	71.4	7.5	71.0
3.2	3.2	139.2	1065.7	72.4	7.7	72.0
3.3	3.3	146.4	1149.0	73.5	7.8	73.0
3.4	3.4	153.8	1235.2	74.5	8.0	74.0
3.5	3.5	161.2	1324.4	75.5	8.2	75.0
3.6	3.6	168.8	1416.5	76.5	8.4	76.0
3.7	3.7	176.4	1511.7	77.6	8.6	77.0
3.8	3.8	184.2	1609.8	78.6	8.7	78.0
3.9	3.9	192.0	1710.9	79.6	8.9	79.0
4.0	4.0	200.0	1815.0	80.7	9.1	80.0

ANALYSIS OF FLOW AT STORM DRAIN INLET AT FIREWHEEL + PRIMROSE

1. DETERMINE INFLOW INTO 60" STORM DRAIN

FLOWLINE ELEV. OF SPILLWAY = 20.5 -
DEPTH OF WEIR FLOW (APPROX.) = 1.7
WATER SURFACE ELEV = 22.2
FLOWLINE OF STORM DRAIN = 11.98
AVAIL. HEAD = 10.22

FROM INLET CONTROL NOMOGRAPH FOR PIPE CULVERTS, FOR ENTRANCE TYPE 1, DISCHARGE = 258 CFS

2. ANALYZE WEIR FLOW (SEE SECTION H-H, PG. 92j)

OVERFLOW INTO SPILLWAY = TOTAL FLOW INTO INLET STRUCTURE
- PIPE INFLOW
= 373 - 258 = 115 CFS

DEPTH OF FLOW = 1.7

WSEL = 22.2

ANALYZE FLOW AT CHANNEL DIVERSION (SEE SECTION J-J, PG. 92l)

1. DEPTH OF FLOW FROM WEIR ANALYSIS = 1.00
WILL CAUSE PONDING AT SUNROSE + FIREWHEEL

2. CHANNEL DIVERSION FLOW = 35 CFS
STREET FLOW = 75 CFS

3. USE WEIR ANALYSIS TO DETERMINE FLOODPLAIN WIDTH ON
FIREWHEEL JUST UPSTREAM OF SECT. J-J. (SEE SECTION I-I, PG. 92k)
TOP WIDTH FOR FLOWRATE OF 115 CFS = 51.4 FT.

ANALYZE FLOW IN CHANNEL SECTION TO POND

AT 100-YR FLOOD ELEV., POND WILL HAVE WEIR EFFECT ON CHANNEL.
(SEE SECTION K-K, PG. 92). AT FLOWRATE = 113 CFS, TOP WIDTH = 28 FT.



BOHANNAN-HUSTON INC.

PROJECT NAME PIEDRAS MARCADAS SHEET 1 OF 1
PROJECT NO. 91200.20 LMM DATE 7-2-92
SUBJECT STORM DRAIN INLET CHD DATE

SECTION H-H

SPILLWAY AT STORM DRAIN

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	25.00	5	82.00	21.30	9	140.00	22.00
2	65.00	24.00	6	82.00	20.50	10	205.00	23.00
3	73.00	23.00	7	94.00	20.50			
4	78.00	22.00	8	94.00	21.30			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
20.60	0.10	1.20	0.99	0.82	12.00
20.70	0.20	2.40	2.79	1.16	12.00
20.80	0.30	3.60	5.13	1.42	12.00
20.90	0.40	4.80	7.89	1.64	12.00
21.00	0.50	6.00	11.03	1.84	12.00
21.10	0.60	7.20	14.50	2.01	12.00
21.20	0.70	8.40	18.27	2.18	12.00
21.30	0.80	9.60	22.32	2.33	12.00
21.40	0.90	11.16	26.87	2.41	19.14
21.50	1.00	13.43	32.52	2.42	26.29
21.60	1.10	16.41	39.65	2.42	33.43
21.70	1.20	20.11	48.52	2.41	40.57
21.80	1.30	24.53	59.36	2.42	47.71
21.90	1.40	29.66	72.38	2.44	54.86
22.00	1.50	35.50	87.75	2.47	62.00
22.10	1.60	42.05	105.64	2.51	69.00
22.20	1.70	49.30	126.19	2.56	76.00
22.30	1.80	57.25	149.53	2.61	83.00
22.40	1.90	65.90	175.80	2.67	90.00
22.50	2.00	75.25	205.14	2.73	97.00
22.60	2.10	85.30	237.64	2.79	104.00
22.70	2.20	96.05	273.45	2.85	111.00
22.80	2.30	107.50	312.65	2.91	118.00
22.90	2.40	119.65	355.38	2.97	125.00
23.00	2.50	132.50	401.72	3.03	132.00

SECTION I-I

WEIR ANALYSIS - FLOW DOWN FIREWHEEL

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.00	4	30.00	0.32	7	55.00	1.00
2	14.00	0.33	5	46.00	0.00	8	65.00	2.00
3	14.00	0.00	6	46.00	0.33			

WSEL	DEPTH	FLOW	FLOW	FLOW	TOP WID
(FT)	INC	AREA	RATE	VEL	PLUS
	(FT)	(SQ FT)	(CFS)	(FPS)	OBSTRUCTIONS
0.10	0.10	0.50	0.33	0.65	10.00
0.20	0.20	2.00	1.86	0.93	20.00
0.30	0.30	4.50	5.12	1.14	30.00
0.40	0.40	7.73	10.36	1.34	33.53
0.50	0.50	11.20	17.22	1.54	35.71
0.60	0.60	14.88	25.53	1.72	37.89
0.70	0.70	18.77	35.25	1.88	40.07
0.80	0.80	22.89	46.35	2.02	42.25
0.90	0.90	27.22	58.82	2.16	44.44
1.00	1.00	31.78	72.66	2.29	46.62
1.10	1.10	36.53	87.87	2.41	48.46
1.20	1.20	41.47	104.43	2.52	50.29
1.30	1.30	46.59	122.34	2.63	52.13
1.40	1.40	51.89	141.60	2.73	53.97
1.50	1.50	57.38	162.22	2.83	55.81
1.60	1.60	63.06	184.20	2.92	57.65
1.70	1.70	68.91	207.56	3.01	59.49
1.80	1.80	74.95	232.31	3.10	61.32
1.90	1.90	81.18	258.46	3.18	63.16
2.00	2.00	87.58	286.01	3.27	65.00

SECTION J-J

STREET & CHANNEL

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.00	5	46.00	0.00	9	74.00	0.00
2	14.00	0.33	6	46.00	0.33	10	84.00	2.00
3	14.00	0.00	7	55.00	1.00			
4	30.00	0.32	8	65.00	0.00			

WSEL	DEPTH	FLOW	FLOW	FLOW	TOP WID
(FT)	INC	AREA	RATE	VEL	PLUS
	(FT)	(SQ FT)	(CFS)	(FPS)	OBSTRUCTIONS
0.10	0.10	1.48	1.11	0.75	20.50
0.20	0.20	4.10	4.21	1.03	32.00
0.30	0.30	7.88	9.72	1.23	43.50
0.40	0.40	12.53	17.83	1.42	48.53
0.50	0.50	17.57	28.22	1.61	52.21
0.60	0.60	22.98	40.73	1.77	55.89
0.70	0.70	28.75	55.32	1.92	59.57
0.80	0.80	34.89	71.98	2.06	63.25
0.90	0.90	41.40	90.75	2.19	66.94
1.00	1.00	48.28	111.62	2.31	70.62
1.10	1.10	55.41	134.56	2.43	71.96
1.20	1.20	62.67	159.39	2.54	73.29
1.30	1.30	70.06	186.03	2.66	74.63
1.40	1.40	77.59	214.40	2.76	75.97
1.50	1.50	85.26	244.49	2.87	77.31
1.60	1.60	93.06	276.24	2.97	78.65
1.70	1.70	100.99	309.65	3.07	79.99
1.80	1.80	109.05	344.69	3.16	81.32
1.90	1.90	117.25	381.35	3.25	82.66
2.00	2.00	125.58	419.61	3.34	84.00

SECTION K-K

WEIR ANALYSIS - CHANNEL TO POND

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.00	3	19.00	0.00			
2	10.00	0.00	4	29.00	2.00			

WSEL	DEPTH	FLOW	FLOW	FLOW	TOP WID
(FT)	INC	AREA	RATE	VEL	PLUS
	(FT)	(SQ FT)	(CFS)	(FPS)	OBSTRUCTIONS
0.10	0.10	0.95	0.77	0.81	10.00
0.20	0.20	2.00	2.26	1.13	11.00
0.30	0.30	3.15	4.34	1.38	12.00
0.40	0.40	4.40	6.94	1.58	13.00
0.50	0.50	5.75	10.08	1.75	14.00
0.60	0.60	7.20	13.73	1.91	15.00
0.70	0.70	8.75	17.93	2.05	16.00
0.80	0.80	10.40	22.65	2.18	17.00
0.90	0.90	12.15	27.93	2.30	18.00
1.00	1.00	14.00	33.74	2.41	19.00
1.10	1.10	15.95	40.14	2.52	20.00
1.20	1.20	18.00	47.10	2.62	21.00
1.30	1.30	20.15	54.67	2.71	22.00
1.40	1.40	22.40	62.81	2.80	23.00
1.50	1.50	24.75	71.59	2.89	24.00
1.60	1.60	27.20	80.96	2.98	25.00
1.70	1.70	29.75	90.99	3.06	26.00
1.80	1.80	32.40	101.64	3.14	27.00
1.90	1.90	35.15	112.96	3.21	28.00
2.00	2.00	38.00	124.93	3.29	29.00

FLOODPLAIN WIDTHS FOR BUTTERFIELD TRAIL EAST OF GOLF COURSE
USING MANNING'S EQUATION (SEE RATING CURVES, PGS. 95-98)

CROSS-SECTION LOCATION (STA)	FLOW (CFS)	TOP WIDTH (FT)	SECTION ON EXHIBIT 1
STA 18+50, 2.79%	83.2	26.0	M-M
STA 23+00, 2.17%	115.2	42.2	N-N
STA 26+00, 2.17%	112.0	39.8	O-O
STA 30+00, 2.17%	97.2	29.6	P-P
STA 38+00, 1.73%	137.7	38.0	Q-Q
CHANNEL TO DAM	147.8	10.0	R-R

AT GOLF COURSE ROAD INTERSECTION, THERE IS A WEIR EFFECT WHERE
FLOW ENTERS BUTTERFIELD TRAIL (SEE SECTION L-L, PG. 94). AT
THE RIGHT-OF-WAY, VERTICAL BARRIER WALLS WILL BE CONSTRUCTED.
DEPTH OF FLOW FOR 90 CFS = 1.0 FT.



BOHANNAN-HOUSTON INC.

PROJECT NAME PIEDRAS MARCADAS SHEET 1 OF 1
PROJECT NO. 91200.20 BY LMM DATE 6-17-92
SUBJECT FLOODPLAIN WIDTHS CIP DATE

SECTION L-L

GOLF COURSE/BUTTERFIELD INTERSECTION

WEIR COEFFICIENT=2.6000

PROGRAM DIVIDED X-SECTION INTO VERTICAL SLICES 1. FEET APART

	POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
VERTICAL WALL →	1	0.00	2.00	5	25.00	0.40	9	51.00	0.00
	2	0.00	0.85	6	25.00	1.00	10	51.00	0.67
	3	5.00	0.67	7	29.00	1.00	11	60.00	0.85
	4	5.00	0.00	8	29.00	0.40	12	60.00	2.00 ← VERTICAL WALL

	WSEL	DEPTH	FLOW	FLOW	FLOW	TOPWID
		INC	AREA	RATE	VEL	PLUS
	FT.	FT.	SQ.FT.	(CFS)	(FPS)	OBSTRUCTIONS
	0.10	0.10	0.53	0.34	0.65	14.50
	0.20	0.20	2.10	1.95	0.93	25.00
	0.30	0.30	4.73	5.38	1.14	35.50
	0.40	0.40	8.40	11.05	1.32	46.00
	0.50	0.50	12.60	18.96	1.50	46.00
	0.60	0.60	16.80	28.50	1.70	46.00
	0.70	0.70	21.04	39.39	1.87	48.33
	0.80	0.80	25.86	51.95	2.01	56.11
2 R.O.W. →	0.90	0.90	31.36	66.61	2.12	60.00
VERTICAL WALL	1.00	1.00	36.96	83.10	2.25	60.00
	1.10	1.10	42.96	101.42	2.36	60.00
	1.20	1.20	48.96	121.35	2.48	60.00
	1.30	1.30	54.96	142.71	2.60	60.00
	1.40	1.40	60.96	165.36	2.71	60.00
	1.50	1.50	66.96	189.23	2.83	60.00
	1.60	1.60	72.96	214.25	2.94	60.00
	1.70	1.70	78.96	240.36	3.04	60.00
	1.80	1.80	84.96	267.52	3.15	60.00
	1.90	1.90	90.96	295.68	3.25	60.00
	2.00	2.00	96.96	324.81	3.35	60.00

SECTION M - M

BUTTERFIELD @ 2.79%

MANNING'S N = .0170

SLOPE = .0279

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	26.00	0.67
2	0.00	0.00	4	26.00	0.12			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.3	0.5	5.1	2.0	5.0
0.2	0.2	1.2	3.2	14.3	2.7	14.0
0.3	0.3	3.1	11.2	24.5	3.6	24.0
0.4	0.4	5.6	29.2	26.7	5.2	26.0
0.5	0.5	8.2	54.7	26.9	6.6	26.0
0.6	0.6	10.8	86.0	27.1	7.9	26.0
0.7	0.7	12.7	110.9	27.2	8.8	26.0

SECTIONS N-N, O-O, P-P

BUTTERFIELD @ 2.17%

MANNING'S N = .0170

SLOPE = .0217

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.85	4	25.00	0.32	7	50.00	0.85
2	9.00	0.67	5	35.00	0.12			
3	9.00	0.00	6	35.00	0.67			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.3	0.4	5.1	1.7	5.0
0.2	0.2	1.2	2.8	14.3	2.4	14.0
0.3	0.3	3.1	9.8	24.5	3.2	24.0
0.4	0.4	5.6	25.8	26.7	4.6	26.0
0.5	0.5	8.2	48.2	26.9	5.9	26.0
0.6	0.6	10.8	75.8	27.1	7.0	26.0
0.7	0.7	13.5	99.3	31.3	7.4	30.0
0.8	0.8	17.2	116.6	44.8	6.8	43.3
0.9	0.9	19.5	131.3	51.6	6.7	50.0

SECTION Q-Q

BUTTERFIELD @ 1.78% IN 50' R.O.W.

MANNING'S N = .0170

SLOPE = .0178

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.85	4	25.00	0.32	7	50.00	0.85
2	9.00	0.67	5	41.00	0.00			
3	9.00	0.00	6	41.00	0.67			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOP
(FT)	INC	AREA	RATE	PER	VEL	WID
		(SQ FT)	(CFS)	(FT)	(FPS)	
0.1	0.1	0.5	0.8	10.2	1.6	10.0
0.2	0.2	2.0	5.0	20.4	2.5	20.0
0.3	0.3	4.5	14.6	30.6	3.2	30.0
0.4	0.4	7.7	34.0	32.8	4.4	32.0
0.5	0.5	10.9	60.5	33.0	5.6	32.0
0.6	0.6	14.1	92.7	33.2	6.6	32.0
0.7	0.7	17.3	123.2	36.4	7.1	35.0
0.8	0.8	21.3	147.7	46.6	6.9	45.0
0.9	0.9	23.7	164.3	51.7	6.9	50.0

SECTION R - R

CHANNEL TO DAM

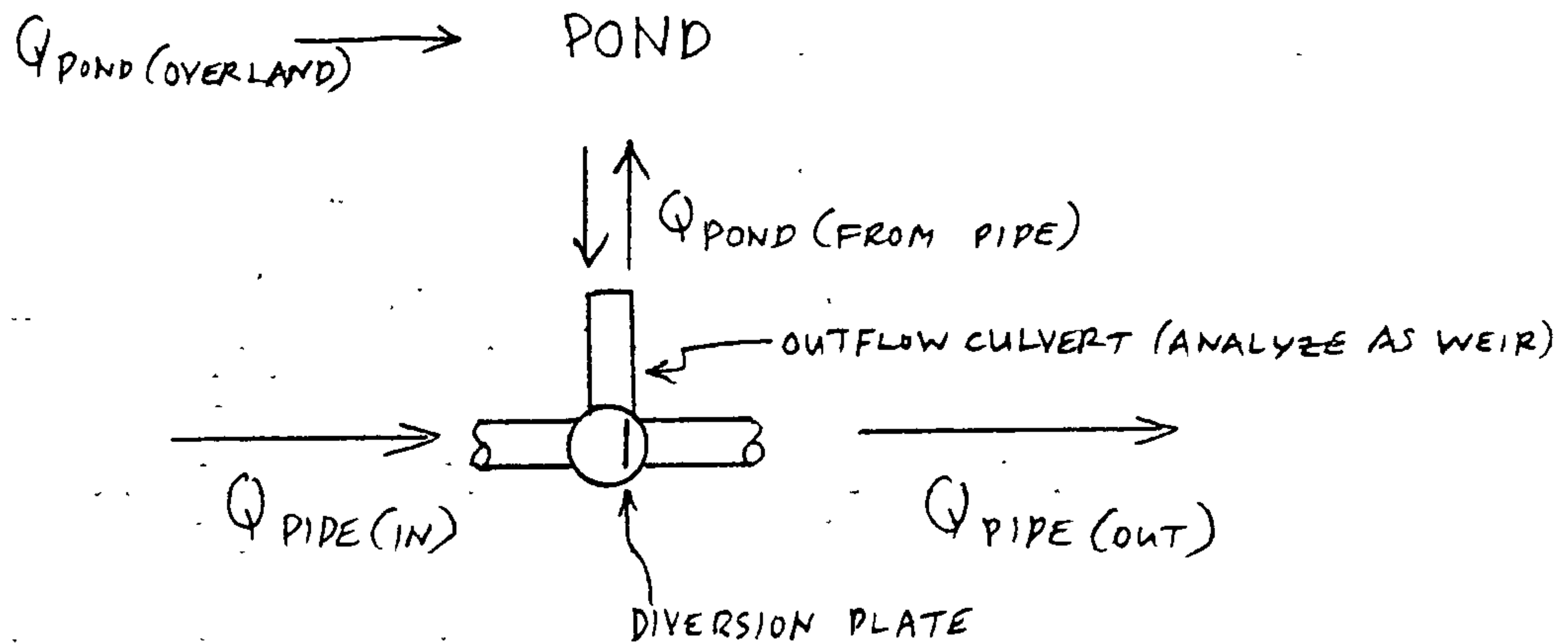
MANNING'S N = .0130

SLOPE = .0145

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.33	3	5.00	0.00	5	10.00	2.33
2	0.00	0.33	4	10.00	0.33			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.2	0.3	3.0	1.9	3.0
0.2	0.2	0.6	1.8	6.1	3.0	6.1
0.3	0.3	1.4	5.3	9.1	3.9	9.1
0.4	0.4	2.4	12.2	10.2	5.2	10.0
0.5	0.5	3.4	21.7	10.4	6.5	10.0
0.6	0.6	4.4	33.1	10.6	7.6	10.0
0.7	0.7	5.4	46.2	10.8	8.6	10.0
0.8	0.8	6.4	60.7	11.0	9.6	10.0
0.9	0.9	7.4	76.6	11.2	10.4	10.0
1.0	1.0	8.4	93.6	11.4	11.2	10.0
1.1	1.1	9.4	111.7	11.6	11.9	10.0
1.2	1.2	10.4	130.8	11.8	12.6	10.0
1.3	1.3	11.4	150.9	12.0	13.3	10.0
1.4	1.4	12.4	171.7	12.2	13.9	10.0
1.5	1.5	13.4	193.4	12.4	14.5	10.0
1.6	1.6	14.4	215.8	12.6	15.0	10.0
1.7	1.7	15.4	239.0	12.8	15.6	10.0
1.8	1.8	16.4	262.7	13.0	16.1	10.0
1.9	1.9	17.4	287.1	13.2	16.5	10.0
2.0	2.0	18.4	312.1	13.4	17.0	10.0
2.1	2.1	19.4	337.6	13.6	17.4	10.0
2.2	2.2	20.4	363.6	13.8	17.9	10.0
2.3	2.3	21.3	390.1	14.0	18.3	10.0
2.3	2.3	21.6	398.1	14.0	18.4	10.0

DIVERSION MANHOLE HYDRAULICS



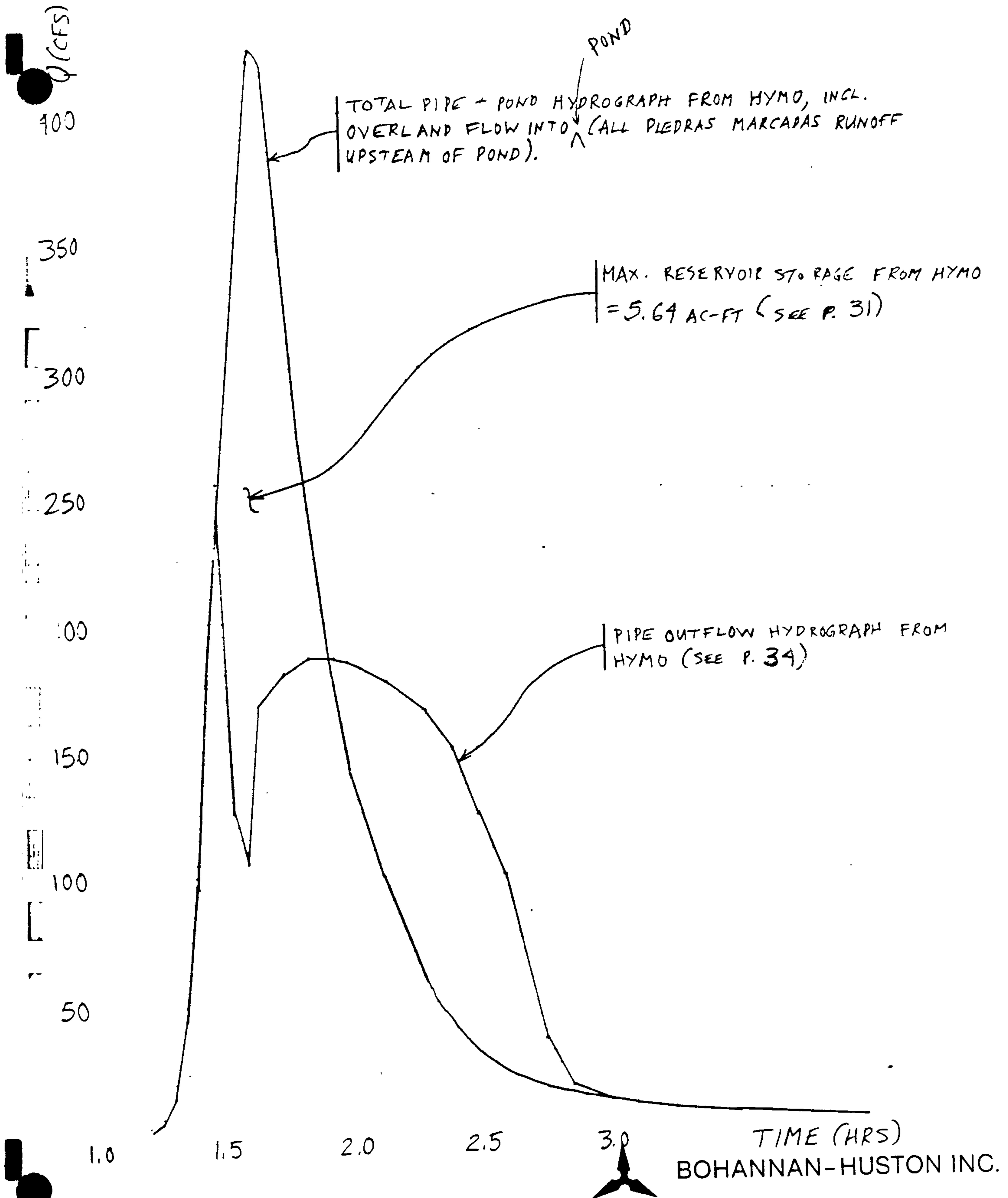
HYMO CALCULATIONS

$Q_{PIPE (IN)}$	P. 20
$Q_{POND (FROM PIPE)}$	P. 23
$Q_{POND (OVERLAND)}$	P. 25
$Q_{PIPE (OUT)}$	P. 34
DIVERSION PLATE HYDRAULICS	P. 101
OUTFLOW CULVERT HYDRAULICS	P. 102
CULVERT RATING CURVE FOR INFLOW PIPE	P. 103



BOHANNAN-HUSTON INC.

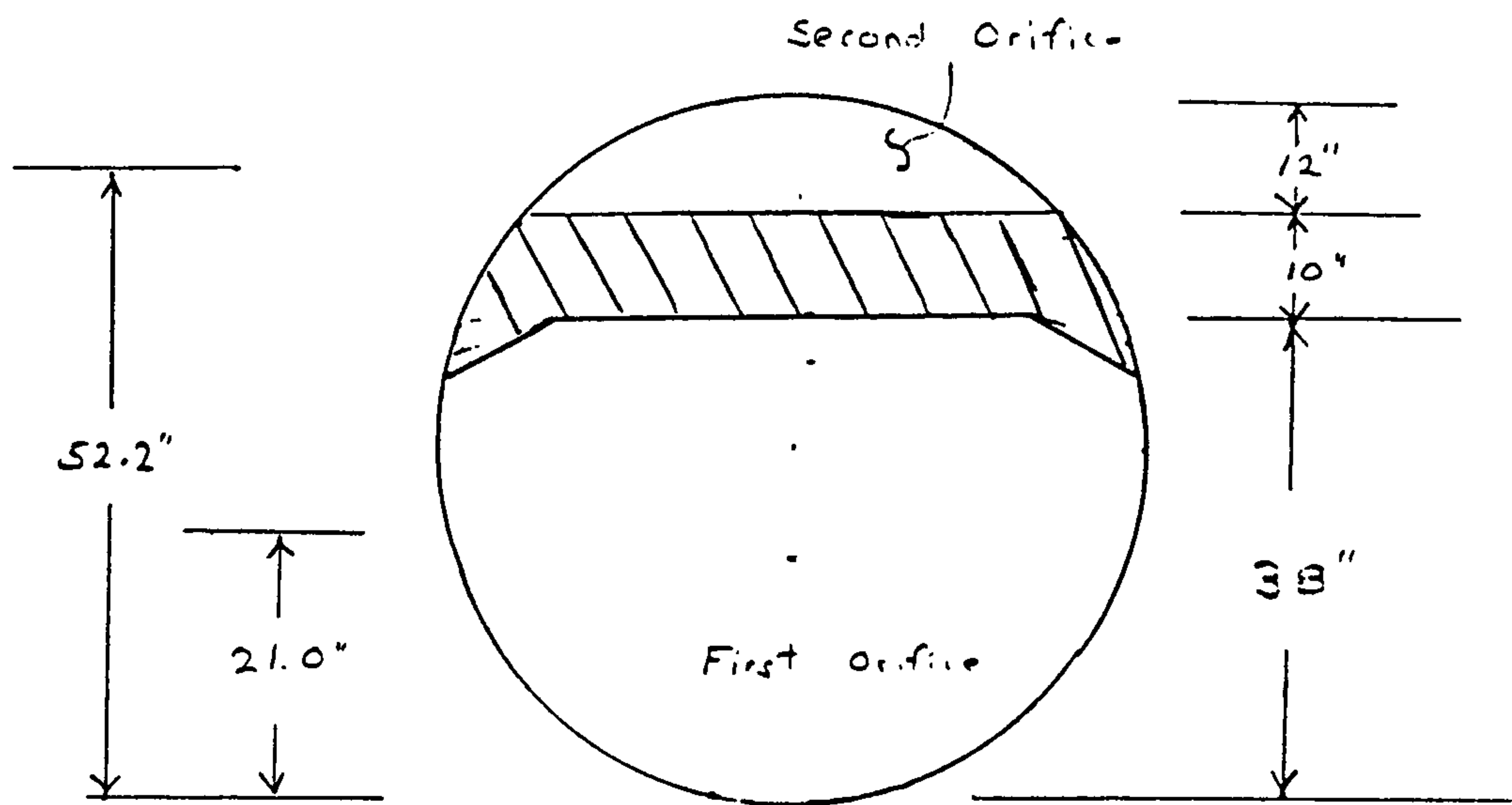
PROJECT NAME _____ SHEET _____ OF _____
 PROJECT NO. _____ BY JPK DATE 6/26/92
 SUBJECT _____ CH'D _____ DATE _____



PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT POND VOLUME DETERMINATION CH'D _____ DATE _____



60" Storm Drain
South Branch Piedras Marcadas

Manhole Invert = 93.21

First Orifice goes from bottom of pipe to 38" High
Second Orifice goes from 48" to Top of Pipe (12" Opening)

	Sq. Ft.	Inches
First Orifice Area =	13.1	Centroid = 21.0
Second Orifice Area =	2.8	Centroid = 52.2

WSEL	First Orifice Water Depth ft.	First Orifice Orifice Height	Flow cfs.	Second Orifice Orifice Height	Flow cfs.	Total Flow cfs
96.71	3.50	1.75	83.44	-		83.4
97	3.79	2.04	90.09	-		90.1
97.5	4.29	2.54	100.53	-		100.5
98	4.79	3.04	109.98	-		110.0
98.5	5.29	3.54	118.68	0.94	13.07	131.7
99	5.79	4.04	126.78	1.44	16.18	143.0
99.5	6.29	4.54	134.40	1.94	18.78	153.2
100	6.79	5.04	141.61	2.44	21.06	162.7
100.5	7.29	5.54	148.46	2.94	23.12	171.6
101	7.79	6.04	155.02	3.44	25.01	180.0
101.25	8.04	6.29	158.19	3.69	25.90	184.1

RATING CURVE FOR 8' WIDE WEIR

WEIR COEFFICIENT = 2.6000

CROSS SECTION DIVIDED INTO VERTICAL SLICES 0. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5.00	3	8.00	0.00			
2	0.00	0.00	4	8.00	5.00			

WSEL	DEPTH	FLOW	FLOW	FLOW	TOP WID
(FT)	INC	AREA	RATE	VEL	PLUS
	(FT)	(SQ FT)	(CFS)	(FPS)	OBSTRUCTIONS
0.20	0.20	1.60	1.86	1.16	8.00
0.40	0.40	3.20	5.26	1.64	8.00
0.60	0.60	4.80	9.67	2.01	8.00
0.80	0.80	6.40	14.88	2.33	8.00
1.00	1.00	8.00	20.80	2.60	8.00
1.20	1.20	9.60	27.34	2.85	8.00
1.40	1.40	11.20	34.46	3.08	8.00
1.60	1.60	12.80	42.10	3.29	8.00
1.80	1.80	14.40	50.23	3.49	8.00
2.00	2.00	16.00	58.83	3.68	8.00
2.20	2.20	17.60	67.87	3.86	8.00
2.40	2.40	19.20	77.34	4.03	8.00
2.60	2.60	20.80	87.20	4.19	8.00
2.80	2.80	22.40	97.45	4.35	8.00
3.00	3.00	24.00	108.08	4.50	8.00
3.20	3.20	25.60	119.07	4.65	8.00
3.40	3.40	27.20	130.40	4.79	8.00
3.60	3.60	28.80	142.07	4.93	8.00
3.80	3.80	30.40	154.08	5.07	8.00
4.00	4.00	32.00	166.40	5.20	8.00
4.20	4.20	33.60	179.03	5.33	8.00
4.40	4.40	35.20	191.97	5.45	8.00
4.60	4.60	36.80	205.21	5.58	8.00
4.80	4.80	38.40	218.74	5.70	8.00
5.00	5.00	40.00	232.55	5.81	8.00

N=0.01300 INCREMENT= 2.00 SLP=0.01460

CULVERT RATING TABLE

60. INCH DIAMETER PIPE			
FLOW DEPTH INCHES	FLOW AREA SQ. FT.	DISCHARGE CFS	VELOCITY FPS.
2.00000	0.20081	0.63433	3.15882
4.00000	0.56215	2.78872	4.96081
6.00000	1.02187	6.57003	6.42940
8.00000	1.55633	11.98578	7.70133
10.00000	2.15102	19.00168	8.83380
12.00000	2.79559	27.55804	9.85769
14.00000	3.48193	37.57719	10.79205
16.00000	4.20338	48.96768	11.64959
18.00000	4.95420	61.62673	12.43929
20.00000	5.72930	75.44185	13.16772
22.00000	6.52407	90.29191	13.83980
24.00000	7.33424	106.04781	14.45928
26.00000	8.15575	122.57290	15.02901
28.00000	8.98475	139.72308	15.55113
30.00000	9.81747	157.34680	16.02723
32.00000	10.65019	175.28471	16.45837
34.00000	11.47919	193.36932	16.84521
36.00000	12.30070	211.42389	17.18795
38.00000	13.11087	229.26137	17.48636
40.00000	13.90564	246.68257	17.73975
42.00000	14.68074	263.47351	17.94688
44.00000	15.43156	279.40131	18.10584
46.00000	16.15301	294.20840	18.21385
48.00000	16.83935	307.60275	18.26690
50.00000	17.48392	319.24097	18.25912
52.00000	18.07861	328.69763	18.18157
54.00000	18.61307	335.39978	18.01959
56.00000	19.07279	338.46030	17.74572
58.00000	19.43413	336.07471	17.29302
60.00000	19.63495	314.69382	16.02723

← $Q_{10} = 168 \text{ cfs}$

INLET HYDRAULICS— INLETS ON GRADE

ANALYSIS:

LOCATION	INLET TYPE	Q_s (CFS)	DEPTH (FEET)	Q_{INLET} (CFS)	REFERENCE DPM CHART ON PAGES 108 & 109.
STA. 25+64, BUTTERFIELD	DBLA	100.5	0.61 ¹	12.8	} 26.3 cfs ⁵
STA. 29+72.30, BUTTERF.	DBLC	86.0	0.63 ²	13.5	
STA. 33+85.33, CALLE NORTENA	DBLA	36.3	0.62 ³	13.0 ⁶	
STA. 34+15.19, CA. NO.	DBLA	33.6	0.53 ⁴	10.5	} 21 cfs ⁷
STA. 34+40.40, CA. NO.	DBLA	33.6	0.53 ⁴	10.5	

NOTES:

1 REFERENCE P. 105 & P. 60.

2 REFERENCE P. 63.

3 REFERENCE P. 70.

4 REFERENCE P. 107.

5 ~~REFERENCE P. OF THIS REPORT. THE COMBINED CAPACITY OF THESE TWO INLETS IS 26.3 CFS, AS COMPARED TO 26.5 CFS USED IN THE HYMO RUN.~~

6 REFERENCE P. 71 OF THIS REPORT. 13.0 CFS DIVIDED OUT OF HYMO RUN.

7 REFERENCE P. 72 OF THIS REPORT. 21 CFS DIVIDED OUT OF HYMO RUN.



BOHANNAN-HUSTON INC.

PROJECT NAME RIVERVIEW ESTATES SHEET _____ OF _____
 PROJECT NO. _____ BY JPK DATE 6/5/92
 SUBJECT _____ CH'D _____ DATE _____

RATING CURVE FOR 26' PARTIAL STREET SECTION

MANNING'S N = .0170

SLOPE = .0343

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	26.00	0.67
2	0.00	0.00	4	26.00	0.12			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.0	0.0	0.0	0.0	1.0	0.7	1.0
0.0	0.0	0.0	0.0	2.0	1.2	2.0
0.1	0.1	0.1	0.1	3.1	1.5	3.0
0.1	0.1	0.2	0.3	4.1	1.9	4.0
0.1	0.1	0.3	0.5	5.1	2.2	5.0
0.1	0.1	0.4	0.9	6.1	2.4	6.0
0.1	0.1	0.5	1.3	8.2	2.5	8.0
0.2	0.2	0.7	1.8	10.2	2.7	10.0
0.2	0.2	0.9	2.6	12.2	2.8	12.0
0.2	0.2	1.2	3.5	14.3	3.0	14.0
0.2	0.2	1.5	4.7	16.3	3.2	16.0
0.2	0.2	1.8	6.2	18.4	3.4	18.0
0.3	0.3	2.2	7.9	20.4	3.6	20.0
0.3	0.3	2.6	10.0	22.4	3.8	22.0
0.3	0.3	3.1	12.4	24.5	4.0	24.0
0.3	0.3	3.6	15.1	26.5	4.2	26.0
0.3	0.3	4.1	18.9	26.6	4.6	26.0
0.4	0.4	4.6	23.1	26.6	5.0	26.0
0.4	0.4	5.1	27.6	26.6	5.4	26.0
0.4	0.4	5.6	32.4	26.7	5.7	26.0
0.4	0.4	6.2	37.5	26.7	6.1	26.0
0.4	0.4	6.7	42.9	26.8	6.4	26.0
0.5	0.5	7.2	48.5	26.8	6.7	26.0
0.5	0.5	7.7	54.5	26.8	7.1	26.0
0.5	0.5	8.2	60.6	26.9	7.4	26.0
0.5	0.5	8.8	67.1	26.9	7.7	26.0
0.5	0.5	9.3	73.8	27.0	8.0	26.0
0.6	0.6	9.8	80.7	27.0	8.2	26.0
0.6	0.6	10.3	87.9	27.0	8.5	26.0
0.6	0.6	10.8	95.3	27.1	8.8	26.0
0.6	0.6	11.4	102.9	27.1	9.1	26.0
0.6	0.6	11.9	110.8	27.2	9.3	26.0
0.7	0.7	12.4	118.9	27.2	9.6	26.0
0.7	0.7	12.7	123.0	27.2	9.7	26.0

RATING CURVE FOR EXISTING 40' F-F STREET

MANNING'S N = .0170

SLOPE = .0450

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	20.00	0.40	5	40.00	0.67
2	0.00	0.00	4	40.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.0	0.0	0.0	0.0	2.0	0.8	2.0
0.0	0.0	0.1	0.1	4.1	1.3	4.0
0.1	0.1	0.2	0.3	6.1	1.8	6.0
0.1	0.1	0.3	0.7	8.2	2.1	8.0
0.1	0.1	0.5	1.2	10.2	2.5	10.0
0.1	0.1	0.7	2.0	12.2	2.8	12.0
0.1	0.1	1.0	3.0	14.3	3.1	14.0
0.2	0.2	1.3	4.3	16.3	3.4	16.0
0.2	0.2	1.6	6.0	18.4	3.7	18.0
0.2	0.2	2.0	7.9	20.4	3.9	20.0
0.2	0.2	2.4	10.2	22.4	4.2	22.0
0.2	0.2	2.9	12.8	24.5	4.5	24.0
0.3	0.3	3.4	15.9	26.5	4.7	26.0
0.3	0.3	3.9	19.3	28.6	4.9	28.0
0.3	0.3	4.5	23.2	30.6	5.2	30.0
0.3	0.3	5.1	27.6	32.6	5.4	32.0
0.3	0.3	5.8	32.5	34.7	5.6	34.0
0.4	0.4	6.5	37.8	36.7	5.8	36.0
0.4	0.4	7.2	43.7	38.8	6.0	38.0
0.4	0.4	8.0	50.1	40.8	6.3	40.0
0.4	0.4	8.8	58.6	40.8	6.7	40.0
0.4	0.4	9.6	67.7	40.9	7.1	40.0
0.5	0.5	10.4	77.4	40.9	7.4	40.0
0.5	0.5	11.2	87.5	41.0	7.8	40.0
0.5	0.5	12.0	98.1	41.0	8.2	40.0
0.5	0.5	12.8	109.1	41.0	8.5	40.0
0.5	0.5	13.6	120.7	41.1	8.9	40.0
0.6	0.6	14.4	132.6	41.1	9.2	40.0
0.6	0.6	15.2	145.1	41.2	9.5	40.0
0.6	0.6	16.0	157.9	41.2	9.9	40.0
0.6	0.6	16.8	171.2	41.2	10.2	40.0
0.6	0.6	17.6	184.8	41.3	10.5	40.0
0.7	0.7	18.4	198.9	41.3	10.8	40.0
0.7	0.7	18.8	206.1	41.3	11.0	40.0

RATING CURVE FOR 26' STREET SECTION D-D

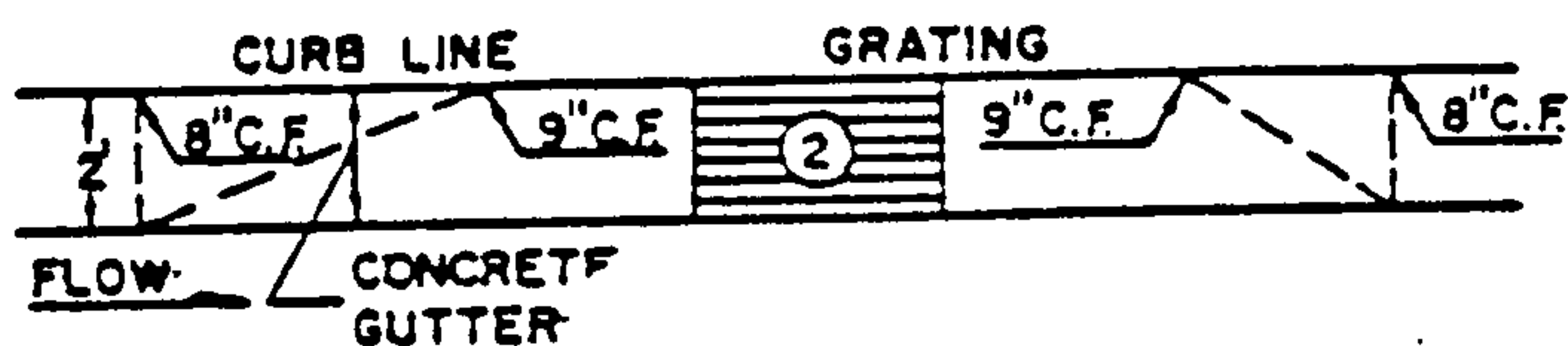
MANNING'S N = .0170

SLOPE = .0050

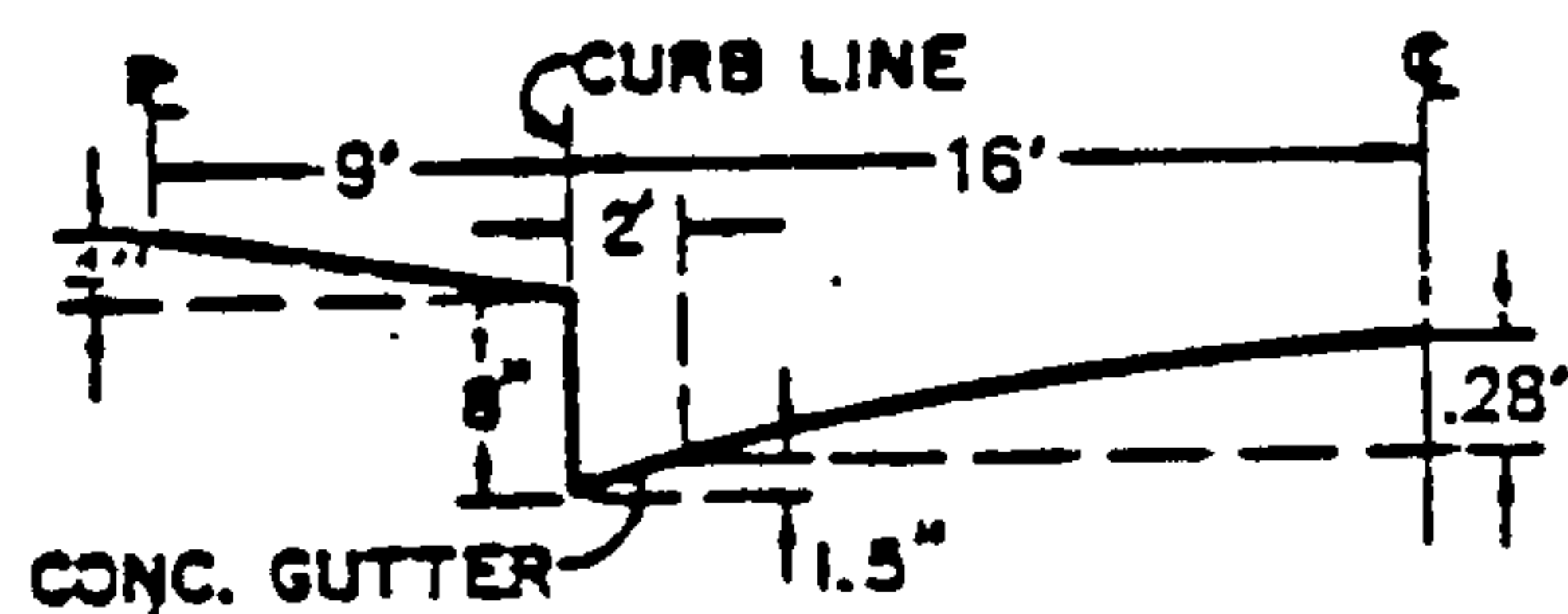
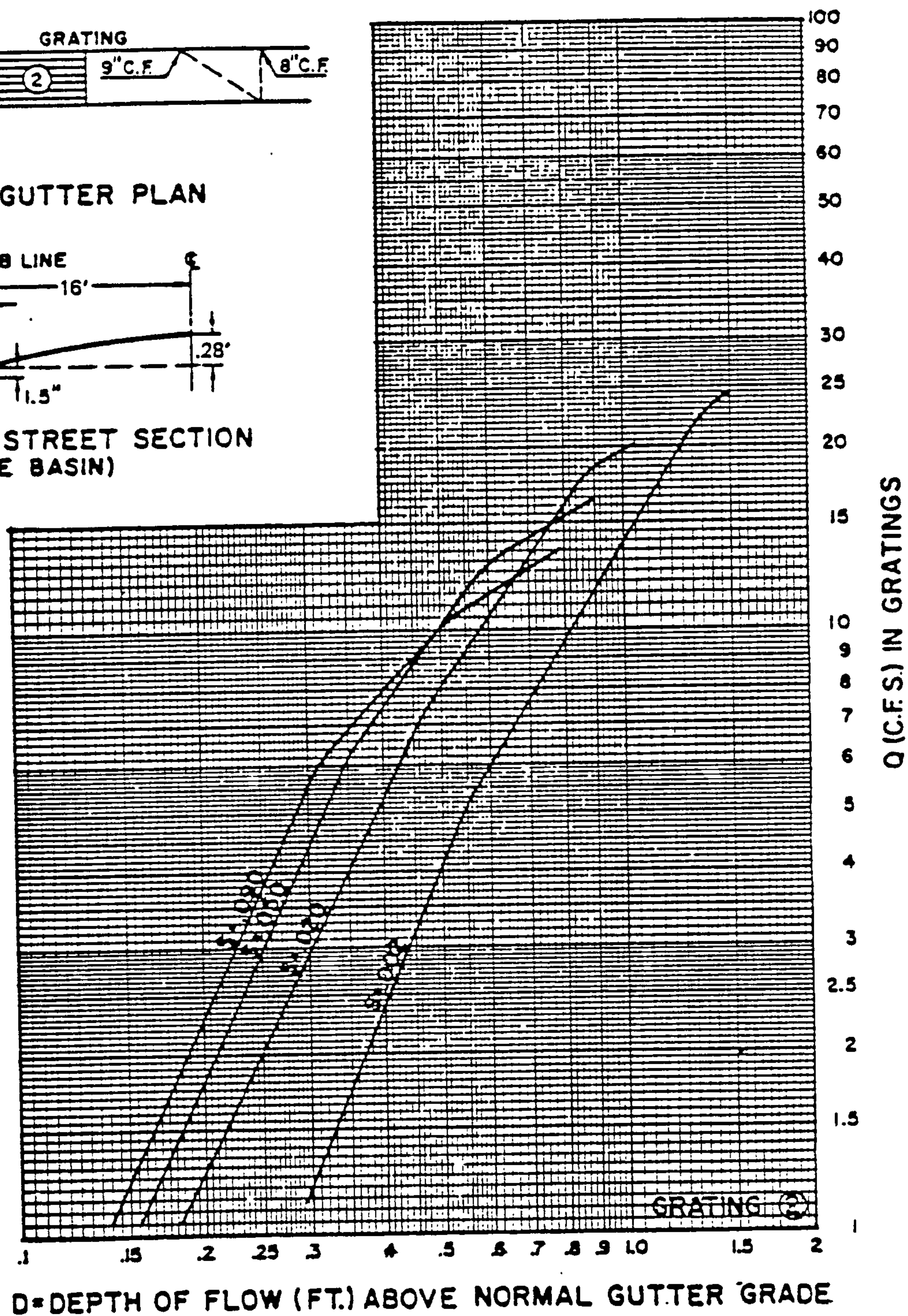
POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	13.00	0.26	5	26.00	0.67
2	0.00	0.00	4	26.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.0	0.0	0.0	0.0	2.0	0.3	2.0
0.0	0.0	0.1	0.0	4.1	0.4	4.0
0.1	0.1	0.2	0.1	6.1	0.6	6.0
0.1	0.1	0.3	0.2	8.2	0.7	8.0
0.1	0.1	0.5	0.4	10.2	0.8	10.0
0.1	0.1	0.7	0.7	12.2	0.9	12.0
0.1	0.1	1.0	1.0	14.3	1.0	14.0
0.2	0.2	1.3	1.4	16.3	1.1	16.0
0.2	0.2	1.6	2.0	18.4	1.2	18.0
0.2	0.2	2.0	2.6	20.4	1.3	20.0
0.2	0.2	2.4	3.4	22.4	1.4	22.0
0.2	0.2	2.9	4.3	24.5	1.5	24.0
0.3	0.3	3.4	5.3	26.5	1.6	26.0
0.3	0.3	3.9	6.7	26.6	1.7	26.0
0.3	0.3	4.4	8.3	26.6	1.9	26.0
0.3	0.3	4.9	9.9	26.6	2.0	26.0
0.3	0.3	5.5	11.7	26.7	2.1	26.0
0.4	0.4	6.0	13.6	26.7	2.3	26.0
0.4	0.4	6.5	15.6	26.8	2.4	26.0
0.4	0.4	7.0	17.8	26.8	2.5	26.0
0.4	0.4	7.5	20.0	26.8	2.7	26.0
0.4	0.4	8.1	22.3	26.9	2.8	26.0
0.5	0.5	8.6	24.7	26.9	2.9	26.0
0.5	0.5	9.1	27.3	27.0	3.0	26.0
0.5	0.5	9.6	29.9	27.0	3.1	26.0
0.5	0.5	10.1	32.6	27.0	3.2	26.0
0.5	0.5	10.7	35.4	27.1	3.3	26.0
0.6	0.6	11.2	38.3	27.1	3.4	26.0
0.6	0.6	11.7	41.2	27.2	3.5	26.0
0.6	0.6	12.2	44.3	27.2	3.6	26.0
0.6	0.6	12.7	47.4	27.2	3.7	26.0
0.6	0.6	13.3	50.7	27.3	3.8	26.0
0.7	0.7	13.8	54.0	27.3	3.9	26.0
0.7	0.7	14.0	55.6	27.3	4.0	26.0

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

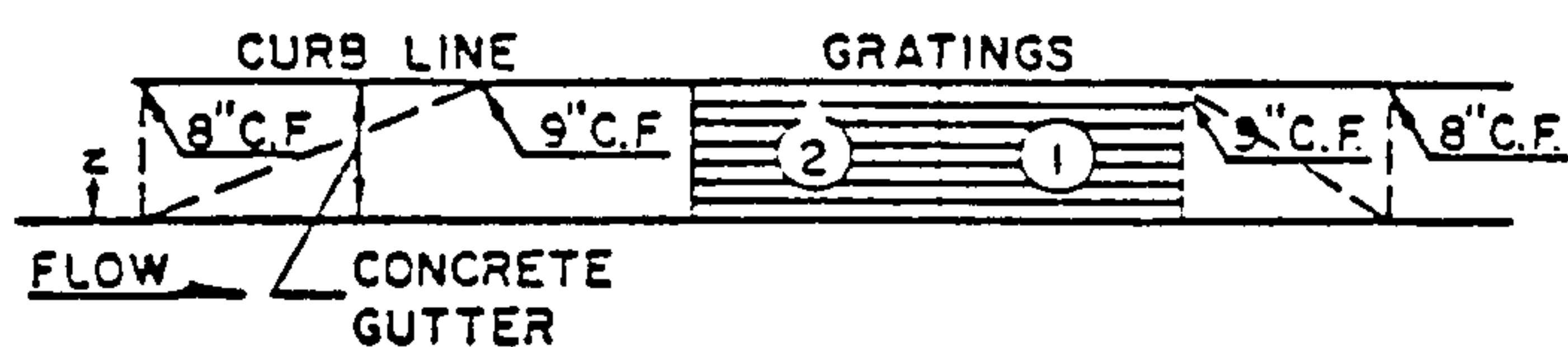


GRATING & GUTTER PLAN

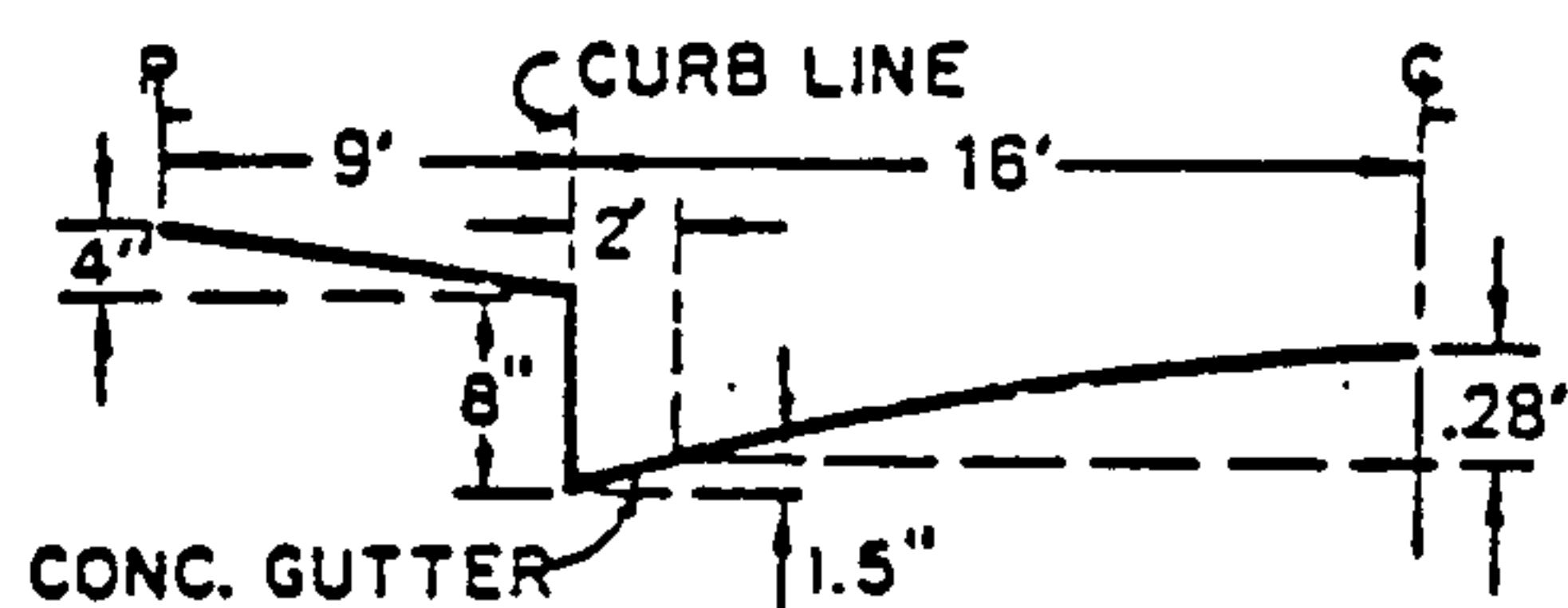
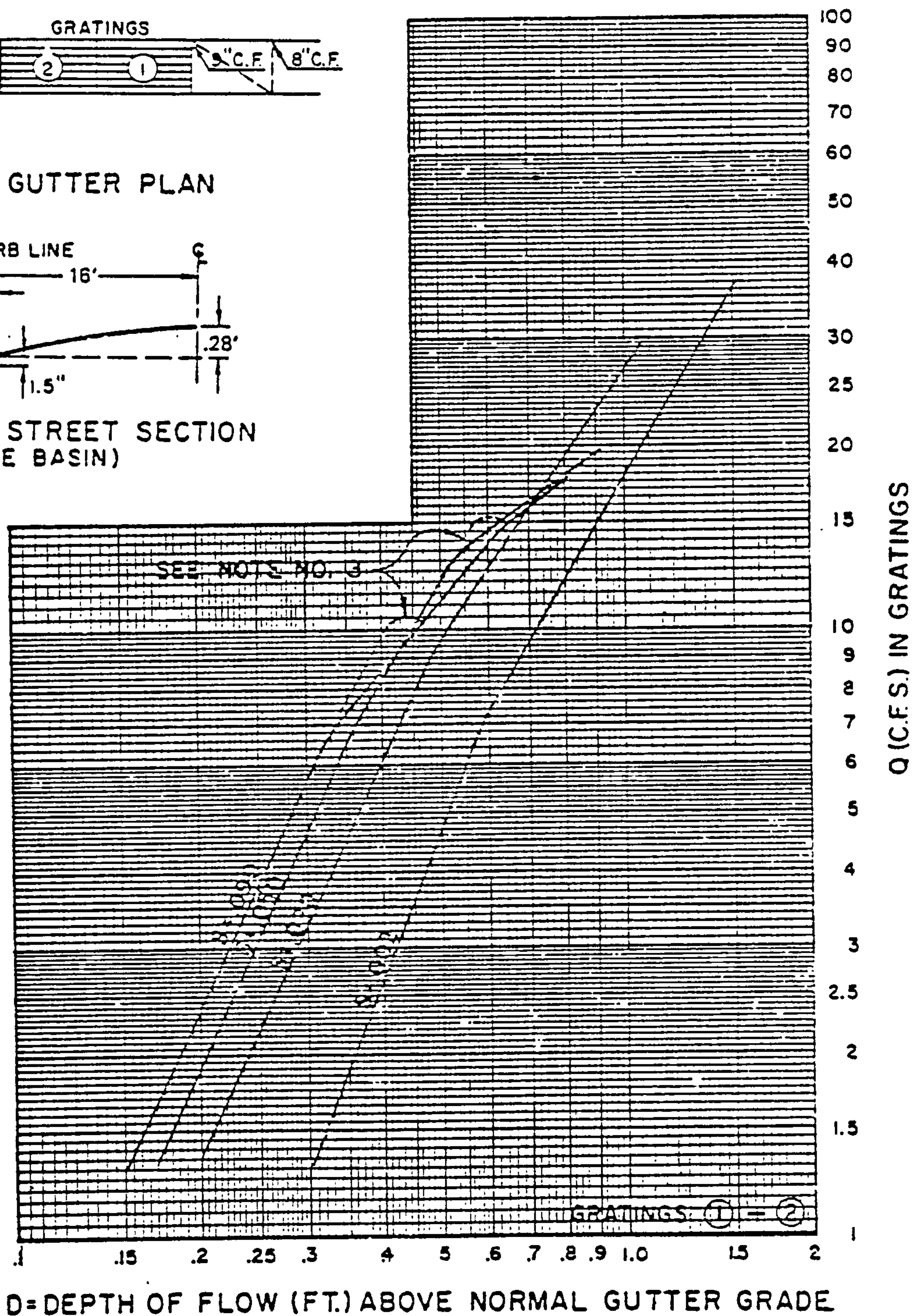
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

GRATING CAPACITIES FOR TYPE DOUBLE

"C," AND "D"



GRATING & GUTTER PLAN

TYPICAL HALF STREET SECTION
(ABOVE BASIN)

CAPACITIES OF INLETS IN SUMP.

1 TRIIPLE "C" INLET AT FIREWHEEL / SUNROSE (P. 111)

FROM ORIGINAL DESIGN, AND FROM FIELD INSPECTION, IT HAS BEEN DETERMINED THAT THIS INLET IS IN A 1.1' SUMP.

USING THE RATING CURVE ON P. 112, IT CAN BE SEEN THAT THE INLET HAS A 50 CFS CAPACITY.

2 DOUBLE "C" INLET AT NW CORNER GOLF COURSE / BUTTERFIELD

THIS INLET IS IN A SUMP, BUT HAS TWO OUTLET POINTS: THE INLET ITSELF, AND THE WATER OVERFLOWING THE ϕ OF THE STREET.

A RATING CURVE WAS MADE FOR THIS SYSTEM ON P. 113

3 SINGLE "C" INLET AT NE CORNER GOLF COURSE / BUTTERFIELD

THIS INLET ACTS AS A SUMP WITH TWO OUTLET POINTS: THE INLET ITSELF, AND THE WATER WHICH CONTINUES EAST ON BUTTERFIELD.

A RATING CURVE WAS MADE FOR THIS SYSTEM ON P. 114

4 HEADWALL AND CULVERT ENTRANCE AT BEGINNING OF STORM DRAIN (P. 115)

STORM RUNOFF POUNDS IN AN 8' DEEP BASIN AT THE ENTRANCE TO THE STORM DRAIN. IT FILLS UP THE BASIN, AND OVERFLOWS THROUGH A CHANNEL INTO FIREWHEEL. THE INLET ACTS AS AN ORIFICE, AND THE CHANNEL ACTS AS A WEIR. A RATING CURVE WAS MADE FOR THIS SYSTEM ON P. 116.



BOHANNAN-HUSTON INC.

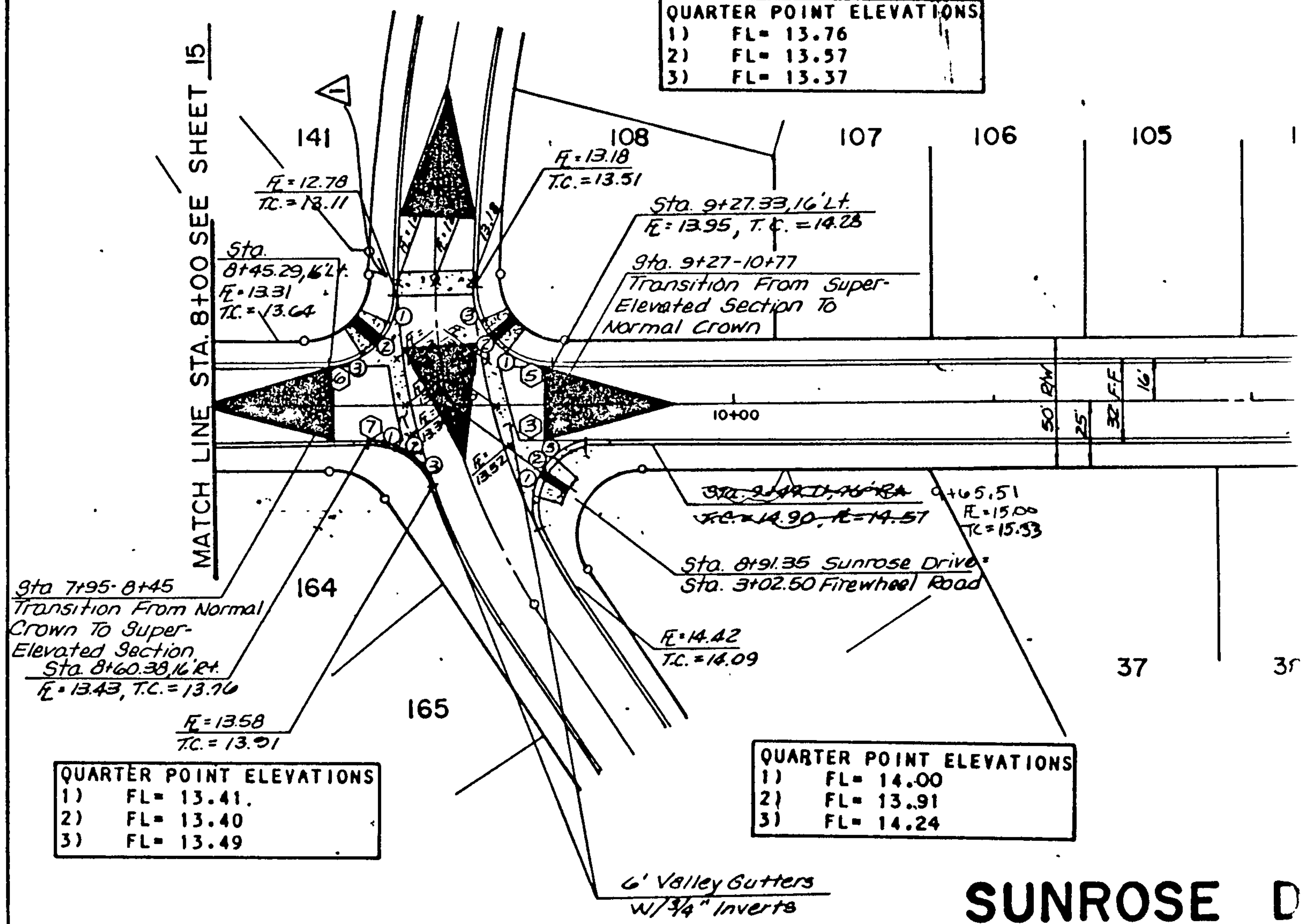
PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO _____ BY JPK DATE 5/13/92
SUBJECT _____ CH'D _____ DATE _____

FROM SHEET 16 OF 41, PROJ 3314 BY CS1, 8/28/87

QUARTER POINT ELEVATIONS	
1)	FL = 12.91
2)	FL = 13.04
3)	FL = 13.18

SEE SHEET 18
FIREWHEEL ROAD, N.W.

QUARTER POINT ELEVATIONS	
1)	FL = 13.76
2)	FL = 13.57
3)	FL = 13.37

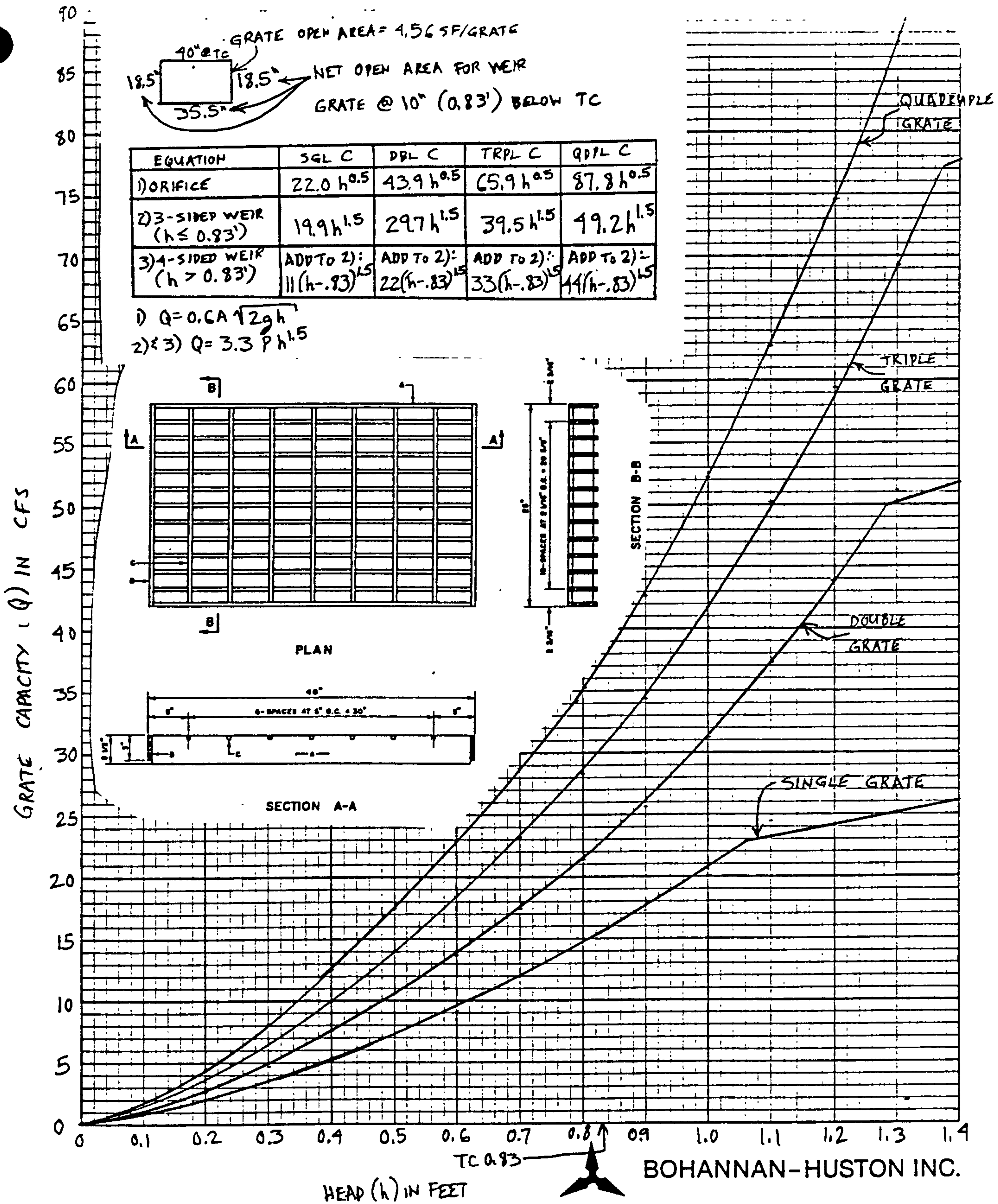


QUARTER POINT ELEVATIONS	
1)	FL = 13.41
2)	FL = 13.40
3)	FL = 13.49

QUARTER POINT ELEVATIONS	
1)	FL = 14.00
2)	FL = 13.91
3)	FL = 14.24

FL ELEV. LT.
(WHEN ≠ RT.)

SUNROSE D
RESIDENTIAL
MOUNTABLE



PROJECT NAME _____ SHEET _____ OF _____

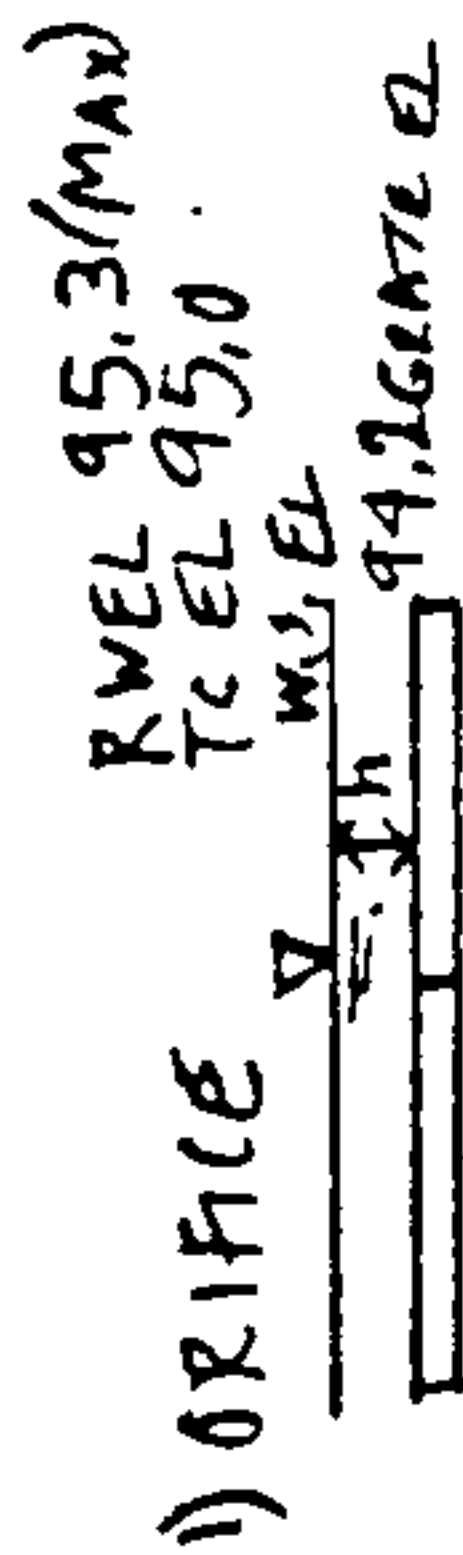
PROJECT NO. _____ BY JPK DATE 4/9/92

SUBJECT RATING CURVE FOR TYPE C INLETS CH'D _____ DATE _____

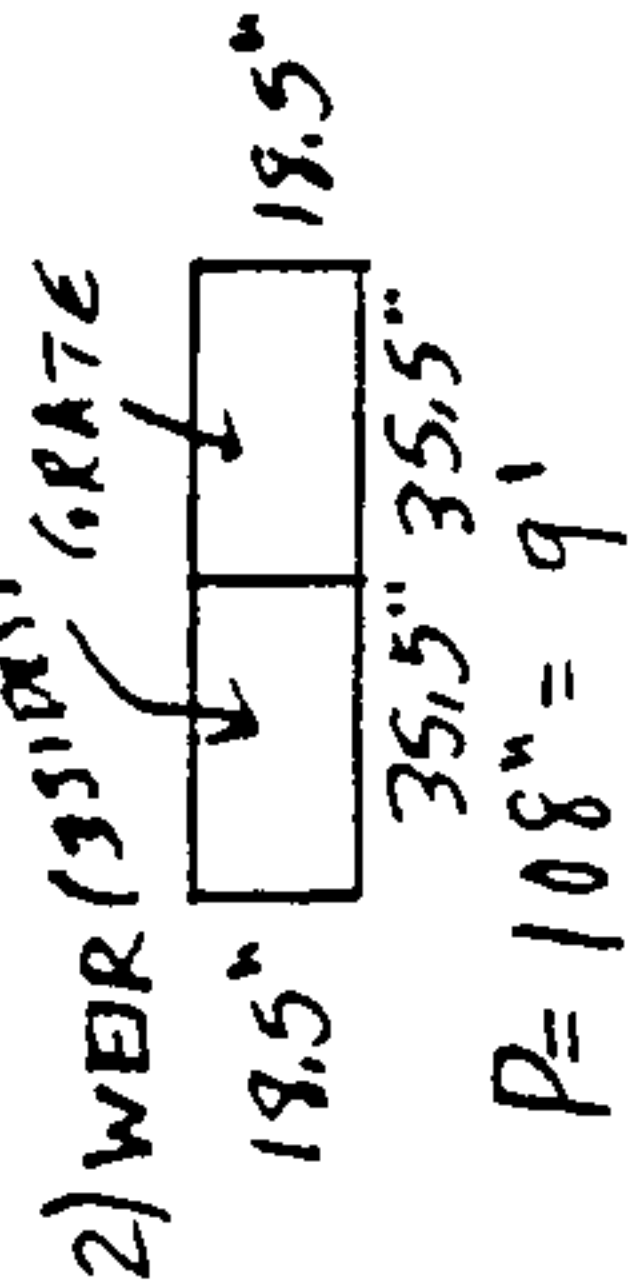
LV SUMP. NO CLOGGING FACTOR

2) DBL C INLET ON WEST SIDE OF GOLF COURSE AT BUTTERFIELD; OVERFLOW WEIR BETWEEN MEDIAN NOSES (75') ACROSS CENTERLINE OF GOLF COURSE.

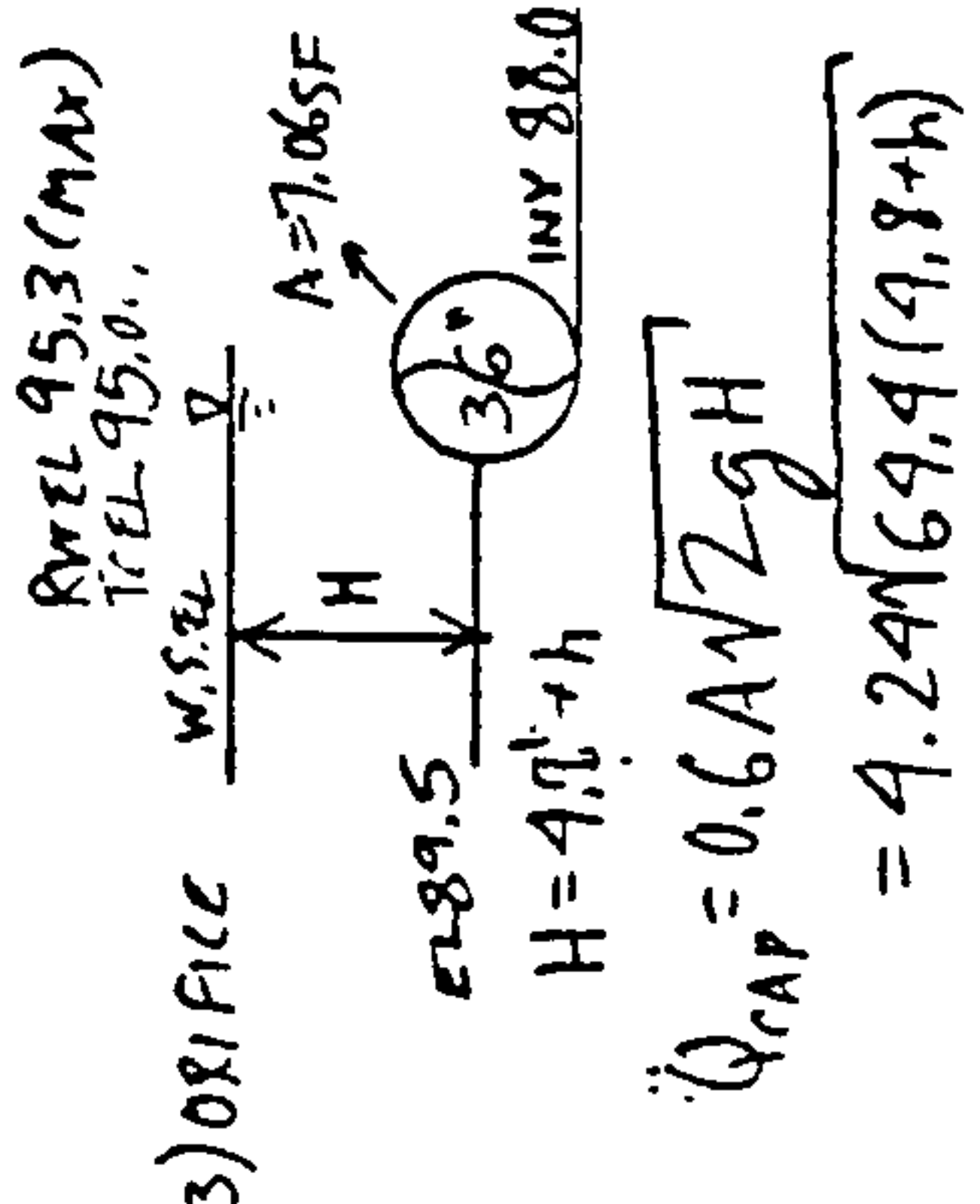
INLET CAPACITY



$A_{GRATES} = 4.56 \times 2 = 9.12 \text{ SF}$
 $Q_{CAP} = 0.6 A \sqrt{2gh}$
 $= 5.47 \sqrt{69.4h}$

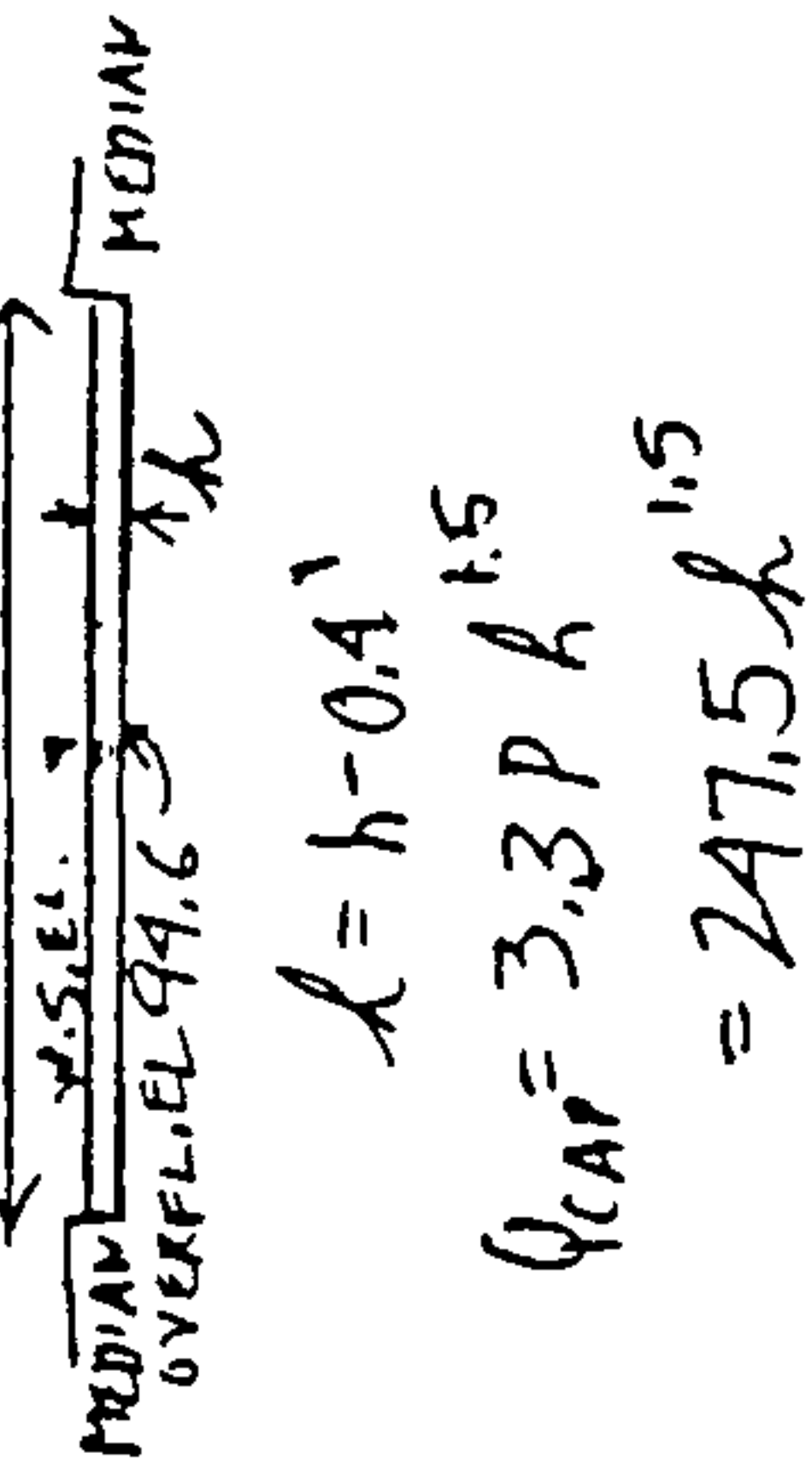


$Q_{CAP} = 3.3 P h^{1.5}$
 $= 29.7 h^{1.5}$



$Q_{CAP} = 0.6 A \sqrt{2gh}$
 $= 4.24 \sqrt{69.4(9.8+h)}$

WEIR OVERFLOW



$L = h - 0.4'$
 $Q_{CAP} = 3.3 P L^{1.5}$
 $= 247.5 L^{1.5}$

INLET CAP = Q_I (A CONTROLS)

W.S. EL	h	H	L	Q_I	Q_2	Q_3	Q_4	$Q_{TOT} = Q_I + Q_4$
94.3	0.1	4.8	0	13.88	0.94*	74.5	0	0.94
94.4	0.2	4.9	0	19.63	2.6*	75.3	0	2.6
94.5	0.3	5.0	0	24.0	4.9*	76.1	0	4.9
94.6	0.4	5.1	0	27.8	7.5*	76.8	0	7.5
94.7	0.5	5.2	0.1	31.0	10.5*	77.6	7.8	18.3
94.8	0.6	5.3	0.2	34.0	13.8*	78.3	22.1	35.9
94.9	0.7	5.4	0.3	36.7	17.4*	79.1	40.7	58.1
95.0	0.8	5.5	0.4	39.3	21.2*	79.8	62.6	83.8
95.1	0.9	5.6	0.5	41.6*	42.0*	80.5	87.5	129.1
95.2	1.0	5.7	0.6	43.9*	49.2*	81.2	115.0	158.9
95.3	1.1	5.8	0.7	46.0*	56.7*	81.9	145.0	191.0

COMBINED STREET / PIPE
 FLOW AT THIS OVERFLOW
 WEIR IS 105.0 CFS.
 So $Q_1 = 40 \text{ CFS}$,
 AND $Q_4 = 65.0 \text{ CFS}$

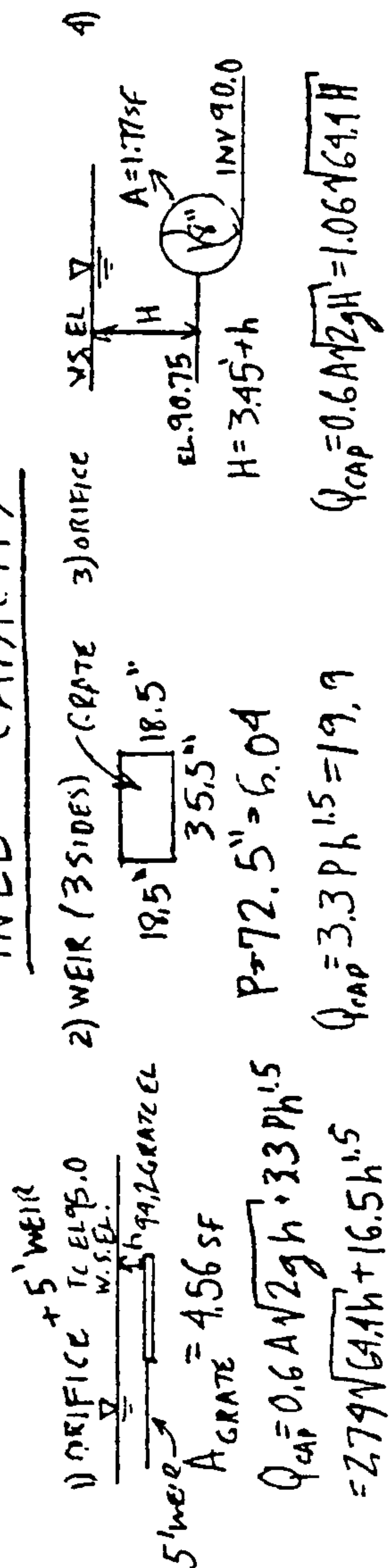
* 4-SIDED WEIR ($P = 14.9'$, $Q_{CAP} = 49.2 h^{1.5}$)



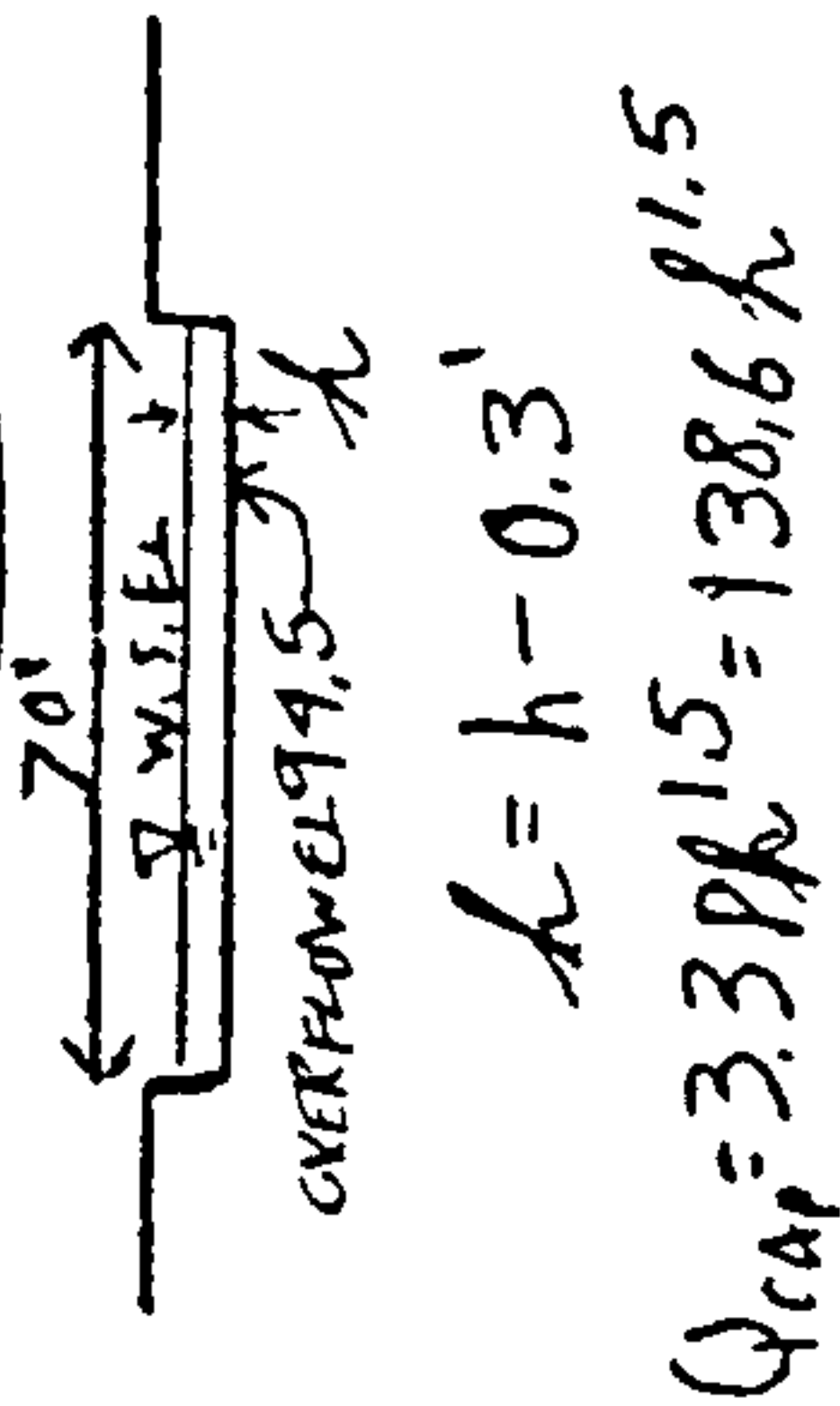
BOHANNAN-HUSTON INC.

A SGL C INLET ON EAST SIDE OF GOLF COURSE AT BUTTERFIELD; OVERFLOW WEIR OVER PARTIAL WATERFLOCK ON BUTTERFIELD (70').

INLET CAPACITY



WEIR OVERFLOW



INLET CAP (Q_I (*CONTROLS))

W.S. EL.	h	H	L	Q ₁	Q ₂	Q ₃	Q ₄	Q _{TOT} = Q _I + Q ₄
94.3	0.1	3.55	0	7.5	0.6*	16.0	0	0.6
94.4	0.2	3.65	0	11.3	1.8*	16.3	0	1.8
94.5	0.3	3.75	0	14.7	3.3*	16.5	0	3.3
94.6	0.4	3.85	0.1	18.1	5.0*	16.7	7.2	12.2
94.7	0.5	3.95	0.2	21.3	7.0*	16.9	20.7	28.4
94.8	0.6	4.05	0.3	24.7	9.3*	17.1	38.0	47.3
94.9	0.7	4.15	0.4	28.1	11.7*	17.3	58.5	70.2
95.0	0.8	4.25	0.5	31.5	14.2*	17.5	81.5	95.7
95.1	0.9	4.35	0.6	34.9	25.3*	17.7*	107.5	125.2
95.2	1.0	4.45	0.7	38.5	29.7*	17.9*	135.2	153.1
95.3	1.1	4.55	0.8	42.1	34.3*	18.1*	165.3	183.4

COMBINED STREET/PIPE
 FLOW AT THIS OVERFLOW
 WEIR IS 65,0 CFS.
 SO Q₂ = 11 CFS,
 AND Q₄ = 54 CFS.

* 4-SIDED WEIR BECAUSE WATER OVER TC (P = 9.0', Q_{cap} = 29.7 h^{1.5})



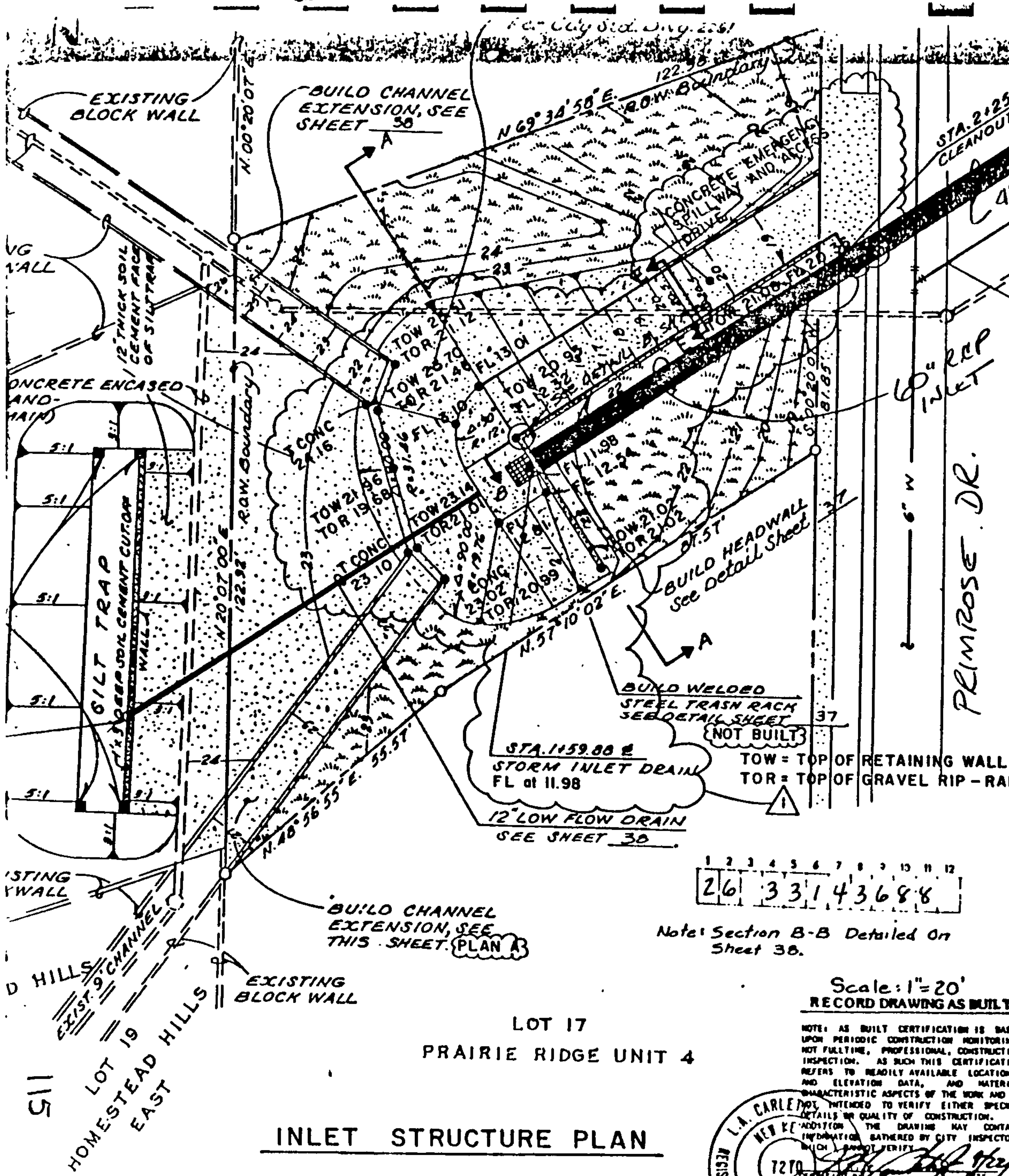
BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO _____ BY JPK _____ DATE _____

SUBJECT OUTFLOW RATING CURVE FOR INLET AT CH'D _____ DATE _____

NE CORNER GOLF COURSE 'BUTTERFIELD' 114

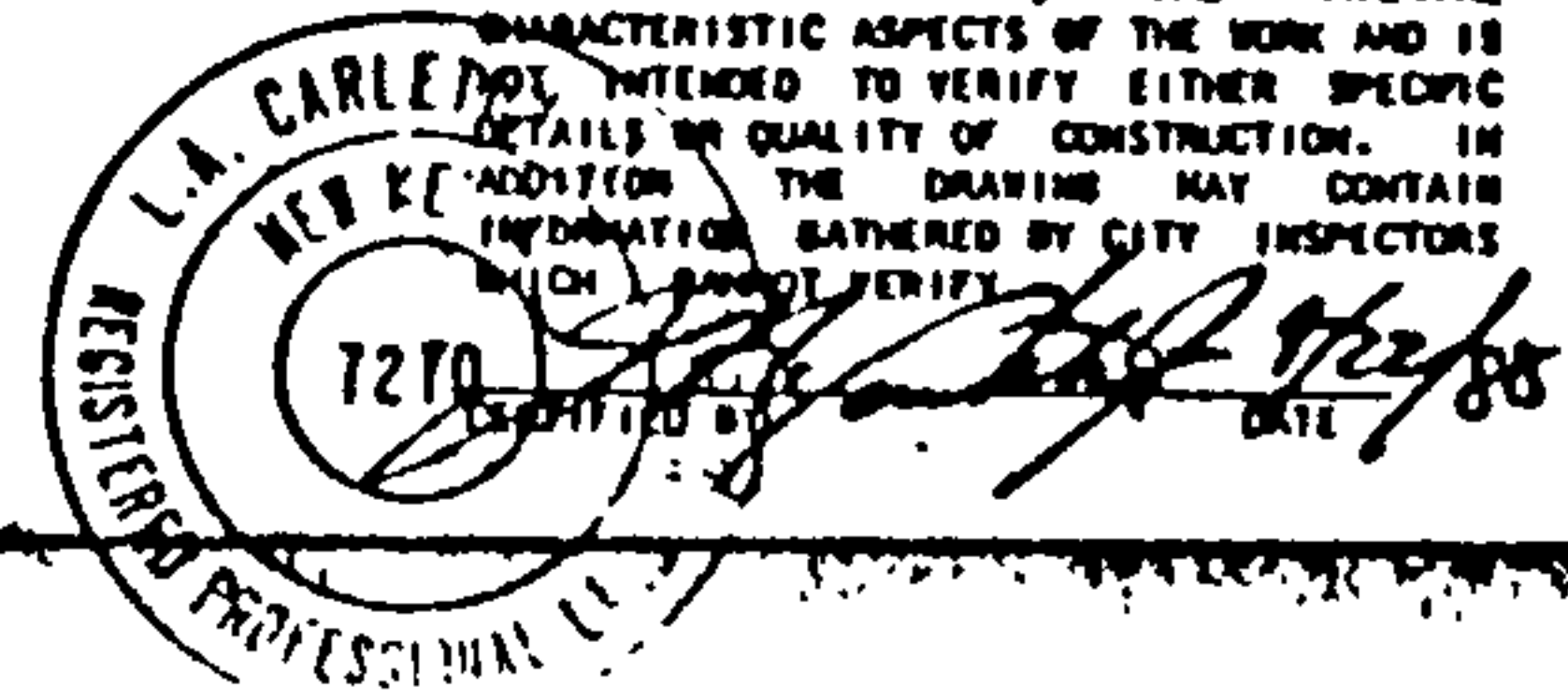


1 2 3 4 5 6 7 8 9 10 11 12
 26 33 14 36 8 8

Note: Section B-B Detailed On Sheet 38.

Scale: 1" = 20'
 RECORD DRAWING AS BUILT

NOTE: AS BUILT CERTIFICATION IS BASED UPON PERIODIC CONSTRUCTION MONITORING, NOT FULLTIME, PROFESSIONAL, CONSTRUCTION INSPECTION. AS SUCH THIS CERTIFICATION REFERS TO READILY AVAILABLE LOCATIONAL AND ELEVATION DATA, AND MATERIAL CHARACTERISTIC ASPECTS OF THE WORK AND IS NOT INTENDED TO VERIFY EITHER SPECIFIC DETAILS OR QUALITY OF CONSTRUCTION. IN ADDITION THE DRAWING MAY CONTAIN INFORMATION GATHERED BY CITY INSPECTORS WHICH CANNOT BE VERIFIED.



INLET STRUCTURE PLAN

LOT 17
 PRAIRIE RIDGE UNIT 4

LOT 109
 PRAIRIE RIDGE UNIT 4

LOT 108
 PRAIRIE RIDGE UNIT 4

ENGINEER'S SEAL



NO.	DATE	REMARKS	BY	DATE
6/91		RECORD SURVEY OF INLET STRUCTURE	BHI	
DESIGN				
		DESIGNED BY	R.D.	DATE 8-87
		DRAWN BY	L.V.R.	DATE 8-87
		CHECKED BY	M.J.Y.	DATE 8-87

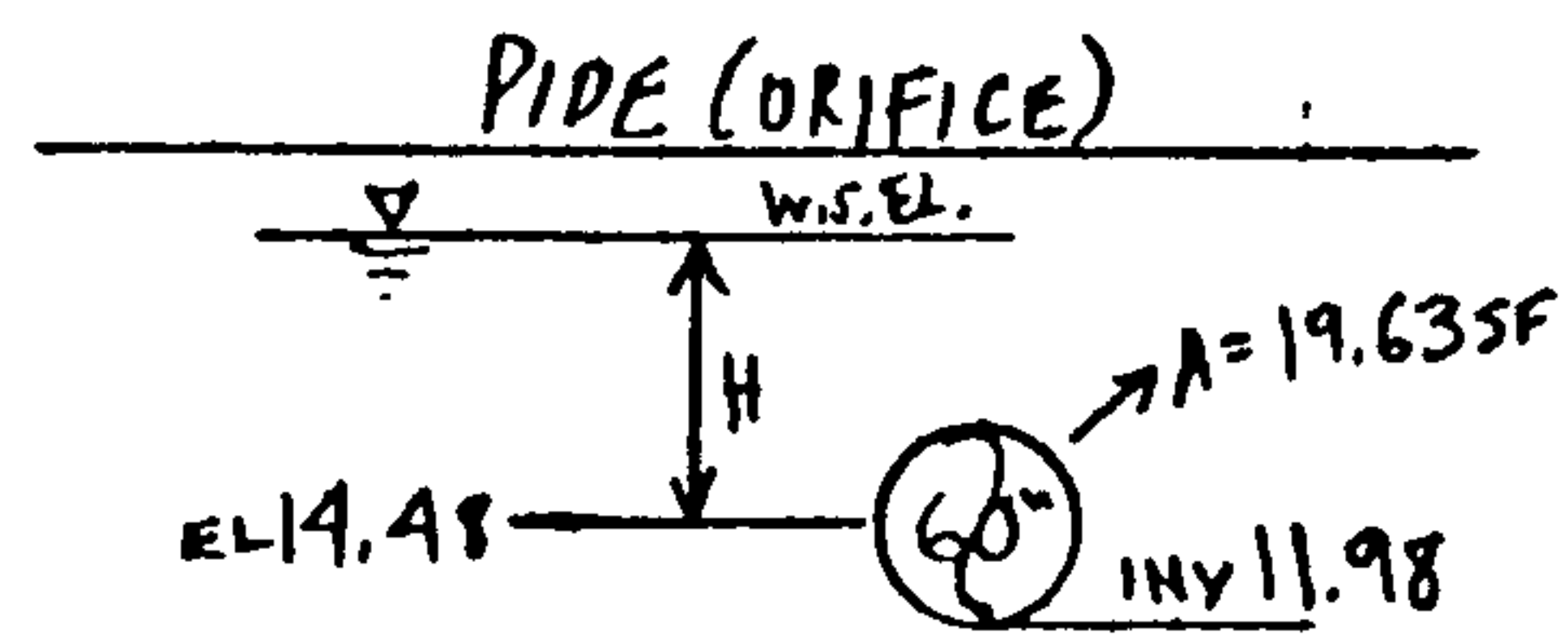
CITY OF ALBUQUERQUE
 PUBLIC WORKS DEPARTMENT
 ENGINEERING GROUP

TITLE: PRAIRIE RIDGE UNIT FOUR
 SOUTH BRANCH INLET STRUCTURE & DETAILS

APPROVALS	ENGINEER	DATE	APPROVALS	ENGINEER	DATE
D.R.C. Chair	[Signature]	9/14/87			
Trans. Dev.	[Signature]	9/4/87			
Utility Dev.	[Signature]	9/4/87			
[Signature]	[Signature]	9-11-87			

DRAWING NO. 3314 MAP NO. D-12 SHEET 36 OF 41

A HEADWALL AND OVERFLOW WEIR (11.7') AT BEGINNING OF SOUTH BRANCH STORM DRAIN; 100-YR FLOW SPlITS BETWEEN PIPE AND WEIR. COMPUTE RATING CURVE BELOW. ALSO COMPUTE POND STORAGE UPSTREAM OF HEADWALL.



$$Q_{CAP} = 0.6 A \sqrt{2gh}$$

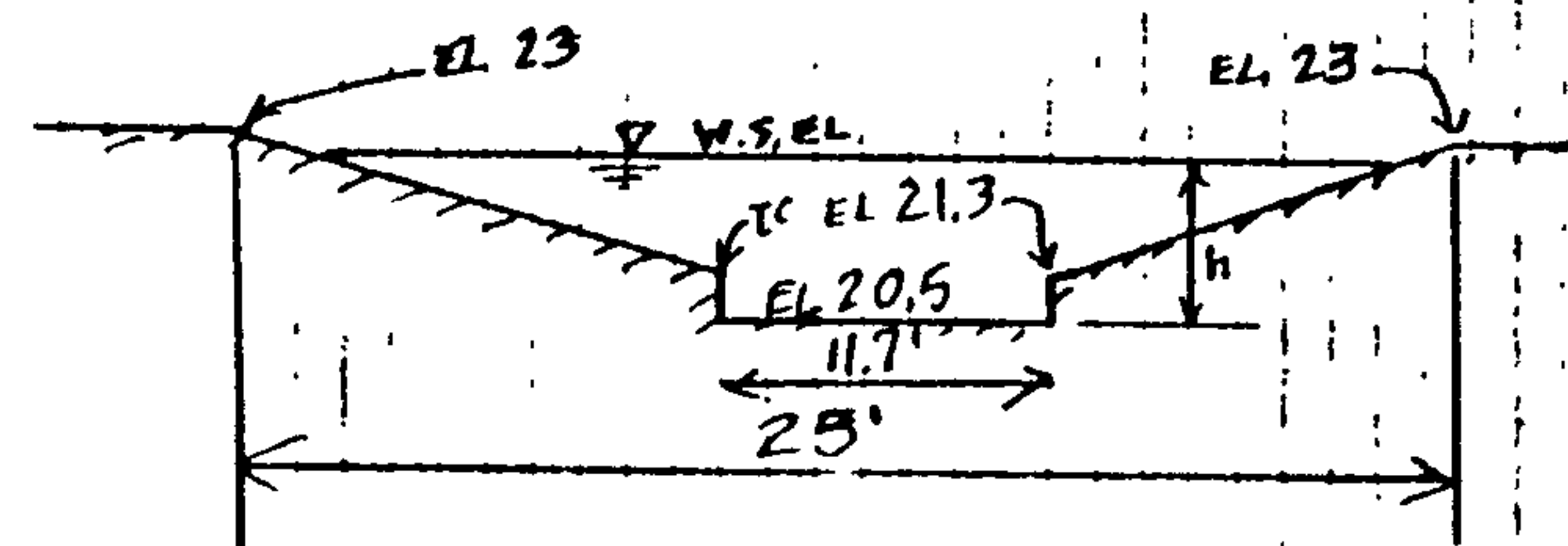
$$= 11.77 \sqrt{64.4 H}$$

$$h = H - 6.02'$$

$$Q = 3.3 L h^{1.5}$$

$$L = 11.7'$$

$$Q_{CAP} = 38.9 h^{1.5}$$



W.S. EL.	H	h	Q_p	Q_w	Q_{TOT}	AREA @ EL (SF)	STORAGE (CF)
11.98	0	0	0	0	0	266	0
16.98	5	0	149.4	0	149.4	1334	3985
20.5	6.02	0.0	231.7	0	231.7	2273	10,790
21.3	6.82	0.8	246.7	27.8	274.5	2486	12,796
22	7.52	1.5	259.2	75.1	334.3	2673	14,694
23	8.52	2.5	275.8	191.4	467.2	3200	19,065

COMBINED STREET / PIPE FLOW AT THIS OVERFLOW WEIR IS 376.8 CFS.

So $Q_p = 265 \text{ CFS}$ AND $Q_w = 111.8 \text{ CFS}$



BOHANNAN-HUSTON INC.

PROJECT NAME

SHEET

OF

PROJECT NO.

BY

DATE

SUBJECT OUTFLOW RATING CURVE FOR PIPE

CH'D

DATE

AT AN ENTRANCE WEST OF PIPE NO. 116

3/31/92



Federal Emergency Management Agency

Washington, D.C. 20472

JUN 17 1988

JUN 20 1988

The Honorable Ken Schultz
Mayor of the City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Case No. 88-06-28R

Dear Mayor Schultz:

This is in reference to a December 23, 1987 letter, to our Region VI office from Mr. Carlos A. Montoya, P.E., Floodplain Administrator for the City of Albuquerque, and forwarded to our Headquarters office in Washington, D.C. In his letter, Mr. Montoya requested that the Federal Emergency Management Agency (FEMA) issue a conditional Letter of Map Revision (LOMR) for two proposed channelization projects along the Piedras Marcadas Arroyo in the vicinity of Golf Course Road Northwest (Shenandoah Units II and III and Prairie Ridge Units 4 and 5). The following technical data prepared by Community Sciences Corporation were submitted in support of the request: technical reports entitled Drainage Management Plan for Shenandoah Units II and III, dated December 1985, and Drainage Management Plan for Prairie Ridge Units 4 and 5, dated July 1987; an onsite drainage basin plan for Shenandoah Units II and III, dated February 1986; a drainage plan for Prairie Ridge Units 4 and 5, dated May 28, 1987; and a vicinity map indicating the location of the proposed projects. On February 8, 1988, we received a check for \$675.00 to cover the cost of the review; this fee was sufficient to cover the review and processing costs associated with this request.

After reviewing the submitted data, we determined that the proposed channelization projects meet the minimum floodplain management criteria of the National Flood Insurance Program. If the projects were built as planned, a revision to the Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for the City of Albuquerque would be warranted. This revision would show a decrease in the 100-year floodplain for the Piedras Marcadas Arroyo through the proposed Shenandoah Units II and III and Prairie Ridge Units 4 and 5 developments east of Golf Course Road, as depicted in the hydrologic calculations presented in the aforementioned reports. Please note that future revisions to the FIS and FIRM for the City of Albuquerque or restudies of flood hazards in this area could modify this determination.

This determination is based on the 100-year flood discharges computed in the effective FIS for your community, and does not consider subsequent changes in watershed characteristics that would tend to increase flood discharges. The development of this project and other projects upstream could result in increased flood discharges, which, in turn, could result in increased 100-year flood elevations. Future restudies of your community's flood hazards would take into account the cumulative effects of development on flood discharges, and could therefore establish higher 100-year flood elevations in this area.

This conditional LOMR is based on minimum floodplain management criteria established under the National Flood Insurance Program. Your community is responsible for approving all proposed floodplain developments, including the projects upon which this request is based, and for assuring that necessary permits required by Federal or State law have been received. State and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If the State of New Mexico or the City of Albuquerque has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum Program requirements.

National Flood Insurance Program regulation Part 60.3(b)(7) requires communities participating in the Program to "assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained." Without proper maintenance, such as the regular clearing of a channelized stream, channel modification projects will, in time, fail to function as designed, thereby recreating the flood hazard that they were intended to mitigate. Therefore, upon completion of the projects, your community must uphold its responsibility for assuring that the modified channels are maintained in order to preserve their design function.

Upon completion of the proposed projects, your community may request a revision to the effective FIS and FIRM. The revision request should be submitted to our Region VI office and must include the data listed below:

1. "As-built" plans of the completed channel modification projects, certified by a registered engineer.
2. Hydrologic calculations reflecting "as-built" conditions for the 100-year frequency flood.
3. Topographic mapping representing "as-built" conditions and delineating the revised 100-year floodplain boundary.

Please note that items 2 & 3 have already been submitted representing proposed conditions; if any changes take place during construction, these items must be submitted to reflect "as-built" conditions.

We have enclosed a document, entitled Conditions and Criteria for Map Revisions, which further describes the nature and extent of the material needed to support a request to revise an effective FIS and FIRM. Compliance with the criteria outlined in this document will expedite FEMA's review process, thus allowing the effective FIS and FIRM for your community to be revised as appropriate, in a timely manner.

3

Should you have any questions regarding this matter, please do not hesitate to contact the Chief, Natural and Technological Hazards Division of the Federal Emergency Management Agency in Denton, Texas, at (817) 898-9127 or members of our Headquarters staff in Washington, D.C., at (202) 646-2754.

Sincerely,

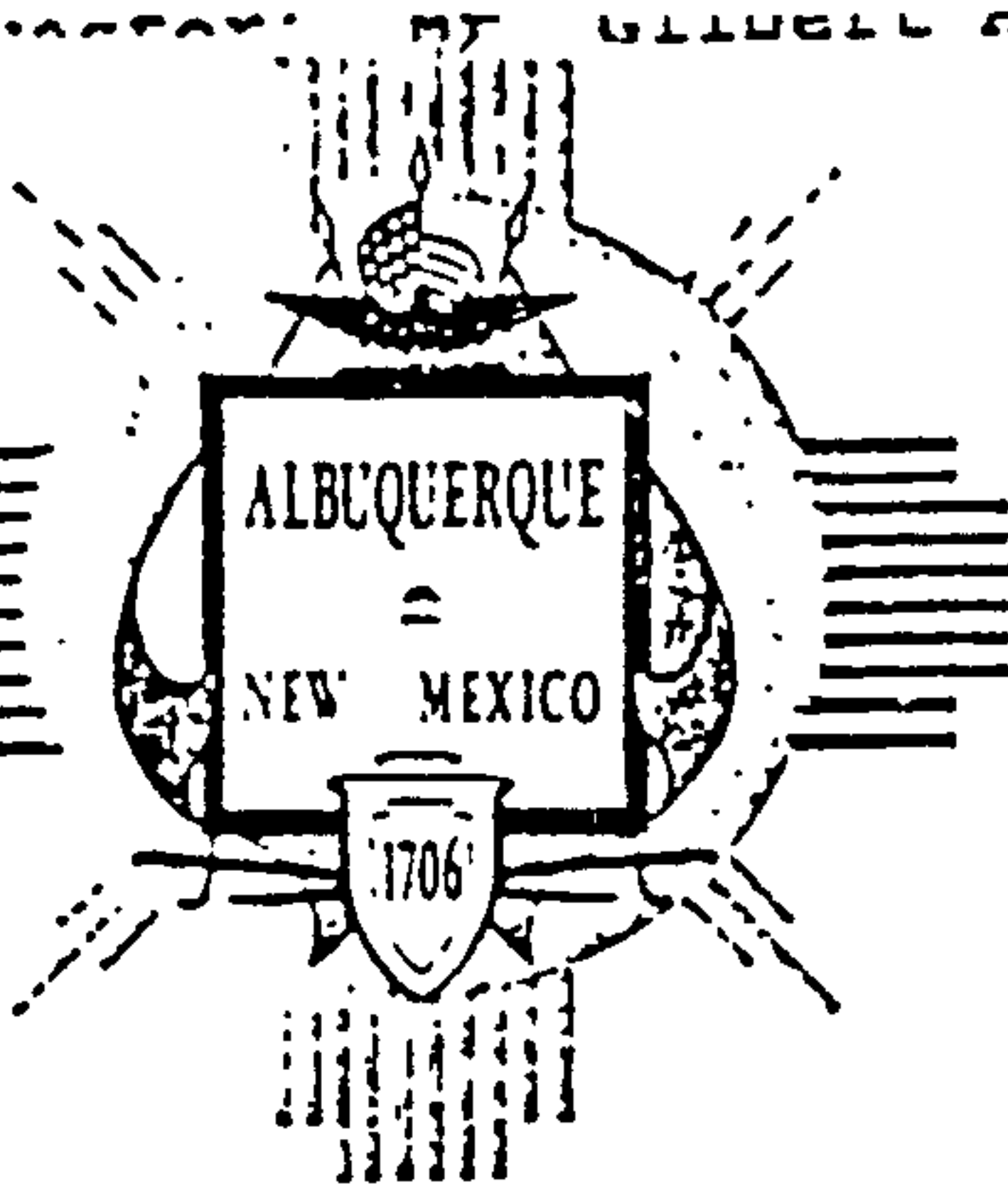


John L. Matticks
Chief, Risk Studies Division
Federal Insurance Administration

Enclosure

cc: Mr. Carlos A. Montoya, P.E.

Mr. Kent M. Whitman, P.E., Community Sciences Corporation



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

C. Cleve Mathews
file 9/128.02

July 31, 1991

Diane Leatherwood
Emergency Management Specialist
Region VI, Federal Center
800 North Loop 288
Denton, Texas 76201-3698

RE: REQUEST FOR LETTER OF MAP REVISION FOR THE SOUTH BRANCH OF THE
PIEDRAS MARCADAS ARROYO

Dear Ms. Leatherwood:

This submittal is in response to the letter from the Federal Emergency Management Agency (FEMA) to the City of Albuquerque dated June 17, 1988 regarding a Conditional Letter of Map Revision (LOMR) along the Piedras Marcadas Arroyo. A copy of that letter is attached for reference, which states that the Conditional LOMR is approved by FEMA and that the Final LOMR will be issued pending receipt of the "as-built" plans for the channel modification projects. The other two items that were required by FEMA, which includes the hydrologic calculations and the topographic mapping representing as-built conditions are indicated to have already been received and approved.

As required, enclosed are the revised "as-built" plans of the completed channel modifications, consisting of two storm sewer projects through this reach of the arroyo. The reason that this information had not been submitted previously was that a change in the land ownership had occurred. Could you please proceed to issue the Letter of Map Revision.

If you should have any questions concerning this submittal, please do not hesitate to call me at (505) 768-2650.

Cordially,

Gilbert Aldaz, P.E. & L.S.
City/County Floodplain Administrator

cc: Kerry L. Davis, P.E. ✓

GA

(WP-1596)

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

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Federal Emergency Management Agency

Washington, D.C. 20472

SEP 24 1991

The Honorable Louis Saavedra
Mayor of the City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

IN REPLY REFER TO:

(65-DR1-100)

Case No.: 6-91-178

Community: City of Albuquerque,
Bernalillo County,
New Mexico

Community No.: 350002

Dear Mayor Saavedra:

This is in reference to a July 31, 1991 request for a revision to the National Flood Insurance Program maps for your community. A copy of the incoming request is enclosed; information pertinent to the revision request is listed below.

Requestor: Mr. Gilbert Aldaz, P.E., L.S., City of Albuquerque Flood-
plain Administrator

Flooding source(s): South Branch of the Piedras Marcadas Arroyo

Project name or area of revision: Shenandoah Units II and III and
Prairie Ridge Units 4 and 5

Map Panel(s) affected: Flood Insurance Rate Map (FIRM) number 350002,
panels 0007 C and 0008 C, dated October 14, 1983

* Please note that due to the changes in criteria by which the Federal Emergency Management Agency reviews revision requests in the City of Albuquerque, we require revised hydrologic and hydraulic computations for the entire South Branch of the Piedras Marcadas Arroyo. These computations should conform to the guidelines set forth in our letters of October 29, 1990, February 7, 1991, and June 5, 1991 (copies enclosed), and to the January 1991 version of the City of Albuquerque's Development Process Manual. In addition, because of the direct relation between the channelization of the South Branch of the Piedras Marcadas Arroyo and the Piedras Marcadas Dam, we require all data necessary to perform a revision reflecting the construction of the Piedras Marcadas Dam. This data should also conform to the guidelines stated above. The additional data required are specified on the enclosed checklist. To provide assistance in preparing the required data, we have enclosed a copy of Part 65 of the National Flood Insurance Program and Related Regulations and a document entitled Guide for the Submittal of Requests to Revise National Flood Insurance Program Maps. The procedures and guidelines outlined in these documents should be followed.

2

Before we revise your community's FIRM to reflect the effects of the above-referenced projects on South Branch of the Piedras Marcadas Arroyo, we must receive the information specified on the enclosed checklist. The required information should be provided by the requestor to the following address:

Federal Emergency Management Agency
Federal Insurance Administration
Office of Risk Assessment
500 C Street, S.W., Room 422
Washington, DC 20472

Attention: Mr. William R. Locke
Chief, Risk Studies Division

The case number referenced above should be included on any further correspondence regarding this request. Further action on this request has been suspended pending receipt of the specified additional data. After receiving the required data as indicated on the enclosed checklist, we will continue our evaluation of the request. If additional information is required to complete our evaluation, we will inform you.

Should you have any questions or if additional time is required to provide the requested information, please contact Matthew B. Miller of my staff at (202) 646-3461.

Sincerely,



William R. Locke
Chief, Risk Studies Division
Federal Insurance Administration

Enclosures

cc: Mr. Gilbert Aldaz, P.E., L.S.
Mr. Kerry L. Davis, P.E., Bohannon-Huston, Inc. ✓

R. WARD HUNNICUTT, CHAIRMAN
PAT D. HIGDON, VICE-CHAIRMAN
DANIEL W. COOK, SECRETARY-TREASURER
GENEIVA MEEKER, DIRECTOR
RONALD D. BROWN, DIRECTOR

LARRY A. BLAIR
EXECUTIVE ENGINEER



**Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority**

2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

August 20, 1992

Mr. William R. Locke
Chief, Risk Studies Division
Federal Emergency Management Agency
Federal Insurance Administration
Office of Risk Assessment
500 C. Street, SW, Room 422
Washington, DC 20472

RE: Piedras Marcadas Watershed

Dear Mr. Locke:

AMAFCA has currently contracted for the preparation of a revised Drainage Management Plan for the referenced watershed. As you are aware, a CLOMR (65-DR-100, Case 6-91-178) for the South Branch of the Piedras Marcadas is currently being prepared for submittal to FEMA by Bohannon-Huston, Inc. The CLOMR is based on using the Piedras Marcadas Dam as an outfall.

The LOMR for the existing Piedras Marcadas Dam and areas downstream is being prepared for AMAFCA by Molzen-Corbin and Associates and will be ready for submittal to FEMA concurrent with the completion of the Revised Drainage Management Plan. We request that the CLOMR (65-DR-100) for the South Branch be allowed to proceed in advance of the LOMR for the Piedras Marcadas Dam.

Sincerely,
AMAFCA

Clifford E. Anderson, P.E. & L.S.
Drainage Engineer

CEA:ij

copy: Bohannon-Huston, Inc.
Molzen-Corbin & Associates

APPENDIX C

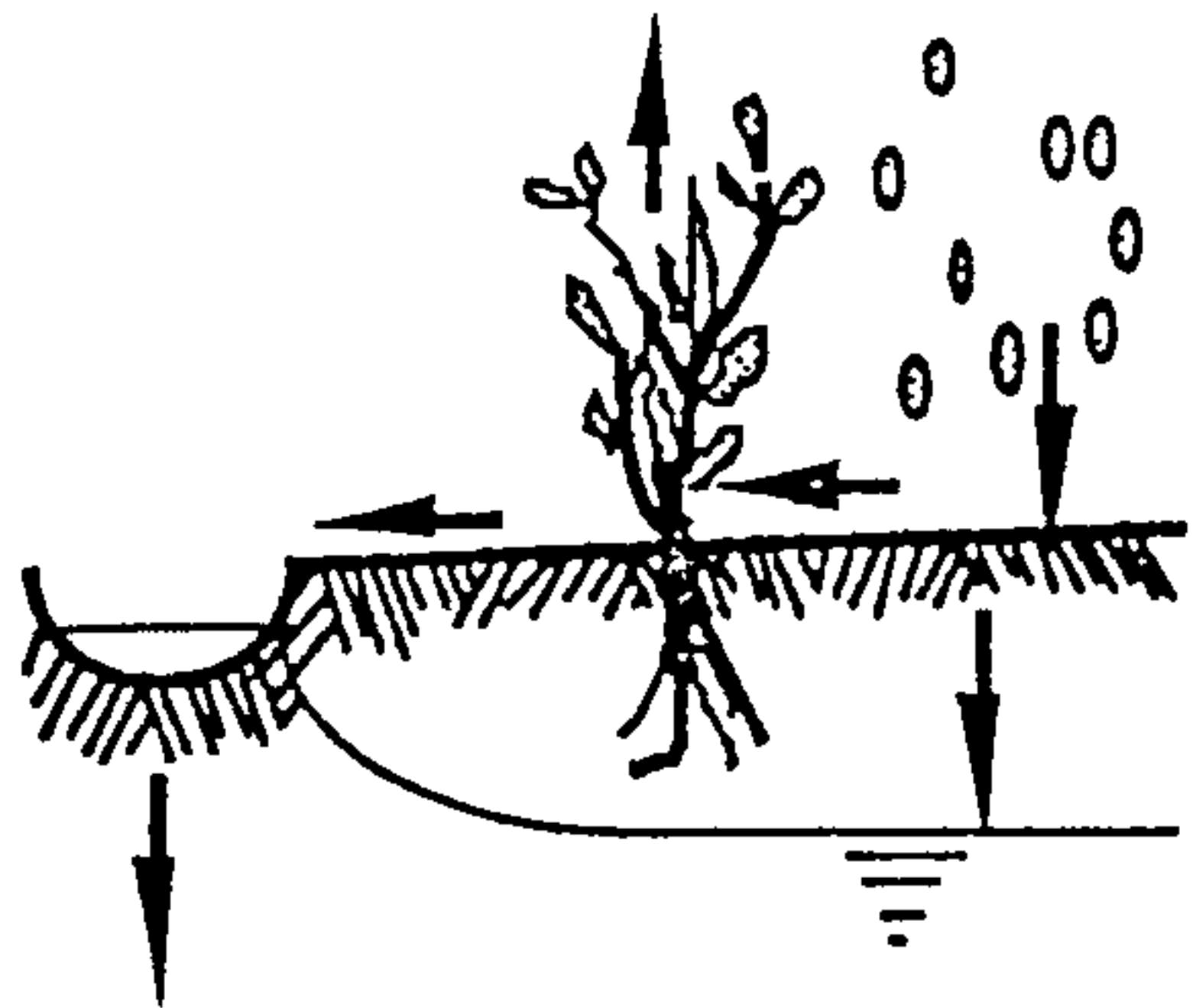
**Sediment Bulking
South Branch of Piedras Marcadas**

1. From Dr. Heggen's Report - Existing Conditions

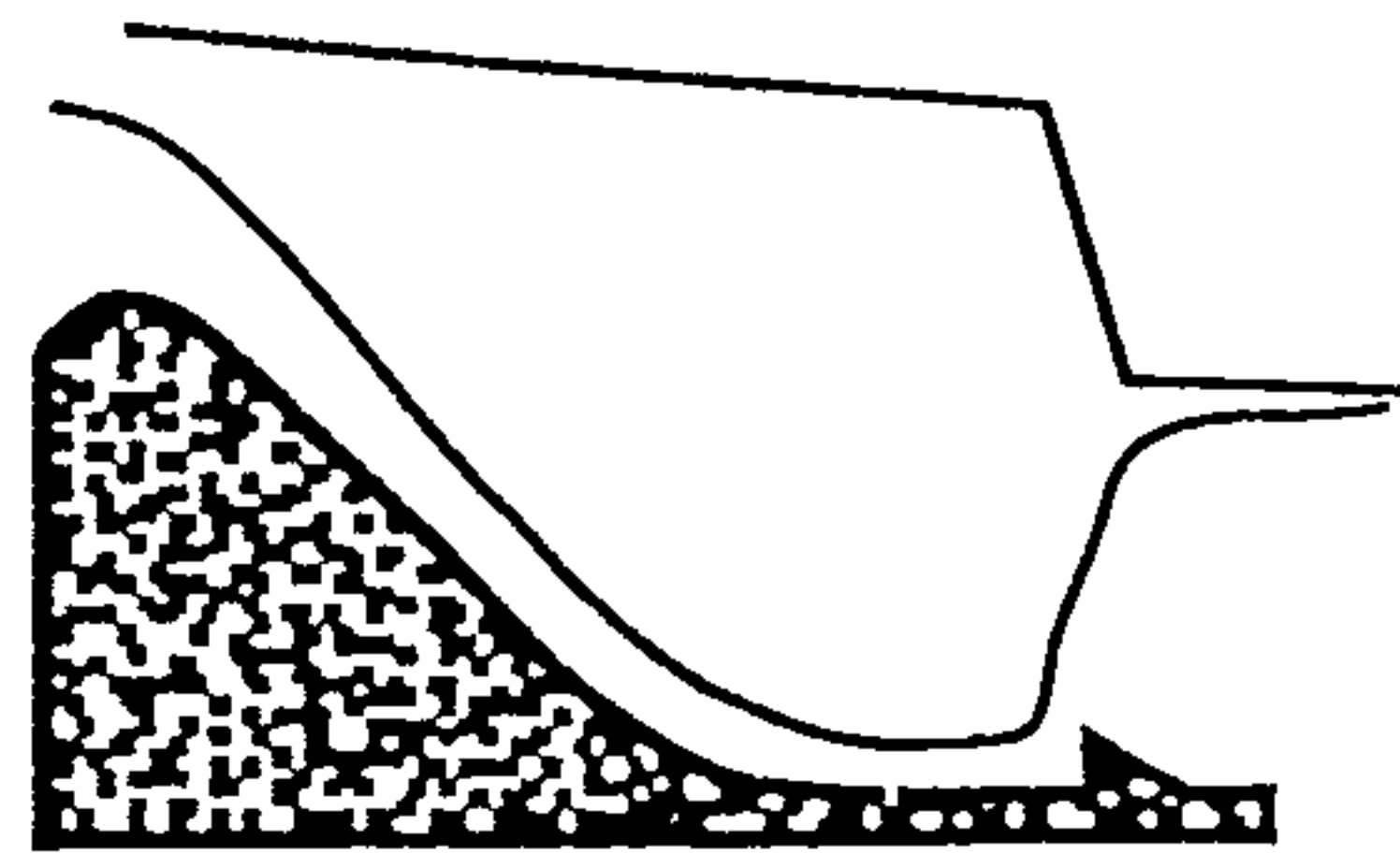
- a. Highest reach value = 10.3%
- b. For this study use 12%

2. From Dr. Heggen's Report - Future Conditions

Dr. Heggen makes no stand on developed runoff. However, in consulting with Dr. Heggen, we arrive at 2% which has been commonly used in Albuquerque.



Richard J. Heggen
PE, PH, PhD
Water Resources
Engineering
620 Ridgecrest SE
Albuquerque, NM 87108
(505) 277-5737



Monday, November 18, 1991

Draft

Sediment Issues in the Piedras Marcadas Watershed Survey

A Report Prepared for Molzen-Corbin & Assoc.

Sediment Issues in the Piedras Marcadas Watershed Survey

A Report Prepared for Molzen-Corbin & Assoc.

Introduction

This report is divided into four sections: Sediment Yield, Sediment Transport, Geomorphology, and the Petroglyph National Monument. The first section discusses erosion within the watershed. The second section discusses sediment flux within and from the watershed. The third section deals with channel shape, slope, planform and overall sediment behavior. The fourth section deals with the relationship between the Monument and urban development.

Sediment Yield

Soils

The 5.86 mi² basin includes 8 different soil types shown in Table 1

Table 1. Soil Types

Percent of Area	Soil	Description	HSG	Runoff	Erosion Potential
49.5	AmB, Alameda	Sandy loam	C	Medium	Blowing, moderate or severe Water, slight
22.0	MWA, Madurez	Fine sandy loam and sandy clay loam	B	Slow	Blowing, moderate to severe
8.4	BKD, Bluepoint	Loamy fine sand	A	Slow	Water, moderate to severe
17.6	BCC, Bluepoint	Loamy fine sand	A	Slow	Blowing, severe
2.4	KR, Kokan-Rock	Gravelly sand and basalt outcrops	A	Soil, slow Outcrops, rapid	Water, slight

The basin is roughly one-half hydrologic soil group C and approximately one-quarter each A and B. By SCS classification, half of the of the basin has slow runoff and half has medium runoff. Less than one-tenth of the basin has moderate hazard of water erosion. More than nine-tenths, however, has moderate or severe hazard of wind erosion. Aeolian erosion is evidenced by abundant blow sand.

Unlike fluvial transport, however, which moves sediment unidirectionally, wind-borne particles follow less regular paths and have no particular propensity to follow the direction of drainage. The basin is typified by slopes in the 2 to 3 percent range.

In its historical condition, as determined by Molzen-Corbin & Assoc. (MCA), the basin was 94.5 percent land treatment A as defined in Section 22.2 of Albuquerque's draft Development Process Manual, 3.2 percent treatment B and 2.3 percent treatment C. Under existing conditions, the basin is 71.9 percent treatment A, 7.8 percent treatment B, 9.4 percent treatment C and 10.9 percent treatment D. Future projection by MCA shows the basin to be 16.0, 14.7, 17.4 and 51.9 percent land treatments A, B, C and D respectively.

A Rule of Thumb

This study benefits from five previous investigation. *Sediment Issues in the San Antonio Arroyo* by MCA and *Sediment Issues in the Amole Basin* by Scanlon & Assoc. are currently under AMAFCA review. Those studies in turn draw upon *Black Arroyo Sediment Issues* by Bohannon-Huston, Inc., *Unser Bridge/Calabacillas Arroyo Detention Basin* by Resource Consultants, Inc., and *Erosion Study to Determine Boundaries for Adjacent Development - Calabacillas Arroyo, Bernalillo County, New Mexico* by Simons, Li & Assoc. The Piedras Marcadas, Amole, San Antonio, Calabacillas and Black Arroyos are within a few miles of one another on Albuquerque's west side. All are of similar terrain and face similar issues of management.

In *Sediment Issues in the San Antonio Arroyo*, the rule-of-thumb basin mean sediment yield, Vol_s , was reviewed. For the Albuquerque area, this mean is somewhat accepted, albeit with little site-specific verification. This mean takes no account of basin-specific characteristics. The estimate is generally applied to undeveloped land in minimally-disturbed or undisturbed condition, although in practice the estimate has been applied to developed watersheds as well. By this rule, Vol_s is 1.0 acre-ft/mi²/year.

Total basin sediment yield, Vol_s , is 5.86 acre-ft/year for the watershed by this rule of thumb.

Piedras Marcadas Dam

The basin drains into the Piedras Marcadas Dam. This structure is not designed for long-term sediment accumulation, but rather to be cleaned of sediment deposition as required. AMAFCA records indicate that 0.37 acre-ft of sediment accumulation were removed after a major runoff event in 1985. Subsequent deposition has not merited remedial action, though the area has experienced at least one rainfall event with a recurrence interval exceeding 10 years. As the reservoir has not been resurveyed, the exact deposition rate cannot be verified. It appears unlikely that Vol_s is more than 0.1 acre-ft/year, as measured by accumulation at the dam.

By this record, vol_s is at most 0.02 acre-ft/mi²/year. The sensitivity to a single storm makes this estimate of questionable precision, but the same criticism may be directed toward the rule-of-thumb. This is not to say that a major storm could not carry many acre-feet of sediment load into the reservoir, but rather to say that the process does not appear to be chronic.

Universal Soil Loss Equation

Distributed soil loss behavior in the basin was modeled with the Universal Soil Loss Equation (USLE) analysis (*Predicting Rainfall Erosion Losses*, superseding Agricultural Handbook No. 282, USDA, 1978). This model predicts soil loss on an annual basis, i.e. that which is lost in an average year. The definition is slightly different than that employed in the previous section, where vol_s was taken to be the average of many years, some of which may have included storms with high recurrence interval. The USLE does not account for sediment loss from streambank, bed and uncontrolled roadsides.

Whereas the USLE is highly precise in several of its parameters, it is loose ^{sin} the estimation of others. The USLE has a high degree of subjectivity for nonidealized, nonhomogeneous large watersheds. Any result should be considered to have at least a 50 percent margin of error. In some cases, reality departs from theory even more.

The USLE is appropriate for spatial, land treatment and recurrence interval comparisons. The USLE is appropriate for sensitivity analysis of the factors which influence soil loss. The USLE can thus be used to estimate relative modifications to a independently-determined basin mean annual rule.

Each of the 33 subbasins defined by MCA was modeled with the USLE. The analysis is comprehensive, but not as distributed as it might be. The USLE is calibrated on plots, not watersheds. Subdividing subbasin into plot-size increments is prohibitive. A USLE analysis for the ~~existing~~ basin is included in the Appendix. By the USLE, the historical basin has a vol_s of 0.15 acre-ft/mi²/year and the existing basin, 0.13 acre-ft/mi²/year. Under future conditions, where land treatments B and D to not contribute to basin loss, vol_s is 0.05 acre-ft/mi²/year for the overall basin. ^{historical}

Sediment Delivery Ratio

The USLE predicts sediment mobilization, not the subsequent split between intrabasin redeposition and net basin loss. The sediment delivery ratio is the proportion of eroded soil that is carried from the basin by streamflow. Basin size and homogeneity are significant to the sediment delivery ratio.

Chapter 6, Section 3 of the SCS NEH, the standard reference on sediment delivery ratios, suggests a ratio of 0.23 be applied to the USLE vol_s for an 5.86 mi² basin. This sediment delivery ratio is reasonable by the Corps EM 1110-2-4000. This correction applied to the existing watershed indicates a net vol_s of 0.034 and 0.030 acre-ft/mi²/year for the historical and existing basins respectively

For a fully developed basin where flow is in constructed channels, the sediment delivery ratio is 1.0. Storm drains and improved channels should have velocities sufficient to transport all sediment inflow to the basin outlet. Were sediment traps maintained in the drainage system, the ratio would be less. Such traps are not anticipated.

Sediment Yield Assignment

Table 2 summarizes the sediment yield estimates.

Table 2. Sediment Yield Estimates

Estimate	vol _s (acre-ft/mi ² /year)		
	Historical	Existing	Future
Rule of thumb	1.00		
Piedras Marcadas Dam		0.10	
USLE	0.15	0.13	0.05
USLE corrected for sediment delivery ratio	0.034	0.030	0.05
Planning recommendation	0.30	0.20	0.10

The difference between the USLE existing vol_s estimate, supported by the sediment removal record, and the rule-of-thumb is significant. To ignore both the record and the USLE and carry out watershed planning using a rule-of-thumb estimate may incur unwarranted infrastructure costs.

In planning for channel and reservoir maintenance, it is recommended that a vol_s of 0.3 acre-ft/mi²/year be employed for the historical basin and 0.2 acre-ft/mi²/year for the existing basin. This value exceeds that evidenced by basin maintenance records by a factor of 2. This value falls, however, within the reported range of yields throughout the region. Error is on the conservative side.

It is recommended that a vol_s of 0.1 acre-ft/mi²/year be employed for planning purposes for the future basin. This value also stretches the USLE on the conservative side. Not included in this estimate is sediment loss associated with construction. It is assumed that the development process will incorporate stringent construction requirements for soil conservation. Such measures may include silt fencing, debris basins, seasonal restrictions, temporary grading and buffer zones. The recommended values are indicated in Table 2.

Spatial Variability

The drainage system consists of North, Middle and South Branches. Each branch has its own tributaries. Fig. 1 indicates the stream network spatially. Fig. 2 indicates the network schematically. Table 3 indicates the respective drainage areas. The difference between historic and existing conditions is due to the

construction of the Rock Channel which diverts subbasins 312 and 320 from the headwaters of the North Branch to the Middle Branch. Future drainage areas are not given, as these areas may be modified by diversions yet to be specified.

Table 3. Drainage Areas

Branch	Area (mi ²)	
	Historical Conditions	Existing Conditions
North	1.319	0.918
Middle	3.785	4.186
South	0.758	0.758
Total	5.862	5.862

For both historic and existing conditions, the subbasins with the vol_s greater than 0.2 acre-ft/mi²/year, uncorrected for sediment delivery ratio, are 302, 308, 309, 310 and 404, in general the zones between the proposed Unser West Alignment and the escarpment. These zones tend to have slopes in the 5 percent range and erodible soil. Subbasins were not defined to narrowly band the escarpment itself. Were this done, exceedingly high yields would be obtained for the escarpment itself. Quantitative establishment of yield directly from the escarpment is beyond the scope of the USLE.

Other than the tendency for vol_s to be somewhat higher immediately above the escarpment, and the observable erosion on the escarpment face, there is no indication of any particular group of subbasins having erosional problems substantially unlike the rest of the basin.

Recurrence Interval

Annual yield is presumed to be lost in the annual event. In reality, smaller storms will initiate the mobilization process, but it is a larger storm that carries the bulk of this sediment downstream. To model sediment yield at less than the annual event would require a modified USLE and hydrologic simulations of a year's storm series. For statistical reasons, an annual event has a recurrence interval of 2.33 years, subsequently approximated here by a 2-year value.

Sediment Issues in the San Antonio Arroyo reviews the proportions between the annual, 10-year and 100-year event sediment yields were estimated. As the Piedras Marcadas is near that watershed and there is no new data regarding recurrence intervals, the results are transferred. The 100-year sediment yield is 6.66 times the annual value and the 10-year value is 2.5 times the annual value.

MCA designated 9 reference points in the watershed, A to I, shown in Figs. 1 and 2. Vol_s by the USLE, uncorrected for sediment delivery ratio, is shown in Table 4. Areas are in mi². H, E and F refer to historical, existing and future conditions. The 2, 10 and 100 refer to annual, 10 and 100-year recurrence intervals.

Table 4. Sediment Yield, USLE

Point	Vol _s (acre-ft/event)										
	H Area	E Area	H 2	E 2	F 2	H 10	E 10	F 10	H 100	E 100	F 100
A	2.131	2.131	0.33	0.32	0.09	0.82	0.81	0.22	2.20	2.15	0.59
B	0.111	0.111	0.02	0.02	0.00	0.05	0.05	0.01	0.12	0.12	0.03
C	0.401	0.401	0.03	0.01	0.01	0.07	0.03	0.02	0.19	0.09	0.05
D	0.176	0.577	0.03	0.04	0.02	0.07	0.11	0.04	0.19	0.28	0.11
E	2.717	3.118	0.44	0.44	0.15	1.09	1.10	0.38	2.90	2.94	1.00
F	1.003	0.602	0.11	0.03	0.02	0.27	0.07	0.04	0.72	0.20	0.12
G	2.882	3.238	0.44	0.45	0.16	1.11	1.12	0.40	2.96	2.99	1.06
H	5.862	5.862	0.87	0.75	0.31	2.18	1.88	0.78	5.81	5.02	2.07
I	0.096	0.096	0.02	0.02	0.01	0.05	0.05	0.01	0.14	0.14	0.04

The same sediment yield analysis can be run for watersheds upstream of selected cross-sections in the channel network. Twenty-seven cross-sections were modeled for historic conditions. Eighteen of those cross-sections were modeled for existing conditions. (Seven cross-sections were altered, in most cases by culverts). Subsequent discussion deals with those 18 common cross-sections: 1, 2, 4, 5.2, 6, 7, 8, 9, 10, 11, 12, 13, 14.1, 14.2, 16, 17, 20 and 22, shown in Figs. 1 and 2. Reach parameters and cross-sections are shown in the Appendix. Table 5 indicates the upstream yield at these cross-sections.

Table 5. Sediment Yield at Cross-sections, USLE

Cross-section	Vol _s (acre-ft/event)								
	H 2	E 2	F 2	H 10	E 10	F 10	H 100	E 100	F 100
1	0.11	0.11	0.03	0.27	0.27	0.07	0.73	0.73	0.20
2	0.17	0.17	0.05	0.43	0.43	.012	1.16	1.15	0.31
4	0.23	0.22	0.06	0.57	0.55	.015	1.51	1.45	0.40
5.2	0.33	0.32	0.09	0.82	0.81	0.22	2.20	2.15	0.59
6	0.08	0.08	0.02	0.21	0.21	0.06	0.56	0.56	0.15
7	0.34	0.33	0.10	0.85	0.83	0.24	2.26	2.21	0.64
8	0.02	0.02	0.01	0.05	0.05	0.01	0.12	0.12	0.03
9	0.03	0.04	0.02	0.07	0.11	0.04	0.19	0.28	0.11
10	0.01	0.01	0.00	0.01	0.01	0.00	0.04	0.04	0.01
11	0.01	0.01	0.00	0.03	0.03	0.01	0.07	0.07	0.03
12	0.38	0.38	0.12	0.94	0.96	0.29	2.52	2.56	0.77
13	0.02	0.02	0.01	0.05	0.05	0.01	0.14	0.14	0.04
14.1	0.44	0.44	0.15	1.09	1.10	0.38	2.90	2.94	1.01
14.2	0.44	0.44	0.15	1.09	1.10	0.38	2.90	2.94	1.01
15	0.44	0.44	0.16	1.11	1.12	0.40	2.95	2.98	1.06
17	0.53	0.53	0.21	1.33	1.32	0.53	3.55	3.51	1.42
20	0.11	0.03	0.02	0.27	0.07	0.04	0.71	0.20	0.12
22	0.69	0.60	0.25	1.73	1.50	0.62	4.61	4.00	1.65

As earlier discussed, the USLE may not be sufficiently conservative for some planning purposes. Employing the recommended yield values from Table 2, Table 6 is developed for the reference points for existing and future conditions, the latter presuming no changes in the network schematic.

Table 6. Sediment Yield, Planning Recommendation

Point	Area	Vol _s (acre-ft/event)					
		E 2	F 2	E 10	F 10	E 100	F 100
A	2.131	0.43	0.21	1.07	0.53	2.84	1.42
B	0.111	0.02	0.01	0.06	0.03	0.15	0.07
C	0.401	0.08	0.04	0.20	0.10	0.53	0.27
D	0.577	0.12	0.06	0.29	0.14	0.77	0.38
E	3.118	0.62	0.31	1.56	0.78	4.16	2.08
F	0.602	0.12	0.06	0.30	0.15	0.80	0.40
G	3.283	0.66	0.33	1.64	0.82	4.38	2.18
H	5.862	1.17	0.59	2.93	1.47	7.81	3.91
I	0.096	0.02	0.01	0.05	0.02	0.13	0.06

Sediment Transport

Hydrographs

MCA generated annual, 10 and 100-year hydrographs for historic, existing and future conditions with AHYMO8-91. Analysis of sediment deals with historic and existing conditions. Subsequent discussion deals with the future.

Hydrographs generated by MCA for existing conditions are shown in the Appendix. The reaches shown are those with AHYMO cross-sections suitable for sediment transport analysis and reaches unchanged between historic and existing conditions. As points are plotted only on the 20-minute interval, maximum discharge is not necessarily shown.

In almost every instance, the 10-year runoff is negligible in comparison with the 100-year value. The annual value is generally not discernable. For sediment transport, the implication is significant. Channels are affected to only a minor extent by annual or 10-year discharges. Channels have a high propensity to be affected by 100-year events. Relatively little occurs in average years. If the watershed is to be properly maintained, the drainage system must satisfy the 100-year loading. Subsequently in this report, only the 100-year behaviors are discussed, as it is on such criteria that sediment management should be based. Whereas the analysis in most cases encompassed annual and 10-year figures, those results are trivial.

Sediment Transport Equation

An area-specific regressed reduction of the Meyer-Peter, Muller and Einstein equations was developed in *Erosion Study to Determine Boundaries for Adjacent Development - Calabacillas Arroyo, Bernalillo County, New Mexico*. As noted in that report,

"This transport relationship.... is a function of the hydraulics of the study reach of Calabacillas and should not be applied to other systems unless they have similar slopes and bed material characteristics."

The slope of the Calabacillas is 1.0-1.5 percent. The Piedras Marcadas is typically 2.5 percent. The lower Calabacillas bed material has a d_{50} of 0.58 mm and a Uniformity Coefficient of 5.98 (Sites E, G, J and L). As reported by Geo-Test to MCA, the Piedras Marcadas has a d_{50} of approximately 0.15 mm and a Uniformity Coefficient of 8.93 (Sites 1, 2, 3 and 10 at surface). The Piedras Marcadas bed material is finer than that of the Calabacillas, but still within the sand classification. As the two arroyos are similar in major respects and subsequent analysis corrects for particle size, the Meyer-Peter, Muller and Einstein model is appropriate for this study,

$$q_s = a V^b Y^c \quad (1)$$

where q_s is sediment transport capacity in cfs/ft, V is mean velocity in fps and Y is depth in ft. The coefficients are given in Table 7.

Table 7. Regression Coefficients

Geometric Mean Size (mm)	a	Coefficient b	c
0.15	0.00034	3.664	0.628
0.80	0.000017	4.638	-0.225
2.65	0.0000053	4.723	-0.400
9.25	0.000021	3.904	-0.410

Total sediment transport capacity per runoff event is the weighted sum,

$$Q_s = \frac{b \Delta t \sum q_s f_s}{43560} \quad (2)$$

where Q_s is acre-ft, b is bed width in feet, Δt is the time increment in seconds and f_s is the decimal fraction of the respective particle size ($\sum f_s = 1$).

Sediment Transport Estimates

A illustrative solution of Eq. 2 for existing conditions is given in the Appendix. Summary results of Eq. 2 at each cross-section are shown in Table 8 for the 100-year event.

Table 8. Sediment Transport Capacities

Cross-section	Q _s (acre-ft/event)		
	Historical	Existing	Existing/Historical
1	0.0465	0.0479	1.03
2	0.2292	0.2405	1.05
4	0.0150	0.0529	3.54
5.2	0.9739	1.3971	1.43
6	0.2598	0.2619	1.01
7	0.3841	0.5309	1.38
8	0.0163	0.0164	1.01
9	0.0677	0.7310	10.80
10	0.0000	0.0000	1.00
11	0.0130	0.0148	1.14
12	1.1007	3.0270	2.75
13	0.0200	0.0238	1.19
14.1	0.6259	1.5875	2.54
14.2	0.5740	1.4823	2.58
15	1.6528	2.6371	1.60
17	0.9186	2.4811	2.70
20	0.2807	0.6419	2.29
22	4.2532	6.1482	1.45

Sediment modeling is sensitive to channel slope, cross section and the stage-discharge relationship. Parameters employed to generate Table 8 were taken from the AHYMO data set, values estimated for general runoff modeling, not necessarily sufficient for precise sediment computations. Cross-section differences are thus qualitatively informative, but not necessarily numerically accurate. Table 8 does substantiate a general conclusion, however: increased runoff (thus greater depth and velocity, Eq. 1) has increased the sediment transport capacity of unimproved channels by an approximate factor of 2. The one significant exception to this generality is cross-section 9. This reach historically drained 0.176 mi². Under existing conditions, the Rock Channel diversion increases this area to 0.577 mi², a significant portion of the increase being urbanized land. A high Existing/Historical ratio should be expected.

Bulking Factor

The bulking factor provides a multiplier by which to increase water-alone volumes to achieve water-plus-sediment volumes,

$$\text{Vol}_{w+s} = (1 + \text{bulking factor}) \text{Vol}_w \quad (3)$$

The approach of *Erosion Study to Determine Boundaries for Adjacent Development - Calabacillas Arroyo, Bernalillo County, New Mexico* yielded a bulking factor of 0.10 below the proposed Black Reservoir for the 100-year event.

Cleanup of the Raymac Reservoir after the major storms of 1988 indicated a bulking factor above this value. Walnut Gulch, Arizona bulking factors reach 0.04 for annual events and are greater for major storms.

The 100-year bulking factor generated by AHYMO and Eq. 2 for existing conditions averages 0.022, lower than estimates for many arroyos, but within the range of experienced values. At peak discharge, the average of the cross-sections is 0.037. The highest value is 0.103, cross-section 12 where depth is nearly 2 ft and velocity exceeds 8 fps.

The above discussion does not dispute that high bulking factors may occur in the Albuquerque area. Exceptionally high values reported in some cases may be attributed to poor watershed conditions or laterally-confined channels with resulting high velocities and bed shear. For a wide arroyo with a stable watershed, quasi-"regime" channels such as most of the Piedras Marcadas, runoff will generally transport only a few percent sediment.

Future Conditions

Analysis has focused on historical and existing conditions because the Petroglyph National Monument imposes a firm constraint on future hydrology. Future hydrographs based on the existing drainage pattern, impervious upper watershed and lined channels, produce high runoff which is sediment starved. The Monument, by its nature, will not have improved channels designed to transmit such unmitigated runoff. The Monument can not be subjected to severe channel degradation from that runoff. Estimates of how much sediment would be carried from the Monument, or how severely the Monument would be degraded, presuming uncontrolled hydrology, are moot. There is no plan for such a future.

Upstream development must be such that flows of both sediment and water in the Main Branch continue in approximately their historic or existing quantities. (The historic level would be preferred, but may not be obtainable in all reaches.) Such containment may be possible through comprehensive management involving such tactics of land use limitations, ponding, diversion and playa and natural watercourse preservation

Geomorphology

Channel Cross-section

In regime behavior, the channel continuously adjusts to a cross-section, slope, and planform such that Q_s equals Vol_s . In actuality, ephemeral channels are not in regime. The channels adjust to discontinuous rainfall events.

As indicated in the Appendix, runoff is in large part subcritical in the natural channels under historic conditions. Wave problems and consequent bank erosion associated with supercritical flow do not occur. Antidunes do not form, as they prone to do in Albuquerque's steeper East Mesa channels. The Piedras Marcadas cross-sections should not be thought of as "stable" sections. Within the range of local ephemeral channels, however, they are less likely than many to radically

alter in cross-section. Bank sloughing is evident, but a general trend toward widening is not.

Channel Slope

Basin-wide, the channel bed does not appear to be undergoing major scour or deposition. There is ample evidence, however, of localized alteration, in most cases readily identifiable with development activities. There, headcutting is evident in side channels. While such changes to the channel do not appear to be major in the larger perspective, they represent behaviors that could be detrimental to particular properties and could be indicators of endemic soil destabilization if not controlled.

The equilibrium slope for a mobile-bed channel used in *Erosion Study to Determine Boundaries for Adjacent Development - Calabacillas Arroyo, Bernalillo County, New Mexico* is,

$$S_{eq} = S \left(\frac{Vols}{Q_s} \right)^{\left(\frac{2}{b-x} \right)} \quad (4)$$

where

$$x = \frac{3}{5} \left(\frac{2}{3} b + c \right) \quad (5)$$

and b and c are defined in Table 7. For 0.3 mm particles (the Piedras Marcadas d_{80}), the Eq. 4 exponent is very nearly 1.0, indicating that slope should not change a great deal with sediment load. The fact that S is very near S_{eq} indicates that channel adjustment to loading will more likely take place as changed cross-section or planform.

Geo-Test reports basalt at from 1 to 8 ft. in all borings above the escarpment. Below the escarpment, no borings to 8.5 ft. encountered basalt. There has been long-term alluvial and aeolian sediment transport over the escarpment, building the lower deposits. The near basalt in the upper watershed imposes an effective limit on degradation in that area.

Planform

Planform describes a channel planar pattern, the migrations, meanders and the braids. In classical fluvial geomorphology, planform is predicted by grade and sediment size. Ephemeral channels are typified by an ill-behaved planform, one in which straight reaches abruptly turn, widen and narrow with little periodicity.

February 1991 1:6000 aerial photography reveals a sparse tributary network. The North, Middle and South Branches are well-incised with low sinuosity. Unconstrained, these branches may undergo minor lateral shifts on occasion, but as a whole would not alter their routes. The lower-order tributaries demonstrate no such planform stability. These channels more typically are ill defined, cutting in

some reaches, dissipating in others. Most roads have become watercourses, evidence of the the natural terrain's limited propensity to establish a fixed channel network.

The planform is significant for what it is not. Nearby Rio Puerco subbasins have extensive incised bifurcation, the drainage network resembling from the air a bush. The gully density makes that watershed a major sediment source for the Rio Grande. From a geomorphic perspective, the Piedras Marcadas planform is unlike that of the Rio Puerco, yielding only a fraction of the latter's vol_s. Under historical conditions, the Piedras Marcadas would retain its current planform. It is less assured that the current planform will persist unaided in the midst of urbanization.

Playas

The watershed contains several dozen playas. MCI identified four major playas shown in Fig. 2. Table 9 presents the stage discharge relations for these four playas at peak 100-year flows for historic conditions. The values are taken at 20-minute time steps. Instantaneous peaks would be somewhat higher.

Table 9. Playas

Playa	Q _{in} (cfs)	Q _{out} (cfs)	Storage (acre-ft)	Depth (ft)
1	236.44	178.58	7.371	2.72
2	189.10	4.54	25.599	3.53
3	75.02	36.71	1.893	1.92
4	15.48	0.10	0.684	1.47

Each playa mitigates peak discharge. Significantly, even at peak discharge, all four playas have detention times such that virtually all of the fine sand will settle. Complete analysis of trap efficiency does not appear to be required. The shortest playa detention time, that of playa 1 is 30 minutes. Particles with settling velocities exceeding approximately 0.1 fpm will be removed. Sand with d₅₀ of 0.15 mm settles at approximately 2 fpm.

The playas serve as a sediment sink for the upper basin. It appears that these playas are somewhat renewable in an overall sense. The basin contains numerous depositional zones. Playas of past years have filled, their role assumed by other low areas. Playas may be a major reason for a lack of well defined tributaries to the main arroyo reaches. Playa behavior may contribute for the fact that the upper watershed has maintained a shallow sand cover over the basalt.

The playas are a significant component of the geomorphic system, regulating outflow and capturing sediment.

Sediment Balance

The geomorphologic response of the watershed can be qualitatively viewed by comparing the sediment yield (Table 5) to the capacity for transport (Table 8), as shown by Table 10. (Vol_s) (Q_s)

Table 10. Sediment Supply and Transport Capacity, Existing Conditions, 100-year Event

Cross-section	Vol_s	Q_s	Q_s/Vol_s
1	0.7284	0.0479	0.07
2	1.1535	0.2405	0.21
4	1.4547	0.0529	0.04
5.2	2.1504	1.3971	0.65
6	0.5644	0.2619	0.46
7	2.2124	0.5309	0.24
8	0.1199	0.0164	0.14
9	0.2802	0.7310	2.61
10	0.0374	0.0000	0.00
11	0.0680	0.0148	0.22
12	2.5606	3.0270	1.18
13	0.1360	0.0238	0.18
14.1	2.9359	1.5875	0.54
14.2	2.9359	1.4823	0.50
15	2.9861	2.6371	0.88
17	3.5129	2.4811	0.71
20	0.1980	0.6419	3.24
22	4.0012	6.1482	1.54

Q_s significantly exceeds Vol_s at cross-sections 9, 20 and 22. Cross-section 20 is easily understood. The reach developed to transmit Vol_s from subbasins 312 and 320, now diverted into the Rock Channel. The cross-section is now adjusting to bring Q_s downward.

Cross-section 9 is influenced by playa 3. The Rock Channel brings both more sediment and more water to that playa. The playa removes the sediment, but not the water. Downstream cross-section 9 thus has an increased Q_s/Vol_s ratio.

Cross-section 22 has a Q_s/Vol_s ratio significantly above upstream cross-sections 17 and 15. The difference may be due to the entrance of the North Branch, which, as noted above has less sediment input than its historical load, the loss diverted to playa 3.

Given a possible 50 percent error in the USLE results, cross-sections with Q_s/Vol_s between 0.50 and 1.50 might be considered to be in approximate sediment balance. Using that criteria, only cross-section 9 appears to be significantly degrading, while most other upper Main Branch cross-sections are aggrading. The North and South Branches (cross-sections 18-21 and 23-25, respectively) are

relatively in balance. As noted earlier, the playas in the upper watershed are significant to sediment balance. The aggrading cross-section are in many cases proximate to playa areas while the more-stable cross-sections are not. These aggrading reaches appear to be geomorphically akin to playas, part of a larger depositional system in the upper watershed.

Petroglyph National Monument

The Petroglyph National Monument comprises portions of subbasins 202, 203, 205, 301, 302, 303, 304, 305, 307, 308 and 404. The Monument comprises 10.3 percent of the drainage to Piedras Marcadas Dam. The Middle Branch passes directly through the Monument. The North and South Branches pass on the respective sides of the Monument, drawing a relatively minor amount of their flow from peripheral Monument lands.

Fig. 2 identifies the channel inflows into the Monument drainage system. Of major significance are the following flows:

Reference point A, which drains 2.131 mi² of the upper mesa.

Reference point D, which historically drained 0.176 mi², but with the construction of the Rock Channel, now drains 0.577 mi².

Table 11 summarizes 100-year event conditions at these two reference points. (As noted earlier, peak rates are taken from 20-minute time step simulation. Instantaneous rates will be higher.)

Table 11. Inflows

Estimate	Reference Point			
		A		D
	Historical	Existing	Historical	Existing
Runoff (acre-ft)	24.29	32.92	3.65	23.71
Q _p (cfs)	284.3	334.0	36.7	278.9
Vols, USLE (acre-ft)	2.20	2.15	0.19	0.28
Q _s (acre-ft)	0.97	1.40	0.07	0.77

While the overall sediment input to the Monument has not changed dramatically, the impact of flow at Reference Point D is now radically different. Historically, flow with all the sediment that it could carry entered at A and D. That remains the case at A, though the margin is reduced. The Rock Canal now introduces water at D with potential for significant localized erosion.

Conclusions

1) The Piedras Marcadas drainage system is not degrading above the escarpment, other than at a few locations where the runoff pattern has been severely altered. The presence of playas appears to be one reason for such general stability. A basalt substratum may be another cause.

2) Below the escarpment, there is more tendency for channel degradation brought on by urbanization. There is not, however, a substantial problem of soil erosion at this time.

3) The Petroglyph National Monument is currently subjected to erosional problems associated with outflow from the Rock Channel. This problem is reduced by natural playa flow regulation.

4) The Petroglyph National Monument must not be subjected to unmitigated runoff from a future developed upper watershed.

Piedras Marcadas Watershed

Routing Schematic

No Scale
Arbitrary Orientation

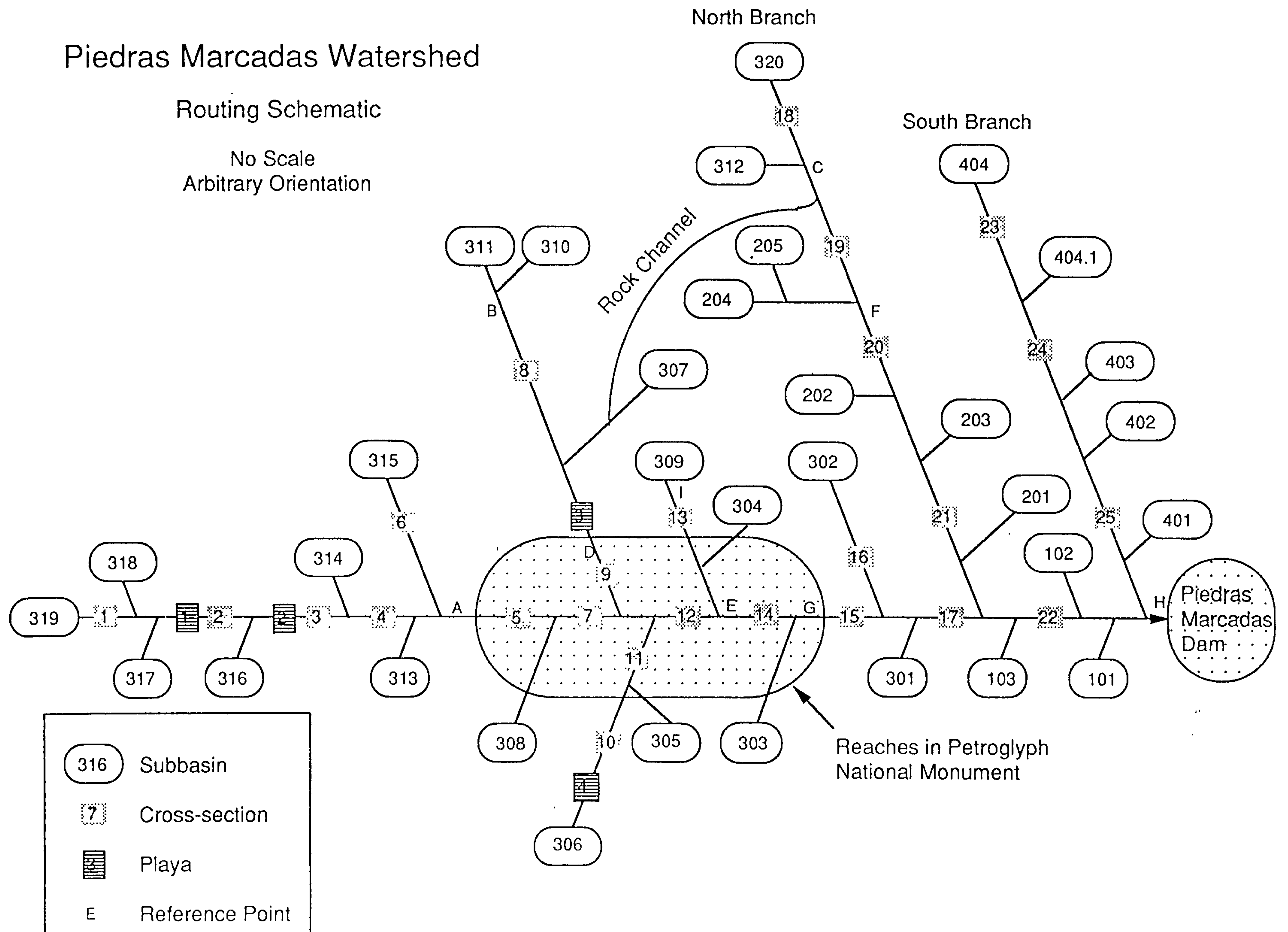
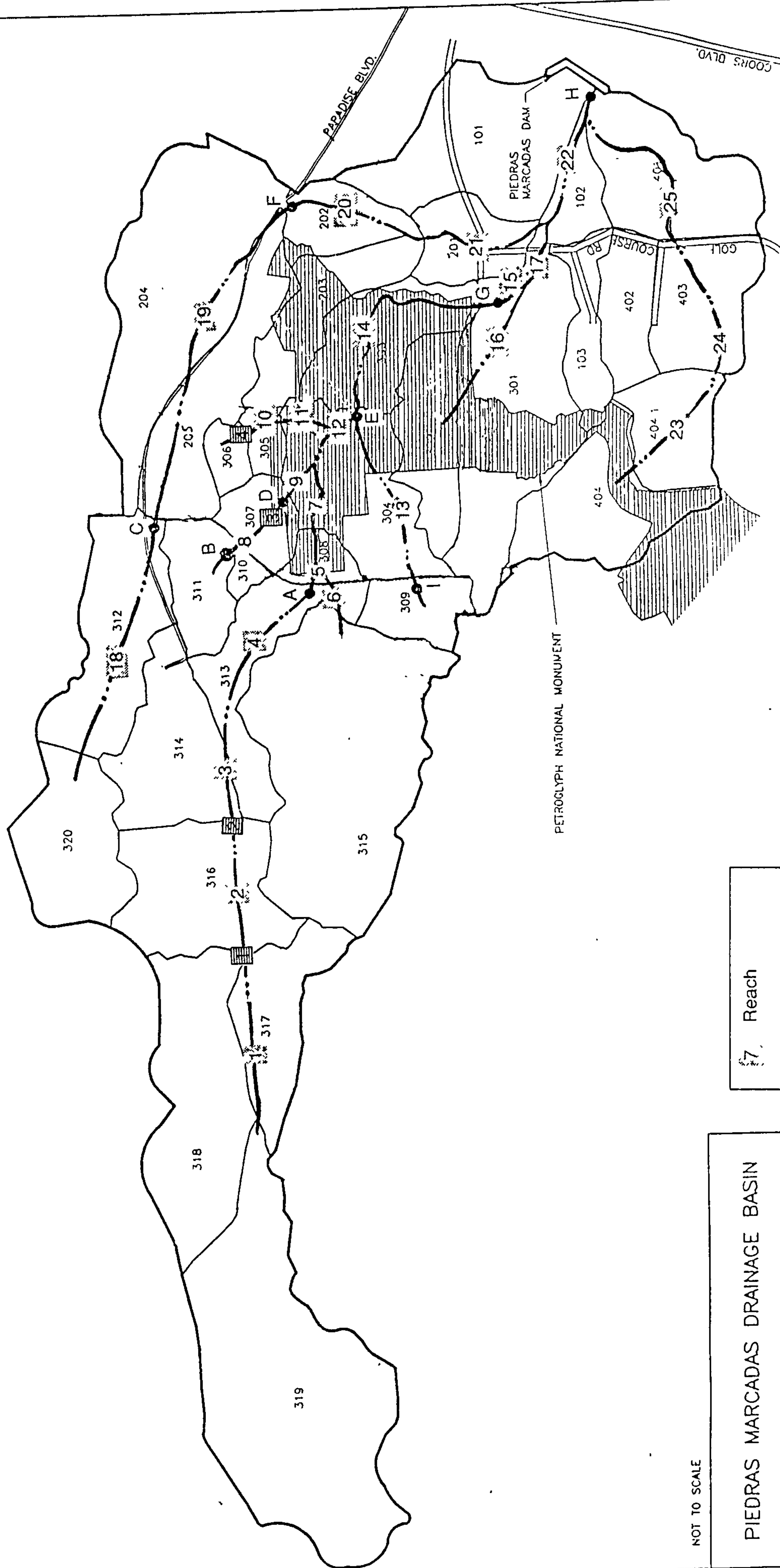
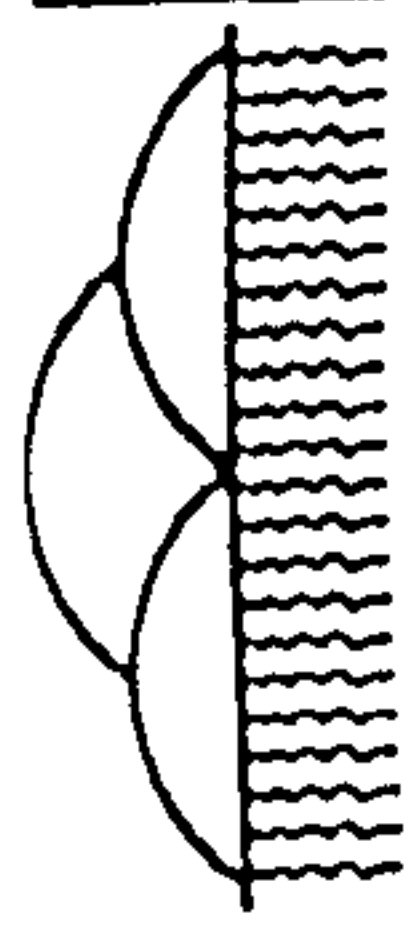


FIG. 1

ADDRESS
 METROCEMENT
 ARROYO
 FLOOD
 CONTROL
 AUTHORITY



NOT TO SCALE

- 7 Reach
- Playa
- B Reference Point

PIEDRAS MARCADAS DRAINAGE BASIN



MOLZEN-CORBIN & Associates

A

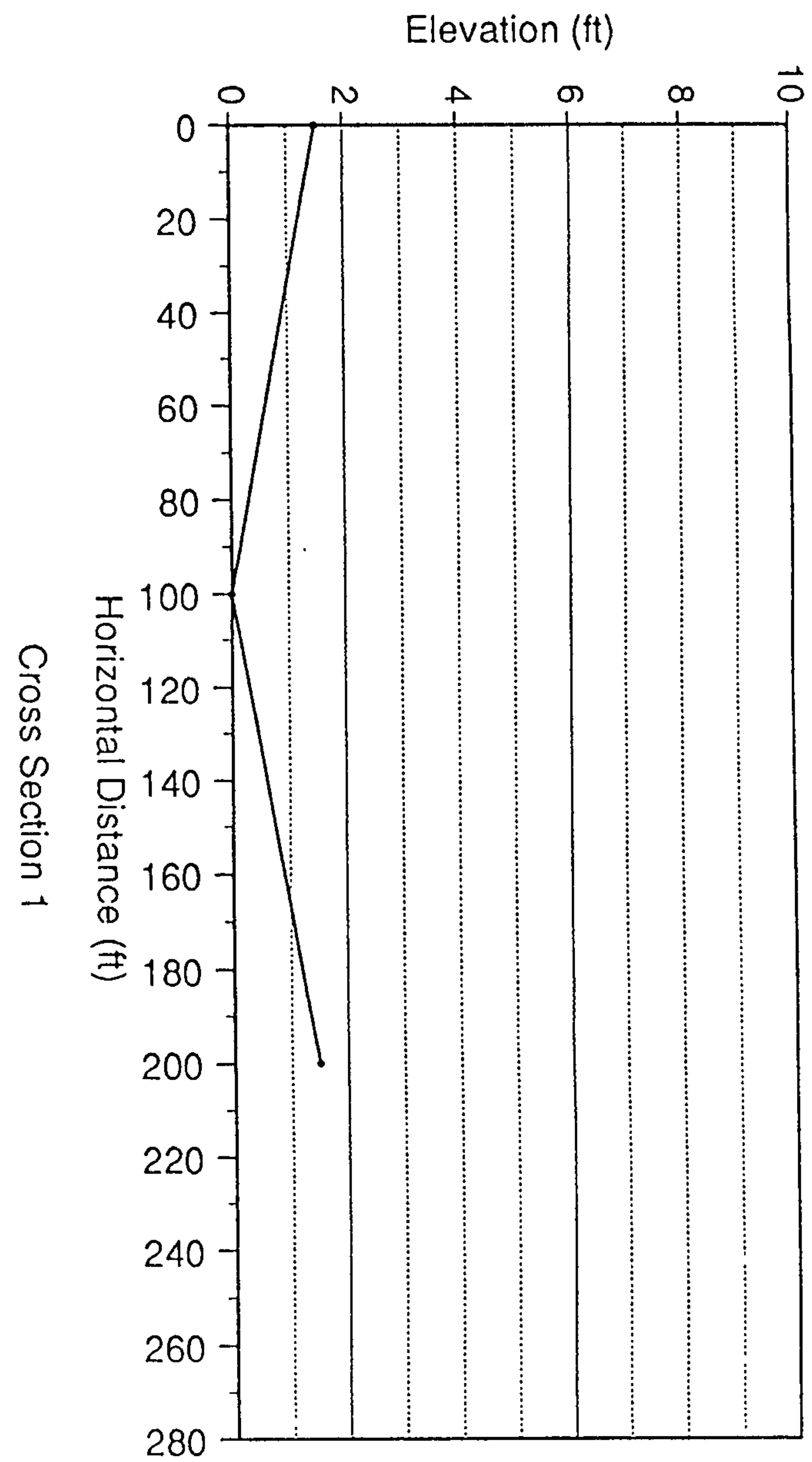
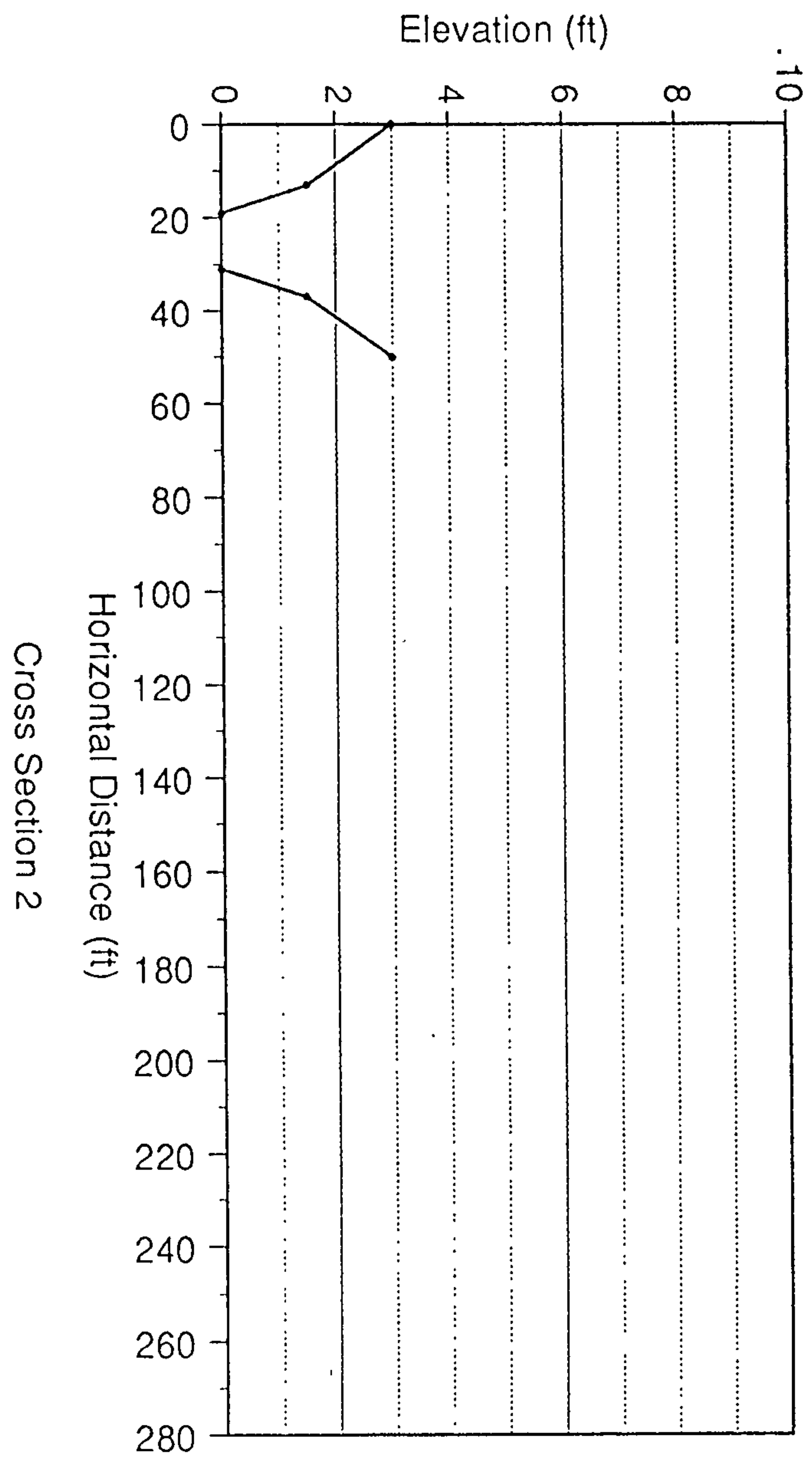
Basin	Sq. Mi.	% A	% B	% C	% D	% BCC	% BKD	% MWA	% AmB	% KR	R	K	S	m
101	0.273	0.950	0.050	0.000	0.000	0.100	0.300	0.600	0.000	0.000	50	0.22	0.0342	0.35
102	0.066	1.000	0.000	0.000	0.000	0.400	0.000	0.400	0.200	0.000	50	0.22	0.0182	0.30
103	0.078	0.980	0.020	0.000	0.000	0.350	0.450	0.150	0.050	0.000	50	0.11	0.0410	0.40
201	0.096	1.000	0.000	0.000	0.000	0.500	0.150	0.350	0.000	0.000	50	0.16	0.0380	0.40
202	0.086	1.000	0.000	0.000	0.000	0.100	0.250	0.600	0.000	0.050	50	0.23	0.0218	0.30
203	0.134	0.900	0.050	0.050	0.000	0.500	0.000	0.150	0.300	0.050	50	0.19	0.0343	0.35
204	0.392	1.000	0.000	0.000	0.000	0.050	0.000	0.900	0.050	0.000	50	0.32	0.0220	0.30
205	0.210	0.820	0.100	0.080	0.000	0.800	0.000	0.150	0.000	0.050	50	0.11	0.0220	0.30
301	0.352	0.800	0.100	0.100	0.000	0.100	0.400	0.100	0.400	0.000	50	0.19	0.0455	0.45
302	0.134	0.780	0.120	0.100	0.000	0.150	0.100	0.000	0.550	0.200	50	0.24	0.0452	0.45
303	0.165	0.760	0.130	0.110	0.000	0.800	0.000	0.000	0.000	0.200	50	0.10	0.0229	0.30
304	0.220	0.760	0.130	0.110	0.000	0.150	0.000	0.000	0.800	0.050	50	0.28	0.0301	0.35
305	0.027	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0217	0.30
306	0.031	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0233	0.30
307	0.065	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0207	0.30
308	0.036	0.950	0.050	0.000	0.000	0.000	0.000	0.000	0.700	0.300	50	0.30	0.0402	0.40
309	0.096	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0288	0.30
310	0.015	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0400	0.40
311	0.096	0.950	0.000	0.030	0.020	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0178	0.30
312	0.211	0.980	0.020	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0091	0.20
313	0.154	0.970	0.030	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0125	0.30
314	0.164	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0099	0.20
315	0.538	0.990	0.010	0.000	0.000	0.000	0.000	0.000	1.000	0.000	50	0.32	0.0167	0.30
316	0.236	1.000	0.000	0.000	0.000	0.100	0.000	0.000	0.900	0.000	50	0.29	0.0140	0.30
317	0.151	1.000	0.000	0.000	0.000	0.000	0.000	0.300	0.700	0.000	50	0.32	0.0164	0.30
318	0.293	1.000	0.000	0.000	0.000	0.500	0.000	0.500	0.000	0.000	50	0.20	0.0222	0.30
319	0.595	1.000	0.000	0.000	0.000	0.150	0.000	0.100	0.750	0.000	50	0.28	0.0215	0.30
320	0.190	1.000	0.000	0.000	0.000	0.800	0.000	0.000	0.200	0.000	50	0.11	0.0106	0.30
401	0.206	0.900	0.070	0.030	0.000	0.050	0.400	0.500	0.050	0.000	50	0.21	0.0211	0.30
402	0.093	1.000	0.000	0.000	0.000	0.000	0.200	0.500	0.300	0.000	50	0.28	0.0256	0.30
403	0.149	1.000	0.000	0.000	0.000	0.000	0.000	0.950	0.050	0.000	50	0.33	0.0089	0.20
404	0.195	0.900	0.050	0.050	0.000	0.000	0.000	0.000	0.850	0.150	50	0.31	0.0529	0.50
404.1	0.115	0.920	0.050	0.030	0.000	0.000	0.750	0.200	0.000	0.050	50	0.12	0.0196	0.30
Tot	5.862	5.533	0.190	0.137	0.002	1.034	0.494	1.292	2.903	0.138				
%		0.944	0.032	0.023	0.000	0.176	0.084	0.220	0.495	0.024				
HSG						A	A	B	C	A				
% Sand						0.800	0.800	0.475	0.550	0.375				
% Silt						0.125	0.125	0.505	0.400	0.325				
% Clay						0.000	0.000	0.020	0.000	0.000				
% Org						0.000	0.000	0.020	0.010	0.000				
Perm						2	2	4	4	1				
Str						2	2	1	2	3				
M						1250	1250	4949	4000	3250				
K						0.060	0.060	0.334	0.320	0.237				
Pt A	2.131													
Pt B	0.111													
Pt C	0.401													
Pt D	0.176													
Pt E	2.717													
Pt F	1.003													
Pt G	2.882													
Pt H	5.862													
Pt I	0.096													

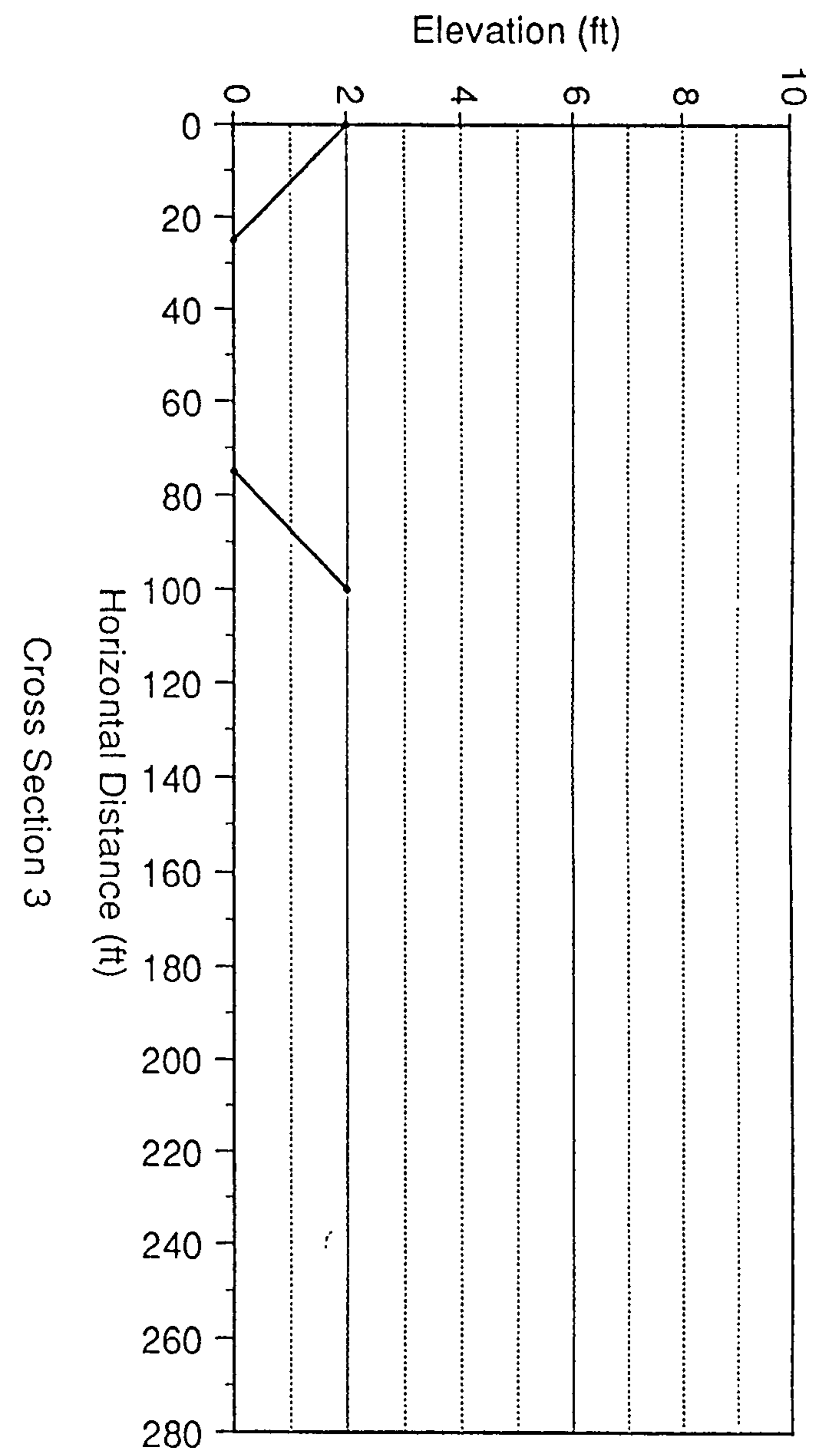
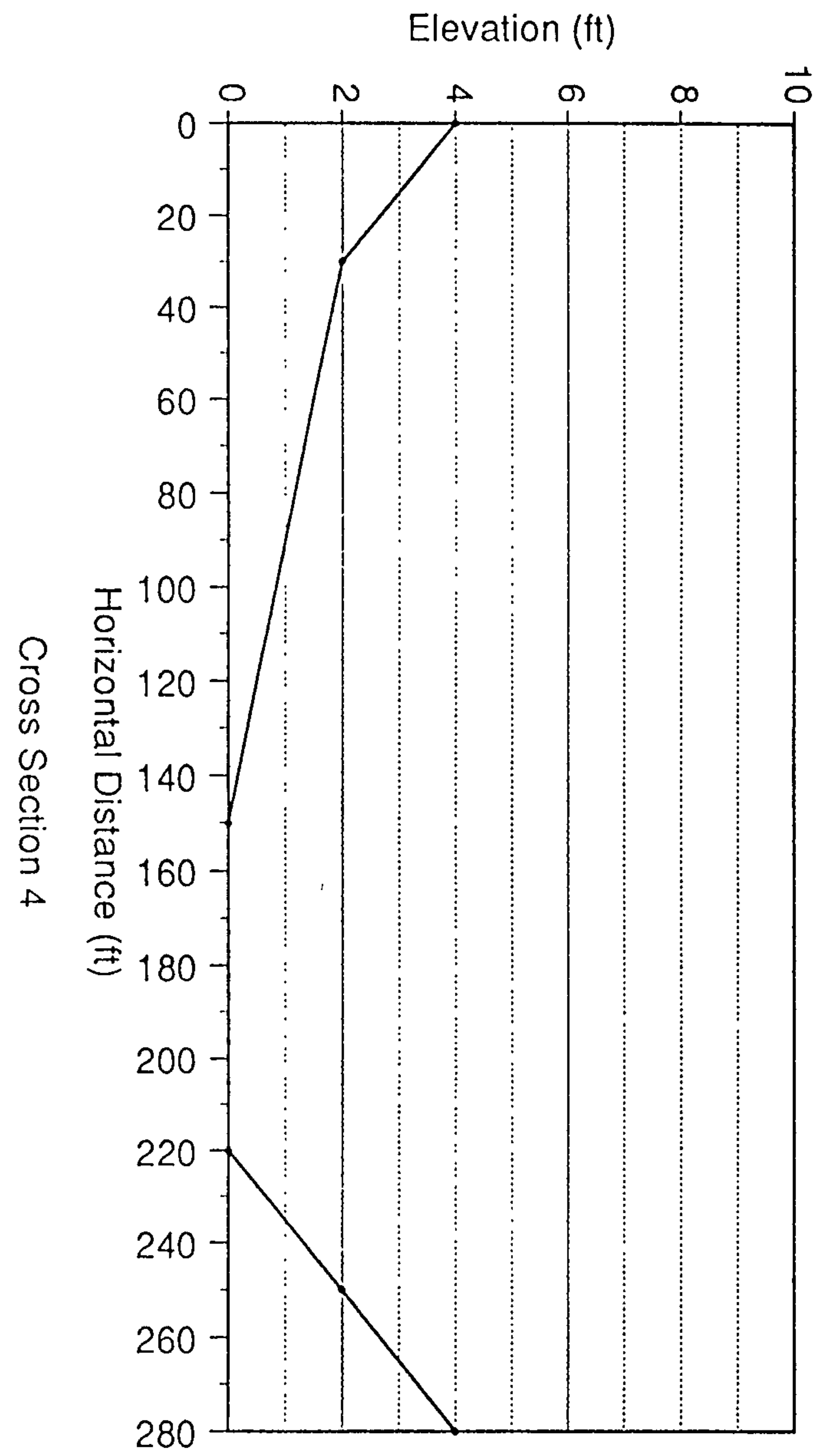
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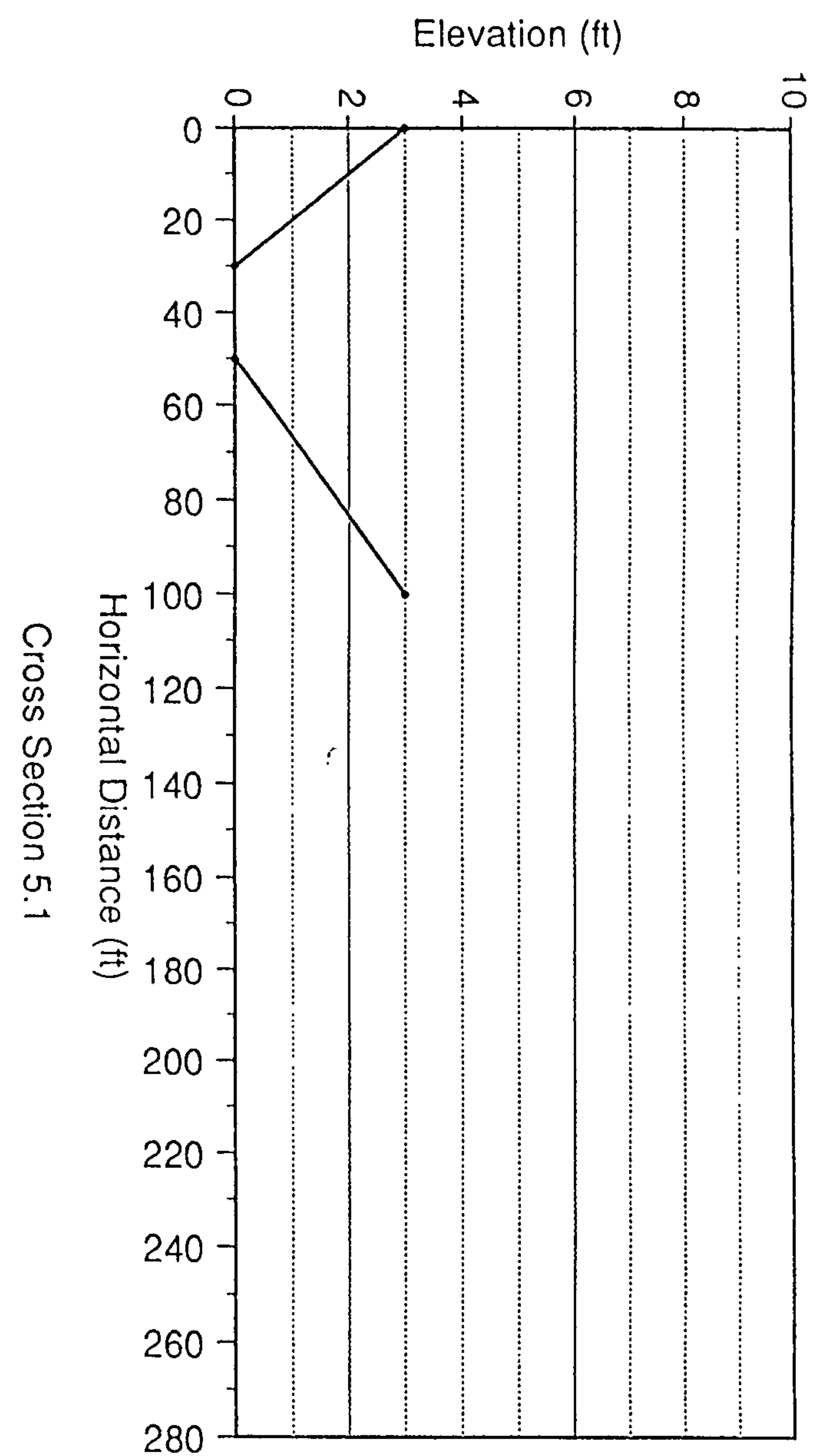
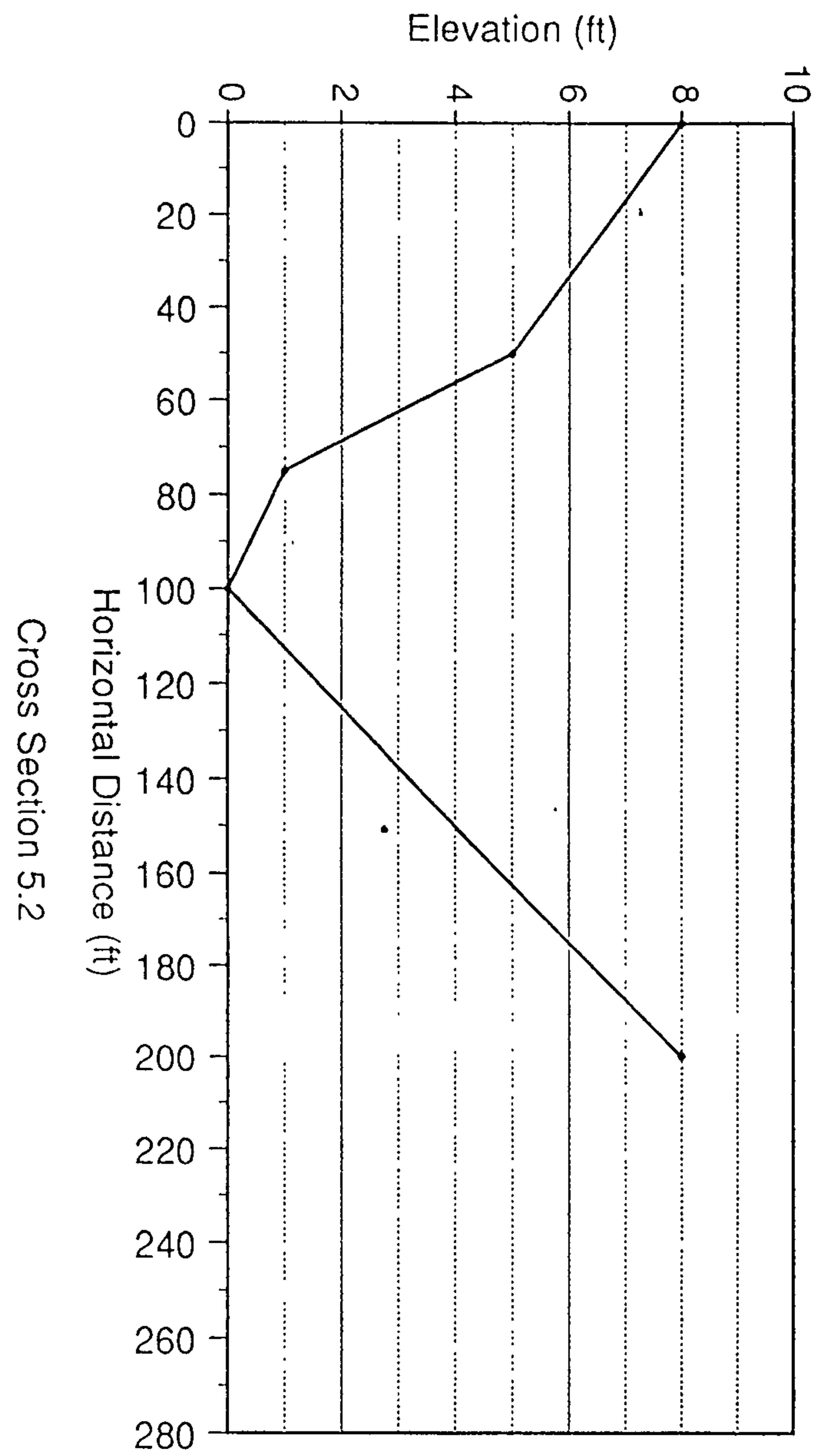
Basin	L	LS	C	P	T/Ac	Tons	Af	af/m2	In.	ACtons	AC Af	ACaf/m2
101	400	0.24	0.20	1.00	0.54	95.0	0.05	0.18	0.003	90.2	0.05	0.17
102	400	0.14	0.20	1.00	0.32	13.3	0.01	0.10	0.002	13.3	0.01	0.10
103	400	0.29	0.20	1.00	0.33	16.3	0.01	0.11	0.002	16.0	0.01	0.10
201	400	0.26	0.20	1.00	0.41	25.2	0.01	0.13	0.003	25.2	0.01	0.13
202	400	0.16	0.20	1.00	0.38	21.1	0.01	0.12	0.002	21.1	0.01	0.12
203	400	0.24	0.20	1.00	0.46	39.1	0.02	0.15	0.003	37.2	0.02	0.14
204	400	0.16	0.20	1.00	0.53	132.4	0.07	0.17	0.003	132.4	0.07	0.17
205	400	0.16	0.20	1.00	0.18	24.5	0.01	0.06	0.001	22.0	0.01	0.05
301	400	0.31	0.20	1.00	0.60	134.8	0.07	0.20	0.004	121.4	0.06	0.18
302	400	0.31	0.20	1.00	0.74	63.4	0.03	0.24	0.005	55.8	0.03	0.21
303	400	0.17	0.20	1.00	0.16	17.2	0.01	0.05	0.001	15.0	0.01	0.05
304	400	0.21	0.20	1.00	0.59	82.9	0.04	0.19	0.004	72.1	0.04	0.17
305	400	0.16	0.20	1.00	0.52	9.0	0.00	0.17	0.003	9.0	0.00	0.17
306	400	0.17	0.20	1.00	0.55	11.0	0.01	0.18	0.003	11.0	0.01	0.18
307	400	0.16	0.20	1.00	0.50	20.9	0.01	0.16	0.003	20.9	0.01	0.16
308	400	0.28	0.20	1.00	0.82	19.0	0.01	0.27	0.005	18.0	0.01	0.26
309	400	0.21	0.20	1.00	0.67	41.3	0.02	0.22	0.004	41.3	0.02	0.22
310	400	0.28	0.20	1.00	0.89	8.5	0.00	0.29	0.005	8.5	0.00	0.29
311	400	0.14	0.20	1.00	0.45	27.5	0.01	0.15	0.003	26.9	0.01	0.14
312	400	0.10	0.20	1.00	0.32	43.0	0.02	0.10	0.002	42.1	0.02	0.10
313	600	0.13	0.20	1.00	0.40	39.4	0.02	0.13	0.002	38.3	0.02	0.13
314	600	0.11	0.20	1.00	0.36	37.7	0.02	0.12	0.002	37.7	0.02	0.12
315	600	0.15	0.20	1.00	0.48	166.1	0.08	0.16	0.003	164.5	0.08	0.16
316	800	0.15	0.20	1.00	0.43	64.9	0.03	0.14	0.003	64.9	0.03	0.14
317	800	0.16	0.20	1.00	0.53	50.9	0.03	0.17	0.003	50.9	0.03	0.17
318	800	0.20	0.20	1.00	0.40	75.8	0.04	0.13	0.002	75.8	0.04	0.13
319	800	0.20	0.20	1.00	0.56	214.4	0.11	0.18	0.003	214.4	0.11	0.18
320	400	0.10	0.20	1.00	0.11	13.8	0.01	0.04	0.001	13.8	0.01	0.04
401	400	0.16	0.20	1.00	0.34	44.2	0.02	0.11	0.002	41.1	0.02	0.10
402	400	0.19	0.20	1.00	0.52	30.8	0.02	0.17	0.003	30.8	0.02	0.17
403	400	0.10	0.20	1.00	0.33	31.3	0.02	0.11	0.002	31.3	0.02	0.11
404	400	0.36	0.20	1.00	1.12	139.5	0.07	0.36	0.007	132.5	0.07	0.35
404.1	400	0.15	0.20	1.00	0.19	13.7	0.01	0.06	0.001	13.0	0.01	0.06
Tot						1767.9	0.90	0.15	0.003	1708.4	0.87	0.15
%												
HSG												
% Sand												
% Silt												
% Clay												
% Org												
Perm												
Str												
M												
K												
Pt A					0.48	649.2	0.33	0.16	0.003	646.3	0.33	0.15
Pt B					0.51	36.0	0.02	0.17	0.003	35.5	0.02	0.16
Pt C					0.22	56.8	0.03	0.07	0.001	55.9	0.03	0.07
Pt D					0.51	56.9	0.03	0.16	0.003	56.4	0.03	0.16
Pt E					0.50	869.2	0.44	0.16	0.003	854.1	0.44	0.16
Pt F					0.33	213.7	0.11	0.11	0.002	210.4	0.11	0.11
Pt G					0.48	886.5	0.45	0.16	0.003	869.1	0.44	0.15
Pt H					0.47	1767.9	0.90	0.15	0.003	1708.4	0.87	0.15
Pt I					0.67	41.3	0.02	0.22	0.004	41.3	0.02	0.22

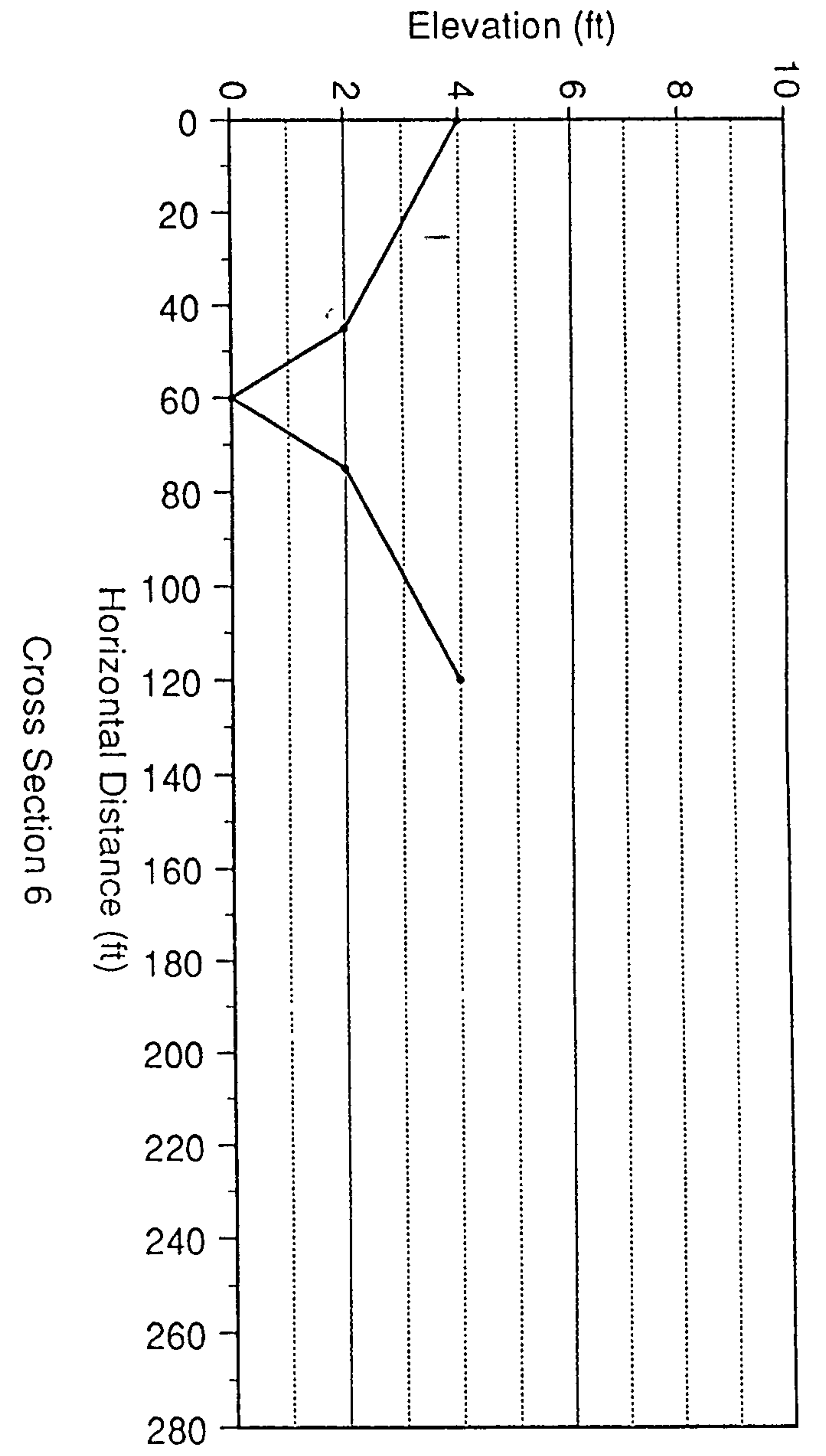
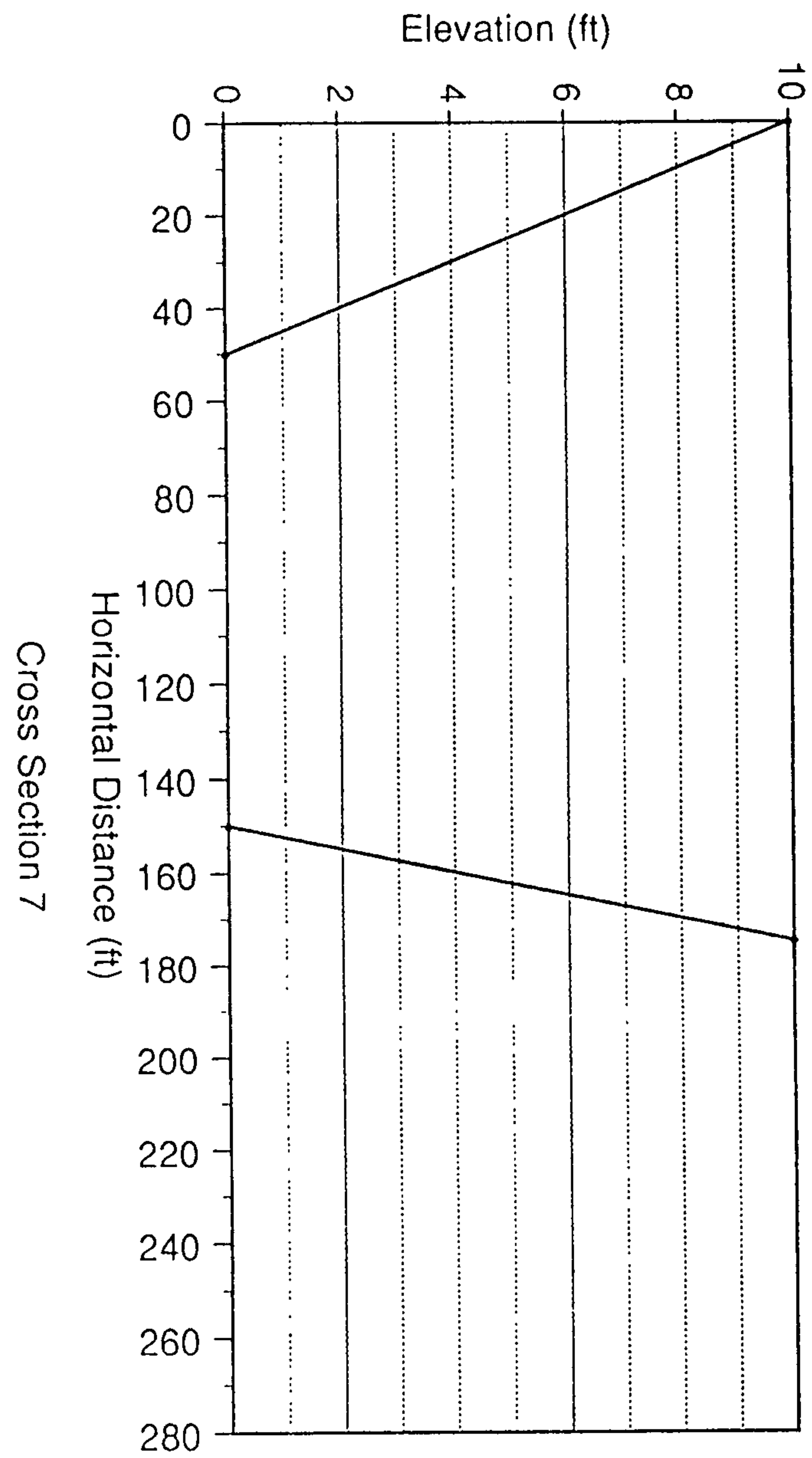
Reaches

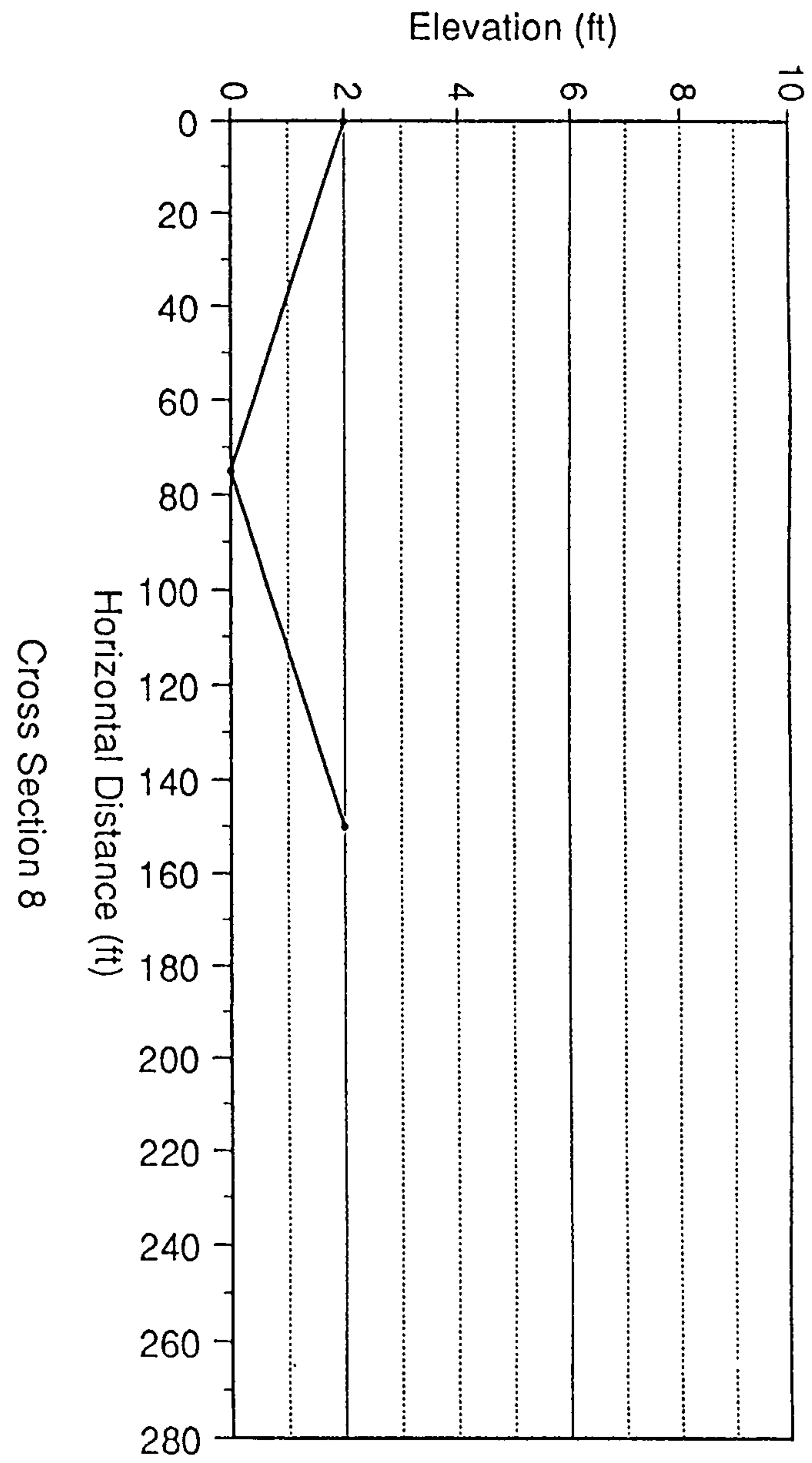
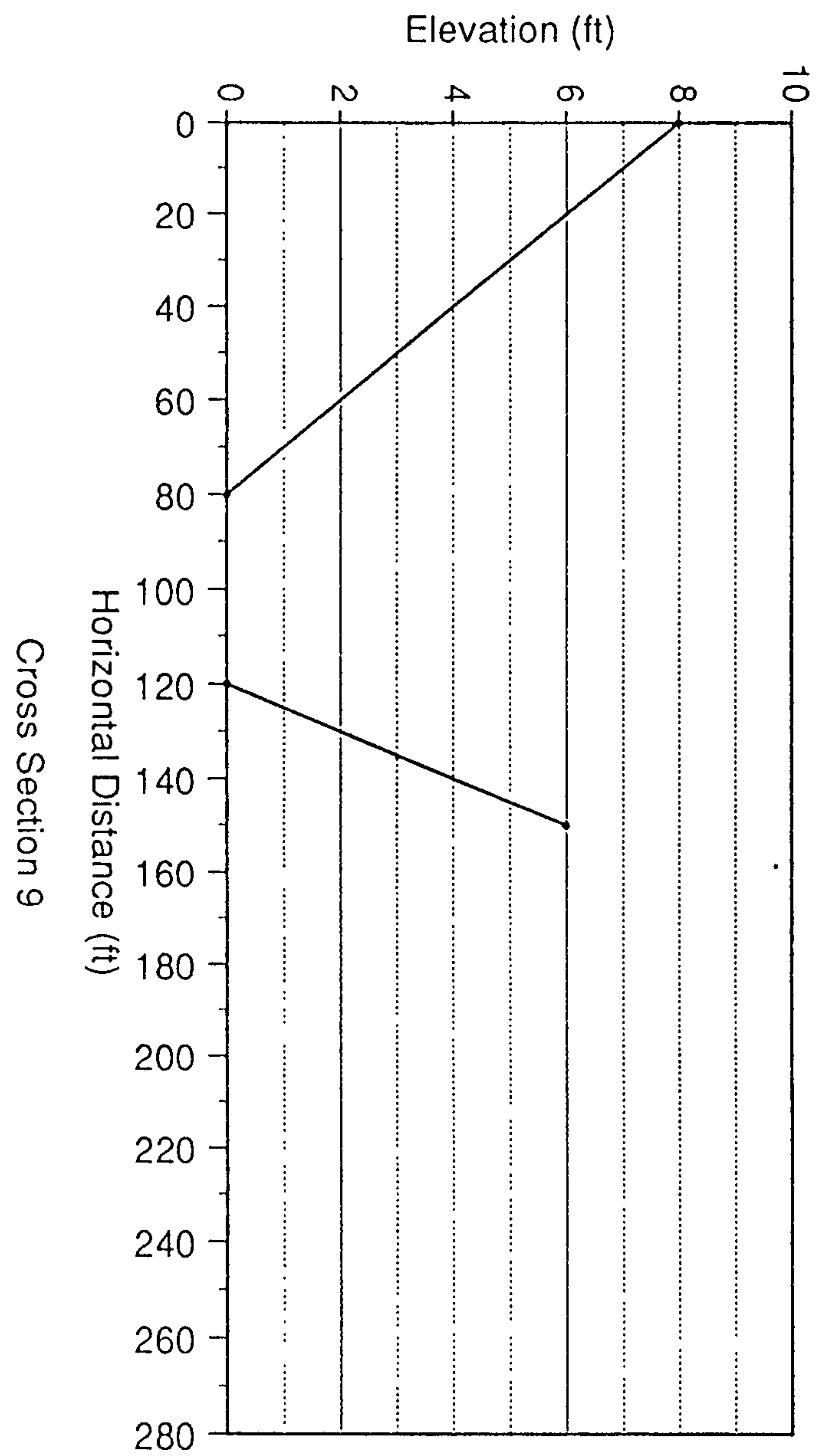
	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO
1	Reach	DA [sm]	L [ft]	s	Vol [af]	Q [cfs]	y [ft]	b(ft)	V [fps]	q [cfs/ft]	F	DRO [in]
2	1	0.595	3200	0.0140	13.6522	141.94	0.861	57.50	2.867	2.469	0.545	0.430
3	2	1.039	2400	0.0120	23.5915	189.39	1.839	19.67	5.237	9.629	0.681	0.426
4	3	1.275	2950	0.0100	4.6635	4.40	0.103	51.45	0.833	0.086	0.458	0.069
5	4	1.439	3600	0.0220	8.3090	30.99	0.191	77.72	2.090	0.399	0.843	0.108
6	5.1	2.131	1050	0.0381	24.2329	293.37	1.891	45.42	3.415	6.460	0.438	0.213
7	5.2	2.131	1050	0.0381	24.2329	293.37	1.396	25.52	8.233	11.497	1.228	0.213
8	6	0.538	400	0.0230	12.4005	227.37	2.187	16.75	6.209	13.577	0.740	0.432
9	7	2.167	2100	0.0200	25.0365	273.50	0.479	113.45	5.033	2.411	1.281	0.217
10	8	0.111	900	0.0270	2.7642	47.51	0.627	23.51	3.223	2.021	0.717	0.467
11	9	0.176	2000	0.0340	3.6489	34.35	0.190	43.16	4.192	0.796	1.695	0.389
12	10	0.031	800	0.0110	0.1332	0.10	0.079	2.19	0.578	0.046	0.362	0.081
13	11	0.058	1000	0.0620	0.7516	12.94	0.520	5.08	4.902	2.546	1.198	0.243
14	12	2.401	700	0.0400	29.4225	303.14	1.976	18.02	8.515	16.823	1.067	0.230
15	13	0.096	3500	0.0330	2.2028	30.13	0.707	10.73	3.976	2.809	0.833	0.430
16	14.1	2.717	4400	0.0200	37.3963	325.59	1.006	58.37	5.546	5.578	0.975	0.258
17	14.2	2.717	4400	0.0200	37.3963	325.59	0.970	62.82	5.342	5.183	0.956	0.258
18	15	2.882	1200	0.0300	41.7691	359.75	2.499	16.71	8.617	21.534	0.961	0.272
19	16	0.134	2150	0.0300	3.5386	78.53	1.120	14.03	4.997	5.597	0.832	0.495
20	17	3.368	550	0.0350	54.5323	481.81	1.366	57.08	6.181	8.441	0.932	0.304
21	18	0.190	5400	0.0090	4.3596	26.24	0.263	57.06	1.751	0.460	0.602	0.430
22	19	0.401	6500	0.0200	9.2405	56.80	0.560	25.69	3.947	2.211	0.929	0.432
23	20	1.003	2300	0.0220	23.6219	269.58	1.584	33.03	5.153	8.161	0.722	0.442
24	21	1.223	2500	0.0230	28.8766	334.82	1.782	26.96	6.969	12.420	0.920	0.443
25	22	4.765	2400	0.0200	87.3441	846.99	5.531	14.95	10.244	56.655	0.768	0.344
26	23	0.195	2400	0.0170	4.7821	91.32	0.468	67.79	2.880	1.347	0.742	0.460
27	24	0.310	2600	0.0137	7.5511	88.91	0.460	80.72	2.395	1.101	0.622	0.457
28	25	0.552	2600	0.0211	13.1106	135.69	0.786	43.69	3.950	3.106	0.785	0.445

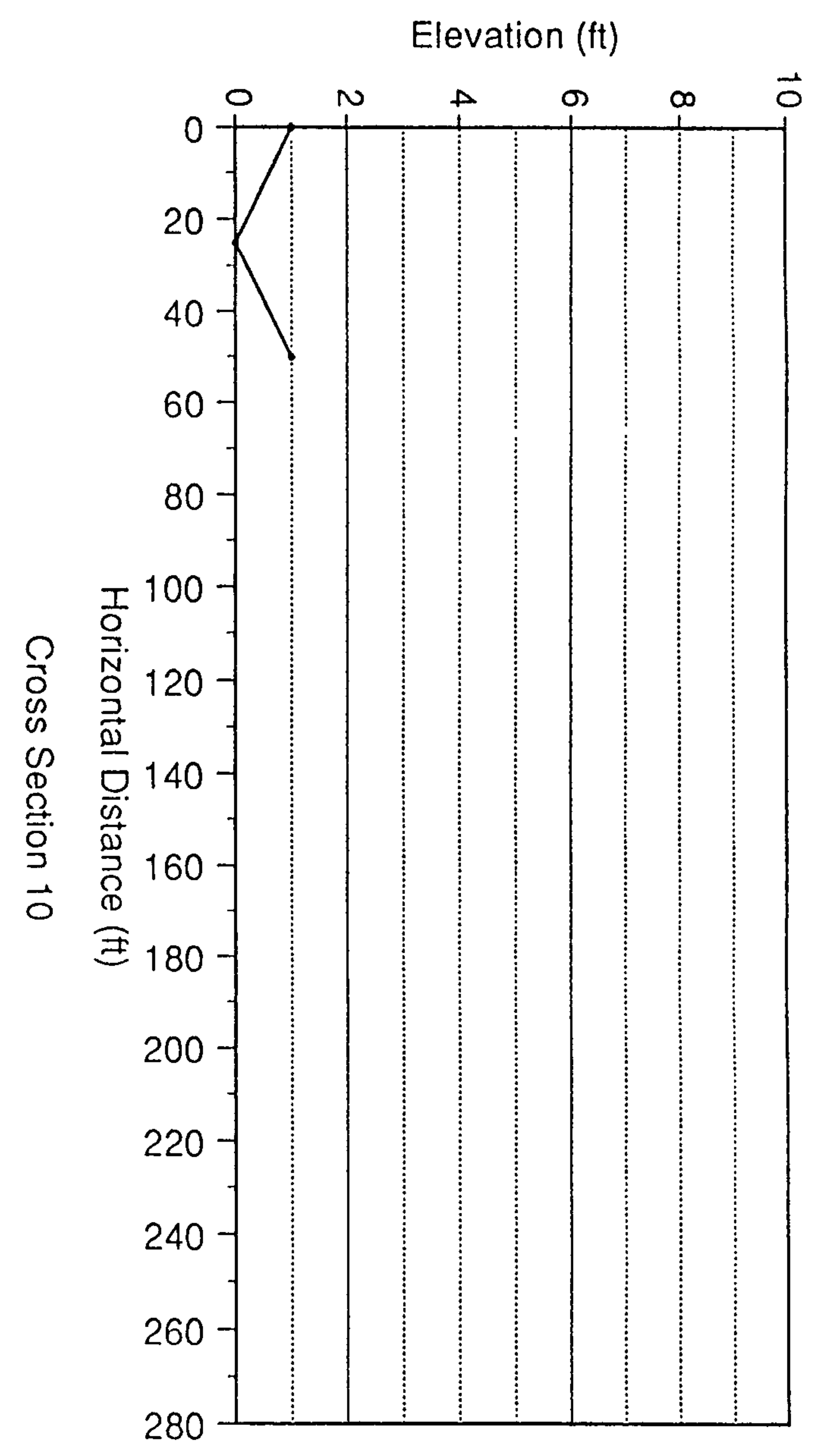
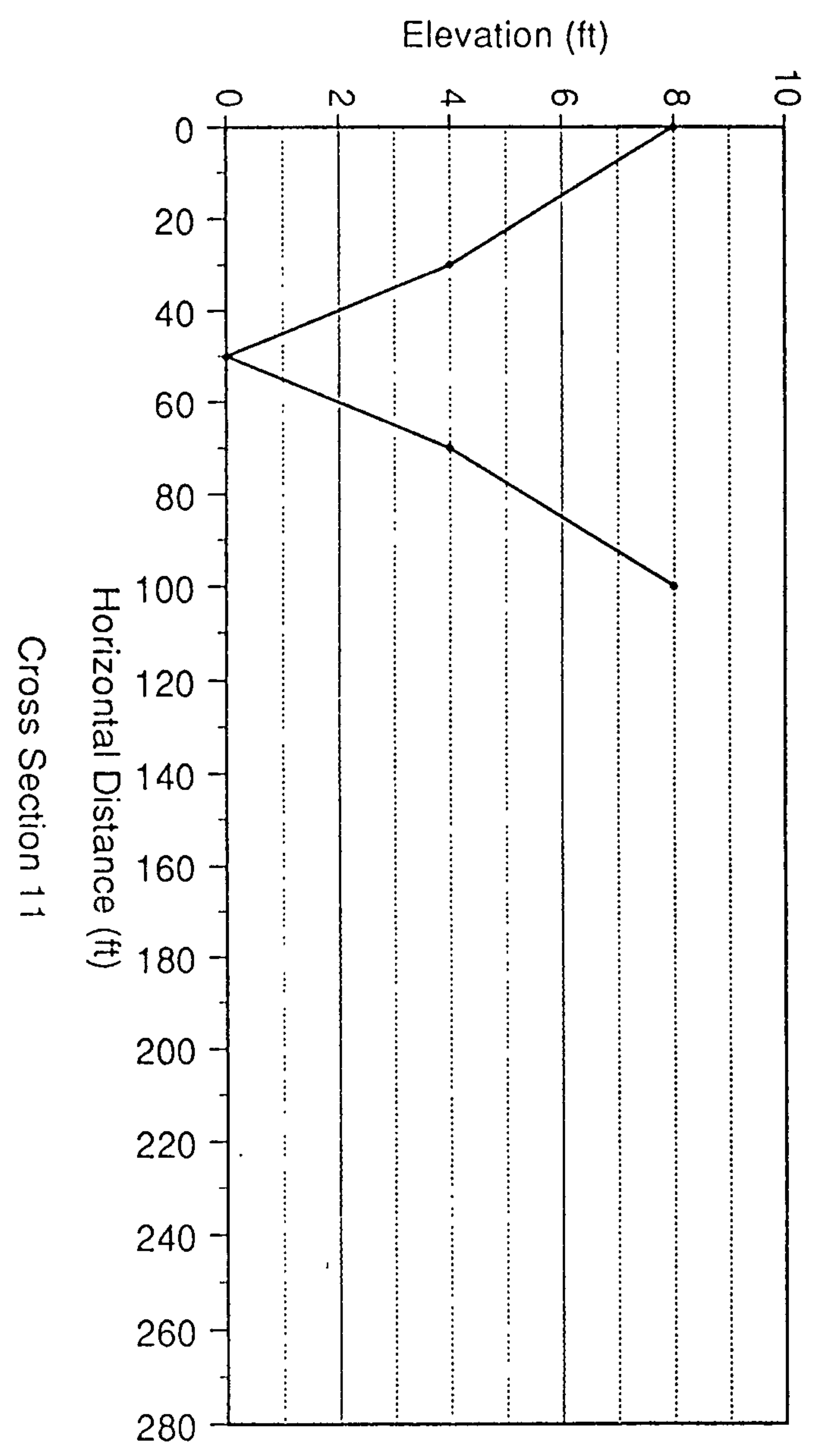


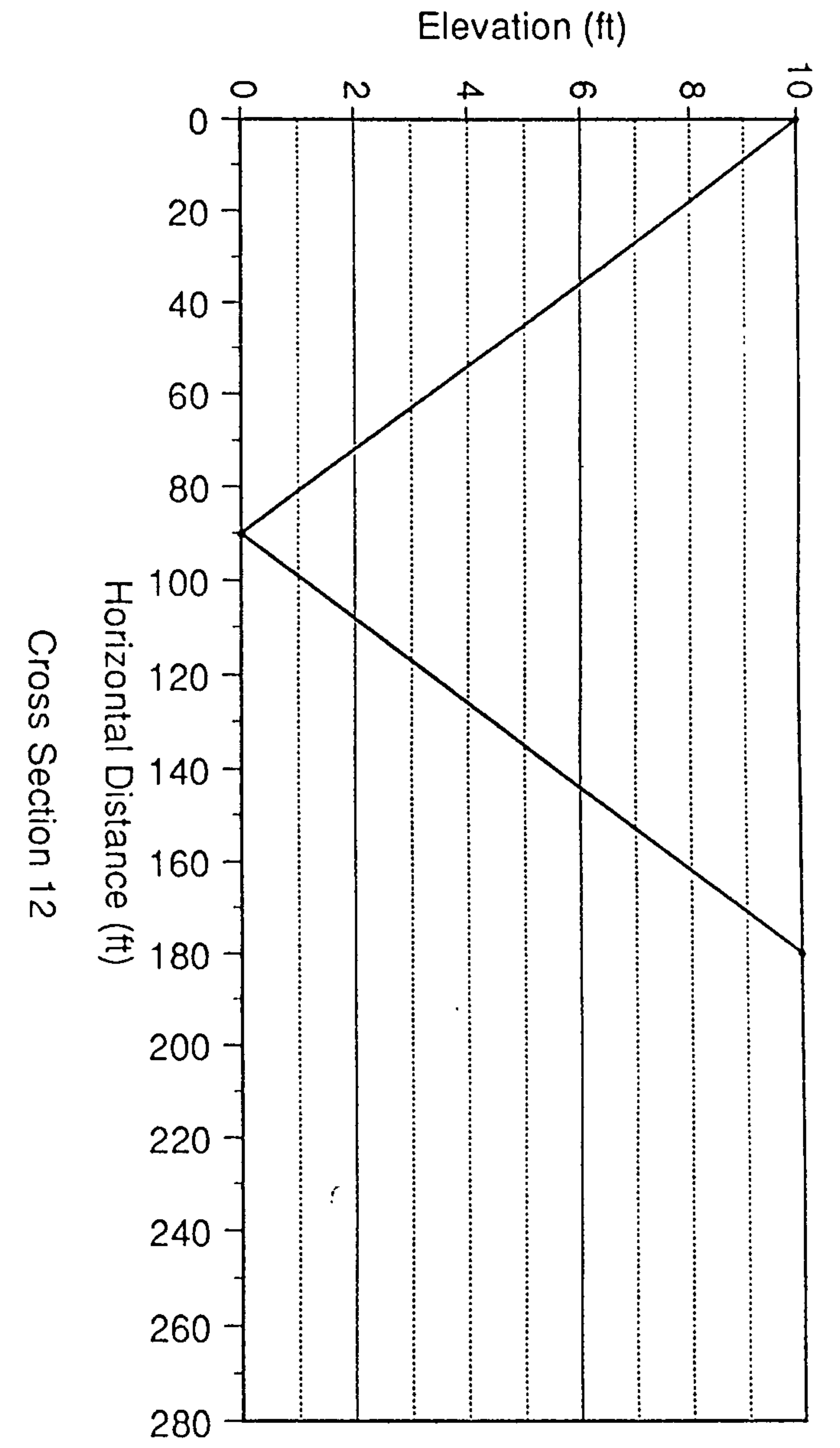
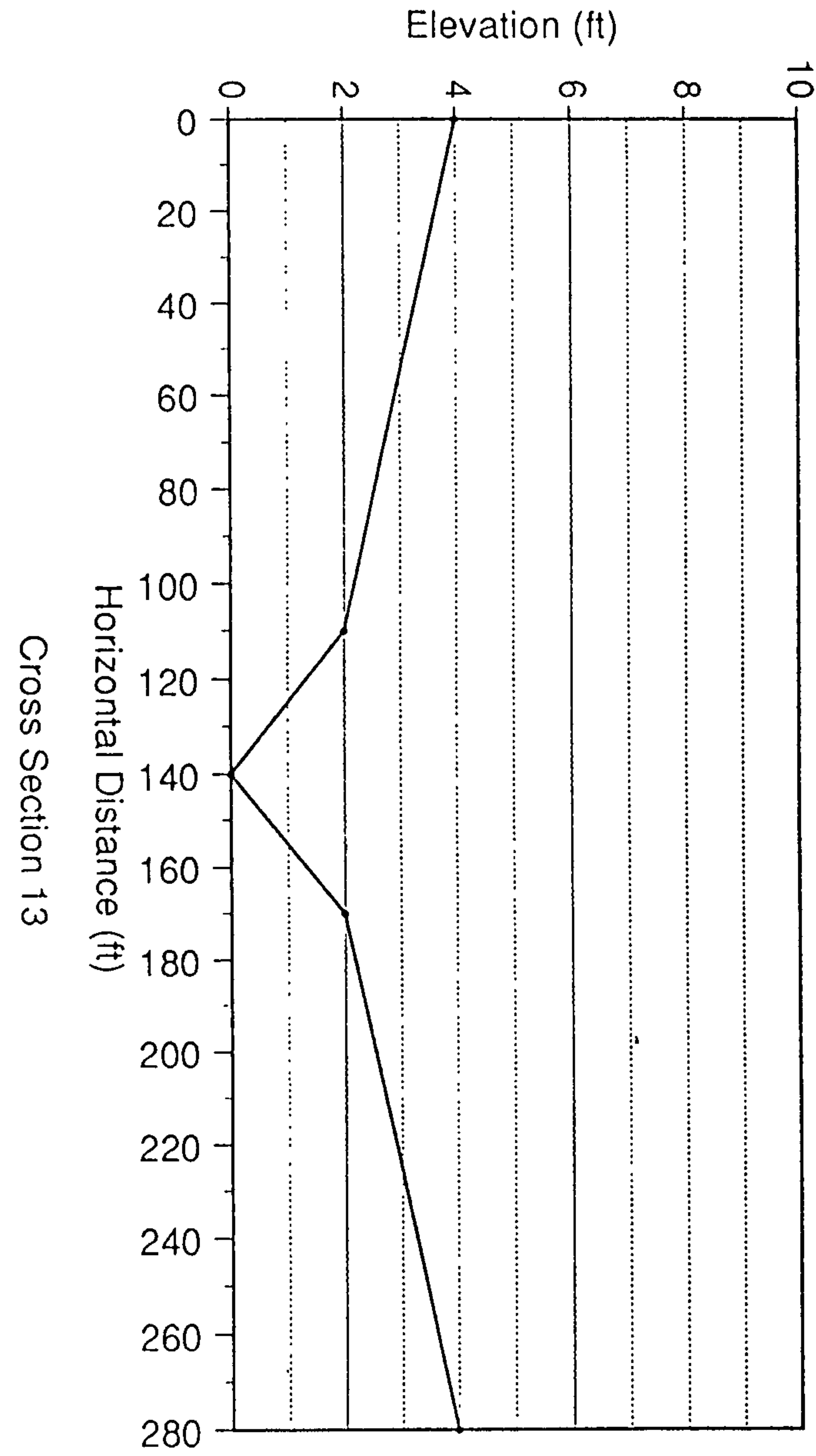


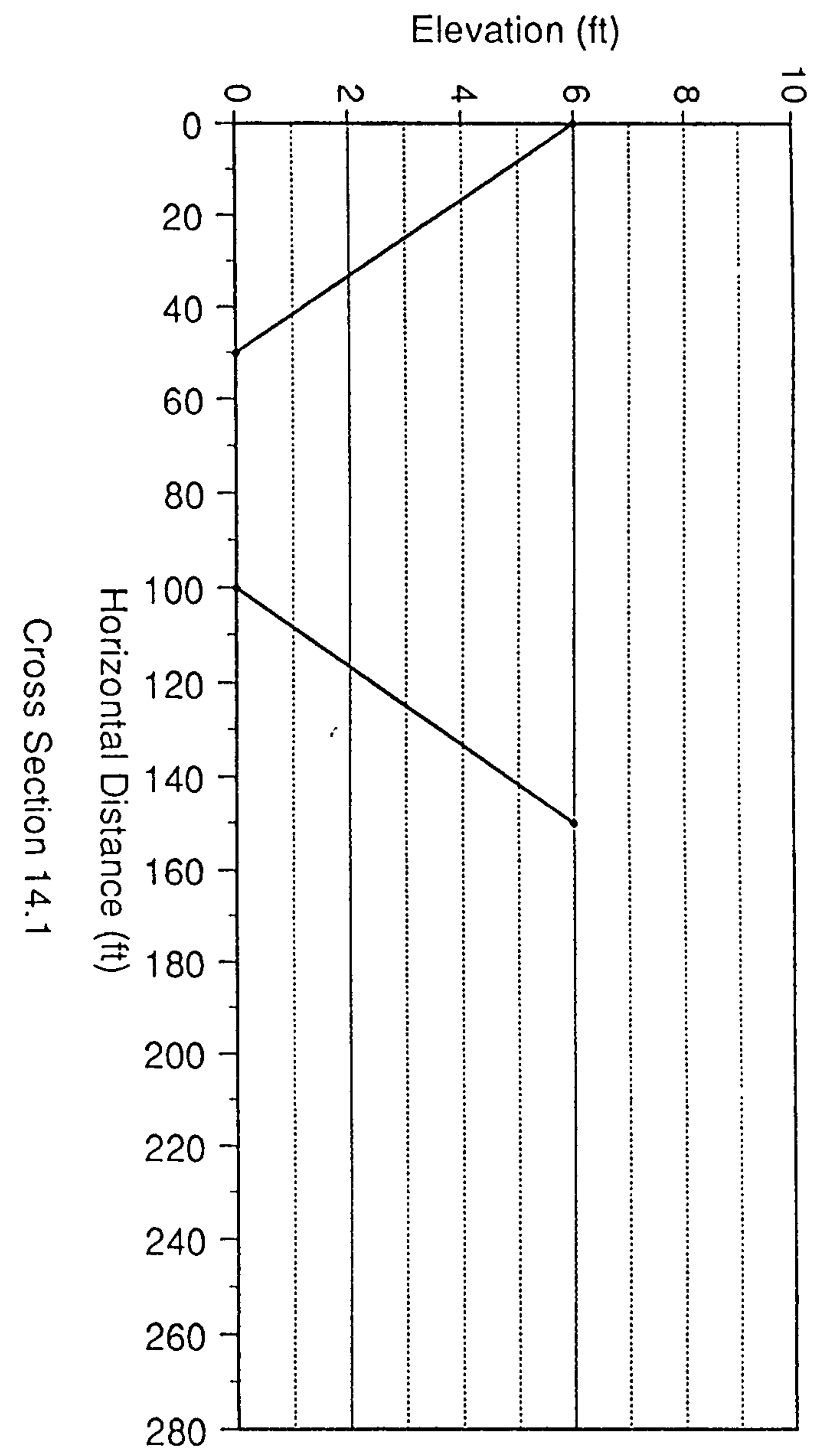
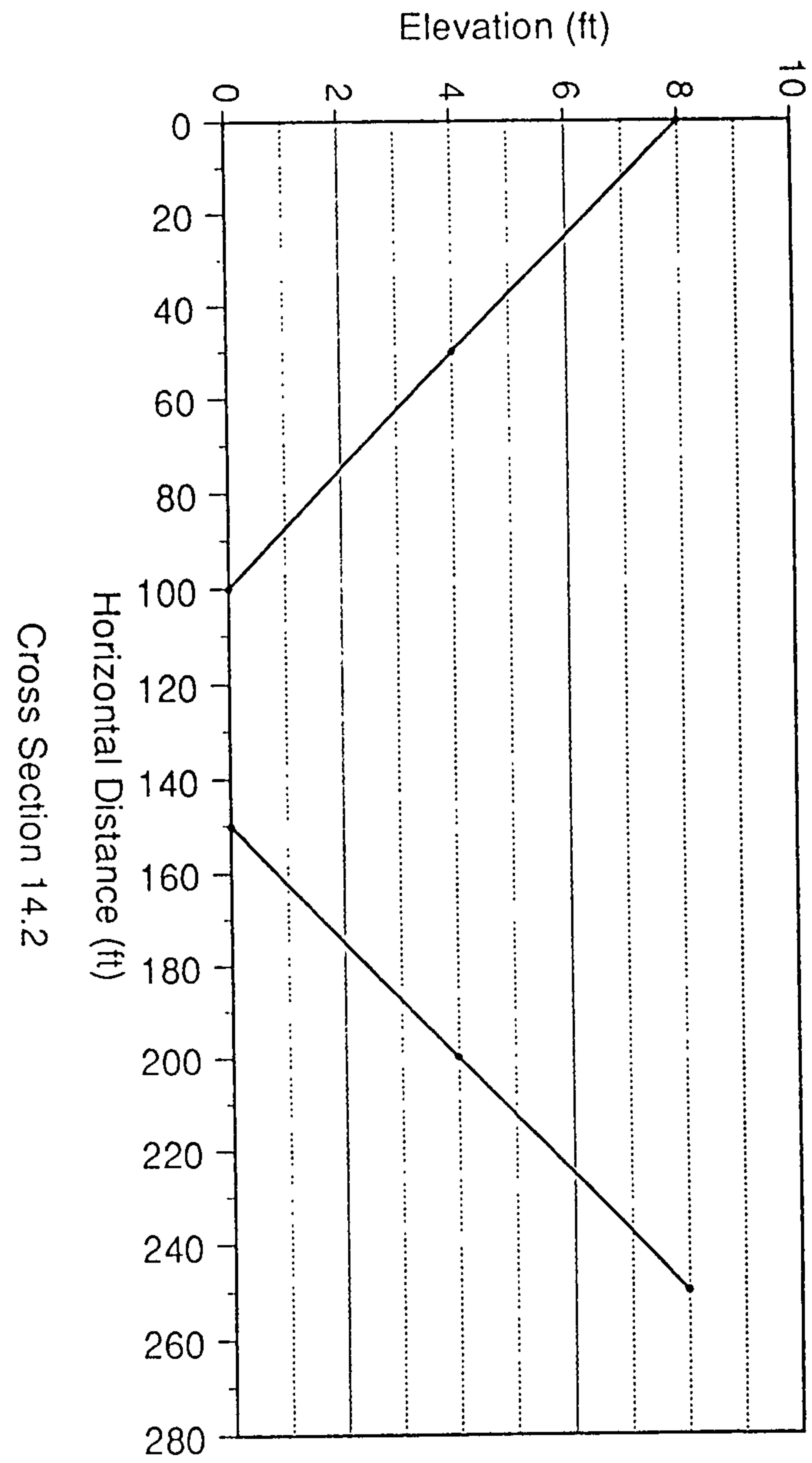


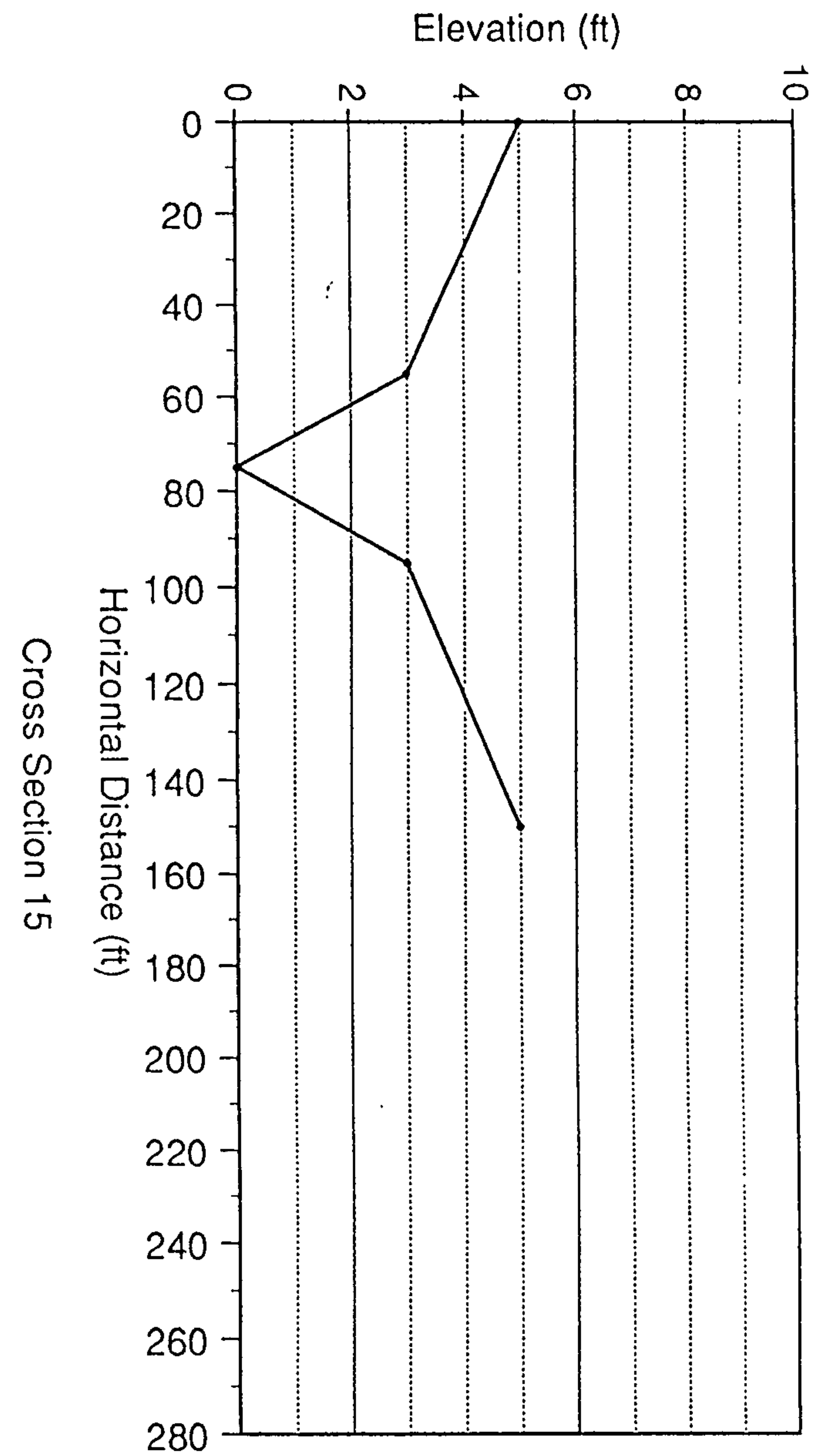
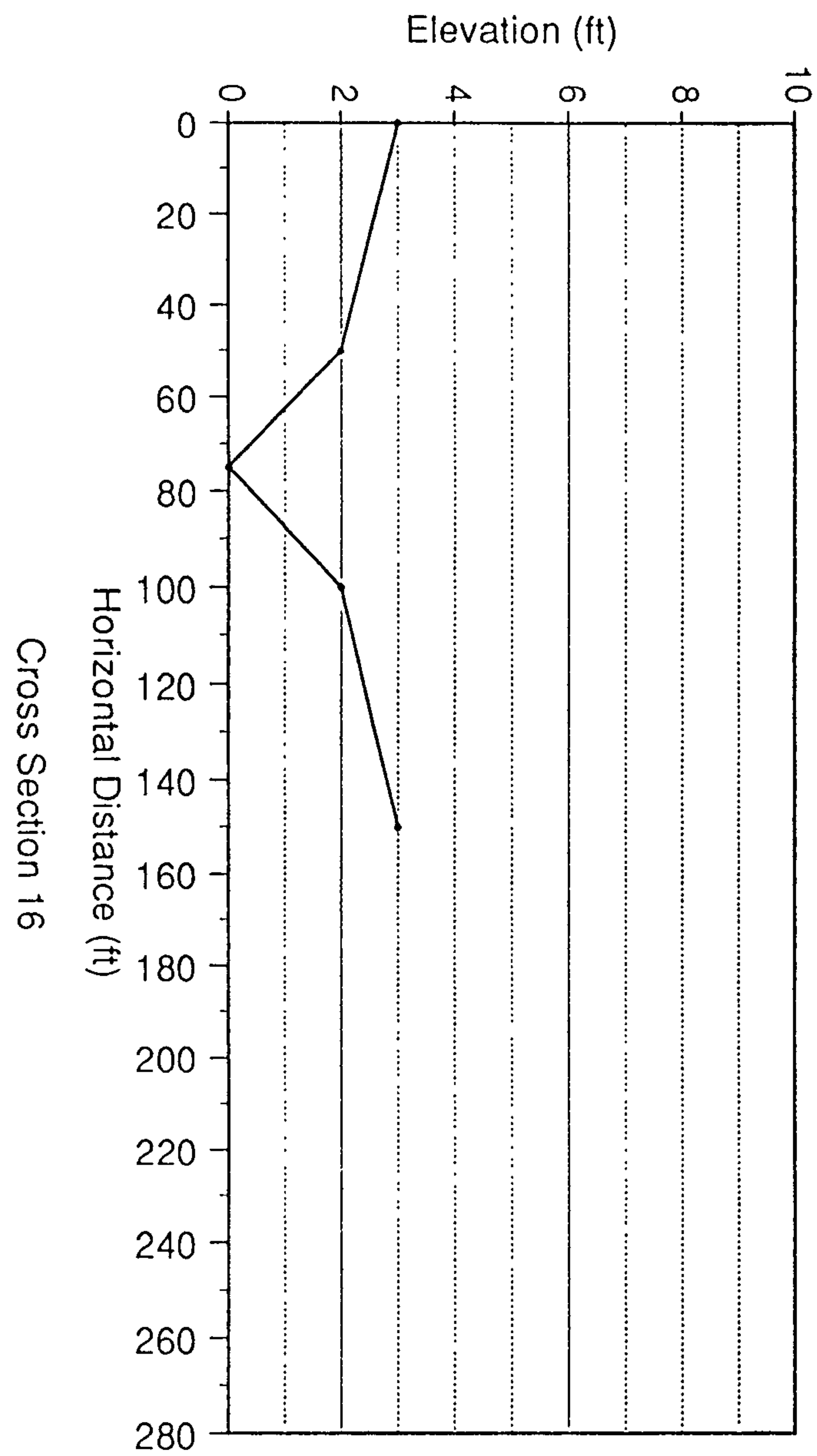


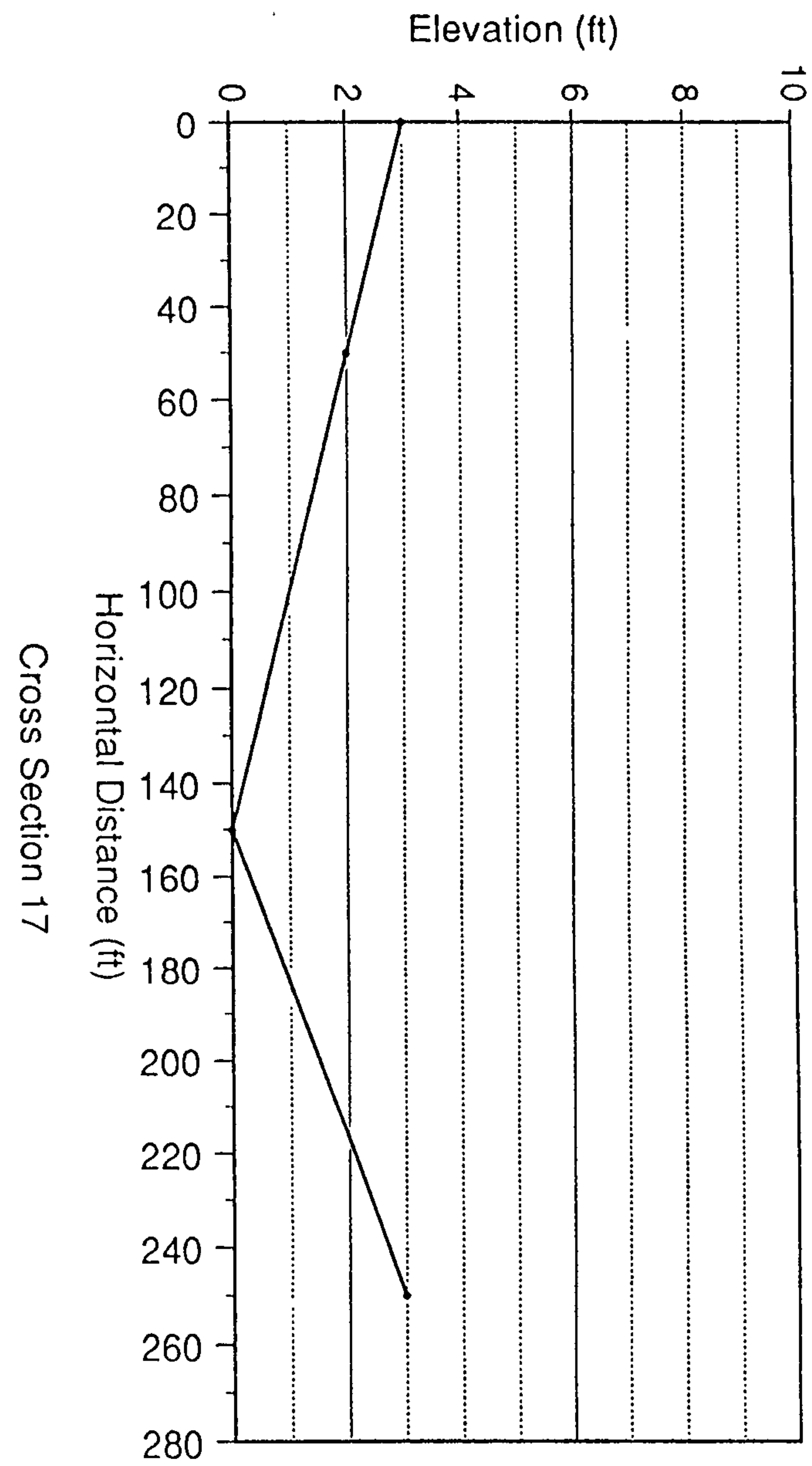
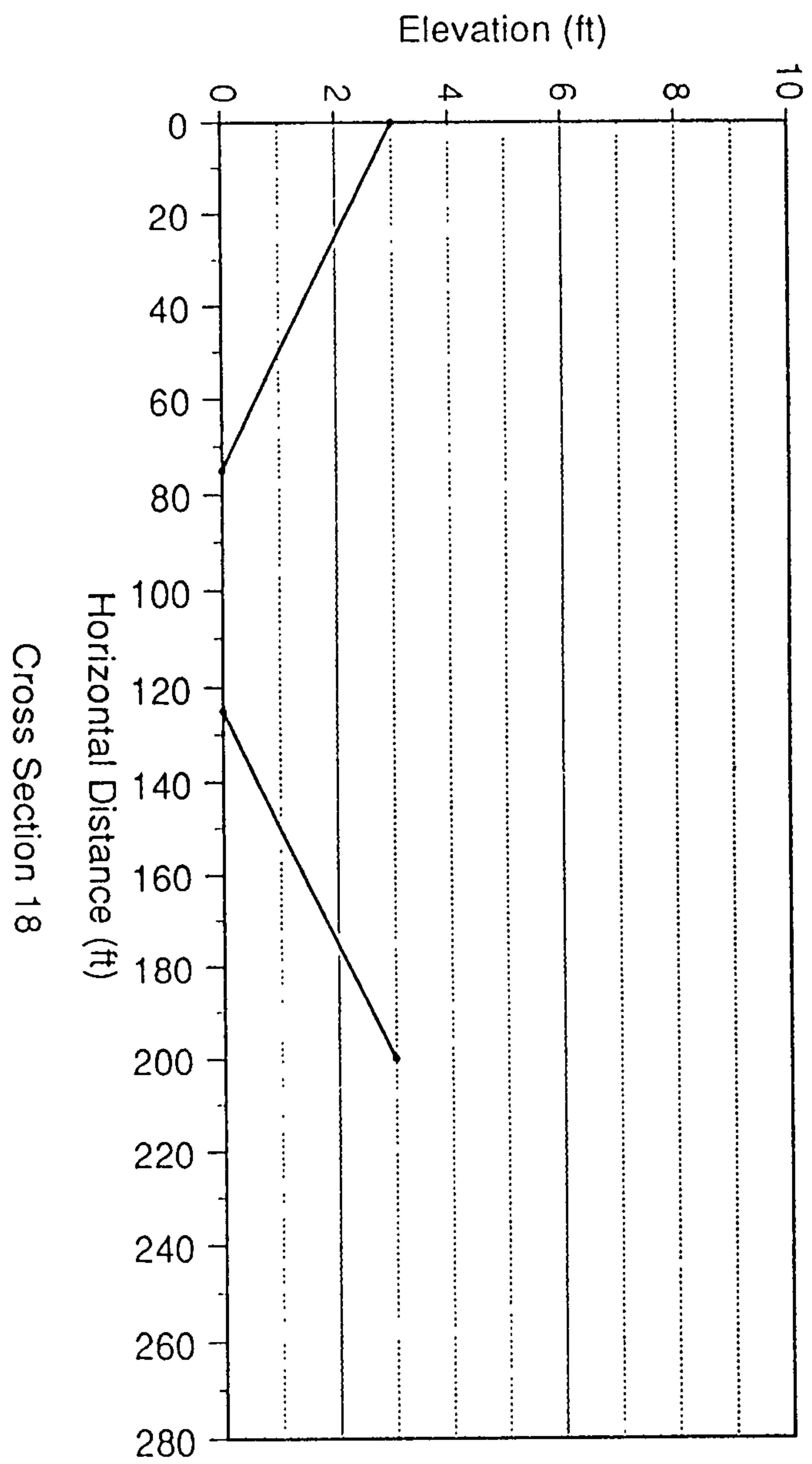


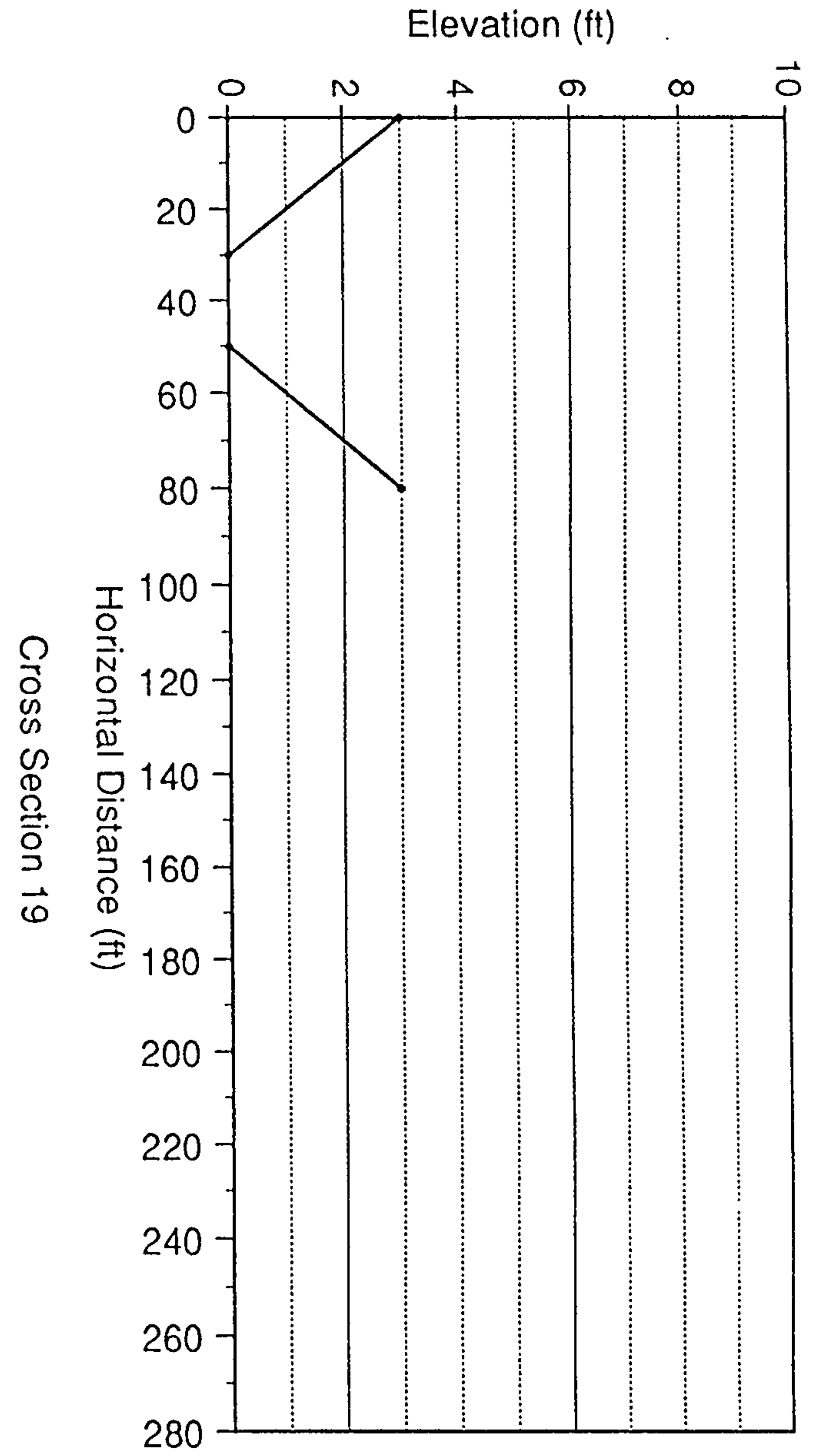
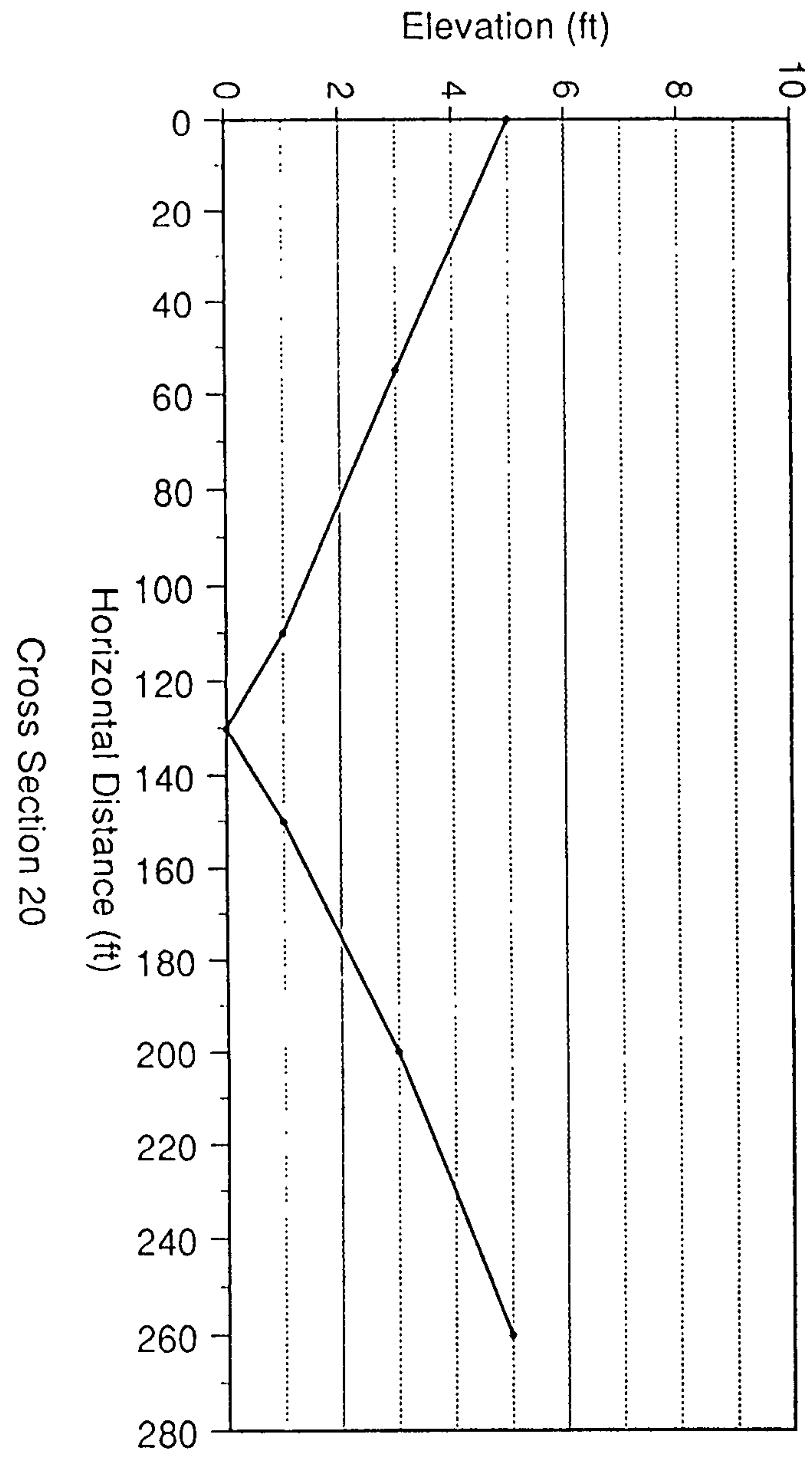


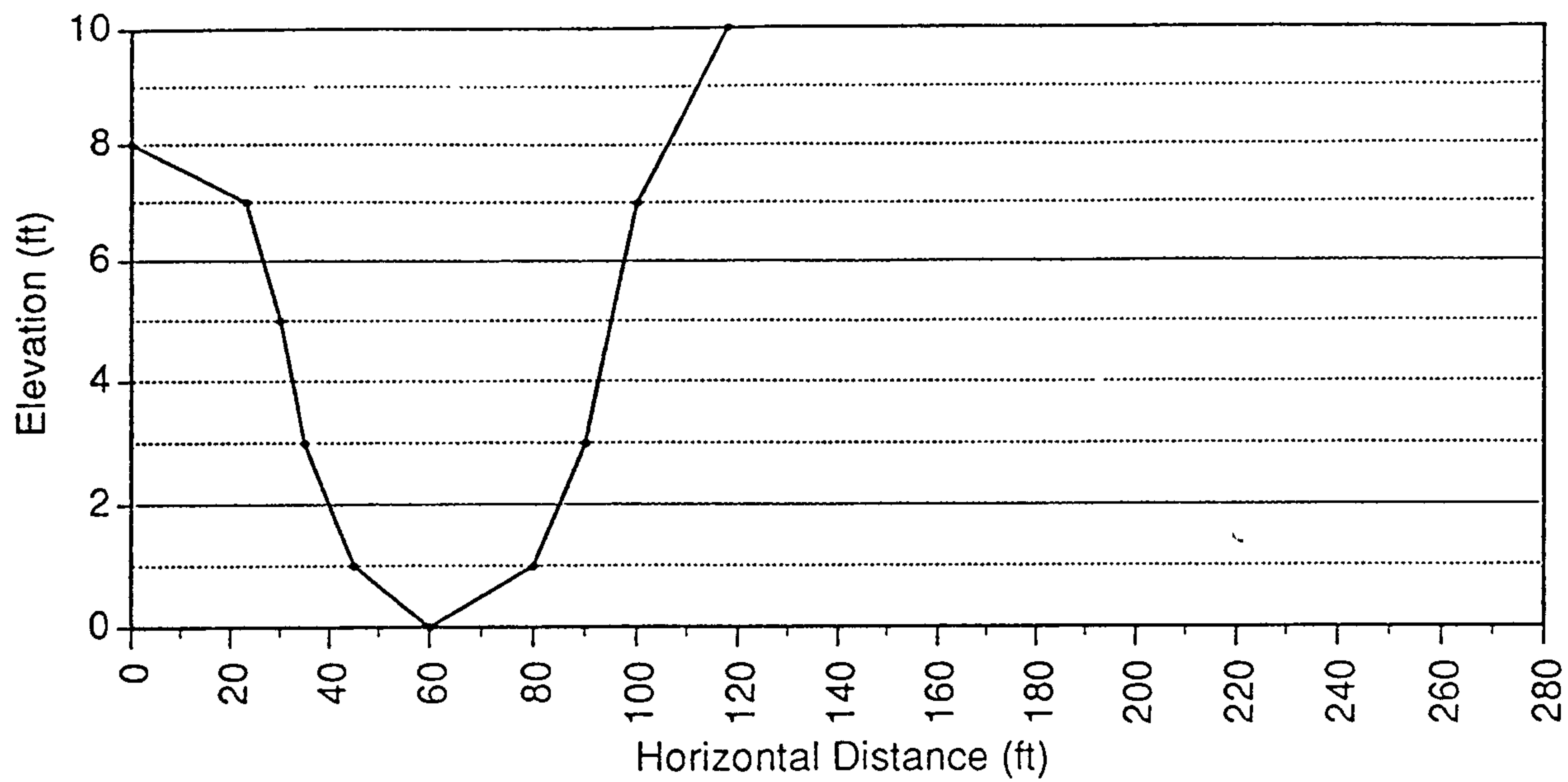




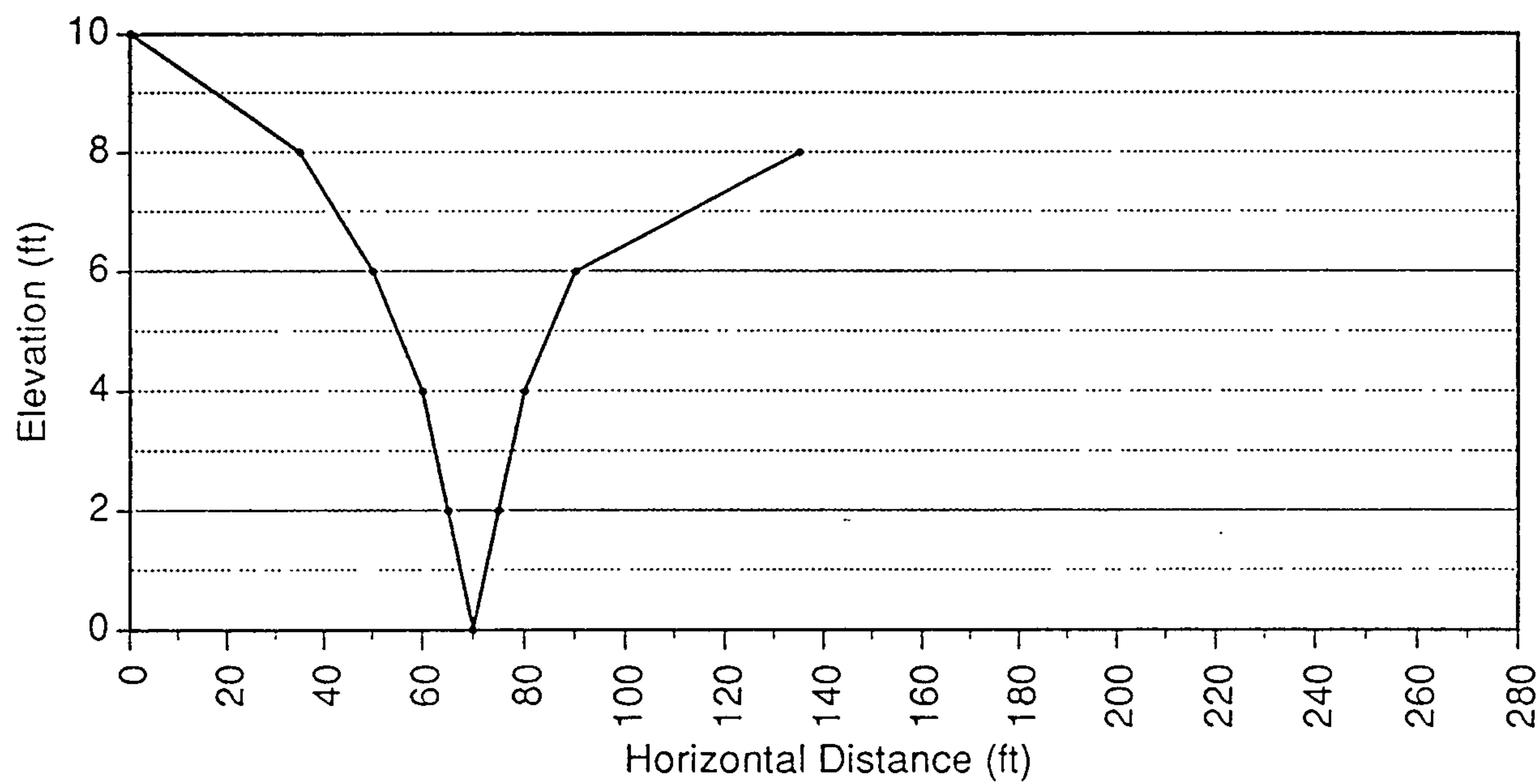




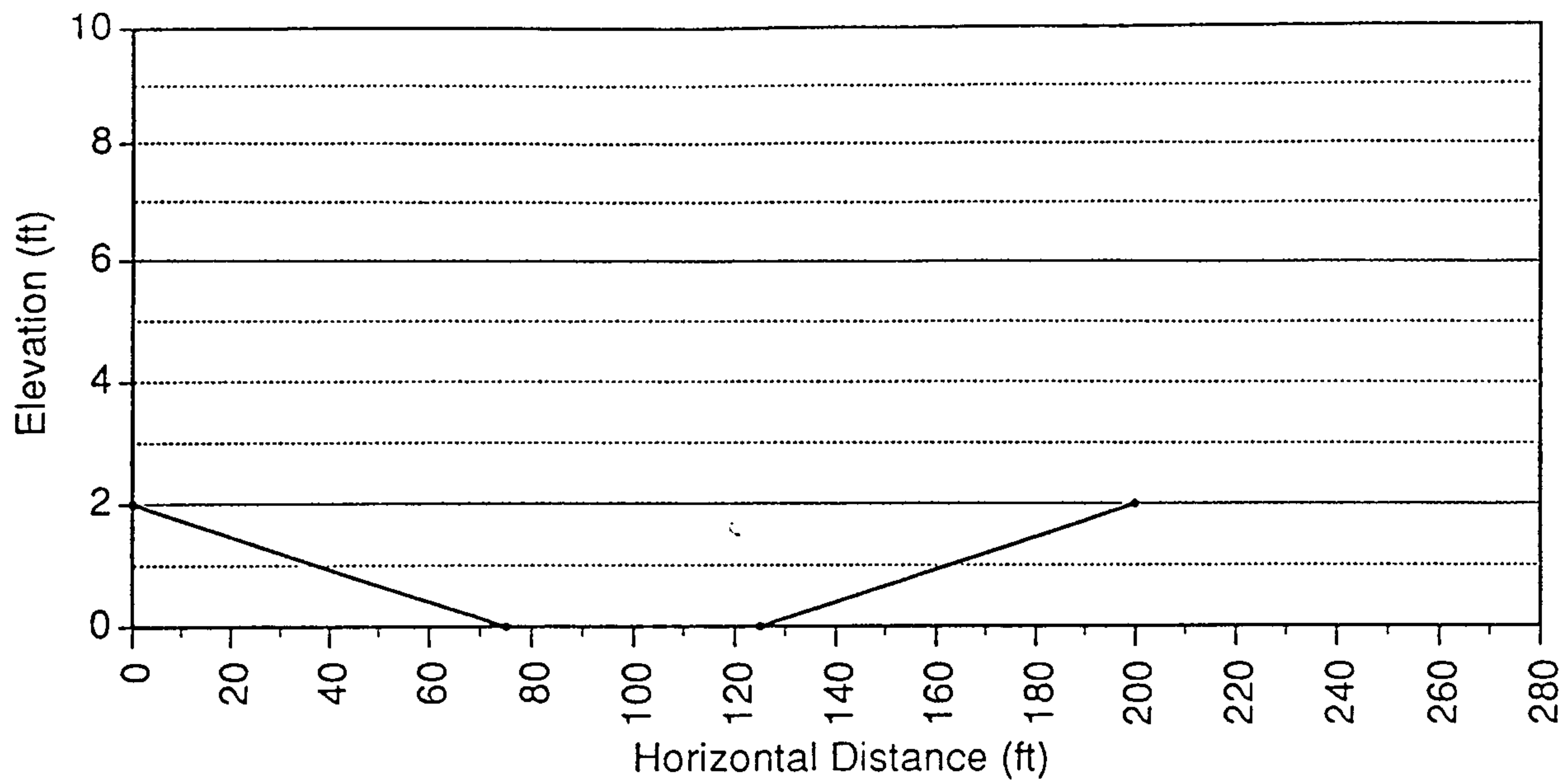




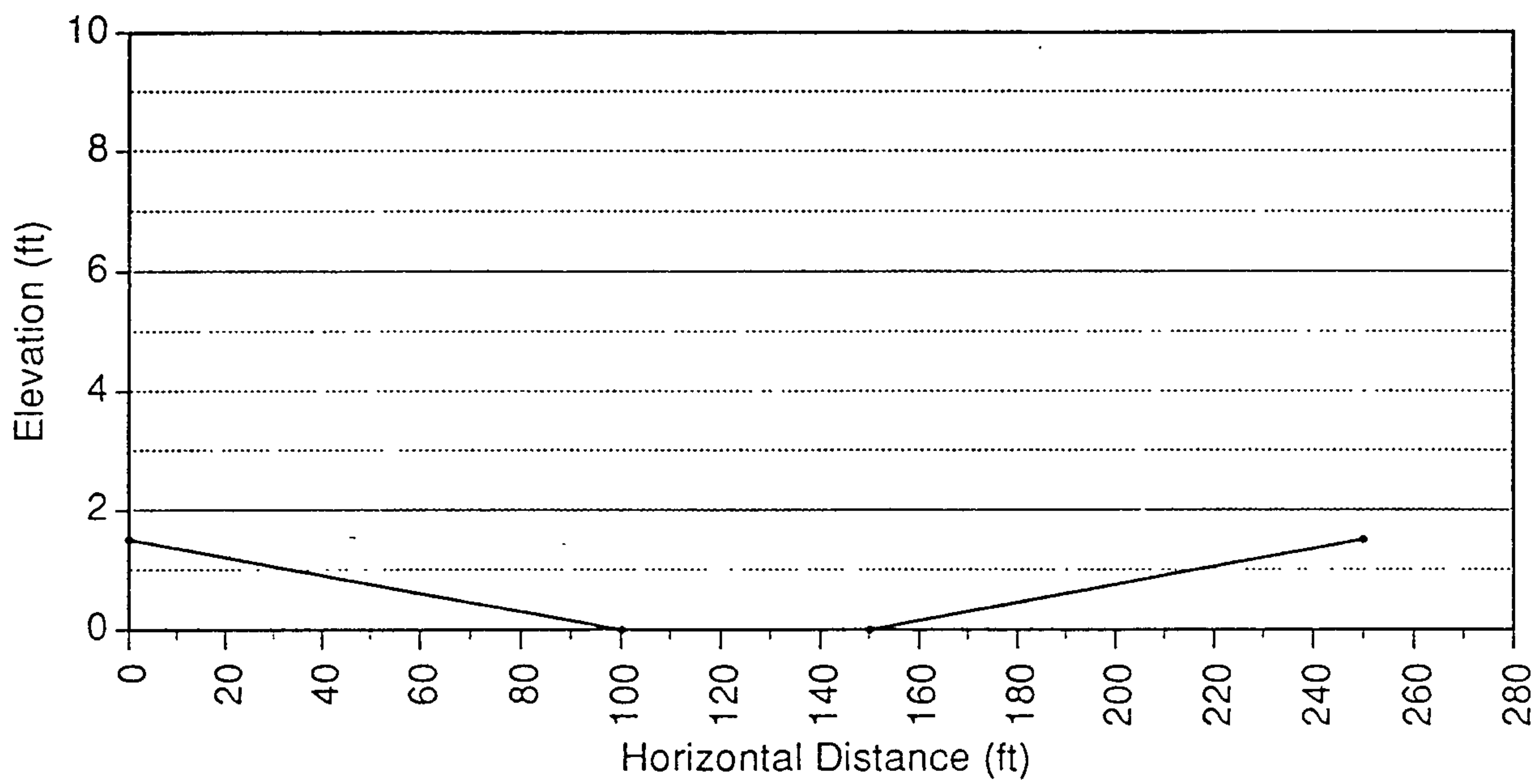
Cross Section 21



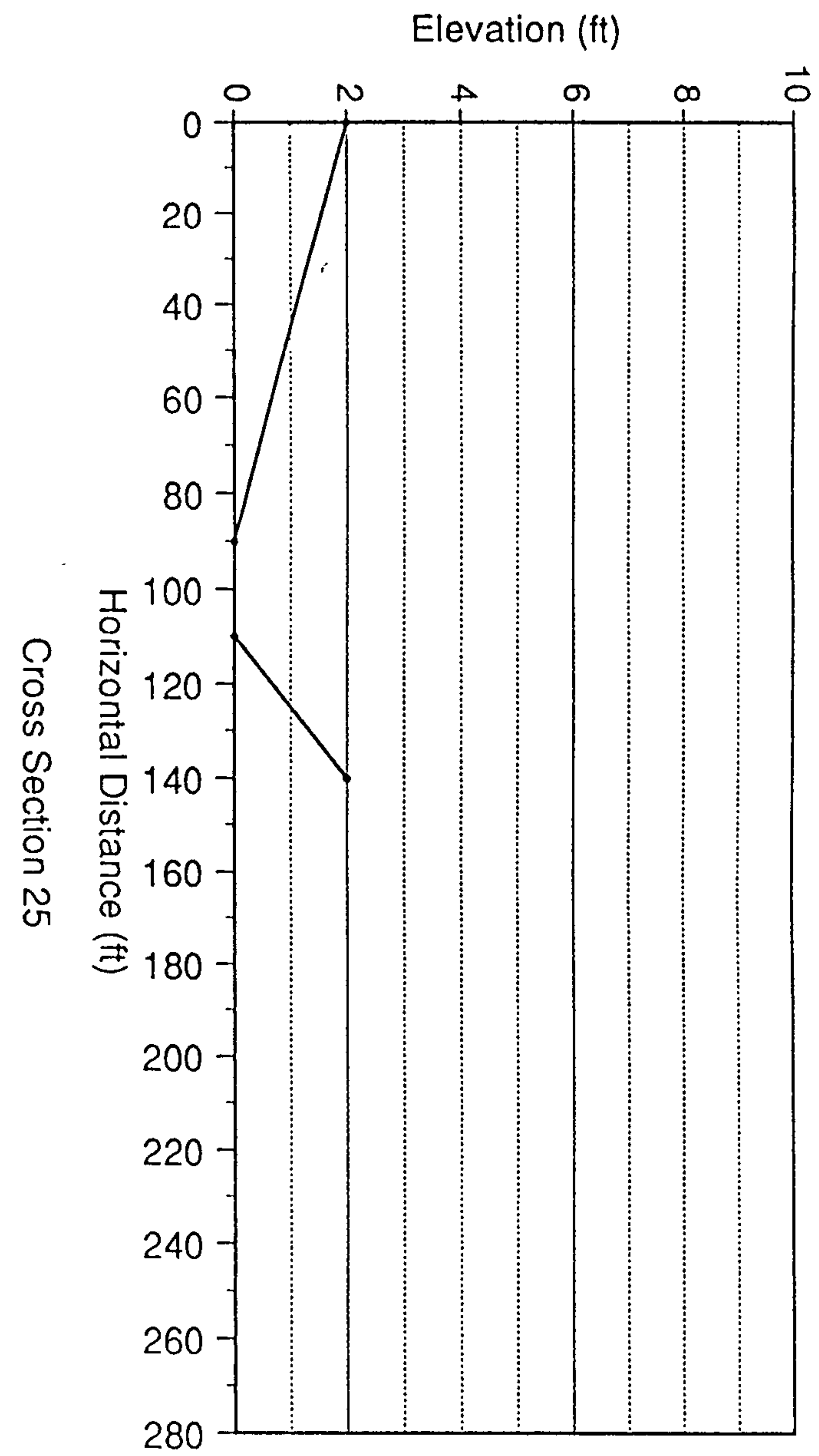
Cross Section 22

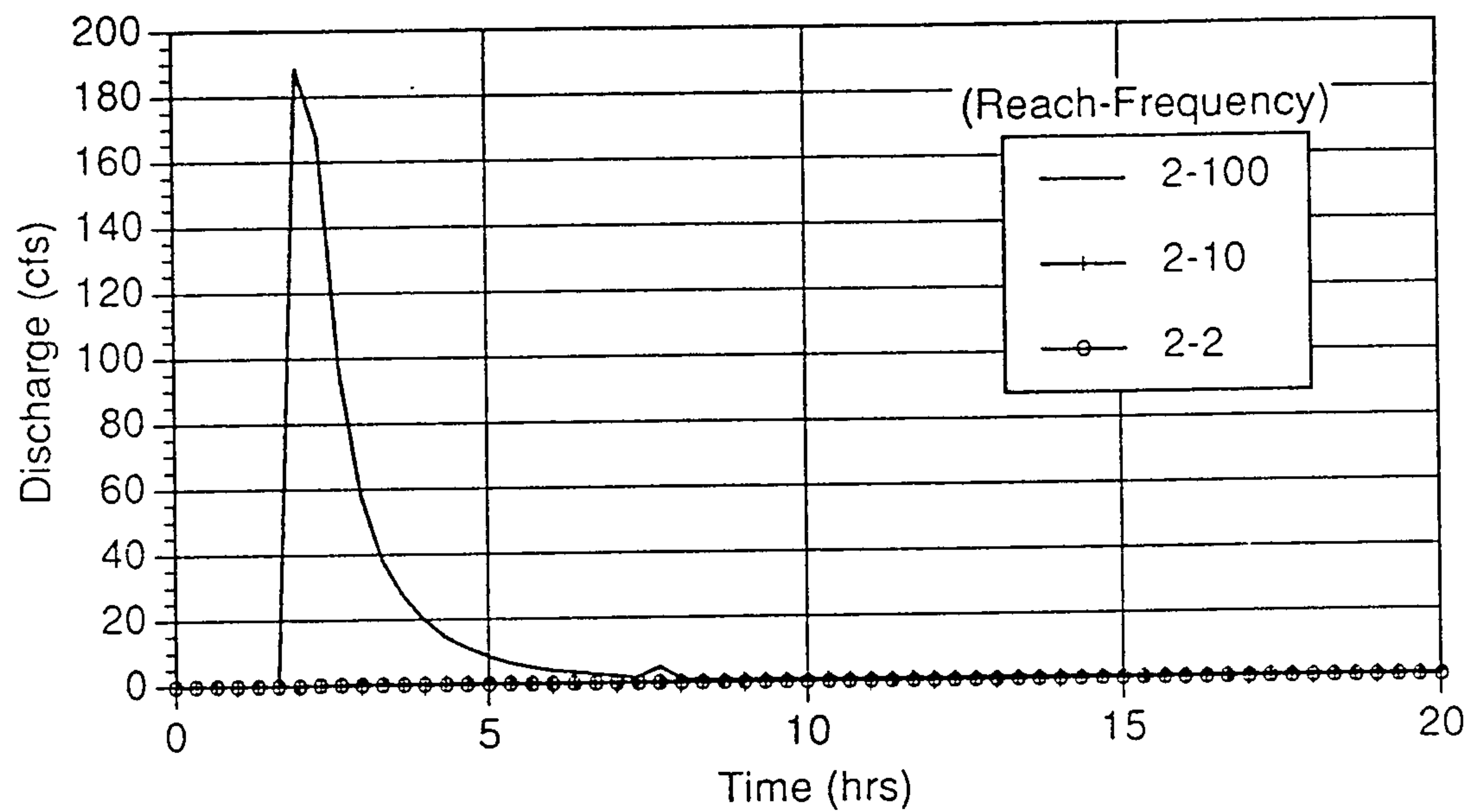
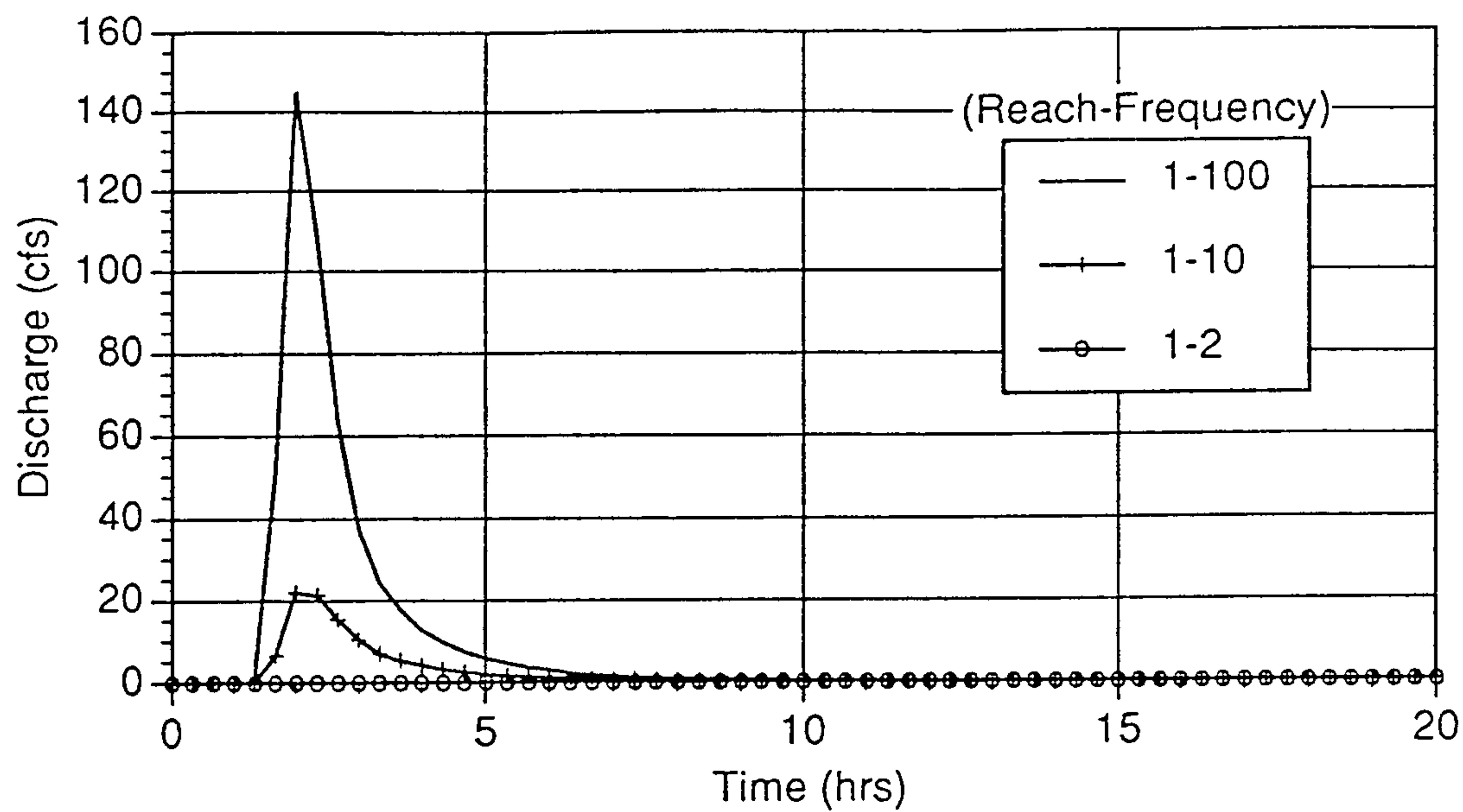


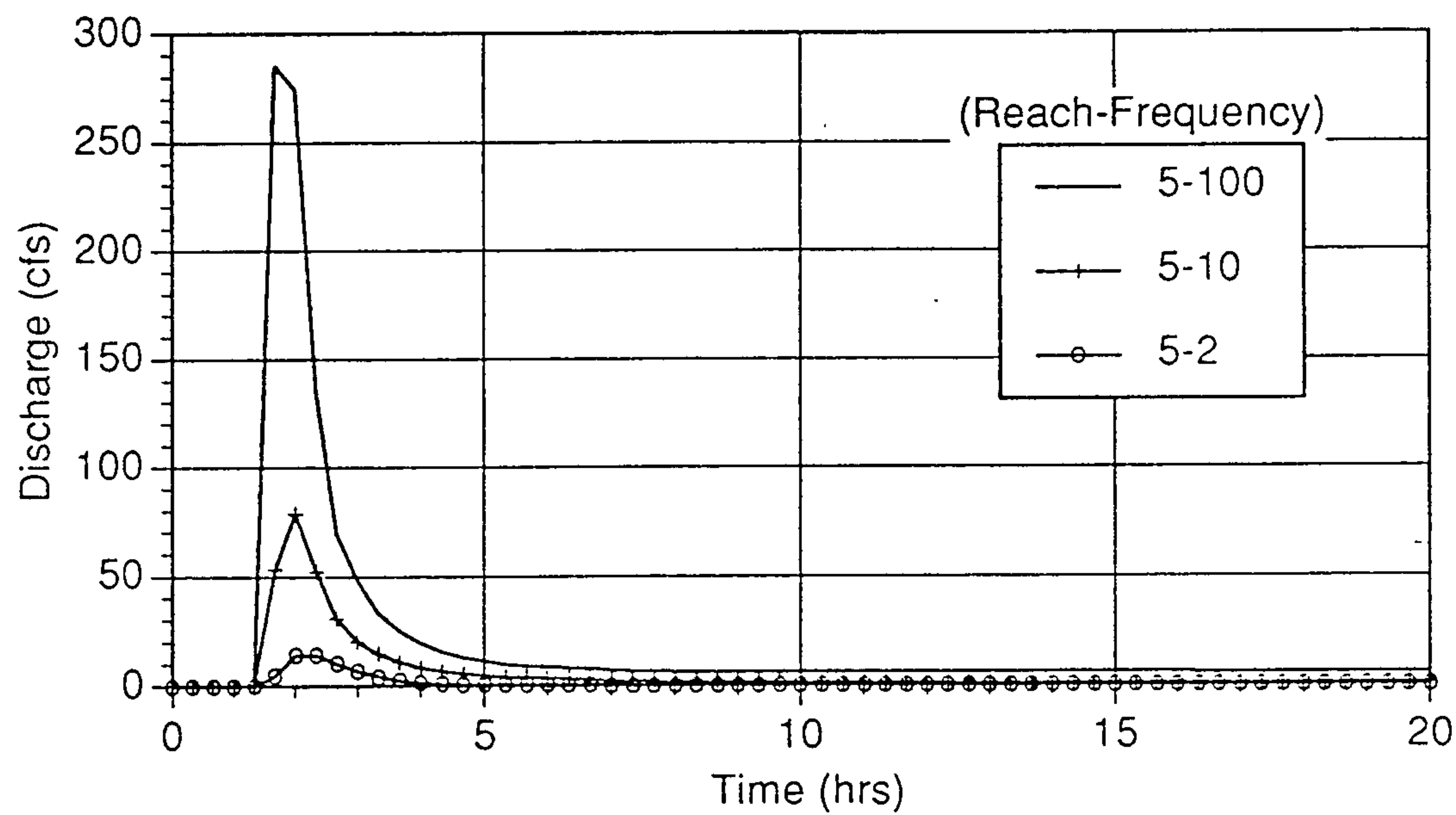
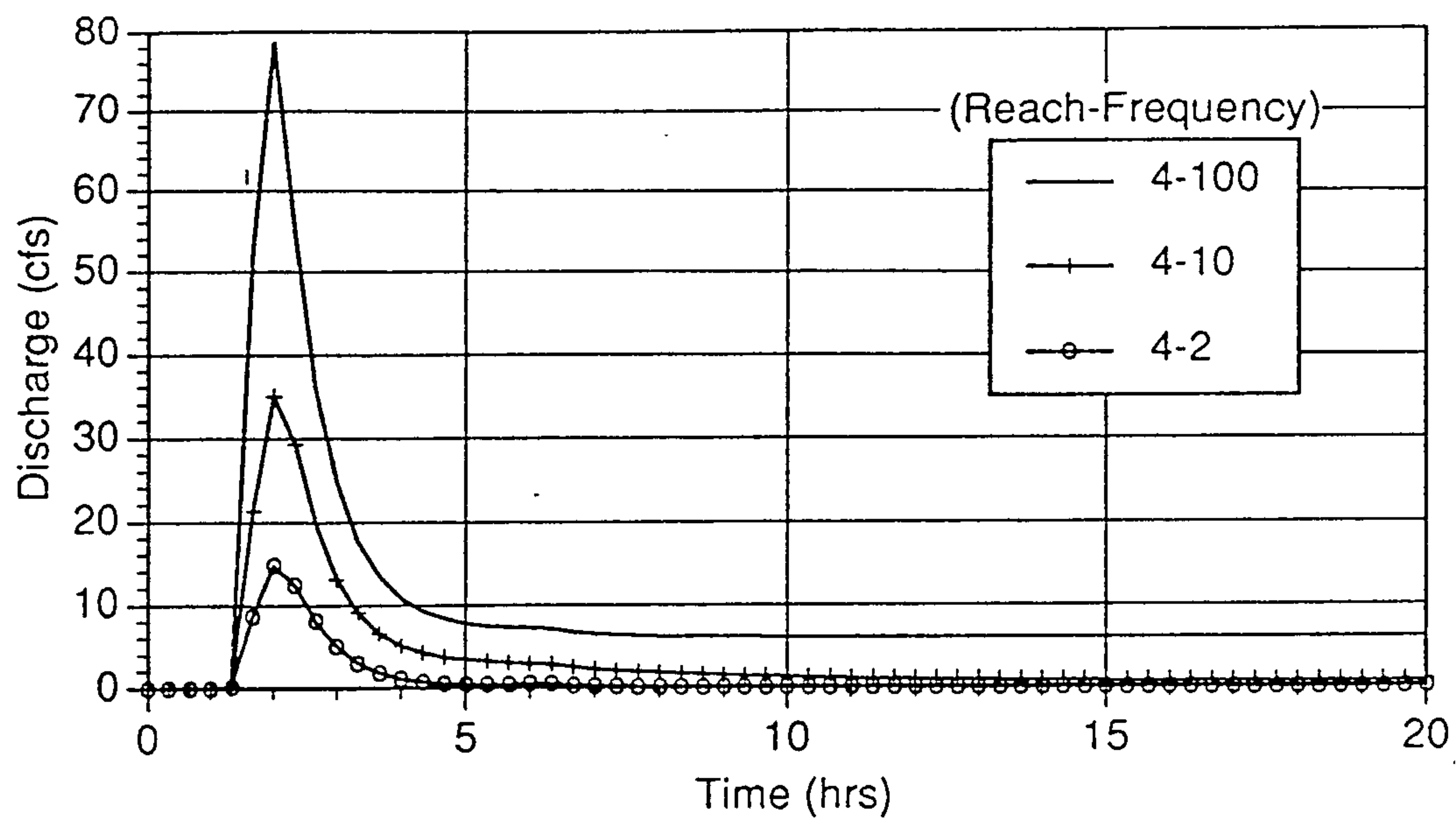
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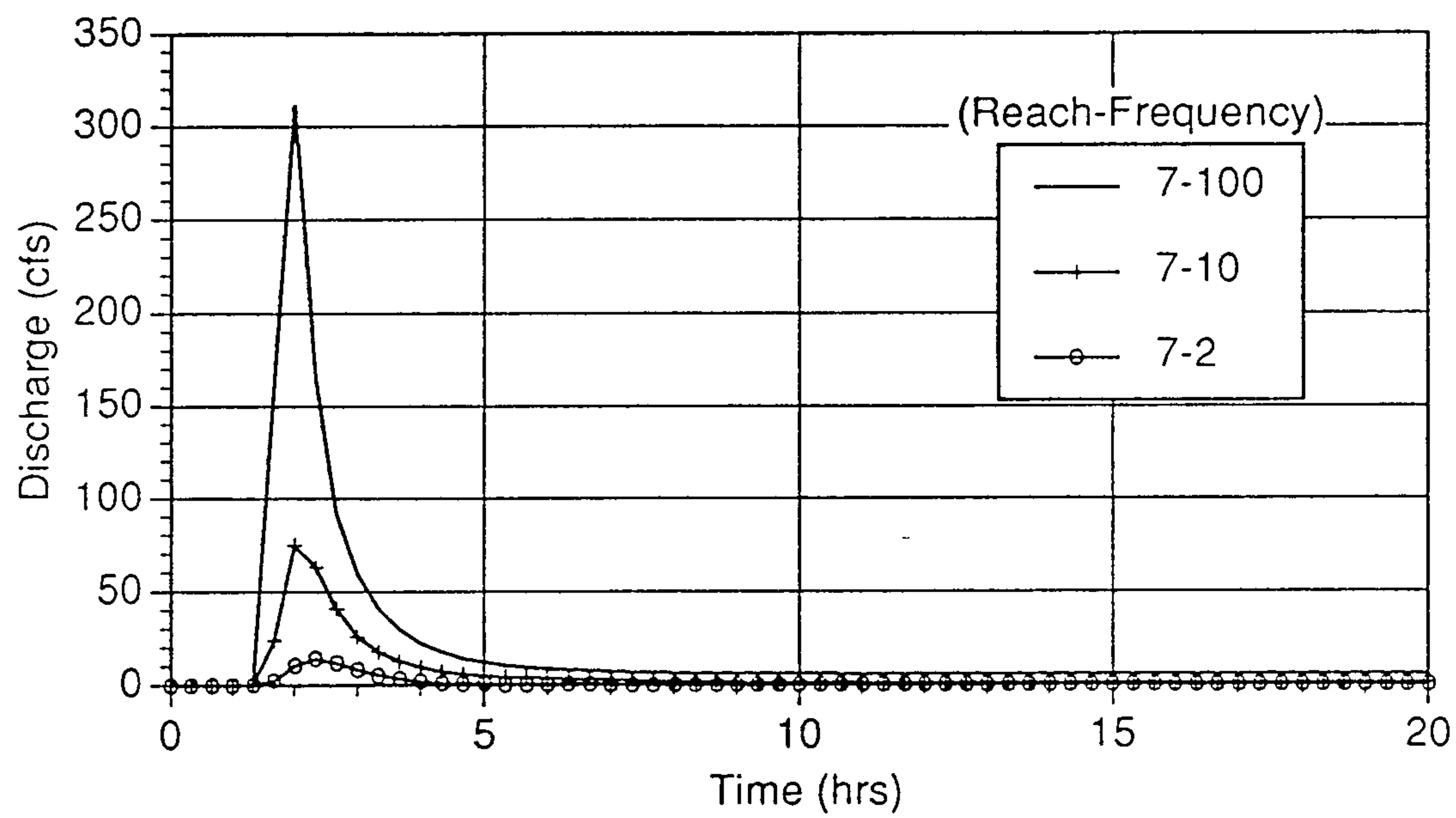
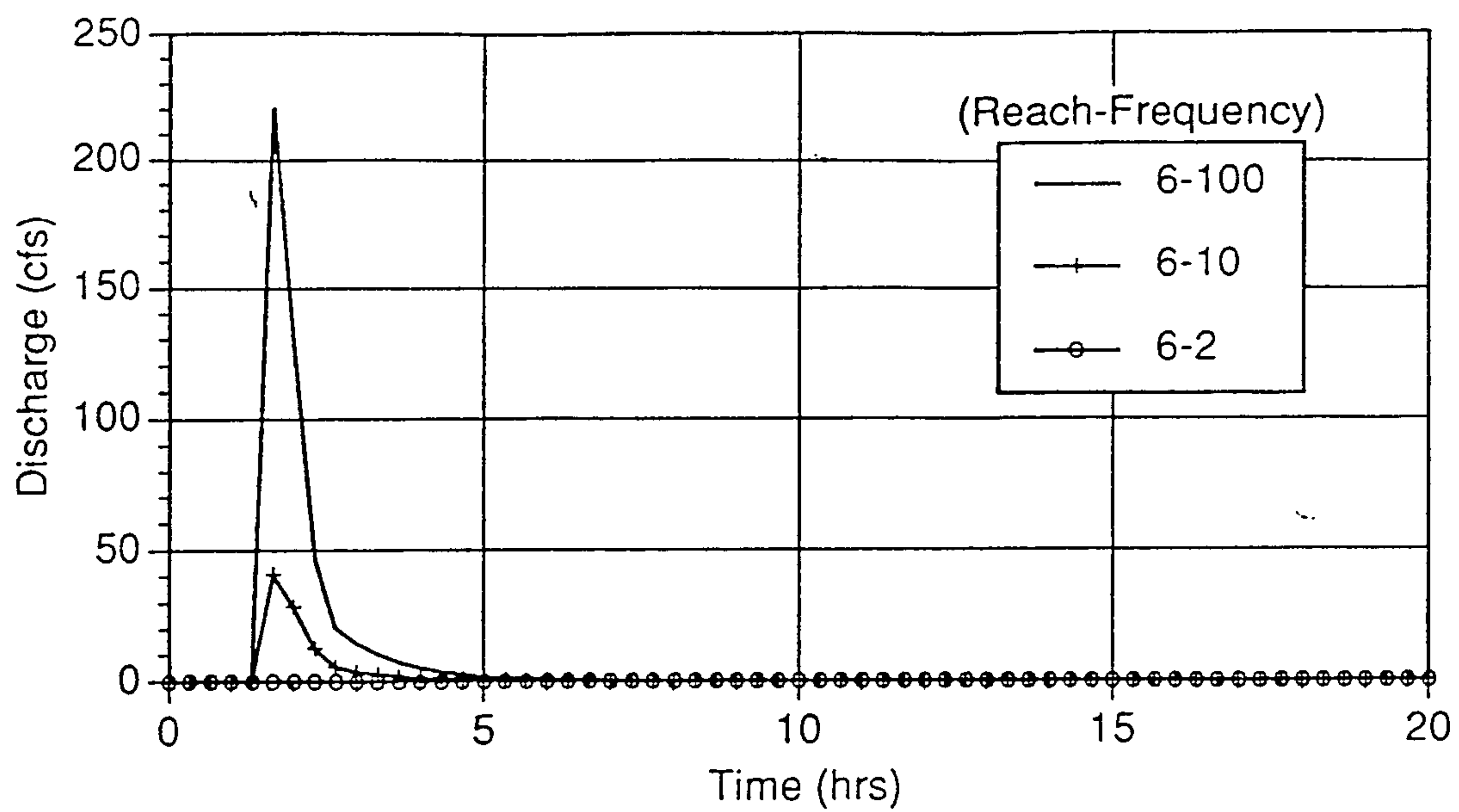


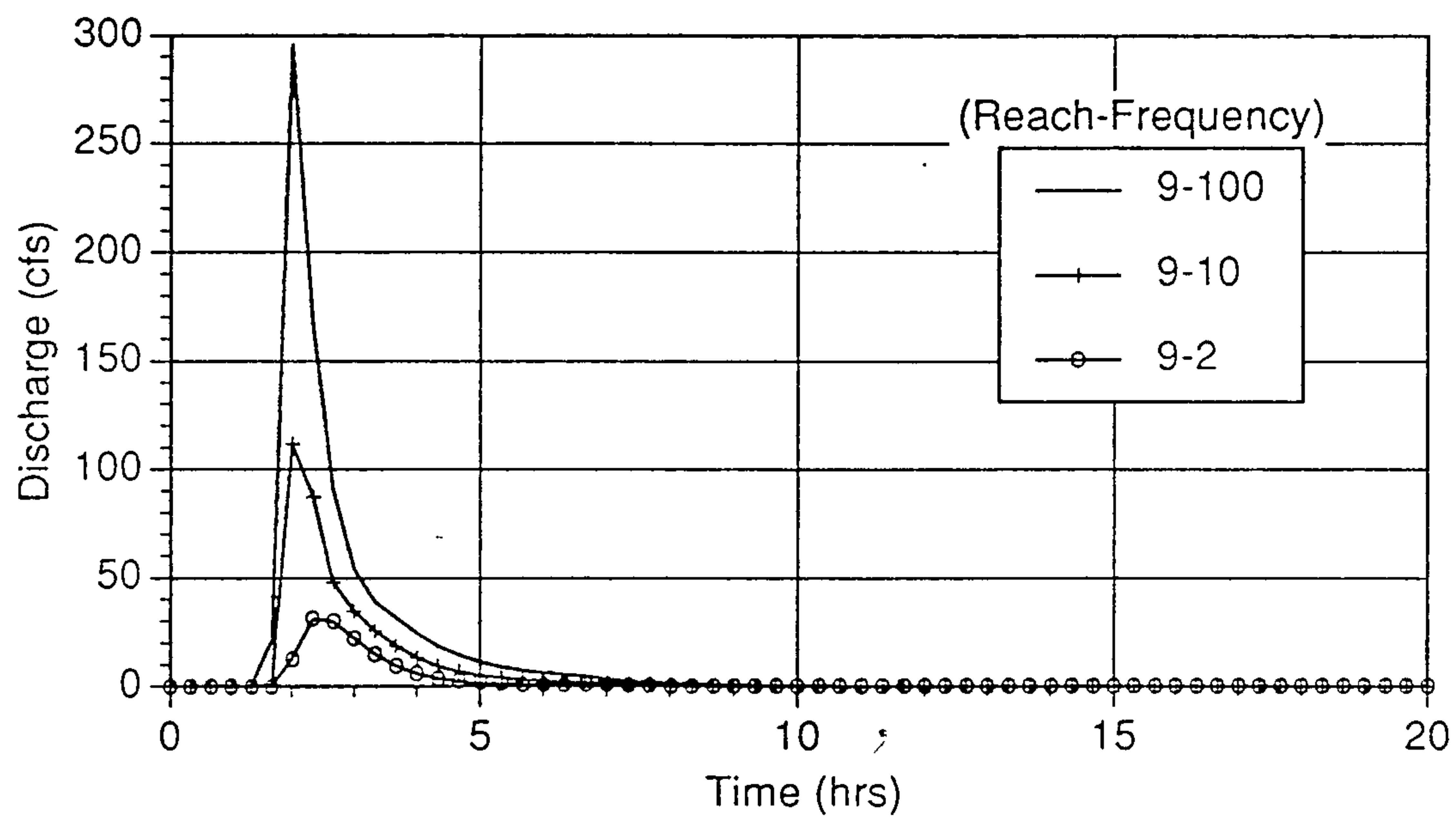
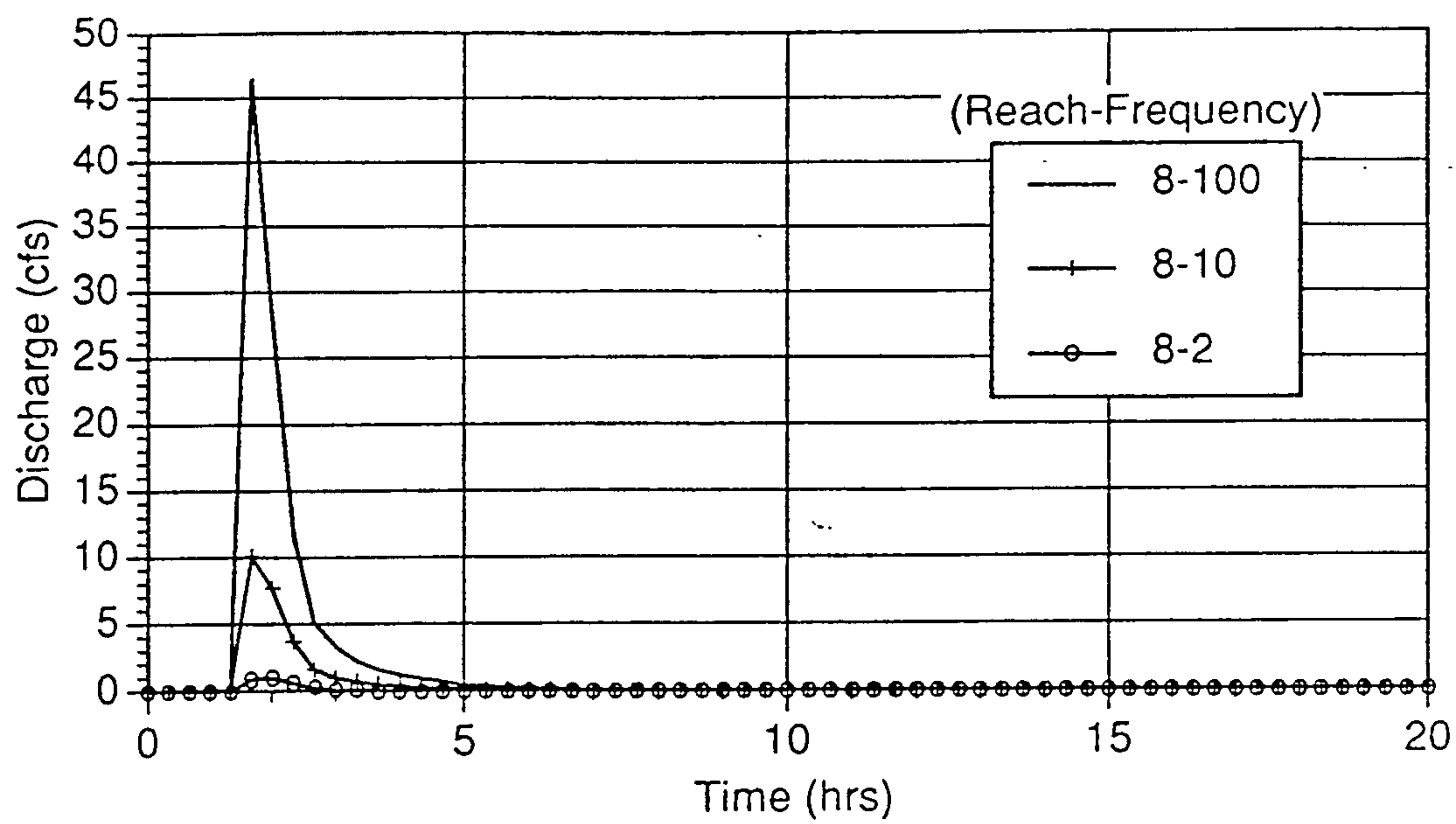
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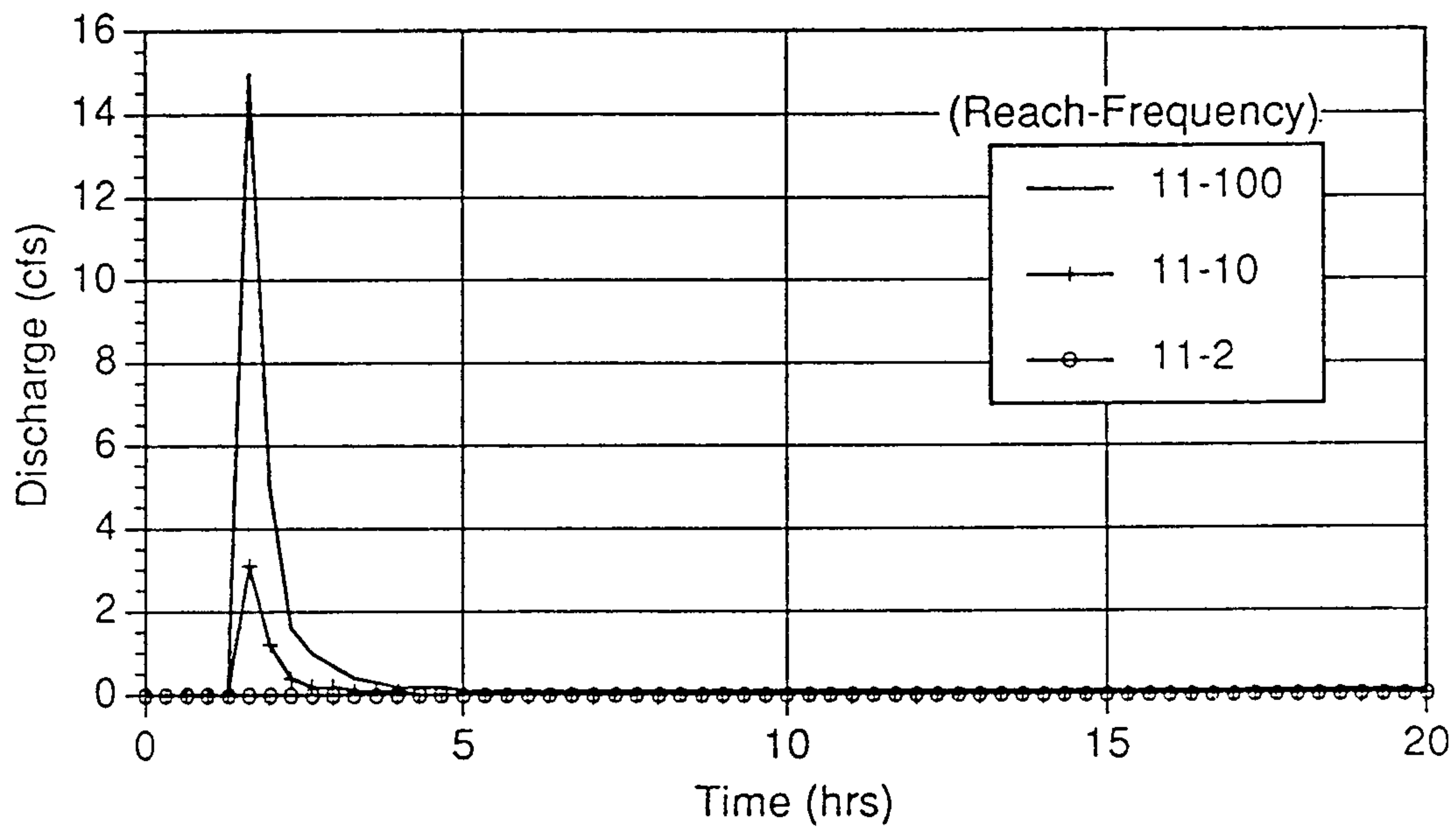
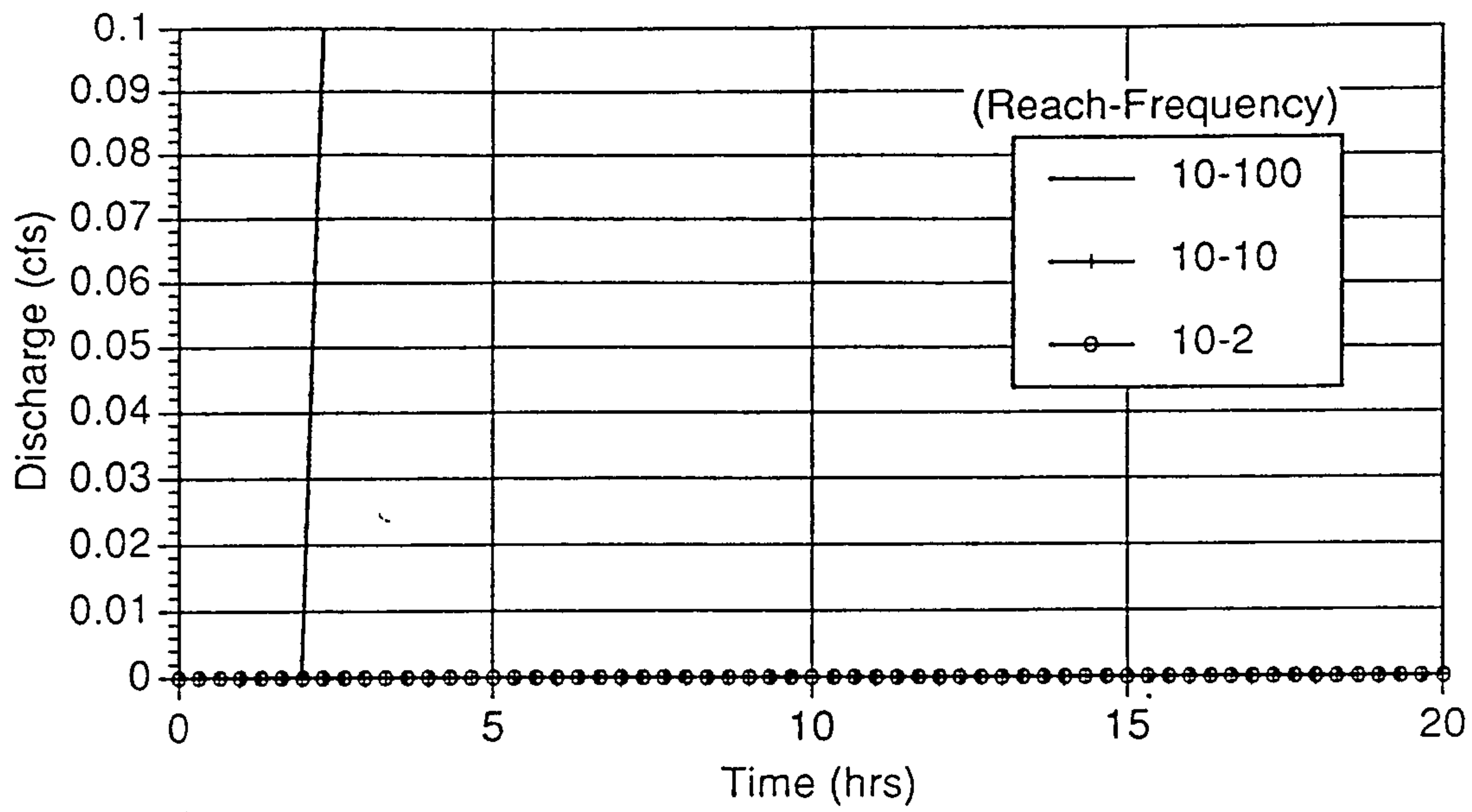


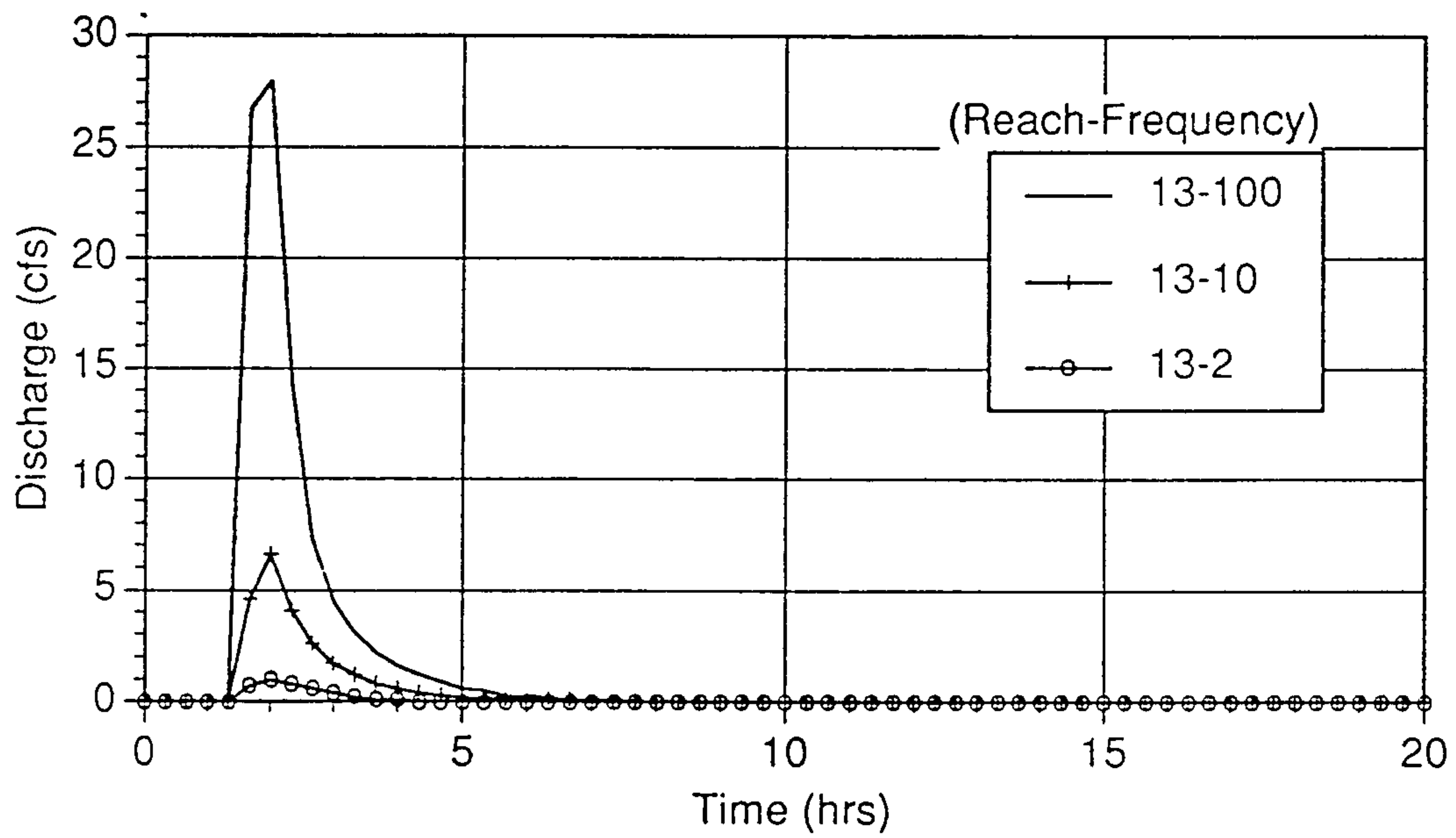
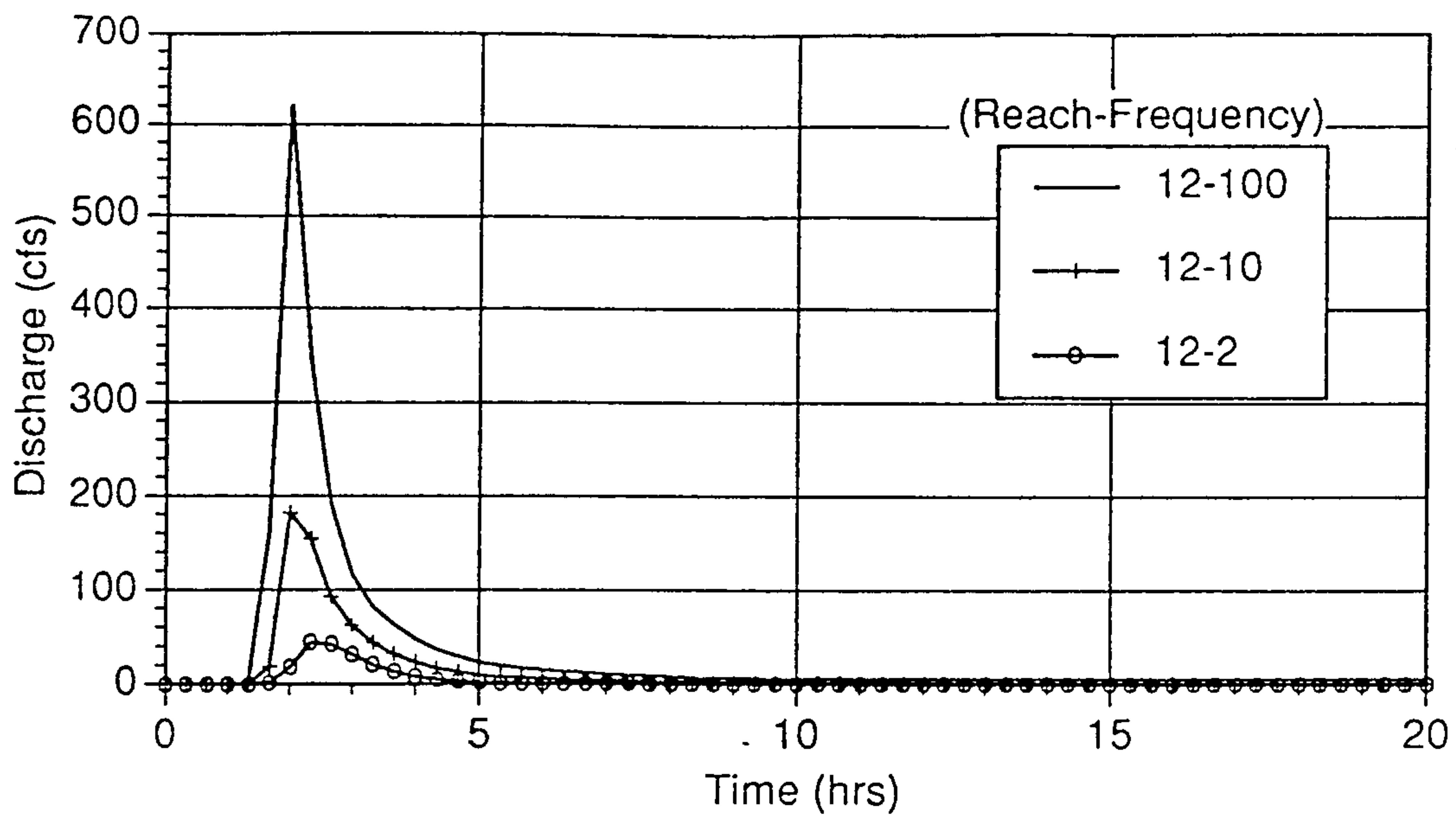


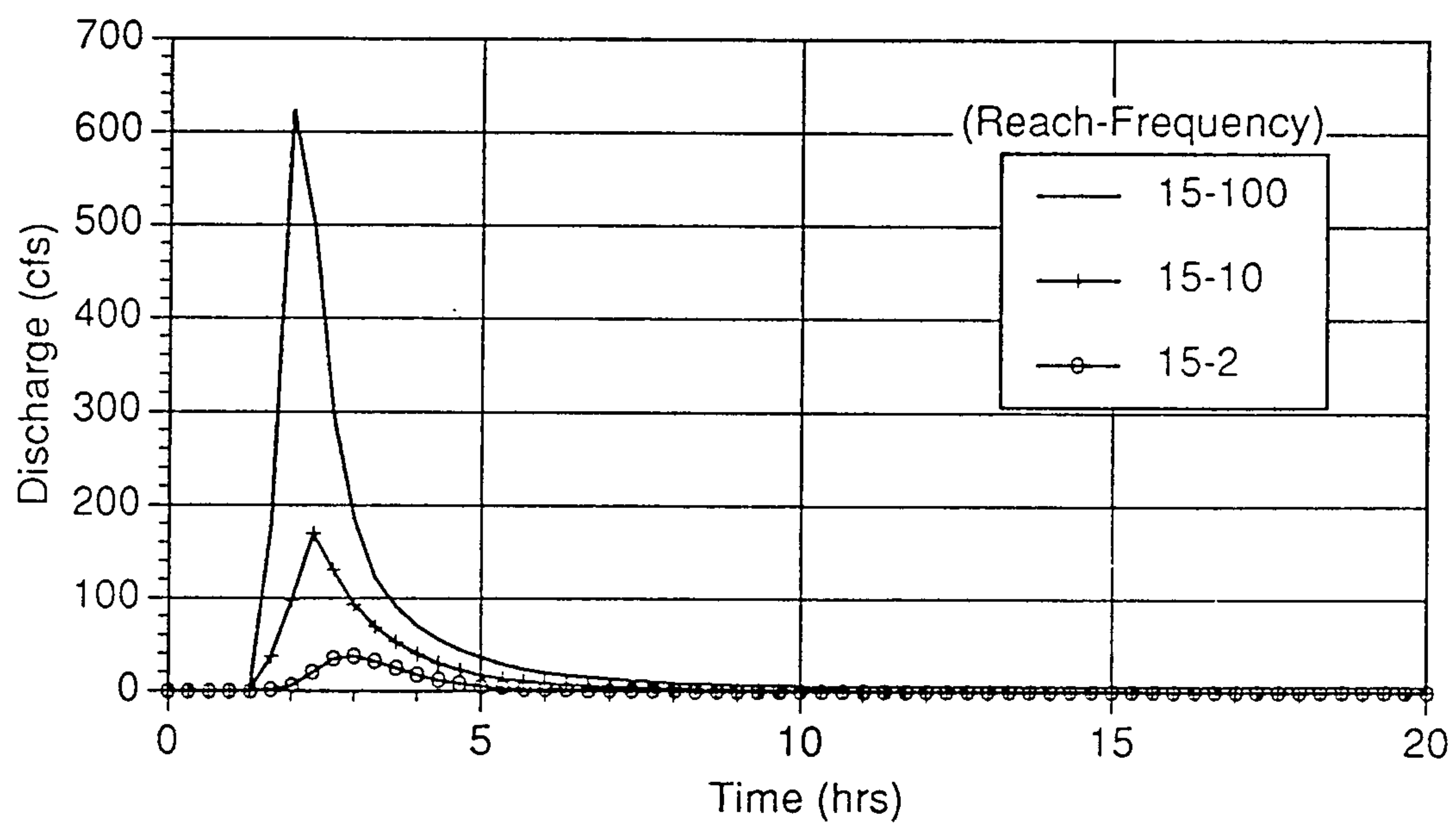
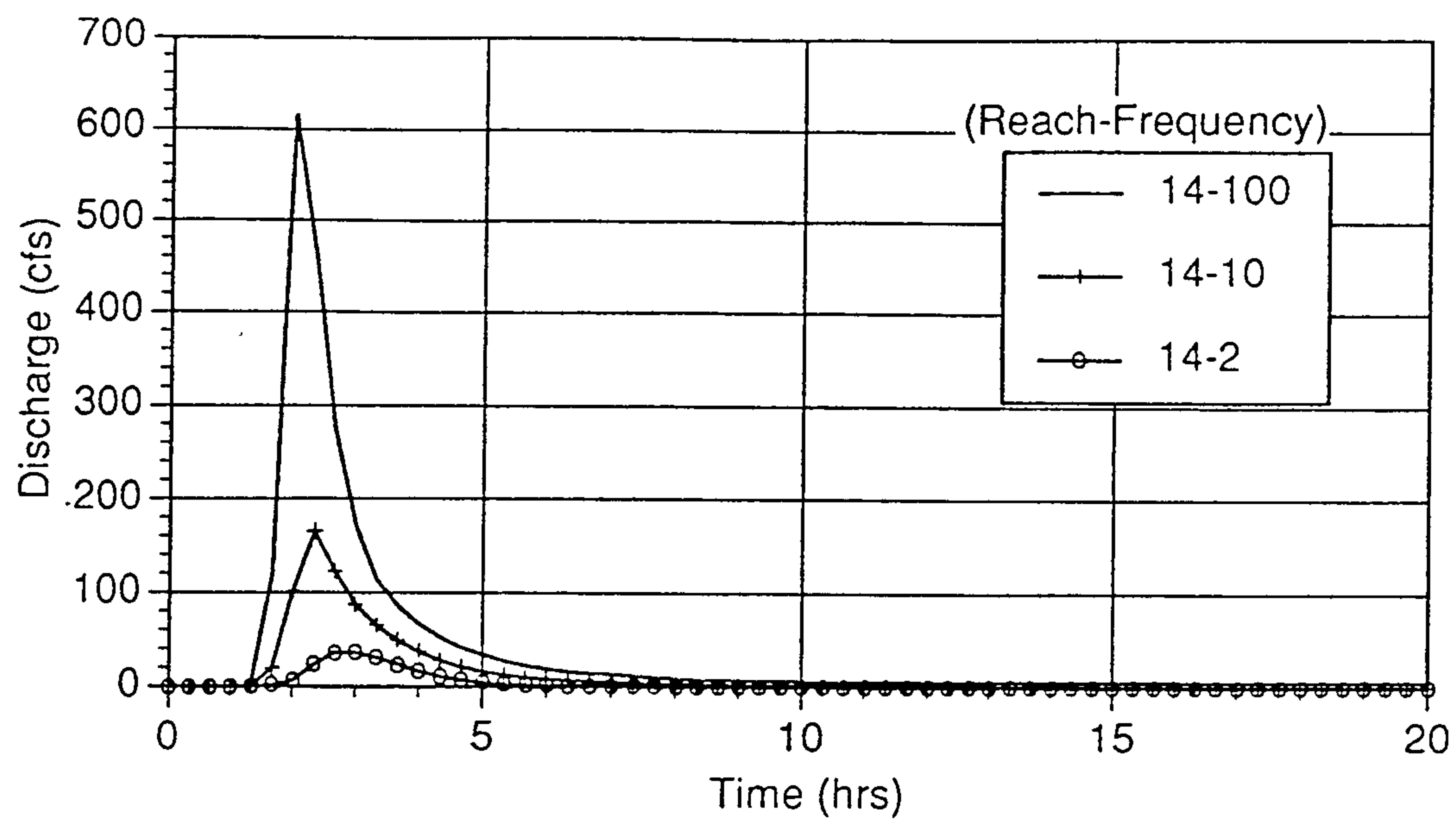


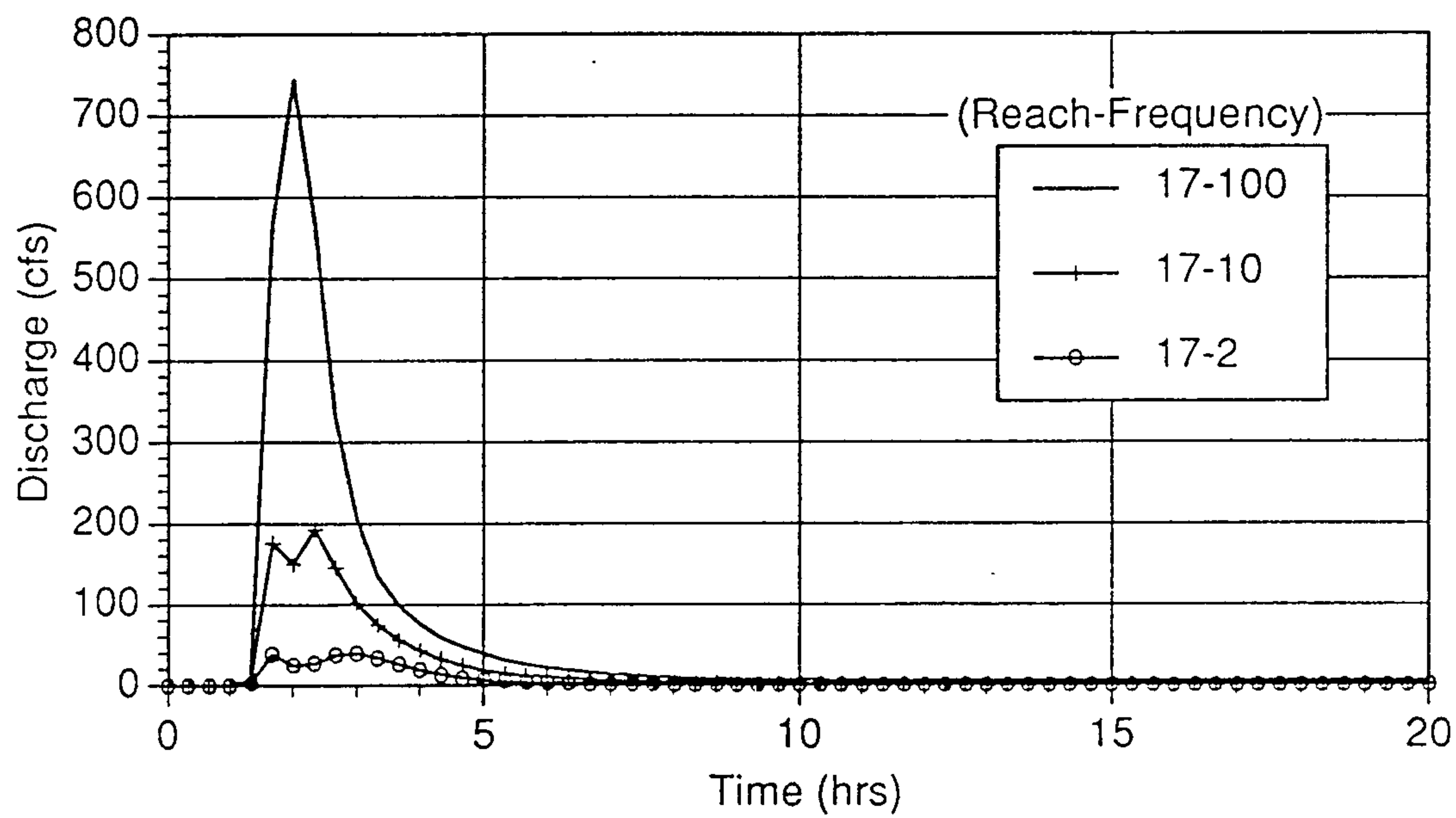
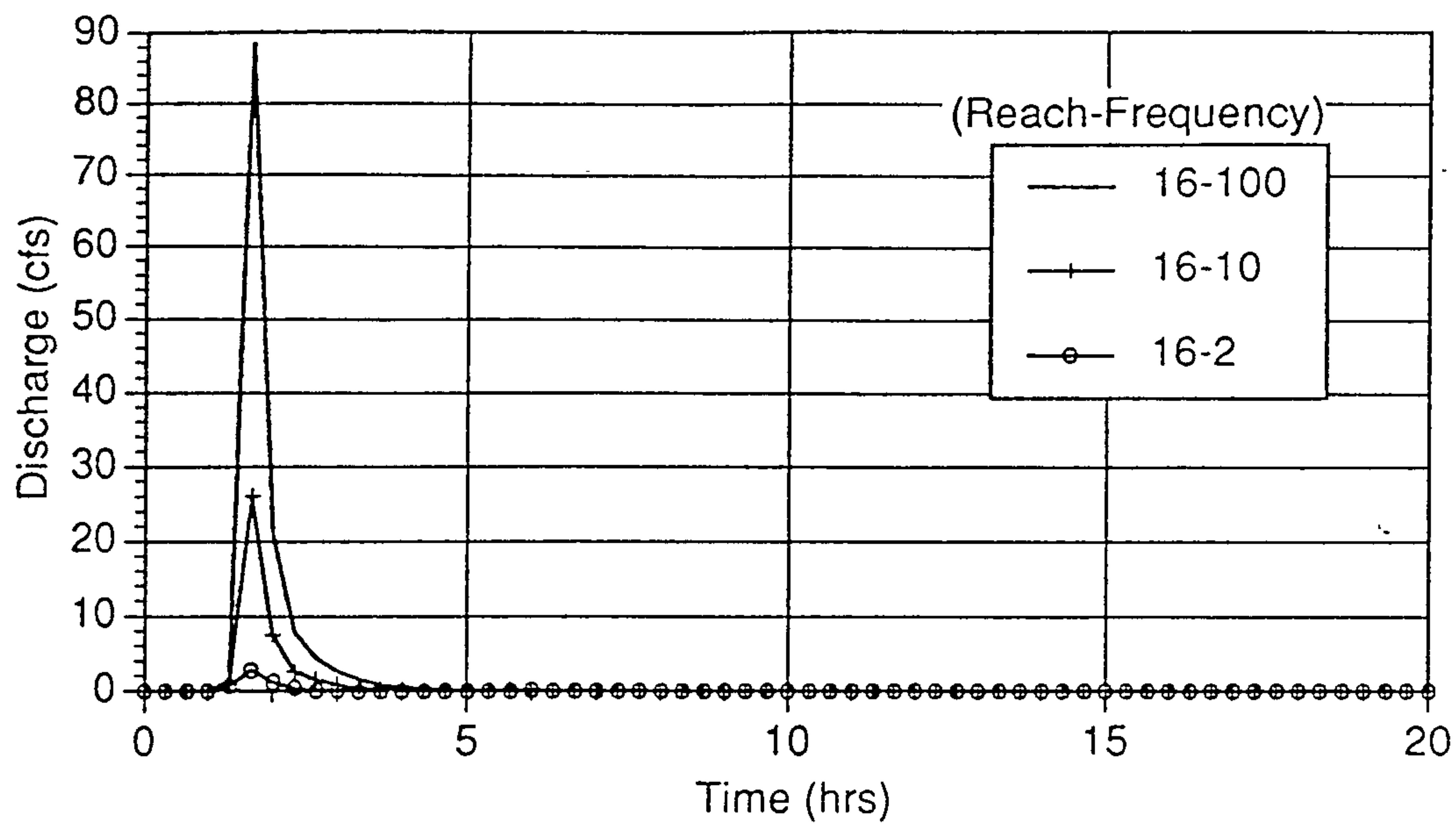


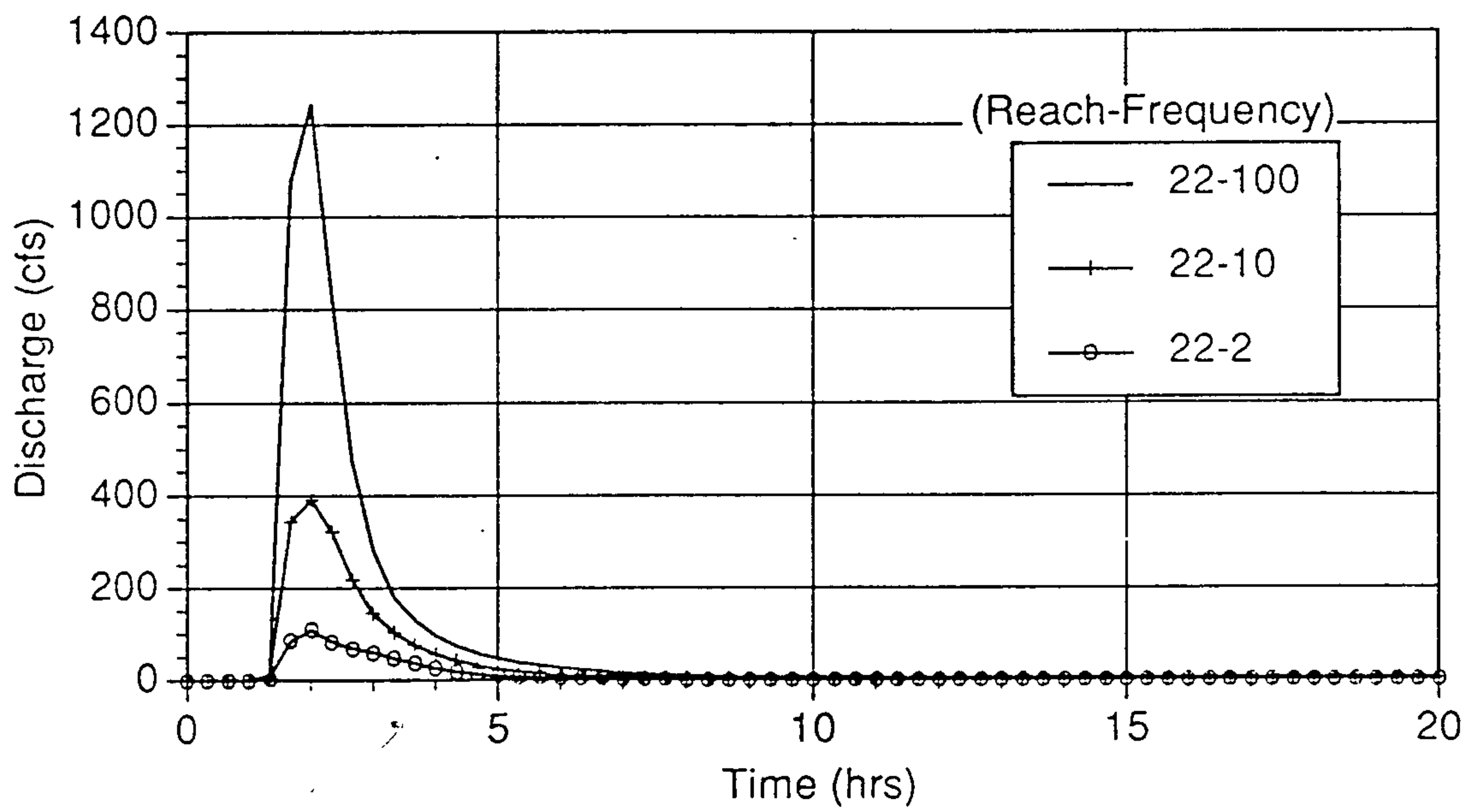
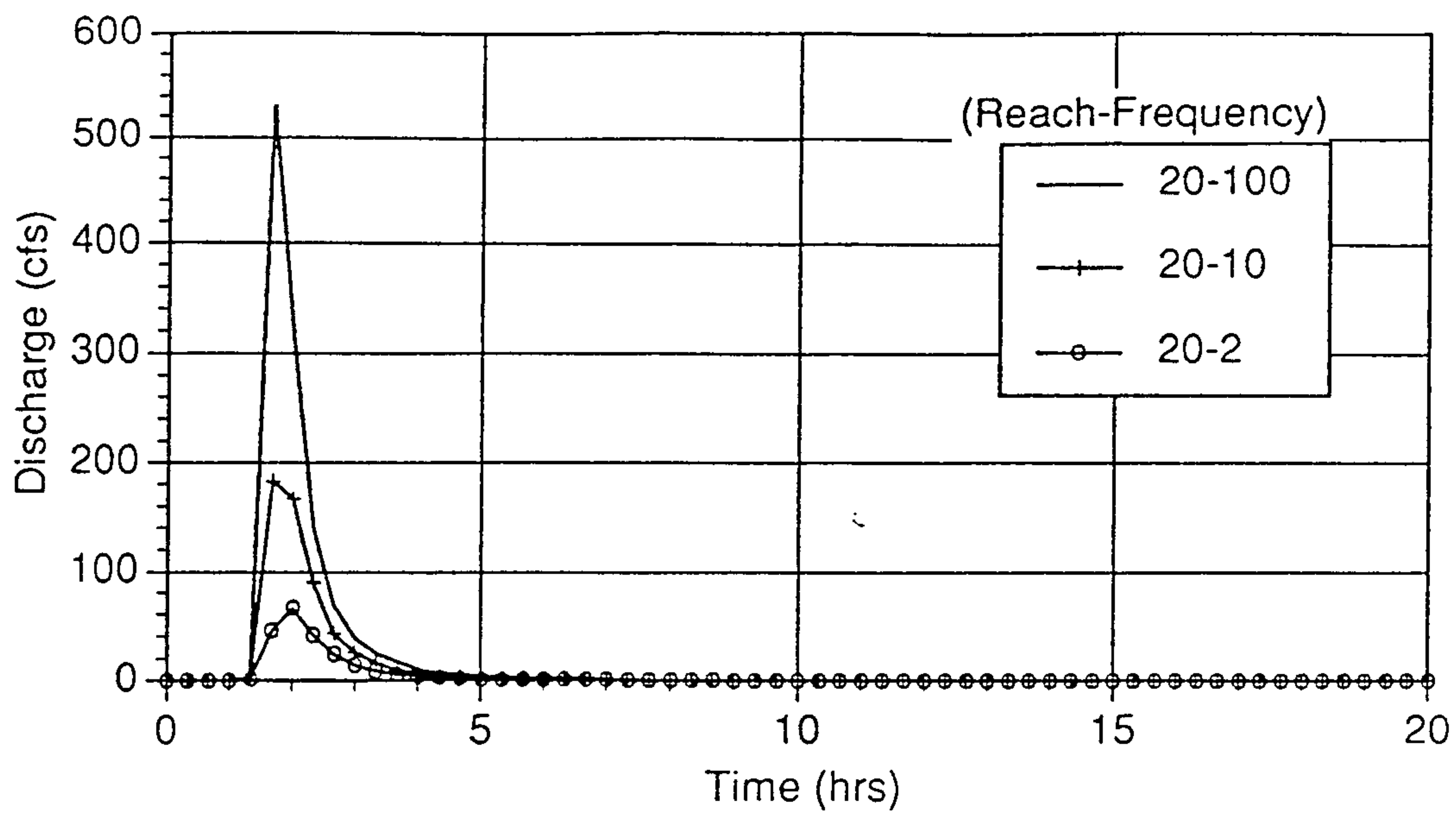












	A	B	C	D	E	F	G	H	I	J	K	L	M
1	t	Q	Q/Qp	b	y	V	q	.15 mm	.8 mm	2.65 mm	9.25 mm	qs	Qs
2	0.00	0.0	0.000	0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
3	0.33	0.0	0.000	0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
4	0.67	0.0	0.000	0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
5	1.00	0.0	0.000	0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
6	1.33	0.0	0.000	0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00
7	1.67	1.3	0.038	14.5	0.06	1.41	0.09	0.000	0.000	0.000	0.000	0.000	0.00
8	2.00	29.4	0.856	41.0	0.18	3.98	0.72	0.018	0.015	0.007	0.009	0.018	0.73
9	2.33	32.8	0.955	42.5	0.19	4.13	0.77	0.021	0.018	0.008	0.011	0.021	0.89
10	2.67	22.9	0.667	37.7	0.17	3.66	0.61	0.013	0.010	0.005	0.007	0.012	0.47
11	3.00	14.1	0.410	32.1	0.14	3.11	0.44	0.006	0.005	0.002	0.004	0.006	0.20
12	3.33	8.8	0.256	27.4	0.12	2.66	0.32	0.003	0.003	0.001	0.002	0.003	0.09
13	3.67	5.7	0.166	23.7	0.10	2.30	0.24	0.002	0.001	0.001	0.001	0.002	0.04
14	4.00	3.8	0.111	20.7	0.09	2.01	0.18	0.001	0.001	0.000	0.001	0.001	0.02
15	4.33	2.6	0.076	18.3	0.08	1.77	0.14	0.001	0.000	0.000	0.001	0.001	0.01
16	4.67	1.8	0.052	16.2	0.07	1.57	0.11	0.000	0.000	0.000	0.000	0.000	0.01
17	5.00	1.3	0.038	14.5	0.06	1.41	0.09	0.000	0.000	0.000	0.000	0.000	0.00
18	5.33	1.0	0.029	13.3	0.06	1.29	0.08	0.000	0.000	0.000	0.000	0.000	0.00
19	5.67	0.7	0.020	11.8	0.05	1.14	0.06	0.000	0.000	0.000	0.000	0.000	0.00
20	6.00	0.5	0.015	10.5	0.05	1.02	0.05	0.000	0.000	0.000	0.000	0.000	0.00
21	6.33	0.4	0.012	9.8	0.04	0.95	0.04	0.000	0.000	0.000	0.000	0.000	0.00
22	6.67	0.3	0.009	8.9	0.04	0.86	0.03	0.000	0.000	0.000	0.000	0.000	0.00
23	7.00	0.2	0.006	7.8	0.03	0.75	0.03	0.000	0.000	0.000	0.000	0.000	0.00
24	7.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
25	7.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
26	8.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
27	8.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
28	8.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
29	9.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
30	9.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
31	9.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
32	10.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
33	10.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
34	10.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
35	11.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
36	11.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
37	11.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
38	12.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
39	12.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
40	12.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
41	13.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
42	13.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
43	13.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
44	14.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
45	14.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
46	14.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
47	15.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
48	15.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00

HIS Qs 100

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	t	Q	Q/Qp	b	y	V	q	.15 mm	.8 mm	2.65 mm	9.25 mm	qs	Qs
49	15.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
50	16.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
51	16.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
52	16.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
53	17.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
54	17.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
55	17.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
56	18.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
57	18.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
58	18.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
59	19.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
60	19.33	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
61	19.67	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
62	20.00	0.1	0.003	6.2	0.03	0.60	0.02	0.000	0.000	0.000	0.000	0.000	0.00
63	Tot	34.4						0.060	0.004	0.001	0.000		
64	%							0.925	0.067	0.008	0.000		
65													
66	dt	1200					a	0.00034	1.7E-05	5.3E-06	2.1E-05		
67	b max	43.164					b	3.664	4.638	4.723	3.904		
68	y max	0.1899					c	0.628	-0.225	-0.4	-0.41		
69	W af	3.62					%	0.90	0.08	0.02	0.00		
70	S af	0.0677	9										
71	b.f.	0.019											
72	b.f.max	0.027											
73													
74													
75													W af
76													S af
77													b.f.
78													b.f.max

HIS Qs 100

	A	N	O	P	Q	R	S	T	U	V	W	X	Y
1	t	b.f.	1	2	3	4	5.1	5.2	6	7	8	9	10
2	0.00	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.33	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.67	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.00	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.33	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	1.67	0.002	50.1	1.7	0.1	12.0	239.4	239.4	217.9	136.5	46.4	1.3	0.0
8	2.00	0.025	141.9	130.5	0.4	30.1	217.7	217.7	127.7	248.7	28.1	29.4	0.0
9	2.33	0.027	106.2	166.7	0.7	28.8	103.6	103.6	46.0	133.8	11.7	32.8	0.1
10	2.67	0.020	62.4	100.3	1.1	21.4	54.3	54.3	20.1	74.0	5.1	22.9	0.1
11	3.00	0.014	36.4	59.5	1.5	14.5	36.3	36.3	14.2	46.1	3.4	14.1	0.1
12	3.33	0.010	24.0	38.4	1.8	10.1	25.7	25.7	10.2	31.3	2.3	8.8	0.1
13	3.67	0.007	17.3	31.1	2.0	7.6	18.7	18.7	7.2	22.5	1.6	5.7	0.1
14	4.00	0.005	12.6	29.3	2.1	6.1	14.2	14.2	5.1	16.5	1.2	3.8	0.1
15	4.33	0.004	9.7	27.8	2.3	5.1	11.2	11.2	3.7	12.7	0.9	2.6	0.1
16	4.67	0.003	7.5	26.1	2.4	4.5	8.7	8.7	2.5	10.0	0.7	1.8	0.1
17	5.00	0.002	5.7	24.4	2.5	4.1	7.2	7.2	1.8	8.0	0.5	1.3	0.1
18	5.33	0.002	4.5	22.6	2.6	3.8	6.1	6.1	1.3	6.6	0.4	1.0	0.1
19	5.67	0.001	3.6	20.9	2.6	3.6	5.3	5.3	0.9	5.7	0.3	0.7	0.1
20	6.00	0.001	2.9	19.2	2.7	3.4	4.7	4.7	0.7	5.0	0.2	0.5	0.1
21	6.33	0.001	2.2	17.5	2.7	3.3	4.2	4.2	0.5	4.4	0.2	0.4	0.1
22	6.67	0.001	1.8	15.8	2.8	3.2	3.9	3.9	0.3	4.1	0.1	0.3	0.1
23	7.00	0.001	1.4	14.3	2.8	3.1	3.6	3.6	0.2	3.8	0.1	0.2	0.1
24	7.33	0.000	1.1	13.1	2.9	3.1	3.5	3.5	0.2	3.6	0.1	0.1	0.1
25	7.67	0.000	0.9	11.9	2.9	3.1	3.3	3.3	0.1	3.4	0.0	0.1	0.1
26	8.00	0.000	0.8	10.8	2.9	3.1	3.2	3.2	0.1	3.3	0.0	0.1	0.1
27	8.33	0.000	0.7	9.8	3.0	3.0	3.2	3.2	0.1	3.2	0.0	0.1	0.1
28	8.67	0.000	0.6	8.8	3.1	3.1	3.2	3.2	0.0	3.2	0.0	0.1	0.1
29	9.00	0.000	0.5	7.7	3.3	3.2	3.2	3.2	0.0	3.2	0.0	0.1	0.1
30	9.33	0.000	0.4	6.9	3.5	3.3	3.3	3.3	0.0	3.2	0.0	0.1	0.1
31	9.67	0.000	0.3	6.3	3.7	3.5	3.4	3.4	0.0	3.4	0.0	0.1	0.1
32	10.00	0.000	0.3	5.7	3.9	3.7	3.6	3.6	0.0	3.5	0.0	0.1	0.1
33	10.33	0.000	0.2	5.2	4.1	3.8	3.8	3.8	0.0	3.7	0.0	0.1	0.1
34	10.67	0.000	0.2	4.7	4.2	4.0	3.9	3.9	0.0	3.9	0.0	0.1	0.1
35	11.00	0.000	0.2	4.3	4.3	4.1	4.1	4.1	0.0	4.0	0.0	0.1	0.1
36	11.33	0.000	0.1	3.9	4.4	4.2	4.2	4.2	0.0	4.1	0.0	0.1	0.1
37	11.67	0.000	0.1	3.5	4.4	4.3	4.3	4.3	0.0	4.2	0.0	0.1	0.1
38	12.00	0.000	0.1	3.2	4.4	4.4	4.3	4.3	0.0	4.3	0.0	0.1	0.1
39	12.33	0.000	0.1	2.9	4.4	4.4	4.4	4.4	0.0	4.4	0.0	0.1	0.1
40	12.67	0.000	0.1	2.6	4.3	4.4	4.4	4.4	0.0	4.4	0.0	0.1	0.1
41	13.00	0.000	0.1	2.3	4.3	4.3	4.3	4.3	0.0	4.4	0.0	0.1	0.1
42	13.33	0.000	0.0	2.1	4.2	4.3	4.3	4.3	0.0	4.3	0.0	0.1	0.1
43	13.67	0.000	0.0	1.9	4.1	4.2	4.2	4.2	0.0	4.3	0.0	0.1	0.1
44	14.00	0.000	0.0	1.7	4.0	4.1	4.2	4.2	0.0	4.2	0.0	0.1	0.1
45	14.33	0.000	0.0	1.5	3.9	4.0	4.1	4.1	0.0	4.1	0.0	0.1	0.1
46	14.67	0.000	0.0	1.4	3.7	3.9	4.0	4.0	0.0	4.0	0.0	0.1	0.1
47	15.00	0.000	0.0	1.2	3.6	3.8	3.9	3.9	0.0	3.9	0.0	0.1	0.1
48	15.33	0.000	0.0	1.1	3.5	3.7	3.7	3.7	0.0	3.8	0.0	0.1	0.1

HIS Qs 100

	A	N	O	P	Q	R	S	T	U	V	W	X	Y
1	t	b.f.	1	2	3	4	5.1	5.2	6	7	8	9	10
49	15.67	0.000	0.0	1.0	3.4	3.5	3.6	3.6	0.0	3.7	0.0	0.1	0.1
50	16.00	0.000	0.0	0.9	3.3	3.4	3.5	3.5	0.0	3.6	0.0	0.1	0.1
51	16.33	0.000	0.0	0.8	3.2	3.3	3.4	3.4	0.0	3.4	0.0	0.1	0.1
52	16.67	0.000	0.0	0.7	3.1	3.2	3.3	3.3	0.0	3.3	0.0	0.1	0.1
53	17.00	0.000	0.0	0.6	3.1	3.2	3.2	3.2	0.0	3.2	0.0	0.1	0.1
54	17.33	0.000	0.0	0.5	3.1	3.1	3.1	3.1	0.0	3.2	0.0	0.1	0.1
55	17.67	0.000	0.0	0.5	3.0	3.1	3.1	3.1	0.0	3.1	0.0	0.1	0.1
56	18.00	0.000	0.0	0.4	3.0	3.0	3.1	3.1	0.0	3.1	0.0	0.1	0.1
57	18.33	0.000	0.0	0.4	3.0	3.0	3.0	3.0	0.0	3.1	0.0	0.1	0.1
58	18.67	0.000	0.0	0.3	3.0	3.0	3.0	3.0	0.0	3.0	0.0	0.1	0.1
59	19.00	0.000	0.0	0.3	3.0	3.0	3.0	3.0	0.0	3.0	0.0	0.1	0.1
60	19.33	0.000	0.0	0.3	3.0	3.0	3.0	3.0	0.0	3.0	0.0	0.1	0.1
61	19.67	0.000	0.0	0.2	3.0	3.0	3.0	3.0	0.0	3.0	0.0	0.1	0.1
62	20.00	0.000	0.0	0.2	3.0	3.0	3.0	3.0	0.0	3.0	0.0	0.1	0.1
63	Tot												
64	%												
65													
66	dt												
67	b max	b max	57.5	19.7	51.4	77.7	45.4	25.5	16.7	113.4	23.5	43.2	2.2
68	y max	y max	0.861	1.839	0.103	0.191	1.891	1.396	2.187	0.479	0.627	0.190	0.079
69	W af	Q max	141.94	189.39	4.4	30.99	293.37	293.37	227.37	273.5	47.51	34.35	0.1
70	S af	Q err	0.00	-0.12	0.00	-0.03	-0.18	-0.18	-0.04	-0.09	-0.02	-0.05	0.00
71	b.f.												
72	b.f.max												
73													
74			1	2	3	4	5.1	5.2	6	7	8	9	10
75		3.62	13.69	24.18	4.72	8.36	24.93	24.93	12.69	25.08	2.85	3.62	0.15
76		0.07	0.05	0.23	0.00	0.01	0.08	0.97	0.26	0.38	0.02	0.07	0.00
77		0.019	0.003	0.009	0.000	0.002	0.003	0.039	0.020	0.015	0.006	0.019	0.000
78		0.027	0.005	0.018	0.000	0.004	0.005	0.065	0.029	0.029	0.008	0.027	0.000

HIS Qs 100

	A	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
1	t	11	12	13	14.1	14.2	15	16	17	18	19	20	21
2	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	1.67	12.9	125.2	23.8	105.0	105.0	169.2	78.5	465.2	7.4	12.0	217.5	224.3
8	2.00	5.7	289.3	24.9	325.2	325.2	359.8	31.6	152.0	24.0	51.7	211.8	274.5
9	2.33	1.8	174.5	12.2	245.4	245.4	267.2	11.2	307.0	23.6	54.1	118.0	156.9
10	2.67	1.1	101.7	6.6	157.1	157.1	172.3	6.9	196.8	18.8	42.1	73.9	90.9
11	3.00	0.7	63.4	4.1	100.8	100.8	110.6	3.6	125.4	15.5	31.7	53.5	65.6
12	3.33	0.5	41.7	2.9	70.4	70.4	76.8	2.1	85.7	12.7	24.5	39.3	49.6
13	3.67	0.4	29.5	2.1	51.5	51.5	55.8	1.4	61.7	10.4	19.6	29.9	37.7
14	4.00	0.3	21.4	1.5	38.2	38.2	41.5	0.9	45.3	8.6	15.7	23.4	29.3
15	4.33	0.2	16.2	1.1	28.4	28.4	30.7	0.6	33.4	7.1	13.1	18.7	23.2
16	4.67	0.2	12.5	0.8	21.3	21.3	23.1	0.4	24.8	5.8	11.1	15.0	18.6
17	5.00	0.2	9.8	0.6	16.1	16.1	17.5	0.3	18.8	4.7	9.5	11.9	14.9
18	5.33	0.1	8.0	0.4	12.4	12.4	13.3	0.2	14.2	3.9	8.2	10.1	12.1
19	5.67	0.1	6.7	0.3	9.8	9.8	10.5	0.1	11.2	3.1	7.0	8.6	10.1
20	6.00	0.1	5.7	0.2	8.0	8.0	8.5	0.1	8.8	2.5	5.9	7.3	8.5
21	6.33	0.1	5.0	0.1	6.6	6.6	7.1	0.0	7.3	2.1	5.0	6.2	7.2
22	6.67	0.1	4.5	0.1	5.7	5.7	6.0	0.0	6.2	1.7	4.3	5.3	6.1
23	7.00	0.1	4.1	0.1	5.0	5.0	5.1	0.0	5.3	1.3	3.6	4.4	5.1
24	7.33	0.1	3.8	0.0	4.5	4.5	4.6	0.0	4.7	1.1	3.0	3.7	4.3
25	7.67	0.1	3.6	0.0	4.1	4.1	4.2	0.0	4.3	0.9	2.4	3.1	3.6
26	8.00	0.1	3.5	0.0	3.8	3.8	3.9	0.0	3.9	0.7	2.0	2.6	3.0
27	8.33	0.1	3.4	0.0	3.6	3.6	3.7	0.0	3.7	0.5	1.6	2.1	2.5
28	8.67	0.1	3.4	0.0	3.5	3.5	3.5	0.0	3.6	0.4	1.3	1.8	2.1
29	9.00	0.1	3.4	0.0	3.4	3.4	3.4	0.0	3.5	0.3	1.1	1.5	1.7
30	9.33	0.1	3.4	0.0	3.4	3.4	3.4	0.0	3.4	0.3	0.9	1.2	1.4
31	9.67	0.1	3.5	0.0	3.4	3.4	3.4	0.0	3.4	0.2	0.7	1.0	1.1
32	10.00	0.1	3.7	0.0	3.5	3.5	3.5	0.0	3.5	0.2	0.6	0.8	0.9
33	10.33	0.1	3.8	0.0	3.7	3.7	3.6	0.0	3.6	0.1	0.5	0.6	0.7
34	10.67	0.1	4.0	0.0	3.8	3.8	3.8	0.0	3.7	0.1	0.4	0.5	0.6
35	11.00	0.1	4.2	0.0	4.0	4.0	3.9	0.0	3.9	0.1	0.3	0.4	0.5
36	11.33	0.1	4.3	0.0	4.1	4.1	4.1	0.0	4.1	0.1	0.2	0.3	0.4
37	11.67	0.1	4.4	0.0	4.3	4.3	4.2	0.0	4.2	0.1	0.2	0.3	0.3
38	12.00	0.1	4.5	0.0	4.4	4.4	4.3	0.0	4.3	0.0	0.2	0.2	0.2
39	12.33	0.1	4.5	0.0	4.4	4.4	4.4	0.0	4.4	0.0	0.1	0.2	0.2
40	12.67	0.1	4.6	0.0	4.5	4.5	4.5	0.0	4.5	0.0	0.1	0.1	0.2
41	13.00	0.1	4.5	0.0	4.5	4.5	4.5	0.0	4.5	0.0	0.1	0.1	0.1
42	13.33	0.1	4.5	0.0	4.5	4.5	4.5	0.0	4.5	0.0	0.1	0.1	0.1
43	13.67	0.1	4.5	0.0	4.5	4.5	4.5	0.0	4.5	0.0	0.0	0.1	0.1
44	14.00	0.1	4.4	0.0	4.5	4.5	4.5	0.0	4.5	0.0	0.0	0.1	0.1
45	14.33	0.1	4.3	0.0	4.4	4.4	4.4	0.0	4.4	0.0	0.0	0.0	0.0
46	14.67	0.1	4.2	0.0	4.3	4.3	4.3	0.0	4.4	0.0	0.0	0.0	0.0
47	15.00	0.1	4.1	0.0	4.2	4.2	4.3	0.0	4.3	0.0	0.0	0.0	0.0
48	15.33	0.1	4.0	0.0	4.1	4.1	4.2	0.0	4.2	0.0	0.0	0.0	0.0

HIS Qs 100

	A	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
1	t	11	12	13	14.1	14.2	15	16	17	18	19	20	21
49	15.67	0.1	3.9	0.0	4.0	4.0	4.0	0.0	4.1	0.0	0.0	0.0	0.0
50	16.00	0.1	3.8	0.0	3.9	3.9	3.9	0.0	4.0	0.0	0.0	0.0	0.0
51	16.33	0.1	3.6	0.0	3.8	3.8	3.8	0.0	3.8	0.0	0.0	0.0	0.0
52	16.67	0.1	3.5	0.0	3.7	3.7	3.7	0.0	3.7	0.0	0.0	0.0	0.0
53	17.00	0.1	3.4	0.0	3.6	3.6	3.6	0.0	3.6	0.0	0.0	0.0	0.0
54	17.33	0.1	3.4	0.0	3.5	3.5	3.5	0.0	3.5	0.0	0.0	0.0	0.0
55	17.67	0.1	3.3	0.0	3.4	3.4	3.4	0.0	3.4	0.0	0.0	0.0	0.0
56	18.00	0.1	3.3	0.0	3.3	3.3	3.3	0.0	3.4	0.0	0.0	0.0	0.0
57	18.33	0.1	3.2	0.0	3.3	3.3	3.3	0.0	3.3	0.0	0.0	0.0	0.0
58	18.67	0.1	3.2	0.0	3.2	3.2	3.3	0.0	3.3	0.0	0.0	0.0	0.0
59	19.00	0.1	3.2	0.0	3.2	3.2	3.2	0.0	3.2	0.0	0.0	0.0	0.0
60	19.33	0.1	3.2	0.0	3.2	3.2	3.2	0.0	3.2	0.0	0.0	0.0	0.0
61	19.67	0.1	3.2	0.0	3.2	3.2	3.2	0.0	3.2	0.0	0.0	0.0	0.0
62	20.00	0.1	3.2	0.0	3.2	3.2	3.2	0.0	3.2	0.0	0.0	0.0	0.0
63	Tot												
64	%												
65													
66	dt												
67	b max	5.1	18.0	10.7	58.4	62.8	16.7	14.0	57.1	57.1	25.7	33.0	27.0
68	y max	0.520	1.976	0.707	1.006	0.970	2.499	1.120	1.366	0.263	0.560	1.584	1.782
69	W af	12.94	303.14	30.13	325.59	325.59	359.75	78.53	481.81	26.24	56.8	269.58	334.82
70	S af	0.00	-0.05	-0.17	0.00	0.00	0.00	0.00	-0.03	-0.09	-0.05	-0.19	-0.18
71	b.f.												
72	b.f.max												
73													
74		11	12	13	14.1	14.2	15	16	17	18	19	20	21
75		0.79	29.40	2.25	37.38	37.38	42.02	3.80	47.38	4.36	9.23	24.12	29.17
76		0.01	1.10	0.02	0.63	0.57	1.65	0.06	0.92	0.01	0.08	0.28	0.70
77		0.016	0.037	0.009	0.017	0.015	0.039	0.016	0.019	0.001	0.009	0.012	0.024
78		0.028	0.070	0.012	0.030	0.028	0.069	0.022	0.035	0.002	0.015	0.018	0.038

	A	AL	AM	AN	AO
1	t	22	23	24	25
2	0.00	0.0	0.0	0.0	0.0
3	0.33	0.0	0.0	0.0	0.0
4	0.67	0.0	0.0	0.0	0.0
5	1.00	0.0	0.0	0.0	0.0
6	1.33	0.0	0.0	0.0	0.0
7	1.67	621.1	91.3	52.5	56.1
8	2.00	788.5	40.4	81.1	135.3
9	2.33	517.1	19.7	48.7	94.9
10	2.67	321.7	11.7	28.8	57.3
11	3.00	209.7	7.5	18.5	36.0
12	3.33	147.4	4.9	12.6	23.5
13	3.67	107.5	3.1	8.8	16.6
14	4.00	80.9	1.9	6.6	12.4
15	4.33	61.2	1.2	5.1	9.3
16	4.67	47.0	0.7	3.8	7.2
17	5.00	36.8	0.4	2.9	5.8
18	5.33	28.4	0.3	2.2	4.7
19	5.67	22.8	0.2	1.6	3.8
20	6.00	18.8	0.1	1.2	3.0
21	6.33	15.7	0.1	0.9	2.4
22	6.67	13.3	0.0	0.6	1.9
23	7.00	11.3	0.0	0.5	1.5
24	7.33	9.4	0.0	0.3	1.1
25	7.67	8.2	0.0	0.2	0.9
26	8.00	7.3	0.0	0.2	0.7
27	8.33	6.5	0.0	0.1	0.5
28	8.67	5.9	0.0	0.1	0.4
29	9.00	5.4	0.0	0.1	0.3
30	9.33	5.0	0.0	0.0	0.2
31	9.67	4.7	0.0	0.0	0.2
32	10.00	4.5	0.0	0.0	0.1
33	10.33	4.4	0.0	0.0	0.1
34	10.67	4.3	0.0	0.0	0.1
35	11.00	4.4	0.0	0.0	0.1
36	11.33	4.4	0.0	0.0	0.0
37	11.67	4.5	0.0	0.0	0.0
38	12.00	4.5	0.0	0.0	0.0
39	12.33	4.6	0.0	0.0	0.0
40	12.67	4.6	0.0	0.0	0.0
41	13.00	4.6	0.0	0.0	0.0
42	13.33	4.6	0.0	0.0	0.0
43	13.67	4.6	0.0	0.0	0.0
44	14.00	4.6	0.0	0.0	0.0
45	14.33	4.5	0.0	0.0	0.0
46	14.67	4.4	0.0	0.0	0.0
47	15.00	4.4	0.0	0.0	0.0
48	15.33	4.3	0.0	0.0	0.0

	A	AL	AM	AN	AO
1	t	22	23	24	25
49	15.67	4.2	0.0	0.0	0.0
50	16.00	4.0	0.0	0.0	0.0
51	16.33	3.9	0.0	0.0	0.0
52	16.67	3.8	0.0	0.0	0.0
53	17.00	3.7	0.0	0.0	0.0
54	17.33	3.6	0.0	0.0	0.0
55	17.67	3.5	0.0	0.0	0.0
56	18.00	3.4	0.0	0.0	0.0
57	18.33	3.4	0.0	0.0	0.0
58	18.67	3.3	0.0	0.0	0.0
59	19.00	3.3	0.0	0.0	0.0
60	19.33	3.2	0.0	0.0	0.0
61	19.67	3.2	0.0	0.0	0.0
62	20.00	3.2	0.0	0.0	0.0
63	Tot				
64	%				
65					
66	dt				
67	b max	15.0	67.8	80.7	43.7
68	y max	5.531	0.468	0.460	0.786
69	W af	846.99	91.32	88.91	135.69
70	S af	-0.07	0.00	-0.09	0.00
71	b.f.				
72	b.f.max				
73					
74		22	23	24	25
75		88.91	5.06	7.64	13.12
76		4.25	0.02	0.02	0.11
77		0.048	0.005	0.003	0.008
78		0.076	0.007	0.004	0.013

Qs Summary

	A	B	C	D	E	F	G	H	I
1			1	2	3	4	5.1	5.2	6
2	Historical Conditions								
3	100	W (af)	13.6915	24.1791	4.7190	8.3609	24.9339	24.9339	12.6942
4		S (af)	0.0465	0.2292	0.0017	0.0150	0.0819	0.9739	0.2598
5		b.f.	0.0034	0.0095	0.0004	0.0018	0.0033	0.0391	0.0205
6		b.f. max	0.0054	0.0185	0.0005	0.0041	0.0055	0.0654	0.0291
7	10	W (af)	2.8678	4.7824	0.0000	0.0000	6.0303	6.0303	2.6942
8		S (af)	0.0037	0.0128	0.0000	0.0000	0.0068	0.0757	0.0272
9		b.f.	0.0013	0.0027			0.0011	0.0126	0.0101
10		b.f. max	0.0020	0.0039			0.0023	0.0253	0.0147
11	2	W (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12		S (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13		b.f.							
14		b.f. max							
15	10/100	W (af)	0.209	0.198	0.000	0.000	0.242	0.242	0.212
16		S (af)	0.079	0.056	0.000	0.000	0.083	0.078	0.105
17		b.f.	0.379	0.281			0.342	0.321	0.494
18		b.f. max	0.364	0.211			0.411	0.386	0.504
19	2/100	W (af)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20		S (af)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21		b.f.							
22		b.f. max							
23									
24	Existing Conditions								
25	100	W (af)	13.9421	19.2314		16.4738		33.6777	12.8650
26		S (af)	0.0479	0.2405		0.0529		1.3971	0.2619
27		b.f.	0.0034	0.0125		0.0032		0.0415	0.0204
28		b.f. max	0.0055	0.0194		0.0078		0.0730	0.0290
29	10	W (af)	3.0275	1.0110		5.7603		9.6116	2.7961
30		S (af)	0.0041	0.0021		0.0123		0.1720	0.0286
31		b.f.	0.0014	0.0021		0.0021		0.0179	0.0102
32		b.f. max	0.0021	0.0021		0.0041		0.0325	0.0149
33	2	W (af)	0.0000	0.1488		1.7355		1.8485	0.0000
34		S (af)	0.0000	0.0010		0.0064		0.0181	0.0000
35		b.f.		0.0065		0.0037		0.0098	
36		b.f. max		0.0065		0.0057		0.0145	
37	10/100	W (af)	0.217	0.053		0.350		0.285	0.217
38		S (af)	0.086	0.009		0.232		0.123	0.109
39		b.f.	0.398	0.168		0.665		0.431	0.503
40		b.f. max	0.385	0.111		0.529		0.445	0.513
41	2/100	W (af)	0.000	0.008		0.105		0.055	0.000
42		S (af)	0.000	0.004		0.121		0.013	0.000
43		b.f.		0.523		1.150		0.236	
44		b.f. max		0.338		0.472		0.134	

Qs Summary

	A	B	J	K	L	M	N	O	P
1			7	8	9	10	11.0	12	13
2	Historical Conditions								
3	100	W (af)	25.0799	2.8457	3.6226	0.1488	0.7851	29.3967	2.2534
4		S (af)	0.3841	0.0163	0.0677	0.0000	0.0130	1.1007	0.0200
5		b.f.	0.0153	0.0057	0.0187	0.0002	0.0165	0.0374	0.0089
6		b.f. max	0.0289	0.0083	0.0270	0.0002	0.0280	0.0704	0.0122
7	10	W (af)	6.1047	0.7190	0.4132	0.0000	0.1377	6.6391	0.4573
8		S (af)	0.0143	0.0019	0.0293	0.0000	0.0020	0.0921	0.0017
9		b.f.	0.0023	0.0026	0.0708		0.0146	0.0139	0.0037
10		b.f. max	0.0049	0.0037	0.1348		0.0210	0.0291	0.0055
11	2	W (af)	0.0000	0.0716	0.0000	0.0000	0.0000	0.0000	0.0000
12		S (af)	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
13		b.f.		0.0013					
14		b.f. max		0.0018					
15	10/100	W (af)	0.243	0.253	0.114	0.000	0.175	0.226	0.203
16		S (af)	0.037	0.115	0.432	0.000	0.155	0.084	0.084
17		b.f.	0.153	0.457	3.788		0.886	0.371	0.412
18		b.f. max	0.170	0.450	4.993		0.751	0.413	0.454
19	2/100	W (af)	0.000	0.025	0.000	0.000	0.000	0.000	0.000
20		S (af)	0.000	0.006	0.000	0.000	0.000	0.000	0.000
21		b.f.		0.232					
22		b.f. max		0.213					
23									
24	Existing Conditions								
25	100	W (af)	33.7218	2.8512	22.5482	0.1488	0.8044	57.1185	2.5289
26		S (af)	0.5309	0.0164	0.7310	0.0000	0.0148	3.0270	0.0238
27		b.f.	0.0157	0.0057	0.0324	0.0002	0.0184	0.0530	0.0094
28		b.f. max	0.0321	0.0083	0.0551	0.0002	0.0302	0.1030	0.0129
29	10	W (af)	9.7052	0.7383	10.6116	0.0006	0.1488	20.5069	0.6529
30		S (af)	0.0931	0.0020	0.1980	0.0000	0.0019	0.6764	0.0025
31		b.f.	0.0096	0.0027	0.0187	0.0001	0.0130	0.0330	0.0038
32		b.f. max	0.0173	0.0038	0.0296	0.0001	0.0183	0.0554	0.0059
33	2	W (af)	1.8678	0.0826	4.0331	0.0000	0.0000	5.8898	0.1074
34		S (af)	0.0476	0.0001	0.0769	0.0000	0.0000	0.1103	0.0002
35		b.f.	0.0255	0.0011	0.0191			0.0187	0.0019
36		b.f. max	0.0389	0.0014	0.0279			0.0279	0.0025
37	10/100	W (af)	0.288	0.259	0.471	0.004	0.185	0.359	0.258
38		S (af)	0.175	0.121	0.271	0.002	0.131	0.223	0.105
39		b.f.	0.609	0.468	0.576	0.640	0.707	0.622	0.408
40		b.f. max	0.540	0.461	0.538	0.640	0.607	0.538	0.455
41	2/100	W (af)	0.055	0.029	0.179	0.000	0.000	0.103	0.042
42		S (af)	0.090	0.005	0.105	0.000	0.000	0.036	0.008
43		b.f.	1.618	0.189	0.588			0.353	0.200
44		b.f. max	0.794	0.131	0.347			0.182	0.146

Qs Summary

	A	B	Q	R	S	T	U	V	W
1			14.1	14.2	15	16	17	18	19
2	Historical Conditions								
3	100	W (af)	37.3774	37.3774	42.0165	3.7989	47.3829	4.3609	9.2259
4		S (af)	0.6259	0.5740	1.6528	0.0590	0.9186	0.0061	0.0844
5		b.f.	0.0167	0.0154	0.0393	0.0155	0.0194	0.0014	0.0092
6		b.f. max	0.0300	0.0275	0.0688	0.0218	0.0347	0.0021	0.0146
7	10	W (af)	8.7493	8.7493	9.8953	0.9890	13.4215	0.9091	1.9532
8		S (af)	0.0389	0.0388	0.1456	0.0066	0.1192	0.0010	0.0053
9		b.f.	0.0044	0.0044	0.0147	0.0067	0.0089	0.0011	0.0027
10		b.f. max	0.0078	0.0077	0.0241	0.0096	0.0154	0.0016	0.0039
11	2	W (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12		S (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13		b.f.							
14		b.f. max							
15	10/100	W (af)	0.234	0.234	0.236	0.260	0.283	0.208	0.212
16		S (af)	0.062	0.068	0.088	0.112	0.130	0.158	0.063
17		b.f.	0.265	0.289	0.374	0.429	0.458	0.760	0.297
18		b.f. max	0.259	0.281	0.350	0.442	0.444	0.730	0.266
19	2/100	W (af)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20		S (af)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21		b.f.							
22		b.f. max							
23									
24	Existing Conditions								
25	100	W (af)	66.7548	66.7548	71.4848		90.1708		
26		S (af)	1.5875	1.4823	2.6371		2.4811		
27		b.f.	0.0238	0.0222	0.0369		0.0275		
28		b.f. max	0.0434	0.0405	0.0654		0.0446		
29	10	W (af)	22.7796	22.7769	24.0716		31.3719		
30		S (af)	0.2465	0.2315	0.6229		0.4580		
31		b.f.	0.0108	0.0102	0.0259		0.0146		
32		b.f. max	0.0187	0.0176	0.0450		0.0220		
33	2	W (af)	6.1680	6.1680	6.3058		8.4738		
34		S (af)	0.0304	0.0519	0.0862		0.0619		
35		b.f.	0.0049	0.0084	0.0137		0.0073		
36		b.f. max	0.0072	0.0122	0.0204		0.0100		
37	10/100	W (af)	0.341	0.341	0.337		0.348		
38		S (af)	0.155	0.156	0.236		0.185		
39		b.f.	0.455	0.458	0.701		0.531		
40		b.f. max	0.432	0.435	0.687		0.493		
41	2/100	W (af)	0.092	0.092	0.088		0.094		
42		S (af)	0.019	0.035	0.033		0.025		
43		b.f.	0.207	0.379	0.370		0.266		
44		b.f. max	0.114	0.208	0.209		1.568		

Qs Summary

	A	B	X	Y	Z	AA	AB	AC
1			20	21	22	23	24	25
2	Historical Conditions							
3	100	W (af)	24.1212	29.1653	88.9118	5.0551	7.6419	13.1240
4		S (af)	0.2807	0.7019	4.2532	0.0237	0.0195	0.1074
5		b.f.	0.0116	0.0241	0.0478	0.0047	0.0026	0.0082
6		b.f. max	0.0175	0.0381	0.0762	0.0070	0.0040	0.0133
7	10	W (af)	5.2645	6.4077	20.5895	1.1680	1.7658	2.9174
8		S (af)	0.0271	0.0670	0.4923	0.0017	0.0015	0.0085
9		b.f.	0.0051	0.0105	0.0239	0.0014	0.0008	0.0029
10		b.f. max	0.0087	0.0183	0.0407	0.0021	0.0013	0.0044
11	2	W (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12		S (af)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13		b.f.						
14		b.f. max						
15	10/100	W (af)	0.218	0.220	0.232	0.231	0.231	0.222
16		S (af)	0.097	0.095	0.116	0.070	0.075	0.079
17		b.f.	0.442	0.434	0.500	0.304	0.327	0.357
18		b.f. max	0.499	0.481	0.534	0.294	0.325	0.332
19	2/100	W (af)	0.000	0.000	0.000	0.000	0.000	0.000
20		S (af)	0.000	0.000	0.000	0.000	0.000	0.000
21		b.f.						
22		b.f. max						
23								
24	Existing Conditions							
25	100	W (af)	32.7631		136.0606			
26		S (af)	0.6419		6.1482			
27		b.f.	0.0196		0.0452			
28		b.f. max	0.0284		0.0689			
29	10	W (af)	15.6061		52.5152			
30		S (af)	0.1856		2.1481			
31		b.f.	0.0119		0.0409			
32		b.f. max	0.0162		0.0608			
33	2	W (af)	6.2176		16.7355			
34		S (af)	0.0464		0.3856			
35		b.f.	0.0075		0.0230			
36		b.f. max	0.0113		0.0353			
37	10/100	W (af)	0.476		0.386			
38		S (af)	0.289		0.349			
39		b.f.	0.607		0.905			
40		b.f. max	0.572		0.882			
41	2/100	W (af)	0.190		0.123			
42		S (af)	0.072		0.063			
43		b.f.	0.381		0.510			
44		b.f. max	0.263		0.334			