3049.001

MASTER DRAINAGE REPORT FOR CHEYENNE MOUNTAIN CENTER AND FINAL DRAINAGE REPORT FOR CHEYENNE MOUNTAIN CENTER FILING NO. 1 AND CHEYENNE MEADOWS ROAD

COLORADO SPRINGS, COLORADO

DREXEL, BARRELL & CO.
ENGINEERS — SURVEYORS
1700 38TH STREET
BOULDER, COLORADO 80301
(303) 442-4338

MASTER DRAINAGE REPORT
FOR
CHEYENNE MOUNTAIN CENTER
AND
FINAL DRAINAGE REPORT FOR
CHEYENNE MOUNTAIN CENTER FILING NO. 1
AND CHEYENNE MEADOWS ROAD
COLORADO SPRINGS, COLORADO

PREPARED BY:

DREXEL, BARRELL & CO.
1700 38TH STREET
BOULDER, COLORADO 80301

PREPARED FOR:

GATES LAND COMPANY

OCTOBER 2, 1985
E-2669
(0259R)

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HYDROLOGY

DRAWINGS (Back Pocket)

CITY OF COLORADO SPRINGS
The "America the Beautiful" City
DEPARTMENT OF PUBLIC WORKS CITY ENGINEERING DIVISION (303) 578-6606
30 S. NEVADA SUITE 403 P.O. BOX 1575
COLORADO SPRINGS, COLORADO 80901

CHEYENNE MOUNTAIN CENTER
MASTER DRAINAGE REPORT AND FILING NO. 1

CONDITIONS OF APPROVAL:

a. The letter of credit to be provided with this report for Filing No. 1 includes the amounts noted herein as items "A", "B", "C", and item "D" for the Sinton Outfall, El Paso County.

b. The Colorado Department of Highways shall maintain all drainage facilities within its right-of-way as stated in the September 9, 1985 letter from R. Q. Brown. All design analysis and proposed construction affecting the roadway and drainage facilities shall meet with the C.D.H.'s requirements.

c. The drainage facilities for the "Sinton Outfall" between Highway I-25 and Fountain Creek shall conform to the design and construction requirements of the El Paso County Department of Transportation.

d. Maintenance for the drainage ways in the Quail Lake Northerly Park area ("K-2 Pond" Basin), west of Venetucci Blvd. is subject to an agreement between the City Parks and Recreation Department and the Gates Land Company. The "K-2 Pond" facility to be maintained by the Department of Public Works after final acceptance.

e. A flood potential and erosion protection analysis will be required for any private properties adjacent to the "K-2 Pond" drainage way in the vicinity of Venetucci Blvd. and Tenderfoot Hills Rd. prior to construction drawing approval for any related drainage improvements.

f. Maintenance responsibilities for the Harrison Creek outfall and drainage way east of Highway I-25 are subject to an agreement by the Harrison School District. If maintenance responsibilities are not established, The Gates Land Company will be required to construct an adequate facility for the design discharge meeting City criteria. (or appropriate letter of credit)

g. All proposed construction to be maintained by the City shall be subject to final design requirements and criteria. Only drainage facilities conveying runoff from public streets or drainage facilities will be accepted for maintenance by the City.

GATES LAND COMPANY

By: ______________________ Date: 11·14·85
Bob Svejkovsky

Title: Director of Engineering

CITY OF COLORADO SPRINGS

Gary R. Haynes 11-14-85
City Engineer

DRAINAGE REPORT STATEMENTS

ENGINEER'S STATEMENT:

The Master Drainage Plan and Report for Cheyenne Mountain Center and Final Drainage Report and Plan for Cheyenne Mountain Center Filing No. 1, were prepared under by direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by the negligent acts, errors or omissions on my part in preparing this report.

FOR: Drexel, Barrell & Co.

JOHN COMMON
11956

BY:

John Common, Professional Engineer 11956

DEVELOPER'S STATEMENT:

The developer has read and will comply with all of the requirements specified in this drainage report.

Gates Land Development Company

BY:

Bob Svejkovsky

TITLE: Director of Engineering

ADDRESS: 155 West Lake Avenue
Colorado Springs, CO 80906

CITY OF COLORADO SPRINGS:

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

City Engineer Gary R. Haynes Date 11/14/85

Conditions:

- Subject to the attached conditions of approval

DREXEL, BARRELL & CO.
ENGINEERS SURVEYORS
1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

FLOOD PLAIN STATEMENT

Cheyenne Mountain Center is not in a designated flood plain as shown on the Federal Insurance Rate Maps.

COLORADO REGISTERED PROFESSIONAL ENGINEER
BARBARA WEISS TURNER
15471

Barbara Weiss Turner
Barbara Weiss Turner

CITY OF COLORADO SPRINGS
The "America the Beautiful" City
DEPARTMENT OF PUBLIC WORKS CITY ENGINEERING DIVISION (303) 578-6606
30 S. NEVADA SUITE 403 P.O. BOX 1575
COLORADO SPRINGS, COLORADO 80901

CHEYENNE MOUNTAIN CENTER
MASTER DRAINAGE REPORT AND FILING NO. 1

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g. All proposed construction to be maintained by the City shall be subject to final design requirements and criteria. Only drainage facilities conveying runoff from public streets or drainage facilities will be accepted for maintenance by the City.

GATES LAND COMPANY
By: ______________________ Date: 11·14-85
Bob Svejkovsky

Title: Director of Engineering

CITY OF COLORADO SPRINGS
Gary R. Haynes 11-14-85
City Engineer

MASTER DRAINAGE REPORT FOR
CHEYENNE MOUNTAIN CENTER
AND
FINAL DRAINAGE REPORT FOR
CHEYENNE MOUNTAIN CENTER FILING NO. 1
AND CHEYENNE MEADOWS ROAD
COLORADO SPRINGS, COLORADO

PURPOSE

The purpose of this report is to update and expand Drexel, Barrell & Co.'s previous report "Master Drainage Report for Cheyenne Mountain Center" dated March 15, 1984 and revised May 9, 1985. The overall hydrologic and hydraulic analysis of the site made in the May 9, 1985 report has not been changed, but the calculations have been modified to agree with the revised site layout. These site revisions include eliminating Road #5, abandoning a portion of the I-25 West Frontage Road, and finalizing the design of the Harrison Creek Outfall and the outfall storm sewer along Highway 85. This report will serve as the Master Drainage Plan for Cheyenne Mountain Center as well as the Final Drainage Plan for Cheyenne Mountain Center, Filing No. 1 and Cheyenne Meadows Road.

The Colorado State Highway Department has approved Drexel, Barrell & Co.'s "Drainage Report for Cheyenne Mountain Center" dated March 15, 1984 and revised May 9, 1985 as a Master Drainage Plan for Cheyenne Mountain Center.

LOCATION

Cheyenne Mountain Center is a proposed commercial development covering approximately 104 acres in part of the NW1/4, Section 32, T14S, R66W of the 6th P.M., Colorado Springs, El Paso County, Colorado. It is bordered on the west by Venetucci Boulevard (U.S. Highway 85), on the north by Lake Avenue (also known as Harrison Street), on the east by Interstate 25, and on the south by the Cheyenne Meadows Road right-of-way. Cheyenne Mountain Center, Filing No. 1 covers approximately 15 acres of the northeastern portion of Cheyenne Mountain Center and a 76 foot right-of-way for the proposed Cheyenne Mountain Boulevard. See the vicinity map in Appendix A.

RELATED REPORTS AND STUDIES

Five major reports/studies have previously analyzed the site and surrounding area. These are entitled "Engineering Study of Southwest Area Drainage Basin (Cheyenne Creek, Cheyenne Run, and Spring Run)" dated February 29, 1984, prepared by Lincoln DeVore Testing Laboratory, Inc.; "Drainage Study, Broadmoor Mesa First Filing" dated August 18, 1969, prepared by Hartzell-Pfeiffenberger and Associates, Inc.; "Master Drainage Plan, Harrison Street - I-25 Vicinity, Cheyenne Mountain Ranch" dated November 15, 1973, prepared by Hartzell-Pfeiffenberger and Associates, Inc.; "Master Drainage Report for a Portion of Area II, Cheyenne Mountain Ranch" dated May 24, 1982 prepared by Drexel, Barrell & Co.; and "Master Drainage Report for Cheyenne Mountain Center" prepared by Drexel, Barrell & Co., dated March 15, 1984, revised May 9, 1985.

In addition, numerous individual site specific drainage studies for the immediate and surrounding area have been approved by the City of Colorado Springs.

DESIGN CRITERIA

The design criteria used in the preparation of this report was taken from the City of Colorado Springs "Determination of Storm Runoff Criteria", dated March, 1977 as amended through May, 1985. Runoff was determined for the 5-year and 100-year, 6-hour storm using the modified SCS Method. The 5-year and 100-year, 24-hour storms were also analyzed, at the request of the City Engineering Department, for the proposed Pond K2 using charts and graphs from "Procedures for Determining Peak Flows in Colorado", prepared by the Soil Conservation Service, March, 1980.

EXISTING DRAINAGE

Site: The existing ground on the site slopes to the east at approximately 2%. Some overlot grading has been performed, but drainage patterns have not changed. The northern portion of the site presently drains to a box culvert under I-25 to the Harrison School property. The southern portion of the site flows to the east to the west Frontage Road of I-25, and then south along the Frontage Road to an underpass near the junction of I-25 and Highway 85.

Tributary Basins and Outfall: Over 1.5 square miles are historically tributary to this site from the west. About 126 acres are tributary to the existing arch culverts at the intersection of Lake Avenue and Highway 85. An existing ditch, refered to as the Harrison Creek Outfall, carries the runoff from the intersection east along Lake Avenue to the west side of I-25, then South along I-25 to an exisiting box culvert under I-25. This box culvert discharges east under I-25 to a pilot channel within the Harrison School property. The flow continues east eventually discharging into Fountain Creek. This area and flow is detailed in the "Master Drainage Plan, Harrison Street - I-25 Vicinity, Cheyenne Mountain Ranch" by Hartzell-Pfeiffenberger and Associates.

The North Gully contributes drainage from an area of about 520 acres to a 5-foot high by 20-foot box culvert located under Highway 85 south of Tenderfoot Hill Road. An area of 51 acres drains across Highway 85 at Cheyenne Mountain Boulevard. An additional 300 acres drain to a bridge below Quail Lake under Highway 85 north of Cheyenne Meadows Boulevard. The runoff from these three areas flows across Cheyenne Mountain Center, into the existing Harrison Creek Outfall, south to the box culvert under I-25, and onto the Harrison School property. Prior to the construction of I-25, the historic path of the North Gully also directed the runoff over what is now the Harrison School property. Drexel, Barrell & Co.'s "Master Drainage Report For a Portion of Area II, Cheyenne Mountain Ranch" describes these three areas in more detail.

Because the capacity of the box culvert at I-25 is less than the amount of 100-year, 6-hour runoff tributary to that point, a portion of the runoff continues to flow south in an existing ditch along I-25. Runoff from the southern portion of the site and 74 acres tributary to Cheyenne Meadows Road also flows into this ditch.

Approximately 2800 feet south of the box culvert, the ditch discharges into an existing I-25 underpass. The flow then continues east and discharges into Fountain Creek. The runoff path east of the underpass is referred to as the Sinton Outfall.

PROPOSED DRAINAGE

General Characteristics: The site, intended for commercial uses and development, will include the construction of commercial buildings, drives, parking lots, three ponds, three public roads, and one private road. The site plan shown for Filing No. 1 and Cheyenne Meadows Road is final. The remainder of the site plan shown is conceptual and the actual interior parking, drives and building layouts may change. Future changes in the site plan should not change the general drainage patterns.

This report establishes final design parameters for drainage improvements within Filing No. 1, Cheyenne Meadows Road, a portion of the Harrison Creek Outfall and the outfall storm sewer along Highway 85. Construction plans for these improvements will follow approval of this report. The remaining improvements shown on the enclosed master drainage plan are conceptual in nature and are intended to be used as a guide only. As the remainder of the site is platted, final drainage reports will be submitted and these conceptual drainage improvements will be finalized.

The Colorado State Highway Department has reviewed and approved, Drexel, Barrell & Co.'s "Drainage Report for Cheyenne Mountain Center", dated March 15, 1984 and revised May 9, 1985 as a "Master Plan". A copy of the letter from the State to the City of Colorado Springs, Engineering Division stating this approval is in Appendix R, Page 7.

Interior Drainage: Proposed interior drainage for Cheyenne Mountain Center is generally directed east to the public or private roads where it is picked up by inlets and storm sewer prior to exceeding road capacity. It is expected that some storm sewer systems will be utilized outside of proposed public roadways. These storm sewer systems will be private and will be placed to reduce flow in proposed roads to acceptable levels. Swales will be provided to drain parking areas to roads where necessary. Three ponds are planned for Cheyenne Mountain Center. These ponds will be a permanent water feature with only the area immediately adjacent to each pond draining to it. Water from public facilities will not drain into the ponds and no outflow is planned. The ponds will be owned and maintained as private facilities.

Buildings located adjacent to each pond will have the finish floor elevation high enough to protect against 100-year storm events. Because the right-of-way for the interior roads is one-half foot behind back of curb, a drainage and sidewalk easement is planned adjacent to the roads. Where a 10-foot sidewalk easement is not sufficient, additional drainage easement will be dedicated. Grading along these roadways will insure that the runoff stays within the right-of-way and/or drainage easement.

The flow from the northern portion of the site will continue to be directed to The Harrison Creek Outfall. The existing ditch will be improved with storm sewer and a grassed lined channel and is more fully described below.

The southern portion of the site drains southeast to the intersection of Cheyenne Meadows Road and the Frontage Road and then south along the Frontage Road. A portion of the 100 year storm flows across the Frontage Road to the eastern borrow ditch (west of I-25) as the capacity of western borrow ditch is exceeded. For most of the reach to the outfall, the capacity of the borrow ditches on both sides of the Frontage Road is adequate to handle the 100-year flow. The southern most portion of the Frontage Road will be inundated by approximately 3" of water for the 100-year major storm. The State Highway regulations require that the crown of the road not be exceeded by 6" of water for a 100-year storm. Both Frontage Road borrow ditches discharge through the I-25 Underpass.

Cheyenne Mountain Center, Filing No. 1: Development within Filing No. 1 will include the construction of a hotel on approximately 15 acres of land, Cheyenne Mountain Boulevard, the storm sewer within Cheyenne Mountain Boulevard and the storm sewer required to drain the proposed cul-de-sac. The drainage from Filing No.1 will be directed either overland or through storm sewer to the improved Harrison Creek Outfall. The 5-year drainage within Cheyenne Mountain Boulevard and its tributary basins will be collected in storm inlets along Cheyenne Mountain Boulevard. At the intersection of Cheyenne Mountain Boulevard and Road No. 3, the storm sewer servicing the roadway will discharge into a temporary swale. When Road No. 3 is completed, the swale will be replaced with storm sewer within Road No. 3. The 100-year flow that is not carried within the storm sewer will be contained within swales and drainage easements above the storm sewer. All of the Cheyenne Mountain Boulevard runoff will be directed to the Harrison Creek Outfall which will be built in conjunction with the development of Filing No. 1.

Harrison Creek Outfall: The Harrison Creek Outfall will continue to collect the offsite runoff from Basin O-1 at the intersection of Venetucci Boulevard (Highway 85) and Lake Avenue. The runoff will be carried in a 73" x 55" C.A.P.A. (corrugated aluminum pipe arch) conduit from the existing culverts under Venetucci Boulevard to approximately 500-feet east of the centerline of proposed Cheyenne Mountain Boulevard. A riprap stilling basin will be provided at the outlet of the 73" x 55" C.A.P.A. to dissipate the water energy. A 5-foot deep and 5-foot bottom width grass-lined trapazoidal channel will continue from the stilling basin to the existing 6-foot high by 10-foot wide box culvert under I-25. At the west side of the box culvert, an overflow structure will be constructed to limit the amount of runoff being directed to the box to 350 cfs, as shown in the Hartzell-Pfeiffenberger report "Master Drainage Plan, Harrison Street - I-25 Vicinity, Cheyenne Mountain Ranch". Any flow greater than the 350 cfs will continue to the south. The existing Frontage Road will be abandoned. The proposed grass lined channel will be constructed where the Frontage Road presently is and will carry the runoff now being conveyed by the borrow ditches. This new channel would lie within the state's right-of-way and will be maintained by the State (see letter in Appendix R, Page 7). The 73"x55" C.A.P.A. will lie in a drainage easement within Cheyenne Mountain Center and will be maintained by the City.

Although the peak 100-year flow from Basin O-1 and the tributary onsite basins is less than 500 cfs, the outfall was designed to convey the 100-year runoff. Calculations for the design and modification of this outfall are included in Appendix G.

Harrison School property is to the east of the existing box culvert under I-25. A small ditch, referred to as the pilot channel, directs the runoff from the box culvert to the existing Harrison Creek Channel. The Pilot Channel has the capacity to carry approximately 120 cfs. The remaining portion of the 350 cfs is contained within a width of about 100 feet. Negotiations between Gates Land Company and Harrison School are underway in efforts to obtain approval from the school to provide necessary maintenance for this reach of the channel. Should these talks fail it is our opinion that because flow now tributary to the School is less than that historically tributary, approval from Harrison School should not stand in the way of development of Cheyenne Mountain Center. Two letters to Colorado Springs engineering which outline the adequacy of this outfall are included with Appendix R, Pages 4-6.

East of the Harrison School property, the existing Harrison Creek Channel has been improved and is adequate to convey the 100 year flow to Fountain Creek.

Pond K2 and Outfall Storm Sewer Along Highway 85: Pond K2 is located in a City of Colorado Springs Park Site in the North Gully where runoff from Basins O, P, N, J, K and K2 converges. The pond will be maintained by the City. The pond is strictly for storm runoff detention and will not store water on a day to day basis. Neither embankment height nor pond storage capacity is great enough to require State approval. The primary outlet is a 66" RCP (see "Drainage Plan for Detention Pond K2, Drawing No. 3D-651, inserted). An emergency overflow spillway is provided to accomodate the design 100-year storm should the primary outlet become nonfunctional or to accomodate a storm of recurrence greater than 100 years. At the request of the City, Pond K2 was analyzed for incoming flows resulting from the 100-year, 24-hour storm. This storm should be safely conveyed through the pond with water discharging through both the outlet pipe and the emergency spillway and leaving 1.4 feet of freeboard in the pond. Final design of Pond

K2 will be coordinated with the City of Colorado Springs Department of Public Works and the City Parks Department.

Discharge from Pond K2 will be conveyed east through the North Gully to the existing Highway 85 double 5-foot high by 10-foot wide box culvert. The North Gully will be left in a natural state. Flow passing through the box culvert will be transitioned into the head of the proposed outfall storm along Highway 85 at the east end of the culvert.

The proposed outfall storm sewer adjacent to the east right-of-way of Highway 85 is designed to intercept the 100-year developed runoff from uplands to the west which historically drain through Cheyenne Mountain Center (see enclosed Master Drainage Plan for Area II, Drawing 3D-081) and discharge it just south of Cheyenne Meadows Boulevard. The storm sewer is divided into three phases. Phase 1 includes the construction of storm sewer from the existing box culvert under Highway 85 south approximately 1100 feet to the south side of Cheyenne Mountain Boulevard, 1700 feet of temporary open drainage channel from Cheyenne Mountain Boulevard to Cheyenne Meadows Road, storm sewer under Cheyenne Meadows Road, and approximtely 300 feet of open drainage channel to the south of Cheyenne Meadows Road. This last channel segment will daylight at the flowline at an existing drainage swale. Gates Land Company owns the land downstream of the Phase 1 outlet and will permit the storm sewer discharge to sheet essentially undirected across its' land south and easterly to the natural point of concentration near the existing I-25 underpass. A letter from Gates Land Company was submitted to the City indicating acceptance of this drainage and a copy is in Appendix R, Page 3.

Phase 2 construction will replace the temporary open channel between Cheyenne Mountain Boulevard and Cheyenne Meadows Road with 72" and 84" RCP storm sewer.

Future phases will replace the temporary channel south of Cheyenne Meadows Boulevard with storm sewer south to the I-25 underpass. The contributing drainage to the future phase outfall from Stratmoor Hills will be detailed prior to development of the land south of Cheyenne Mountain Center. Refer to Drexel, Barrell's "Master Drainage Report for a portion of Area II, Cheyenne Mountain Ranch" for details on sizing.

Hydraulic design for the Phase 1 and 2 outfall storm sewer followed the criteria established in the City "Determination of Storm Runoff Criteria" Manual; in particular the August 28, 1980 addendum thereto. The pipes, located adjacent to Highway 85, are designed to flow full and to go under pressure while maintaining the hydraulic grade line well below the ground surface. Design calculations are included in Appendix I. The conceptual plan for the outfall storm sewer south of Cheyenne Meadows Road, Drawing 3D-291 is included.

The existing drainage facilities at the I-25 underpass includes a 48" pipe in addition to a 14' wide by 11'-8" high box culvert underpass. These facilities have adequate capacity to handle the 100-year flow and are discussed in the "Master Drainage Report for a Portion of Area II". In order to keep the underpass mostly clear during a 100-year storm, the Colorado Department of Highways, C.D.H., has proposed placing a 72" RCP culvert under Interstate 25 approximately 100 feet north of the underpass. Gates Land Company and C.D.H. have signed an agreement concerning this construction. A letter from C.D.H. is included in Appendix R, Page 1. It is anticipated that the 72" culvert will be constructed within one year.

The proposed Sinton Outfall Channel will collect runoff discharged east through the Interstate 25 embankment and convey it to Fountain Creek. The proposed design includes a concrete lined channel with drops outside the 100-year floodplain and a grass lined channel to the floodway of Fountain Creek. The grassed lined channel is acceptable to El Paso County. The enclosed plan (3D-589) has been reviewed by El Paso County and final design will be coordinated with the County. A letter of credit from Gates for this channel will be given to the City upon approval of this report.

Presently, the planned improvements of Highway 85 include curb and gutter. The storm sewer connections to the Phase 1 and 2 outfall storm sewer shown on the master drainage plan, Drawing 1Q-298, are conceptual. As stated before, the C.D.H. has approved Drexel, Barrell and Co's Drainage Report for Cheyenne Mountain Center" dated March 15, 1984 and revised May 9, 1985 and with it, the conceptual drainage improvements in and along Highway 85. A separate drainage report for the final Highway 85 improvements will be submitted to the State for their review.

CONCLUSION:

This report is a Master Drainage Plan for The Cheyenne Mountain Center as well as a Final Drainage Report for Cheyenne Mountain Center, Filing No. 1 and Cheyenne Meadows Road. It provides a hydrologic and hydraulic analysis of Cheyenne Mountain Center and tributary areas and specifies drainage improvements necessary to convey both the 5-year and 100-year storms. Within the site, the storm sewer was designed to carry the 5-year flow and provisions were made to handle the 100-year flow. The major storm sewer and channels along The Harrison Creek Outfall and along Highway 85 were designed to carry the 100-year flow. Included in the appendices of this report are the vicinity map, calculations, pertinent letters, cost estimates and drainage plans.

By agreement with the City of Colorado Springs and Gates Land Company, no drainage fees will be required. Drainage facilities for this site will be built and paid for by Gates Land Company.

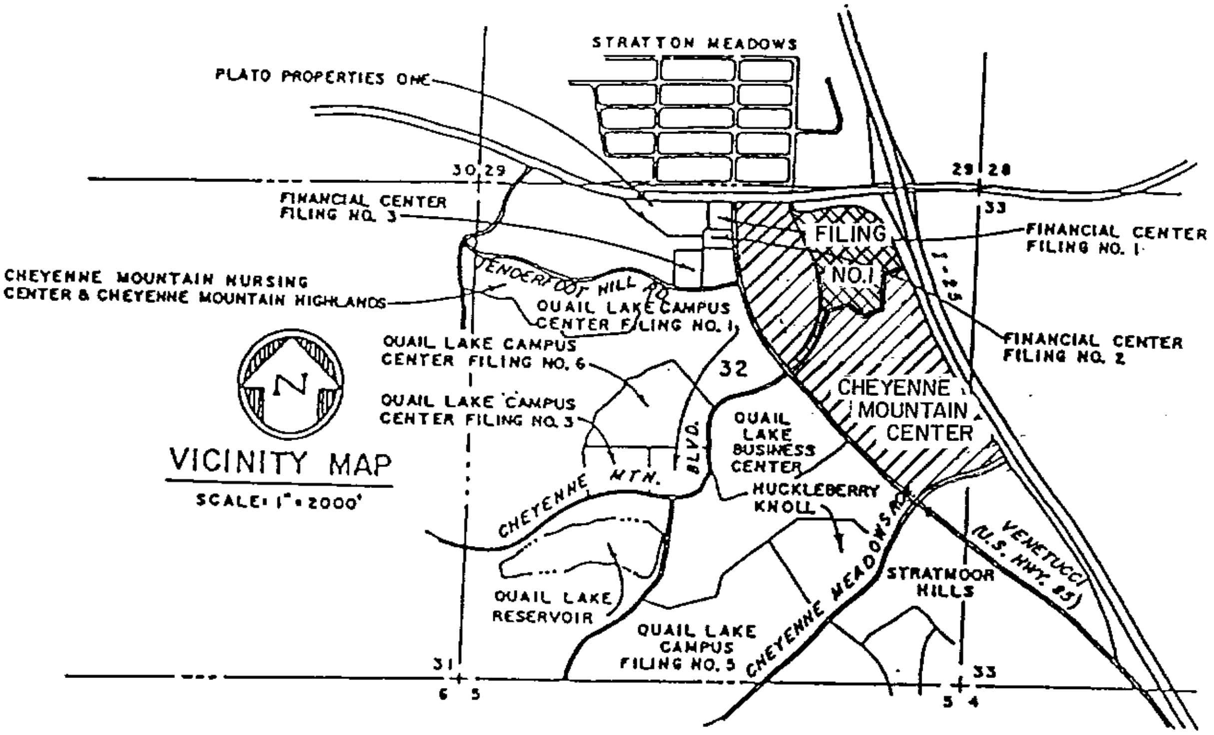
Respectfully submitted,

Barbara Weiss Turner

Barbara Weiss Turner, P.E.
Drexel, Barrell & Co.

A1/2

EXHIBIT "A"

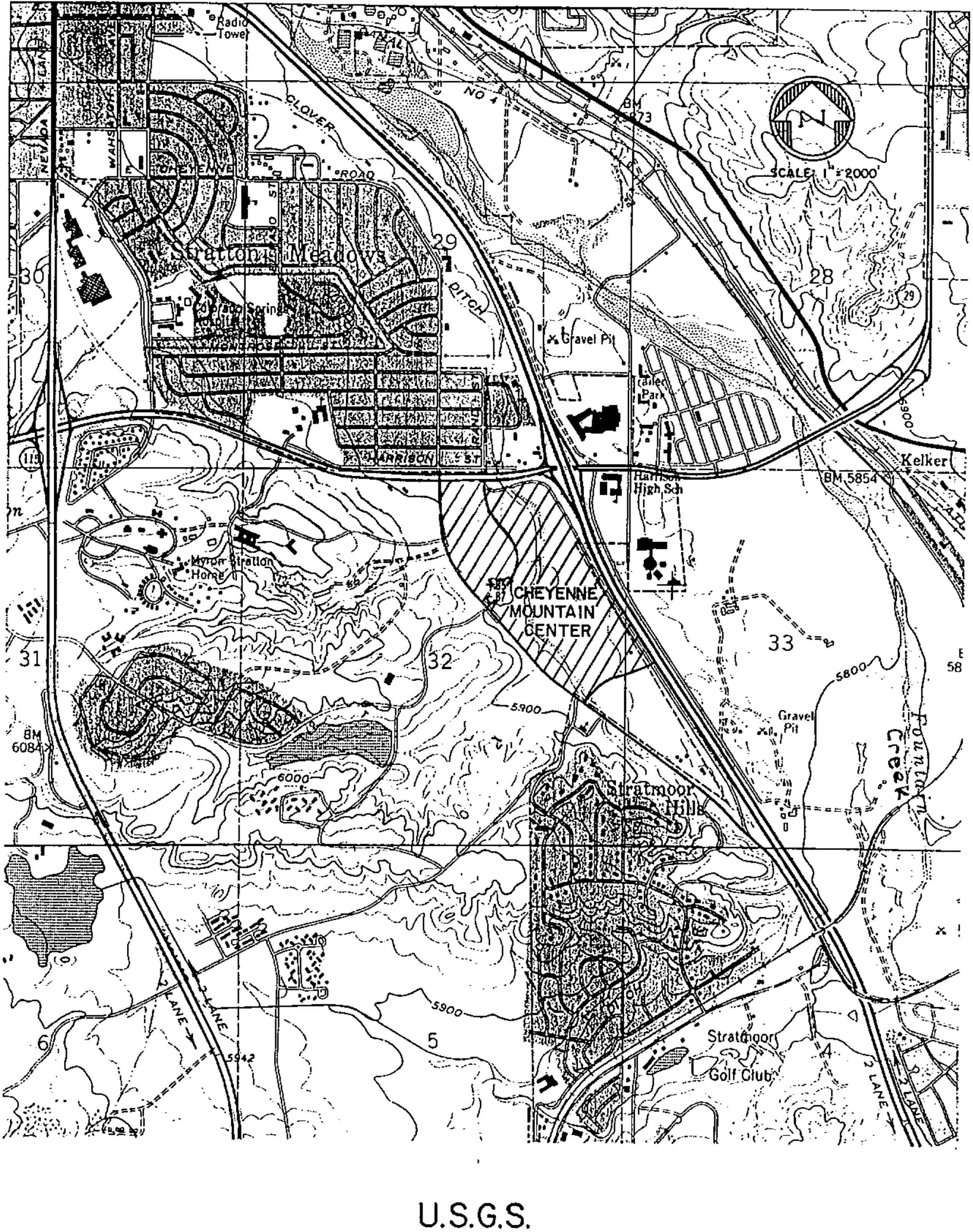


VICINITY MAP

SCALE: 1" = 2000'

A2/2

EXHIBIT "A1"

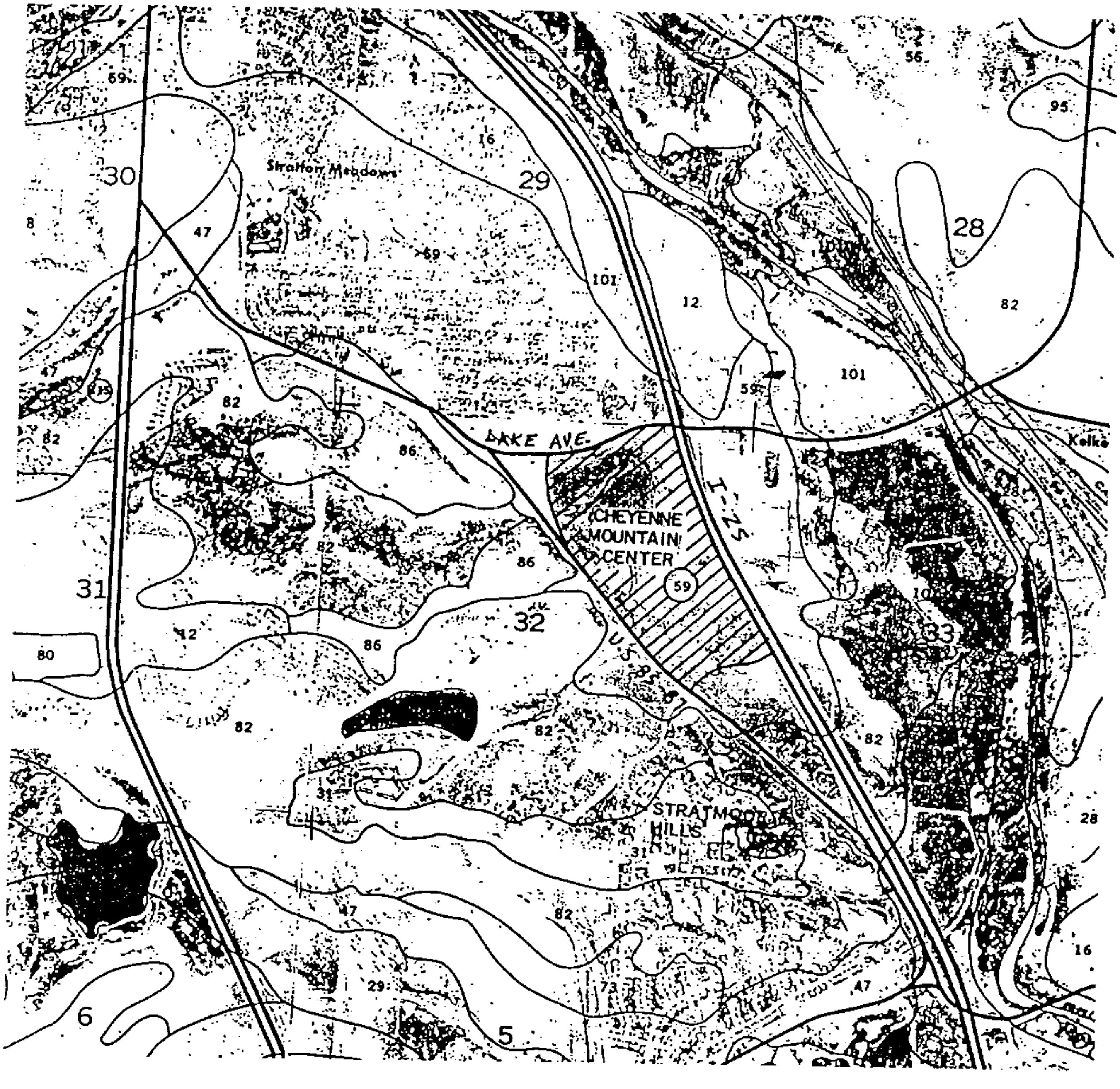


U.S.G.S.

VICINITY MAP

SCALE: 1" = 2000'

EXHIBIT "B"



SOILS MAP

SCALE: 1" = 2000'

B2/2

EXHIBIT "B"

HYDROLOGIC SOILS GROUPS

FOR
NORTHWEST PORTION CHEYENNE MOUNTAIN CENTER

No.	Classification	Hydrologic Group
12	Bresser	B
59	Nunn	C
82	Schamber-Razor Complex	A/C
86	Stoneham	B

APPENDIX C

EXHIBIT "C"
INDIVIDUAL BASIN DATA SUMMARY SHEET

Basin Designation	Area (ac.)	CN	Tc (hr)	Q5 (in)	Q100 (in)	qp (csm/in)	q5 (cfs)	q100 (cfs)	Former Basin Designation
A-1	4.12	94	0.22	1.49	2.84	1040	10.0	19.0	(25)
A-2	2.39	94	0.21	1.49	2.84	1050	5.8	11.1	(26)
A-3	7.10	98	0.24	1.87	3.27	1000	20.7	36.3	(2)
A-4	7.90	96	0.20	1.67	3.04	1070	22.1	40.2	(1)
A-5	2.08	94	0.27	1.49	2.84	960	4.6	8.9	(1)
A-6	3.28	88	0.13	1.05	2.27	1200	6.5	14.0	(25,26)
A-7	2.14	88	0.10	1.05	2.27	1280	4.5	9.7	(1)
A-8	3.17	96	0.13	1.67	3.04	1200	9.9	18.1	(2)
B-1	0.53	98	0.10	1.87	3.27	1280	2.0	3.5	(27)
B-2	1.19	98	0.12	1.87	3.27	1220	4.2	7.4	(3)
B-3	1.47	98	0.10	1.87	3.27	1280	5.5	9.6	(5)
B-4	0.86	98	0.10	1.87	3.27	1280	3.2	5.6	(3)
B-5	12.8	94	0.19	1.49	2.84	1090	32.5	61.9	(8,28)
C-1	7.9	94	0.10	1.49	2.84	1280	23	45	(9)
D-1	0.25	94	0.10	1.49	2.84	1280	1	2	(4)
D-2	3.35	94	0.13	1.49	2.84	1200	9	18	(7)
D-3	5.47	94	0.12	1.49	2.84	1220	16	30	(6)
D-4	5.93	94	0.12	1.49	2.84	1220	17	32	(17)
D-5	7.88	94	0.25	1.49	2.84	1000	18	35	(14)
D-6	4.94	94	0.17	1.49	2.84	1110	13	24	(15)
D-7	5.86	94	0.23	1.49	2.84	1020	14	27	(16)
D-8	0.94	94	0.17	1.49	2.84	1110	2	5	(11)
D-9	0.78	94	0.10	1.49	2.84	1280	2	4	(18)
E-1	9.7	86	0.14	0.92	2.10	1180	16.5	37.6	(10-13)
F-1	2.27	94	0.13	1.49	2.84	1200	6.3	12.1	(19)
F-2	4.02	94	0.10	1.49	2.84	1380	12.0	22.8	(20)
F-3	3.81	97	0.10	1.77	3.16	1280	13.5	24.1	(21)
F-4	2.95	94	0.16	1.49	2.84	1140	7.8	14.9	(22)
F-5	1.36	84	0.10	0.82	1.94	1280	2.2	5.3	(23)
F-6	0.96	98	0.11	1.87	3.27	1250	3.4	5.9	(24)
0	4.24	83	0.27	0.77	1.86	960	4.9	11.8	

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** C2/28

Project	Job №
CMC - DRAINAGE CALCS.	E-2669

Client	By	Date
GATES	TDL	7/7/83

DATA - KNOWN (GIVEN)

Soil type is 59 - Nunn

Commercial and business area CN=94 unless otherwise noted
Soil Group C (Pg. 5) or (P. 42 in City of Co Spgs - subd manual)

For $P = 3.5''$ $Q = 2.94$ in (100 yr)] 6 HR STORM
$P = 2.10''$ $Q = 1.49$ in (5 yr)

formula $q = q_p A Q$ Peak discharge (Pg. 44)

640 Acre = 1 sq. mile
determine q_p from Tc figure I
A - in sq. miles -

C3/28

Project NORTHWEST PORTION OF CHEYENNE MOUNTAIN CENTER DRAINAGE

Job Nº E-3234

Client GATES

By ROOTH

Date 15 APRIL 1985

4 JUNE 85

DETERMINE 6-HOUR PEAK DISCHARGES FROM SUB-BASINS USING MODIFIED SCS METHODOLOGY

FOR ALL SUB-BASINS, SOIL IS NUNN CLAY LOAM, HYDROLOGIC SOIL GROUP C.

SUB-BASIN A-1: AREA = 4.12 AC

1. RUNOFF CURVE NUMBER = 94 (COMMERCIAL).
2. FROM TABLE 1, $Q_5 = 1.49$ IN ; $Q_{100} = 2.84$ IN.
3. DETERMINE TIME OF CONCENTRATION (T_c):

GUTTER FLOW → 1000' @ 0.5%, USE V = 2.0 FPS, ∴ 8.33 MIN.

ROOF FLOW → 5 MIN. 5 MIN.

TOTAL 13.33 MIN.

= 0.22 HR

4. FROM FIGURE I, $q_p = 1040$ CSM/IN.
5. DETERMINE PEAK DISCHARGE (q):

$$q = q_p A Q$$

$$q_5 = 1040 \left(\frac{4.12}{640}\right) 1.49 \qquad q_{100} = 1040 \left(\frac{4.12}{640}\right) 2.84$$

$$= 10.0 \text{ cfs} \qquad = 19.0 \text{ cfs}$$

Project

Job Nº E-3234

Client GATES

By RDW III

Date * REV. 8 MAY 85
15 APRIL 1985
4 JUNE 85 Kurt Roll

SUB-BASIN A-2: AREA = 2.39 AC.

1. RUNOFF CURVE NUMBER = 94 (COMMERCIAL)

2. $Q_5 = 1.49$ IN. & $Q_{100} = 2.84$ IN.

3. DETERMINE TIME OF CONCENTRATION (T_c):

GUTTER FLOW → 900' @ 0.5%, USE V = 2.0 FPS, ∴ 7.5 MIN
ROOF FLOW → 5 MIN. 5 MIN.
TOTAL 12.5 MIN.
= 0.21 HR.

4. $q_r = 1050$ CSM/IN.

5. DETERMINE PEAK DISCHARGE (q):

$$q_5 = 1050\left(\frac{2.39}{640}\right)1.49 \qquad q_{100} = 1050\left(\frac{2.39}{640}\right)2.84$$

$$= 5.8 \text{ cfs} \qquad = 11.1 \text{ cfs}$$

*COMBINE SUB-BASINS A-1 & A-2:

DETERMINE QA/640'S, THEN ADD & USE LONGER T_c FOR q_r

A-1 → 5-YR. QA/640 = (4.12/640) 1.49 = 0.0096
100-YR QA/640 = (4.12/640) 2.84 = 0.0183

A-2 → 5-YR. QA/640 = (2.39/640) 1.49 = 0.0056
100-YR QA/640 = (2.39/640) 2.84 = 0.0106

USE $T_c = 0.22$ HR. ∴ $q_r = 1040$ CSM/IN.

$q_5 = 1040(0.0096 + 0.0056) = 15.8$ cfs

$q_{100} = 1040(0.0183 + 0.0106) = 30.1$ cfs

C5/28

Project	Job № E-3234
Client GATES	By
	Date 16 APRIL 1985 4 JUNE 85

SUB-BASIN A-3 : AREA = 7.10 AC.

1. RUNOFF CURVE NUMBER = 98 (PAVED SURFACE & LAKE + COMMERCIAL)

2. $Q_5 = 1.87$ IN. ; $Q_{100} = 3.27$ IN.

3. DETERMINE TIME OF CONCENTRATION (T_c):

LAKE FLOW →	INSTANTANEOUS	0 MIN.
SHEET FLOW →	550' @ 2.0%, USE V = 1 FPS, ∴	9.17 MIN
ROOF FLOW →	5 MIN.	5 MIN.
	TOTAL	14.17 MIN.
		= 0.24 HR.

4. $q_p = 1000$ CSM/IN.

5. DETERMINE PEAK DISCHARGE (q):

$$q_5 = 1000\left(\frac{7.10}{640}\right)1.87 = 20.7 \text{ cfs} \qquad q_{100} = 1000\left(\frac{7.10}{640}\right)3.27 = 36.3 \text{ cfs}$$

Subbasin A-3 will drain to the onsite pond which will retain any tributary runoff of Subbasin A-3.

Project

Job Nº E-3234

Client GATES

By ADD III

Date 16 APRIL 1985

4 JUNE 85 Kurt Poll

SUB-BASIN A-4: AREA = 7.90 AC.

1. RUNOFF CURVE NUMBER = 96 (COMMERCIAL; PARKING LOT)

2. $Q_5 = 1.67$ IN. & $Q_{100} = 3.04$ IN.

3. DETERMINE TIME OF CONCENTRATION (T_c):

GUTTER FLOW → 1300' @ 1.5%; USE V = 3.0 FPS, ∴ 7.22 MIN.

ROOF FLOW → 5 MIN. 5 MIN.

TOTAL 12.22 MIN.

= 0.20 HR

4. $q_p = 1070$ csm/IN.

5. DETERMINE PEAK DISCHARGE (q):

$$q_5 = 1070\left(\frac{7.90}{640}\right)1.67 \qquad q_{100} = 1070\left(\frac{7.90}{640}\right)3.04$$

$$= 22.1 \text{ cfs} \qquad = 40.2 \text{ cfs}$$

DREXEL, BARRELL & CO. **LAND SURVEYORS**
CIVIL ENGINEERS

CT/28

Project

Job Nº E-3234

Client GATES

By

Date 16 APRIL 1985
4 JUNE 85 Kurt Rolli

SUB-BASIN A-5: AREA = 2.08 AC.

1. RUNOFF CURVE NUMBER = 94 (COMMERCIAL)

2. $Q_5 = 1.49$ IN. & $Q_{100} = 2.84$ IN.

3. DETERMINE T_c:

GUTTER FLOW → 400' @ 2.5%, USE V = 4.0 FPS, ∴ 1.67 MIN

SHEET FLOW → 400' @ 1.0%, USE V = 0.7 FPS, ∴ 9.52 MIN

ROOF FLOW → 5 MIN. 5 MIN.

TOTAL 16.19 MIN.

= 0.27 HR.

4. $q_p = 960$ csm/in.

5. DETERMINE q:

$$q_5 = 960\left(\frac{2.08}{640}\right)1.49 \qquad q_{100} = 960\left(\frac{2.08}{640}\right)2.84$$

$$= 4.6 \text{ cfs} \qquad = 8.9 \text{ cfs}$$

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

C8/28

Project

Job Nº E-3234

Client GATES

By

Date 16 APR 1985
4 JUNE 85 Kurt Rolli

SUB-BASIN A-6 : AREA = 3.28 Ac.

1. RUNOFF CURVE NUMBER = 60% @ 98 (STREET) = 58.8
40% @ 74 (OPEN) = 29.6
88.4
∴ USE CN = 88

2. $Q_5 = 1.05$ IN ; $Q_{100} = 2.27$

3. DETERMINE T_c :

GUTTER FLOW → 750' @ 2.5%, USE V = 4.0 FPS, ∴ 3.13 MIN.
CHANNEL FLOW → 600' W/ H = 10' (FROM FIG. II) = 0.09 HR ∴ 5.20 MIN
0.13 HR

4. $q_p = 1200$ CSM/IN.

5. DETERMINE q :

$$q_5 = 1200 \left(\frac{3.28}{640}\right) 1.05 \qquad q_{100} = 1200 \left(\frac{3.28}{640}\right) 2.27$$

$$= 6.5 \text{ cfs} \qquad\qquad = 14.0 \text{ cfs}$$

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project

Job Nº E-3234

Client GATES

By

Date 16 APRIL 1985
4 JUNE 85

SUB-BASIN A-J : AREA = 2.14 AC

1. RUNOFF CURVE NUMBER = 60% @ 98 (STREET) = 58.8
   40% @ 74 (OPEN) = 29.6
   88.4

   ∴ USE CN = 88

2. $Q_5 = 1.05$ IN. & $Q_{100} = 2.27$ IN.

3. DETERMINE T_c :

   GUTTER FLOW → 1100' @ 2.0%, USE V = 3.5 FPS, ∴ 5.24 MIN.

   USE 0.10 HR

4. $q_p = 1280$ csm/IN.

5. DETERMINE q :

$$q_5 = 1280\left(\frac{2.14}{640}\right)1.05 \qquad q_{100} = 1280\left(\frac{2.14}{640}\right)2.27$$

$$= 4.5 \text{ cfs} \qquad = 9.7 \text{ cfs}$$

C10/28

Project

Job Nº E-3234

Client GATES

By

Date 16 APRIL 1985

4 JUNE 95 Kurt Kalli

SUB-BASIN A-8: AREA = 3.17 AC

1. RUNOFF CURVE NUMBER = 96 (STREETS & COMMERCIAL)

2. $Q_5 = 1.67$ IN. & $Q_{100} = 3.04$ IN.

3. DETERMINE T_c:

GUTTER FLOW → 1200' @ 1.0%, USE V = 2.5 FPS, ∴ 8.0 MIN.

= 0.13 HR.

4. $q_p = 1200$ CSM/IN.

5. DETERMINE q:

$$q_5 = 1200\left(\frac{3.17}{640}\right)1.67 \qquad q_{100} = 1200\left(\frac{3.17}{640}\right)3.04$$

$$= 9.9\ cfs \qquad = 18.1\ cfs$$

Project

Job Nº E-3234

Client GATES

By RUO III

Date 17 APRIL 1995

4 JUNE 95 Cut Bill

SUB-BASIN B-1 : AREA = 0.53 AC.

1. RUNOFF CURVE NUMBER = 98 (STREET)

2. Q_5 = 1.87 IN. & Q_{100} = 3.27 IN.

3. DETERMINE T_c:

GUTTER FLOW ⇒ 350' @ 1.0%, USE V = 2.5 FPS ; ∴ 2.33 MIN.

USE 0.10 HR

4. q_p = 1280 csm/IN.

5. DETERMINE q:

$$q_5 = 1280\left(\frac{0.53}{640}\right)1.87 \qquad q_{100} = 1280\left(\frac{0.53}{640}\right)3.27$$

$$= 2.0\ cfs \qquad = 3.5\ cfs$$

C12/28

Project

Job No E-3234

Client GATES

By

Date 17 APRIL 1985
4 JUNE 85 Kurt Roth

SUB-BASIN B-2: AREA = 1.19 AC.

1. RUNOFF CURVE NUMBER = 98 (STREET)

2. $Q_5 = 1.87$ IN. & $Q_{100} = 3.27$ IN.

3. DETERMINE T_c:

GUTTER FLOW → 1100'@ 1.0%, USE V=2.5FPS, ∴ 7.33 MIN
= 0.12 HR.

4. $q_p = 1220$ csm/IN.

5. DETERMINE q:

$q_5 = 1220\left(\frac{1.19}{640}\right)1.87$ $q_{100} = 1220\left(\frac{1.19}{640}\right)3.27$

= 4.2 cfs = 7.4 cfs

C13/28

Project	Job Nº E-3234
Client GATES	By
	Date 17 APRIL 1995 4 JUNE 95

SUB-BASIN B-3: AREA = 1.47 Ac.

1. RUNOFF CURVE NUMBER = 98 (STREET)

2. Q_5 = 1.87 IN & Q_{100} = 3.27 IN.

3. DETERMINE T_c:

GUTTER FLOW → 300' @ 2.5%, USE V = 4.0 FPS, ∴ 1.25 MIN.
" " → 400' @ 4.0%, USE V = 5.0 FPS, ∴ 1.33 MIN.
SHEET FLOW → 150' @ 1.0%, USE V = 0.7 FPS, ∴ 3.57 MIN

TOTAL 6.15 MIN.
= 0.10 HR.

4. q_p = 1280 csm/IN.

5. DETERMINE q:

$$q_5 = 1280 \left(\frac{1.47}{640}\right) 1.87 \qquad q_{100} = 1280 \left(\frac{1.47}{640}\right) 3.27$$

$$= 5.5 \text{ cfs} \qquad = 9.6 \text{ cfs}$$

C14/28

Project

Job Nº E-3234

Client GATES

By RDD III

Date 6 MAY 1985

4 JUNE 85 Kurt Pill

SUB-BASIN B-4: AREA = 0.86 AC

1. RUNOFF CURVE NUMBER = 98 (STREET & PARKING)

2. $Q_5 = 1.87$ & $Q_{100} = 3.27$

3. DETERMINE T_c:

   USE MINIMUM $T_c = 0.10$ HR

4. $q_p = 1280$ csm/IN.

5. DETERMINE q:

$$q_5 = 1280\left(\frac{0.86}{640}\right)1.87 \qquad q_{100} = 1280\left(\frac{0.86}{640}\right)3.27$$

$$= 3.2 \text{ cfs} \qquad = 5.6 \text{ cfs}$$

Project

Job Nº E-3234

Client GATES

By

Date 7 MAY 1985

4 JUNE 85 Kurt Ballh

DETERMINE 6-HOUR PEAK DISCHARGES FROM BASINS O-4 AND O-6

BASIN ~~O-4~~ B-5: AREA = 12.8 AC.

1. RUNOFF CURVE NUMBER = 94 (COMMERCIAL).

2. FROM TABLE 1, $Q_5 = 1.49$ IN ; $Q_{100} = 2.84$ IN.

3. DETERMINE T_c:

ROOF FLOW → 5 MIN.   5 MIN.

GUTTER FLOW → 1000' @ 1.0%, USE V = 2.5 FPS ∴ 6.67 MIN.

TOTAL 11.67 MIN.

= 0.19 HR.

4. $q_p = 1090$ csm/IN.

5. DETERMINE q:

$$q_5 = 1090\left(\frac{12.8}{640}\right)1.49 \qquad q_{100} = 1090\left(\frac{12.8}{640}\right)2.84$$

$$= 32.5 \text{ cfs} \qquad = 61.9 \text{ cfs}$$

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

C16 / 28

Project

Job Nº E-3234

Client GATES

By KDW

Date 6 MAY 1985

4 JUNE 85 Kurt Roll

DETERMINE POND RETENTION CAPACITY (BASIN C-1)

AREA OF LAKE @ NORMAL WATER SURFACE = 6.0 AC

CONTRIBUTING RUNOFF AREA = 15.0 AC (A-3 PLUS ~~D-5~~ C-1)

DETERMINE RUNOFF DEPTH FROM TABLE I:

ALL RUNOFF FROM SUB-BASINS A-3 & C-1 WILL BE STORED IN RETENTION PONDS. NO RUNOFF WILL BE RELEASED TO DOWNSTREAM BASINS.

SOIL GROUP	ACREAGE	USE	CN	%	PRODUCT
59 (c)	6.00Ac	POND	100	40.0	40.0
	9.00Ac	COMMERCIAL	94	60.0	56.4
				100	96.4

USE CN = 97 , ∴ $Q_5 = 1.77$ IN & $Q_{100} = 3.16$ IN.

DETERMINE RUNOFF VOLUME:

$VOL_5 = 15.0Ac (1.77"/12 in/ft)$ $VOL_{100} = 15.0Ac (3.16"/12 in/ft)$

$= 2.21$ AC-FT $= 3.95$ AC-FT

DETERMINE RISE IN POND WATER SURFACE:

$DEPTH_5 = 2.21 \text{ Ac Ft}/6.0 \text{ Ac}$ $DEPTH_{100} = 3.95 \text{ Ac Ft}/6.0 \text{ Ac}$

$= 0.37'$ $= 0.66'$

CHECK POND FREEBOARD:

PROJECTED POND NORMAL W.S. EL. = 68.0'

PROJECTED POND MAXIMUM , W.S. EL. = 69.5'

∴ FREEBOARD = 1.5' > 0.37' OR 0.66' ✓

C17 / 28

Project: CMC - DRAINAGE CALCS.

Job №: E-2669

Client: GATES

By: TDL

Date: 7-7-83

Rev. 9/30/85 DJN

BASIN No.	AREA (Acres)	Determine Tc (min.)
~~1~~	~~11.17~~	~~L=1600', H=31' @ 2.8fps say 10MIN.~~
~~2~~	~~10.12~~	~~(Roof Time) 3min + (Swale) 3MIN + (L=950, H=20' @ 2.8)~~ 6min. = 12 MIN
~~3~~	~~1.31~~	~~(L=900, H=13 @ 2.4 fps) = 6.25 ≈ 6MIN~~
D-1 ~~4~~	0.29	(L=100', H=8' @ 2.0 fps = 0.83min) = 1 MIN
~~5~~	~~0.99~~	~~L=100', H=8' @ 2.0 fps = .83min, say 2min.~~
D-3 ~~6~~	5.29	(L=300', H=8' ≈ 2 min) + (Roof) 3min. + (Swale) 2m = 7MIN
D-2 ~~7~~	3.31	3min (Roof) + 2min (Swale) + (L=450', H=8' @ 2.7fps) 3m = 8MIN
~~8~~	~~7.68~~	~~3MIN (Roof) + 2MIN (Swale) + (L=200', H=9' @ 1.5fps) 2MIN +~~ ~~(L=400', H=4' @ 2.0fps) 3MIN = 10MIN~~
C-1 ~~9~~	7.84	3MIN (Roof) + 2MIN (Swale) = 5MIN
~~10~~	~~4.97~~	~~3MIN (Roof) + (L=450', H=6' @ 0.8fps) 9MIN = 12MIN.~~
D-8 ~~11~~	1.49	3MIN (Roof) + (L=150', H=2' @ 0.8fps) 3MIN + (L=550', H=6' @ 2.1fps) 4MIN = 10 MIN
~~12~~	~~0.20~~	~~L=200', H=1.7' @ 1.3fps ≈ 3 MIN~~
~~13~~	~~1.80~~	~~3MIN (Roof) + 2MIN (Swale) = 5 MIN~~
D-5 ~~14~~	8.59	3MIN (Roof) + 2MIN (Swale) + (L=1500', H=24' @ 2.5fps) 10m = 15MIN
D-6 ~~15~~	4.94	3MIN (Roof) + (L=600', H=18 @ 1.4 fps) 7MIN = 10MIN
D-7 ~~16~~	5.86	3MIN (Roof) + 2MIN (Swale) + (L=1100', H=12' @ 2.0fps) 9m = 14MIN
D-4 ~~17~~	5.93	(L=800', H=12' @ 2.5fps) 5MIN + (L=200', H=7' @ 1.4fps) 2m = 7MIN
D-9 ~~18~~	0.78	L=500', H=4' @ 2fps = 4 MIN
~~19~~	~~2.12~~	~~L=700', H=14' @ 2.8fps = 4MIN~~

Project: CMC - DRAINAGE CALCS.

Job Nº: E-2669

Client: GATES

By: TDL

Date: 7-7-83

Rev 9/30/85

BASIN No.	AREA (Acres)	Determine T_c (MIN)
~~20~~	~~5.10~~	~~L=650', H=6' @ 2.0 fps = 5 MIN.~~
~~21~~	~~3.73~~	~~L=200' H=12' @ 1.7 fps = 2 MIN.~~
~~22~~	~~3.19~~	~~3 MIN (Roof) + 2 MIN (Swale) + (L=400', H=5' @ 2.3 fps) 3 MIN = 8 MIN~~
~~23~~	~~1.09~~	~~L=800', H=16' @ 2.8 fps = 5 MIN~~
~~24~~	~~0.82~~	~~L=1000', H=20' @ 2.8 fps = 6 MIN.~~
~~25~~	~~1.53~~	~~L=100', H=10' @ 2.2 fps = 2 MIN~~
~~26~~	~~3.80~~	~~L=1100', H=17' @ 2.5 fps = 7 MIN.~~
~~27~~	~~0.30~~	~~L=350', H=4' @ 2.1 fps = 3 MIN~~
~~28~~	~~2.46~~	~~L=500', H=8' @ 0.9 fps = 9 MIN.~~

Use Min. T_c = 6 MIN

= 0.10 HR.

NOTE: SUB BASINS DELETED HAVE BEEN RECALCULATED ELSEWHERE IN THIS REPORT.

Project: CMC - DRAINAGE CALCS.
Job Nº: E-2669
Client: GATES
By: TDL
Date: 7-8-83

Rev. 9/30/85 DJR

5 + 100 year flow for each Basin

$$q_s = q_P \times \frac{Q_s \times A}{640}$$

Basin	Area (Acres)	Tc (Hr.)	Q_s (IN)	Q_{100} (IN)	$\frac{Q_s \times A}{640}$	q_P (csm/in)	q_s (cfs)	$\frac{Q_{100} \times A}{640}$	q_{100} (cfs)
~~1~~	~~11.17~~	~~.17~~	~~1.49~~	~~2.84~~	~~.0260~~	~~1110~~	~~29~~	~~.0496~~	~~55~~
~~2~~	~~10.12~~	~~.20~~	~~1.49~~	~~2.84~~	~~.0236~~	~~1070~~	~~25~~	~~.0449~~	~~48~~
~~3~~	~~1.31~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0030~~	~~1280~~	~~4~~	~~.0058~~	~~7~~
D-1 ~~4~~	0.21	.10	1.49	2.84	.0007	1280	1	.0013	2
~~5~~	~~0.99~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0023~~	~~1280~~	~~3~~	~~.0044~~	~~6~~
D-3 ~~6~~	5.47	.12	1.49	2.84	.0127	1220	16	.0243	30
D-2 ~~7~~	3.35	.13	1.49	2.84	.0078	1200	9	.0149	18
~~8~~	~~7.68~~	~~.17~~	~~1.49~~	~~2.84~~	~~.0179~~	~~1110~~	~~20~~	~~.0341~~	~~38~~
C-1 ~~9~~	7.84	.10	1.49	2.84	.0183	1280	23	.0348	45
~~10~~	~~4.97~~	~~.20~~	~~1.49~~	~~2.84~~	~~.0116~~	~~1070~~	~~12~~	~~.0221~~	~~24~~
D-8 ~~11~~	0.94	.17	1.49	2.84	.0022	1110	2	.0042	5
~~12~~	~~0.20~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0005~~	~~1280~~	~~1~~	~~.0009~~	~~1~~
~~13~~	~~1.80~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0042~~	~~1280~~	~~5~~	~~.0080~~	~~10~~
D-5 ~~14~~	7.88	.25	1.49	2.84	.0183	1000	18	.0350	35
D-6 ~~15~~	4.94	.17	1.49	2.84	.0115	1110	13	.0219	24
D-7 ~~16~~	5.86	.23	1.49	2.84	.0136	1020	14	.0260	27
D-4 ~~17~~	5.93	.12	1.49	2.84	.0138	1220	17	.0263	32
D-9 ~~18~~	0.78	.10	1.49	2.84	.0018	1280	2	.0035	4
~~19~~	~~2.12~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0049~~	~~1280~~	~~6~~	~~.0094~~	~~12~~
~~20~~	~~5.10~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0119~~	~~1280~~	~~15~~	~~.0226~~	~~29~~
~~21~~	~~3.73~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0087~~	~~1280~~	~~11~~	~~.0166~~	~~21~~
~~22~~	~~3.19~~	~~.13~~	~~1.49~~	~~2.84~~	~~.0074~~	~~1200~~	~~9~~	~~.0142~~	~~17~~
~~23~~	~~1.09~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0025~~	~~1280~~	~~3~~	~~.0048~~	~~6~~
~~24~~	~~0.82~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0019~~	~~1280~~	~~2~~	~~.0036~~	~~5~~
~~25~~	~~1.53~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0036~~	~~1280~~	~~6~~	~~.0068~~	~~9~~
~~26~~	~~3.80~~	~~.12~~	~~1.49~~	~~2.84~~	~~.0088~~	~~1220~~	~~11~~	~~.0169~~	~~21~~
~~27~~	~~0.30~~	~~.10~~	~~1.49~~	~~2.84~~	~~.0007~~	~~1280~~	~~1~~	~~.0013~~	~~2~~
~~28~~	~~2.46~~	~~.15~~	~~1.49~~	~~2.84~~	~~.0057~~	~~1160~~	~~7~~	~~.0109~~	~~13~~

Project	Job Nº
CMC - DRAINAGE CALCS.	E-2669

Client	By	Date
GATES	TDL	7/8/83

100 year & 5 year flow @ Design Points

rev. 2/8/85
Rev. 9/30/85 DJM

BASINS	5 YR. EQA/640	Tc (HR.)	qp (csm/in)	q5	100 YR. EQA/640	q100	
~~1 & 2~~	~~.0496~~	~~.20~~	~~1070~~	~~53~~	~~0.95~~	~~101~~	
~~4 & 5~~	~~.0030~~	~~.10~~	~~1280~~	~~4~~	~~0.0057~~	~~7~~	
A3, A4, A8, B2 & B3 ~~1 thru 5~~	.0556	.20	1070	59	0.12	113	- use for Preliminary sizing of storm sewer only
D-2 & D-3 ~~6 & 7~~	.0205	.17	1110	23	0.0391	43	
A3, A4, A5, A8, B2, B3 D1-3 ~~1 thru 7~~	.0761	.20	1070	81	0.145	155	
~~8 thru 10~~	~~.0477~~	~~.20~~	~~1070~~	~~51~~	~~0.091~~	~~97~~	
~~8 thru 11~~	~~.0512~~	~~.20~~	~~1070~~	~~55~~	~~0.098~~	~~104~~	
~~1 thru 12~~	~~.1273~~	~~.20~~	~~1070~~	~~136~~	~~0.24~~	~~260~~	
~~15 thru 17~~	~~.0389~~	~~.23~~	~~1020~~	~~40~~	~~0.074~~	~~76~~	
D4, D5, D6, D7 ~~14 thru 17~~	.0573	.25	1000	57	0.109	109	
D4, D5, D6, D7, D9 ~~14 thru 18~~	.0591	.25	1000	59	0.113	113	*
~~1 thru 18~~	~~.1922~~	~~.25~~	~~1000~~	~~192~~	~~0.37~~	~~367~~	*
~~20 thru 22~~	~~.0280~~	~~.13~~	~~1200~~	~~34~~	~~0.053~~	~~64~~	
~~20 thru 23~~	~~.0305~~	~~.13~~	~~1200~~	~~37~~	~~0.058~~	~~79~~	
~~19 thru 23~~	~~.0355~~	~~.13~~	~~1200~~	~~43~~	~~0.068~~	~~81~~	
~~19 thru 24~~	~~.0374~~	~~.13~~	~~1200~~	~~45~~	~~0.071~~	~~85~~	
~~8-10, 25-28~~	~~.0665~~	~~.24~~	~~1010~~	~~67~~	~~0.127~~	128	

* NOTE: 100 YEAR STORM EXCEEDS CAPACITY OF 48" RCP

DIVERSION OF FLOWS IS NECESSARY TO INHIBIT SURCHARGING OF SYSTEM.

FLOW TO DIVERT (FROM SUBBASINS ~~14-18~~ D4-D7, D9 TO FRONTAGE ROAD)

$Q_{OVERFLOW}$ = 113 CFS - 80 CFS = 33 CFS

~~∴ FLOW TO HARRISON SCHOOL = 367 CFS - 33 CFS = 231 CFS~~

FLOW TO SOUTH OF CHEYENNE MOUNTAIN CENTER (SUBBASINS ~~19-24~~ F1-F6)

85 CFS + 33 CFS = 118 CFS

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

C21/28

Project

Job Nº E-3234

Client GATES

By

Date 7 MAY 1985

4 JUNE 85 Kurt Rolli

BASIN ~~Q-6~~ E-1: AREA = 9.7 AC.

1. RUNOFF CURVE NUMBER

SOIL GROUP	USE	CN	%	PRODUCT
59(C)	OPEN	74	50.0	37.0
	STREET, ROOF, PARKING	98	50.0	49.0
			100	86.0

2. FROM TABLE 1, $Q_5 = 0.92$ IN ; $Q_{100} = 2.10$ IN.

3. DETERMINE T_c:

ROOF FLOW → 5 MIN.	5 MIN.
GUTTER FLOW → 350' @ 1.0%, USE V=2.5 FPS ∴	2.33 MIN.
CHANNEL FLOW → 300' @ 5 FPS ∴	1.00 MIN.
TOTAL	8.33 MIN.
	= 0.14 HR.

4. q_p = 1180 CSM/IN.

5. DETERMINE q:

$$q_5 = 1180\left(\frac{9.7}{640}\right)0.92 \qquad q_{100} = 1180\left(\frac{9.7}{640}\right)2.10$$

$$= 16.5\text{ cfs} \qquad = 37.6\text{ cfs}$$

Project CHEYENNE MEADOWS ROAD DRAINAGE AT CHEYENNE MOUNTAIN CENTER

Job Nº E-2669

Client GATES

By KDDM

Date 19 JULY 1985

Checked by CS 7-22-85

DETERMINE 6-HOUR PEAK DISCHARGES FROM BASINS USING MODIFIED SCS METHOD

FOR ALL BASINS, SOIL IS NUNN CLAY LOAM, HYDROLOGIC SOIL GROUP C.

BASIN ~~14~~ F-1: AREA = 2.27 AC

1. RUNOFF CURVE NO. = 94 (COMMERCIAL)
2. FROM TABLE 1, $Q_5 = 1.49$ IN & $Q_{100} = 2.84$ IN.
3. DETERMINE TIME OF CONCENTRATION, T_c:

ROOF FLOW → 5 MIN.	5.0 MIN.
SHEET FLOW (GRASS) → 150' @ 2%, V = 1.0 FPS	2.5
GUTTER FLOW → 100' @ 2.0%, V = 3.5 FPS	0.5
	8.0 MIN.
	= 0.13 HR.

4. FROM FIG. I, $q_p = 1200$ csm/IN.

5. DETERMINE PEAK DISCHARGE, q:

$$q = q_p A Q$$

$$q_5 = 1200\left(\frac{2.27}{640}\right)1.49 = 6.3 \text{ cfs} \qquad q_{100} = 1200\left(\frac{2.27}{640}\right)2.84 = 12.1 \text{ cfs}$$

6. DETERMINE QA/640's:

5-YR QA/640 = 0.0053 100-YR QA/640 = 0.0101

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

C23/28

Project

Job Nº E-2669

Client GATES

By KDD III

Date 19 JULY 1985

Checked by CS 7-22-85

BASIN ~~20~~ F-2: AREA = 4.02 AC.

1. RUNOFF CURVE NO. = 94 (COMMERCIAL)
2. FROM TABLE 2, $Q_5 = 1.49$ IN. ; $Q_{100} = 2.84$ IN.
3. DETERMINE T_c:

ROOF FLOW → 5 MIN. 5 MIN.

SHEET FLOW (PAVED) → 200' @ 2%, V = 3.0 FPS 1.11

6.11 MIN

= 0.10 HR

4. FROM FIGURE I, $q_p = 1280$ csm/in.
5. DETERMINE q:

$$q_5 = 1280\left(\frac{4.02}{640}\right)1.49 = 12.0 \text{ cfs} \qquad q_{100} = 1280\left(\frac{4.02}{640}\right)2.84 = 22.8 \text{ cfs}$$

6. DETERMINE QA/640:

5-YR. QA/640 = 0.0094 100-YR. QA/640 = 0.0178

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

Project

Job Nº E-2669

Client GATES

By RDOTT

Date 19 JULY 1985

Checked by CS 7-22-85

BASIN ~~21~~ F-3: AREA = 3.81 AC. (DRAINS TO POND, SEE PG. F2)

1 RUNOFF CURVE NO.

SOIL GROUP	ACREAGE	USE	CN	%	PRODUCT
59 (c)	1.5	POND	100	39.37	39.37
	2.31	COMMERCIAL	94	60.63	56.99
					96.36

USE CN = 97

2. FROM TABLE 1, $Q_5 = 1.77$ IN. & $Q_{100} = 3.16$ IN.

3. USE $T_c = 0.10$ = MINIMUM T_c

4. FROM FIG. I, $q_p = 1280$ csm/IN.

5. DETERMINE q:

$$q_5 = 1280\left(\frac{3.81}{640}\right)1.77 = 13.5 \text{ cfs}$$

$$q_{100} = 1280\left(\frac{3.81}{640}\right)3.16 = 24.1 \text{ cfs}$$

Subbasin will drain to the on-site pond which will retain any tributary runoff from Subbasin F-3

Project

Job Nº E-2669

Client GATES

By RDDIII

Date 19 JULY 1985

Checked by CS 7-22-85

BASIN ~~22~~ F-4: AREA = 2.95 AC

1. RUNOFF CURVE NO. = 94 (COMMERCIAL)
2. FROM TABLE I, Q_5 = 1.49 IN ; Q_{100} = 2.84 IN.
3. DETERMINE T_c:

ROOF FLOW → 5 MIN. — 5 MIN.

SHEET FLOW (PAVED) → 250' @ 3.0%, V = 3.5 FPS — 1.19

SHEET FLOW (GRASS) → 250' @ 3.0%, V = 1.2 FPS — 3.47

9.66 MIN.

= 0.16 HR.

4. FROM FIG. I, q_p = 1140 CSM/IN.
5. DETERMINE q:

$$q_5 = 1140\left(\frac{2.95}{640}\right)1.49 = 7.8\text{ cfs} \qquad q_{100} = 1140\left(\frac{2.95}{640}\right)2.84 = 14.9\text{ cfs}$$

6. DETERMINE QA/640 :

5-YR. QA/640 = 0.0069 100-YR. QA/640 = 0.0131

C26/28

Project

Job Nº E-2669

Client GATES

By RDO III

Date 19 JULY 1985

Checked by CS 7-22-85

BASIN ~~25~~ F-5: AREA = 1.36 AC

1. RUNOFF CURVE NO.:

SOIL GROUP	USE	CN	%	PRODUCT
59 (c)	STREET	98	40	39.2
	OPEN	74	60	44.4
				83.6

USE CN = 84

2. FROM TABLE 1, $Q_5 = 0.82$ IN. & $Q_{100} = 1.94$ IN.

3. DETERMINE T_c:

SHEET FLOW (GRASS) → 100' @ 3.0%, V = 1.2 FPS 1.39 MIN.

GUTTER FLOW → 500' @ 0.75%, V = 2.3 FPS 3.62

5.01 MIN.

USE T_c = 0.10 HR.

4. FROM FIG. I, q_p = 1280 csm/in.

5. DETERMINE q:

$$q_5 = 1280\left(\frac{1.36}{640}\right)0.82 = 2.2$$

$$q_{100} = 1280\left(\frac{1.36}{640}\right)1.94 = 5.3 \text{ cfs}$$

6. DETERMINE QA/640:

5-YR. QA/640 = 0.0017   100-YR QA/640 = 0.0041

Project

Job Nº E-2669

Client GATES

By

Date 19 JULY 1985

Checked by CS 7-22-85

BASIN ~~24~~ F-6: AREA = 0.92 AC

1. RUNOFF CURVE NO. = 98 (STREET)
2. FROM TABLE 1, $Q_5 = 1.87$ IN. & $Q_{100} = 3.27$ IN.
3. DETERMINE T_c:

GUTTER FLOW → 400' @ 4.5%, V = 5.0 FPS — 1.33 MIN.

750' @ 0.75%, V = 2.3 FPS — 5.43

6.77 MIN.

= 0.11 HR.

4. FROM FIG. I, $q_p = 1250$ CSM/IN.
5. DETERMINE q:

$$q_5 = 1250\left(\frac{0.92}{640}\right)1.87 = 3.4\text{ cfs} \qquad q_{100} = 1250\left(\frac{0.92}{640}\right)3.27 = 5.9\text{ cfs}$$

6. DETERMINE QA/640:

5-YR. QA/640 = 0.0027 100-YR. QA/640 = 0.0047

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

C28/28

Project

Job Nº E-2669

Client GATES

By KDDN

Date 19 JUNE 1985

Checked by CS 7-22-85

BASIN O: AREA = 4.24 AC

1. RUNOFF CURVE NO:

SOIL GROUP	USE	CN	%	PRODUCT
59(C)	STREET	98	36	35.28
	OPEN	74	64	47.36
				82.64

USE CN = 83

2. FROM TABLE 1; $Q_5 = 0.77$ IN ; $Q_{100} = 1.86$ IN

3. DETERMINE T_c:

SHEET FLOW (GRASS) → 100' @ 4%, V = 1.5 FPS 1.11 MIN.

CHANNEL FLOW → L = 1350, H = 7', T_c = 0.25 HR 15 MIN

16 11

= 0.27 HR.

4. FROM FIG. I, q_p = 760 csm/IN.

5. DETERMINE q:

$q_5 = 960\left(\frac{4.24}{640}\right)0.77$ $q_{100} = 760\left(\frac{4.24}{640}\right)1.86$

= 4.9 cfs = 11.8 cfs

6. DETERMINE QA/640:

5-YR QA/640 = 0.0051 100-YR QA/640 = 0.0123

APPENDIX D

The street sections analyzed in this report are not covered by Table 5 in the "Storm Runoff Criteria". Therefore, street capacities were determined using the method described in the latest revision of the "Urban Storm Drainage Criteria Manual" (USDCM) published by the Denver Regional Council of Governments (DRCOG) for determining theoretical and allowable curb flows. This method utilizes a nomograph developed by the Bureau of Public Roads for determining theoretical capacities of composite triangular gutters and then applies a reduction factor to arrive at an allowable capacity. A copy of the nomographs for each calculation and of the reduction factor graph have been included in Appendix D. The reduction factor, accounting for flow obstruction primarily due to parked cars, provides for conservative gutter capacities on Cheyenne Mountain Boulevard and Venetucci Boulevard (U.S. 85) where no parking will be allowed.

Project

Job Nº E-3234

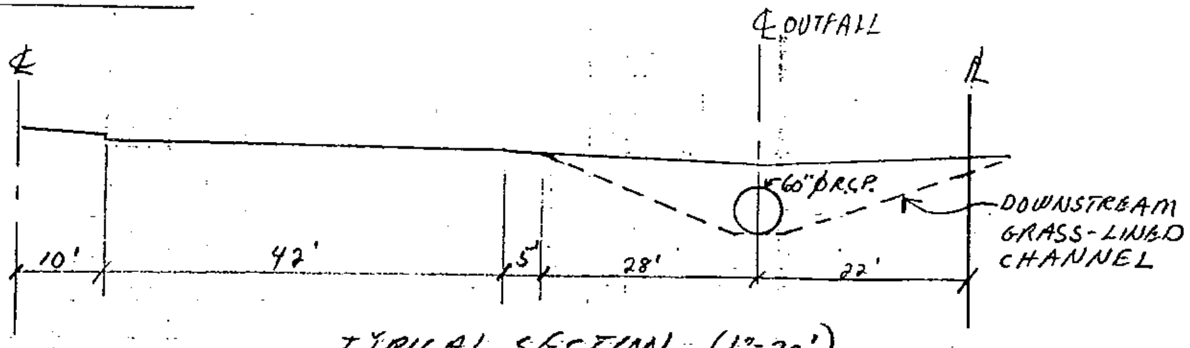
Client GATES

By

Date 17 APRIL 1985
4 JUNE 85 Kurt Pulli

DETERMINE STREET DRAINAGE CAPACITIES

LAKE AVENUE:

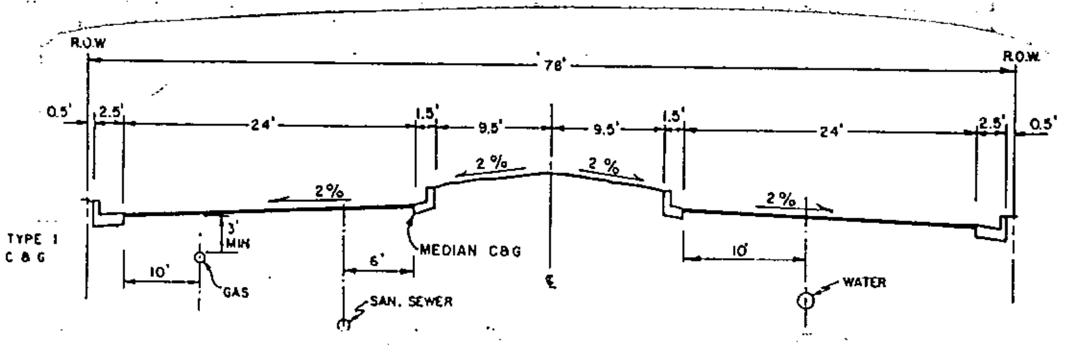


TYPICAL SECTION (1"=20')

AT CHEYENNE MOUNTAIN BLVD.

NO CURB & GUTTER. ALL RUNOFF DIRECTLY TO HARRISON CREEK OUTFALL. INLET WILL BE PROVIDED ON WEST SIDE OF CHEYENNE MOUNTAIN BOULEVARD.

CHEYENNE MOUNTAIN BOULEVARD:



TYPICAL SECTION (N.T.S.)

DETERMINE Z/n FOR TYPICAL SECTION:

CURB & GUTTER ⇒ n = 0.016 , z = 16 ∴ Z/n = 1000
ASPHALT STREET → n = 0.019 , z = 50 ∴ Z/n = 2632

USE DEPTH TO TOP OF CURB (y = 0.67') FOR BOTH 5-YR. & 100-YR. FLOW.

D2 / 12

Project

Job Nº E-3234

Client GATES

By ROO

Date 17 APRIL 1985

4 JUNE 85

CHEYENNE MOUNTAIN BOULEVARD (CONT.):

WEST SIDE @ LAKE AVE.: (SUB-BASINS A-1 ; A-2)

$q_5 = 15.8$ cfs ; $q_{100} = 30.1$ cfs SEE PG. C2

$CAP_5 = CAP_{100} = 22.5$ cfs SEE PG. D4

EAST SIDE @ LAKE AVE.: (SUB-BASIN B-1)

$q_5 = 2.0$ cfs ; $q_{100} = 3.5$ cfs SEE PG. C9

$CAP_5 = CAP_{100} = 30.4$ cfs SEE PG. D5

WEST SIDE NORTH OF LOW POINT: (SUB-BASIN A-8)

$q_5 = 9.9$ cfs ; $q_{100} = 18.1$ cfs SEE PG. C8

$CAP_5 = 32.8$ cfs ; $CAP_{100} = 32.0$ cfs SEE PG. D6

EAST SIDE NORTH OF LOW POINT: (SUB-BASIN B-2)

$q_5 = 4.2$ cfs ; $q_{100} = 7.4$ cfs SEE PG. C10

$CAP_5 = 32.8$ cfs ; $CAP_{100} = 32.0$ cfs SEE PG. D6

NORTH SIDE WEST OF LOW POINT: (SUB-BASIN A-5)

$q_5 = 4.6$ cfs ; $q_{100} = 8.9$ cfs SEE PG. C5

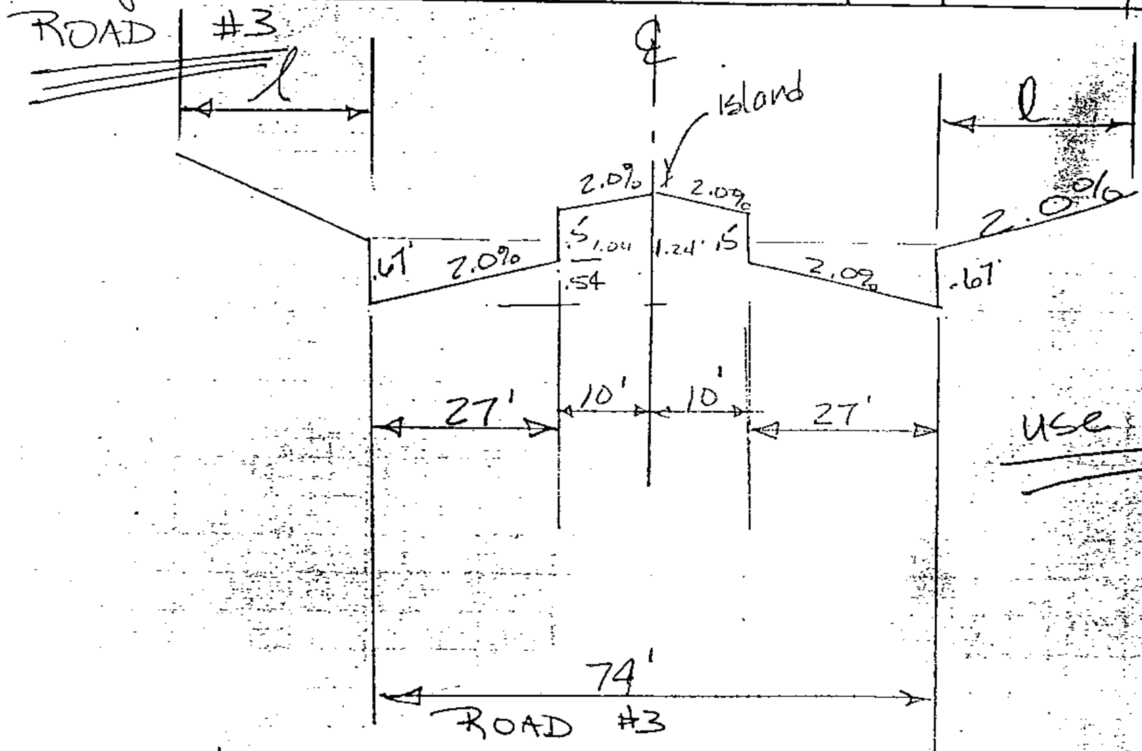
$CAP_5 = 44.7$ cfs ; $CAP_{100} = 38.3$ cfs SEE PG. D7

SOUTH SIDE WEST OF LOW POINT: (SUB-BASIN B-3)

$q_5 = 5.5$ cfs ; $q_{100} = 9.6$ cfs SEE PG. C11

$CAP_5 = 44.7$ cfs ; $CAP_{100} = 38.3$ cfs SEE PG. D7

Project: Checked Capacity of Rd for [illegible] yr-flood	Job Nº E-7669
Client: Cheyenne Mtn Center - Gates	By: Date: 3/21/84



use l = 15'

GIVEN: N = .02
S = .97%
Q = 113 cfs

Find: l

Solution: Q in street = Q = 57.23 cfs

if l = 10' (both)
D = .2
(both) $Q = \overset{(14.53)(2)}{29.05} + 57.23 = 86.28$ cfs < 113 NG

if l = 15'
D = .3
Q = 29.71 (2) + 57.23 = 116.64 cfs Good

A drainage easement will be provided on each side of the R.O.W. where it is required.

Project

Job Nº E-2669

Client GATES

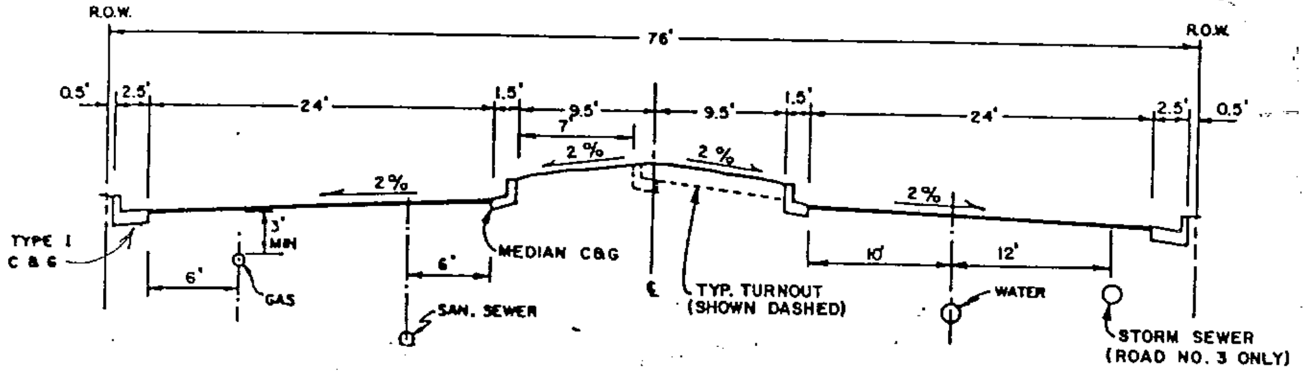
By

Date 14 JULY 1985

Checked by CS 7-22-85

DETERMINE STREET DRAINAGE CAPACITIES

ROAD NO. 3: - MOST SOUTHERN 150'



TYPICAL SECTION
N.T.S.

DETERMINE z/n FOR TYPICAL SECTION:

CURB & GUTTER → $n = 0.016$, $z = 16$ ∴ $z/n = 1000$

ASPHALT STREET → $n = 0.019$, $z = 50$ ∴ $z/n = 2632$

USE DEPTH TO TOP OF CURB, $y = 0.67'$, FOR BOTH 5-YEAR & 100-YEAR FLOW.

DETERMINE ½ STREET CAPACITY:

WITH SLOPE = 1.5%, $CAP_5 = 34.4$ cfs (SEE PG D3)

$CAP_{100} = 32.3$ cfs

Project

Job Nº E-2669

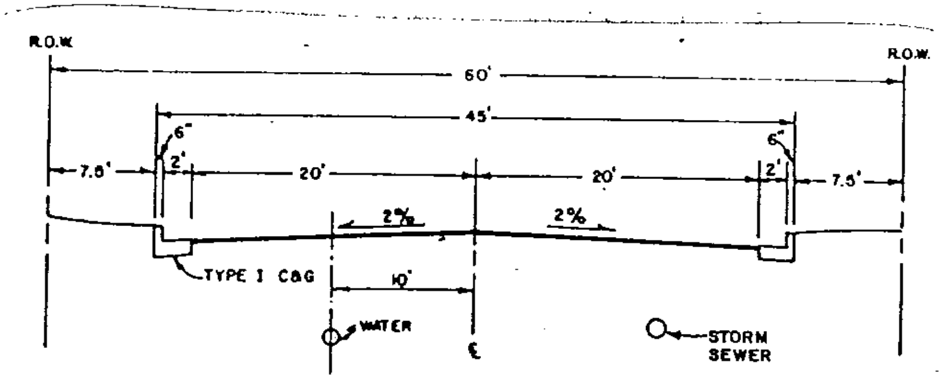
Client GATES

By RDO III

Date 14 JULY 1985

Checked by CS 1-22

CHEYENNE MEADOWS ROAD:



TYPICAL SECTION
N.T.S.

DETERMINE z/n FOR TYPICAL SECTION:

CURB & GUTTER → $n = 0.016$, $z = 16$ ∴ $z/n = 1000$

ASPHALT STREET → $n = 0.019$, $z = 50$ ∴ $z/n = 2632$

USE DEPTH TO TOP OF CURB, $y = 0.67'$, FOR BOTH 5-YR & 100-YR. FLOW.

DETERMINE 1/2 STREET CAPACITY:

WITH SLOPE @ 0.75%; $CAP_5 = CAP_{100} = 25.0$ cfs (SEE PG. D4)

Q_5 FROM BASIN 19 = 6.3 cfs < 25.0 cfs ✓

Q_{100} " " " = 12.1 cfs " " ✓

Q_5 FROM COMBINED BASINS 19 & 23 = 7.4 cfs < 25.0 cfs ✓

Q_{100} " " " " = 14.7 cfs < 25.0 cfs ✓

Q_5 FROM BASIN 24 = 3.4 cfs < 25.0 cfs ✓

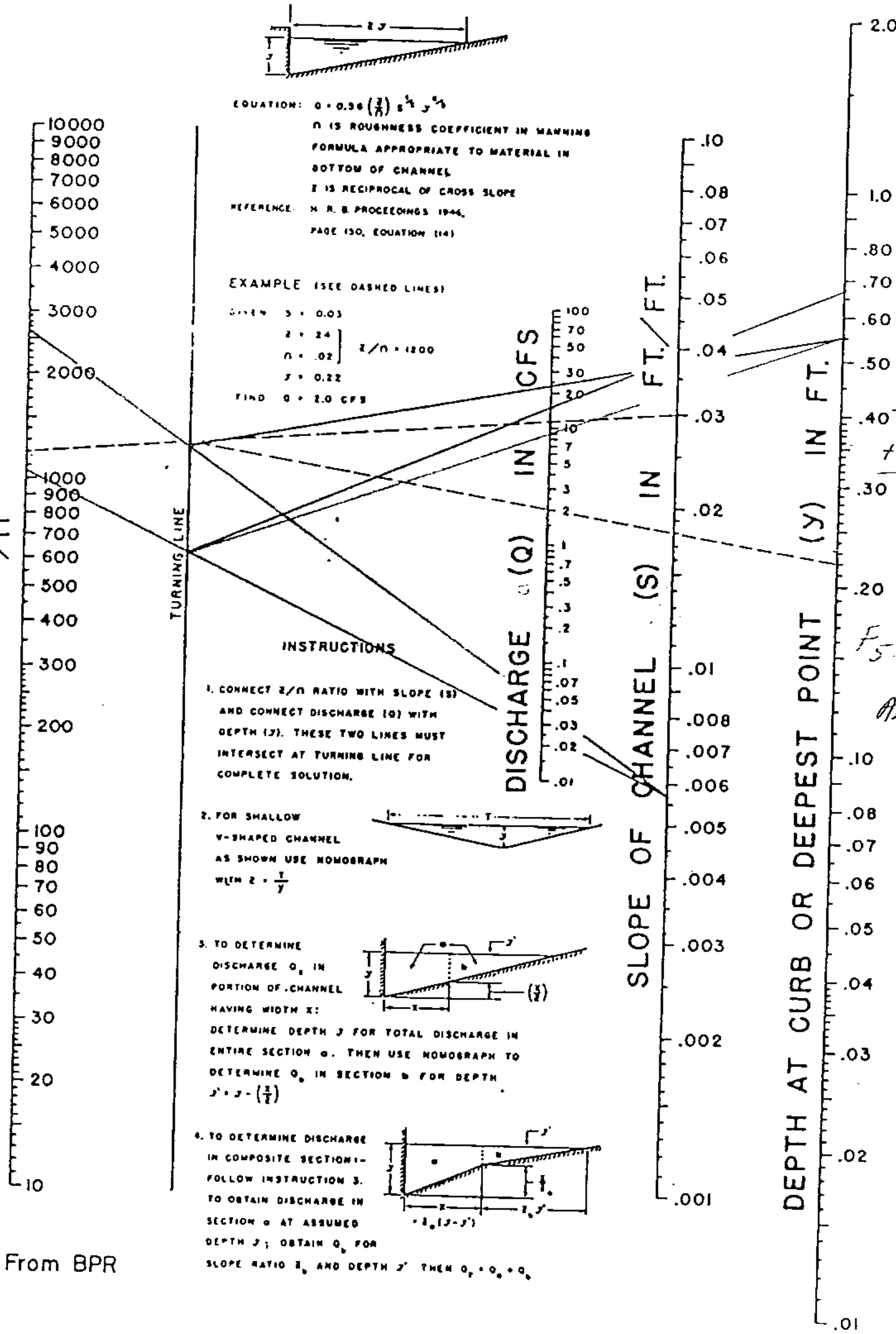
Q_{100} " " " = 5.9 cfs < 25.0 cfs ✓

E-3[illegible]54
21 APR 85
[illegible]

D5/12

REV. 3 MAY 85
4 June 85 Kurt Ball

CHEYENNE MOUNTAIN BLVD.
5-YR. & 100-YR. ALLOW. CAP.
y = 0.67', S = 0.57 %



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) S^{1/2} y^{8/3}$
n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL
z IS RECIPROCAL OF CROSS SLOPE
REFERENCE: H. R. B. PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN S = 0.03
z = 24
n = .02
z/n = 1200
y = 0.22
FIND Q = 2.0 CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$
3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

15.0 cfs
9.0 cfs
+ 04.0 cfs
30.0 cfs

$F_5 = F_{100} = 0.75$

ALLOW. CAP. = 22.5 cfs

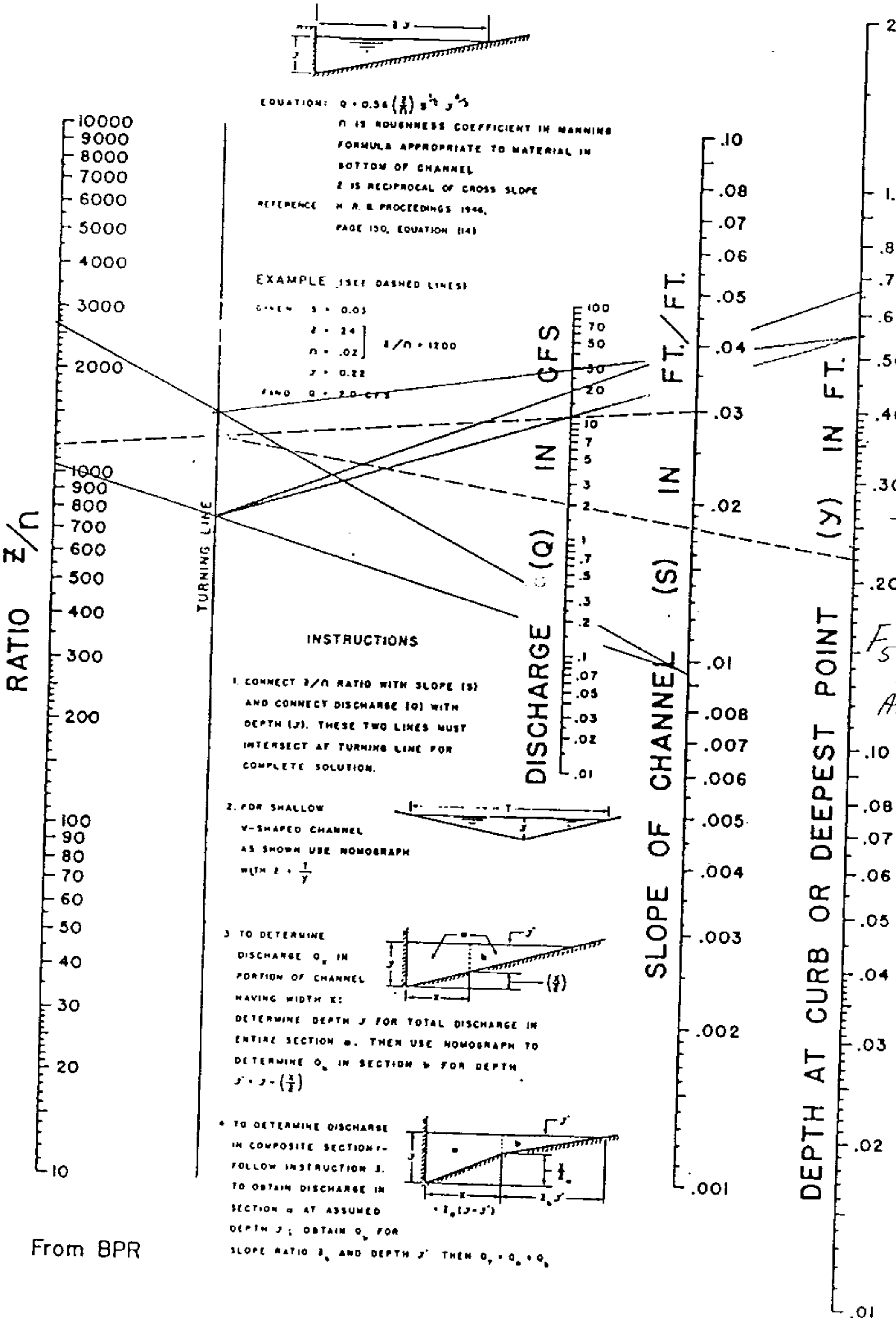
FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

E-3234
21 APR 85
[illegible] III

D6/12

CHEYENNE MOUNTAIN BLVD.
5-YR. & 100-YR. ALLOW. CAP.
Y = 0.67', S = 0.94%

REV. 8 APR 85
4 Jun. 85



EQUATION: $Q = 0.56 \left(\frac{z}{n}\right) S^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE H. R. B. PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN $S = 0.03$
$z = 24$
$n = .02$ $z/n = 1200$
$y = 0.22$
FIND $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$

3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$

4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

20 cfs
-12 cfs
+30 cfs

38 cfs

$F_5 = F_{100} = 0.80$

ALLOW. CAP.
= 30.4 cfs

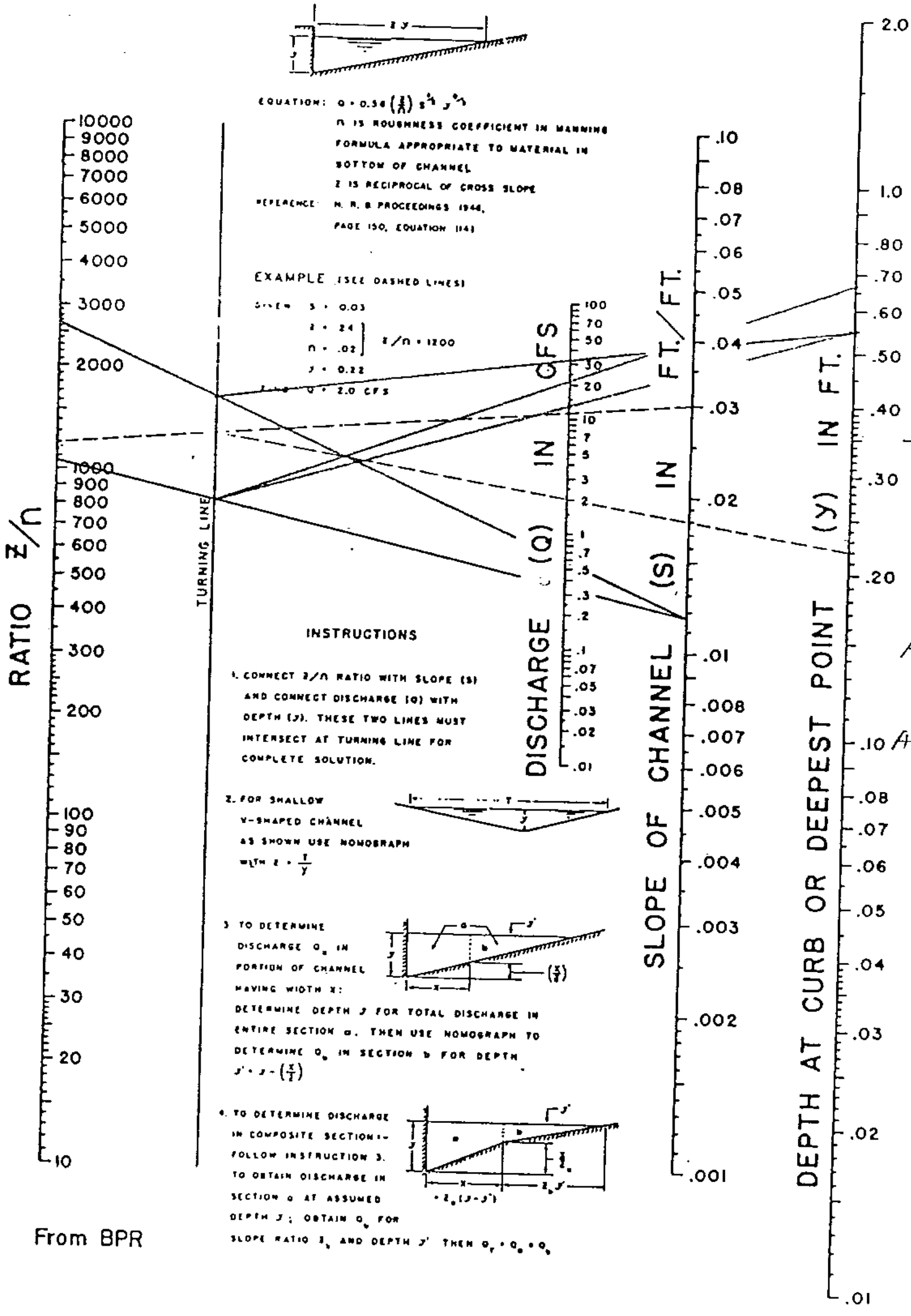
FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

21APR 85
[illegible]

D7/12

CHEYENNE MOUNTAIN BLVD.
5-YR & 100-YR. ALLOW. CAP.
[illegible] 0.69', S = 1.17%

REV. 9 MAR '85
4 J[illegible] – K.+ [illegible]



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) S^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN $S = 0.03$
$z = 24$
$n = .02$] $z/n = 1200$
$y = 0.22$
FIND $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$
3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

22 cfs
−13 cfs
+32 cfs

41 cfs

$F_5 = 0.80$
$F_{100} = 0.78$

ALLOW. CAP$_5$ = 32.8 cfs

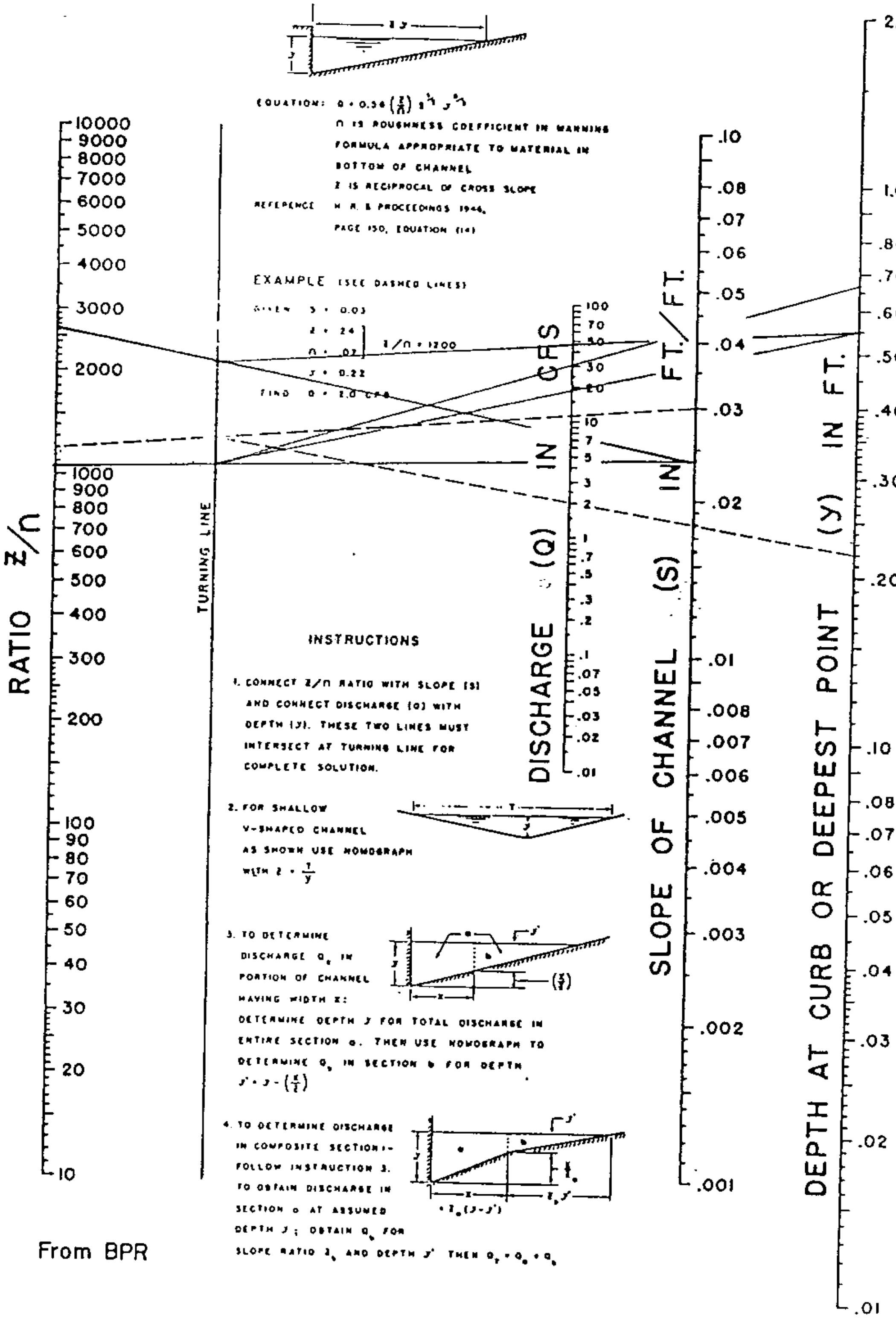
ALLOW. CAP$_{100}$ = 32.0

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

DIAMOND
KDA III

CHEYENNE MOUNTAIN BLVD
5-YR & 100-YR. ALLOW. CAP.
Y = 0.64', S = 2.40 %

REV. 9 MAR 85
4 JUNE 85 K+T.M



EQUATION: $Q = 0.56\left(\frac{z}{n}\right)s^{1/2}y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE H. R. B. PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN S = 0.03
z = 24
n = .02
z/n = 1200
y = 0.22
FIND Q = 2.0 CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$
3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - (\frac{x}{z})$
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

30 cfs
- 17 cfs
+ 47 cfs

58 cfs

$F_5 = 0.77$
$F_{100} = 0.66$

ALLOW. CAP_5
= 44.7 cfs

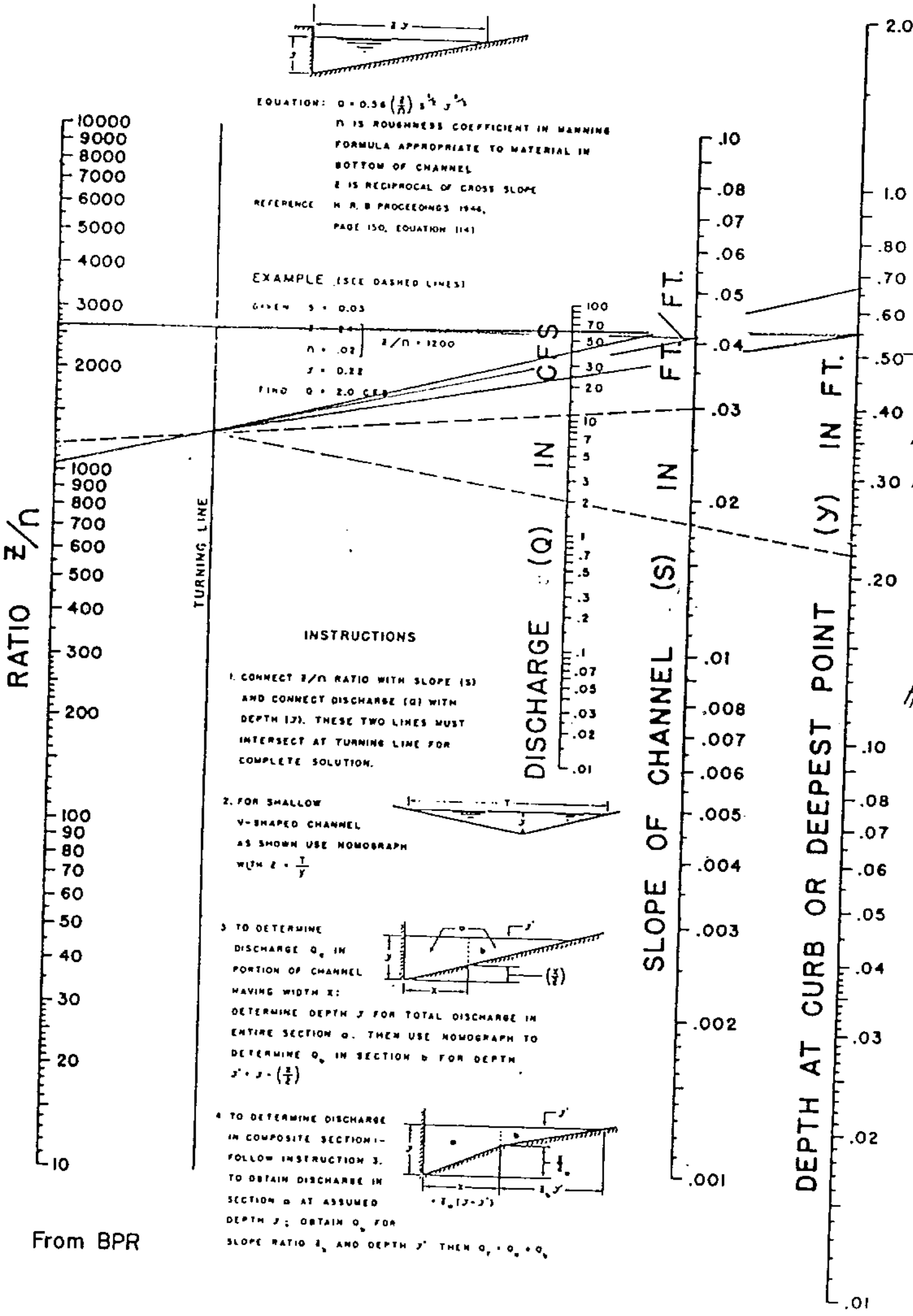
ALLOW. CAP_{100}
= 38.3 cfs

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

21 APR85 KDATE D9/12

CHEYENNE MOUNTAIN BLVD.
5-YR. & 100-YR. ALLOW. CAP.
y = 0.67', S = 4.13%

REV. 9 MAY 85
4 JUN 85 Kait...



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) S^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE H. R. B PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN S = 0.03
z = 24
n = .02 } z/n = 1200
y = 0.22
FIND Q = 2.0 CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$

3. TO DETERMINE DISCHARGE Q_a IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$

4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

40 cfs
− 25 cfs
+ 60 cfs

75 cfs

$F_5 = 0.61$
$F_{100} = 0.49$

ALLOW. CAP.$_5$ = 45.8 cfs

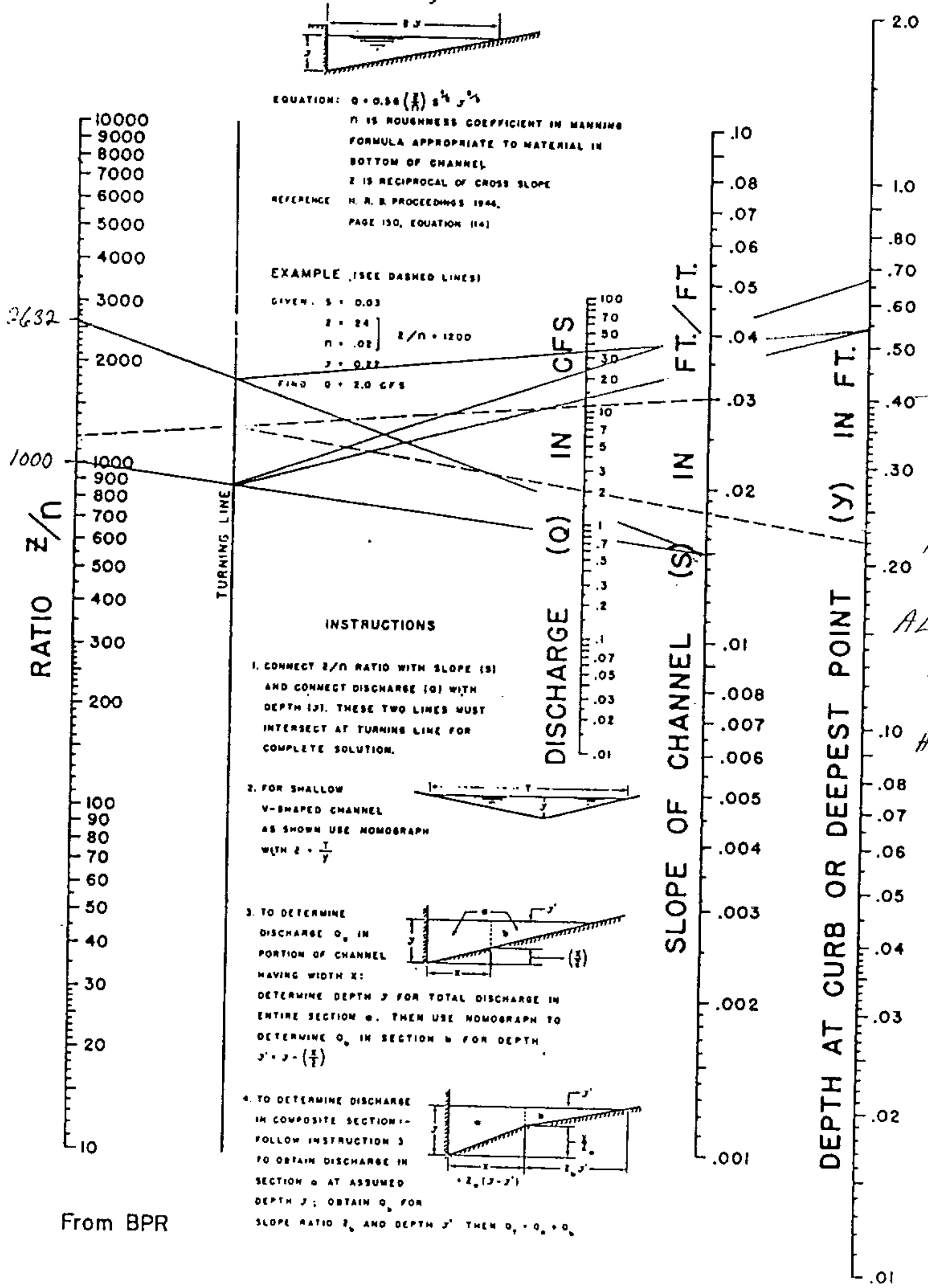
ALLOW. CAP.$_{100}$ = 36.8 cfs

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

E-2669
14 JULY 1985
RDD III

D10/12

ROAD NO. 3
5-YR. & 100-YR. ALLOW. CAP.
Y = 0.67', S = 1.5%



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) S^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL.

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE H. R. B. PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN: $S = 0.03$

$z = 24$, $n = .02$ — $z/n = 1200$

$y = 0.22$

FIND $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$
3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3 TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

THEOR. CAP.

24.0 cfs
- 14.0 cfs
+ 33.0 cfs
43.0 cfs

$F_5 = 0.80$

$F_{100} = 0.75$

ALLOW. CAP.$_5$
= 34.4 cfs

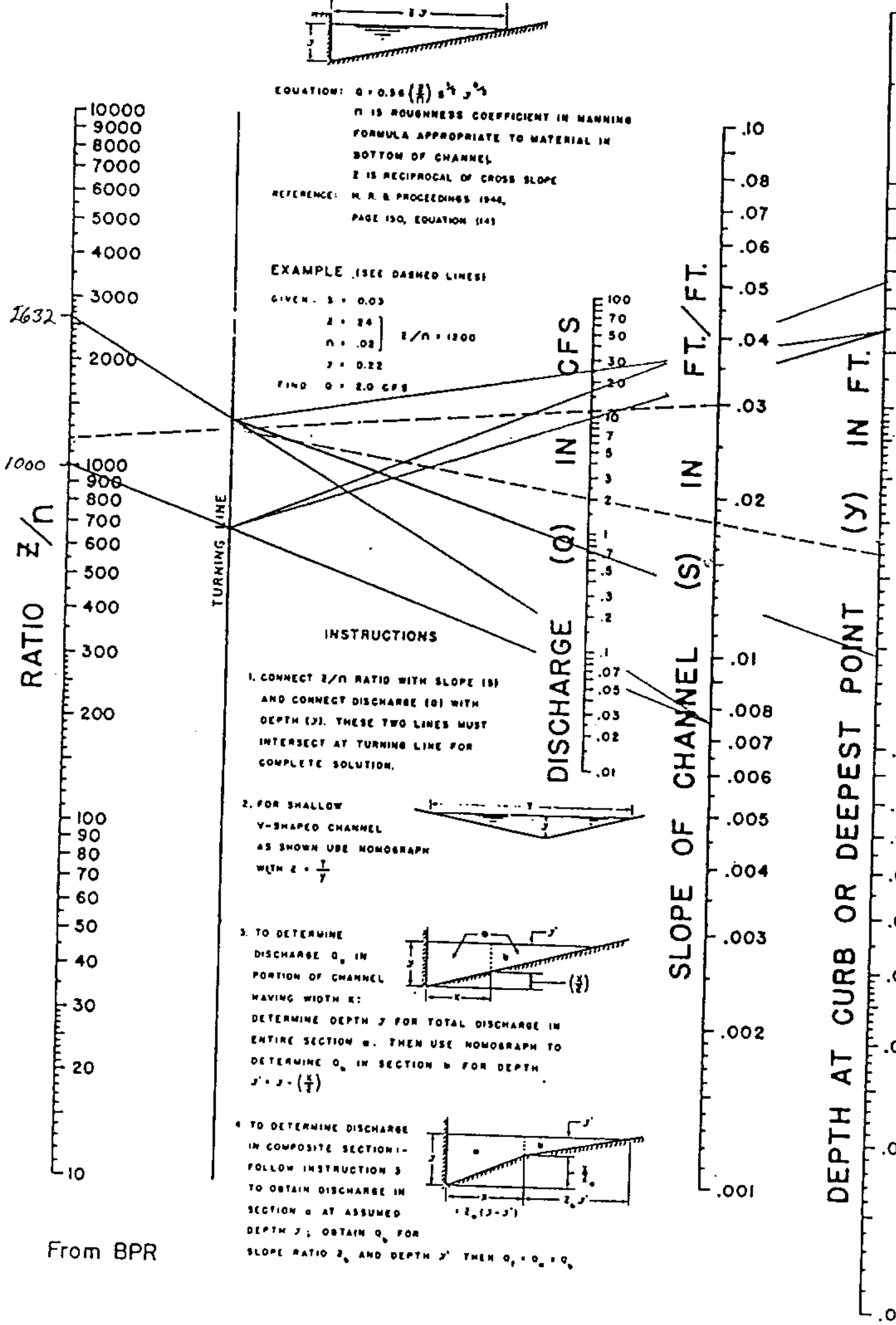
ALLOW. CAP.$_{100}$
= 32.3 cfs

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

E-2669
15 JULY 1985
KDD III

D11/12

CHEYENNE MEADOWS ROAD
5-YR. & 100-YR ALLOW. CAP.
Y= 0.67', S= 0.75%



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) s^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1944, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN: $S = 0.03$
$z = 24$
$n = .02$ $z/n = 1200$
$y = 0.22$
FIND: $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$
3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION: FOLLOW INSTRUCTION 3 TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_t = Q_a + Q_b$

From BPR

THEOR CAP.
17.0 cfs
- 10.0 cfs
+ 25.0 cfs
- 0.7 cfs
31.3 cfs

$F_5 = F_{100} = 0.80$

ALLOW. CAP = 25.0 cfs

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

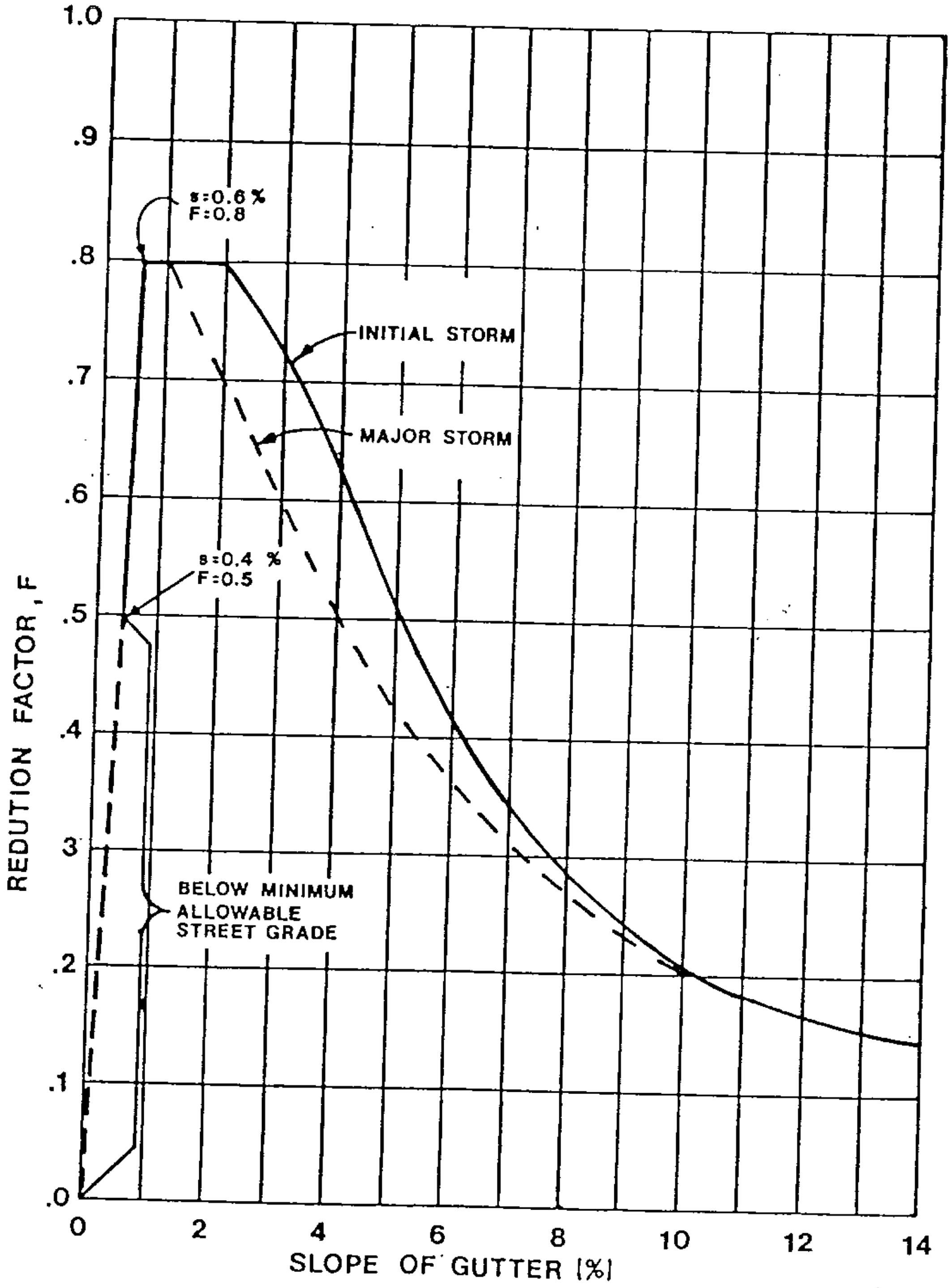


FIGURE 6-2 REDUCTION FACTOR FOR ALLOWABLE GUTTER CAPACITY LOCAL AND COLLECTOR STREETS

APPLY REDUCTION FACTOR FOR APPLICABLE SLOPE TO THE THEORETICAL GUTTER CAPACITY TO OBTAIN ALLOWABLE GUTTER CAPACITY APPROACHING ARTERIAL STREET

APPENDIX E

Project NORTWEST PORTION, CHEYENNE MOUNTAIN CENTER
HARRISON CREEK OUTFALL

Job Nº E-3234

Client GATES

By KDM

Date 1 MAY 1985
4 JUNE 85 Kurt Rall

DETERMINE 5-YR & 100-YR PEAK DISCHARGE
FOR HARRISON CREEK DRAINAGE CHANNEL

DESIGN POINT 1* (BASIN 0-1 AREA = 110 AC)

SOIL GROUP	ACREAGE	USE	CN	%	PRODUCT
12 (B)	1.4	OPEN (GOOD)	61	1.27	0.77
59 (C)	22.6	COMMERCIAL	94	20.55	19.32
82 (A/C)	5.9	OPEN (GOOD)	61	5.36	3.27
USE B	52.8	RES. (< 1/8 AC.)	85	48.00	40.80
86 (B)	12.7	OPEN (GOOD)	61	11.55	7.05
	14.6	RES. (< 1/8 AC.)	85	13.27	11.28
	110.0			100	82.49

USE CN = 82, ∴ $Q_5 = 0.71$ IN & $Q_{100} = 1.78$ IN.

T_c : 550' OVERLAND @ 3.5% (≃1.3 FPS) → 0.12 HR.
5500' CHANNEL w/ H = 165' (FROM FIG. II) → 0.38 HR.
0.50 HR.

$q_p = 730$ csm/in

$q_5 = 730(110/640)\,0.71$
$= 89$ cfs

$q_{100} = 730(110/640)\,1.78$
$= 223$ cfs

* SAME AS DESIGN POINT 5 IN HARTZELL - PFEIFFENBERGER "MASTER DRAINAGE PLAN, HARRISON STREET - I-25 AND VICINITY, CHEYENNE MOUNTAIN RANCH"; HOWEVER, REVISED BASIN ACREAGE AND UPDATED METHODOLOGY TO DETERMINE PEAK DISCHARGES.

Project

Job Nº E-3234

Client GATES

By RDOIII

Date 2 MAY 1985

4 JUNE 95 Kt Polli

DESIGN POINT 2: CONTRIBUTING AREA = 132 AC.

COMBINE BASINS 0-1 ; ~~0-4~~ B-5 PLUS SUB-BASINS A-1, A-2, A-6, B-1 ; B-4. DETERMINE QA/640'S, THEN ADD. ADD TRAVEL TIME IN CHANNEL @ 10 FPS TO T_c @ DESIGN PT. 1 TO DETERMINE q_p.

0-1 → 5-YR. QA/640 = (110/640)0.71 = 0.1220
100-YR. QA/640 = (110/640)1.78 = 0.3059

~~0-4~~ B-5 → RUNOFF CURVE NO = 94
∴ Q_5 = 1.49 IN ; Q_{100} = 2.84 IN
5-YR. QA/640 = (12.8/640) 1.49 = 0.0298
100-YR. QA/640 = (12.8/640) 2.84 = 0.0568

A-1 → 5-YR. QA/640 = (4.12/640) 1.49 = 0.0096
100-YR QA/640 = (4.12/640) 2.84 = 0.0183

A-2 → 5-YR. QA/640 = (2.39/640) 1.49 = 0.0056
100-YR QA/640 = (2.39/640) 2.84 = 0.0106

A-6 → 5-YR QA/640 = (3.28/640) 1.05 = 0.0054
100 YR. QA/640 = (3.28/640) 2.27 = 0.0116

B-1 → 5-YR QA/640 = (0.53/640) 1.87 = 0.0015
100-YR QA/640 = (0.53/640) 3.27 = 0.0027

B-4 → 5-YR QA/640 = (0.86/640) 1.87 = 0.0025
100-YR QA/640 = (0.86/640) 3.27 = 0.0044

USE T_c = 0.50 + (700/20 FPS + 1200/5 FPS)/60/60 = 0.58 HR
∴ q_p = 680 CSM/IN.

q_5 = 680(0.1220 + 0.0298 + 0.0096 + 0.0056 + 0.0054 + 0.0015 + 0.0025)
= 680(0.1764) = 120 cfs

q_{100} = 680(0.3059 + 0.0568 + 0.0183 + 0.0106 + 0.0116 + 0.0027 + 0.0044)
= 680(0.4103) = 279 cfs

Project

Job Nº E-3234

Client GATES

By

Date 2 MAY 1985

4 JUNE 85

DESIGN POINT 3: CONTRIBUTING AREA = 143 AC

COMBINE BASINS O-1, ~~O-4~~ & ~~O-6~~ B-5, E1; PLUS SUB-BASINS A-1, A-2, A-6, B-1 & B-4
DETERMINE QA/640's, THEN ADD. ADD TRAVEL TIME IN CHANNEL @ 5 FPS TO T_c @ DESIGN PT. 2 TO DETERMINE q_p.

~~O-6~~ E-1 → DETERMINE RUNOFF CURVE NUMBER

USE	CN	%	PRODUCT
OPEN	74	50.0	37.0
STREET ROOF PARKING	98	50.0	49.0
			86

(SEE PG. C15)

FROM TABLE 1, $Q_5 = 0.92$ IN. ; $Q_{100} = 2.10$ IN.

$$5\text{-YR } QA/640 = (9.7/640)\,0.92 = 0.0139$$

$$100\text{-YR } QA/640 = (9.7/640)\,2.10 = 0.0318$$

$$\text{USE } T_c = 0.58 + (1450/5\text{FPS})/60/60 = 0.66 \text{ HR.}$$

$$\therefore q_p = 640 \text{ CSM/IN.}$$

$$q_5 = 640\,(0.1764 + 0.0139) = 640\,(0.1903) = 122 \text{ cfs}$$

$$q_{100} = 640\,(0.4103 + 0.0318) = 640\,(0.4421) = 283 \text{ cfs}$$

DETERMINE MAX. FLOW FROM 24" C.M.P. UNDER LAKE AVE.:

$$L = 265.4,\ \Delta H = 3.84' \ \therefore\ S = 0.0145\ \%,\ n = 0.024$$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$= \frac{1.486}{0.024}\, 3.14\, (0.50)^{2/3} (0.0145)^{1/2}$$

$$= 14.7 \text{ cfs}$$

CHECK VS. OUTLET CONTROL:

$$HW_{AVAIL} = 3',\ h_o = 2.5'\ ;\ LS_o = 3.84'$$

$$H = HW - h_o + LS_o = 4.34'$$

FROM NOMOGRAPH, $Q = 20$ cfs ⟸ USE THIS.

Project: ADDENDUM NO. 1

Job Nº: E-3234

Client: GATES

By: RDD III

Date: 1 JULY 1985

OK. CHECKED 22 JULY 85 KR

*DESIGN POINT 4: CONTRIBUTING AREA = 205 AC

COMBINE BASINS O-1, ~~O-4~~ B5, ~~O-6~~ E1; ~~O-7~~ BASIN 'D'; PLUS SUB-BASINS A-1 THRU A-8 AND SUB-BASINS B-1 THRU B-4. DETERMINE QA/640's, THEN ADD. CHECK T_c @ DESIGN PT. 3 VS. T_c FOR BASIN O-7 AND USE LARGER TO DETERMINE q_p.

~~O-7~~ BASIN 'D' → 5-YR QA/640 = (36.1/640) 1.49 = 0.0840

100-YR QA/640 = (36.1/640) 2.84 = 0.1602

A-3 → 5-YR QA/640 = (7.10/640) 1.87 = 0.0207

100-YR QA/640 = (7.10/640) 3.27 = 0.0363

A-4 → 5-YR QA/640 = (7.90/640) 1.67 = 0.0206

100-YR QA/640 = (7.90/640) 3.04 = 0.0375

A-5 → 5-YR QA/640 = (2.08/640) 1.49 = 0.0048

100-YR QA/640 = (2.08/640) 2.84 = 0.0092

A-7 → 5-YR QA/640 = (2.14/640) 1.05 = 0.0035

100-YR QA/640 = (2.14/640) 2.27 = 0.0076

A-8 → 5-YR QA/640 = (3.17/640) 1.67 = 0.0083

100-YR QA/640 = (3.17/640) 3.04 = 0.0151

B-2 → 5-YR QA/640 = (1.19/640) 1.87 = 0.0035

100-YR QA/640 = (1.19/640) 3.27 = 0.0061

B-3 → 5-YR QA/640 = (1.47/640) 1.87 = 0.0043

100-YR QA/640 = (1.47/640) 3.27 = 0.0075

USE T_c = 0.66 HR > 0.31 HR OF BASIN O-7

∴ q_p = 640 csm/IN.

$$q_5 = 640(0.1903 + 0.0840 + 0.0207 + 0.0206 + 0.0048 + 0.0035 + 0.0083 + 0.0035 + 0.0045)$$
$$= 640(0.3400) = 218 \text{ cfs}$$

$$q_{100} = 640(0.4421 + 0.1602 + 0.0363 + 0.0375 + 0.0092 + 0.0076 + 0.0151 + 0.0061 + 0.0075)$$
$$= 640(0.7216) = 462 \text{ cfs}$$

E5/9

Project	Job №
ADDENDUM NO. 1 CHEYENNE MOUNTAIN CENTER Box CULVERT OVER FLOW	E-3234

Client	By	Date
GATES	CN	7-1-85

CHECKED 22 JUN 85 KE

FOR INLET CONTROL

$Q = 350$ cfs
$B = 10'$
$Q/B = 35$
$H = 6'$
WINGWALL FLARE 53°+/-
$HW/D = 0.87$ (FIG 804-1C Co. STATE DESIGN MANUAL
$HW = 5.22'$
$HWel = 59.50$ (ENTRANCE INVERT = 54.28)

FOR OUTLET CONTROL

$A = 60$ sf
$K_e = 0.4$ for WINGWALL OF 53°+/- and CROWN EDGE SQUARE ⇒ USE 0.5
$L = 112$ ft
$n = 0.012$
$LS_o = 0.96' \Rightarrow$ USE 1.0'
$H = 0.92$ FROM FIGURE 804-1G Co STATE DESIGN MAN

$$HW = h_o + H - LS_o$$

$$h_o = (d_c + D)/2$$

$d_c = 3.5'$ FROM FIG. 32, CONCRETE PIPE DESIGN MANUAL

$$= (3.5 + 6.0)/2$$

$$= 4.75$$

$$\therefore HW = 4.75 + 0.92 - 0.96$$

$$= 4.71 = 0.785 D$$

$< 5.22'$ THUS, INLET CONTROL

Project

Job Nº E-3234

Client GATES

By KDO III

Date 1 JULY 1985

Checked 22 July 85 KR

OVERFLOW @ 6'x10' BOX CULVERT

DESIGN AS BROAD-CRESTED WEIR:

$$Q = CLH^{3/2}$$

IF $Q = 112$ cfs, & $H = 0.5'$, FIND L:

USE $C = 3.1$ FROM TABLE 5-9 KING AND BRATER.

$$\therefore L = \frac{Q}{CH^{3/2}} = \frac{112}{3.1(0.5)^{1.5}}$$

$$= 102.19'$$

THE CREST ELEVATION OF THE WEIR SHOULD BE SET @ 59.0, weir length = 102.5'
See Const. Dwg 3D 627, sheet 9 of 12 for Details

FINAL DESIGN SUBJECT TO APPROVAL.

Project: DRAINAGE @ CHEYENNE MEADOWS ROAD

Job No: E-2669

Client: GATES

By: KDOIII

Date: 11 JULY 1985

Checked by CS 7-23-85

COMBINED BASIN FLOWS

DESIGN POINT ~~1~~ 5: CONTRIBUTING AREA = 11.21 AC + 100-YR. OVERFLOW

COMBINE BASINS ~~20~~ F-2, ~~21~~ F-4 & O', ADD QA/640's AND USE ADJUSTED T_c TO DETERMINE q_p. ADD TRAVEL TIME OF 100-YR. OVERFLOW FROM HARRISON CREEK OUTFALL TO GET $T_{c_{100}}$

$T_{c_5} = 0.25 + 0.10 = 0.35$ HR $\therefore q_{p5} = 860$ csm/IN

BASIN 20 T_c

CHANNEL TIME IN BASIN O

$*T_{c_{100}} = 0.66 + 0.25 = 0.91$ HR

$\therefore q_{p100} = 530$ csm/IN.

$q_5 = 860\,(0.0094 + 0.0069 + 0.0051)$

$= 860\,(0.0214) = 18.4$ cfs

$q_{100} = 530\,(0.0178 + 0.0131 + 0.0123) + 112$ cfs

$= 530\,(0.0432) + 112 = 135$ cfs

$*$ $T_{c_{100}}$ INCLUDES TRAVEL TIME FOR HARRISON CREEK OUTFALL = 0.66 HR. FROM APPENDIX G.

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

EB / 9

Project

Job Nº E-2669

Client GATES

By

Date 11 JULY 1985

Checked by CJ 7-23-85

DESIGN POINT ~~2~~ 6: CONTRIBUTING AREA = 12.13 AC + 100-YR OVERFLOW

COMBINE BASINS ~~20, 22~~, ~~24~~ F2, F4, F6; O; ADD QA/640's AND USE ADJUSTED T_c TO DETERMINE q_p. USE OVERFLOW TRAVEL TIME FOR $T_{c_{100}}$:

$T_{c_5} = 0.35$ HR $\therefore q_{p_5} = 860$ csm/IN.

$T_{c_{100}} = 0.91$ HR $\therefore q_{p_{100}} = 530$ csm/IN.

$$q_5 = 860\,(0.0214 + 0.0027)$$
$$= 860\,(0.0241) = 20.7 \text{ cfs}$$

$$q_{100} = 530\,(0.0432 + 0.0047) + 112 \text{ cfs}$$
$$= 530\,(0.0479) + 112 = 137 \text{ cfs}$$

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project

Job Nº E-2669

Client GATES

By KDOTT

Date 11 JULY 1785

Checked by CS 7-23-85

DESIGN POINT ~~6~~ 7: CONTRIBUTING AREA = 3.63 AC

COMBINE BASINS ~~1~~ F1 & ~~3~~ F5, ADD QA/640's, FIND ADJUSTED T_c TO DETERMINE q_p.

FIND T_c:

T_c FROM UPSTREAM BASIN	0.13 HR
GUTTER FLOW → 650' @ 0.75%, V = 2.3 FPS	0.08
	0.21 HR

$\therefore q_p = 1050$ csm/in

$$q_5 = 1050(0.0053 + 0.0017)$$
$$= 1050(0.0070) = 7.4\ cfs$$

$$q_{100} = 1050(0.0101 + 0.0041)$$
$$= 1050(0.0142) = 14.9\ cfs$$

APPENDIX F

Project

Job No E-3234

Client

By KDOH

Date 21 APRIL 1985

4 June 85 Kurt Roth

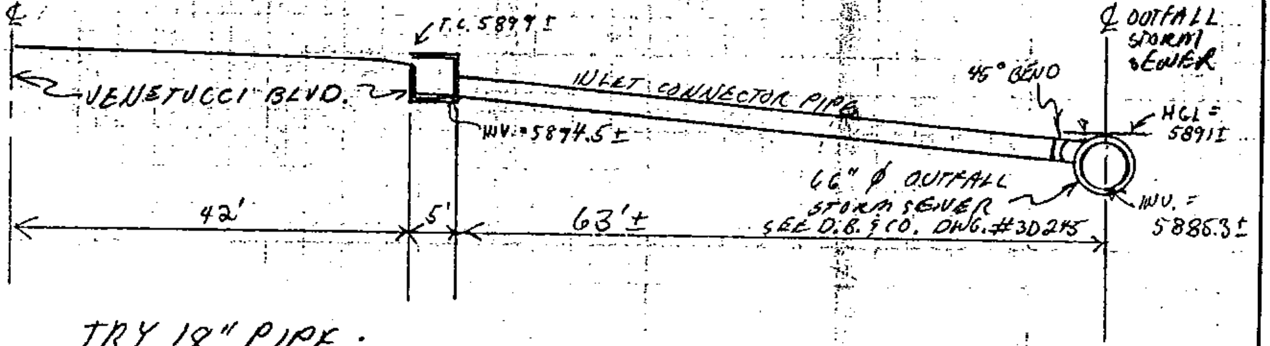
DETERMINE INLET & STORM SEWER SIZING

INLET ON VENETUCCI @ CHEYENNE MOUNTAIN BLVD.:

Q_5 = 4.5 cfs FROM SUB-BASIN A-7 (SEE PG. C7).

FROM TABLE 6, WITH SLOPE @ 2.0%,
USE OPENING LENGTH = 4', CAPACITY = 6.5 cfs

SIZE INLET CONNECTOR PIPE TO CONNECT TO OUTFALL STORM SEWER:



TRY 18" PIPE:

FRICTION SLOPE, $S = \left(Qn / 1.486\, AR^{2/3}\right)^2$

$= \left(4.5(0.013) / 1.486(1.767)(0.375)^{2/3}\right)^2$

$= 0.0018$ FT/FT.

FRICTION HEAD, $h_L = LS = 63(0.0018) = 0.11'$

VELOCITY HEAD, $V^2/2g = (Q/A)^2/2g = (4.5/1.767)^2/64.4 = 0.10$

EXIT LOSS COEFF., $K_L = 0.10$ (SEE FIG 8-14, URBAN STORM DRAINAGE CRITERIA MANUAL (USDCM).)

BEND LOSS COEFF., $K_B = 0.18$ (FROM PG. 3-113, CAMERON HYDRAULIC DATA)

BEND & EXIT LOSS $= (0.10 + 0.18)\, V^2/2g = 0.03'$

TOTAL HEAD LOSS, $H = 0.11' + 0.03' = 0.14'$

PRESSURE HGL IN CONNECTOR PIPE = 5891 + 0.14 - 5891.14
∴ INLET NOT UNDER PRESSURE CONDITIONS. CHECK CAP.
WITH MANNINGS AND SLOPE = (94.5 - 87.3)/63 = 0.0825 FT/FT

$Q = 1.486\, AR^{2/3} S^{1/2}/n = 30.2$ cfs ✓ USE 18" PIPE

Project

Job Nº E-3234

Client GATES

By

Date 21 APRIL 1985
4 JUNE 85

INLETS @ LOW POINT ON CHEYENNE MOUNTAIN BLVD.:

WEST SIDE:

COMBINE SUB-BASINS A-5 & A-8 TO DETERMINE INLET OPENING. DETERMINE QA/640'S, THEN ADD; USE LONGER T_c FOR q_p:

A-5 → 5-YR. $QA/640 = \left(\frac{2.08}{640}\right)1.49 = 0.0048$

100-YR $QA/640 = \left(\frac{208}{640}\right)2.84 = 0.0092$

A-8 → 5-YR. $QA/640 = \left(\frac{3.17}{640}\right)1.67 = 0.0083$

100-YR. $QA/640 = \left(\frac{3.17}{640}\right)3.04 = 0.0151$

SUM → 5-YR. $0.0048 + 0.0083 = 0.0131$

100-YR $0.0092 + 0.0151 = 0.0243$

USE $T_c = 0.27$ HR ∴ $q_p = 960$ CSM/IN.

$q_5 = 960(0.0131) = 12.6$ cfs

$q_{100} = 960(0.0243) = 23.3$ cfs

FROM TABLE 6, WITH SUMP CONDITION, USE OPENING LENGTH = 6.0'
CAPACITY = 12.8 cfs.

EAST SIDE: (TWO INLETS, ONE @ NORTH BCR, ONE @ SUMP)

INTERCEPT FLOW FROM SUB-BASIN B-2 WITH INLET ON CHEYENNE MOUNTAIN BLVD. @ NORTH BCR FOR FUTURE "ROAD NO. 3."

$q_5 = 4.2$ cfs FROM SUB-BASIN B-2 (SEE PG. C10)

FROM TABLE 6, WITH SLOPE @ 1.0%, USE OPENING LENGTH = 4.0'
CAPACITY = 8.6 cfs

SIZE SUMP INLET FOR FLOWS FROM BASIN B-3.

$q_5 = 5.5$ cfs (SEE PG. C11)

Project

Job Nº E-3234

Client GATES

By RDD III

Date 21 APRIL 1985

4 JUNE 85 Kurt Rollins

FROM TABLE 6, WITH SUMP CONDITION, USE OPENING LENGTH = 6.0
CAPACITY = 12.8 cfs (WILL HANDLE 100-YR FLOW w/o EXCESSIVE PONDING)

ADD FLOW FROM SUB-BASIN A-4 AND SIZE STORM SEWER:

COMBINE SUB-BASINS A-4, A-5, A-8, B-2 & B-3 FOR OUTFLOW.
DETERMINE QA/640's, THEN ADD & USE LONGER T_c FOR q_p:

$$A\text{-}4 \rightarrow 5\text{-YR.} \quad QA/640 = \frac{7.90}{640}(1.67) = 0.0206$$

$$100\text{-YR.} \quad QA/640 = \frac{7.90}{640}(3.04) = 0.0375$$

$$B\text{-}2 \rightarrow 5\text{-YR.} \quad QA/640 = \frac{1.19}{640}(1.87) = 0.0035$$

$$100\text{-YR.} \quad QA/640 = \frac{1.19}{640}(3.27) = 0.0061$$

$$B\text{-}3 \rightarrow 5\text{-YR.} \quad QA/640 = \frac{1.47}{640}(1.87) = 0.0043$$

$$100\text{-YR.} \quad QA/640 = \frac{1.47}{640}(3.27) = 0.0075$$

$$SUM \rightarrow 5\text{-YR.} \quad 0.0131 + 0.0206 + 0.0035 + 0.0043 = 0.0415$$

$$100\text{-YR.} \quad 0.0243 + 0.0375 + 0.0061 + 0.0075 = 0.0754$$

PIPE TIME NEGLIGIBLE USE $T_c = 0.27$ HR $\therefore q_1 = 960$ CSM/IN.

$$q_5 = 760(0.0415) = 40 \text{ cfs}$$

$$q_{100} = 960(0.0754) = 72 \text{ cfs}$$

DETERMINE OUTFLOW PIPE SIZE W/ MANNING'S IF AVAIL. SLOPE = 1.0%:

$C_1 = Q/\sqrt{S} = 40/\sqrt{0.01} = 400$, USE 36" RCP. FROM CONCRETE PIPE DESIGN MANUAL PG. 96.

$$Q_{FULL} = 66.6 \text{ cfs}$$

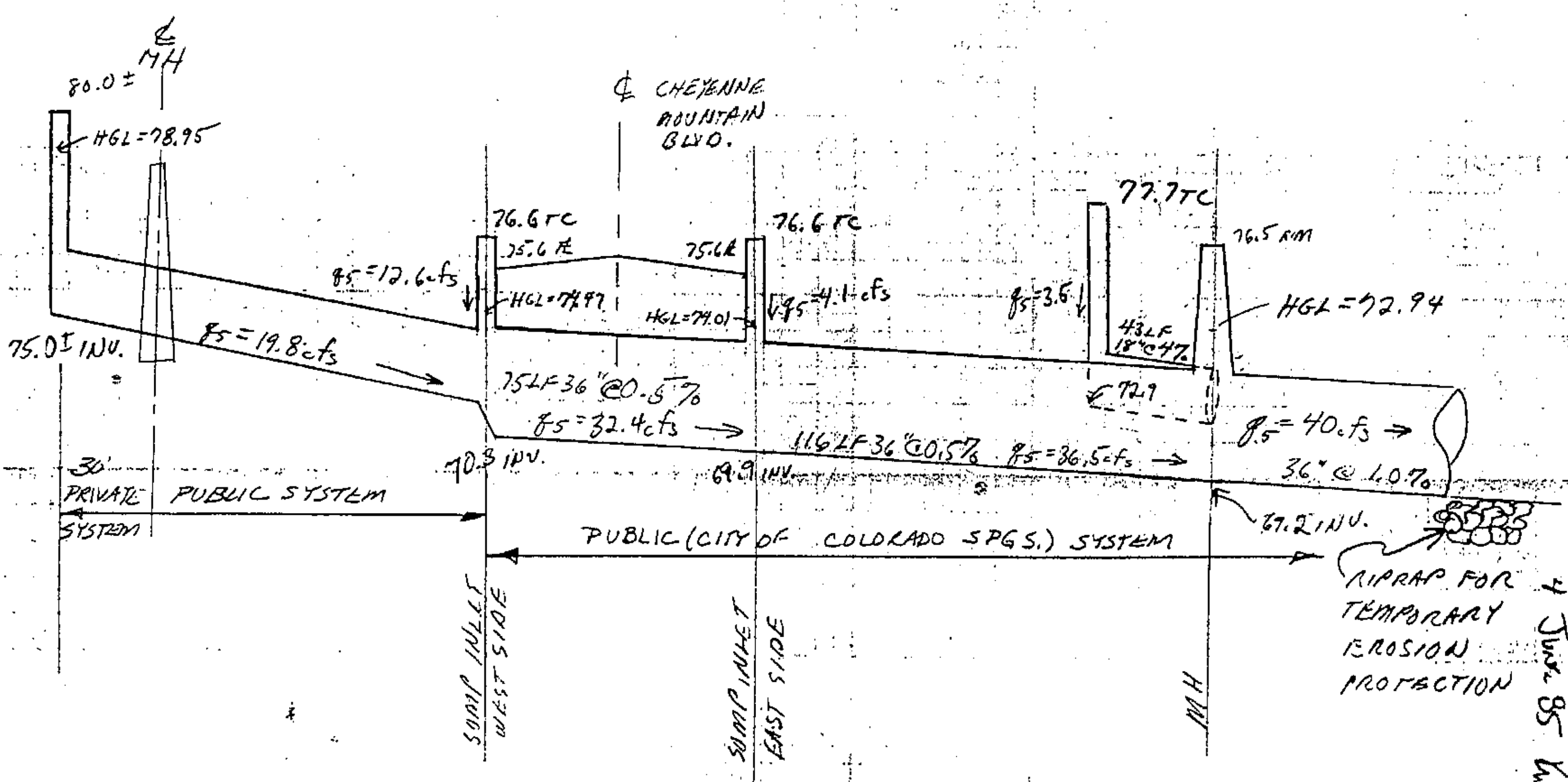
FRICTION SLOPE; $S = (Qn/1.486\,AR^{2/3})^2$
$= 0.0036$ FT/FT.

COMBINE SUB-BASINS A-4, A-5, A-8 & B-3 FOR UPSTREAM FLOW INTO MANHOLE AND USE REMAINDER OF 40 cfs AS LATERAL FLOW.

ASSUME FULL FLOW IN 36" AT MANHOLE WITH WATER LEVEL AT TOP OF PIPE AND PROCEED UPSTREAM.

PIPING SCHEMATIC

CHEY. MTN. BLVD. @ ROAD NO. 3



DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project

Client GATES

By KDOTT

Date 22 APRIL 1985

4 June 85

Job Nº E-3234

F4/29

Project	Job Nº
	E-3234

Client	By	Date
GATES	MDOTT	22 APRIL 1985 5 JUNE 85 Kurt Kohli

UPSTREAM $q_5 = 960(0.0131 + 0.0206 + 0.0043) = 36.5$ cfs

LATERAL $q_5 = 40 - 36.5 = 3.5$ cfs

TRY $D_0 = 36''$; $D_L = 18''$. USE FIG. 8-15 USDCM FOR 36" & FIG 8-14 FOR 18"

$36'' \rightarrow K = 1.08$ FOR 80° DEFLECTION

$18'' \rightarrow K_L = 0.40$

$V_0^2/2g = (Q/A)^2/2g = (40/7.069)^2/2(32.174) = 0.50$

$h = \Sigma K (V_0^2/2g) = (1.08 + 0.40)\,0.50 = 0.74$

$\therefore$ HGL @ MANHOLE $= 69.2 + 3.0 + 0.74 = 72.94$

DETERMINE HGL @ EAST SIDE INLET:

COMBINE SUB-BASINS A-4, A-5 & A-8 FOR UPSTREAM FLOW AND USE REMAINDER OF 36.5cfs FOR GUTTER FLOW.

UPSTREAM $q_5 = 960(0.0206 + 0.0131) = 32.4$ cFs

GUTTER $q_5 = 36.5 - 32.4 = 4.1$ cfs

TRY $D_0 = 36''$ AND FIG. 8-12 WITH PARA 8.4.6g PLUS $K_G = 0.3$ FOR GUTTER

OUTFALL PIPE FRICTION LOSS $= L_S = L\left(\frac{Qn}{1.486 A R^{2/3}}\right)^2$

$$= 116\left(\frac{36.5(0.013)}{1.486(7.069)(0.75)^{2/3}}\right)^2 = 0.35'$$

OUTFALL PIPE PRESSURE LINE $= 72.94 + 0.35 = 73.29$

$V_0^2/2g = \left(\frac{36.5}{7.069}\right)^2/2(32.174) = 0.41$

$D_L/D_0 = 36/36 = 1.0$, $B/D_0 = 4/3 = 1.33$

$K_L = 1.47$, $h_L = 1.47(0.41) = 0.60$

$K_G = 0.3$, $h_G = 0.3(0.41) = 0.12$

TOTAL CHANGE $= 0.60 - 0.12 = 0.72$

W.S.EL $= 73.29 + 0.72 = 74.01$ OK FOR EAST SIDE, BUT W.S.EL ON WEST SIDE MAY BE TO HIGH.

TRY $D_0 = 36''$ AND FIG. 8-12 WITH PARA 8.4.6i PLUS $K_G = 0.3$

$K_L = 1.04$ FOR 45° DEFLECTOR

$K_L = 1.30$ FOR 15° DEFLECTOR

$K_L = 1.34$ FOR PARALLEL WALL DEFLECTOR

Project	**Job Nº** E-3234
Client GATES	**By** RODIII
	Date 25 APRIL 1985 5 JUNE 85 KAR

$h = (1.04 + 0.3)\,0.41 = 0.55'$ FOR 45°

$h = (1.30 + 0.3)\,0.41 = 0.66$ FOR 15°

$h = (1.34 + 0.3)\,0.41 = 0.67$ FOR PARALLEL WALL

W.S. EL. = 73.29 + 0.55 = 73.84

W.S. EL. = 73.29 + 0.66 = 73.95

W.S. EL. = 73.29 + 0.67 = 73.96

DETERMINE HGL @ WEST SIDE INLET: (TRY FIRST WITH D/S W.S. EL. = 74.01)

COMBINE SUB-BASINS A-5 & A-8 FOR GUTTER FLOW AND USE REMAINDER OF 32.4 cfs FOR UPSTREAM FLOW.

GUTTER q_5 = 12.6 cfs (SEE PAGE 2)

UPSTREAM $q_5 = 32.4 - 12.6 = 19.8$ cfs

TRY $D_u = 24''$ AND FIG. 8-8

OUTFALL PIPE FRICTION LOSS, $L_s = L\left(Qn/1.486AR^{2/3}\right)^2$

$= 75\,(0.0024) = 0.18'$

OUTFALL PIPE PRESSURE LINE = 74.01 + 0.18 = 74.19'

$V_o^2/2g = (32.4/7.069)^2/2(32.174) = 0.33$

$D_u/D_o = 24/36 = 0.67,\ Q_u/Q_o = 19.8/32.4 = 0.61,\ Q_G/Q_o = 0.39$

ESTIMATE $K = 3\frac{Q_G}{Q_o}$ AND $d = [3(0.39).33 + 74.19] - 70.3 = 4.28$ FT

$d/D_o = 4.28/3.0 = 1.43$

$K_u = 0.65 + 0.2 = 0.85$

$h_u = 0.85(0.33) = 0.28$

W.S. EL = 74.19 + 0.28 = 74.47 ✓

$d_{ACT} = 74.47 - 70.3 = 4.17$, CLOSE ENOUGH TO 4.28'

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

Project

Job Nº E-3234

Client GATES

By RDDIII

Date 25 APRIL 1985

5 JUNE 85

DETERMINE HGL @ PRIVATE INLET:

TRY $D_o = 24''$ AND FIG. 8-6 WITH SIDE OUTLET ; $q_5 = 19.8$ cfs

OUTFALL PIPE FRICTION LOSS, $L_s = L(Qn/1.486AR^{2/3})^2$

ASSUME $L = 200' \therefore L_s = 200(0.0077) = 1.53'$

OUTFALL PIPE PRESSURE LINE $= 74.47 + 1.53' = 76.00$

VELOCITY HEAD, $V_o^2/2g = (19.8/3.142)^2/2(32.174) = 0.62$

ESTIMATE DEPTH, $d = (76.00 - 75.0) + 5(0.62) = 4.10$

THUS, $d/D_o = 4.10/2.0 = 2.05$

FROM FIG. 8-6, $K_G = 4.65$

$h_G = 4.65(0.62) = 2.88'$

TRIAL W.S. EL. $= 76.00 + 2.88 = 78.88$

NEW $d = 78.88 - 75.0 = 3.88'$

THUS, $d/D_o = 3.88/2.0 = 1.94$

FROM FIG. 8-6, $K_G = 4.9$

$h_G = 4.9(0.62) = 3.04'$

TRIAL W.S. EL. $= 76.00 + 3.04 = 79.04$

NEW $d = 79.04 - 75.0 = 4.04'$

THUS, $d/O_o = 4.04/2.0 = 2.02$

FROM FIG. 8-6, $K_G = 4.7$

$h_G = 4.7(0.62) = 2.91'$

TRIAL W.S. EL. $= 76.00 + 2.91 = 78.91$

NEW $d = 78.91 - 75.0 = 3.91'$

THUS $d/D_o = 3.91/2.0 = 1.96$

Project

Job № E-3234

Client GATES

By WDIII

Date *REV- 8 MAY85
25 APRIL 1985
5 JUNE 85 Kurt Roth

FROM FIG. 8-6, $k_o = 4.85$

$h_o = 4.85(0.62) = 3.01'$

TRIAL W.S. EL. = 76.00 + 3.01 = 79.01

NEW $d = 79.01 - 75.0 = 4.01$

d IS APPROACHING 3.95'±, ∴ USE W.S. EL.
= 75.0 + 3.95 = 78.95 @ PRIVATE INLET.

INLET WEST OF CHEY. MTN. BLVD. @ LAKE AVENUE: (SUMP CONDITION)

$q_5 = 6.5$ cfs, FROM SUB-BASIN A-6 (SEE PG. C6)

TRY TYPE 13 INLET AND FIND REQ'D HEAD TO PASS 6.5 cfs WITH 50% FLOW REDUCTION

$Q = Ca\sqrt{2gh}$ WITH $C = 0.60$

FIND AREA: 24 OPENINGS @ 1¾" × 7 15/16"

$a = 24\left(1\tfrac{3}{4}/12\right)\left(7\tfrac{15}{16}/12\right)$

$= 2.32\ FT^2$

REDUCE BY 50%: $2.32(0.5) = 1.16\ FT^2$

$$h = \left(\frac{Q}{ca}\right)^2 / 2g = \left(\frac{6.5}{0.6(1.16)}\right)^2 / 64.35 = 1.36'$$

IF $h_{AVAIL.} = 1.5'$, THEN $Q_{CAP} = 0.60(1.16)\sqrt{2(32.174)1.5}$

$= 6.8$ cfs

∴ SET INLET GRATE 1.5' BELOW CHEY. MTN. BLVD. T.C.

*INLET @ LOW PT. IN CHEY. MTN BLVD @ WEST BCR FOR LAKE AVE.: (SUMP CONDITION)

$q_5 = 15.8$ cfs FROM SUB-BASINS A-1 & A-2 (SEE PG. C2)

FROM TABLE 6, WITH SUMP CONDITION, USE OPENING LENGTH = 8.0', CAPACITY = 18.4 cfs

Project		Job Nº E-3234
Client GATES	By RDD III	Date 6 MAY 1985

4 JUNE 85 KwA Rolli

INLET ON CUL-DE-SAC : (SUMP CONDITION)

$Q_5 = 3.2$ cfs, FROM SUB-BASIN B-4 (SEE PG. C12).

FROM TABLE 6, WITH SUMP CONDITION, USE OPENING LENGTH = 4.0', CAPACITY = 7.9 cfs

FOR DISCHARGE PIPE, TRY 18" R.C.P @ 1.0% & CHECK W/ MANNING'S:

$Q = 1.486\, AR^{2/3} S^{1/2} / n = 10.5$ cfs ✓

SIZE RIPRAP @ TEMP. OUTFALL FOR 36" R.C.P.:

FIND VELOCITY @ OUTLET:

$V = Q/A$ WITH A = FUNCTION OF NORMAL DEPTH, y_n

FIND y_n USING SECTION FACTOR, $AR^{2/3} = Qn / 1.486\sqrt{S}$

$AR^{2/3} = 40(0.013) / 1.486\sqrt{0.01} = 3.50$

$AR^{2/3} / d_0^{8/3} = 0.19$

FROM CHOW FIG. 6-1, $y/d_0 = 0.56 \therefore y_n = 1.68'$

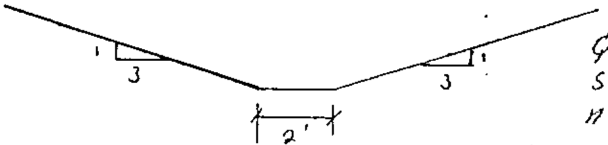
WITH $y/d_0 = 0.56$, $A = 4.07$ FT^2

THUS VELOCITY, $V = Q/A = 40/4.07 = 9.82$ FPS

FROM "RIPRAP STONE SIZING CHART", $d_{50} = 9"$

HOWEVER, USE $d_{50} = 18"$ TO DISCOURAGE VANDALISM.

CHECK TEMP. SWALE:



$Q = 40$ cfs
$S = 0.003$ FT/FT
$n = 0.040$

FIND y_n USING SECTION FACTOR, $AR^{2/3} = Qn / 1.486\sqrt{S} = 19.66$

$AR^{2/3} / b^{8/3} = 3.10$; FROM CHOW FIG. 6-1, $y/b = 1.05 \therefore y_n = 2.10'$

VELOCITY $= Q/A = 40 / (2 + 3(2.10))2.10 = 2.3$ FPS ✓

F10/29

Project

Job № E-2669

Client

By KOD III

Date 12 JULY 1985

Checked by CS 7-23-85

SIZE CULVERT UNDER CHEYENNE MEADOWS ROAD @ FRONTAGE ROAD

Check Inlet vs Outlet Control for different future HW's.

TRY 48" W/ F.E.S.: (SEE FIG. 52, CONC. PIPE DESIGN MANUAL) ENCLOSED ON PG. F14

$Q = 135$ cfs

CHECK INLET CONTROL: $HW = 6.5'$

CHECK OUTLET CONTROL: $HW + S_oL = 6.9'$

$HW = 6.9 - S_oL$

$= 6.9 - 0.002(140)$

$= 6.6' > 6.5'$

∴ OUTLET CONTROL GOVERNS

CHECK PIPE CAPACITY GIVEN AVAILABLE $HW = 7.2'$

$HW + S_oL = 7.2 + 0.3$

$= 7.5'$

$Q_{CAP} = 145$ cfs

Project

Job Nº E-2669

Client GATES

By LDO III

Date 14 JULY 1985

Checked by CJ 7-25-8

DETERMINE POND RETENTION CAPACITY - SUB BASIN F3

AREA OF LAKE @ NORMAL WATER SURFACE = 1.5 AC

CONTRIBUTING RUNOFF AREA = 3.81 AC (BASIN ~~21~~ F3)

DETERMINE RUNOFF DEPTH FROM TABLE I:

SOIL GROUP	ACREAGE	USE	CN	%	PRODUCT
59 (c)	1.5	POND	100	39.37	39.37
	2.31	COMMERCIAL	94	60.63	56.99
					96.36

USE CN = 97, ∴ Q_5 = 1.77 IN & Q_{100} = 3.16 IN

DETERMINE RUNOFF VOLUME:

VOL_5 = 3.81 (1.77/12) = 0.56 AC-FT

VOL_{100} = 3.81 (3.16/12) = 1.00 AC-FT

DETERMINE RISE IN POND WATER SURFACE:

$DEPTH_5$ = 0.56/1.5 = 0.37'

$DEPTH_{100}$ = 1.00/1.5 = 0.67'

CHECK POND FREEBOARD:

PROJECTED POND NORMAL W.S. EL. = 51.0

PROJECTED POND MAXIMUM W.S. EL. = 52.0

∴ FREEBOARD = 1.0' > 0.37' OR 0.67' ✓

No Pond Discharge will be allowed for a 100-year storm or less,

F12/29

Project

Job Nº E-2669

Client GATES

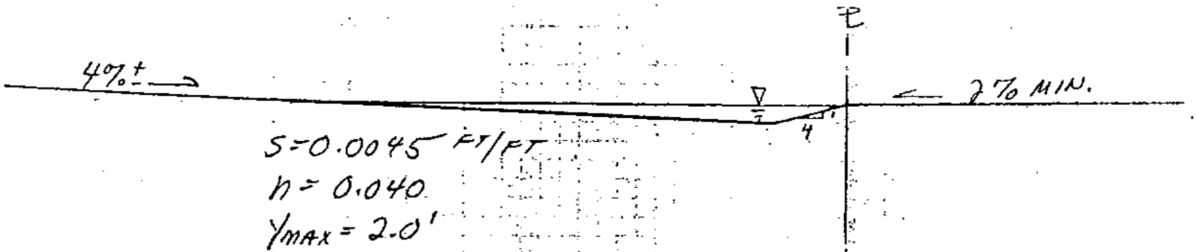
By

Date 19 JULY 1985

Checked by CS 7-23-85

DETERMINE CAPACITY OF PROPOSED CHANNEL ALONG EAST ℄

Between 10'x6' Box and Cheyenne Meadows Road along the West side of I-25. The channel will replace the existing frontage road.



S = 0.0045 FT/FT

n = 0.040

Y

$Y_{MAX} = 2.0'$

TYPICAL CHANNEL SECTION

SCALE: 1" = 20'

CHECK USING TRIANGULAR CHANNEL NOMOGRAPH:

$z = T/y = 58/2$

$= 29$

$z/n = 29/0.040$

$= 725$

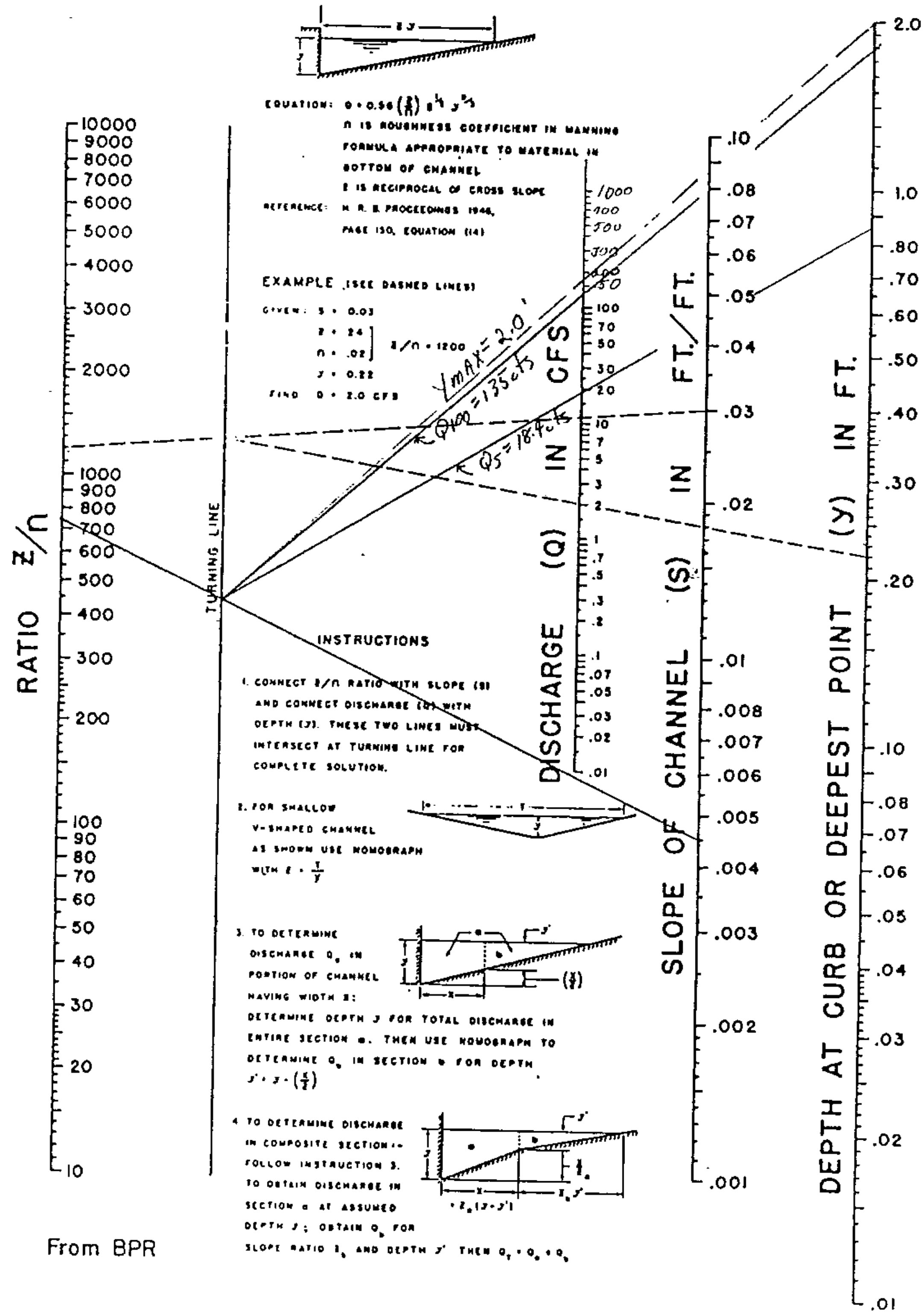
FROM NOMOGRAPH, CAPACITY @ y = 2.0' = 175 cfs ✓

FOR $Q = 135$ cfs, $y = 1.8'$

FOR $Q = 18.4$ cfs $y = 0.85'$

E-2669
19 JULY 1985
RDD III

F13 / 29



EQUATION: $Q = 0.56 \left(\frac{z}{n}\right) s^{1/2} y^{8/3}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

GIVEN: $S = 0.03$

$z = 24$

$n = .02$ $\Big]$ $z/n = 1200$

$y = 0.22$

FIND $Q = 2.0$ CFS

INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $z = \frac{T}{y}$

3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH y FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $y' = y - \left(\frac{x}{z}\right)$

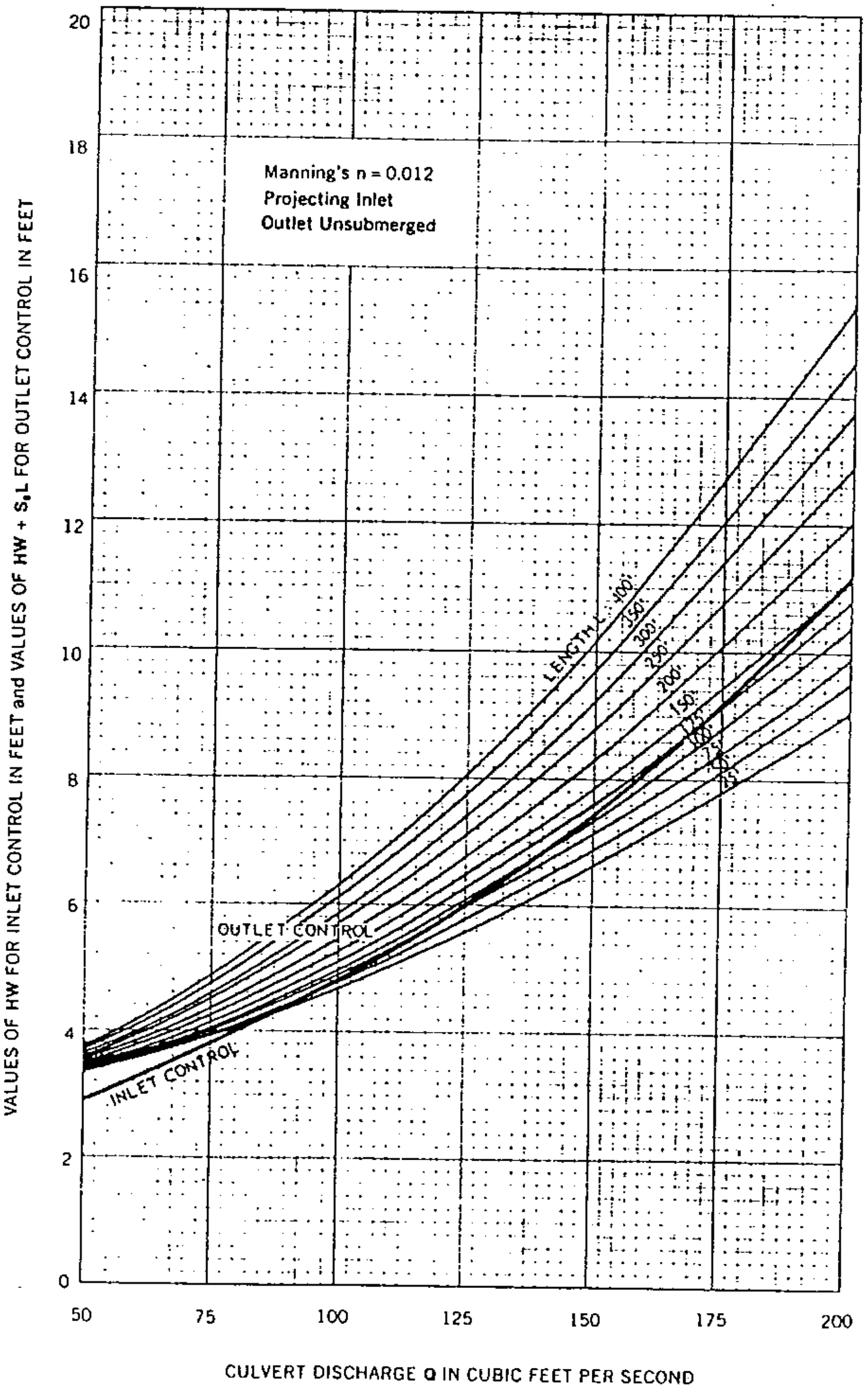
4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH y; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH y' THEN $Q_T = Q_a + Q_b$

From BPR

FIGURE 6-1. NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

E-2669
12 JULY 1992
KOOTT

FIGURE 52



DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

F15/29

Project: CMC - DRAINAGE CALCS.

Job Nº E-2669

Client: GATES

By: K.L.

Date: 9-20 83

DESIGN CURB OPENING INLETS + STORM SEWER

Table 6 - (C. Springs Design Manual)

BASINS 1&2 (Central Intersection)

Q = 53 cfs (sump)

L = 36'

Capac. = 53.2 cfs ✓

Outlet Pipe

[n = 0.013]

USE 36" R.C.P. AT .6% = S (minimum)

$H_W/D = 1.29$ (inlet control)

H = 1.29 (3) = 3.87 ft.

W.S. = 68.54 + 3.87 = 72.41

BASIN 3 (N. Side of Intersection)

Q ≈ 4 cfs

S ≈ 1%

L = 4'

Capacity = 5.2 cfs ✓

Outlet Pipe

USE 18" R.C.P. (AT A MINIMUM OF .25% = S)

$H_W/D = 0.85$ (inlet control)

H = 0.85 (1.5) = 1.29 ft.

BASINS 4&5 (S. Side of Intersection)

Q = 4 cfs

Use L = 4' inlet

Use 18" R.C.P.

See Pg. F-2

9/30/85

F16/29

Project: CMC - DRAINAGE CALCS.

Job Nº: F-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 DAN

~~BASINS 1 thru 5 (Outlet Pipe from M.H. 1 + 2)~~

~~$Q_5 \approx 59$ cfs~~

~~USE 36" R.C.P. (from M.H. 1)~~

~~AT A MINIMUM SLOPE OF .78%~~
~~(by mannings)~~

See Pg. F-3

BASIN ~~6 + 7~~ D3 & D2

Inlets

Q = 23 cfs

S = 1.0 %

Use 2 - 8' Inlets

Capacity = (2 x 9.4) 0.6 ≈ 12 cfs (6 cfs each)

Bypass → 23 - 12 = 11 cfs

Outlet pipe from 1st 8' Inlet

Q = 6 cfs

USE 18" R.C.P. AT MINIMUM SLOPE OF S = .33%

$HW/D = 0.92$ (Inlet Control)

H = .92(1.5) = 1.38'

W.S. = 62.61 + 1.38 = 63.99

Outlet Pipe from 2nd 8' Inlet

Q = 12 cfs

USE 24" R.C.P. AT MINIMUM Slope of S = 0.28%

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

F17 / 29

Project: CMC - DRAINAGE CALCS.

Job Nº: E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 DJM

A3, A4, A5, A8, B2, B3, D1, D2, D3

BASINS ~~1 thru 7~~ (Outlet from M.H. 3)

Q_5 = 81 cfs

Use 42" R.C.P. Sf = .65%

AT MINIMUM SLOPE OF S = 0.65%

okay for preliminary sizing of storm sewer

~~BASINS 8 thru 10~~ ~~B-5, C-1, E-1~~

~~Q = 51 cfs~~

~~Use 42" R.C.P at minimum slope of S = .6%~~

~~Hw/D = 0.94~~

~~H = 0.94(3.5) = 3.29~~

~~W.S. = 57.41 + 3.29 = 60.70~~

~~BASIN 11 (Inlet)~~

~~Q = 4 cfs~~

~~S = 1.5%~~

~~L = 6' inlet~~

~~Capacity = 10.6(.6) = 6.4 cfs~~

~~Outlet Pipe (Basins 8 thru 11)~~

~~Q = 55 cfs~~

~~Use 60"x38" Oval R.C.P. at minimum Slope of S = .5%~~

~~Hw/D = 0.85~~

road + inlet eliminated

F18/29

Project: CMC - DRAINAGE CALCS.

Job No: E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 DTm

~~BASINS 1 thru 11 (outlet for M.H. 4)~~

~~Q = 136 cfs~~

~~Use 76"x48" Oval R.C.P.~~

~~at a minimum slope of S = .6%~~

BASIN 12 (inlet)

Q = 1 cfs

S = 1.5%

L = 4 ft.

Capacity = 4.6 cfs ✓

Use 8' inlet to accomodate pipe size

road and inlet eliminated

~~Outlet Pipe (Basins 1 thru 12)~~

~~Q = 136 cfs~~

~~Use 76"x48" Oval R.C.P.~~

~~at a minimum slope of S = .5%~~

BASIN ~~#4~~ D-5 (inlet)

Q = 18 cfs

S = 4%

L = 8'

Capacity = 10.2 cfs

Project: CMC - DRAINAGE CALCS.
Job Nº: E-2669
Client: GATES
By: KL
Date: 9-20-83

Rev. 9/30/85 OAP

Outlet pipe (Basin ~~#4~~ D-5)

Q = 10.2 cfs
Use 24" R.C.P.
at a minimum slope of S = .20%
inlet control: HW/D = 1.5 or 3'

Outlet pipe (M.H. 6)

Q = 10.2 cfs
Use 24" R.C.P. at minimum slope of S = .20%
H = 2.34'

BASINS ~~#4 thru 17~~ (inlet) D-5, D-6, D-7 & D-4

Q = 57 - 10.2 $^{\text{w-pipe}}$ + 13 $^{\text{carryover}}$ = 59.8 cfs
L = 42 ft.
Capacity = 62.1 cfs ✓

Outlet pipe

Q = 59.8 cfs
Use a 48" R.C.P. at minimum slope of S = .18%
HW/D = 0.85
H = 0.85 (4.0) = 3.40
Inlet Control

Project: CHEYENNE MOUNTAIN CENTER

Job Nº: E-2669

Client: GATES LAND CO

By: JGS

Date: 05 FEBRUARY 1985

SIZE INLET AT ROAD # 3

- SUMP ON WEST SIDE SERVICING SUBBASINS D7+D4 ~~16+17~~

CONSIDER 19 CFS FROM THE NORTH AND SOUTH ALIKE

TOTAL Q_5 = 38 CFS

NECESSARY SUMP INLET = 16' INLET, CAPACITY = 39.4 CFS

REMAINING FLOW (10 CFS FROM NORTH AND 17.8 CFS FROM SOUTH) IS ASSUMED TO BE PICKED UP WITHIN THE DEVELOPED AREAS COMPRISING SUBBASINS D7-D4 ~~16+17~~ AND DIRECTED EASTWARD TO THE 48" OUTLET (CAPACITY = 73 CFS)

Project: CMC - DRAINAGE CALCS.
Job No: E-2669
Client: GATES
By: KL
Date: 9-20-83

Rev. 9/30/85

D-5, D-6, D-7, D4, D9
BASINS ~~14 thru 18~~ (outlet for M.H.S10)

$Q = 59 + 11 = 70$ cfs
Use 48" R.C.P. $S_f = .25\%$
at minimum slope of $S = .26\%$

OUTLET PIPE (M.H. 10)

Use 60" x 38" H.E.R.C.P.
$H^W/_D = 1.03$ (inlet control)
use 48" RCP → $Q_S = 73$ cfs.
For $Q = 80$ cfs a minimum of $S = .31\%$

D-9
BASIN ~~18~~ (inlet)
$Q_{100} = 4$ cfs (Sump)
$L = 4'$
Capacity = 4.7 cfs ✓

Outlet Pipe
$Q = 4$ cfs
Use 18" R.C.P. at a minimum slope of .15%
$H^W/_D = 0.72$ (inlet control)

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

F22/29

Project: CMC - DRAINAGE CALCS.
Job Nº: E-2669
Client: GATES
By: KL
Date: 9-20-83

Rev. 9/30/85 DPN
Frontage Road eliminated

AT 6'X10' Box under I-25

$Q_{100} = 350$ cfs

Use DRCOG Approx. for 5yr.

$Q_s = 350\left(\frac{2.1}{10}\right) + 192 = 266$ cfs

$Q/B = \frac{266}{10} = 26.6$

$Hw/D = 0.70$

$H = 0.70\ (6) = 4.20$

$W.S.\ El. = 54.38 + 4.20 = 58.58$

Pipes Under FRONTAGE ROAD (Basins 1 thru 18)

$Q_s = 192$ cfs

Try 2 - 68"X43" Oval Conc Pipes - $Q = \frac{192}{2} = 96$ cfs

Inlet Control

$Hw/D = 1.03$

$H = 1.03\left(\frac{43}{12}\right) = 3.69$

$W.S. = 55.1 + 3.69 = 58.79$

Outlet Control

$H = 0.66'$

$W.S. = 58.58 + 0.78 = 59.36$

Raise Road to El. 60.0 @ E.A.

Try using series of 24" R.C.P. w/o raising road

Inlet Control

$Hw/D = \frac{2.3}{2} = 1.15$

$Q = 17$ cfs

$N = \frac{192}{17} = 11$

Outlet Control

Use 11 pipes - $Q = \frac{192}{10} = 19.2$ cfs

$H = 0.8'$

$W.S.\ El. = 58.58 + 0.8 = 59.38$

Approx. 1.4' Over Top of Road - No

Project: CMC - DRAINAGE CALCS.

Job №: E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev 9/30/85 DAM

Inlet eliminated

~~BASIN~~ ~~#9~~ ~~F-1 (inlet)~~

~~Q = 6cfs (Sump)~~

~~L = 6 ft.~~

~~Capacity = 7.7cfs ✓~~

~~Outlet Pipe~~

~~Use 18" R.C.P. at minimum slope of S = .54%~~

~~H_w/D = 0.92 S_f = .32%~~

Project: CMC - DRAINAGE CALCS.

Job № E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 DJm

BASINS 20 thru 22

Q = 34 cfs

Use 36" R.C.P. at minimum slope of S = 0.26%

H_w/D = 1.30 (inlet control)

H = 1.30(2.5) = 3.25'

W.S. = 49.32 + 3.25 = 52.57

BASIN 23. (inlet)

Q = 3 cfs

S = 1.3%

L = 4'

Capacity = 5.2 cfs ✓

Outlet Pipe (Basins 20 thru 23)

Q = 37 cfs

Use 36" R.C.P. at minimum slope of S = .31%

H_w/D = 0.97

Inlets Eliminated

BASINS 19 thru 23 (outlet from M.H. 9)

Q = 43 cfs

Use 36" R.C.P. at minimum slope of S = .42%

BASIN 24 (inlet)

Q = 2 cfs

S = 1.3%

L = 4'

Capacity = 5.2 cfs

Project: CMC - DRAINAGE CALCS.

Job Nº: E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 DTN

~~Outlet Pipe (Basins 19 thru 24)~~

~~Q = 45 cfs~~

~~Use 42" R.C.P. at minimum slope of S = .2%~~

~~BASIN~~ ~~26~~ ~~A-2 (inlet)~~

~~Q = 11 cfs (Sump)~~

~~L = 8 ft.~~

~~Capacity = 18.4 (.6) = 11 cfs~~

~~Place inlet over 3'X16' Box Culvert~~

See Pg F-8

~~BASIN 27 (inlet)~~

~~Q = 1 cfs~~

~~S = 2%~~

~~L = 4 ft.~~

~~Capacity = 3.9 cfs ✓~~

~~Place inlet over 3'X16' Box Culvert~~

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F26/29

Project: CMC - DRAINAGE CALCS.

Job Nº E-2669

Client: GATES

By: KL

Date: 9-20-83

Rev. 9/30/85 OAR

Channel for North Flow - Section A-A

Q_{100} = 240 cfs HP report Harrison St - I-25 Vicinity

$S_{min} = .006$

$n = .015$ (concrete channel)

$A = 5d + 2d^2$

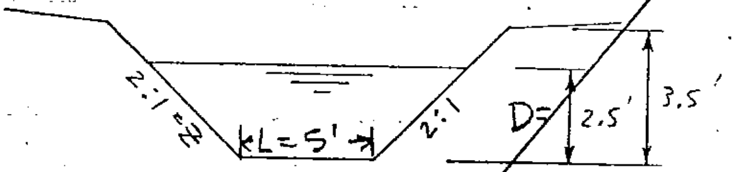
$P = 5 + 4.47d$

$$Q = \frac{1.487}{.015} \frac{A^{5/3}}{P^{2/3}} (.006)^{1/2}$$

$$Q = 7.68 \frac{(5d + 2d^2)^{5/3}}{(5 + 4.47)^{2/3}}$$

$d = 2.5' < 3'$ ∴ supercritical flow

$V = 10.4$ fps



or grass lined

S = .8%, L = 5', Z = 4:1

n = .04, V = 4.8 fps D = 3'

for 260 cfs D = 3.1 V = 4.9 fps

Box Culvert Under Cheyenne Mountain Boulevard Frontage Rd & Road #5

Q_{100} = 260 cfs ok

Try a 3' X 16' Box

Inlet Control

$260/16 = 16.25$

$HW/D = 1.08$

$HW = 1.08(3) = 3.24'$ ✓

Outlet Control

$$\frac{D_c + D}{2} = \frac{2+3}{2} = 2.5'$$

L = 90' @ 0.5%

$A = 3 \times 16 = 48\ ft^2$

$H = 0.75'$

$HW = 2.5 + 0.75 - 90(.005) = 2.8'$

See Pg. G1

Use M-601-2, 8-8-A Double Conc. Box Culvert, H = 3'

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F27/29

Project	Job Nº
Cheyenne Mtn. Centre	E-2669

Client	By	Date
Gates		8-2-84

Rev. 9/30/85 DJN

~~Channel design for North Flow + onsite flow~~

~~for offsite flow $Q_{100} = 242$cfs per HP report~~
~~$T_c = 40$ min~~

~~for basin 25-28 + 8-10 $Q_{100} = 128$ cfs~~
~~$T_c = 14$ min~~

~~∴ onsite flow will be gone before offsite peaks~~
~~but capacity grass lined channel @ top freeboard~~
~~$Q = 474$cfs w/ $V = 5.6$fps~~

~~Q_{max} 100 yr @ box = 350cfs per HP report~~

See Pg. G 1

Project: CMC

Job Nº: E-2469

Client: Gates

By: BMW

Date: 8-11-84

Rev 9/30/85

~~Channel thru Basin C-C~~

~~Q_{100} = 260 cfs onsite > Q_{100} offsite of 240cfs~~

~~∴ at depth = 3.1' Q=260cfs~~

~~See D 8/9 for outfall of Basin 13 plus Basin 16, 17~~

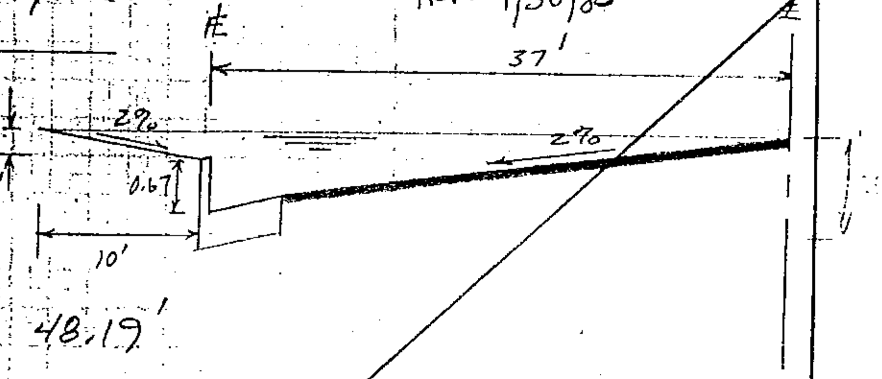
See Pg G1

F29/29

Project: CMC - DRAINAGE CALCS.	Job Nº E-2669
Client: GATES	By K.L. Date 9-2-83

Check Flow in W. Side of Cheyenne Mountain Boulevard @ Sump

Rev. 9/30/85



$$Q = \frac{1.486}{n}\,\frac{A^{5/3}}{P^{2/3}}\,S^{1/2}$$

$$P = (35^2 + .7^2)^{1/2} + \left[(2^2 + .17^2)^{1/2} + .67 + .5\right] + (10^2 + .2^2)^{1/2}$$

$$P = 35.01 + 3.18 + 10.0 = 48.19'$$

$$n = \frac{35.01(.014) + 3.18(.012) + 10.0(.035)}{48.19} = .018$$

$$A = 10(.2)(.5) + .5(.2) + .17(2)(.5) + 2(.7) + 35(.7)(.5)$$

$$A = 14.92\ ft^2$$

$$Q = \frac{1.486}{.018}\,\frac{(14.92)^{5/3}}{(48.19)^{2/3}}\,S^{1/2} = 563.7\ S^{1/2}$$

@ 0.5%, Q = 39.9 cfs

Min. Slope = 0.5%

@ 0.50%, Q = 39.9 cfs > 28cfs ✓

∴ water will not overflow street crown

See Pg D2

APPENDIX G

Project Harrison Creek Outfall

Job Nº E2669

Client Gates

By DJN

Date 10/22/85

According to the City of Colorado Springs design criteria, if the 100 year flow is less than 500cfs, the 100 year flow can be carried overland and the 5 year storm runoff should be conveyed in storm sewer. Gates Land Co. elected to size the storm sewer from Venetucci Blvd (Hwy 85) to 500 feet east of Cheyenne Mountain Boulevard to carry the 100 year runoff. Appendix G is included for informational purposes only. It analyzes the 100 year storm through a 60" RCP to approximately 60' east of Cheyenne Mountain Blvd. Although the 60" RCP was shown to be adequate, Gates Land Co. elected to increase the size to 73"x 55" C.A.P. and to lengthen the pipe to 500' east of Cheyenne Mountain Blvd.

The 100 year H.G.L. calculations shown here are for a 60" RCP. The revised pipe is a 73"x55" C.A.P. and has somewhat superior conveyance characteristics. Therefore, these calculations for the 60" RCP are conservative when compared to the actual HGL of the 73"x53" C.A.P

Project NORTHWEST PORTION, CHEYENNE MOUNTAIN CENTER HARRISON CREEK OUTFALL

Job Nº E-3234

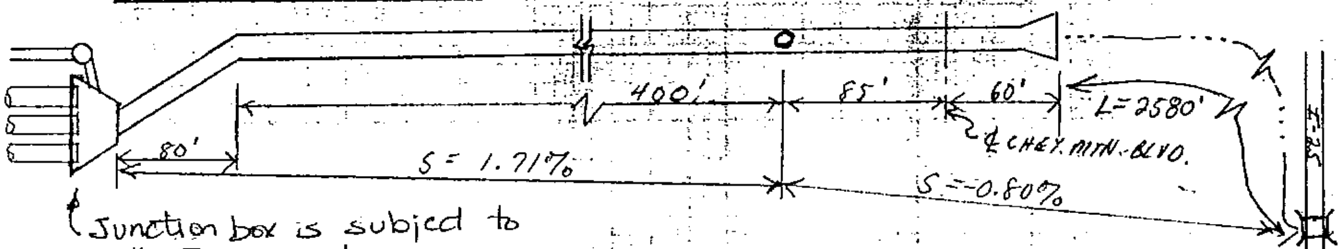
Client GATES

By KDD III

Date 30 APRIL 1985

4 JUNE 85 KmA Roth

HYDRAULIC ANALYSIS OF 60" R.C.P. AND GRASS LINED CHANNEL



Junction box is subjed to CDH. Requrements

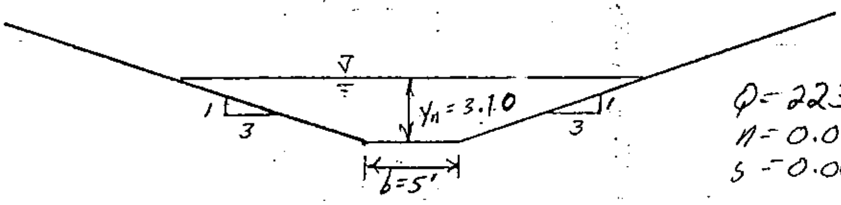
CRITICAL POINT FOR CLEARANCE @ EAST T.C. OF CHEY. MTN. BLVD.:

PROJECTED T.C. EL. =	82.9
CURB & GUTTER HEIGHT =	-1.2
CLEARANCE =	-1.0'
WALL THICKNESS (60"Ø R.C.P., CL III, T&G.)	-0.5'
INSIDE DIAMETER =	-5.0'
INVERT =	75.2

DISTANCE TO D/S BOX @ I-25 = 2600' & INV. @ BOX = 54.4 ∴ S = 0.80%

FIND OUTLET DEPTH: (ASSUMED TO BE GREATER OF TAILWATER DEPTH OR $\frac{d_c+D}{2}$.) SEE PG. 3-45, CONC. PIPE HANDBOOK.

DETERMINE TAILWATER DEPTH (NORMAL DEPTH, y_n) IN PROPOSED GRASS-LINED CHANNEL:



$Q = 223$ cfs
$n = 0.040$
$S = 0.0080$ FT./FT.

TYPICAL SECTION
SCALE: 1" = 10' HORZ. & VERT.

FIND y_n USING SECTION FACTOR, $AR^{2/3} = Qn/1.486\sqrt{S}$

$AR^{2/3} = 223(0.04)/1.486\sqrt{0.008} = 67.11$

$AR^{2/3}/b^{8/3} = 0.92$

FROM CHOW FIG. 6-1, $y/b = 0.62$ ∴ $y_n = 3.10'$

VELOCITY = $Q/A = 223/(5+3(3.10))3.10 = 5.03$ FPS

FROUDE NO., $F = V/\sqrt{gL}$ = 0.65 ∴ SUBCRITICAL

∴ TAILWATER DEPTH = 3.10'

$\frac{d_c+D}{2} = \frac{4.2+5.0}{2} = 4.60'$ ∴ USE OUTLET DEPTH = 4.60'

Project

Job Nº E-3234

Client GATES

By

Date 30 APRIL 1985

4 JUNE 85 Kurt Kolle

FIND OUTLET INVERT:

OUTLET 23' D/S FROM REQ'D INV. @ EAST T.C. C.M.B.

OUTLET INVERT = 75.2 - 23 (0.0080)

= 75.02

FIND y_n ; y_c IN PIPE & CHECK FOR PRESSURE FLOW ($y_n/D \geq 0.90$):

- FROM TYPE 13 INLET, D/S TO OUTLET W/ S = 0.0080 FT/FT.

FIND y_n USING SECTION FACTOR, $AR^{2/3} = Qn/1.486\sqrt{S}$

$= 223 (0.013)/1.486\sqrt{0.008} = 21.81$

$AR^{2/3}/d_0^{8/3} = 0.30$

FROM CHOW, FIG. 6-1, $y/d_0 = 0.79 < 0.90$

THUS, $y_n = 3.95'$ AND OUTLET VELOCITY = 13.4 FPS

FIND y_c USING CRITICAL SECTION FACTOR, $Z = Q/\sqrt{g}$

$= 223/\sqrt{32.174} = 39.31$

$Z/d_0^{2.5} = 0.70$

FROM CHOW, FIG. 4-1, $y/d_0 = 0.84$

THUS, $y_c = 4.20'$

- FROM JUNCTION BOX D/S TO TYPE 13 INLET W/ S = 0.0171 FT/FT.

FIND y_n USING SECTION FACTOR

$AR^{2/3} = 223 (0.013)/1.486\sqrt{0.0171} = 14.92$

$AR^{2/3}/d_0^{8/3} = 0.20$

FROM CHOW, FIG. 6-1, $y/d_0 = 0.58 < 0.90$

THUS, $y_n = 2.90'$

PER CHOW, ART. 17-8 & FIG. 17-30, $H/d = 1.60$; $H = 8.00$'
WITH ROUNDED ENTRANCE, $H/d = 1.25$; $H = 6.25'$

USE ROUNDED ENTRANCE

$\therefore$ IF INV. = 84.4 @ ENTRANCE TO 60" PIPE, THEN W.S. EL. = 90.65
EXIST. ROADWAY ELEV. = 90.1 $\therefore$, USE BOLT-ON MANHOLE LID.

Project	Job Nº E-3234
Client GATES	By / Date 1 MAY 1985 4 JUNE 85

CHECK CULVERTS UNDER VENETUCCI BLVD. (US 85/87):

FIND HEADWATER DEPTH WITH OUTLET HGL @ 90.65

U/S HGL = 90.65 + H, $H = h_e + h_f + h_v$ (CONC. PIPE HANDBOOK PG. 3-42)

WHERE: h_e IS THE ENTRANCE LOSS, $K_e V^2/2g$

h_f IS THE FRICTION LOSS, $L(29.14 n^2/R^{4/3}) V^2/2g$

h_v IS THE VELOCITY HEAD LOSS, $V^2/2g$

$V = Q/A = 223/(3(11.8)+3.14) = 5.79 \quad \therefore V^2/2g = 0.52$

$K_e = 0.90$ (PROJECTING INLET)

$H = 0.90(0.52) + 80[29.14(0.024)^2/(3(0.90)+0.50)^{4/3}]0.52 + 1.0(0.52)$

$= 1.14'$

$\therefore$ U/S HGL = 90.65 + 1.14' = 91.79. THIS IS HIGHER THAN THE ADJACENT ROADWAY w/ ELEV. ≃ 90.5.
$\therefore$ CAPACITY OF CULVERTS IS EXCEEDED.

FIND HEADWATER DEPTH FOR 5-YR. STORM. Q = 89 cfs

60"ϕ OUTLET H/d = 0.8, REDUCED = 0.87(0.8) = 0.70 (PER CHOW)
; H = 5(0.70) = 3.50'

ASSUME DEPTH = 3.50' @ CULVERT OUTLETS $\therefore$ SUBMERGED
IF INVERT OF CULVERTS = 86.2, THEN D/S HGL = 89.70

U/S HGL = 89.70 + $h_e + h_f + h_v$

$V = Q/A = 89/(3(11.8)+3.14) = 2.31$ fps $\therefore V^2/2g = 0.08$

U/S HGL $= 89.70 + 0.90(0.08) + 80[29.14(0.024)^2/(3(0.90)+0.50)^{4/3}]0.08 + 0.08$

$= 89.70 + 0.17$

$= 89.87$

Project

Job Nº E-3234

Client GATES

By RDD III

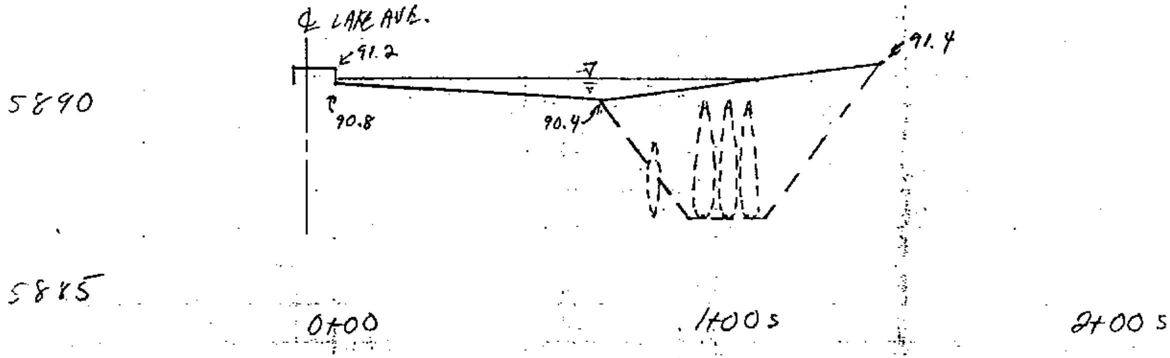
Date 8 MAY 1985

4 JUNE 85 Kurt Rothe

FIND DEPTH OF WATER OVER ROADWAY DURING 100-YR STORM:

BALANCE FLOW OVER ROADWAY WITH FLOW THRU CULVERTS

TREAT ROADWAY AS OPEN CHANNEL WITH THE FOLLOWING SECTION:



CHECK COMBINED CAPACITY WITH DEPTH IN ROAD = 0.5'

FIND ROAD CAPACITY:

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2} \quad \text{WITH: } n = 0.019,\ S = 1.20\%$$

$$= \frac{1.486}{0.019} \sqrt{0.012}\ A R^{2/3}$$

$$= 8.57\ A R^{2/3}$$

$$A = \frac{0.4(70)}{2} + 0.1(70) + \frac{0.5(37)}{2} = 30.25 \text{ FT}^2$$

$$R = A/WP = 30.25/(0.1 + 70.0 + 37) = 0.28$$

$$= 8.57(30.25)(0.28)^{2/3}$$

$$= 111 \text{ cfs}$$

VELOCITY, $V = Q/A = 111/30.25 = 3.67$ FPS

REMAINDER OF FLOW, 223 - 111 = 112 cfs, THRU CULVERTS

60" OUTLET $H/d = 0.9$, REDUCED = 0.87(0.9) = 0.78 (CHOW)

; $H = 5(0.78) = 3.90'$

G5/12

Project

Job Nº E-3204

Client GATES

By KDOTT

Date 9 MAY 1985

4 JUNE 85 Curt Bell

ASSUME DEPTH = 3.90' @ CULVERT OUTLETS

∴ SUBMERGED & D/S HGL = 90.10

$U/S\ HGL = 90.10 + h_e + h_f + h_v$

$V = Q/A = 112/(3(11.8) + 3.14) = 2.91$ FPS

$\therefore V^2/2g = 0.13$

$H = 0.7(0.13) + 80[29.14(0.024)^2/(3(0.90) + 0.50)^{4/3}]0.13 + 0.13$

$= 0.25'$

$U/S\ HGL = 90.10 + 0.25$

$= 90.35 < 90.90$

THEREFORE, FLOW WILL BALANCE WITH HW SOMEWHERE BETWEEN 90.35 & 90.90 AND FLOW DEPTH OVER CROWN OF ROAD WILL BE LESS THAN 0.5 FEET.

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** G6/12

Project

Job Nº E-3234

Client GATES

By RDD III

Date 10 MAY 1985

4 June 85

DETERMINE EROSION PROTECTION AT 60" R.C.P. OUTLET

RIPRAP PER URBAN STORM DRAINAGE CRITERIA MANUAL

FIND REQ'D ROCK SIZE:

CHECK $Q/D^{2.5} = 223/5^{2.5} = 3.99 < 6.0$ OK

FLOW IS SUPERCRITICAL IN BARREL HOWEVER, SO USE

$D_a = 1/2(D + Y_n)$ FOR D

FIND $Q/D_a^{1.5} = 223/\left[\frac{(5+3.95)}{2}\right]^{1.5} = 23.56$

FIND $Y_t/D_a = 3.10/\left(\frac{5+3.95}{2}\right) = 0.69$ BUT USE 0.40 (JUMP SUSPECTED)

∴ FROM FIG. 5-7, REQ'D ROCK SIZE = TYPE VH ($d_{50} = 24"$) AS SHOWN ON ENCLOSED FIG. 5-7 & TABLE 5-1.

CHECK VELOCITY VS. COLO. SPGS. CRITERIA:

$V = 13.4$ FPS (PG. F5) ∴ STONE SIZE REQ'D = 12", USE $d_{50} = 24"$

DETERMINE LENGTH OF PROTECTION:

L = LENGTH OF PROTECTION $= (1/(2\tan\theta))(A_t/Y_t - D)$

FROM FIG. 5-9, WITH $Y_t/D = 3.1/5 = 0.62$; $Q/D^{2.5} = 3.99$

$1/(2\tan\theta)$ = EXPANSION FACTOR = 6.2

$A_t = Q/V = 223/5.03$

$= 44.33$

$L = 6.2(44.33/3.10 - 5.0)$

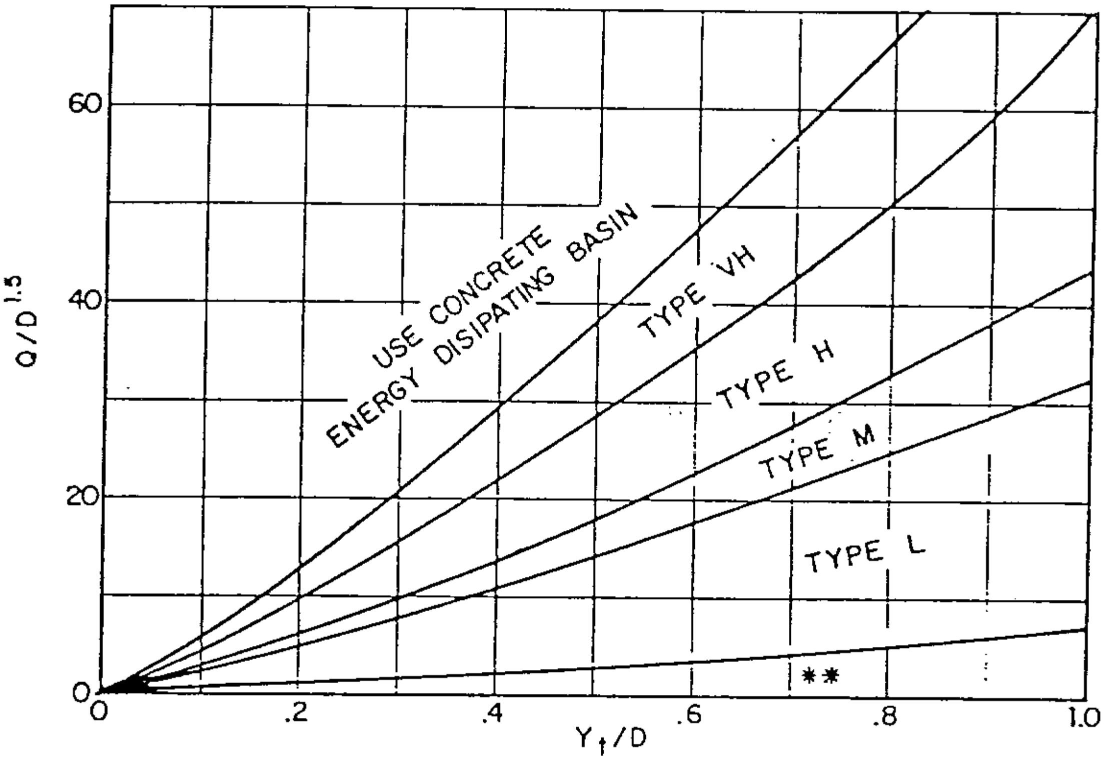
$= 57.67'$, USE 60'

FIGURES 5-9 & 5-6 ARE ENCLOSED

DETERMINE GRANULAR BEDDING REQUIREMENT:

USE 4" TYPE I + 6" TYPE II OR 12" TYPE II PER TABLE 5-4 & TABLE 5-3 WHICH ARE ENCLOSED.

E-3234
10 MAY 85
PDO III



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

FIGURE 5-7. RIPRAP EROSION PROTECTION AT CIRCULAR CONDUIT OUTLET.

F-3234
10 MAY 85
[illegible]

Table 5-1

CLASSIFICATION AND GRADATION OF ORDINARY RIPRAP

4 June 85
Kent Bell

Riprap Designation	% Smaller Than Given Size By Weight	Intermediate Rock Dimension (Inches)	d_{50}* (Inches)
Type VL	70-100	12	
	50-70	9	
	35-50	6	6**
	2-10	2	
Type L	70-100	15	
	50-70	12	
	35-50	9	9**
	2-10	3	
Type M	70-100	21	
	50-70	18	
	35-50	12	12
	2-10	4	
Type H	100	30	
	50-70	24	
	35-50	18	18
	2-10	6	
Type VH	100	42	
	50-70	33	
	35-50	24	24
	2-10	9	

*d_{50} = Mean particle size

** Bury types VL and L with native top soil and revegetate to protect from vandalism.

- 5854

10 MAY85

FDD III

G9/12

4 JUNE 85

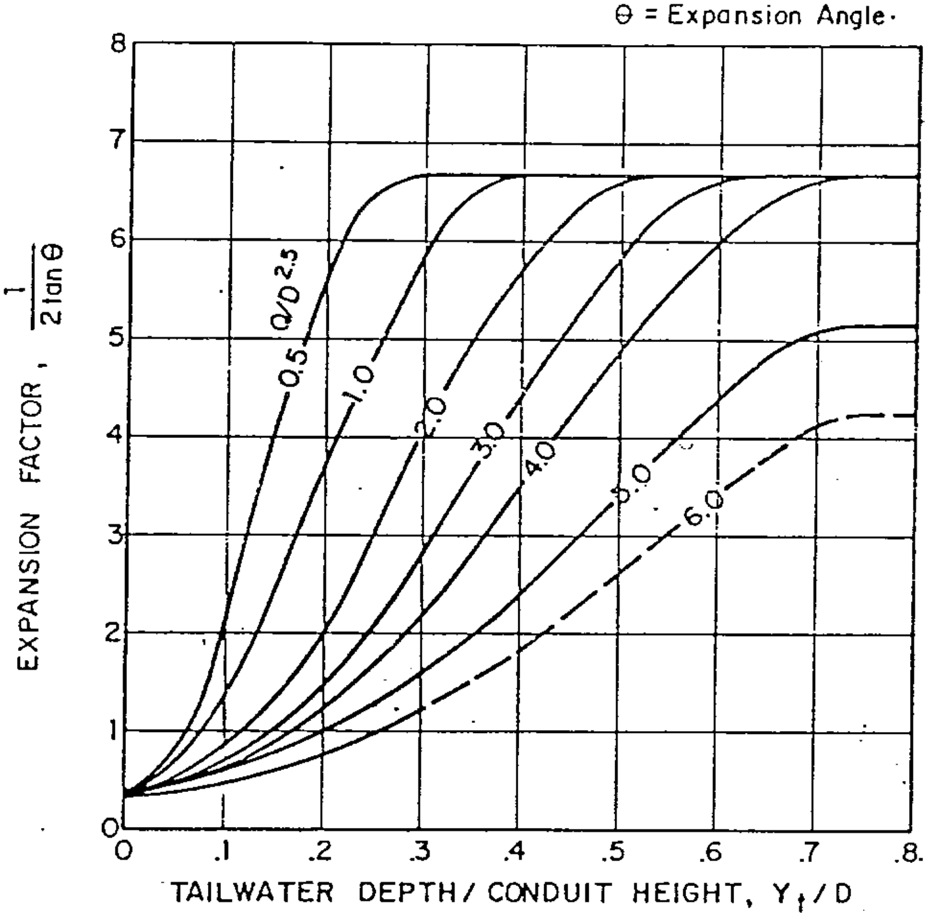


FIGURE 5-9. EXPANSION FACTOR FOR CIRCULAR CONDUITS

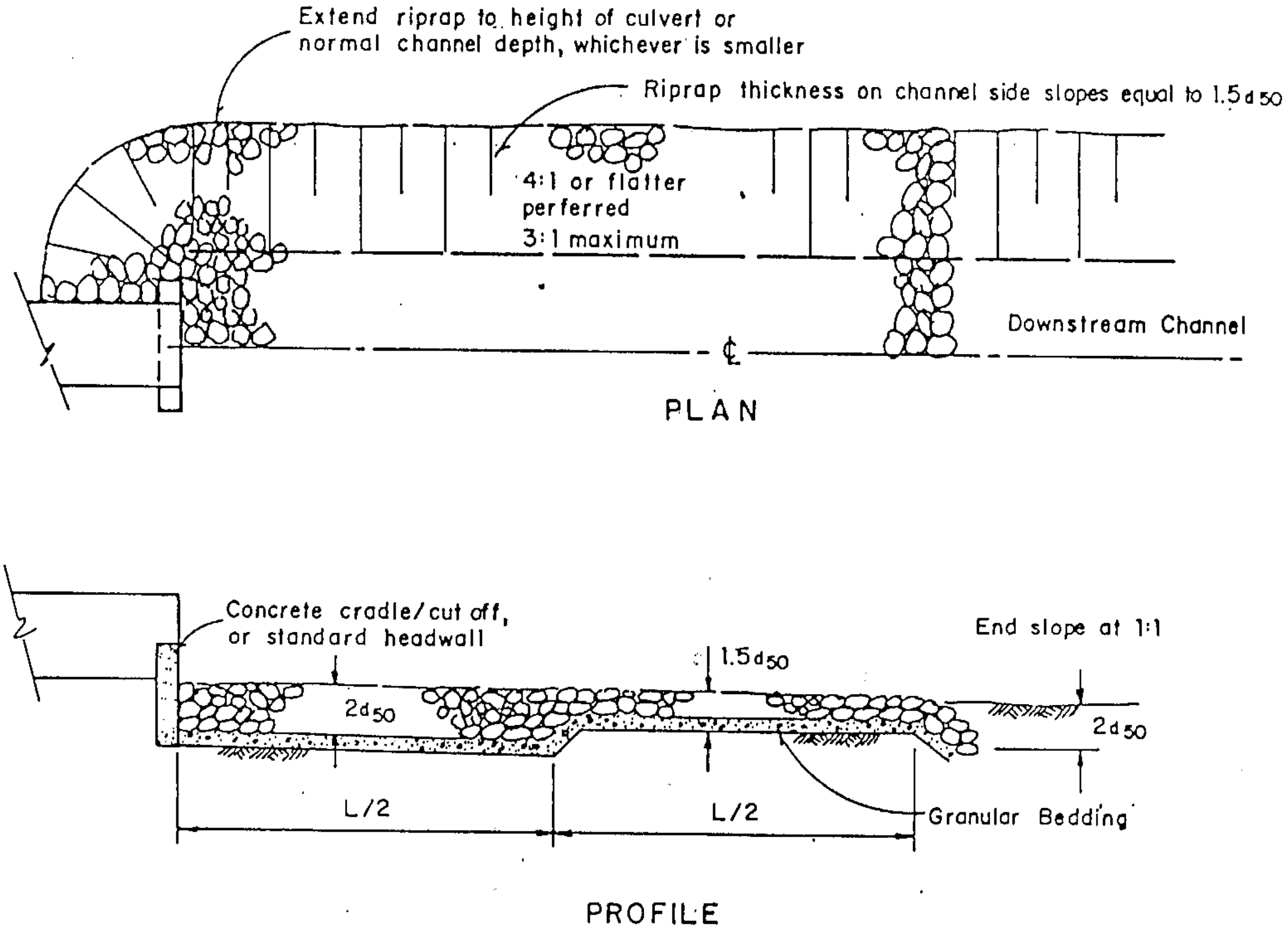


FIGURE 5-6. CONDUIT OUTLET EROSION PROTECTION

E-3039
10 MAY 85
ROO TF

4 June 85 K+Rull

E-3234
10 MAY 85
ADD III

G11/12

-1 [illegible] [illegible]

Table 5-4

THICKNESS REQUIREMENTS FOR GRANULAR BEDDING

Riprap Designation	Minimum Bedding Thickness (Inches)		
	Fine Grained Soils*		Course Grained Soils**
	Type I	Type II	Type II
L, G, SM	4	4	6
M	4	4	6
H	4	6	8
VH	4	6	8

*May substitute one 12 inch layer of Type II bedding. Substitution of one layer of Type II bedding shall not be permitted at drop structures. Use of a combination of filter fabric and Type II bedding at drop structures is acceptable, see Section 5.3.2 for use of filter fabric at drop structures.

**Fifty percent or more by weight retained on the #40 sieve.

E-3234
10 MAY 85

G12/12
4 June 85

Table 5-3

GRADATION FOR GRANULAR BEDDING

U. S. Standard Sieve Size	Percent Weight By Passing	Square Mesh Sieves
	Type I	Type II
3"	-	90 - 100
1-1/2"	-	-
3/4"	-	20 - 90
3/8"	100	-
#4	95 - 100	0 - 20
#16	45 - 80	-
#50	10 - 30	-
#100	2 - 10	-
#200	0 - 2	0 - 3

APPENDIX H

H1/5

Project	Job №
Drainage along & adjacent to HWY 85	E-2825

Client	By	Date
Gates	BNW	2/8/85

Area D*(master Drainage Area II)* note added 10/4/85

Flow tributary to Cheyenne Mountain Bo.

see details prepared by D-B Quail Lake Campus Center Filing #7
sht 1/2 & 2/2

briefly

① Quail Lake #1, #3 & #6 → flow to pipe = 34.1cfs

② add western inlets → 11.8cfs + 4.4cfs

add ① & ② or total of 50.3cfs

24" pipe capacity = 49.6cfs limites

③ add inlets prior to 85-87 → 12.2cfs + 11.7cfs

add 24" + inlets → total = 73.5cfs

30' pipe capacity = 89.9cfs OK

* This Area is shown on the Drainage Plan for Area II, Dwg 3D-081 which is included in the pocket of this report.

- These calculations are included for your information only.

Project: Drainage along & adjacent to Hwy 85

Job No: E-2825

Client: Gates

By:

Date: 4-2-84

rev 9/11/84

Calculate local flow for HWY 85

E side

1/2 ROW = 70'

1/2 street width = 44 in

let $C = .8$

@ Quail Lake outfall

$A = 1800(70) = 2.9\ Ac$

$Tc = 5\ min \quad I_{100} = 9\ in/hr$

$Q_{100} = .8(2.9)(9)$

$= 20\ cfs$

inlets along 85-87

per CDH if sump w/ 6" use 1 cfs per 1' of openning

force sump @ each location

flow depth ≥ 6"

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS H3/5

Project: Drainage along & adjacent to Hwy 85

Job Nº: E-2825

Client: Gates

By:

Date: 4-2-84

rev 8/11/84

Determine 100 Yr flow @ Cheyenne Meadows Bo & 85

See drainage reports for Huckleberry Knoll June 83 & Cheyenne Meadows Bo Sept '80

Area B st flow (1500' @ 4%)

$Tc = .16hr + 3min = .21 hr$ or 13min $qp = 1030 \frac{csm}{in}$

Calc CN

$$\{\underset{A_1}{74.2(3.6)} + \underset{A_2}{91(7.5)} + \underset{A_3}{88(4.7)} + \underset{B}{80(17)} + \underset{C_1}{77(5.7)} +$$

$$\underset{C}{76(20.3)} + \underset{D}{72(12.4)} + \underset{E}{65(2.7)}\} \div 74 = 78$$

$Q = 1.5$ in

$q = qp\ A\ Q = 1030 \left(\frac{74}{640}\right) 1.5 = 179$ cfs

subtract 5yr from Huckleberry Knoll of <u>41cfs</u>
(directed to Quail Lake outflow)

subtract flow from 2' wide conc box
200' N of intersection <u>22cfs</u>

remaining flow $179 - 63 = 116$cfs
subtract 14cfs from two proposed inlets
Q = 102cfs

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** #4/5

Project: Drainage along + Adjacent to Hwy 85

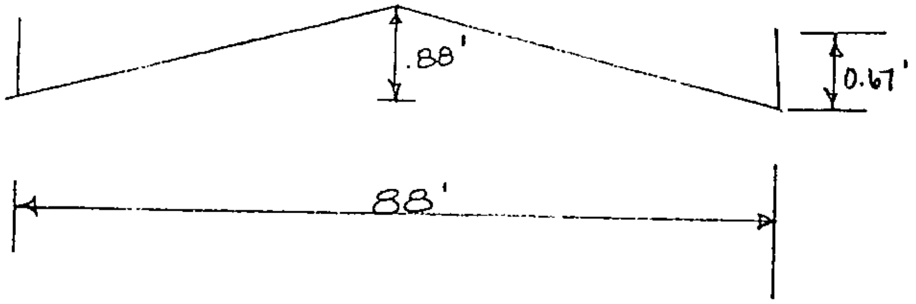
Job Nº: E-2825

Client: Gates

By:

Date: 4/2/84

rev 8/11/84



$S = 0.52\%$

$n = 0.017$

$LS = 0$

$RS = 50$

flow calculated by Manning's EQ. $Q = \frac{1.49 A R^{2/3} S^{1/2}}{n}$

find Q for 1/2 the width of Road

Using D = .5' and D = 1.0'

IF D = .5'
LS = 0
RS = 50
W = 0

$Q_{1/2} =$ 15.5 cfs x 2 = 31 cfs

For Full street width flow

V = 2.48 fps

IF D = 1.0*

* Subject to C.D.H. Allowable Flows

1/2 street width flow Q = 69.8 cfs + 8.09

V = 3.6

$Q_{1/2}$ = 77.29 cfs

For Full width street flow

Q = 2(77.89) = 155.78 cfs

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS H5/5

Project: Drainage along & adjacent Hwy 85

Job No: 6-2825

Client: Gates

By:

Date: 4-2-84

rev 8/11/64
rev. 10/3/85

Intersection
@ Chey. Mead Rd & 85

W side Rd Q = 102 + 40 = 142 c/s
1/2 rd capacity = 70 c/s to .83' deep
assume all flows continues S on 85

capacity exist. 3' wide conc. culvert
assume (conservative) = 36' CMP @ 0.5%
Q = 25 c/s

capacity for outlet = ≥ 25 c/s + 29.6 c/s
≥ 54.6 c/s

use 36" RCP @ 0.7%

APPENDIX I

Project OUTFALL STORM SEWER AT CHEYENNE MOUNTAIN CENTER

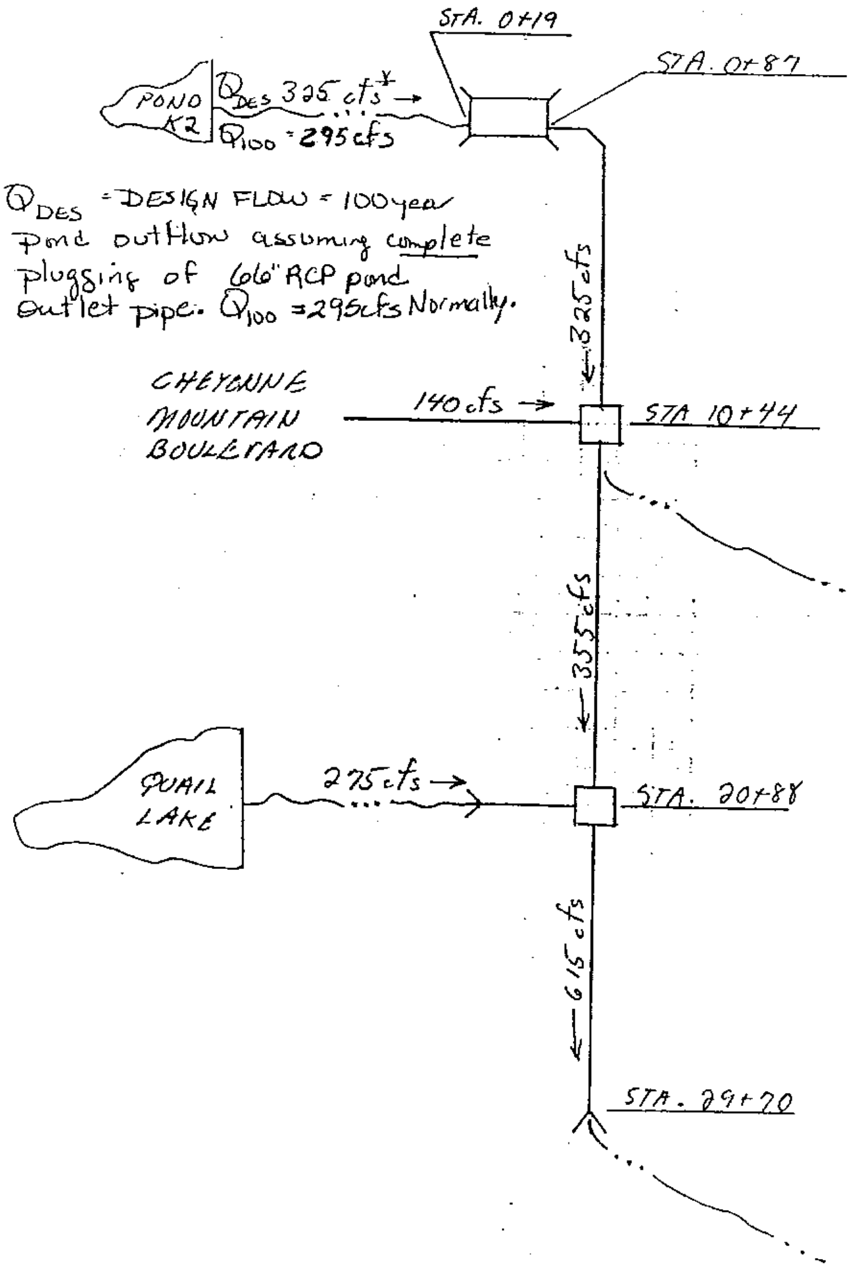
Job Nº E-2825

Client GATES LAND COMPANY

By RADIII

Date 11 SEPTEMBER 1985

DESIGN LAYOUT:



*Q_{DES} = DESIGN FLOW = 100 year Pond outflow assuming complete plugging of 66" RCP pond outlet pipe. Q_{100} = 295 cfs Normally.

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** I 2 / 15

Project	Job Nº
	E-2825

Client	By	Date
GATES	WDIII	11 SEPTEMBER 1985

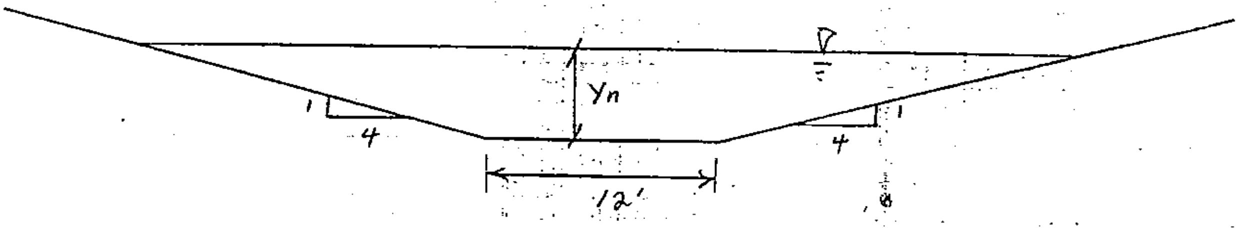
TEMPORARY DISCHARGE CHANNEL @ STA. 29+70

$Q = 615$ cfs

$n = 0.040$

$S = 0.30\%$

TRY TRAPEZOIDAL SECTION WITH 4:1 SIDE SLOPES & 12' BOTTOM WIDTH



SECTION FACTOR, $AR^{2/3} = nQ/1.486\sqrt{S}$

$= 302.24$

$AR^{2/3}/b^{8/3} = 302.24/754.77$

$= 0.40$

FROM CHOW FIG. 6-1, $y/b = 0.40$ & $Y_n = 0.4(12) = 4.8'$ TAILWATER DEPTH

Project

Job Nº E-2825

Client GATES

By RDOIII

Date 11 SEPTEMBER 1985

HYDRAULIC GRADE LINE DETERMINATION

84" R.C.P. FROM STA. 20+88 TO OUTLET @ STA. 29+70:

$Q = 615$ cfs, $L = 882'$

OUTLET INVERT = 5866.00

OUTLET DEPTH ASSUMED TO BE GREATER OF TAILWATER DEPTH OR $\frac{d_c + D}{2}$.

TAILWATER DEPTH = 4.80',

$\frac{d_c + D}{2} = \frac{\boxed{6.3} + 7.0}{2} = 6.65'$, GREATER ∴ USE.

→ FROM FIG. 3.11, CONCRETE PIPE HANDBOOK.

∴ HGL @ OUTLET = 66.00 + 6.65 = 72.65

HGL @ d/s SIDE OF JUNCTION BOX @ 20+88 = 72.65 + 882(S_f)

S_f = FRICTION SLOPE $= \left(Qn / 1.486\, AR^{2/3}\right)^2$

$= \left[615(0.013) / 1.486(38.485)(1.75)^{2/3}\right]^2$

$= 0.0093$ FT/FT

HGL = 72.65 + 882(0.0093)

= 80.83

CHECK VS. CROWN ELEV. TO VERIFY FULLFLOW ASSUMPTION:

INVERT = 73.50, CROWN = 80.50 < 80.83 ✓ OK.

CHECK VS. RIM ELEV. TO VERIFY NO OVERFLOW @ STRUCTURE:

RIM = 87.5 > 80.83 ✓ OK.

Project

Job Nº E-2825

Client GATES

By LDO III

Date 11 SEPTEMBER 1985

JUNCTION BOX @ STA. 20+88: (Quail Lake Outfall)

$Q_U / Q_O = 355/615 = 0.58$, $D_O = 84''$, $D_U = 72''$, $D_L = 78''$

USE FIGURES 8-12, 8-13 & 8-15 FROM STORM SEWERS, URBAN STORM DRAINAGE CRITERIA MANUAL (USDCM).

$V_O^2 / 2g = (615/38.484)^2 / 64.348$

$= 3.97$

$D_U / D_O = 72/84 = 0.86$

$(Q_U / Q_O)(D_O / D_U) = 0.58(84/72) = 0.68$

$B / D_O = 10/7 = 1.43$

$D_L / D_O = 78/84 = 0.93$

FROM FIG. 8-12, $\bar{K}_L = 1.47$, $m_L = 0.57$, $K_L = 0.84$, $h_L = 3.97(084) = 3.33'$

$\therefore$ LATERAL HGL = 80.83 + 3.33 = 84.16

FROM FIG. 8-13, $\bar{K}_U = 1.72$, $m_U = 0.53$, $K_U = 0.91$, h_U $3.97(0.91) = 3.62'$

ALSO USE FIG. 8-15 AND ADD h_Δ FOR 12.32° DEFLECTION

FROM FIG. 8-15, $K_\Delta = 0.06$ $\therefore$ $h_\Delta = 3.97(0.06) = 0.24'$

$\therefore$ UPSTREAM HGL = 80.83 + 3.62 + 0.24 = 84.69

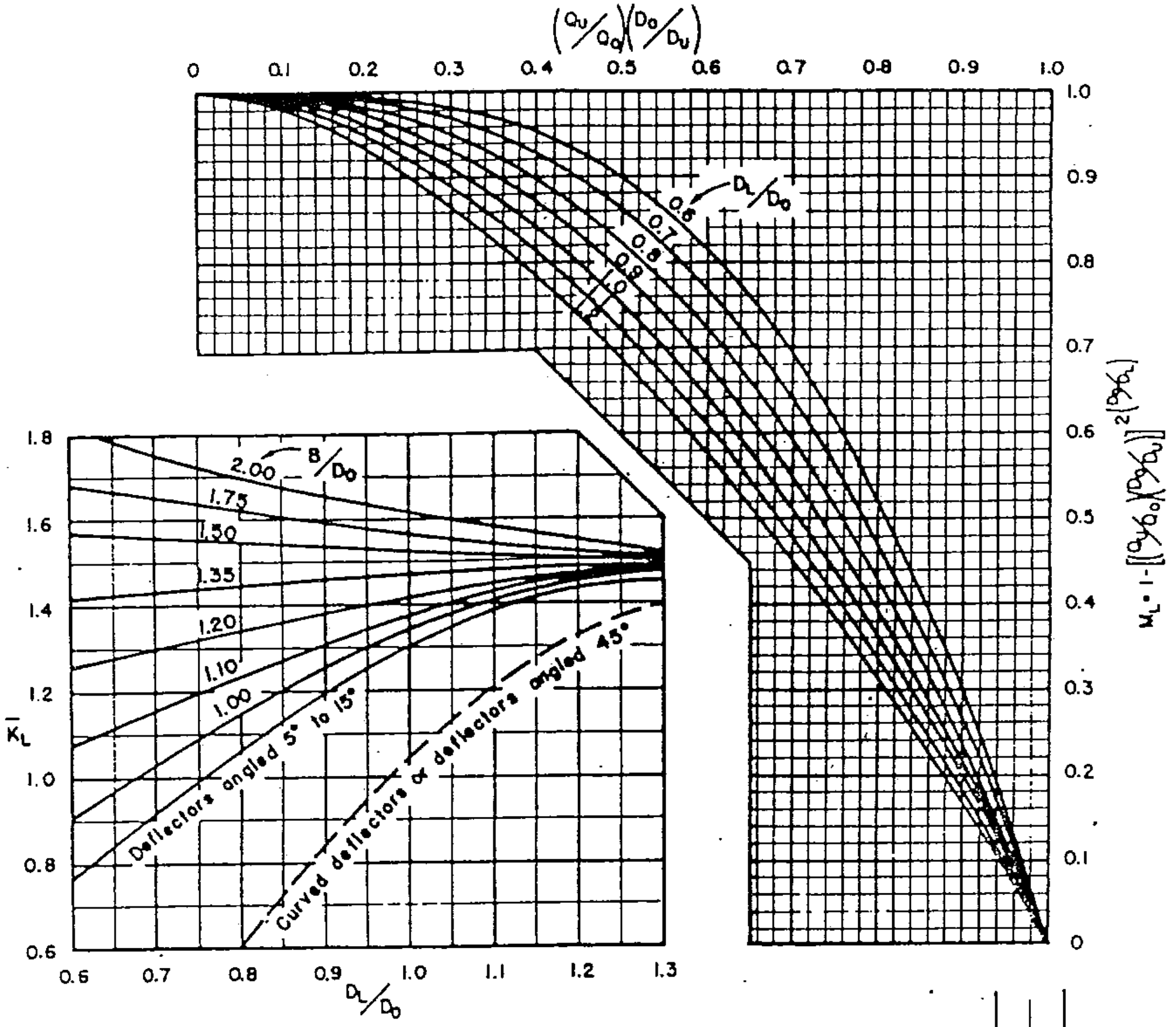
UPSTREAM HGL GREATER THAN LATERAL HGL $\therefore$ USE HGL = 84.69

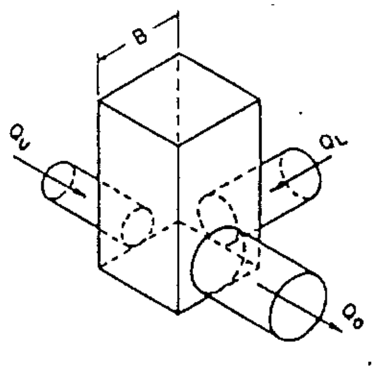
CHECK VS. CROWN ELEV. TO VERIFY FULL FLOW:

CROWN = 80.50 < 84.69 ✓ OK.

CHECK VS. RIM ELEV. TO VERIFY NO OVERFLOW:

RIM = 87.5 > 84.69 ✓ OK.





Elevation Sketch

To find K_L for the lateral pipe, first read $\bar{K}_L$ from the lower graph. Next determine M_L. Then

$$K_L = \bar{K}_L \times M_L$$

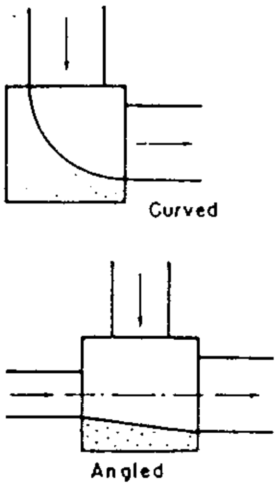
Dashed curve for curved or 45° angle deflectors applies only to manholes without upstream in-line pipe.

Use this chart for round manholes also.

For rounded entrance to outfall pipe, reduce chart values of $\bar{K}_L$ by 0.2 for combining flow.

For $Q_U/Q_O \times D_O/D_U > 1$ use Figure 8-14

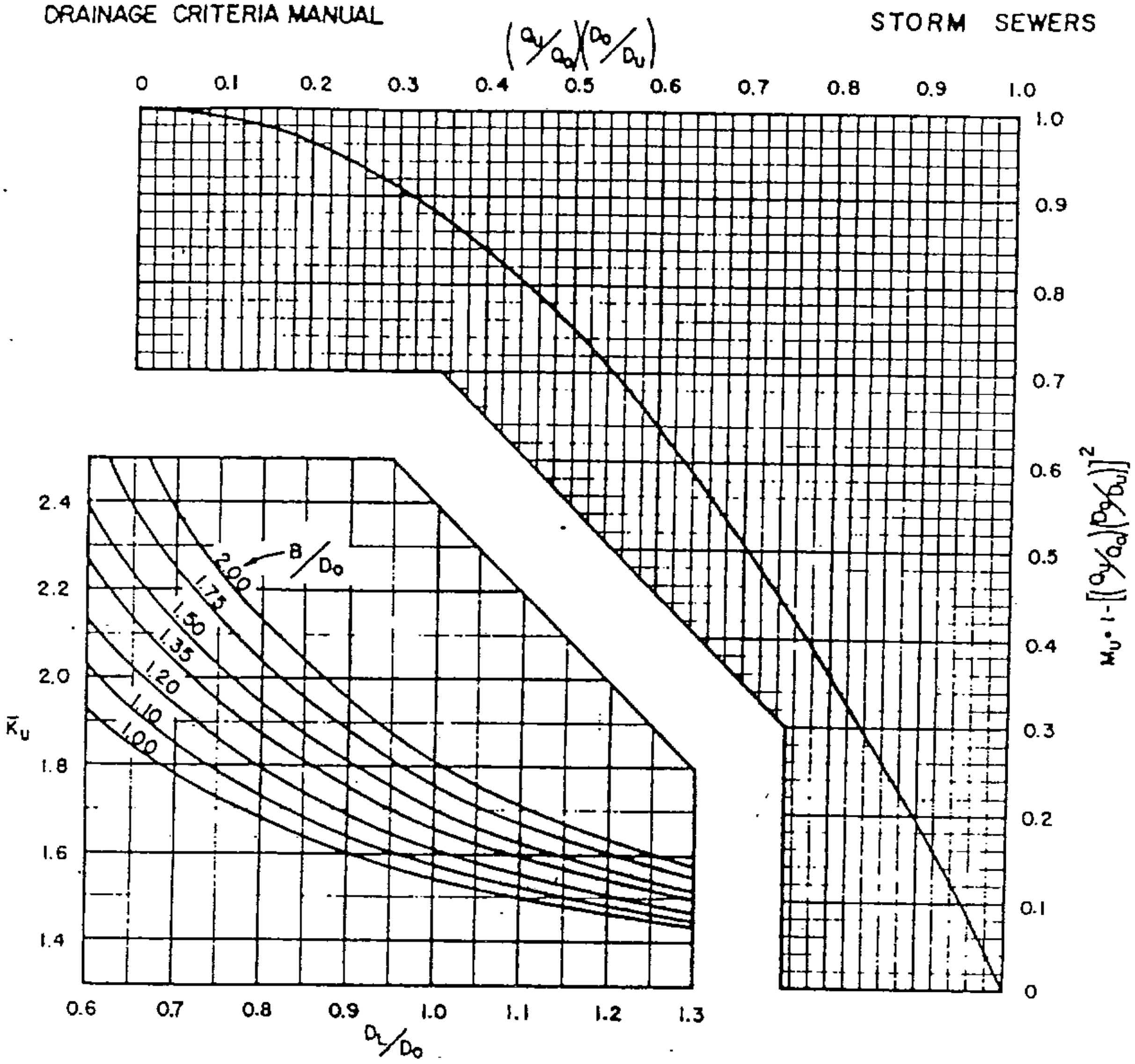
For $D_L/D_O < 0.6$ use Figure 8-14

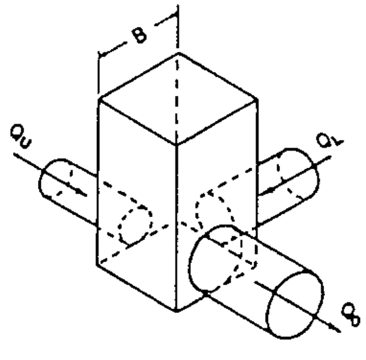


Plan of Deflectors

$$h_L = K_L \frac{V_O^2}{2g}$$

FIGURE 8-12. MANHOLE AT 90° DEFLECTION OR ON THROUGH PIPELINE AT JUNCTION OF 90° LATERAL PIPE (LATERAL COEFFICIENT). (15)





Elevation Sketch

To find K_U for the upstream main, first read $\bar{K}_U$ from the lower graph. Next determine M_U. Then

$$K_U = \bar{K}_U \times M_U$$

For manholes with deflectors at 0° to 15°, read $\bar{K}_U$ on curve for $B/D_O = 1.0$

Use this chart for round manholes also.

For rounded entrance to outfall pipe, reduce chart values of $\bar{K}_U$ by 0.2 for combining flow.

For deflectors refer to sketches on Figure 8-12

For $Q_U/Q_O \times D_O/D_U > 1$ use Figure 8-14

For $D_L/D_O < 0.6$ use Figure 8-14

$$h_U = K_U \frac{V_O^2}{2g}$$

FIGURE 8-13 MANHOLE ON THROUGH PIPELINE AT JUNCTION OF A 90° LATERAL PIPE (IN-LINE PIPE COEFFICIENT) (15)

I7/15

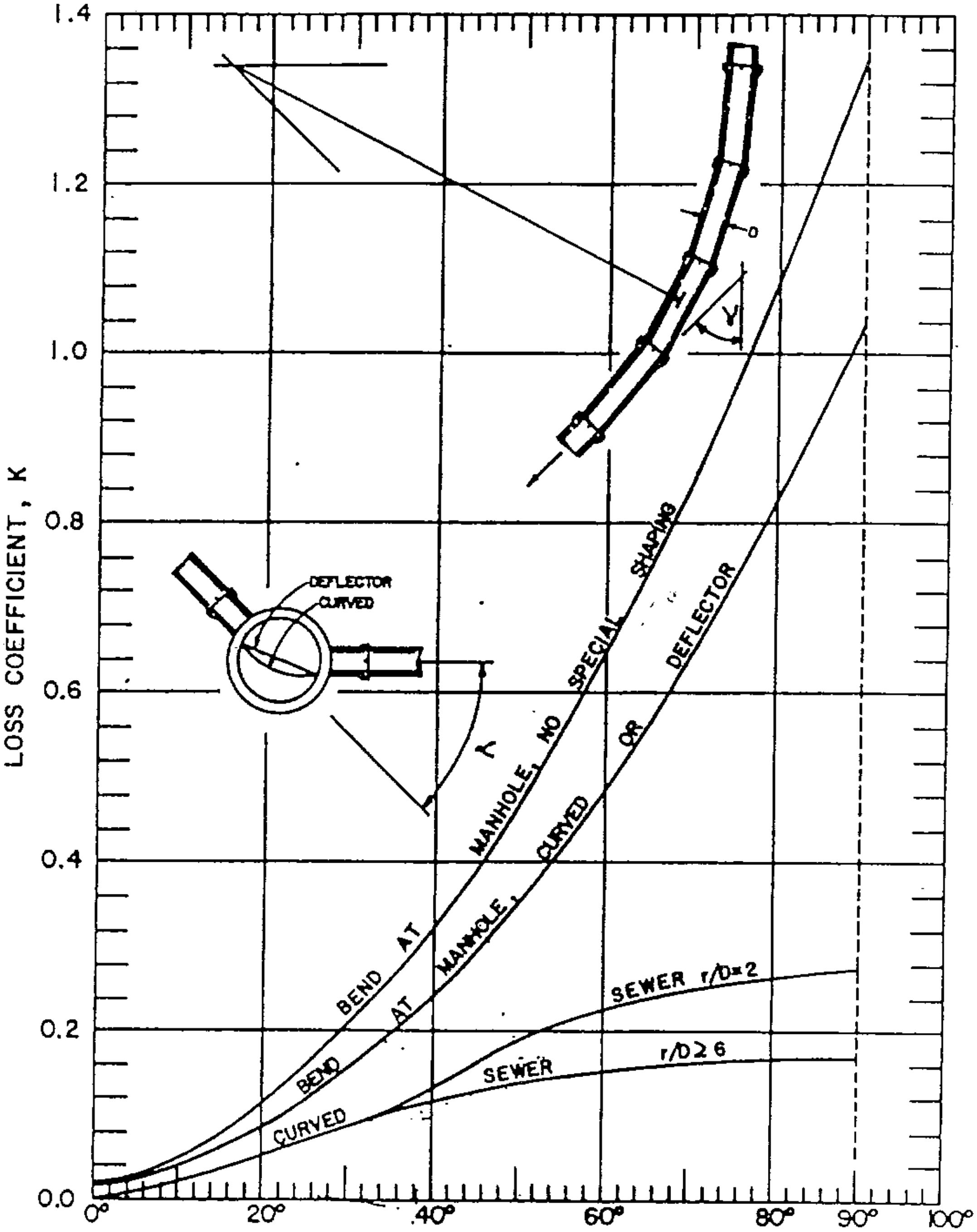


FIGURE 8-15. SEWER BEND LOSS COEFFICIENT (15,16,17)

Project

Job Nº E-2825

Client GATES

By RDD III

Date 11 SEPTEMBER 1985

78" R.C.P. CULVERT UNDER HIGHWAY 85 @ STA. 20+88 :

$Q = 275$ cfs, $L = 155'$

HGL @ CULVERT ENTRANCE = $84.69 + 155(S_F) + h_b + h_e$

WHERE : S_f = FRICTION SLOPE = $(Qn/1.486AR^{2/3})^2$

= 0.0028 FT/FT

h_b = BEND LOSS = $V^2/2g\,(K_B)$

WHERE : K_b = BEND LOSS COEFFICIENT = 0.30
FROM FIG. 8-15 (SEE PG. 7)

$V^2/2g$ = VELOCITY HEAD = $\left(\frac{275}{38.183}\right)^2 / 64.348$

= 1.07

$\therefore h_b = 1.07(0.30) = 0.32'$

h_e = ENTRANCE LOSS = $V^2/2g\,(k_e)$

WHERE : k_e = ENTRANCE LOSS COEFF. = 0.50
FROM CONC. PIPE HANDBOOK

$\therefore h_e = 1.07(0.50) = 0.54'$

HGL = $84.69 + 155(0.0028) + 0.32 + 0.54'$

= 85.94

CHECK VS. CROWN ELEV. TO VERIFY FULL FLOW ASSUMPTION :
INV. = 78.52 , CROWN = 85.02 < 85.94 ✓ OK.

CHECK VS. ROADWAY EL. TO VERIFY NO OVERFLOW :
TOP OF ROAD = 87.4 > 85.94 ✓ OK.

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Project	Job Nº E-2825
Client GATES	By HDD III · Date 11 SEPTEMBER 1985

72" R.C.P. FROM STA. 10+44 TO STA 20+88:

$Q = 355$ cfs, $L = 1044'$

HGL @ d/s SIDE OF JUNCTION BOX @ 10+44 $= 84.69 + 1044 (S_f)$

$$S_f = \left(Qn / 1.486\, AR^{2/3}\right)^2$$

$$= \left[355(0.013) / 1.486(28.274)(1.5)^{2/3}\right]^2$$

$$= 0.0070 \text{ FT/FT}$$

$$HGL = 84.69 + 1044(0.0070)$$

$$= 92.00$$

CHECK VS. CROWN ELEV. TO VERIFY FULL FLOW ASSUMPTION:

INV. = 83.50, CROWN = 89.50 < 92.00 ✓ OK.

CHECK VS. RIM ELEV. TO VERIFY NO OVERFLOW:

RIM = 98.90 > 92.00 ✓ OK.

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** I 10/15

Project

Job Nº E-2825

Client GATES

By

Date 11 SEPTEMBER 1985

JUNCTION BOX @ STA. 10+44:

$Q_U / Q_O = 325/355 = 0.92$, $D_O = 72''$, $D_U = 66''$, $D_L = 36''$

USE FIGURE 8-14 FROM STORM SEWERS, USDCM

$V_o^2/2g = (355/28.274)^2/64.348$

$= 2.45$

$D_U / D_O = 66/72 = 0.92$

FROM FIG. 8-14, $k_U = 0.04$ & $h_U = 0.04(2.45) = 0.10'$

∴ UPSTREAM & LATERAL HGL = 92.00 + 0.10 = 92.10

CHECK VS. CROWN ELEV. TO VERIFY FULL FLOW:

CROWN = 89.50 < 92.10 ✓ OK.

CHECK VS. RIM ELEV. TO VERIFY NO OVERFLOW:

RIM = 98.90 > 92.10 ✓ OK.

-I 11/15

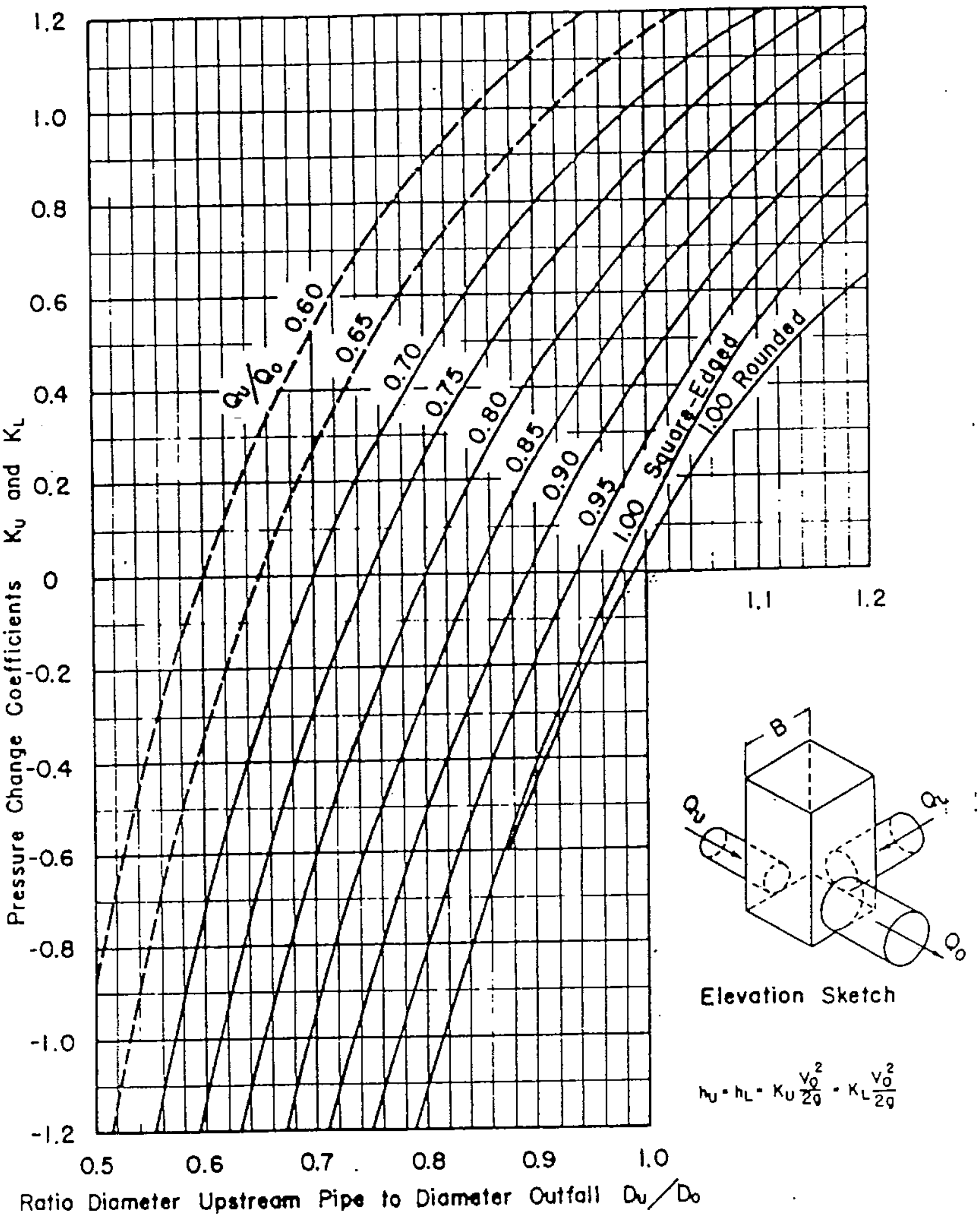

FIGURE 8-14. MANHOLE ON THROUGH PIPELINE AT JUNCTION OF A 90° LATERAL PIPE (FOR CONDITIONS OUTSIDE RANGE OF FIGURES 8-12 & 8-13)(15)

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LAND SURVEYORS
CIVIL ENGINEERS

I-12/15

Project

Job Nº F-2825

Client EATES

By RDD III

Date * REV. 11 OCT 85 RDD III
12 SEPTEMBER 1985

*66" R.C.P. FROM STA. 1+50.31 TO STA. 10+44:

$Q = 325$ cfs , $L = 893.69$

HGL @ STA. 1+50.31 = 92.10 + 644 (S_f)

$$S_f = \left[325(0.013)/1486(23.758)(1.375)^{2/3}\right]^2$$

$$= 0.0094 \text{ FT/FT}$$

$$HGL = 92.10 + 893.69(0.0094)$$

$$= 100.50$$

CHECK VS. CROWN TO VERIFY FULL FLOW ASSUMPTIONS:

$$INV. = 84.00 + 890.44(0.0092)$$

$$= 92.19$$

CROWN = 92.19 + 5.5 = 97.69 < 100.50 ✓ OK

~~60"x66" R.C.P. ECCENTRIC REDUCER @ STA. 4+00:~~

~~GRADUAL EXPANSION →~~ ~~$K = 2.6 \sin \frac{\theta}{2}\left(1 - \frac{A_1}{A_2}\right)^2$~~ ~~FROM CRANE TECHNICAL PAPER NO. 410~~

~~ASSUME $\theta = 9.5°$ ∴ $k = 0.08$~~

~~$HGL = 98.12 + K\left(V^2/2g\right)$; WHERE V = VELOCITY IN SMALLER PIPE~~

~~$V = Q/A = 325/19.635 = 16.55$ FPS~~

~~$HGL = 98.12 + 0.08\left(16.55^2/2(32.174)\right)$~~

~~$= 98.46$~~

~~CHECK VS. CROWN TO VERIFY FULLFLOW ASSUMPTION:~~

~~CROWN = 95.39 < 98.46 ✓ OK.~~

VOID
11 OCT 85
RDD III

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project

Job Nº E-2825

Client GATES

By RDD III

Date * REV. 11 OCT 85 RDD III
13 SEPTEMBER 1985

~~60" R.C.P. FROM STA. 1+50.31 TO STA. 4+00:~~

~~$Q = 325$ cfs , $L = 249.69'$~~

~~HGL @ STA. 1+50.31 = 98.46 + 249.69 (S_f)~~

~~$S_f = \left[325\,(0.013) / 1.486\,(19.635)(1.25)^{2/3}\right]^2$~~

~~= 0.0156 FT/FT~~

~~HGL = 98.46 + 249.69 (0.0156)~~

~~= 5902.36~~

~~CHECK VS. CROWN TO VERIFY FULL FLOW:~~

~~INV. = 92.69 , CROWN = 97.69 < 102.36' ✓ OK.~~

VOID
11 OCT 85
RDD III

*66" R.C.P. 45° BEND @ STA 1+50.31:

$HGL = 100.50 + K_{BEND}\left(V^2/2g\right)$

$K_{BEND} = 0.30$ FROM FIG. 8-15, STORM SEWERS, USDCM

$HGL = 100.50 + 0.30\left(\left(\frac{325}{23.758}\right)^2 / 2(32.174)\right)$

= 101.37

CHECK VS. CROWN TO VERIFY FULL FLOW:

CROWN = 97.69 < 101.37 ✓ OK.

*66" R.C.P. FROM STA. 1+38.29 TO STA. 1+50.31:

$Q = 325$ cfs , $L = 12.02'$, $S = 0.0094$ FT/FT

HGL @ STA. 1+38.29 = 101.37 + 12.02 (0.0094)

= 101.48

CHECK VS. CROWN TO VERIFY FULL FLOW:

INV. = 93.28 , CROWN = 98.78 < 101.48 ✓ OK.

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

J-14/15

Project

Job Nº E-2825

Client GATES

By NDIII

Date * REV. 11OCT85 RDNIII
13 SEPTEMBER 1985

*66" R.C.P. 45° BEND @ STA. 1+38.29:

$$HGL = 101.48 + 0.30\left(\left(\frac{325}{23.758}\right)^2 / 2(32.174)\right)$$

$$= 102.35$$

CHECK VS. CROWN TO VERIFY FULL FLOW:

CROWN = 98.78 < 102.35 ✓ OK.

*66" R.C.P. FROM STA. 0+87 TO STA 1+38.29:

$Q = 325\ cfs$, $L = 51.29'$, $S_f = 0.0094\ FT/FT$

$$HGL @ STA. 0+87 = 102.35 + 51.29(0.0094$$

$$= 102.83$$

CHECK VS. CROWN TO VERIFY FULL FLOW:

INVERT = 100.53, CROWN = 106.03 > 102.83

∴ FLOW GOES FROM OPEN CHANNEL TO PRESSURE FLOW.

$Q_{FULL} = 1221\ cfs$

$Q/Q_{FULL} = \frac{325}{1221} = 0.27$

$d/D = 0.40$

$\therefore d = 0.4(5.5')$

$= 2.20'$

$100.53 + 2.2 = 102.73$

~~TIE IN WITH EXIST. JUNCTION BOX @ STA. 0+87:~~

~~SUDDEN CONTRACTION → $K = 0.5\left(1 - A_1/A_2\right)$~~ ~~FROM CRANE TECHNICAL PAPER NO. 410~~

~~$A_1 = 19.635\ FT^2$~~

~~$A_2 = 48.61\ FT^2$~~

~~$\therefore K = 0.42$~~

~~$HGL = 105.91 + K\left(V^2/2g\right)$; WHERE V = VELOCITY IN SMALLER CONDUIT~~
~~$= 16.55\ FPS$~~

~~$HGL = 105.71 + 0.42\left(16.55^2/2(32.174)\right)$~~

~~$= 107.70$~~

~~CHECK VS. CROWN TO VERIFY FULL FLOW:~~

~~CROWN = 106.04 < 107.70 ✓ OK.~~

VOID
11 OCT 1985
NDIII

Project

Job Nº E-2825

Client GATES

By HNDIII

Date * REV. 11 OCT 1985 RDDIII
13 SEPTEMBER 1985

*<u>5 x 10' BOX CULVERT TO STA. 0+87:</u>

$Q = 325$ cfs , $L = 100'$ (CULVERT EXTENDED TO ACCOMODATE FUTURE HIGHWAY WIDENING)

OPEN CHANNEL FLOW ∴ CHECK NORMAL DEPTH, y_n

$$AR^{2/3} = nQ / 1.486\sqrt{S}$$

$$= 0.015\,(325) / 1.486\sqrt{0.025} = 20.75$$

$$AR^{2/3}/b^{8/3} = 20.75/10^{8/3} = 0.045$$

FROM CHOW FIG. 6-1, $y/b = 0.175$ ∴ $y_n = 1.75'$

APPENDIX J

Project: X-Sections of Existing Channel S. of ℞

Job Nº: E-2669

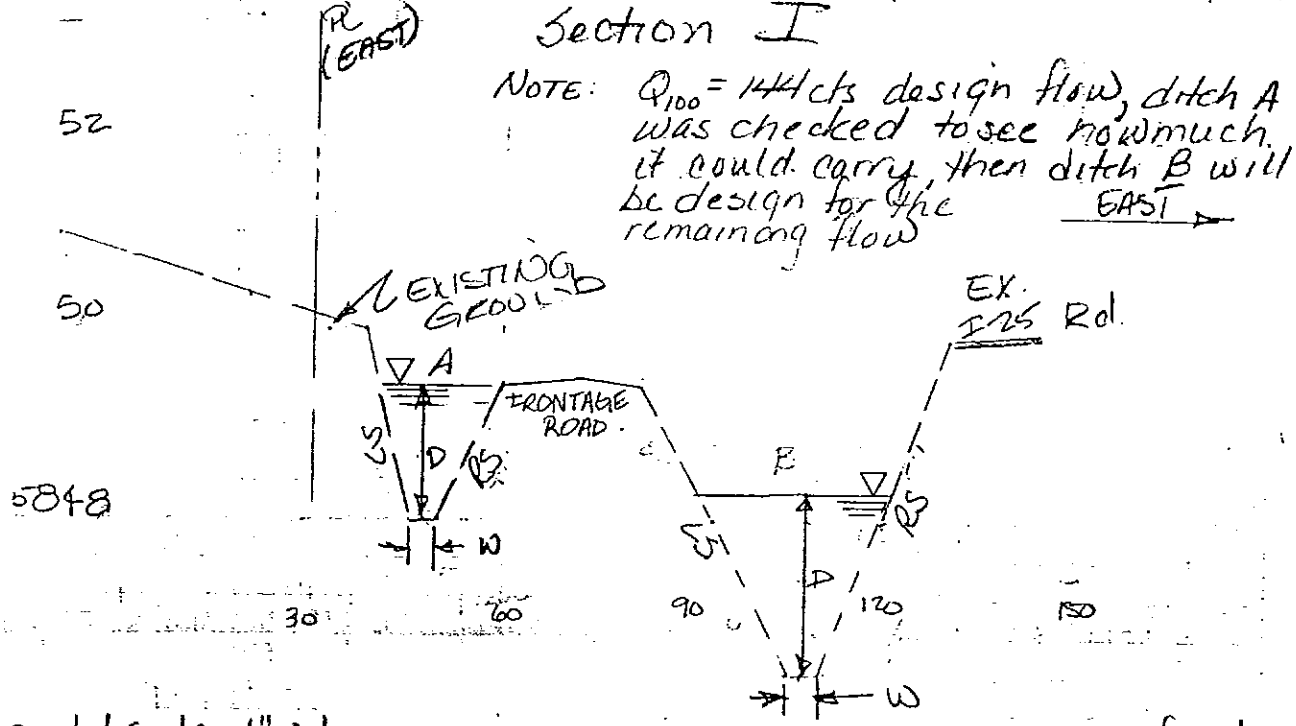
Client: Gates

By: td

Date: 8/2/84

see D&B plan 3D291 (included in the back pocket of this report.)

Section I



NOTE: Q_{100} = 144 cfs design flow, ditch A was checked to see how much it could carry, then ditch B will be design for the remaining flow

Horizontal scale: 1" = 30'
Vertical Scale = 1" = 2'

D = Depth of water
W = base width

$Q_0 = 144 - 52 = 92$ cfs

$Q_{design} = 92$ cfs

ditch A

using n = .04
LS = 3.5:1
RS = 7:1
W = 5
S = 0.8%
D = 1.4'

It has capacity of
Q = 52 cfs
V = 3.02 fps

DITCH B

n = .04
RS = 5:1
LS = 8:1
W = 5'
D = 1.71'
S = 0.8 %

Q_c = 92 cfs
V = 3.34 fps

The proposed drainage along I-25 has received conceptual approval by the Colorado State Highway Department through their approval of Drexel, Barrell's "Master Drainage Report for Cheyenne Mountain Center," dated March 15, 1984 + revised May 9, 1985. See the approval letter on pg. R7/10.

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

J 2/5

Project: X-SECTION OF EXISTING CHANNEL S OF R

Job Nº: E-2669

Client: GATES

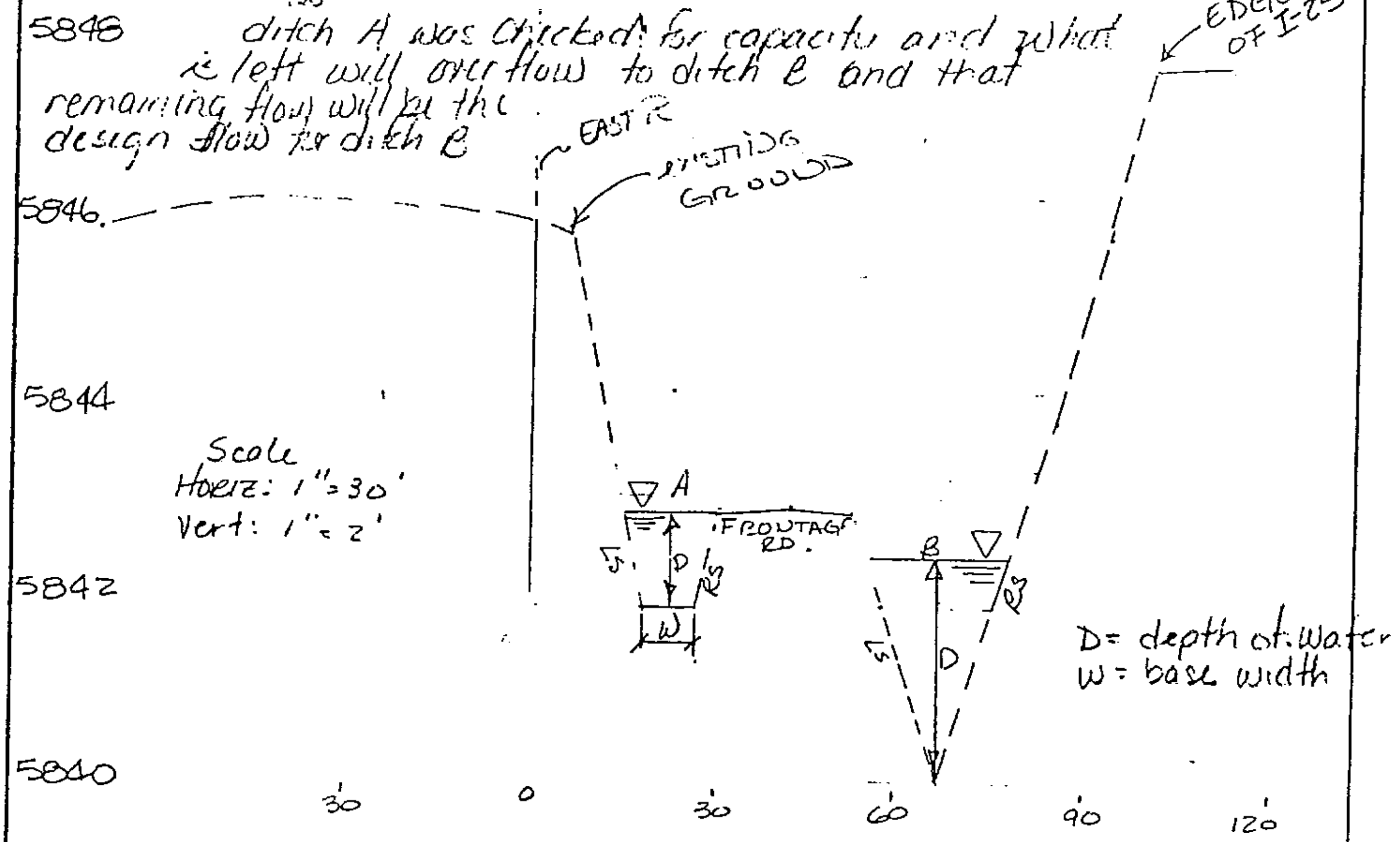
By: td

Date: 8/2/84

See D&B plan 30291 for location of SECTION II

NOTE: Q_{100} = 144 cfs design flow

ditch A was checked for capacity and what is left will overflow to ditch B and that remaining flow will be the design flow for ditch B



Scale
Horiz: 1" = 30'
Vert: 1" = 2'

D = depth of water
W = base width

ditch A

using
n = .04
S = 0.8%
D = 1.0'
LS = 3:1
RS = 3:1
W = 9.0'

Q_c = 34 cfs (max. capacity)
V = 2.83 fps

∴ Q_b = 144 − 34 = 110 cfs
ditch B must carry
Q_c = 87 cfs

ditch B

n = .04
S = 0.8%
LS = 6:1
RS = 5:1
W = 0
D = 2.34'

Q_c = 110.19 CFS
V = 3.66 FPS

J3/5

Project
X-Sections of Existing Channel S of R

Job Nº
E-2669

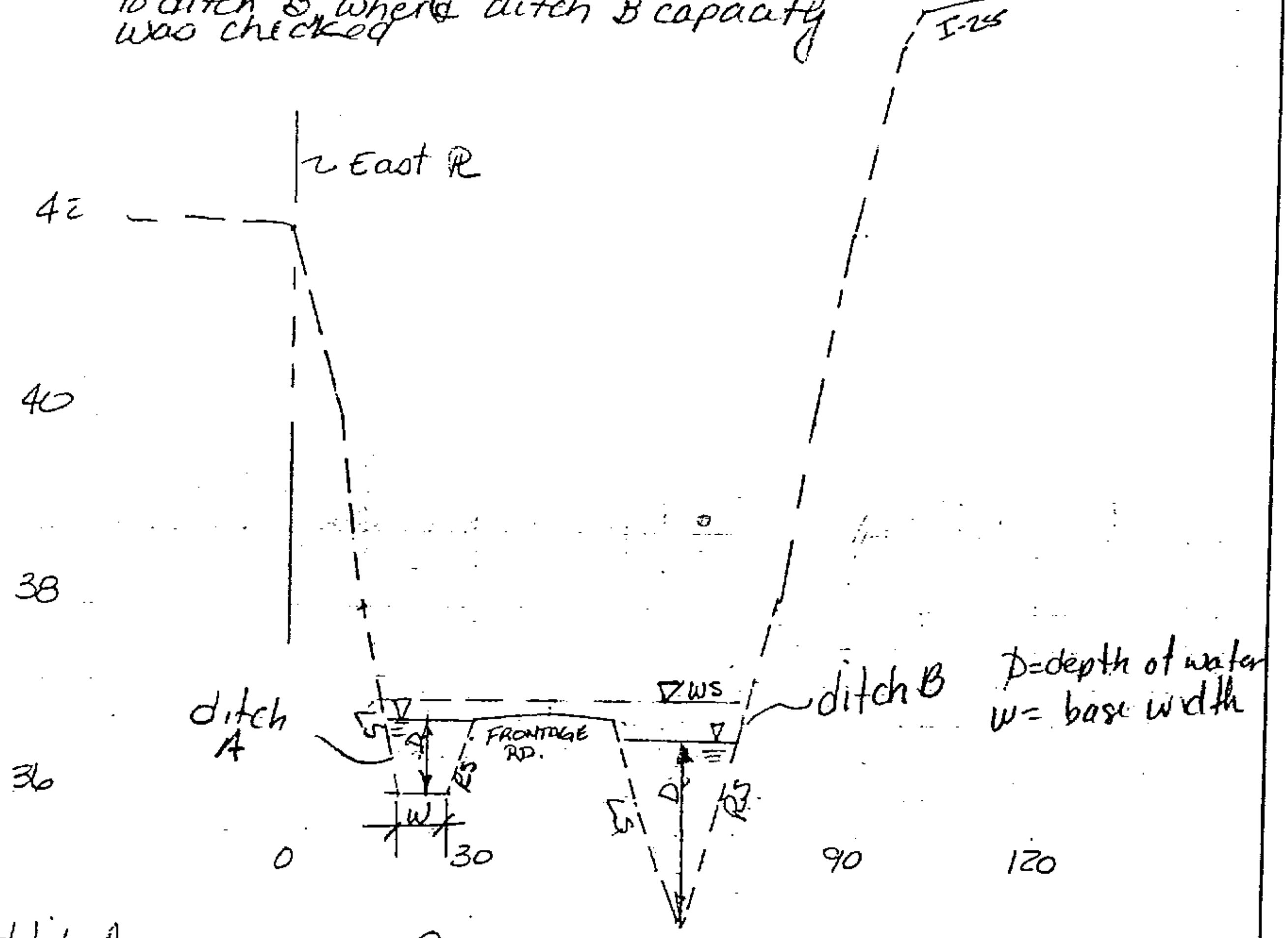
Client
GATES.

By
tdl

Date
8-2-84

See D&R plan 3D291 for Section III

NOTE: The design flow is 144 cfs - ditch A was checked for its capacity and the rest of the will flow to ditch B where ditch B capacity was checked



ditch A
using S=1.33%
n=.04
D=.8
LS=3:1
R=3:1
W=8'
has a capacity of
Q_c= 26 cfs
V= 3.18 fps

Q_D= 144-26 = 118 cfs.

Q_{Design} = 118 CF
ditch B
using n=.04
S=1.33%
D=2.0'
LS=6:1
RS=4:1
W=0
has a capacity of
Q_c= 85 CFS
V= 4.24 FPS

The two ditches have a total Capacity of 111 CFS
Therefore the remainder 144-111 = 33 CFS will flow in the road
using data
S=1.33%
(Q_D=33CFS) N=.04
LS=3:1
RS=4:1
W=58'

D=0.30'
Q_c= 33.67 CFS
V= 1.90 FPS

Project CMC			Job Nº E-2669
Client Gates	By td	Date 8/2/84	

Offsite flow to highway 85 and an Ex. 3' box Culvert just south of Cheyenne Meadows Rd and west of 85

A = .72 acres

$C_5 = .88$ $C_{100} = .93$

Tc = 5 min (min) L = 330'

H = 12

S = 3.64%

flow = 2.8 fps

2 min

$I_5 = 6.1$

$I_{100} = 9.0$

$$\boxed{Q_5 = .88(6.1)(.72) = 3.87 \text{ cfs}}$$

$$\boxed{Q_{100} = .93(9)(.72) = 6.03 \text{ cfs}}$$

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

J5/5

Project: Cheyenne Mtn Center

Job Nº: E-2669

Client: Gates

By: td

Date: 8/3/84

offsite Contributing area highway 85 - that flows north to the intersection of Lake ave. & 85/87 where it drains into the ditch of Lake Ave. and flows east through the 3 ex 58" x 36" cmp

$A = 5.07$ acres

$C = .90$

$t_c = 5$ min

$L = 960$

$S = 3.44\%$

flow =

$I_5 = 6.1$

$I_{100} = 9.0$

$Q_5 = .9(6.1)(5.07) = 27.83$ cfs

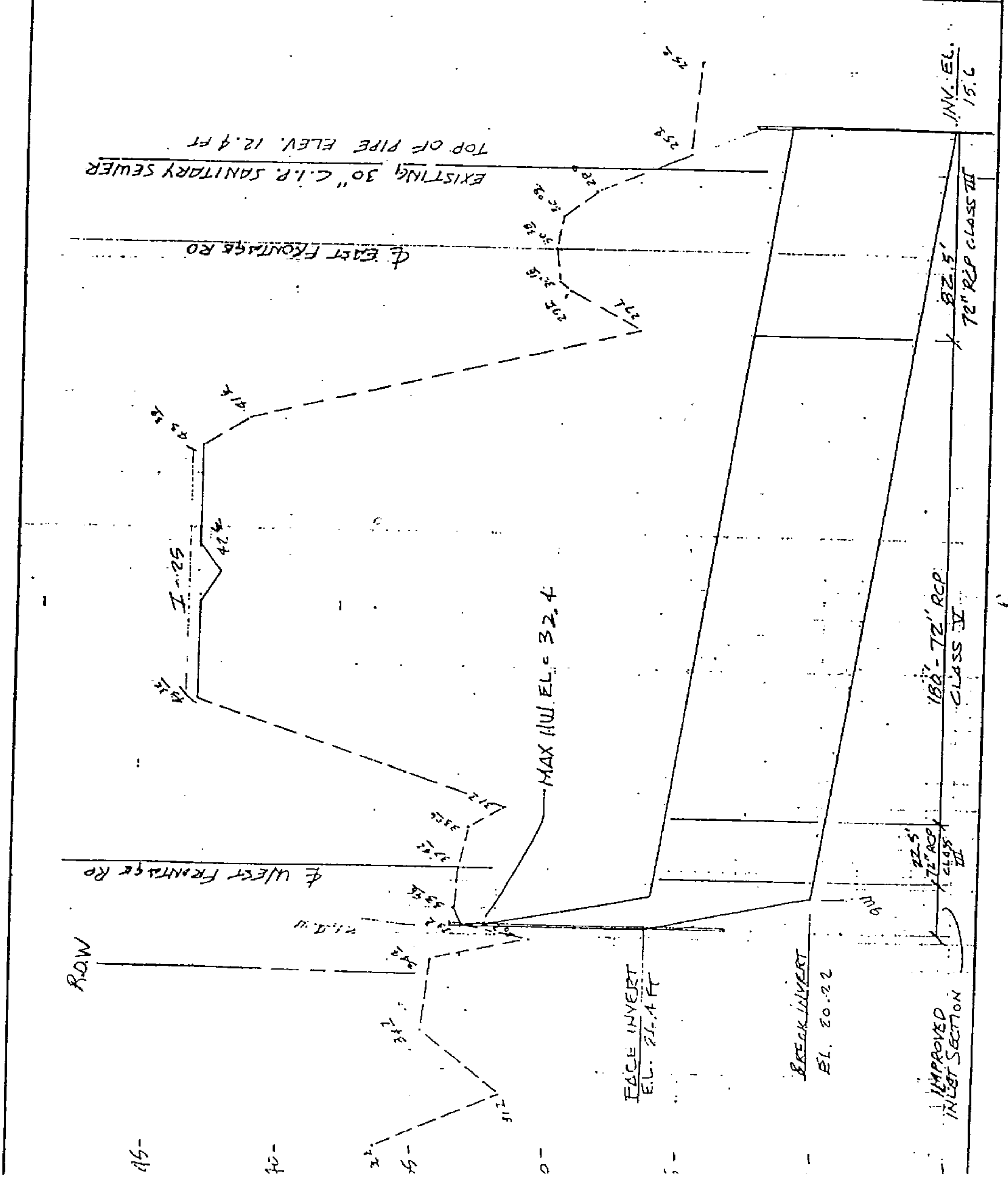
$Q_{100} = .9(9)(5.07) = 41.07$ cfs

APPENDIX K

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

XI/5

Project: I 25 CULVERT CROSSING AT UNDERPASS			Job Nº 4-2875
Client: GATES	CROSS-SECTION AT PROPOSED CULVERT 63' NORTH OF UNDERPASS	By DCM	Date 3-2-84



K2/5

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project: I-25 CROSSING AT UNDERPASS

Job Nº: E-7825

Client: GATES

By: DEM

Date: 3-2-84

FLOW DISTRIBUTION

	PROPOSED 72" RCP WITH IMPROVED INLET	EXISTING 48" CMP/RCP SYSTEM	OVERTOPPING FRONTAGE ROAD AND FLOWING THRU UNDERPASS
Q_{25} = 870 cfs	530	80	260 (DEPTH = 1.7')
Q_{100} = 1165 cfs	530	85	550 (DEPTH = 2.8')

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

K3/5

Project: DRAINAGE, I-75 CROSSING AT SINTON RANCH

Job Nº: E-2875

Client: GATES

PROPOSED CULVERT

By: DEM

Date: 2-23-84

72" RCP WITH IMPROVED INLET PER HEC-13

Q = 532 cfs

$B_f = 12.9' \Rightarrow$ TAPER $= 3.5' \Rightarrow L_1 (MIN) = 14' \; (4:1)$

$H_t = 12.2' \Rightarrow$ FALL $= 6.2' \Rightarrow L_2 (MIN) = 12.4' \; (2:1)$

$L_3 (MIN) = 3' \; (\frac{D}{2})$

USE $L_1 = 15.4' \; (4.4:1)$

$L_2 = 12.4'$

$L_3 = 3'$

FACE INVERT EL = 26.42FT @ 311'

BREAK INVERT EL = 20.22FT @ 298.6'

$$S = \frac{20.22 - 15.45}{298.6} = 0.01597$$

CAPACITY = 535 cfs

USE Q = 530 cfs

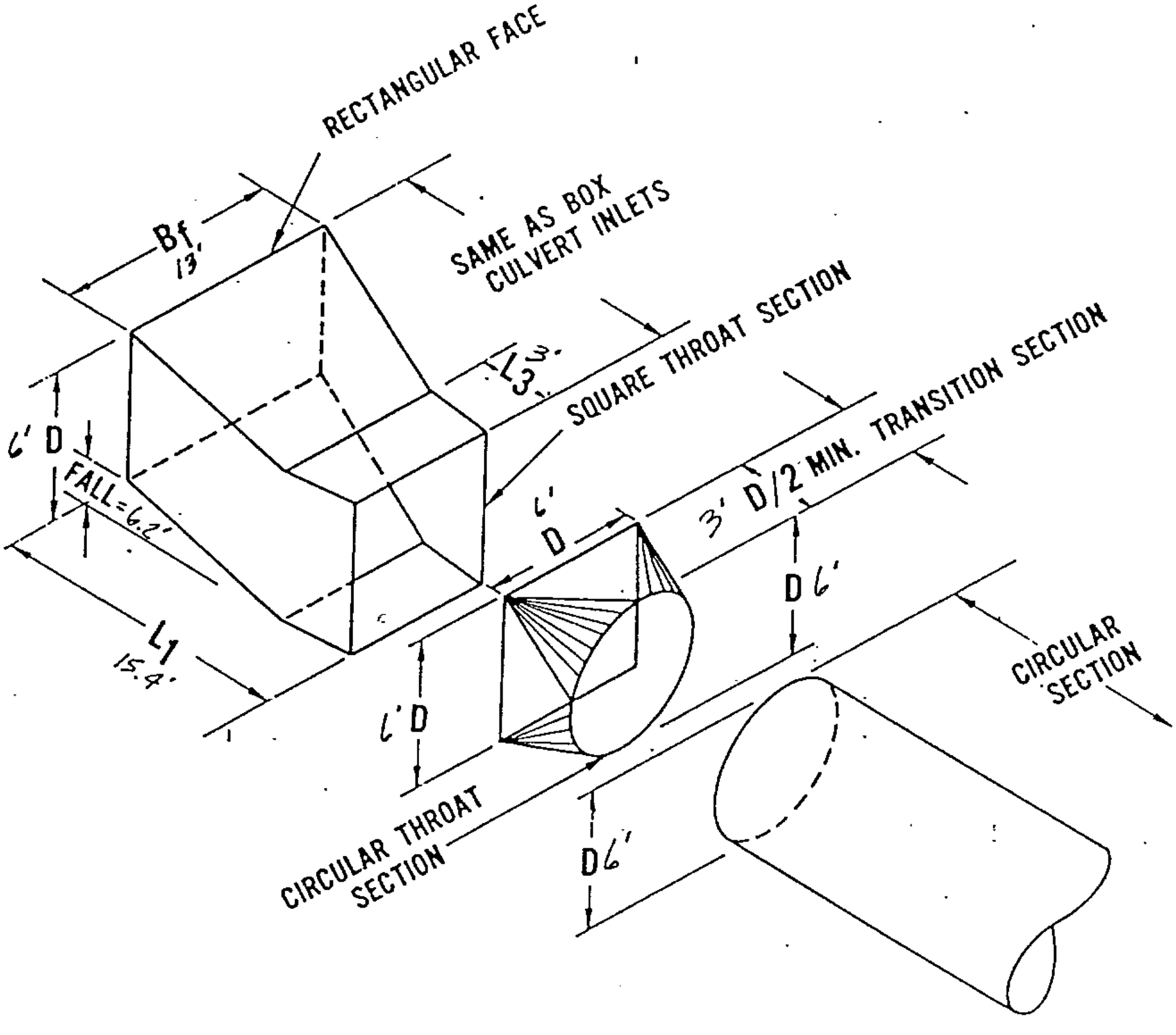
ASSUMPTIONS

MAX HEADWATER ELEV. WITHOUT OVERTOPPING WEST FRONTAGE ROAD = 32.4

MAX HW/D AT INLET = 1.0

K4/5

Figure 17



SLOPE-TAPERED INLET
APPLIED TO CIRCULAR PIPE

HEC 13 - Hydraulic Design of Improved
Inlets for Culverts

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project: DRAINAGE, I-25 CROSSING AT SINTON RANCH

Client: GATES

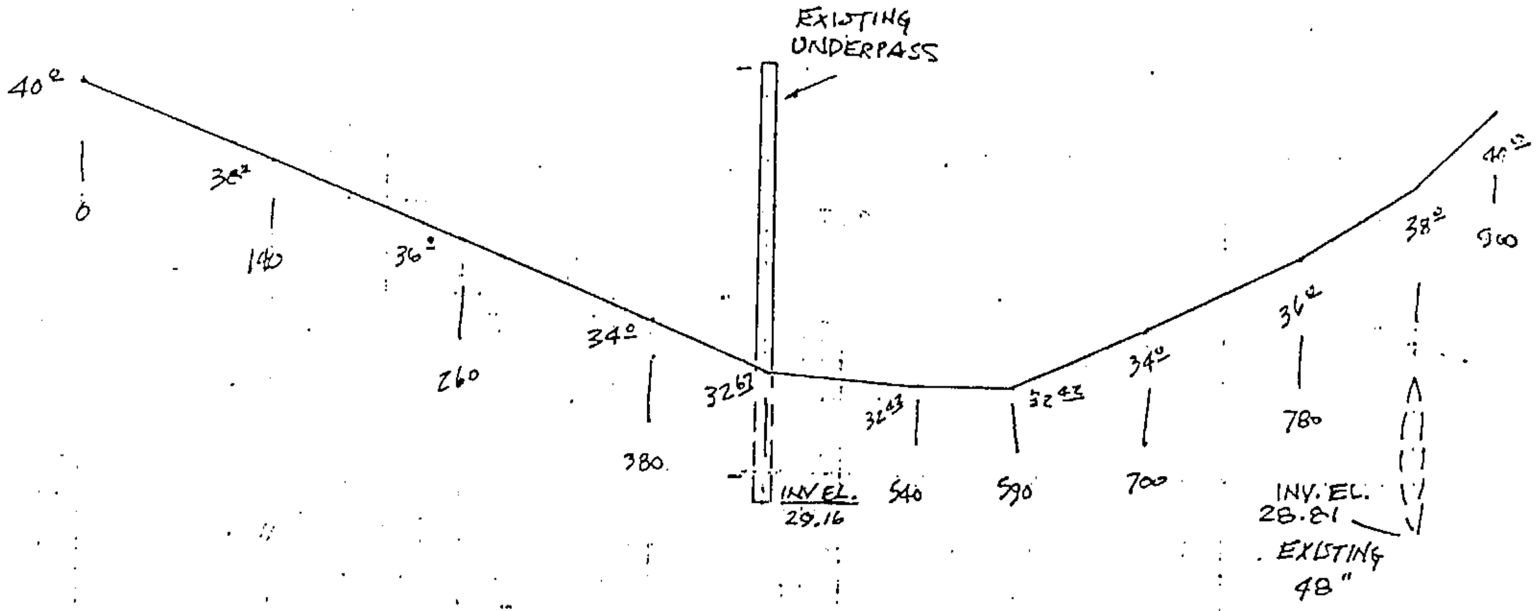
Job Nº: E-2825

By: DEM

Date: 2-29-84

K5/5

WEST FRONTAGE ROAD PROFILE



APPENDIX L

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project: CHEYENNE MT CENTER

Job Nº: E-2669

Client: GATES

By: DEM

Date: 1/29/85

(add refit basin # 6/7/85)

HISTORIC DRAINAGE TO HARRISON SCHOOL BOX
- refer to Master Drainage Plan for a portion of Area II - in back cover

AREA = 907 AC = 1.42 SQ MI - INCLUDES AREA DRAINING TO NORTH GULLY & AREA DRAINING TO THE QUAIL LAKE OUTFLOW channel (Basins P, O, K, N, D, M, L, I, C, T1)

Soils:

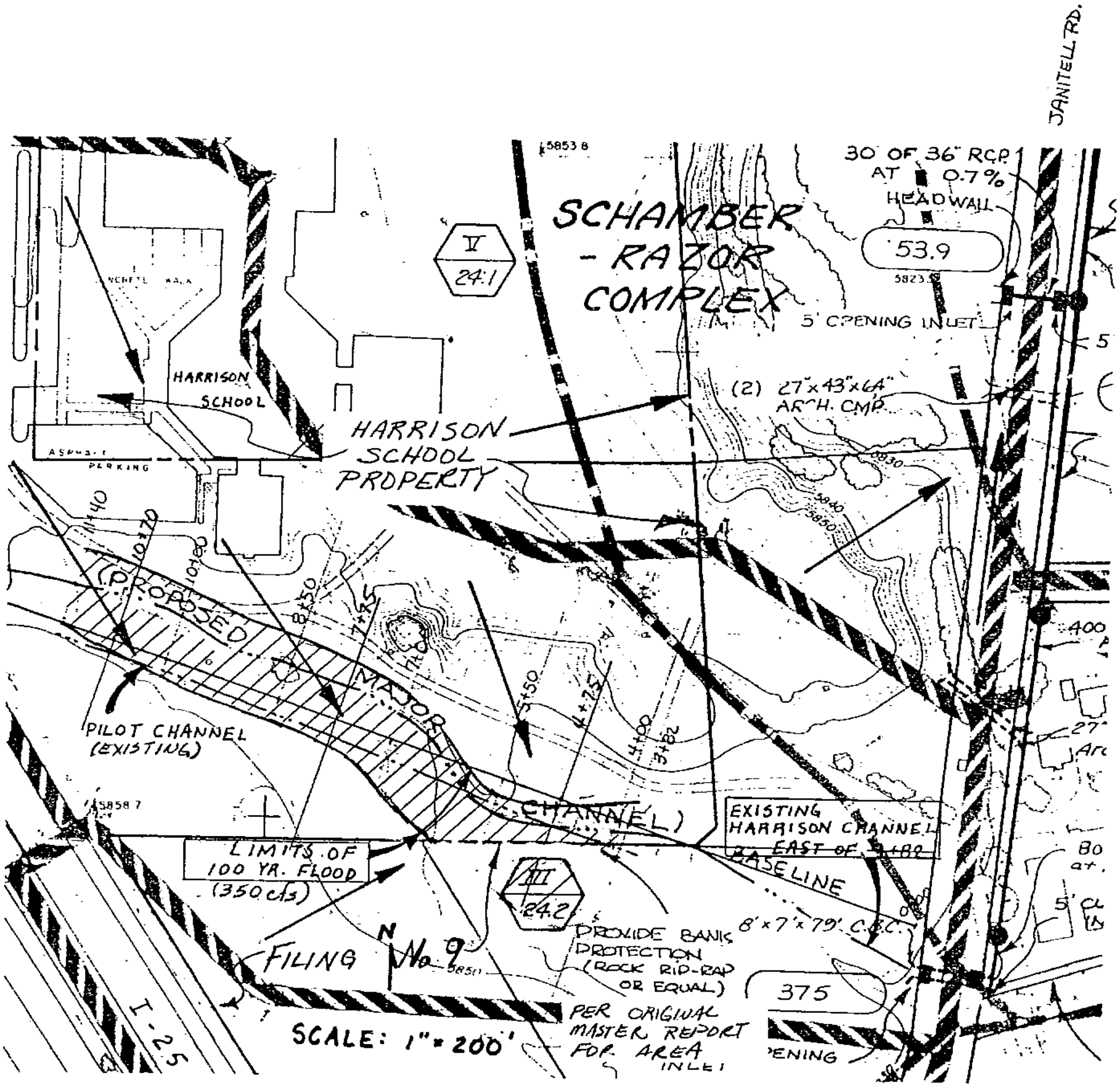
SOIL #	%	HYDROLOGIC GROUP		CN	CN	WEIGHTED CN
12	35	B			70	69
16	3	A			54	
59	10	C			80	
80	2	B			70	
82	45	A	40%	54		
		B	30%	70	67	
		C	30%	80		
86	5	B			70	

TABLE 1 ⇒ $Q_{100} = 0.96$ IN

assume: historic conditions
(no development, no lakes)

TIME OF CONCENTRATION - FIG. II
CHANNEL LENGTH = 16,000 FT
ELEVATION DIFFERENCE = 6290 - 5853 = 437'
TIME OF CONCENTRATION = 0.83 HR
FIGURE I ⇒ $q_p = 560$ CSM/IN.

100 YR PEAK DISCHARGE $q_{100} = 560\,(1.42)(0.96)$
$= \underline{763}$ cfs



HARRISON CREEK OUTFALL

100 YR Flood Limits Of
Existing Pilot Channel

DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

23/10

Project: PILOT CHANNEL FOR HARRISON PARK

Job Nº: E-2085

Client: GATES LAND CO.

By: JGS

Date: 06 FEBRUARY 1985

SUMMARY OF PILOT CHANNEL FLOW CAPACITIES
(SEE FIGURE E-1)

STATION	Existing Capacity of Pilot Channel Q (CFS)
3+82	317
4+00	187
5+50	147.5
7+00	123
8+50	163.5
10+00	17.2 *
11+40	124

REQ'D CAPACITY

Q_{100} = 375 CFS

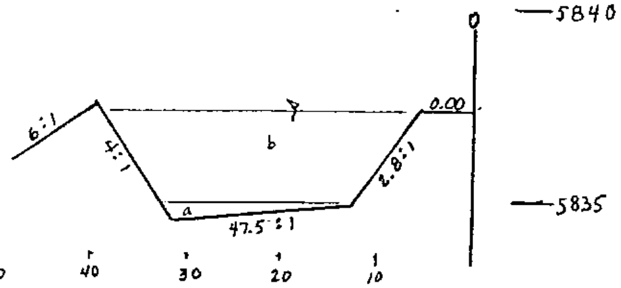
* STATION 10+00 IS APPROXIMATE LOCATION OF ENCROACHMENT OF CONCRETE AND RIPRAP ON CHANNEL.

Project: PILOT CHANNEL FOR HARRISON PARK
Job Nº: E-2085
Client: GATES LAND CO.
By: JGS
Date: 06 FEBRUARY 1985

STA 3+82

USE MANNINGS EQN TO DETERMINE FLOWS IN EXISTING PILOT CHANNEL.

$$Q = \frac{1.486}{\eta} A(R)^{2/3} (S)^{1/2}$$



S = 0.6 %
η = 0.04

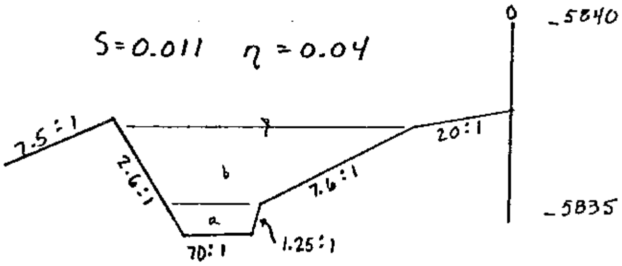
area (a)
SLOPE = 0.006
η = 0.04
WIDTH @ BASE = 0
LEFT SLOPE = 4:1
RIGHT SLOPE = 47.5:1
DEPTH = 0.4'
Q = 4 CFS

area (b)
SLOPE = 0.006
η = 0.04
WIDTH @ BASE = 20'
LEFT SLOPE = 4:1
RIGHT SLOPE = 2.8:1
DEPTH = 2.5'
Q = 313 CFS

TOTAL Q = 4 + 313 = 317 CFS

STA 4+00

S = 0.011 η = 0.04



area (a)
SLOPE = 0.011
η = 0.04
WIDTH @ BASE = 7.0'
LEFT SLOPE = 2.6:1
RIGHT SLOPE = 1.25:1
DEPTH = 0.8'
Q = 20 CFS

(b) SLOPE = 0.011
η = 0.04
WIDTH @ BASE = 10.5'
LEFT SLOPE = 2.6:1
RIGHT SLOPE = 7.6:1
DEPTH = 2.1'
Q = 167 CFS

Q = 20 + 167 = 187 CFS

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

L5 / 10

Project: PILOT CHANNEL AT HARRISON SCHOOL

Job Nº: E-2085

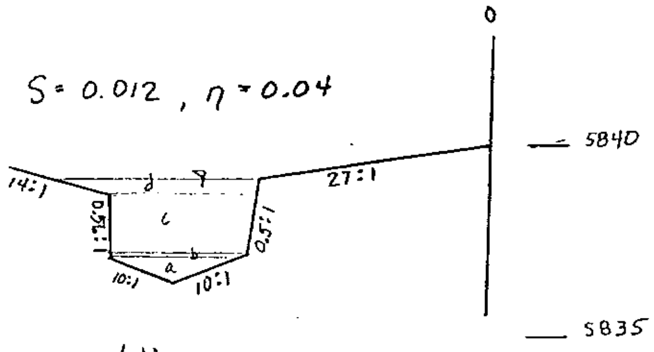
Client: GATES LAND CO

By: JGS

Date: 06 FEBRUARY 1985

STA 5+50

S = 0.012 , η = 0.04



(a)
BASE = 0
L. SLOPE = 10:1
R. SLOPE = 10:1
DEPTH = 0.6'
Q = 6.5 CFS

(b)
BASE = 14.5
L. SLOPE = 10:1
R. SLOPE = 0.5:1
DEPTH = 0.2'
Q = 4 CFS

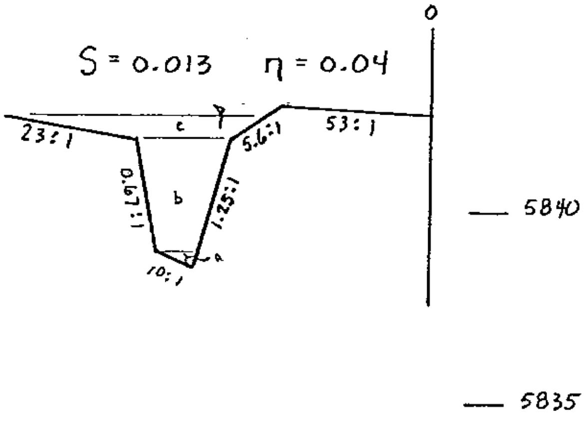
(c)
BASE = 14.5'
L. SLOPE = 0.56:1
R. SLOPE = 0.5:1
DEPTH = 1.6'
Q = 122 CFS

(d)
BASE = 15.5'
L. SLOPE = 14:1
R. SLOPE = 0.5:1
DEPTH = 0.4
Q = 15 CFS

TOTAL Q = 6.5 + 4.0 + 122 + 15 ≈ 147.5 CFS

STA 7+00

S = 0.013 η = 0.04



(a)
BASE = 0
L. SLOPE = 10:1
R. SLOPE = 1.25:1
DEPTH = 0.4'
Q = 1 CFS

(b)
BASE = 4.5'
L. SLOPE = 0.67:1
R. SLOPE = 1.25:1
DEPTH = 2.8'
Q = 119 CFS

(c)
BASE = 10'
L. SLOPE = 23:1
R. SLOPE = 5.6:1
DEPTH = 0.2'
Q = 3 CFS

TOTAL Q = 1 + 119 + 3 = 123 CFS

Project: PILOT CHANNEL @ HARRISON SCHOOL

Job Nº E-2085

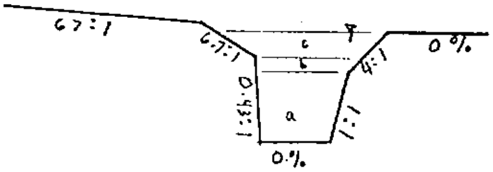
Client: GATES LAND CO.

By: JGS

Date: 06 FEBRUARY 1985

STA 8+50

S = 0.026 η = 0.04



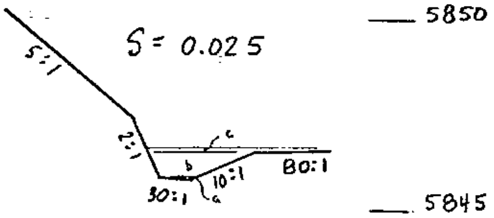
(a)
BASE = 7.0
L. SLOPE = 0.43 : 1
R. SLOPE = 1 : 1
DEPTH = 1.9'
Q = 117.5 CFS

(b)
BASE = 10
L. SLOPE = 0.43 : 1
R. SLOPE = 4 : 1
DEPTH = 0.4'
Q = 13 CFS

(c)
BASE = 11.5'
L. SLOPE = 6.7 : 1
R. SLOPE = 4 : 1
DEPTH = 0.6'
Q = 33 CFS

TOTAL Q = 117.5 + 13 + 33 = 163.5 CFS

STA 10+00



(a)
BASE = 0'
L. SLOPE = 30 : 1
R. SLOPE = 10 : 1
DEPTH = 0.1'
Q = 0.2 CFS

(b)
BASE = 4'
L. SLOPE = 2 : 1
R. SLOPE = 10 : 1
DEPTH = 0.6'
Q = 15 CFS

(c)
BASE = 11'
L. SLOPE = 2 : 1
R. SLOPE = 80 : 1
DEPTH = 0.1'
Q = 2 CFS

TOTAL Q: 0.2 + 15 + 2 = 17.2 CFS

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

L7/10

Project: PILOT CHANNEL AT HARRISON SCHOOL

Job Nº: E-2085

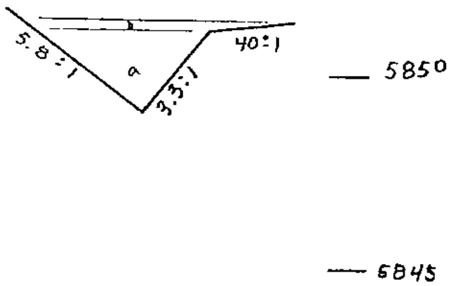
Client: GATES LAND CO.

By: JGS

Date: 06 FEBRUARY 1985

STA 11+40

$S = 0.0236$ $n = 0.04$



(a)
BASE = 0
L. SLOPE = 5.8:1
R. SLOPE = 3.3:1
DEPTH = 2.1'
Q = 116 CFS

(b)
BASE =
L. SLOPE = 5.8:1
R. SLOPE = 40:1
DEPTH = 0.2'
Q = 8 CFS

TOTAL Q = 116 + 8 = 124 CFS

18/10

Project: CHANNEL FOR HARRISON PARK

Job Nº: E-2669

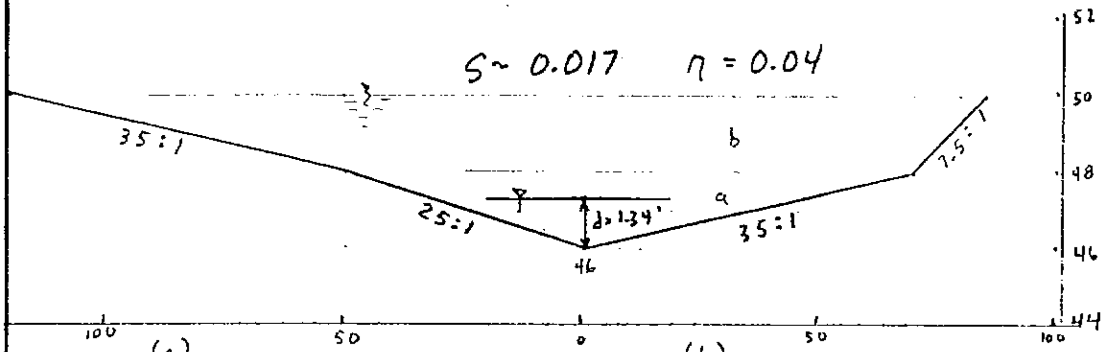
Client: GATES LAND CO.

By: JGS

Date: 07 FEB 1985

DETERMINE LIMITS OF 100 YR. FLOW. (ASSUME PILOT Q ~ 175 CFS)

(APPROXIMATELY STA. 10+70, SEE FIGURE E-1)



(a)	(b)
BASE = 0'	BASE = 120'
L. SLOPE = 25:1	L. SLOPE = 35:1
R. SLOPE = 35:1	R. SLOPE = 7.5:1
DEPTH = 2'	DEPTH = 2'
Q = 581 CFS	Q = 2140 CFS

TOTAL Q = 2721 CFS

CONCLUSION: EXISTING CROSS SECTION WILL ACCOMMODATE FLOWS FROM CHEYENNE MOUNTAIN CENTER.

NECESSARY DEPTH TO CARRY 200 CFS (TOTAL INCL. PILOT = 375 CFS)

d = 1.34 FT
V = 3.71 f/s
TOP WIDTH = 80 FT

L9/10

Project: CHANNEL FOR HARRISON SCHOOL

Job Nº: E-2085

Client: GATES LAND CO.

By: JGS

Date: 07 FEBRUARY 1985

10/85 added note re: Filing #9 BWT

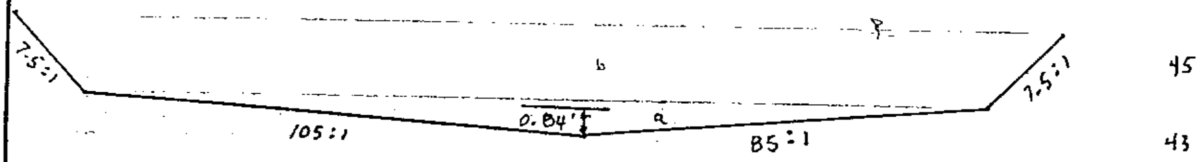
LIMITS OF 100 YR. FLOW

THIS IS BASED ON AERIAL TOPO FLOWN IN 1970 ±

STA. 7+75

$S \sim 0.02$

$n = 0.04$



(a)
BASE = 0
L. SLOPE = 105:1
R. SLOPE = 85:1
DEPTH = 1.0
Q = 314 CFS

(b)
BASE ~ 190
L. SLOPE = 7.5:1
R. SLOPE = 7.5:1
DEPTH = 2.0
Q = 3260 CFS

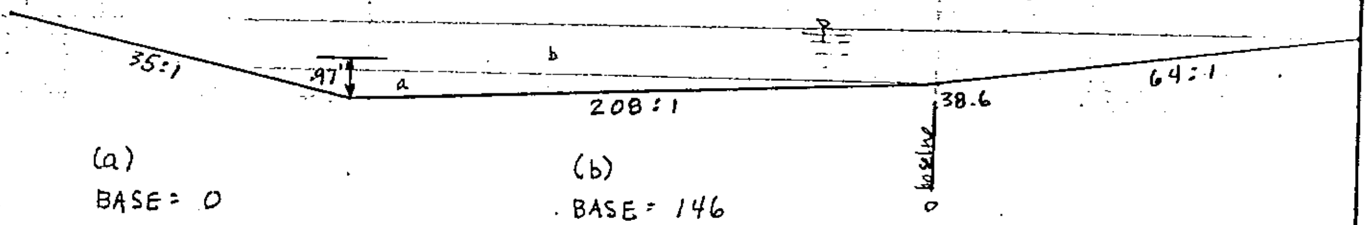
TOTAL Q = 314 + 3260 = 3574 CFS

REQUIRED DEPTH TO ACHIEVE 200 CFS d = 0.84 FT
TOP WIDTH = 160'

STA 4+75

$S = 0.012$

$n = 0.04$



(a)
BASE = 0
L. SLOPE = 35:1
R. SLOPE = 208:1
DEPTH = 0.6
Q = 80 CFS

(b)
BASE = 146
L. SLOPE = 35:1
R. SLOPE = 64:1
DEPTH = 2'
Q = 2524 CFS

REQUIRED DEPTH TO ACHIEVE Q = 200 CFS → d = 0.97'
TOP WIDTH = 183'

Note: The need for a drainage channel north of Filing #9 to transition storm flows to the Harrison Creek riprap channel is addressed in the drainage report for Harrison Park Filing #9. The School District owns this property and agreed to provide the necessary easement

Project: CHANNEL @ HARRISON SCHOOL

Job Nº: E-2085

Client: GATES LAND CO

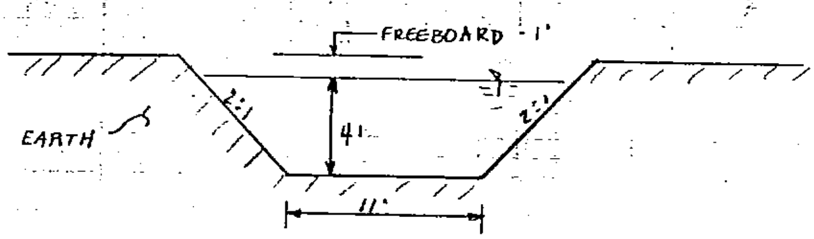
By: JGS

Date: 12 FEBRUARY 1985

BASE WIDTH = 11' , SIDE SLOPE = 2:1

EXISTING HARRISON CREEK CHANNEL PROPERTIES

$S = 0.006$, $n = 0.045$; $d = 4'$, $V = 4.9$ f/s, $Q_{CAP} = 375$ CFS



Q = 375 CFS
S = 0.006
n = 0.04
d = 3.79'
V = 5.3 f/s

TEMPORARY CHANNEL SECTION

HOWEVER, SAME SECTION @ 1% VELOCITY = 6.4 (>> 5 f/s)

S = 0.01
n = 0.04
BASE = 11 FT
SIDE SLOPE = 2:1
DEPTH = 3.32 FT
VELOCITY = 6.4 f/s

Q = 375 CFS

SAME SECTION @ 2.5%

n = 0.04
BASE = 11 FT
SIDE SLOPE = 2:1
DEPTH = 2.6 FT
VELOCITY = 8.9 f/s

Q = 375 CFS

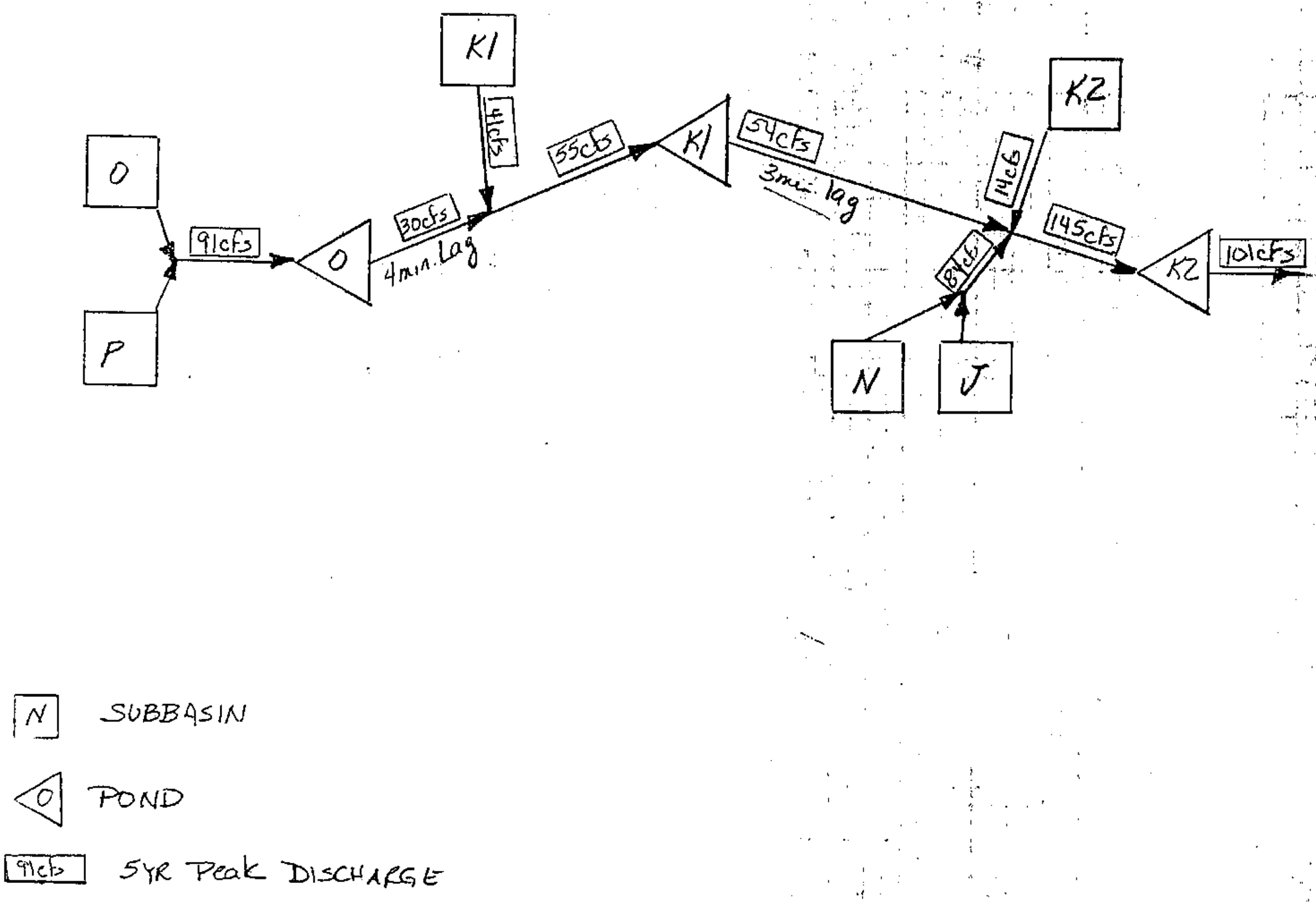
AN EXTENTION OF THE EXISTING HARRISON CREEK CHANNEL TO THE NORTHWEST CAN BE ACHIEVED USING THE TYPICAL SECTION FROM THE EXISTING CHANNEL & APPLYING THE REPRESENTATIVE SLOPES UPSTREAM.

1% AND 2.5% SLOPES ARE ENCOUNTERED UPSTREAM. THESE SLOPES GENERATE VELOCITIES OF 6.4 f/s AND 8.9 f/s RESPECTIVELY. THESE VELOCITIES MAY SCOUR THE CHANNEL SO, IF USED IT IS RECOMMENDED TO EMPLOY A SETTLING BASIN UPSTREAM OF THE EXISTING RIPRAP CHANNEL.

APPENDIX M

BASIN ROUTING SCHEMATIC

5yr. 6hr STORM



DREXEL, BARRELL & CO.

LAND SURVEYORS CIVIL ENGINEERS

Project Cheyenne Mtn Ranch - 5yr-6hr storm

Client Oates

By QTR

Date 8/26/85

Job Nº E2825

M1/26

M 2/26

Project Basin O+P, 5yr flow

Job № E 2825

Client Gates / Cheyenne Mtn. Ranch

By DM

Date 8/21/85

Basins O+P

from 100yr calcs: $CN = 71.8$, $T_c = 0.4 hrs$, Area $= 218.9 Ac$

For 5yr storm; $P = 2.10 in$

$Q = 0.33 in$ (Table 1, p41)

$q_p = 810$ csm/in (Figure I, p45) $\frac{cfs}{s(mi)^2 in}$

$$q = \frac{q_p}{640\ Ac/smi} \times A(ac)\ Q(in) = cfs$$

$$= 810 \frac{ft^3}{s\ mi^2\ in} \times \frac{218.9\ Ac}{640\ Ac/mi^2} \times 0.33\ in$$

$q = 91$ cfs

$$t_b = \frac{2\ AQ}{q} = \frac{in\ Acres}{}$$

$$= \frac{2\ (218.9 Ac)(0.33\ in)}{91\ ft^3/s}$$

$t_b = 1.6$ hr $= 96$ min

$D = 0.133\ T_c$

$D = 0.133\ (0.4 hr) = 0.05 hr = 3$ min

$t_b = 2.67\ t_p \Rightarrow t_p = \frac{T_b}{2.67}$

$$t_p = \frac{1.6 hr}{2.67}$$

$t_p = 0.6$ hr $= 36$ min

M 3 / 26

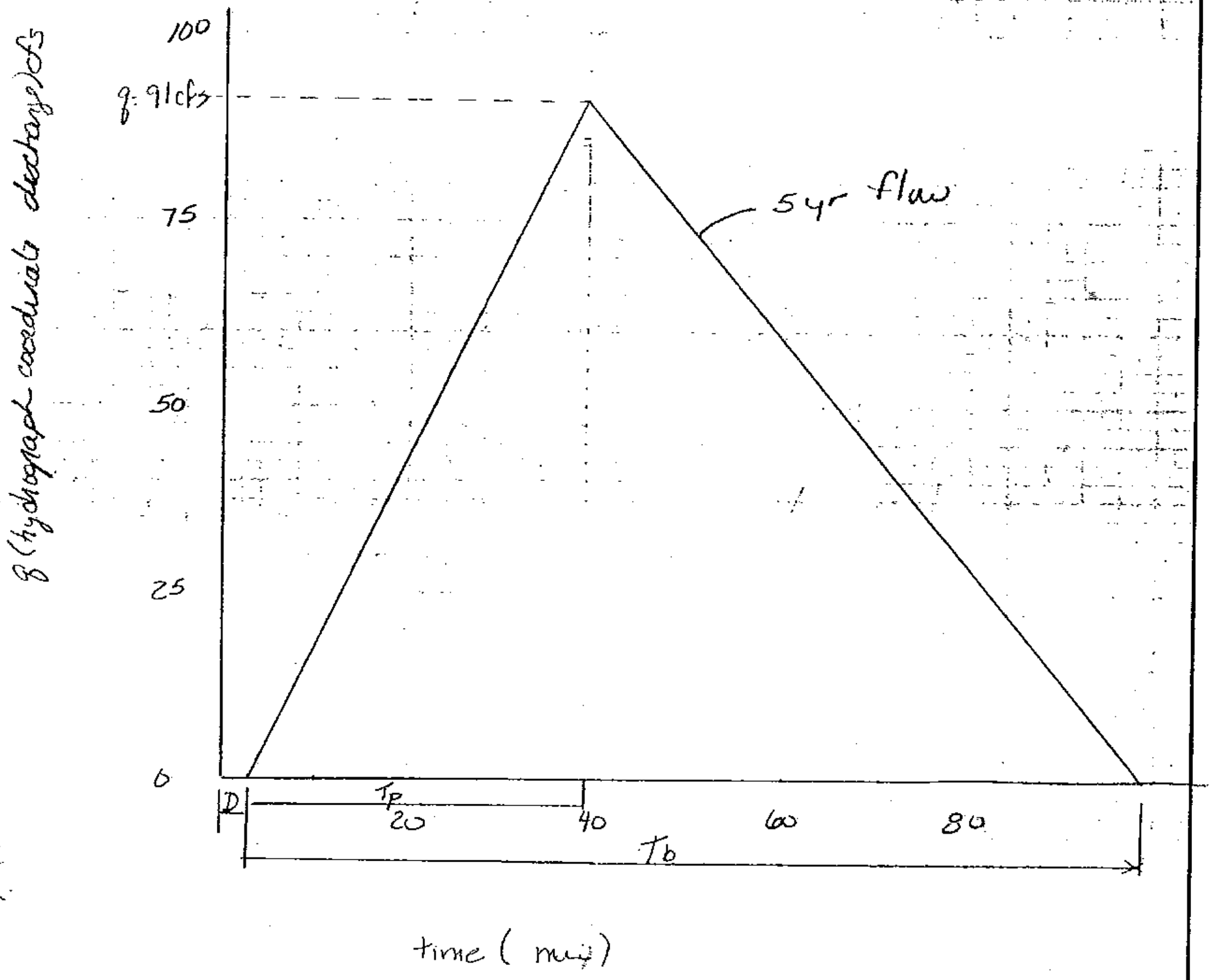
Project: Basn Out, 5yr flow

Job Nº: E2825

Client: Gates

By: ORN

Date: 8/22/85



D=3min
T_p=36min
T_b=96min

t mins	q_T (cfs)
3 min	0 cfs
12	23
21	46
30	69
39	91
54	69
69	46
84	23
99	0

Project Basin K1

Job Nº E2825

Client Gates

By DJN

Date 8/22/85

Basin K1

from 100 yr calcs, Area = 62 Ac, CN = 73.0, T_c = 0.15 hr

for 5 yr storm

$P = 2.1 in$

$Q = 0.37 in$

$q_p = 1150 \text{ csm/in}$

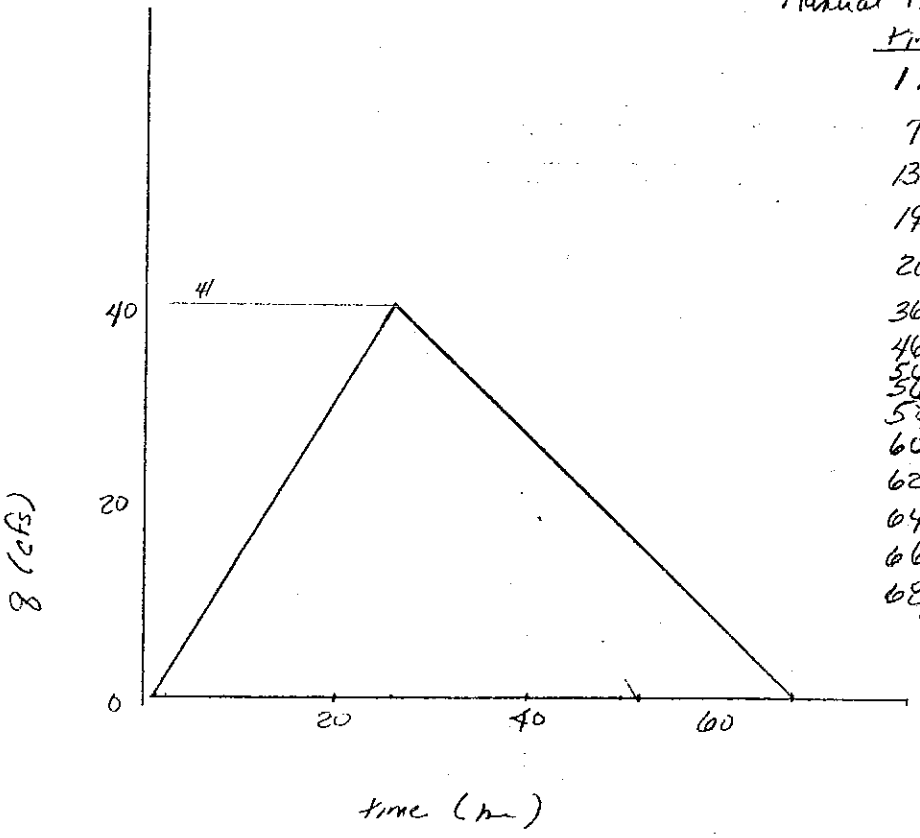
$$q = 1150 \frac{csm}{in} \times \frac{62 Ac}{640 Ac/mi^2} \times 0.37 in$$

$q = \underline{41 cfs}$

$$t_b = \frac{2(62 Ac)(0.37 in)}{41 cfs} = 1.12 hr = 67 min$$

$D = 0.133 T_c = 0.133 (0.15 hr) = 0.02 hr = 1.2 min$

$$t_p = \frac{1.12 hr}{2.67} = 0.42 hr = 25 min$$



Manual Hydrograph Input

time	flow
1 min	0
7	10 cfs
13	20
19	31
26 min	41
36	31
46	21
50	17
56	12
58	10
60	8
62	6
64	4
66	2
68	0

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

M5/26

Project: Basin K2, 5yr flow

Job Nº: E2825

Client: Dalco

By: OJR

Date: 8/22/85

Basin K2

from 100yr calcs, Area = 25 Ac, CN = 71.4, t_c = 0.17 hr

For 5yr storm: , $P = 2.10$ in

$Q = 0.32$ in

$q_p = 1100$ csm/in

$q = 1100 \text{ csm/in} \times \frac{25 \text{ Ac}}{640 \text{ Ac/sm}} \times 0.32 \text{ in}$

$q = 14$ cfs

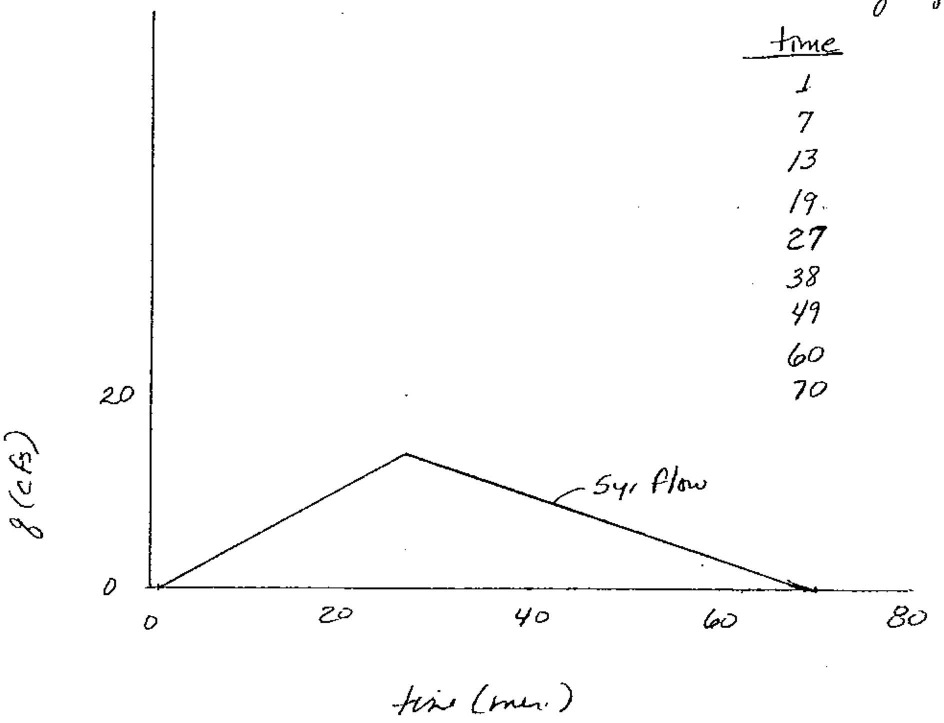
$t_b = \frac{2AQ}{q} = \frac{2(25 \text{ Ac})\, 0.32 \text{ in}}{14 \text{ cfs}} = 1.14 \text{ hr} = 69 \text{ min}$

$D = 0.133\,(0.17 \text{ hr}) = 0.02 \text{ hr} = 1 \text{ min}$

$t_p = \frac{1.14 \text{ hr}}{2.67} = 0.43 \text{ hr} = 26 \text{ min}$

Manual Hydrograph Input

time	flow
1	0
7	3
13	6
19	10
27	14
38	10
49	7
60	3
70	0



Project: Basins N+J, 5yr flow

Job Nº: E2825

Client: Gates

By: DJR

Date: 8/22/85

Basins N+J,

from 100yr Calcs, Area = 163 Ac, CN = 75.7, T_c = 0.52hr

5yr storm $P = 2.10$ in

$Q = 0.46$ in

$q_p = 720$ csm/in

$$q = \frac{720 \text{ csm/in}}{} \times \frac{163 \text{ Ac}}{640 \text{ ac/smi}} \times 0.46 \text{ in}$$

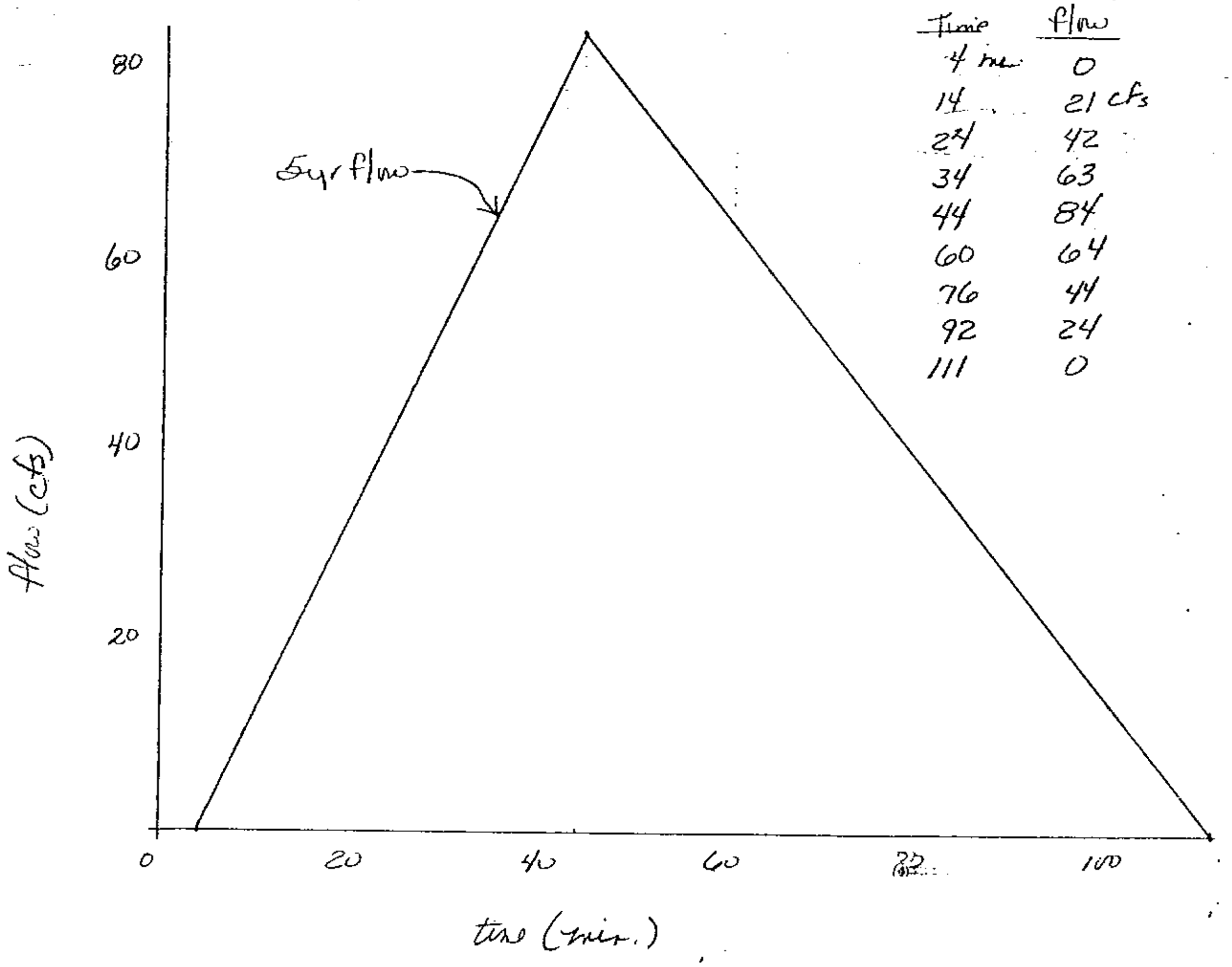
$q = 84$ cfs

$$t_b = \frac{2AQ}{q} = \frac{2(163)(0.46)}{84} = 1.78 \text{ hr} = 107 \text{ min}$$

$$t_p = \frac{1.78 \text{ hr}}{2.67} = 0.67 \text{ hr} = 40 \text{ min}$$

$D = 0.133(0.52\text{hr}) = 0.07$ hr = 4 min

Time	flow
4 min	0
14	21 cfs
24	42
34	63
44	84
60	64
76	44
92	24
111	0



M 7/26

SUB BASINS O & P DATA

```
O&P5YR — Hydrograph file

     Description of hydrograph :                                  Page   1

     5 YEAR HYDROGRAPH FOR BASINS O AND P
   Area =  218.90 ac.    Rational 'C'  = .##     Time of Concent. =  24 min.
                             Storm frequency, years =    5

    Time         Flow          Time         Flow          Time         Flow
   0:03.0  *   0.0 cfs       0:12.0  *  23.0 cfs       0:21.0  *  46.0 cfs
   0:30.0  *  69.0 cfs       0:39.0  *  91.0 cfs       0:54.0  *  69.0 cfs
   1:09.0  *  46.0 cfs       1:24.0  *  23.0 cfs       1:39.0  *   0.0 cfs
   1:54.0  *   0.0 cfs       2:09.0  *   0.0 cfs       2:24.0  *   0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 1 ***

M 8/26

Date 8/22/85 SUBBASINS O+P ROUTED THR. POND 'O'

Pond File : PONDO

```
RATING CURVE FOR POND O



      Number          Elevation          Storage           Outflow
        1               57.70             0.000              0.00
        2               60.00             0.800             14.50
        3               62.00             1.400             27.00
        4               64.00             7.300             35.00
        5               64.50             8.700             74.00
        6               64.70             9.000            174.00
        7               65.00            10.000            495.00
```

Routing of Hydrograph # 1

```
Description of hydrograph :                                     Page   1

5 YEAR HYDROGRAPH FOR BASINS O AND P
Area =  218.90 ac.     Rational 'C'  = .##     Time of Concent. =  24 min.
                     Storm frequency, years =    5

Hydrograph # 2  - total outflow hydrograph
Description :
BASINS O&P ROUTED THROUGH POND O - 5 YEAR STORM
```

M 9/26

Date 8/22/85

Inflow H'graph: 5 YEAR HYDROGRAPH FOR BASINS O AND P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	57.70	0.00
0:05.0	5.11	0.0069	57.72	0.12
0:07.0	10.22	0.0271	57.78	0.49
0:09.0	15.33	0.0602	57.87	1.09
0:11.0	20.44	0.1053	58.00	1.91
0:13.0	25.56	0.1620	58.17	2.94
0:15.0	30.67	0.2297	58.36	4.16
0:17.0	35.78	0.3078	58.58	5.58
0:19.0	40.89	0.3958	58.84	7.17
0:21.0	46.00	0.4933	59.12	8.94
0:23.0	51.11	0.5998	59.42	10.97
0:25.0	56.22	0.7148	59.76	12.96
0:27.0	61.33	0.8378	60.13	15.29
0:29.0	66.44	0.9680	60.56	18.00
0:31.0	71.44	1.1044	61.01	20.84
0:33.0	76.33	1.2464	61.49	23.80
0:35.0	81.22	1.3937	61.98	26.87
0:37.0	86.11	1.5497	62.05	27.20
0:39.0	91.00 ←	1.7184	62.11	27.43
0:41.0	88.07	1.8891	62.17	27.66
0:43.0	85.13	2.0512	62.22	27.88
0:45.0	82.20	2.2046	62.27	28.09
0:47.0	79.27	2.3493	62.32	28.29
0:49.0	76.33	2.4855	62.37	28.47
0:51.0	73.40	2.6131	62.41	28.64
0:53.0	70.47	2.7321	62.45	28.81
0:55.0	67.47	2.8425	62.49	28.96
0:57.0	64.40	2.9442	62.52	29.09
0:59.0	61.33	3.0371	62.55	29.22
1:01.0	58.27	3.1211	62.58	29.33
1:03.0	55.20	3.1965	62.61	29.44
1:05.0	52.13	3.2631	62.63	29.53
1:07.0	49.07	3.3211	62.65	29.60
1:09.0	46.00	3.3703	62.67	29.67
1:11.0	42.93	3.4110	62.68	29.73
1:13.0	39.87	3.4431	62.69	29.77
1:15.0	36.80	3.4667	62.70	29.80
1:17.0	33.73	3.4817	62.71	29.82
1:19.0	30.67	3.4882	62.71	29.83
1:21.0	27.60	3.4863	62.71	29.83 ←
1:23.0	24.53	3.4760	62.70	29.81
1:25.0	21.47	3.4572	62.70	29.79
1:27.0	18.40	3.4301	62.69	29.75
1:29.0	15.33	3.3947	62.68	29.70
1:31.0	12.27	3.3510	62.66	29.65
1:33.0	9.20	3.2990	62.64	29.57
1:35.0	6.13	3.2387	62.62	29.49
1:37.0	3.07	3.1703	62.60	29.40

Inflow H'graph: 5 YEAR HYDROGRAPH FOR BASINS O AND P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:39.0	0.00✓	3.0936	62.57	29.30
1:41.0	0.00	3.0131	62.55	29.19
1:43.0	0.00	2.9328	62.52	29.08
1:45.0	0.00	2.8529	62.49	28.97
1:47.0	0.00	2.7732	62.47	28.86
1:49.0	0.00	2.6939	62.44	28.75
1:51.0	0.00	2.6148	62.41	28.65
1:53.0	0.00	2.5360	62.39	28.54
1:55.0	0.00	2.4575	62.36	28.43
1:57.0	0.00	2.3794	62.33	28.33
1:59.0	0.00	2.3015	62.31	28.22
2:01.0	0.00	2.2239	62.28	28.12
2:03.0	0.00	2.1466	62.25	28.01
2:05.0	0.00	2.0695	62.23	27.91
2:07.0	0.00	1.9928	62.20	27.80
2:09.0	0.00	1.9163	62.18	27.70
2:11.0	0.00	1.8402	62.15	27.60
2:13.0	0.00	1.7643	62.12	27.49
2:15.0	0.00	1.6887	62.10	27.39
2:17.0	0.00	1.6134	62.07	27.29
2:19.0	0.00	1.5383	62.05	27.19
2:21.0	0.00	1.4636	62.02	27.09
2:23.0	0.00	1.3894	61.96	26.78
2:25.0	0.00	1.3177	61.73	25.28
2:27.0	0.00	1.2500	61.50	23.87
2:29.0	0.00	1.1860	61.29	22.54
2:31.0	0.00	1.1257	61.09	21.28
2:33.0	0.00	1.0687	60.90	20.10
2:35.0	0.00	1.0148	60.72	18.98
2:37.0	0.00	0.9640	60.55	17.92
2:39.0	0.00	0.9160	60.39	16.92
2:41.0	0.00	0.8707	60.24	15.97
2:43.0	0.00	0.8280	60.09	15.08
2:45.0	0.00	0.7875	59.96	14.27
2:47.0	0.00	0.7492	59.85	13.58
2:49.0	0.00	0.7127	59.75	12.92
2:51.0	0.00	0.6779	59.65	12.29
2:53.0	0.00	0.6449	59.55	11.69
2:55.0	0.00	0.6135	59.46	11.12
2:57.0	0.00	0.5835	59.38	10.58
2:59.0	0.00	0.5552	59.30	10.06
3:01.0	0.00	0.5281	59.22	9.57
3:03.0	0.00	0.5024	59.14	9.11
3:05.0	0.00	0.4779	59.07	8.66
3:07.0	0.00	0.4547	59.01	8.24
3:09.0	0.00	0.4325	58.94	7.84
3:11.0	0.00	0.4114	58.88	7.46
3:13.0	0.00	0.3914	58.83	7.09

M 11/26

Inflow H′graph: 5 YEAR HYDROGRAPH FOR BASINS O AND P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:15.0	0.00	0.3723	58.77	6.75
3:17.0	0.00	0.3542	58.72	6.42
3:19.0	0.00	0.3369	58.67	6.11
3:21.0	0.00	0.3205	58.62	5.81
3:23.0	0.00	0.3049	58.58	5.53
3:25.0	0.00	0.2901	58.53	5.26
3:27.0	0.00	0.2759	58.49	5.00
3:29.0	0.00	0.2625	58.45	4.76
3:31.0	0.00	0.2497	58.42	4.53
3:33.0	0.00	0.2375	58.38	4.31
3:35.0	0.00	0.2260	58.35	4.10
3:37.0	0.00	0.2150	58.32	3.90
3:39.0	0.00	0.2045	58.29	3.71
3:41.0	0.00	0.1945	58.26	3.53
3:43.0	0.00	0.1850	58.23	3.35
3:45.0	0.00	0.1760	58.21	3.19
3:47.0	0.00	0.1675	58.18	3.04
3:49.0	0.00	0.1593	58.16	2.89
3:51.0	0.00	0.1515	58.14	2.75
3:53.0	0.00	0.1442	58.11	2.61
3:55.0	0.00	0.1371	58.09	2.49
3:57.0	0.00	0.1305	58.08	2.36
3:59.0	0.00	0.1241	58.06	2.25
4:01.0	0.00	0.1181	58.04	2.14
4:03.0	0.00	0.1123	58.02	2.04
4:05.0	0.00	0.1068	58.01	1.94
4:07.0	0.00	0.1016	57.99	1.84
4:09.0	0.00	0.0967	57.98	1.75
4:11.0	0.00	0.0920	57.96	1.67
4:13.0	0.00	0.0875	57.95	1.59
4:15.0	0.00	0.0832	57.94	1.51
4:17.0	0.00	0.0792	57.93	1.43
4:19.0	0.00	0.0753	57.92	1.37
4:21.0	0.00	0.0716	57.91	1.30
4:23.0	0.00	0.0682	57.90	1.24
4:25.0	0.00	0.0648	57.89	1.18
4:27.0	0.00	0.0617	57.88	1.12
4:29.0	0.00	0.0587	57.87	1.06
4:31.0	0.00	0.0572	57.86	1.04
4:33.0	0.00	0.0558	57.86	1.01
4:35.0	0.00	0.0544	57.86	0.99
4:37.0	0.00	0.0529	57.85	0.96
4:39.0	0.00	0.0515	57.85	0.93
4:41.0	0.00	0.0501	57.84	0.91
4:43.0	0.00	0.0487	57.84	0.88
4:45.0	0.00	0.0472	57.84	0.86
4:47.0	0.00	0.0458	57.83	0.83
4:49.0	0.00	0.0444	57.83	0.80

M 12/26

```
Inflow H'graph: 5 YEAR HYDROGRAPH FOR BASINS O AND P
 Time          Inflow        Storage        Elevation       Outflow
hr:min          cfs           ac ft           feet         cfs (Tot)
--------------------------------------------------------------------

4:51.0         0.00          0.0429          57.82           0.78
4:53.0         0.00          0.0415          57.82           0.75
4:55.0         0.00          0.0401          57.82           0.73
4:57.0         0.00          0.0386          57.81           0.70
4:59.0         0.00          0.0372          57.81           0.67
5:01.0         0.00          0.0358          57.80           0.65
5:03.0         0.00          0.0343          57.80           0.62
5:05.0         0.00          0.0329          57.79           0.60
5:07.0         0.00          0.0315          57.79           0.57
5:09.0         0.00          0.0301          57.79           0.54
5:11.0         0.00          0.0286          57.78           0.52
5:13.0         0.00          0.0272          57.78           0.49
5:15.0         0.00          0.0258          57.77           0.47
5:17.0         0.00          0.0243          57.77           0.44
5:19.0         0.00          0.0229          57.77           0.41
5:21.0         0.00          0.0215          57.76           0.39
5:23.0         0.00          0.0200          57.76           0.36
5:25.0         0.00          0.0186          57.75           0.34
5:27.0         0.00          0.0172          57.75           0.31
5:29.0         0.00          0.0157          57.75           0.29
5:31.0         0.00          0.0143          57.74           0.26
5:33.0         0.00          0.0129          57.74           0.23
5:35.0         0.00          0.0114          57.73           0.21
5:37.0         0.00          0.0100          57.73           0.18
5:39.0         0.00          0.0086          57.72           0.16
5:41.0         0.00          0.0072          57.72           0.13
5:43.0         0.00          0.0057          57.72           0.10
5:45.0         0.00          0.0043          57.71           0.08
5:47.0         0.00          0.0029          57.71           0.05
5:49.0         0.00          0.0014          57.70           0.03
5:51.0         0.00        - 0.0000          57.70         - 0.00
```

SUBBASIN K1 DATA

```
===============================================================================

K1-5YR - Hydrograph file

    Description of hydrograph :                                       Page  2

    BASIN K1 - 5 YEAR
  Area =    62.00 ac.    Rational 'C'  = .##     Time of Concent. =   9 min.
                        Storm frequency, years =   5

  Time         Flow          Time         Flow          Time         Flow
  0:01.0  *    0.0 cfs      0:07.0  *   10.0 cfs      0:13.0  *   20.0 cfs
  0:19.0  *   31.0 cfs      0:26.0  *   41.0 cfs      0:36.0  *   31.0 cfs
  0:46.0  *   21.0 cfs      0:50.0  *   17.0 cfs      0:56.0  *   12.0 cfs
  0:58.0  *   10.0 cfs      1:00.0  *    8.0 cfs      1:02.0  *    6.0 cfs
  1:04.0  *    4.0 cfs      1:06.0  *    2.0 cfs      1:08.0  *    0.0 cfs
  1:10.0  *    0.0 cfs      1:12.0  *    0.0 cfs      1:14.0  *    0.0 cfs
```

M 14/26

```
***     ROUTING  OF  HYDROGRAPH  #  5                       ***
     Date 8/22/85 SUBBASIN K1 & POND 'O' OUTFLOW  ROUTED
          Pond  File  :  PONDK1   THR  POND 'K1'

RATING CURVE FOR POND K1


                PIPES                               WEIRS
   Str   Diam    Elev       #         Left  Length   Right   Elev    Height   Type
   No.    in      ft                  S/S     ft      S/S     ft       ft
    1  -  60     79.00      1    -                                             HP

      Number            Elevation            Storage            Outflow
         1                79.00               0.000               0.00
         2                84.00               0.137             139.42
         3                86.00               0.580             203.86
         4                88.00               1.652             242.26
         5                90.00               3.739             279.03
         6                94.00              10.929             348.02


             Routing  of  Hydrograph  #  5

     Description of hydrograph :                               Page   1

     LAGGED POND O OUTFLOW AND BASIN K1 FLOW - 5 YEAR
   Area =  280.90 ac.    Rational 'C'  = .##     Time of Concent. =  24 min.
                       Storm frequency, years =    5


     Hydrograph # 6  - total outflow hydrograph
     Description :
     LAGGED OUTFLOW OF POND O AND BASIN K1 ROUTED TH. POND K1-5YR
```

Inflow H'graph: LAGGED POND O OUTFLOW AND BASIN K1 FLOW - 5 YEAR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	79.00	0.00
0:09.0	11.43	0.0119	79.43	2.80
0:11.0	17.21	0.0303	80.11	12.48
0:13.0	21.30	0.0397	80.45	19.21
0:15.0	25.67	0.0453	80.65	23.71
0:17.0	30.33	0.0507	80.85	28.38
0:19.0	35.09	0.0559	81.04	33.23
0:21.0	39.52	0.0607	81.22	37.90
0:23.0	43.96	0.0651	81.38	42.39
0:25.0	48.07	0.0692	81.52	46.70
0:27.0	50.89	0.0722	81.64	50.05
0:29.0	51.01	0.0732	81.67	51.15
0:31.0	51.39	0.0733	81.67	51.22
0:33.0	52.04	0.0738	81.69	51.82
0:35.0	52.87	0.0745	81.72	52.59
0:37.0	53.82	0.0753	81.75	53.51
0:39.0	54.68	0.0761	81.78	54.41
0:41.0	53.18	0.0756	81.76	53.82
0:43.0	51.43	0.0739	81.70	51.98
0:45.0	49.66	0.0724	81.64	50.24
0:47.0	47.88	0.0708	81.58	48.47
0:49.0	46.17	0.0692	81.53	46.73
0:51.0	44.45	0.0676	81.47	45.03
0:53.0	42.97	0.0661	81.41	43.46
0:55.0	41.44	0.0647	81.36	41.98
0:57.0	39.76	0.0631	81.30	40.36
0:59.0	37.95	0.0614	81.24	38.60
1:01.0	36.09	0.0596	81.17	36.77
1:03.0	34.21	0.0577	81.10	34.91
1:05.0	32.27	0.0557	81.03	33.01
1:07.0	29.64	0.0532	80.94	30.70
1:09.0	29.52	0.0518	80.89	29.45
1:11.0	29.60	0.0520	80.90	29.57
1:13.0	29.67	0.0521	80.90	29.64
1:15.0	29.72	0.0521	80.90	29.70
1:17.0	29.77	0.0522	80.90	29.75
1:19.0	29.80	0.0522	80.91	29.79
1:21.0	29.82	0.0522	80.91	29.81
1:23.0	29.83	0.0523	80.91	29.83
1:25.0	29.83	0.0523	80.91	29.83
1:27.0	29.81	0.0522	80.91	29.82
1:29.0	29.79	0.0522	80.91	29.80
1:31.0	29.75	0.0522	80.90	29.76
1:33.0	29.70	0.0521	80.90	29.72
1:35.0	29.64	0.0521	80.90	29.67
1:37.0	29.57	0.0520	80.90	29.60
1:39.0	29.49	0.0519	80.89	29.52
1:41.0	29.39	0.0518	80.89	29.43

Inflow H'graph: LAGGED POND Q OUTFLOW AND BASIN K1 FLOW - 5 YEAR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:43.0	29.29	0.0517	80.89	29.33
1:45.0	29.19	0.0516	80.88	29.23
1:47.0	29.08	0.0515	80.88	29.12
1:49.0	28.97	0.0514	80.87	29.01
1:51.0	28.86	0.0512	80.87	28.91
1:53.0	28.75	0.0511	80.87	28.80
1:55.0	28.65	0.0510	80.86	28.69
1:57.0	28.54	0.0509	80.86	28.58
1:59.0	28.43	0.0508	80.85	28.48
2:01.0	28.33	0.0506	80.85	28.37
2:03.0	28.22	0.0505	80.84	28.27
2:05.0	28.12	0.0504	80.84	28.16
2:07.0	28.01	0.0503	80.84	28.05
2:09.0	27.91	0.0502	80.83	27.95
2:11.0	27.80	0.0501	80.83	27.85
2:13.0	27.70	0.0499	80.82	27.74
2:15.0	27.60	0.0498	80.82	27.64
2:17.0	27.49	0.0497	80.81	27.54
2:19.0	27.39	0.0496	80.81	27.43
2:21.0	27.29	0.0495	80.81	27.33
2:23.0	27.18	0.0494	80.80	27.23
2:25.0	26.93	0.0491	80.79	27.04
2:27.0	26.29	0.0486	80.77	26.57
2:29.0	25.23	0.0476	80.74	25.69
2:31.0	23.90	0.0462	80.69	24.47
2:33.0	22.56	0.0446	80.63	23.14
2:35.0	21.30	0.0430	80.57	21.86
2:37.0	20.12	0.0415	80.52	20.65
2:39.0	19.00	0.0401	80.46	19.52
2:41.0	17.95	0.0387	80.41	18.45
2:43.0	16.95	0.0373	80.36	17.43
2:45.0	16.00	0.0360	80.32	16.46
2:47.0	15.11	0.0348	80.27	15.55
2:49.0	14.30	0.0336	80.23	14.72
2:51.0	13.59	0.0325	80.19	13.96
2:53.0	12.93	0.0315	80.15	13.28
2:55.0	12.30	0.0306	80.12	12.64
2:57.0	11.70	0.0296	80.08	12.04
2:59.0	11.13	0.0287	80.05	11.45
3:01.0	10.59	0.0279	80.02	10.90
3:03.0	10.07	0.0270	79.99	10.37
3:05.0	9.58	0.0262	79.96	9.87
3:07.0	9.11	0.0254	79.93	9.40
3:09.0	8.67	0.0246	79.90	8.95
3:11.0	8.25	0.0239	79.87	8.52
3:13.0	7.85	0.0232	79.84	8.11
3:15.0	7.46	0.0224	79.82	7.72
3:17.0	7.10	0.0218	79.79	7.34

Inflow H'graph: LAGGED POND O OUTFLOW AND BASIN K1 FLOW - 5 YEAR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:19.0	6.75	0.0211	79.77	6.99
3:21.0	6.42	0.0205	79.75	6.65
3:23.0	6.11	0.0198	79.72	6.33
3:25.0	5.82	0.0192	79.70	6.03
3:27.0	5.53	0.0187	79.68	5.74
3:29.0	5.26	0.0181	79.66	5.46
3:31.0	5.01	0.0175	79.64	5.20
3:33.0	4.76	0.0170	79.62	4.95
3:35.0	4.53	0.0165	79.60	4.71
3:37.0	4.31	0.0160	79.58	4.49
3:39.0	4.10	0.0155	79.57	4.27
3:41.0	3.90	0.0150	79.55	4.07
3:43.0	3.71	0.0146	79.53	3.87
3:45.0	3.53	0.0141	79.52	3.69
3:47.0	3.36	0.0137	79.50	3.51
3:49.0	3.19	0.0133	79.49	3.34
3:51.0	3.04	0.0129	79.47	3.18
3:53.0	2.89	0.0125	79.46	3.03
3:55.0	2.75	0.0121	79.44	2.88
3:57.0	2.62	0.0118	79.43	2.75
3:59.0	2.49	0.0114	79.42	2.61
4:01.0	2.37	0.0111	79.40	2.49
4:03.0	2.25	0.0107	79.39	2.37
4:05.0	2.14	0.0104	79.38	2.26
4:07.0	2.04	0.0101	79.37	2.15
4:09.0	1.94	0.0098	79.36	2.05
4:11.0	1.84	0.0095	79.35	1.95
4:13.0	1.75	0.0092	79.34	1.86
4:15.0	1.67	0.0089	79.33	1.77
4:17.0	1.59	0.0087	79.32	1.68
4:19.0	1.51	0.0084	79.31	1.60
4:21.0	1.44	0.0082	79.30	1.53
4:23.0	1.37	0.0079	79.29	1.45
4:25.0	1.30	0.0077	79.28	1.38
4:27.0	1.24	0.0074	79.27	1.32
4:29.0	1.18	0.0072	79.26	1.26
4:31.0	1.12	0.0070	79.26	1.20
4:33.0	1.07	0.0068	79.25	1.14
4:35.0	1.04	0.0066	79.24	1.10
4:37.0	1.01	0.0065	79.24	1.06
4:39.0	0.99	0.0064	79.23	1.03
4:41.0	0.96	0.0063	79.23	1.00
4:43.0	0.93	0.0061	79.22	0.97
4:45.0	0.91	0.0060	79.22	0.95
4:47.0	0.88	0.0059	79.22	0.92
4:49.0	0.86	0.0058	79.21	0.89
4:51.0	0.83	0.0057	79.21	0.87
4:53.0	0.80	0.0056	79.21	0.84

Inflow H'graph: LAGGED POND O OUTFLOW AND BASIN K1 FLOW - 5 YEAR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:55.0	0.78	0.0055	79.20	0.82
4:57.0	0.75	0.0054	79.20	0.79
4:59.0	0.73	0.0053	79.19	0.77
5:01.0	0.70	0.0052	79.19	0.74
5:03.0	0.67	0.0051	79.19	0.72
5:05.0	0.65	0.0050	79.18	0.69
5:07.0	0.62	0.0048	79.18	0.66
5:09.0	0.60	0.0047	79.17	0.64
5:11.0	0.57	0.0046	79.17	0.61
5:13.0	0.54	0.0045	79.16	0.59
5:15.0	0.52	0.0044	79.16	0.56
5:17.0	0.49	0.0042	79.16	0.54
5:19.0	0.47	0.0041	79.15	0.51
5:21.0	0.44	0.0040	79.15	0.49
5:23.0	0.41	0.0039	79.14	0.46
5:25.0	0.39	0.0037	79.14	0.44
5:27.0	0.36	0.0036	79.13	0.41
5:29.0	0.34	0.0035	79.13	0.39
5:31.0	0.31	0.0033	79.12	0.36
5:33.0	0.29	0.0032	79.12	0.34
5:35.0	0.26	0.0030	79.11	0.31
5:37.0	0.23	0.0029	79.11	0.29
5:39.0	0.21	0.0027	79.10	0.26
5:41.0	0.18	0.0026	79.09	0.24
5:43.0	0.16	0.0024	79.09	0.22
5:45.0	0.13	0.0022	79.08	0.19
5:47.0	0.10	0.0021	79.08	0.17
5:49.0	0.07	0.0019	79.07	0.14
5:51.0	0.00	0.0016	79.06	0.11
5:53.0	0.00	0.0013	79.05	0.08
5:55.0	0.00	0.0012	79.04	0.07
5:57.0	0.00	0.0011	79.04	0.06
5:59.0	0.00	0.0010	79.04	0.05
6:01.0	0.00	0.0009	79.03	0.04
6:03.0	0.00	0.0008	79.03	0.04
6:05.0	0.00	0.0007	79.02	0.03
6:07.0	0.00	0.0006	79.02	0.02
6:09.0	0.00	0.0004	79.02	0.01
6:11.0	0.00	0.0003	79.01	0.01
6:13.0	0.00	0.0002	79.01	0.00
6:15.0	0.00	0.0001	79.00	0.00
6:17.0	0.00	- 0.0000	79.00	0.00

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SUBBASINS N + J DATA

Hydrograph # 1
Description of hydrograph :

Date 8/23/85
Page 1

BASINS N & J - 5 YEAR STORM
Area = 163.00 ac. Rational 'C' = .## Time of Concent. = 31 min.
Storm frequency, years = 5

Inflow H'graph: BASINS N & J - 5 YEAR STORM

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:04.0	0.0	0.000	0.000
0:14.0	21.0	0.145	0.145
0:24.0	42.0	0.434	0.579
0:34.0	63.0	0.723	1.302
0:44.0	84.0	1.012	2.314
0:48.0	79.0	0.449	2.763
0:52.0	74.0	0.421	3.185
0:56.0	69.0	0.394	3.579
1:00.0	64.0	0.366	3.945
1:04.0	59.0	0.339	4.284
1:08.0	54.0	0.311	4.595
1:12.0	49.0	0.284	4.879
1:16.0	44.0	0.256	5.135
1:20.0	39.0	0.229	5.364
1:24.0	34.0	0.201	5.565
1:28.0	29.0	0.174	5.738
1:32.0	24.0	0.146	5.884
1:36.0	19.0	0.118	6.003
1:38.0	16.0	0.048	6.051
1:42.0	11.0	0.074	6.125
1:46.0	6.0	0.047	6.172
1:51.0	0.0	0.021	6.193

Depth of runoff = 0.46 in.

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SUBBASIN K2 DATA

Hydrograph # 4
Description of hydrograph :

Date 8/23/85
Page 2

BASIN K2 - 5 YEAR STORM
Area = 25.00 ac. Rational 'C' = .## Time of Concent. = 10 min.
Storm frequency, years = 5

Inflow H'graph: POND K1 OUTFLOW LAGGED 3 MINUTES - 5 YEAR STORM

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:01.0	0.0	0.000	0.000
0:07.0	3.0	0.012	0.012
0:13.0	6.0	0.037	0.050
0:19.0	10.0	0.066	0.116
0:27.0	14.0	0.132	0.248
0:29.0	13.0	0.037	0.285
0:33.0	12.0	0.069	0.354
0:37.0	11.0	0.063	0.417
0:41.0	9.0	0.055	0.472
0:45.0	8.0	0.047	0.519
0:49.0	7.0	0.041	0.561
0:53.0	6.0	0.036	0.596
0:57.0	4.0	0.028	0.624
1:01.0	3.0	0.019	0.643
1:05.0	2.0	0.014	0.657
1:10.0	0.0	0.007	0.664

Depth of runoff = 0.32 in.

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*** ROUTING OF HYDROGRAPH # 5 ***

SUBBASINS N,J+K2 + OUTFLOW OF POND 'K1'
ROUTED THROUGH POND 'K2'

Date 8/23/85

Pond File : NEWK2

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*********TRIAL THREE*********


            PIPES                                    WEIRS
 Str    Diam    Elev       #          Left  Length   Right   Elev   Height   Type
 No.     in      ft                    S/S    ft      S/S     ft      ft
  1  -   66     34.00      1    -                                             HP

      Number          Elevation          Storage          Outflow
         1              34.00             0.000             0.00
         2              35.00             0.121            11.56
         3              36.00             0.730            35.06
         4              38.00             3.492           106.30
         5              40.00             7.569           203.37
         6              42.00            12.299           265.49
         7              42.60            13.938           278.92
```

Routing of Hydrograph # 5

```
  Description of hydrograph :                                        Page   1

Area =  468.90 ac.    Rational 'C'  = .##     Time of Concent. =  31 min.
                  Storm frequency, years =   5


  Hydrograph # 6  - total outflow hydrograph
  Description :
  LAGGED OUTFLOW OF POND K1 & BASINS N,J,K2 THR. POND K2 - 5YR
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Date 8/23/85

Inflow H'graph:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	34.00	0.00
0:09.0	12.95	0.0171	34.14	0.51
0:11.0	21.19	0.0585	34.48	3.62
0:13.0	31.93	0.1125	34.93	10.30
0:15.0	44.92	0.1855	35.11	13.59
0:17.0	57.17	0.2841	35.27	16.91
0:19.0	67.57	0.4033	35.46	21.28
0:21.0	77.50	0.5371	35.68	26.61
0:23.0	87.40	0.6823	35.92	32.90
0:25.0	97.18	0.8398	36.08	37.32
0:27.0	106.12	1.0120	36.20	40.97
0:29.0	113.61	1.1963	36.34	45.01
0:31.0	119.80	1.3878	36.48	49.36
0:33.0	124.08	1.5815	36.62	53.90
0:35.0	128.12	1.7739	36.76	58.57
0:37.0	132.51	1.9650	36.89	63.34
0:39.0	136.55	2.1544	37.03	68.22
0:41.0	140.66	2.3415	37.17	73.16
0:43.0	144.52 ←	2.5259	37.30	78.16
0:45.0	143.65	2.7008	37.43	83.01
0:47.0	138.86	2.8552	37.54	87.39
0:49.0	134.10	2.9853	37.63	91.14
0:51.0	129.32	3.0928	37.71	94.28
0:53.0	124.23	3.1788	37.77	96.82
0:55.0	119.14	3.2446	37.82	98.79
0:57.0	112.90	3.2902	37.85	100.16
0:59.0	105.78	3.3145	37.87	100.89
1:01.0	98.79	3.3181	37.87	101.00 ←
1:03.0	93.03	3.3047	37.86	100.59
1:05.0	88.79	3.2791	37.85	99.82
1:07.0	84.50	3.2442	37.82	98.78
1:09.0	82.08	3.2032	37.79	97.55
1:11.0	79.69	3.1591	37.76	96.24
1:13.0	77.27	3.1121	37.72	94.85
1:15.0	74.85	3.0624	37.69	93.39
1:17.0	72.42	3.0101	37.65	91.86
1:19.0	69.98	2.9554	37.61	90.27
1:21.0	67.52	2.8983	37.57	88.62
1:23.0	65.05	2.8391	37.53	86.93
1:25.0	62.57	2.7778	37.48	85.18
1:27.0	60.07	2.7146	37.44	83.40
1:29.0	57.57	2.6494	37.39	81.57
1:31.0	55.06	2.5824	37.34	79.71
1:33.0	52.53	2.5136	37.29	77.82
1:35.0	49.92	2.4429	37.24	75.89
1:37.0	47.19	2.3703	37.19	73.93
1:39.0	44.44	2.2956	37.13	71.93
1:41.0	41.81	2.2191	37.04	69.91

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Inflow H'graph:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:43.0	39.23	2.1409	37.02	67.86
1:45.0	35.65	2.0600	36.96	65.77
1:47.0	31.35	1.9741	36.90	63.58
1:49.0	29.18	1.8854	36.84	61.34
1:51.0	29.07	1.7996	36.77	59.20
1:53.0	28.96	1.7192	36.72	57.23
1:55.0	28.85	1.6437	36.66	55.40
1:57.0	28.74	1.5727	36.61	53.70
1:59.0	28.64	1.5060	36.56	52.11
2:01.0	28.53	1.4432	36.52	50.64
2:03.0	28.42	1.3841	36.47	49.27
2:05.0	28.32	1.3282	36.43	47.99
2:07.0	28.21	1.2756	36.40	46.79
2:09.0	28.11	1.2258	36.36	45.67
2:11.0	28.00	1.1787	36.32	44.62
2:13.0	27.90	1.1342	36.29	43.63
2:15.0	27.79	1.0920	36.26	42.70
2:17.0	27.69	1.0519	36.23	41.83
2:19.0	27.59	1.0140	36.21	41.01
2:21.0	27.48	0.9779	36.18	40.24
2:23.0	27.38	0.9437	36.15	39.51
2:25.0	27.26	0.9110	36.13	38.82
2:27.0	27.07	0.8798	36.11	38.16
2:29.0	26.75	0.8497	36.09	37.53
2:31.0	26.08	0.8199	36.07	36.91
2:33.0	25.01	0.7895	36.04	36.28
2:35.0	23.79	0.7576	36.02	35.63
2:37.0	22.52	0.7244	35.99	34.81
2:39.0	21.28	0.6909	35.94	33.28
2:41.0	20.09	0.6582	35.88	31.82
2:43.0	18.99	0.6264	35.83	30.42
2:45.0	17.95	0.5953	35.78	29.07
2:47.0	16.97	0.5651	35.73	27.78
2:49.0	16.03	0.5357	35.68	26.55
2:51.0	15.16	0.5071	35.63	25.38
2:53.0	14.35	0.4794	35.59	24.26
2:55.0	13.63	0.4526	35.54	23.19
2:57.0	12.97	0.4267	35.50	22.18
2:59.0	12.35	0.4018	35.46	21.22
3:01.0	11.76	0.3778	35.42	20.31
3:03.0	11.19	0.3547	35.38	19.45
3:05.0	10.64	0.3323	35.35	18.63
3:07.0	10.13	0.3106	35.31	17.85
3:09.0	9.64	0.2897	35.28	17.11
3:11.0	9.18	0.2695	35.24	16.40
3:13.0	8.74	0.2499	35.21	15.73
3:15.0	8.32	0.2310	35.18	15.09
3:17.0	7.91	0.2126	35.15	14.48

M 24/26

Inflow H'graph:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:19.0	7.53	0.1948	35.12	13.89
3:21.0	7.17	0.1776	35.09	13.33
3:23.0	6.83	0.1609	35.07	12.80
3:25.0	6.50	0.1446	35.04	12.29
3:27.0	6.19	0.1289	35.01	11.81
3:29.0	5.89	0.1147	34.95	10.61
3:31.0	5.61	0.1035	34.85	9.01
3:33.0	5.34	0.0953	34.79	7.89
3:35.0	5.08	0.0890	34.74	7.08
3:37.0	4.84	0.0840	34.69	6.45
3:39.0	4.60	0.0799	34.66	5.96
3:41.0	4.38	0.0765	34.63	5.55
3:43.0	4.17	0.0734	34.61	5.20
3:45.0	3.97	0.0707	34.58	4.90
3:47.0	3.78	0.0683	34.56	4.63
3:49.0	3.60	0.0660	34.55	4.39
3:51.0	3.43	0.0639	34.53	4.17
3:53.0	3.26	0.0619	34.51	3.96
3:55.0	3.11	0.0601	34.50	3.77
3:57.0	2.96	0.0583	34.48	3.59
3:59.0	2.82	0.0566	34.47	3.43
4:01.0	2.68	0.0549	34.45	3.27
4:03.0	2.55	0.0533	34.44	3.12
4:05.0	2.43	0.0518	34.43	2.98
4:07.0	2.32	0.0503	34.42	2.84
4:09.0	2.21	0.0489	34.40	2.71
4:11.0	2.10	0.0475	34.39	2.59
4:13.0	2.00	0.0462	34.38	2.48
4:15.0	1.90	0.0449	34.37	2.37
4:17.0	1.81	0.0436	34.36	2.26
4:19.0	1.73	0.0424	34.35	2.16
4:21.0	1.64	0.0412	34.34	2.07
4:23.0	1.57	0.0401	34.33	1.98
4:25.0	1.49	0.0390	34.32	1.89
4:27.0	1.42	0.0379	34.31	1.81
4:29.0	1.35	0.0369	34.30	1.73
4:31.0	1.29	0.0358	34.30	1.65
4:33.0	1.23	0.0349	34.29	1.58
4:35.0	1.17	0.0339	34.28	1.51
4:37.0	1.12	0.0330	34.27	1.45
4:39.0	1.08	0.0321	34.27	1.39
4:41.0	1.04	0.0313	34.26	1.33
4:43.0	1.01	0.0305	34.25	1.28
4:45.0	0.99	0.0298	34.25	1.23
4:47.0	0.96	0.0292	34.24	1.19
4:49.0	0.93	0.0286	34.24	1.15
4:51.0	0.91	0.0280	34.23	1.11
4:53.0	0.88	0.0274	34.23	1.08

Inflow H'graph:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:55.0	0.86	0.0269	34.22	1.04
4:57.0	0.83	0.0264	34.22	1.01
4:59.0	0.80	0.0259	34.21	0.98
5:01.0	0.78	0.0254	34.21	0.95
5:03.0	0.75	0.0249	34.21	0.92
5:05.0	0.73	0.0245	34.20	0.90
5:07.0	0.70	0.0240	34.20	0.87
5:09.0	0.68	0.0236	34.19	0.84
5:11.0	0.65	0.0231	34.19	0.82
5:13.0	0.63	0.0226	34.19	0.79
5:15.0	0.60	0.0222	34.18	0.77
5:17.0	0.58	0.0217	34.18	0.74
5:19.0	0.55	0.0213	34.18	0.72
5:21.0	0.53	0.0208	34.17	0.69
5:23.0	0.50	0.0204	34.17	0.67
5:25.0	0.48	0.0199	34.16	0.64
5:27.0	0.45	0.0194	34.16	0.62
5:29.0	0.43	0.0190	34.16	0.60
5:31.0	0.40	0.0185	34.15	0.57
5:33.0	0.38	0.0180	34.15	0.55
5:35.0	0.35	0.0175	34.14	0.53
5:37.0	0.33	0.0170	34.14	0.50
5:39.0	0.30	0.0166	34.14	0.48
5:41.0	0.28	0.0161	34.13	0.46
5:43.0	0.25	0.0156	34.13	0.43
5:45.0	0.23	0.0151	34.12	0.41
5:47.0	0.20	0.0145	34.12	0.39
5:49.0	0.18	0.0140	34.12	0.37
5:51.0	0.16	0.0135	34.11	0.35
5:53.0	0.13	0.0130	34.11	0.32
5:55.0	0.10	0.0124	34.10	0.30
5:57.0	0.08	0.0119	34.10	0.28
5:59.0	0.07	0.0113	34.09	0.26
6:01.0	0.05	0.0108	34.09	0.24
6:03.0	0.00	0.0102	34.08	0.22
6:05.0	0.00	0.0099	34.08	0.21
6:07.0	0.00	0.0096	34.08	0.20
6:09.0	0.00	0.0093	34.08	0.19
6:11.0	0.00	0.0090	34.07	0.18
6:13.0	0.00	0.0087	34.07	0.17
6:15.0	0.00	0.0084	34.07	0.16
6:17.0	0.00	0.0081	34.07	0.15
6:19.0	0.00	0.0078	34.06	0.14
6:21.0	0.00	0.0075	34.06	0.14
6:23.0	0.00	0.0072	34.06	0.13
6:25.0	0.00	0.0069	34.06	0.12
6:27.0	0.00	0.0066	34.05	0.11
6:29.0	0.00	0.0063	34.05	0.10

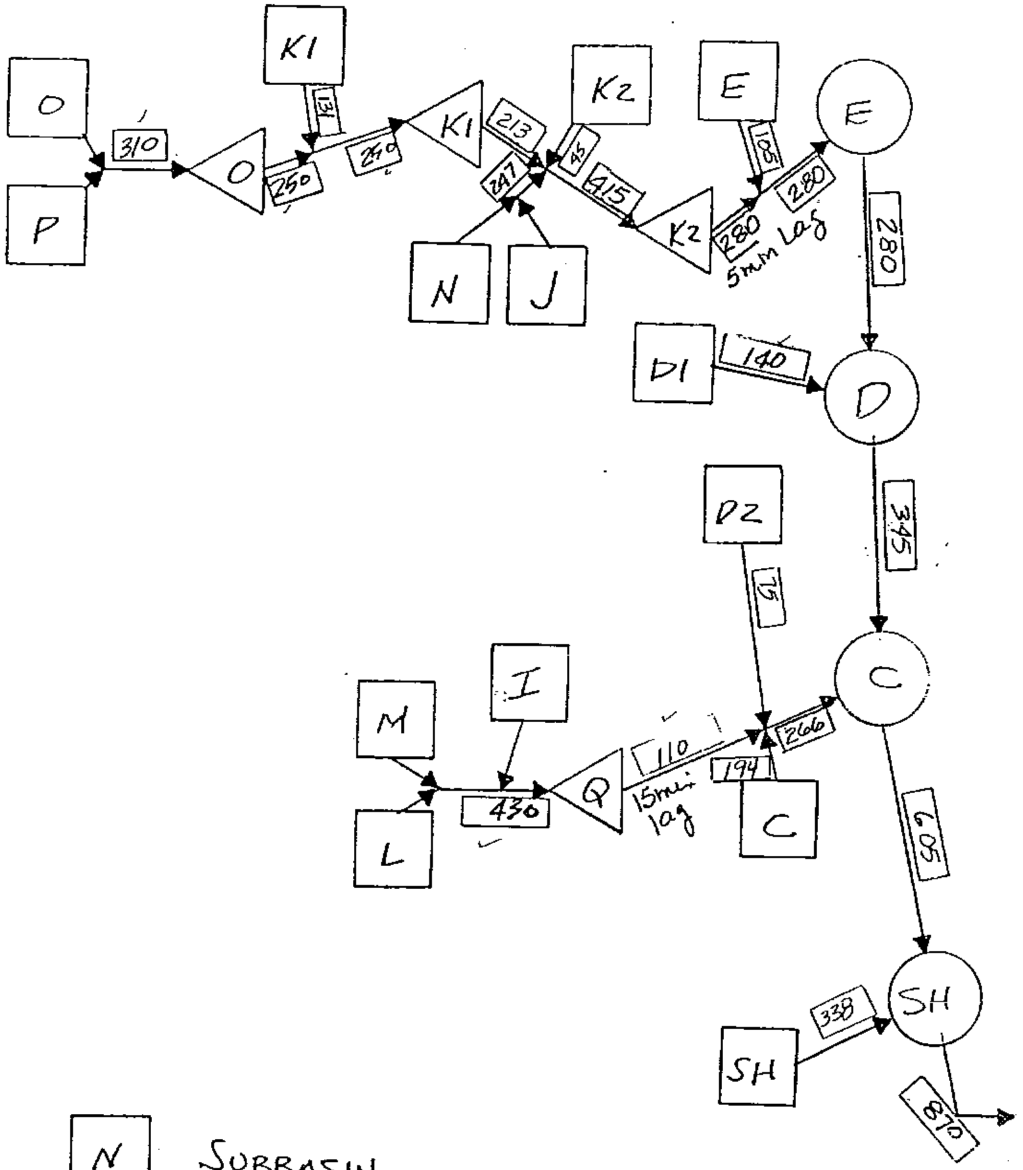
Inflow H'graph:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:31.0	0.00	0.0060	34.05	0.10
6:33.0	0.00	0.0057	34.05	0.09
6:35.0	0.00	0.0054	34.04	0.08
6:37.0	0.00	0.0051	34.04	0.07
6:39.0	0.00	0.0048	34.04	0.07
6:41.0	0.00	0.0045	34.04	0.06
6:43.0	0.00	0.0042	34.03	0.05
6:45.0	0.00	0.0039	34.03	0.05
6:47.0	0.00	0.0036	34.03	0.04
6:49.0	0.00	0.0033	34.03	0.04
6:51.0	0.00	0.0030	34.02	0.03
6:53.0	0.00	0.0027	34.02	0.03
6:55.0	0.00	0.0024	34.02	0.02
6:57.0	0.00	0.0021	34.02	0.02
6:59.0	0.00	0.0018	34.01	0.01
7:01.0	0.00	0.0015	34.01	0.01
7:03.0	0.00	0.0012	34.01	0.01
7:05.0	0.00	0.0009	34.01	0.00
7:07.0	0.00	0.0006	34.00	0.00
7:09.0	0.00	0.0003	34.00	0.00
7:11.0	0.00	- 0.0000	34.00	0.00

APPENDIX N

Project
MASTER DRAINAGE - AREA II CHEYENNE MT RANCH
Job No
E-2825
Client
GATES
By
DEM
Date
10/10/85

FIGURE 1.
BASIN ROUTING SCHEMATIC
100YR- 6HR STORM



N SUBBASIN

C POINT OF CONCENTRATION

Q POND

110 100-YR PEAK DISCHARGE

* These revised discharge values are the same or less than the discharge values calculated and approved in Drexel, Barrell's "Master Drainage Report for a Portion of Area II, Cheyenne Mountain Center". The outfall storm sewer was designed using the higher discharge values previously calculated.

OP100 — Hydrograph file

```
    Description of hydrograph :                                      Page   1

    100-YR RUNOFF, BASINS O & P
  Area =     1.00 ac.    Rational 'C'  = .##    Time of Concent. =   1 min.
                            Storm frequency, years = 100


   Time         Flow            Time         Flow            Time         Flow
  0:03.0  *    0.0 cfs        0:15.0  * 103.0 cfs        0:27.0  * 207.0 cfs
  0:39.0  *  310.0 cfs        0:59.0  * 207.0 cfs        1:19.0  * 103.0 cfs
  1:39.0  *    0.0 cfs        1:59.0  *   0.0 cfs        1:39.0  *   0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 1 ***

N-3/47

Date 10/08/85

Pond File : PONDO

RATING CURVE FOR POND O

Number	Elevation	Storage	Outflow
1	57.70	0.000	0.00
2	60.00	0.800	14.50
3	62.00	1.400	27.00
4	64.00	7.300	35.00
5	64.50	8.700	74.00
6	64.70	9.000	174.00
7	65.00	10.000	495.00

Routing of Hydrograph # 1

Description of hydrograph :

100-YR RUNOFF, BASINS O & P
Area = 1.00 ac. Rational 'C' = .## Time of Concent. = 1 min.
Storm frequency, years = 100

Hydrograph # 2 - total outflow hydrograph
Description :
BASINS O&P ROUTED THROUGH POND O - 100 YEAR, 6 HOUR

Inflow H'graph: 100-YR RUNOFF, BASINS O & P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	57.70	0.00
0:06.0	25.75	0.0513	57.85	0.93
0:09.0	51.50	0.2014	58.28	3.65
0:12.0	77.25	0.4433	58.97	8.03
0:15.0	103.00	0.7703	59.91	13.96
0:18.0	129.00	1.1747	61.25	22.31
0:21.0	155.00	1.6589	62.09	27.35
0:24.0	181.00	2.2384	62.28	28.14
0:27.0	207.00	2.9219	62.52	29.06
0:30.0	232.75	3.7082	62.78	30.13
0:33.0	258.50	4.5962	63.08	31.33
0:36.0	284.25	5.5853	63.42	32.67
0:39.0	310.00	6.6750	63.79	34.15
0:42.0	294.55	7.7550	64.16	47.68
0:45.0	279.10	8.6895	64.50	73.71
0:48.0	263.65	9.1798	64.75	231.72
0:51.0	248.20	9.2399	64.77	251.02
0:54.0	232.75	9.2137	64.76	242.61
0:57.0	217.30	9.1700	64.75	228.59
1:00.0	201.80	9.1228	64.74	213.40
1:03.0	186.20	9.0745	64.72	197.93
1:06.0	170.60	9.0260	64.71	182.35
1:09.0	155.00	8.9778	64.69	166.59
1:12.0	139.40	8.9303	64.65	150.78
1:15.0	123.80	8.8834	64.62	135.13
1:18.0	108.20	8.8366	64.59	119.53
1:21.0	92.70	8.7899	64.56	103.97
1:24.0	77.25	8.7434	64.53	88.48
1:27.0	61.80	8.6953	64.50	73.87
1:30.0	46.35	8.6180	64.47	71.71
1:33.0	30.90	8.4887	64.42	68.11
1:36.0	15.45	8.3131	64.36	63.22
1:39.0	0.00	8.0962	64.28	57.18
1:42.0	0.00	7.8728	64.20	50.96
1:45.0	0.00	7.6737	64.13	45.41
1:48.0	0.00	7.4963	64.07	40.47
1:51.0	0.00	7.3381	64.01	36.06
1:54.0	0.00	7.1916	63.96	34.85
1:57.0	0.00	7.0480	63.91	34.66
2:00.0	0.00	6.9052	63.87	34.46
2:03.0	0.00	6.7632	63.82	34.27
2:06.0	0.00	6.6220	63.77	34.08
2:09.0	0.00	6.4815	63.72	33.89
2:12.0	0.00	6.3419	63.68	33.70
2:15.0	0.00	6.2030	63.63	33.51
2:18.0	0.00	6.0649	63.58	33.33
2:21.0	0.00	5.9276	63.53	33.14
2:24.0	0.00	5.7910	63.49	32.95

Inflow H'graph: 100-YR RUNOFF, BASINS O & P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
2:27.0	0.00	5.6552	63.44	32.77
2:30.0	0.00	5.5202	63.40	32.59
2:33.0	0.00	5.3859	63.35	32.40
2:36.0	0.00	5.2524	63.31	32.22
2:39.0	0.00	5.1196	63.26	32.04
2:42.0	0.00	4.9876	63.22	31.86
2:45.0	0.00	4.8563	63.17	31.69
2:48.0	0.00	4.7257	63.13	31.51
2:51.0	0.00	4.5958	63.08	31.33
2:54.0	0.00	4.4667	63.04	31.16
2:57.0	0.00	4.3383	63.00	30.98
3:00.0	0.00	4.2107	62.95	30.81
3:03.0	0.00	4.0837	62.91	30.64
3:06.0	0.00	3.9574	62.87	30.47
3:09.0	0.00	3.8319	62.82	30.30
3:12.0	0.00	3.7071	62.78	30.13
3:15.0	0.00	3.5829	62.74	29.96
3:18.0	0.00	3.4594	62.70	29.79
3:21.0	0.00	3.3367	62.66	29.63
3:24.0	0.00	3.2146	62.62	29.46
3:27.0	0.00	3.0932	62.57	29.30
3:30.0	0.00	2.9725	62.53	29.13
3:33.0	0.00	2.8524	62.49	28.97
3:36.0	0.00	2.7331	62.45	28.81
3:39.0	0.00	2.6144	62.41	28.65
3:42.0	0.00	2.4963	62.37	28.49
3:45.0	0.00	2.3789	62.33	28.33
3:48.0	0.00	2.2622	62.29	28.17
3:51.0	0.00	2.1461	62.25	28.01
3:54.0	0.00	2.0307	62.21	27.86
3:57.0	0.00	1.9159	62.17	27.70
4:00.0	0.00	1.8018	62.14	27.54
4:03.0	0.00	1.6883	62.10	27.39
4:06.0	0.00	1.5754	62.06	27.24
4:09.0	0.00	1.4632	62.02	27.09
4:12.0	0.00	1.3534	61.84	26.03
4:15.0	0.00	1.2503	61.50	23.88
4:18.0	0.00	1.1557	61.19	21.91
4:21.0	0.00	1.0689	60.90	20.10
4:24.0	0.00	0.9893	60.63	18.44
4:27.0	0.00	0.9162	60.39	16.92
4:30.0	0.00	0.8492	60.16	15.52
4:33.0	0.00	0.7876	59.96	14.27
4:36.0	0.00	0.7307	59.80	13.24
4:39.0	0.00	0.6780	59.65	12.29
4:42.0	0.00	0.6290	59.51	11.40
4:45.0	0.00	0.5836	59.38	10.58
4:48.0	0.00	0.5415	59.26	9.81

Inflow H'graph: 100-YR RUNOFF, BASINS O & P

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:51.0	0.00	0.5024	59.14	9.11
4:54.0	0.00	0.4661	59.04	8.45
4:57.0	0.00	0.4325	58.94	7.84
5:00.0	0.00	0.4013	58.85	7.27
5:03.0	0.00	0.3723	58.77	6.75
5:06.0	0.00	0.3454	58.69	6.26
5:09.0	0.00	0.3205	58.62	5.81
5:12.0	0.00	0.2973	58.55	5.39
5:15.0	0.00	0.2759	58.49	5.00
5:18.0	0.00	0.2560	58.44	4.64
5:21.0	0.00	0.2375	58.38	4.30
5:24.0	0.00	0.2203	58.33	3.99
5:27.0	0.00	0.2044	58.29	3.71
5:30.0	0.00	0.1969	58.27	3.57
5:33.0	0.00	0.1893	58.24	3.43
5:36.0	0.00	0.1817	58.22	3.29
5:39.0	0.00	0.1741	58.20	3.16
5:42.0	0.00	0.1666	58.18	3.02
5:45.0	0.00	0.1590	58.16	2.88
5:48.0	0.00	0.1514	58.14	2.74
5:51.0	0.00	0.1439	58.11	2.61
5:54.0	0.00	0.1363	58.09	2.47
5:57.0	0.00	0.1287	58.07	2.33
6:00.0	0.00	0.1211	58.05	2.20
6:03.0	0.00	0.1136	58.03	2.06
6:06.0	0.00	0.1060	58.00	1.92
6:09.0	0.00	0.0984	57.98	1.78
6:12.0	0.00	0.0909	57.96	1.65
6:15.0	0.00	0.0833	57.94	1.51
6:18.0	0.00	0.0757	57.92	1.37
6:21.0	0.00	0.0681	57.90	1.24
6:24.0	0.00	0.0606	57.87	1.10
6:27.0	0.00	0.0530	57.85	0.96
6:30.0	0.00	0.0454	57.83	0.82
6:33.0	0.00	0.0379	57.81	0.69
6:36.0	0.00	0.0303	57.79	0.55
6:39.0	0.00	0.0227	57.77	0.41
6:42.0	0.00	0.0151	57.74	0.27
6:45.0	0.00	0.0076	57.72	0.14
6:48.0	0.00	-0.0000	57.70	-0.00

K1100 – Hydrograph file

```
     Description of hydrograph :                                          Page   2

     100-YEAR RUNOFF FROM BASIN K1
   Area =     1.00 ac.     Rational 'C'  = .##     Time of Concent. =   1 min.
                              Storm frequency, years = 100


    Time          Flow             Time          Flow             Time          Flow
   0:01.0   *    0.0 cfs         0:11.0   *   52.0 cfs         0:21.0   *  105.0 cfs
   0:26.0   *  131.0 cfs         0:34.0   *  105.0 cfs         0:51.0   *   52.0 cfs
   1:07.0   *    0.0 cfs         1:59.0   *    0.0 cfs         1:21.0   *    0.0 cfs
```

N-8/47

*** ROUTING OF HYDROGRAPH # 4 ***

Date 10/08/85

Pond File : PONDK1

```
RATING CURVE FOR POND K1


                 PIPES                                WEIRS
Str    Diam     Elev      #         Left   Length    Right    Elev    Height   Type
No.     in       ft                 S/S      ft       S/S      ft       ft
 1  -   60     79.00      1   -                                                 HP

         Number            Elevation           Storage           Outflow
            1                79.00              0.000              0.00
            2                84.00              0.137            139.42
            3                86.00              0.580            203.86
            4                88.00              1.652            242.26
            5                90.00              3.739            279.03
            6                94.00             10.929            348.02
```

Routing of Hydrograph # 4

```
  Description of hydrograph :                                  Page   1

  BASIN K1 + LAGGED POND O OUTFLOW  - 100 YEAR, 6 HOUR
Area =    2.00 ac.    Rational 'C'  = .##    Time of Concent. =   1 min.
                  Storm frequency, years = 100


  Hydrograph # 5  - total outflow hydrograph
  Description :
  BASIN K1 AND LAGGED POND O OUTFLOW ROUTED TH. POND K1
```

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	79.00	0.00
0:13.0	66.25	0.0600	81.19	37.21
0:16.0	86.53	0.1064	82.88	93.10
0:19.0	108.36	0.1110	83.05	99.58
0:22.0	132.51	0.1319	83.81	131.18
0:25.0	153.15	0.1553	84.08	143.13
0:28.0	152.64	0.1836	84.21	148.94
0:31.0	143.81	0.1816	84.20	148.51
0:34.0	135.13	0.1553	84.08	143.14
0:37.0	126.98	0.1315	83.80	130.52
0:40.0	118.97	0.1241	83.53	119.00
0:43.0	111.09	0.1201	83.38	112.98
0:46.0	115.26	0.1203	83.39	113.28
0:49.0	131.94	0.1305	83.76	129.00
0:52.0	231.72	0.2700	84.60	167.16
0:55.0	251.02	0.5131	85.70	197.90
0:58.0	242.61	0.6943	86.21	208.04
1:01.0	228.59	0.8002	86.41	211.90
1:04.0	213.40	0.8352	86.48	213.17
1:07.0	197.93	0.8063	86.42	212.12
1:10.0	182.35	0.7219	86.26	209.05
1:13.0	166.59	0.5890	86.02	204.19
1:16.0	150.78	0.4295	85.32	190.38
1:19.0	135.13	0.2780	84.64	168.89
1:22.0	119.53	0.1582	84.10	143.73
1:25.0	103.97	0.1126	83.11	101.86
1:28.0	88.48	0.1067	82.89	93.44
1:31.0	73.87	0.0933	82.40	75.39
1:34.0	71.71	0.0903	82.30	71.62
1:37.0	68.11	0.0884	82.23	69.15
1:40.0	63.22	0.0843	82.08	64.14
1:43.0	57.18	0.0796	81.91	58.53
1:46.0	50.96	0.0742	81.71	52.25
1:49.0	45.41	0.0691	81.52	46.60
1:52.0	40.47	0.0643	81.35	41.58
1:55.0	36.06	0.0599	81.19	37.09
1:58.0	34.85	0.0576	81.10	34.90
2:01.0	34.66	0.0574	81.10	34.71
2:04.0	34.46	0.0572	81.09	34.51
2:07.0	34.27	0.0570	81.08	34.32
2:10.0	34.08	0.0568	81.07	34.13
2:13.0	33.89	0.0566	81.07	33.94
2:16.0	33.70	0.0564	81.06	33.75
2:19.0	33.51	0.0563	81.05	33.56
2:22.0	33.33	0.0561	81.05	33.37
2:25.0	33.14	0.0559	81.04	33.19
2:28.0	32.95	0.0557	81.03	33.00
2:31.0	32.77	0.0555	81.02	32.82

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
2:34.0	32.59	0.0553	81.02	32.63
2:37.0	32.40	0.0551	81.01	32.45
2:40.0	32.22	0.0549	81.00	32.27
2:43.0	32.04	0.0547	81.00	32.09
2:46.0	31.86	0.0545	80.99	31.91
2:49.0	31.69	0.0543	80.98	31.73
2:52.0	31.51	0.0541	80.98	31.56
2:55.0	31.33	0.0539	80.97	31.38
2:58.0	31.16	0.0538	80.96	31.20
3:01.0	30.98	0.0536	80.95	31.03
3:04.0	30.81	0.0534	80.95	30.86
3:07.0	30.64	0.0532	80.94	30.68
3:10.0	30.47	0.0530	80.93	30.51
3:13.0	30.30	0.0528	80.93	30.34
3:16.0	30.13	0.0526	80.92	30.17
3:19.0	29.96	0.0524	80.91	30.00
3:22.0	29.79	0.0523	80.91	29.84
3:25.0	29.63	0.0521	80.90	29.67
3:28.0	29.46	0.0519	80.89	29.50
3:31.0	29.30	0.0517	80.89	29.34
3:34.0	29.13	0.0515	80.88	29.18
3:37.0	28.97	0.0514	80.87	29.01
3:40.0	28.81	0.0512	80.87	28.85
3:43.0	28.65	0.0510	80.86	28.69
3:46.0	28.49	0.0508	80.85	28.53
3:49.0	28.33	0.0506	80.85	28.37
3:52.0	28.17	0.0505	80.84	28.21
3:55.0	28.01	0.0503	80.84	28.05
3:58.0	27.86	0.0501	80.83	27.90
4:01.0	27.70	0.0499	80.82	27.74
4:04.0	27.54	0.0498	80.82	27.59
4:07.0	27.39	0.0496	80.81	27.43
4:10.0	27.24	0.0494	80.80	27.28
4:13.0	27.09	0.0492	80.80	27.13
4:16.0	26.03	0.0484	80.77	26.39
4:19.0	23.88	0.0463	80.69	24.55
4:22.0	21.91	0.0438	80.60	22.45
4:25.0	20.10	0.0415	80.52	20.64
4:28.0	18.44	0.0394	80.44	18.95
4:31.0	16.92	0.0373	80.36	17.40
4:34.0	15.52	0.0354	80.29	15.98
4:37.0	14.27	0.0336	80.23	14.69
4:40.0	13.24	0.0320	80.17	13.60
4:43.0	12.29	0.0305	80.11	12.63
4:46.0	11.40	0.0292	80.06	11.73
4:49.0	10.58	0.0278	80.02	10.89
4:52.0	9.81	0.0266	79.97	10.11
4:55.0	9.11	0.0254	79.93	9.39

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:58.0	8.45	0.0242	79.88	8.72
5:01.0	7.84	0.0231	79.84	8.10
5:04.0	7.27	0.0221	79.81	7.52
5:07.0	6.75	0.0211	79.77	6.98
5:10.0	6.26	0.0201	79.73	6.49
5:13.0	5.81	0.0192	79.70	6.02
5:16.0	5.39	0.0184	79.67	5.59
5:19.0	5.00	0.0175	79.64	5.20
5:22.0	4.64	0.0167	79.61	4.83
5:25.0	4.30	0.0160	79.58	4.48
5:28.0	3.99	0.0153	79.56	4.16
5:31.0	3.71	0.0146	79.53	3.87
5:34.0	3.57	0.0141	79.51	3.65
5:37.0	3.43	0.0137	79.50	3.51
5:40.0	3.29	0.0134	79.49	3.38
5:43.0	3.16	0.0130	79.48	3.24
5:46.0	3.02	0.0127	79.46	3.10
5:49.0	2.88	0.0124	79.45	2.97
5:52.0	2.74	0.0120	79.44	2.83
5:55.0	2.61	0.0116	79.42	2.70
5:58.0	2.47	0.0113	79.41	2.56
6:01.0	2.33	0.0109	79.40	2.42
6:04.0	2.20	0.0105	79.38	2.29
6:07.0	2.06	0.0101	79.37	2.15
6:10.0	1.92	0.0097	79.35	2.02
6:13.0	1.78	0.0093	79.34	1.88
6:16.0	1.65	0.0089	79.32	1.75
6:19.0	1.51	0.0084	79.31	1.62
6:22.0	1.37	0.0080	79.29	1.48
6:25.0	1.24	0.0075	79.28	1.35
6:28.0	1.10	0.0071	79.26	1.21
6:31.0	0.96	0.0066	79.24	1.08
6:34.0	0.82	0.0061	79.22	0.95
6:37.0	0.69	0.0055	79.20	0.82
6:40.0	0.55	0.0050	79.18	0.69
6:43.0	0.41	0.0044	79.16	0.56
6:46.0	0.27	0.0037	79.14	0.44
6:49.0	0.14	0.0030	79.11	0.31
6:52.0	0.00	0.0023	79.08	0.20
6:55.0	0.00	0.0019	79.07	0.15
6:58.0	0.00	0.0015	79.05	0.10
7:01.0	0.00	0.0011	79.04	0.06
7:04.0	0.00	0.0008	79.03	0.03
7:07.0	0.00	0.0004	79.01	0.01
7:10.0	0.00	0.0000	79.00	0.00

K2/100/6 — Hydrograph file

```
   Description of hydrograph :                                    Page   3

   100-YR, 6-HR RUNOFF, BASIN K2
 Area =    25.00 ac.    Rational 'C'  = .##    Time of Concent. =  10 min.
                          Storm frequency, years = 100


  Time           Flow            Time           Flow            Time           Flow
 0:01.0   *    0.0 cfs         0:04.0   *    5.0 cfs         0:07.0   *   10.0 cfs
 0:10.0   *   15.0 cfs         0:13.0   *   20.0 cfs         0:16.0   *   25.0 cfs
 0:19.0   *   30.0 cfs         0:22.0   *   35.0 cfs         0:25.0   *   40.0 cfs
 0:28.0   *   45.0 cfs         0:33.0   *   40.0 cfs         0:38.0   *   35.0 cfs
 0:42.0   *   31.0 cfs         0:47.0   *   26.0 cfs         0:52.0   *   21.0 cfs
 0:57.0   *   16.0 cfs         1:02.0   *    9.0 cfs         1:07.0   *    6.0 cfs
 1:13.0   *    0.0 cfs         1:19.0   *    0.0 cfs         1:25.0   *    0.0 cfs
```

```
N&J@K2 — Hydrograph file

    Description of hydrograph :                                  Page   1

    100 YR FLOW AT BASINS N & J
  Area =     1.00 ac.    Rational 'C'  = .##     Time of Concent. =   1 min.
                        Storm frequency, years = 100


   Time          Flow          Time          Flow          Time         Flow
  0:04.0  *    0.0 cfs        0:18.0  *   82.0 cfs        0:32.0  * 165.0 cfs
  0:46.0  *  247.0 cfs        1:08.0  *  165.0 cfs        1:30.0  *  82.0 cfs
  1:52.0  *    0.0 cfs        1:59.0  *    0.0 cfs        1:56.0  *   0.0 cfs
```

N-14/47

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      ***   ROUTING OF HYDROGRAPH # 2   ***

   Date 10/08/85

        Pond File  :  NEWK2

 ***TRIAL THREE - WITH BOTH PIPE AND OVERFLOW WEIR***


            PIPES                              WEIRS
 Str   Diam    Elev     #        Left  Length  Right   Elev   Height   Type
 No.    in      ft               S/S     ft     S/S     ft      ft
  1  -  66    34.00     1   -                                           HP
  2  -                      -    2.0   25.00    2.0   42.60    5.4      BC

     Number          Elevation          Storage          Outflow
        1              34.00             0.000             0.00
        2              35.00             0.121            11.56
        3              36.00             0.730            35.06
        4              38.00             3.492           106.30
        5              40.00             7.569           203.37
        6              42.00            12.299           265.49
        7              42.60            13.938           278.92
        8              44.00            17.806           429.07
        9              45.50            22.311           752.97
       10              48.00            31.002          1667.44


        Routing of Hydrograph # 2

   Description of hydrograph :                              Page   1

   BASINS K2,N&J + LAGGED POND K1 OUTFLOW -100 YEAR, 6 HOUR
 Area =    28.00 ac.    Rational 'C'  = .##     Time of Concent. =  10 min.
                     Storm frequency, years = 100


   Hydrograph # 3  - total outflow hydrograph
   Description :
   BASINS K2,N&J + LAGGED POND K1 OUTFLOW ROUTED THR. POND K2
```

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW -100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
0:00.0	0.00	0.0000	34.00	0.00	0.00
0:07.0	39.02	0.0705	34.58	4.88	4.88
0:10.0	70.18	0.2533	35.22	15.85	15.85
0:13.0	101.34	0.5213	35.66	25.96	25.96
0:16.0	132.50	0.8723	36.10	38.00	38.00
0:19.0	211.03	1.4010	36.49	49.66	49.66
0:22.0	240.30	2.0932	36.99	66.63	66.63
0:25.0	294.68	2.8789	37.56	88.06	88.06
0:28.0	329.42	3.7553	38.13	111.85	111.85
0:31.0	350.01	4.6561	38.57	131.61	131.61
0:34.0	364.23	5.5453	39.01	152.27	152.27
0:37.0	373.42	6.3971	39.43	173.10	173.10
0:40.0	375.38	7.1872	39.81	193.31	193.31
0:43.0	378.43	7.9088	40.14	211.22	211.22
0:46.0	386.98	8.5845	40.43	227.15	227.15
0:49.0	373.10	9.1962	40.69	236.88	236.88
0:52.0	374.63	9.7539	40.92	240.93	240.93
0:55.0	398.61	10.3440	41.17	246.68	246.68
0:58.0	414.77	10.9922	41.45	252.96	252.96
1:01.0	409.53	11.6372	41.72	259.17	259.17
1:04.0	399.61	12.2264	41.97	264.80	264.80
1:07.0	387.89	12.7502	42.17	269.21	269.21
1:10.0	369.58	13.1952	42.33	272.86	272.86
1:13.0	355.18	13.5590	42.46	275.83	275.83
1:16.0	339.01	13.8486	42.57	278.20	278.20
1:19.0	313.88	14.0437	42.64	280.24	279.77
1:22.0	281.07	14.1127	42.66	281.31	280.33
1:25.0	244.59	14.0387	42.64	280.16	279.73
1:28.0	191.40	13.7870	42.54	277.69	277.69
1:31.0	93.44	13.2373	42.34	273.20	273.20
1:34.0	75.39	12.4702	42.06	266.90	266.90
1:37.0	71.62	11.6860	41.74	259.64	259.64
1:40.0	69.15	10.9192	41.42	252.26	252.26
1:43.0	64.14	10.1673	41.10	244.96	244.96
1:46.0	58.53	9.4235	40.78	237.69	237.69
1:49.0	52.25	8.6869	40.47	229.61	229.61
1:52.0	46.60	7.9771	40.17	212.81	212.81
1:55.0	41.58	7.3133	39.87	196.61	196.61
1:58.0	37.09	6.6964	39.57	180.66	180.66
2:01.0	34.90	6.1281	39.29	166.41	166.41
2:04.0	34.71	5.6102	39.04	153.82	153.82
2:07.0	34.51	5.1406	38.81	142.72	142.72
2:10.0	34.32	4.7133	38.60	132.90	132.90
2:13.0	34.13	4.3236	38.41	124.17	124.17
2:16.0	33.94	3.9672	38.23	116.39	116.39
2:19.0	33.75	3.6405	38.07	109.42	109.42
2:22.0	33.56	3.3433	37.89	101.76	101.76
2:25.0	33.37	3.0774	37.70	93.83	93.83

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW -100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
2:28.0	33.19	2.8414	37.53	86.99	86.99
2:31.0	33.00	2.6309	37.38	81.06	81.06
2:34.0	32.82	2.4426	37.24	75.88	75.88
2:37.0	32.63	2.2737	37.12	71.35	71.35
2:40.0	32.45	2.1215	37.01	67.36	67.36
2:43.0	32.27	1.9842	36.91	63.83	63.83
2:46.0	32.09	1.8599	36.82	60.70	60.70
2:49.0	31.91	1.7470	36.74	57.91	57.91
2:52.0	31.73	1.6444	36.66	55.41	55.41
2:55.0	31.56	1.5508	36.59	53.17	53.17
2:58.0	31.38	1.4653	36.53	51.16	51.16
3:01.0	31.20	1.3869	36.48	49.34	49.34
3:04.0	31.03	1.3151	36.42	47.69	47.69
3:07.0	30.86	1.2490	36.38	46.19	46.19
3:10.0	30.68	1.1881	36.33	44.83	44.83
3:13.0	30.51	1.1319	36.29	43.58	43.58
3:16.0	30.34	1.0799	36.25	42.44	42.44
3:19.0	30.17	1.0317	36.22	41.39	41.39
3:22.0	30.00	0.9870	36.19	40.43	40.43
3:25.0	29.84	0.9454	36.16	39.54	39.54
3:28.0	29.67	0.9066	36.13	38.72	38.72
3:31.0	29.50	0.8704	36.10	37.96	37.96
3:34.0	29.34	0.8366	36.08	37.26	37.26
3:37.0	29.18	0.8049	36.05	36.60	36.60
3:40.0	29.01	0.7751	36.03	35.99	35.99
3:43.0	28.85	0.7472	36.01	35.42	35.42
3:46.0	28.69	0.7213	35.99	34.66	34.66
3:49.0	28.53	0.6984	35.95	33.62	33.62
3:52.0	28.37	0.6788	35.92	32.74	32.74
3:55.0	28.21	0.6620	35.89	31.99	31.99
3:58.0	28.05	0.6474	35.86	31.34	31.34
4:01.0	27.90	0.6347	35.84	30.78	30.78
4:04.0	27.74	0.6235	35.83	30.29	30.29
4:07.0	27.59	0.6135	35.81	29.86	29.86
4:10.0	27.43	0.6046	35.79	29.47	29.47
4:13.0	27.28	0.5966	35.78	29.13	29.13
4:16.0	27.13	0.5893	35.77	28.81	28.81
4:19.0	26.39	0.5815	35.76	28.48	28.48
4:22.0	24.55	0.5701	35.74	27.99	27.99
4:25.0	22.45	0.5530	35.71	27.28	27.28
4:28.0	20.64	0.5312	35.67	26.37	26.37
4:31.0	18.95	0.5062	35.63	25.34	25.34
4:34.0	17.40	0.4788	35.59	24.23	24.23
4:37.0	15.98	0.4500	35.54	23.09	23.09
4:40.0	14.69	0.4204	35.49	21.93	21.93
4:43.0	13.60	0.3906	35.44	20.79	20.79
4:46.0	12.63	0.3611	35.39	19.69	19.69
4:49.0	11.73	0.3323	35.35	18.63	18.63

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW -100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
4:52.0	10.89	0.3041	35.30	17.62	17.62
4:55.0	10.11	0.2767	35.26	16.65	16.65
4:58.0	9.39	0.2501	35.21	15.73	15.73
5:01.0	8.72	0.2243	35.17	14.86	14.86
5:04.0	8.10	0.1993	35.13	14.04	14.04
5:07.0	7.52	0.1752	35.09	13.26	13.26
5:10.0	6.98	0.1519	35.05	12.52	12.52
5:13.0	6.49	0.1294	35.01	11.82	11.82
5:16.0	6.02	0.1102	34.91	9.97	9.97
5:19.0	5.59	0.0969	34.80	8.11	8.11
5:22.0	5.20	0.0881	34.73	6.96	6.96
5:25.0	4.83	0.0817	34.67	6.17	6.17
5:28.0	4.48	0.0766	34.63	5.57	5.57
5:31.0	4.16	0.0725	34.60	5.09	5.09
5:34.0	3.87	0.0688	34.57	4.69	4.69
5:37.0	3.65	0.0657	34.54	4.35	4.35
5:40.0	3.51	0.0631	34.52	4.08	4.08
5:43.0	3.38	0.0609	34.50	3.86	3.86
5:46.0	3.24	0.0590	34.49	3.67	3.67
5:49.0	3.10	0.0573	34.47	3.50	3.50
5:52.0	2.97	0.0557	34.46	3.34	3.34
5:55.0	2.83	0.0542	34.45	3.20	3.20
5:58.0	2.70	0.0527	34.44	3.06	3.06
6:01.0	2.56	0.0512	34.42	2.92	2.92
6:04.0	2.42	0.0497	34.41	2.79	2.79
6:07.0	2.29	0.0482	34.40	2.65	2.65
6:10.0	2.15	0.0467	34.39	2.52	2.52
6:13.0	2.02	0.0452	34.37	2.39	2.39
6:16.0	1.88	0.0436	34.36	2.26	2.26
6:19.0	1.75	0.0421	34.35	2.13	2.13
6:22.0	1.62	0.0405	34.33	2.00	2.00
6:25.0	1.48	0.0388	34.32	1.88	1.88
6:28.0	1.35	0.0372	34.31	1.75	1.75
6:31.0	1.21	0.0355	34.29	1.63	1.63
6:34.0	1.08	0.0338	34.28	1.50	1.50
6:37.0	0.95	0.0320	34.26	1.38	1.38
6:40.0	0.82	0.0302	34.25	1.26	1.26
6:43.0	0.69	0.0284	34.23	1.14	1.14
6:46.0	0.56	0.0265	34.22	1.02	1.02
6:49.0	0.44	0.0246	34.20	0.90	0.90
6:52.0	0.31	0.0226	34.19	0.79	0.79
6:55.0	0.20	0.0206	34.17	0.68	0.68
6:58.0	0.15	0.0187	34.15	0.58	0.58
7:01.0	0.10	0.0170	34.14	0.50	0.50
7:04.0	0.06	0.0154	34.13	0.43	0.43
7:07.0	0.00	0.0139	34.12	0.36	0.36
7:10.0	0.00	0.0132	34.11	0.33	0.33
7:13.0	0.00	0.0125	34.10	0.30	0.30

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW -100 YEAR, 6 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
7:16.0	0.00	0.0117	34.10	0.28	0.28
7:19.0	0.00	0.0110	34.09	0.25	0.25
7:22.0	0.00	0.0103	34.08	0.22	0.22
7:25.0	0.00	0.0095	34.08	0.20	0.20
7:28.0	0.00	0.0088	34.07	0.17	0.17
7:31.0	0.00	0.0081	34.07	0.15	0.15
7:34.0	0.00	0.0073	34.06	0.13	0.13
7:37.0	0.00	0.0066	34.05	0.11	0.11
7:40.0	0.00	0.0059	34.05	0.09	0.09
7:43.0	0.00	0.0051	34.04	0.07	0.07
7:46.0	0.00	0.0044	34.04	0.06	0.06
7:49.0	0.00	0.0037	34.03	0.04	0.04
7:52.0	0.00	0.0029	34.02	0.03	0.03
7:55.0	0.00	0.0022	34.02	0.02	0.02
7:58.0	0.00	0.0015	34.01	0.01	0.01
8:01.0	0.00	0.0007	34.01	0.00	0.00
8:04.0	0.00	- 0.0000	34.00	0.00	0.00

SUBBE100 — Hydrograph file

```
  Description of hydrograph :                                    Page   5

  SUBBASIN E 100-YEAR RUNOFF
Area =    1.00 ac.   Rational 'C'  = .##    Time of Concent. =   1 min.
                   Storm frequency, years = 100


 Time         Flow           Time         Flow           Time         Flow
0:02.0  *   0.0 cfs        0:12.0  *  36.0 cfs        0:22.0  *  72.0 cfs
0:31.0  * 105.0 cfs        0:46.0  *  72.0 cfs        1:03.0  *  36.0 cfs
1:20.0  *   0.0 cfs        1:59.0  *   0.0 cfs        1:22.0  *   0.0 cfs
```

Hydrograph # 6 Date 10/09/85 N-20/47

Description of hydrograph : Page 1

BASIN E + LAGGED POND K2 OUTFLOW COMBINED - 100 YEAR, 6 HOUR
Area = 5.00 ac. Rational 'C' = .## Time of Concent. = 1 min.
Storm frequency, years = 100

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:12.0	0.0	0.000	0.000
0:14.1	43.7	0.065	0.065
0:16.3	51.4	0.140	0.205
0:18.4	63.2	0.169	0.374
0:20.6	89.3	0.225	0.599
0:22.7	108.7	0.292	0.891
0:24.9	127.2	0.348	1.240
0:27.0	147.3	0.405	1.645
0:29.1	170.0	0.468	2.113
0:31.3	191.0	0.533	2.646
0:33.4	205.6	0.585	3.231
0:35.6	216.6	0.623	3.854
0:37.7	226.8	0.654	4.508
0:39.9	237.1	0.685	5.193
0:42.0	247.3	0.715	5.908
0:44.0	256.7	0.694	6.602
0:46.0	265.6	0.719	7.322
0:48.0	273.8	0.743	8.065
0:50.0	280.4	0.763	8.828
0:52.0	286.6	0.781	9.609
0:54.0	290.2	0.794	10.403
0:56.0	288.9	0.798	11.201
0:58.0	287.9	0.795	11.996
1:00.0	287.8	0.793	12.789
1:02.0	287.8	0.793	13.582
1:06.0	257.7	1.503	15.084
1:08.2	261.6	0.779	15.863
1:10.4	265.1	0.790	16.653
1:12.5	268.2	0.800	17.453
1:14.7	270.8	0.808	18.261
1:16.9	273.1	0.816	19.077
1:19.1	275.1	0.822	19.899
1:21.2	276.7	0.827	20.726
1:23.4	277.9	0.832	21.558
1:25.6	278.6	0.835	22.392
1:27.8	278.8	0.836	23.228
1:30.0	278.2	0.835	24.063
1:32.1	276.9	0.833	24.896
1:34.3	274.7	0.827	25.723
1:36.5	271.2	0.819	26.542
1:38.7	266.5	0.806	27.348
1:40.8	261.6	0.792	28.140
1:43.0	256.3	0.777	28.917
1:45.2	251.0	0.761	29.677
1:47.4	245.7	0.745	30.422
1:49.5	240.8	0.730	31.152
1:51.7	235.8	0.715	31.866
1:53.9	227.5	0.695	32.561
1:56.1	216.1	0.665	33.226

Hydrograph # 6

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF.

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
1:58.3	204.3	0.630	33.857
2:00.4	192.6	0.595	34.452
2:02.6	181.3	0.561	35.013
2:04.8	170.8	0.528	35.541
2:07.0	161.1	0.498	36.038
2:09.1	152.3	0.470	36.508
2:11.3	144.2	0.445	36.953
2:13.5	136.9	0.422	37.375
2:15.7	130.2	0.400	37.775
2:17.9	123.9	0.381	38.156
2:20.0	118.2	0.363	38.519
2:22.2	113.0	0.347	38.866
2:24.4	107.8	0.331	39.197
2:26.6	102.2	0.315	39.512
2:28.7	96.5	0.298	39.810
2:30.9	91.2	0.281	40.091
2:33.1	86.4	0.266	40.358
2:35.3	82.0	0.252	40.610
2:37.5	78.1	0.240	40.850
2:39.6	74.5	0.229	41.079
2:41.8	71.3	0.219	41.298
2:44.0	68.4	0.209	41.507
2:46.2	65.7	0.201	41.708
2:48.3	63.2	0.193	41.902
2:50.5	61.0	0.186	42.088
2:52.7	58.9	0.180	42.268
2:54.9	57.0	0.174	42.442
2:57.0	55.2	0.168	42.610
2:59.2	53.6	0.163	42.773
3:01.4	52.1	0.158	42.932
3:03.6	50.7	0.154	43.086
3:05.8	49.4	0.150	43.236
3:07.9	48.1	0.146	43.382
3:10.1	47.0	0.143	43.525
3:12.3	46.0	0.139	43.664
3:14.5	45.0	0.136	43.800
3:16.6	44.1	0.134	43.934
3:18.8	43.2	0.131	44.065
3:21.0	42.4	0.128	44.193
3:23.2	41.6	0.126	44.319
3:25.4	40.9	0.124	44.443
3:27.5	40.2	0.122	44.564
3:29.7	39.6	0.120	44.684
3:31.9	39.0	0.118	44.802
3:34.1	38.4	0.116	44.918
3:36.2	37.9	0.114	45.032
3:38.4	37.4	0.113	45.145
3:40.6	36.9	0.111	45.256
3:42.8	36.4	0.110	45.366
3:45.0	36.0	0.109	45.475

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
3:47.1	35.5	0.107	45.582
3:49.3	35.1	0.106	45.688
3:51.5	34.4	0.104	45.792
3:53.7	33.7	0.102	45.894
3:55.8	33.0	0.100	45.994
3:58.0	32.4	0.098	46.093
4:00.2	31.9	0.097	46.189
4:02.4	31.4	0.095	46.284
4:04.5	31.0	0.094	46.378
4:06.7	30.6	0.092	46.470
4:08.9	30.3	0.091	46.562
4:11.1	30.0	0.090	46.652
4:13.3	29.7	0.089	46.741
4:15.4	29.4	0.089	46.830
4:17.6	29.2	0.088	46.918
4:19.8	28.9	0.087	47.005
4:22.0	28.7	0.086	47.091
4:24.1	28.4	0.086	47.177
4:26.3	28.1	0.085	47.262
4:28.5	27.6	0.083	47.345
4:30.7	27.0	0.082	47.427
4:32.9	26.4	0.080	47.507
4:35.0	25.7	0.078	47.585
4:37.2	24.9	0.076	47.661
4:39.4	24.1	0.073	47.734
4:41.6	23.3	0.071	47.805
4:43.7	22.4	0.069	47.874
4:45.9	21.6	0.066	47.940
4:48.1	20.8	0.064	48.004
4:50.3	20.0	0.061	48.065
4:52.5	19.2	0.059	48.123
4:54.6	18.4	0.056	48.180
4:56.8	17.7	0.054	48.234
4:59.0	17.0	0.052	48.286
5:01.2	16.3	0.050	48.336
5:03.3	15.7	0.048	48.384
5:05.5	15.0	0.046	48.430
5:07.7	14.4	0.044	48.474
5:09.9	13.8	0.042	48.516
5:12.0	13.3	0.041	48.557
5:14.2	12.7	0.039	48.596
5:16.4	12.0	0.037	48.633
5:18.6	10.1	0.033	48.666
5:20.8	7.7	0.027	48.693
5:22.9	5.9	0.020	48.713
5:25.1	4.6	0.016	48.729
5:27.3	3.4	0.012	48.741
5:29.5	2.4	0.009	48.750
5:31.6	1.5	0.006	48.756
5:33.8	0.8	0.003	48.759

N-23/47

```
PCD1100 — Hydrograph file

    Description of hydrograph :                                    Page   6

    100-YEAR RUNOFF, BASIN D1
  Area =    35.00 ac.    Rational 'C'  = .##    Time of Concent. =   6 min.
                          Storm frequency, years = 100


  Time          Flow           Time         Flow           Time          Flow
 0:01.0  *    0.0 cfs        0:10.0  *   48.0 cfs        0:20.0  *  102.0 cfs
 0:27.0  *  140.0 cfs        0:41.0  *   94.0 cfs        0:56.0  *   46.0 cfs
 1:10.0  *    0.0 cfs        1:59.0  *    0.0 cfs        1:13.0  *    0.0 cfs
```

Hydrograph # 4 Date 10/09/85

Description of hydrograph :

LAGGED POND K2 OUTFLOW, BASIN E +BASIN D1 COMBINED-100YR,6HR
Area = 40.00 ac. Rational 'C' = .## Time of Concent. = 6 min.
Storm frequency, years = 100

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:10.0	0.0	0.000	0.000
0:12.2	62.8	0.093	0.093
0:14.3	113.5	0.262	0.355
0:16.5	135.7	0.370	0.724
0:18.6	162.0	0.442	1.166
0:20.8	196.2	0.531	1.697
0:22.9	228.2	0.630	2.327
0:25.1	259.1	0.723	3.050
0:27.2	286.1	0.809	3.858
0:29.4	304.2	0.876	4.734
0:31.5	316.9	0.921	5.656
0:33.7	324.6	0.952	6.607
0:35.8	328.8	0.969	7.576
0:38.0	332.0	0.980	8.557
0:40.0	335.0	0.919	9.475
0:42.0	338.1	0.927	10.403
0:44.0	341.1	0.936	11.338
0:46.0	343.6	0.943	12.281
0:48.0	345.4	0.949	13.230
0:50.0	345.6	0.952	14.182
0:52.0	345.4	0.952	15.134
0:54.0	342.6	0.948	16.082
0:56.0	334.9	0.933	17.015
0:58.0	287.9	0.858	17.873
1:02.0	287.8	1.586	19.459
1:04.2	271.4	0.838	20.297
1:06.4	258.3	0.794	21.091
1:08.5	262.2	0.780	21.871
1:10.7	265.6	0.791	22.662
1:12.9	268.5	0.800	23.462
1:15.1	271.1	0.809	24.271
1:17.2	273.3	0.816	25.087
1:19.4	275.3	0.822	25.909
1:21.6	276.8	0.827	26.736
1:23.8	278.0	0.831	27.568
1:25.9	278.6	0.834	28.402
1:28.1	278.7	0.835	29.237
1:30.3	278.0	0.834	30.072
1:32.5	276.5	0.831	30.903
1:34.6	274.1	0.825	31.728
1:36.8	270.3	0.816	32.544
1:39.0	265.7	0.803	33.347
1:41.2	260.7	0.789	34.136
1:43.3	255.5	0.774	34.910
1:45.5	250.2	0.758	35.667
1:47.7	245.0	0.742	36.409
1:49.9	240.1	0.727	37.136
1:52.0	234.5	0.711	37.847
1:54.2	225.8	0.690	38.537

Hydrograph # 4

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
1:56.4	214.4	0.660	39.197
1:58.6	202.6	0.625	39.822
2:00.8	191.0	0.590	40.412
2:02.9	179.9	0.556	40.968
2:05.1	169.5	0.524	41.491
2:07.3	160.0	0.494	41.985
2:09.5	151.3	0.466	42.452
2:11.6	143.3	0.441	42.893
2:13.8	136.0	0.419	43.312
2:16.0	129.3	0.398	43.709
2:18.2	123.1	0.378	44.087
2:20.3	117.5	0.361	44.448
2:22.5	112.2	0.344	44.792
2:24.7	107.0	0.328	45.121
2:26.9	101.4	0.312	45.433
2:29.0	95.8	0.296	45.729
2:31.2	90.6	0.279	46.008
2:33.4	85.8	0.264	46.272
2:35.6	81.5	0.251	46.523
2:37.7	77.6	0.239	46.762
2:39.9	74.1	0.227	46.989
2:42.1	70.9	0.217	47.207
2:44.3	68.0	0.208	47.415
2:46.4	65.4	0.200	47.615
2:48.6	63.0	0.192	47.807
2:50.8	60.7	0.185	47.992
2:53.0	58.7	0.179	48.171
2:55.2	56.8	0.173	48.345
2:57.3	55.0	0.168	48.512
2:59.5	53.4	0.163	48.675
3:01.7	51.9	0.158	48.833
3:03.9	50.5	0.153	48.986
3:06.0	49.2	0.149	49.135
3:08.2	48.0	0.146	49.281
3:10.4	46.9	0.142	49.423
3:12.6	45.8	0.139	49.562
3:14.7	44.9	0.136	49.698
3:16.9	44.0	0.133	49.831
3:19.1	43.1	0.130	49.962
3:21.3	42.3	0.128	50.090
3:23.4	41.5	0.126	50.215
3:25.6	40.8	0.123	50.339
3:27.8	40.1	0.121	50.460
3:30.0	39.5	0.119	50.580
3:32.1	38.9	0.118	50.697
3:34.3	38.3	0.116	50.813
3:36.5	37.8	0.114	50.927
3:38.7	37.3	0.113	51.040
3:40.8	36.8	0.111	51.151
3:43.0	36.4	0.110	51.260

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
3:45.2	35.9	0.108	51.369
3:47.4	35.5	0.107	51.476
3:49.6	35.0	0.106	51.581
3:51.7	34.3	0.104	51.685
3:53.9	33.6	0.102	51.787
3:56.1	33.0	0.100	51.887
3:58.3	32.4	0.098	51.985
4:00.4	31.9	0.096	52.081
4:02.6	31.4	0.095	52.176
4:04.8	31.0	0.094	52.269
4:07.0	30.6	0.092	52.362
4:09.1	30.3	0.091	52.453
4:11.3	29.9	0.090	52.543
4:13.5	29.7	0.089	52.632
4:15.7	29.4	0.088	52.721
4:17.8	29.1	0.088	52.809
4:20.0	28.9	0.087	52.896
4:22.2	28.7	0.086	52.982
4:24.4	28.4	0.085	53.067
4:26.5	28.0	0.084	53.152
4:28.7	27.5	0.083	53.235
4:30.9	27.0	0.082	53.317
4:33.1	26.3	0.080	53.396
4:35.2	25.6	0.078	53.474
4:37.4	24.8	0.075	53.550
4:39.6	24.0	0.073	53.623
4:41.8	23.2	0.071	53.694
4:44.0	22.3	0.068	53.762
4:46.1	21.5	0.066	53.827
4:48.3	20.7	0.063	53.891
4:50.5	19.9	0.061	53.952
4:52.7	19.1	0.058	54.010
4:54.8	18.4	0.056	54.066
4:57.0	17.6	0.054	54.120
4:59.2	16.9	0.052	54.172
5:01.4	16.3	0.050	54.222
5:03.5	15.6	0.048	54.270
5:05.7	15.0	0.046	54.315
5:07.9	14.4	0.044	54.359
5:10.1	13.8	0.042	54.401
5:12.2	13.2	0.040	54.442
5:14.4	12.6	0.039	54.481
5:16.6	11.7	0.036	54.517
5:18.8	9.8	0.032	54.549
5:20.9	7.7	0.026	54.575
5:23.1	5.9	0.020	54.596
5:25.3	4.5	0.016	54.611
5:27.5	3.4	0.012	54.623
5:29.6	2.3	0.009	54.632
5:31.8	1.5	0.006	54.637

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IMJ/1006 — Hydrograph file

     Description of hydrograph :                                       Page   1

     SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF
   Area =  177.00 ac.    Rational 'C'  = .##    Time of Concent. =  17 min.
                         Storm frequency, years = 100


   Time           Flow          Time           Flow          Time           Flow
  0:03.0  *    0.0 cfs         0:08.0  *   72.0 cfs         0:13.0  * 143.0 cfs
  0:18.0  *  215.0 cfs         0:23.0  *  287.0 cfs         0:28.0  * 358.0 cfs
  0:33.0  *  430.0 cfs         0:40.0  *  376.0 cfs         0:47.0  * 323.0 cfs
  0:54.0  *  269.0 cfs         1:01.0  *  215.0 cfs         1:08.0  * 161.0 cfs
  1:15.0  *  108.0 cfs         1:22.0  *   54.0 cfs         1:29.0  *   0.0 cfs
  1:36.0  *    0.0 cfs         1:43.0  *    0.0 cfs         1:50.0  *   0.0 cfs
```

```
***    ROUTING OF HYDROGRAPH # 1    ***
```

N 28/47

Date 10/09/85

```
     Pond File : QUAIL

QUAIL LAKE

       Number         Elevation        Storage        Outflow
          1             70.00           0.000           0.00
          2             71.00          15.000          92.00
          3             72.00          40.000         227.00
          4             73.00          69.000         360.00
          5             74.00          90.000         520.00
          6             75.00         127.000         915.00
          7             75.50         147.000        1180.00


      Routing of Hydrograph # 1

   Description of hydrograph :                                 Page  1

   SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF
 Area =  177.00 ac.    Rational 'C'  = .##    Time of Concent. =  17 min.
                    Storm frequency, years = 100

   Hydrograph # 2  - total outflow hydrograph
   Description :
   SUBBASINS I,M&L ROUTED THROUGH POND QUAIL - 100 YEAR, 6 HOUR
```

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	70.00	0.00
0:06.0	43.20	0.0881	70.01	0.54
0:09.0	86.20	0.3499	70.02	2.15
0:12.0	128.80	0.7798	70.05	4.78
0:15.0	171.80	1.3736	70.09	8.42
0:18.0	215.00	2.1284	70.14	13.05
0:21.0	258.20	3.0406	70.20	18.65
0:24.0	301.20	4.1058	70.27	25.18
0:27.0	343.80	5.3190	70.35	32.62
0:30.0	386.80	6.6765	70.45	40.95
0:33.0	430.00	8.1759	70.55	50.15
0:36.0	406.86	9.6787	70.65	59.36
0:39.0	383.71	11.0495	70.74	67.77
0:42.0	360.86	12.2920	70.82	75.39
0:45.0	338.14	13.4105	70.89	82.25
0:48.0	315.29	14.4081	70.96	88.37
0:51.0	292.14	15.2872	71.01	93.55
0:54.0	269.00	16.0515	71.04	97.68
0:57.0	245.86	16.7044	71.07	101.20
1:00.0	222.71	17.2482	71.09	104.14
1:03.0	199.57	17.6855	71.11	106.50
1:06.0	176.43	18.0185	71.12	108.30
1:09.0	153.43	18.2500	71.13	109.55
1:12.0	130.71	18.3829	71.14	110.27
1:15.0	108.00	18.4200	71.14	110.47
1:18.0	84.86	18.3626	71.13	110.16
1:21.0	61.71	18.2120	71.13	109.34
1:24.0	38.57	17.9700	71.12	108.04
1:27.0	15.43	17.6388	71.11	106.25
1:30.0	0.00	17.2362	71.09	104.08
1:33.0	0.00	16.8109	71.07	101.78
1:36.0	0.00	16.3949	71.06	99.53
1:39.0	0.00	15.9882	71.04	97.34
1:42.0	0.00	15.5904	71.02	95.19
1:45.0	0.00	15.2014	71.01	93.09
1:48.0	0.00	14.8212	70.99	90.90
1:51.0	0.00	14.4503	70.96	88.63
1:54.0	0.00	14.0887	70.94	86.41
1:57.0	0.00	13.7361	70.92	84.25
2:00.0	0.00	13.3923	70.89	82.14
2:03.0	0.00	13.0571	70.87	80.08
2:06.0	0.00	12.7303	70.85	78.08
2:09.0	0.00	12.4117	70.83	76.13
2:12.0	0.00	12.1011	70.81	74.22
2:15.0	0.00	11.7982	70.79	72.36
2:18.0	0.00	11.5030	70.77	70.55
2:21.0	0.00	11.2151	70.75	68.79
2:24.0	0.00	10.9344	70.73	67.06

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Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
2:27.0	0.00	10.6607	70.71	65.39
2:30.0	0.00	10.3939	70.69	63.75
2:33.0	0.00	10.1338	70.68	62.15
2:36.0	0.00	9.8802	70.66	60.60
2:39.0	0.00	9.6329	70.64	59.08
2:42.0	0.00	9.3918	70.63	57.60
2:45.0	0.00	9.1568	70.61	56.16
2:48.0	0.00	8.9276	70.60	54.76
2:51.0	0.00	8.7042	70.58	53.39
2:54.0	0.00	8.4863	70.57	52.05
2:57.0	0.00	8.2739	70.55	50.75
3:00.0	0.00	8.0669	70.54	49.48
3:03.0	0.00	7.8650	70.52	48.24
3:06.0	0.00	7.6681	70.51	47.03
3:09.0	0.00	7.4762	70.50	45.85
3:12.0	0.00	7.2891	70.49	44.71
3:15.0	0.00	7.1067	70.47	43.59
3:18.0	0.00	6.9288	70.46	42.50
3:21.0	0.00	6.7554	70.45	41.43
3:24.0	0.00	6.5863	70.44	40.40
3:27.0	0.00	6.4215	70.43	39.39
3:30.0	0.00	6.2608	70.42	38.40
3:33.0	0.00	6.1041	70.41	37.44
3:36.0	0.00	5.9513	70.40	36.50
3:39.0	0.00	5.8024	70.39	35.59
3:42.0	0.00	5.6572	70.38	34.70
3:45.0	0.00	5.5156	70.37	33.83
3:48.0	0.00	5.3776	70.36	32.98
3:51.0	0.00	5.2430	70.35	32.16
3:54.0	0.00	5.1117	70.34	31.35
3:57.0	0.00	4.9838	70.33	30.57
4:00.0	0.00	4.8591	70.32	29.80
4:03.0	0.00	4.7375	70.32	29.06
4:06.0	0.00	4.6189	70.31	28.33
4:09.0	0.00	4.5033	70.30	27.62
4:12.0	0.00	4.3906	70.29	26.93
4:15.0	0.00	4.2807	70.29	26.26
4:18.0	0.00	4.1736	70.28	25.60
4:21.0	0.00	4.0691	70.27	24.96
4:24.0	0.00	3.9673	70.26	24.33
4:27.0	0.00	3.8680	70.26	23.72
4:30.0	0.00	3.7712	70.25	23.13
4:33.0	0.00	3.6768	70.25	22.55
4:36.0	0.00	3.5848	70.24	21.99
4:39.0	0.00	3.4951	70.23	21.44
4:42.0	0.00	3.4076	70.23	20.90
4:45.0	0.00	3.3223	70.22	20.38
4:48.0	0.00	3.2392	70.22	19.87

Inflow H’graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:51.0	0.00	3.1581	70.21	19.37
4:54.0	0.00	3.0791	70.21	18.88
4:57.0	0.00	3.0020	70.20	18.41
5:00.0	0.00	2.9269	70.20	17.95
5:03.0	0.00	2.8536	70.19	17.50
5:06.0	0.00	2.7822	70.19	17.06
5:09.0	0.00	2.7126	70.18	16.64
5:12.0	0.00	2.6447	70.18	16.22
5:15.0	0.00	2.5785	70.17	15.81
5:18.0	0.00	2.5140	70.17	15.42
5:21.0	0.00	2.4510	70.16	15.03
5:24.0	0.00	2.3897	70.16	14.66
5:27.0	0.00	2.3299	70.16	14.29
5:30.0	0.00	2.2716	70.15	13.93
5:33.0	0.00	2.2147	70.15	13.58
5:36.0	0.00	2.1593	70.14	13.24
5:39.0	0.00	2.1053	70.14	12.91
5:42.0	0.00	2.0526	70.14	12.59
5:45.0	0.00	2.0012	70.13	12.27
5:48.0	0.00	1.9511	70.13	11.97
5:51.0	0.00	1.9023	70.13	11.67
5:54.0	0.00	1.8547	70.12	11.38
5:57.0	0.00	1.8083	70.12	11.09
6:00.0	0.00	1.7630	70.12	10.81
6:03.0	0.00	1.7189	70.11	10.54
6:06.0	0.00	1.6759	70.11	10.28
6:09.0	0.00	1.6339	70.11	10.02
6:12.0	0.00	1.5930	70.11	9.77
6:15.0	0.00	1.5532	70.10	9.53
6:18.0	0.00	1.5143	70.10	9.29
6:21.0	0.00	1.4764	70.10	9.06
6:24.0	0.00	1.4394	70.10	8.83
6:27.0	0.00	1.4034	70.09	8.61
6:30.0	0.00	1.3683	70.09	8.39
6:33.0	0.00	1.3340	70.09	8.18
6:36.0	0.00	1.3007	70.09	7.98
6:39.0	0.00	1.2681	70.08	7.78
6:42.0	0.00	1.2364	70.08	7.58
6:45.0	0.00	1.2054	70.08	7.39
6:48.0	0.00	1.1753	70.08	7.21
6:51.0	0.00	1.1458	70.08	7.03
6:54.0	0.00	1.1172	70.07	6.85
6:57.0	0.00	1.0892	70.07	6.68
7:00.0	0.00	1.0620	70.07	6.51
7:03.0	0.00	1.0354	70.07	6.35
7:06.0	0.00	1.0095	70.07	6.19
7:09.0	0.00	0.9842	70.07	6.04
7:12.0	0.00	0.9596	70.06	5.89

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
7:15.0	0.00	0.9356	70.06	5.74
7:18.0	0.00	0.9121	70.06	5.59
7:21.0	0.00	0.8893	70.06	5.45
7:24.0	0.00	0.8671	70.06	5.32
7:27.0	0.00	0.8454	70.06	5.18
7:30.0	0.00	0.8242	70.05	5.06
7:33.0	0.00	0.8036	70.05	4.93
7:36.0	0.00	0.7835	70.05	4.81
7:39.0	0.00	0.7638	70.05	4.68
7:42.0	0.00	0.7447	70.05	4.57
7:45.0	0.00	0.7261	70.05	4.45
7:48.0	0.00	0.7079	70.05	4.34
7:51.0	0.00	0.6902	70.05	4.23
7:54.0	0.00	0.6729	70.04	4.13
7:57.0	0.00	0.6561	70.04	4.02
8:00.0	0.00	0.6397	70.04	3.92
8:03.0	0.00	0.6237	70.04	3.83
8:06.0	0.00	0.6080	70.04	3.73
8:09.0	0.00	0.5928	70.04	3.64
8:12.0	0.00	0.5780	70.04	3.55
8:15.0	0.00	0.5635	70.04	3.46
8:18.0	0.00	0.5494	70.04	3.37
8:21.0	0.00	0.5357	70.04	3.29
8:24.0	0.00	0.5223	70.03	3.20
8:27.0	0.00	0.5092	70.03	3.12
8:30.0	0.00	0.4965	70.03	3.04
8:33.0	0.00	0.4840	70.03	2.97
8:36.0	0.00	0.4719	70.03	2.89
8:39.0	0.00	0.4601	70.03	2.82
8:42.0	0.00	0.4486	70.03	2.75
8:45.0	0.00	0.4374	70.03	2.68
8:48.0	0.00	0.4264	70.03	2.62
8:51.0	0.00	0.4157	70.03	2.55
8:54.0	0.00	0.4053	70.03	2.49
8:57.0	0.00	0.3952	70.03	2.42
9:00.0	0.00	0.3853	70.03	2.36
9:03.0	0.00	0.3757	70.03	2.30
9:06.0	0.00	0.3663	70.02	2.25
9:09.0	0.00	0.3571	70.02	2.19
9:12.0	0.00	0.3482	70.02	2.14
9:15.0	0.00	0.3394	70.02	2.08
9:18.0	0.00	0.3309	70.02	2.03
9:21.0	0.00	0.3227	70.02	1.98
9:24.0	0.00	0.3146	70.02	1.93
9:27.0	0.00	0.3067	70.02	1.88
9:30.0	0.00	0.2990	70.02	1.83
9:33.0	0.00	0.2916	70.02	1.79
9:36.0	0.00	0.2843	70.02	1.74

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
9:39.0	0.00	0.2771	70.02	1.70
9:42.0	0.00	0.2702	70.02	1.66
9:45.0	0.00	0.2634	70.02	1.62
9:48.0	0.00	0.2569	70.02	1.58
9:51.0	0.00	0.2504	70.02	1.54
9:54.0	0.00	0.2473	70.02	1.52
9:57.0	0.00	0.2441	70.02	1.50
10:00.0	0.00	0.2409	70.02	1.48
10:03.0	0.00	0.2377	70.02	1.46
10:06.0	0.00	0.2346	70.02	1.44
10:09.0	0.00	0.2314	70.02	1.42
10:12.0	0.00	0.2282	70.02	1.40
10:15.0	0.00	0.2251	70.02	1.38
10:18.0	0.00	0.2219	70.01	1.36
10:21.0	0.00	0.2187	70.01	1.34
10:24.0	0.00	0.2156	70.01	1.32
10:27.0	0.00	0.2124	70.01	1.30
10:30.0	0.00	0.2092	70.01	1.28
10:33.0	0.00	0.2060	70.01	1.26
10:36.0	0.00	0.2029	70.01	1.24
10:39.0	0.00	0.1997	70.01	1.22
10:42.0	0.00	0.1965	70.01	1.21
10:45.0	0.00	0.1934	70.01	1.19
10:48.0	0.00	0.1902	70.01	1.17
10:51.0	0.00	0.1870	70.01	1.15
10:54.0	0.00	0.1839	70.01	1.13
10:57.0	0.00	0.1807	70.01	1.11
11:00.0	0.00	0.1775	70.01	1.09
11:03.0	0.00	0.1743	70.01	1.07
11:06.0	0.00	0.1712	70.01	1.05
11:09.0	0.00	0.1680	70.01	1.03
11:12.0	0.00	0.1648	70.01	1.01
11:15.0	0.00	0.1617	70.01	0.99
11:18.0	0.00	0.1585	70.01	0.97
11:21.0	0.00	0.1553	70.01	0.95
11:24.0	0.00	0.1522	70.01	0.93
11:27.0	0.00	0.1490	70.01	0.91
11:30.0	0.00	0.1458	70.01	0.89
11:33.0	0.00	0.1426	70.01	0.87
11:36.0	0.00	0.1395	70.01	0.86
11:39.0	0.00	0.1363	70.01	0.84
11:42.0	0.00	0.1331	70.01	0.82
11:45.0	0.00	0.1300	70.01	0.80
11:48.0	0.00	0.1268	70.01	0.78
11:51.0	0.00	0.1236	70.01	0.76
11:54.0	0.00	0.1205	70.01	0.74
11:57.0	0.00	0.1173	70.01	0.72
12:00.0	0.00	0.1141	70.01	0.70

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
12:03.0	0.00	0.1109	70.01	0.68
12:06.0	0.00	0.1078	70.01	0.66
12:09.0	0.00	0.1046	70.01	0.64
12:12.0	0.00	0.1014	70.01	0.62
12:15.0	0.00	0.0983	70.01	0.60
12:18.0	0.00	0.0951	70.01	0.58
12:21.0	0.00	0.0919	70.01	0.56
12:24.0	0.00	0.0888	70.01	0.54
12:27.0	0.00	0.0856	70.01	0.52
12:30.0	0.00	0.0824	70.01	0.51
12:33.0	0.00	0.0792	70.01	0.49
12:36.0	0.00	0.0761	70.01	0.47
12:39.0	0.00	0.0729	70.00	0.45
12:42.0	0.00	0.0697	70.00	0.43
12:45.0	0.00	0.0666	70.00	0.41
12:48.0	0.00	0.0634	70.00	0.39
12:51.0	0.00	0.0602	70.00	0.37
12:54.0	0.00	0.0571	70.00	0.35
12:57.0	0.00	0.0539	70.00	0.33
13:00.0	0.00	0.0507	70.00	0.31
13:03.0	0.00	0.0475	70.00	0.29
13:06.0	0.00	0.0444	70.00	0.27
13:09.0	0.00	0.0412	70.00	0.25
13:12.0	0.00	0.0380	70.00	0.23
13:15.0	0.00	0.0349	70.00	0.21
13:18.0	0.00	0.0317	70.00	0.19
13:21.0	0.00	0.0285	70.00	0.17
13:24.0	0.00	0.0254	70.00	0.16
13:27.0	0.00	0.0222	70.00	0.14
13:30.0	0.00	0.0190	70.00	0.12
13:33.0	0.00	0.0158	70.00	0.10
13:36.0	0.00	0.0127	70.00	0.08
13:39.0	0.00	0.0095	70.00	0.06
13:42.0	0.00	0.0063	70.00	0.04
13:45.0	0.00	0.0032	70.00	0.02
13:48.0	0.00	- 0.0000	70.00	- 0.00

D2/100/6 — Hydrograph file

```
   Description of hydrograph :                                    Page   2

   SUBBBASON D2 - 100 YEAR, 6 HOUR RUNOFF
 Area =    17.00 ac.     Rational 'C'  = .##     Time of Concent. =   6 min.
                        Storm frequency, years = 100


  Time          Flow          Time          Flow          Time          Flow
 0:01.0  *    0.0 cfs      0:08.0  *   23.0 cfs      0:16.0  *   49.0 cfs
 0:24.0  *   75.0 cfs      0:37.0  *   49.0 cfs      0:49.0  *   26.0 cfs
 1:02.0  *    0.0 cfs      1:15.0  *    0.0 cfs      1:28.0  *    0.0 cfs
```

C/100/6 — Hydrograph file

```
    Description of hydrograph :                                   Page   4

    SUBBASIN C - 100 YEAR, 6 HOUR RUNOFF
  Area =  123.00 ac.    Rational 'C'  = .##     Time of Concent. =  28 min.
                            Storm frequency, years = 100


   Time          Flow           Time          Flow           Time          Flow
  0:04.0  *    0.0 cfs        0:12.0  *   41.0 cfs        0:20.0  *   82.0 cfs
  0:28.0  *  123.0 cfs        0:36.0  *  163.0 cfs        0:42.0  *  194.0 cfs
  0:52.0  *  164.0 cfs        1:02.0  *  133.0 cfs        1:12.0  *  103.0 cfs
  1:22.0  *   73.0 cfs        1:32.0  *   42.0 cfs        1:42.0  *   12.0 cfs
  1:46.0  *    0.0 cfs        1:50.0  *    0.0 cfs        1:54.0  *    0.0 cfs
```

Hydrograph # 5 Date 10/09/85

N37/47

Description of hydrograph : Page 1

BASINS D2 & C + QUAIL POND OUTFLOW LAGGED 15 MINUTES
Area = 317.00 ac. Rational 'C' = .## Time of Concent. = 28 min.
Storm frequency, years = 100

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:30.0	205.1	4.237	4.237
0:32.0	214.2	0.577	4.814
0:34.0	223.4	0.603	5.417
0:36.0	232.9	0.628	6.045
0:38.0	244.0	0.657	6.702
0:40.0	255.2	0.688	7.390
0:42.0	266.4	0.718	8.108
0:44.0	262.0	0.728	8.836
0:46.0	258.1	0.716	9.552
0:48.0	254.3	0.706	10.258
0:50.0	226.3	0.662	10.920
0:54.0	224.9	1.243	12.163
0:59.6	221.2	1.732	13.895
1:05.3	215.1	1.694	15.589
1:10.9	206.0	1.635	17.224
1:16.6	194.7	1.556	18.780
1:22.2	181.2	1.460	20.240
1:27.8	165.2	1.345	21.585
1:33.5	147.6	1.215	22.800
1:39.1	128.6	1.072	23.872
1:44.7	104.2	0.904	24.776
1:50.4	100.0	0.793	25.569
1:56.0	95.9	0.761	26.330
2:01.7	91.8	0.729	27.059
2:07.3	87.7	0.697	27.756
2:12.9	83.6	0.665	28.421
2:18.6	79.7	0.634	29.055
2:24.2	76.0	0.605	29.660
2:29.8	72.5	0.577	30.236
2:35.5	69.1	0.550	30.786
2:41.1	65.9	0.524	31.310
2:46.8	62.8	0.500	31.810
2:52.4	59.9	0.477	32.287
2:58.0	57.1	0.454	32.741
3:03.7	54.5	0.433	33.174
3:09.3	51.9	0.413	33.588
3:14.9	49.5	0.394	33.981
3:20.6	47.2	0.376	34.357
3:26.2	45.0	0.358	34.715
3:31.9	42.9	0.341	35.057
3:37.5	40.9	0.326	35.382
3:43.1	39.0	0.310	35.693
3:48.8	37.2	0.296	35.989
3:54.4	35.5	0.282	36.271
4:00.0	33.8	0.269	36.540
4:05.7	32.3	0.257	36.796
4:11.3	30.8	0.245	37.041
4:17.0	29.3	0.233	37.274
4:22.6	28.0	0.222	37.497

Hydrograph # 5
Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
4:28.2	26.7	0.212	37.709
4:33.9	25.4	0.202	37.911
4:39.5	24.2	0.193	38.104
4:45.1	23.1	0.184	38.287
4:50.8	22.0	0.175	38.463
4:56.4	21.0	0.167	38.630
5:02.1	20.0	0.159	38.789
5:07.7	19.1	0.152	38.941
5:13.3	18.2	0.145	39.086
5:19.0	17.4	0.138	39.224
5:24.6	16.6	0.132	39.356
5:30.2	15.8	0.126	39.481
5:35.9	15.0	0.120	39.601
5:41.5	14.4	0.114	39.715
5:47.2	13.7	0.109	39.824
5:52.8	13.0	0.104	39.928
5:58.4	12.4	0.099	40.027
6:04.1	11.9	0.094	40.121
6:09.7	11.3	0.090	40.211
6:15.3	10.8	0.086	40.297
6:21.0	10.3	0.082	40.379
6:26.6	9.8	0.078	40.457
6:32.3	9.3	0.074	40.531
6:37.9	8.9	0.071	40.602
6:43.5	8.5	0.068	40.670
6:49.2	8.1	0.064	40.734
6:54.8	7.7	0.061	40.795
7:00.4	7.4	0.059	40.854
7:06.1	7.0	0.056	40.910
7:11.7	6.7	0.053	40.963
7:17.4	6.4	0.051	41.014
7:23.0	6.1	0.048	41.062
7:28.6	5.8	0.046	41.109
7:34.3	5.5	0.044	41.153
7:39.9	5.3	0.042	41.195
7:45.6	5.0	0.040	41.235
7:51.2	4.8	0.038	41.273
7:56.8	4.6	0.036	41.309
8:02.5	4.4	0.035	41.344
8:08.1	4.2	0.033	41.377
8:13.7	4.0	0.032	41.409
8:19.4	3.8	0.030	41.439
8:25.0	3.6	0.029	41.467
8:30.7	3.4	0.027	41.495
8:36.3	3.3	0.026	41.521
8:41.9	3.1	0.025	41.546
8:47.6	3.0	0.024	41.569
8:53.2	2.8	0.023	41.592
8:58.8	2.7	0.022	41.614
9:04.5	2.6	0.021	41.634

Hydrograph # 5

Inflow H'graph: SUBBASINS I,M&L - 100 YEAR, 6 HOUR RUNOFF

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
9:10.1	2.5	0.020	41.654
9:15.8	2.3	0.019	41.672
9:21.4	2.2	0.018	41.690
9:27.0	2.1	0.017	41.707
9:32.7	2.0	0.016	41.723
9:38.3	1.9	0.015	41.739
9:43.9	1.9	0.015	41.754
9:49.6	1.8	0.014	41.768
9:55.2	1.7	0.013	41.781
10:00.9	1.6	0.013	41.794
10:06.5	1.5	0.012	41.806
10:12.1	1.5	0.012	41.818
10:17.8	1.5	0.011	41.829
10:23.4	1.4	0.011	41.840
10:29.0	1.4	0.011	41.851
10:34.7	1.4	0.011	41.862
10:40.3	1.3	0.010	41.872
10:46.0	1.3	0.010	41.882
10:51.6	1.2	0.010	41.892
10:57.2	1.2	0.009	41.902
11:02.9	1.2	0.009	41.911
11:08.5	1.1	0.009	41.920
11:14.1	1.1	0.009	41.928
11:19.8	1.1	0.008	41.937
11:25.4	1.0	0.008	41.945
11:31.1	1.0	0.008	41.953
11:36.7	0.9	0.008	41.960
11:42.3	0.9	0.007	41.967
11:48.0	0.9	0.007	41.974
11:53.6	0.8	0.007	41.981
11:59.2	0.8	0.006	41.987
12:04.9	0.8	0.006	41.993
12:10.5	0.7	0.006	41.999
12:16.2	0.7	0.006	42.005
12:21.8	0.7	0.005	42.010
12:27.4	0.6	0.005	42.015
12:33.1	0.6	0.005	42.020
12:38.7	0.5	0.004	42.024
12:44.3	0.5	0.004	42.028
12:50.0	0.5	0.004	42.032
12:55.6	0.4	0.004	42.035
13:01.3	0.4	0.003	42.039
13:06.9	0.4	0.003	42.042
13:12.5	0.3	0.003	42.044
13:18.2	0.3	0.002	42.047
13:23.8	0.3	0.002	42.049
13:29.4	0.2	0.002	42.051
13:35.1	0.2	0.002	42.052
13:40.7	0.1	0.001	42.053
13:46.4	0.1	0.001	42.054

Hydrograph # 1 Date 10/09/85

N40/47

Description of hydrograph : Page 1

TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR
Area = 357.00 ac. Rational 'C' = .## Time of Concent. = 28 min.
Storm frequency, years = 100

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:24.2	245.9	4.090	4.090
0:27.2	285.1	1.097	5.187
0:30.2	514.5	1.652	6.839
0:33.2	542.2	2.183	9.023
0:36.2	563.0	2.283	11.306
0:39.2	584.2	2.370	13.676
0:42.2	604.4	2.456	16.132
0:45.2	602.3	2.493	18.625
0:48.2	597.5	2.479	21.104
0:51.2	571.4	2.415	23.519
0:54.2	566.8	2.352	25.871
1:00.2	508.5	4.444	30.315
1:05.7	476.6	3.776	34.090
1:11.3	471.3	3.633	37.723
1:16.8	466.6	3.595	41.318
1:22.4	457.5	3.542	44.860
1:28.0	443.1	3.452	48.312
1:33.5	422.5	3.318	51.630
1:39.1	394.0	3.129	54.759
1:44.7	358.0	2.882	57.641
1:50.2	339.1	2.672	60.313
1:55.8	313.5	2.501	62.814
2:01.4	280.0	2.275	65.088
2:06.9	249.7	2.030	67.118
2:12.5	224.3	1.817	68.935
2:18.1	203.5	1.640	70.575
2:23.6	185.9	1.492	72.067
2:29.2	168.4	1.358	73.426
2:34.8	152.8	1.231	74.657
2:40.3	139.9	1.122	75.779
2:45.9	129.4	1.032	76.811
2:51.5	120.5	0.958	77.769
2:57.0	112.9	0.895	78.664
3:02.6	106.3	0.840	79.504
3:08.2	100.5	0.793	80.297
3:13.7	95.4	0.751	81.047
3:19.3	90.8	0.714	81.761
3:24.8	86.6	0.680	82.441
3:30.4	82.8	0.650	83.091
3:36.0	79.4	0.622	83.712
3:41.5	76.2	0.596	84.309
3:47.1	73.3	0.573	84.882
3:52.7	70.0	0.549	85.431
3:58.2	66.8	0.524	85.955
4:03.8	64.0	0.501	86.456
4:09.4	61.5	0.481	86.937
4:14.9	59.3	0.463	87.400
4:20.5	57.3	0.447	87.847
4:26.1	55.2	0.431	88.279

Hydrograph # 1

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
4:31.6	52.6	0.413	88.692
4:37.2	49.6	0.392	89.084
4:42.8	46.4	0.368	89.452
4:48.3	43.2	0.343	89.795
4:53.9	40.2	0.319	90.114
4:59.5	37.3	0.297	90.411
5:05.0	34.7	0.276	90.688
5:10.6	32.3	0.257	90.944
5:16.2	29.4	0.237	91.181
5:21.7	24.0	0.205	91.386
5:27.3	19.7	0.167	91.553
5:32.8	15.7	0.135	91.689
5:38.4	14.7	0.117	91.805
5:44.0	14.1	0.110	91.916
5:49.5	13.4	0.105	92.021
5:55.1	12.8	0.100	92.121
6:00.7	12.2	0.096	92.217
6:06.2	11.6	0.091	92.309
6:11.8	11.1	0.087	92.396
6:17.4	10.6	0.083	92.479
6:22.9	10.1	0.079	92.559
6:28.5	9.7	0.076	92.634
6:34.1	9.2	0.072	92.707
6:39.6	8.8	0.069	92.776
6:45.2	8.4	0.066	92.841
6:50.8	8.0	0.063	92.904
6:56.3	7.6	0.060	92.964
7:01.9	7.3	0.057	93.021
7:07.5	6.9	0.055	93.076
7:13.0	6.6	0.052	93.128
7:18.6	6.3	0.050	93.177
7:24.2	6.0	0.047	93.225
7:29.7	5.8	0.045	93.270
7:35.3	5.5	0.043	93.313
7:40.8	5.2	0.041	93.354
7:46.4	5.0	0.039	93.393
7:52.0	4.8	0.037	93.431
7:57.5	4.5	0.036	93.467
8:03.1	4.3	0.034	93.501
8:08.7	4.1	0.033	93.533
8:14.2	4.0	0.031	93.564
8:19.8	3.8	0.030	93.594
8:25.4	3.6	0.028	93.622
8:30.9	3.4	0.027	93.649
8:36.5	3.3	0.026	93.675
8:42.1	3.1	0.025	93.699
8:47.6	3.0	0.023	93.722
8:53.2	2.8	0.022	93.745
8:58.8	2.7	0.021	93.766
9:04.3	2.6	0.020	93.786

Hydrograph # 1

N42/47

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
9:09.9	2.5	0.019	93.806
9:15.5	2.4	0.018	93.824
9:21.0	2.2	0.018	93.842
9:26.6	2.1	0.017	93.859
9:32.2	2.0	0.016	93.875
9:37.7	2.0	0.015	93.890
9:43.3	1.9	0.015	93.905
9:48.8	1.8	0.014	93.919
9:54.4	1.7	0.013	93.932
10:00.0	1.6	0.013	93.945
10:05.5	1.6	0.012	93.957
10:11.1	1.5	0.012	93.969
10:16.7	1.5	0.011	93.980
10:22.2	1.4	0.011	93.991
10:27.8	1.4	0.011	94.002
10:33.4	1.4	0.011	94.012
10:38.9	1.3	0.010	94.023
10:44.5	1.3	0.010	94.033
10:50.1	1.3	0.010	94.042
10:55.6	1.2	0.009	94.052
11:01.2	1.2	0.009	94.061
11:06.8	1.1	0.009	94.070
11:12.3	1.1	0.009	94.079
11:17.9	1.1	0.008	94.087
11:23.5	1.0	0.008	94.095
11:29.0	1.0	0.008	94.103
11:34.6	1.0	0.008	94.110
11:40.2	0.9	0.007	94.117
11:45.7	0.9	0.007	94.124
11:51.3	0.9	0.007	94.131
11:56.8	0.8	0.006	94.138
12:02.4	0.8	0.006	94.144
12:08.0	0.7	0.006	94.149
12:13.5	0.7	0.006	94.155
12:19.1	0.7	0.005	94.160
12:24.7	0.6	0.005	94.165
12:30.2	0.6	0.005	94.170
12:35.8	0.6	0.004	94.175
12:41.4	0.5	0.004	94.179
12:46.9	0.5	0.004	94.183
12:52.5	0.5	0.004	94.186
12:58.1	0.4	0.003	94.190
13:03.6	0.4	0.003	94.193
13:09.2	0.3	0.003	94.196
13:14.8	0.3	0.003	94.198
13:20.3	0.3	0.002	94.200
13:25.9	0.2	0.002	94.202
13:31.5	0.2	0.002	94.204
13:37.0	0.2	0.001	94.206
13:42.6	0.1	0.001	94.207

SH/100/6 — Hydrograph file

```
  Description of hydrograph :                                  Page   3

  SUBBBASIN SH - 100 YEAR, 6 HOUR RUNOFF
Area =  214.00 ac.    Rational 'C'  = .##     Time of Concent. =  15 min.
                    Storm frequency, years = 100


  Time          Flow           Time          Flow           Time          Flow
 0:02.0  *    0.0 cfs         0:07.0  *   58.0 cfs         0:12.0  *  117.0 cfs
 0:17.0  *  175.0 cfs         0:22.0  *  233.0 cfs         0:27.0  *  291.0 cfs
 0:31.0  *  338.0 cfs         0:38.0  *  290.0 cfs         0:45.0  *  241.0 cfs
 0:52.0  *  193.0 cfs         0:59.0  *  145.0 cfs         1:06.0  *   97.0 cfs
 1:13.0  *   48.0 cfs         1:20.0  *    0.0 cfs         1:27.0  *    0.0 cfs
 1:34.0  *    0.0 cfs         1:41.0  *    0.0 cfs         1:48.0  *    0.0 cfs
```

Hydrograph # 3 Date 10/09/85 N-44/47

Description of hydrograph : Page 1

TOTAL FLOW INTO POINT SH - 100 YEAR, 6 HOUR
Area = 571.00 ac. Rational 'C' = .## Time of Concent. = 28 min.
Storm frequency, years = 100

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
0:00.0	0.0	0.000	0.000
0:27.0	574.1	10.676	10.676
0:29.0	740.8	1.811	12.487
0:31.0	860.3	2.205	14.692
0:33.0	865.0	2.376	17.069
0:35.0	865.6	2.384	19.452
0:37.0	865.8	2.385	21.837
0:39.0	866.1	2.386	24.223
0:41.0	865.7	2.385	26.608
0:43.0	858.8	2.375	28.984
0:45.0	843.4	2.345	31.328
0:47.0	826.6	2.300	33.629
0:51.0	772.6	4.406	38.034
0:56.6	704.6	5.691	43.725
1:02.2	620.0	5.103	48.829
1:07.8	559.2	4.543	53.372
1:13.4	508.5	4.113	57.485
1:19.0	463.1	3.744	61.229
1:24.6	451.9	3.526	64.754
1:30.2	435.0	3.417	68.172
1:35.8	411.2	3.260	71.432
1:41.3	379.5	3.046	74.478
1:46.9	350.3	2.812	77.290
1:52.5	328.5	2.615	79.905
1:58.1	299.5	2.420	82.324
2:03.7	267.2	2.183	84.507
2:09.3	238.8	1.949	86.457
2:14.9	215.3	1.750	88.207
2:20.5	195.8	1.584	89.790
2:26.1	178.2	1.441	91.231
2:31.7	161.4	1.308	92.539
2:37.3	146.9	1.188	93.727
2:42.9	135.1	1.087	94.814
2:48.5	125.3	1.003	95.817
2:54.1	117.0	0.933	96.750
2:59.7	109.8	0.874	97.624
3:05.3	103.5	0.822	98.446
3:10.9	98.0	0.776	99.222
3:16.4	93.1	0.736	99.959
3:22.0	88.7	0.701	100.659
3:27.6	84.7	0.668	101.328
3:33.2	81.1	0.639	101.967
3:38.8	77.8	0.612	102.579
3:44.4	74.7	0.587	103.166
3:50.0	71.6	0.564	103.730
3:55.6	68.3	0.539	104.269
4:01.2	65.3	0.515	104.783
4:06.8	62.6	0.493	105.276
4:12.4	60.3	0.474	105.750
4:18.0	58.2	0.457	106.207

Hydrograph # 3

N45/47

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
4:23.6	56.2	0.441	106.647
4:29.2	53.8	0.423	107.071
4:34.8	50.9	0.403	107.474
4:40.4	47.8	0.380	107.854
4:46.0	44.6	0.356	108.210
4:51.6	41.4	0.331	108.541
4:57.1	38.5	0.308	108.849
5:02.7	35.8	0.286	109.135
5:08.3	33.3	0.266	109.402
5:13.9	30.6	0.246	109.648
5:19.5	26.2	0.219	109.866
5:25.1	21.4	0.183	110.049
5:30.7	17.2	0.149	110.198
5:36.3	15.1	0.124	110.322
5:41.9	14.3	0.113	110.436
5:47.5	13.7	0.108	110.543
5:53.1	13.0	0.103	110.646
5:58.7	12.4	0.098	110.744
6:04.3	11.8	0.093	110.838
6:09.9	11.3	0.089	110.927
6:15.5	10.8	0.085	111.012
6:21.1	10.3	0.081	111.093
6:26.7	9.8	0.077	111.170
6:32.2	9.4	0.074	111.244
6:37.8	8.9	0.070	111.315
6:43.4	8.5	0.067	111.382
6:49.0	8.1	0.064	111.446
6:54.6	7.7	0.061	111.507
7:00.2	7.4	0.058	111.565
7:05.8	7.0	0.056	111.621
7:11.4	6.7	0.053	111.674
7:17.0	6.4	0.051	111.724
7:22.6	6.1	0.048	111.773
7:28.2	5.8	0.046	111.819
7:33.8	5.6	0.044	111.863
7:39.4	5.3	0.042	111.904
7:45.0	5.1	0.040	111.944
7:50.6	4.8	0.038	111.982
7:56.2	4.6	0.036	112.019
8:01.8	4.4	0.035	112.053
8:07.3	4.2	0.033	112.086
8:12.9	4.0	0.032	112.118
8:18.5	3.8	0.030	112.148
8:24.1	3.6	0.029	112.177
8:29.7	3.5	0.027	112.204
8:35.3	3.3	0.026	112.230
8:40.9	3.2	0.025	112.255
8:46.5	3.0	0.024	112.279
8:52.1	2.9	0.023	112.301
8:57.7	2.7	0.022	112.323

Hydrograph # 3

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
9:03.3	2.6	0.021	112.344
9:08.9	2.5	0.020	112.363
9:14.5	2.4	0.019	112.382
9:20.1	2.3	0.018	112.400
9:25.7	2.2	0.017	112.417
9:31.3	2.1	0.016	112.433
9:36.9	2.0	0.016	112.449
9:42.4	1.9	0.015	112.464
9:48.0	1.8	0.014	112.478
9:53.6	1.7	0.013	112.491
9:59.2	1.6	0.013	112.504
10:04.8	1.6	0.012	112.516
10:10.4	1.5	0.012	112.528
10:16.0	1.5	0.011	112.540
10:21.6	1.4	0.011	112.551
10:27.2	1.4	0.011	112.562
10:32.8	1.4	0.011	112.572
10:38.4	1.3	0.010	112.583
10:44.0	1.3	0.010	112.593
10:49.6	1.3	0.010	112.603
10:55.2	1.2	0.010	112.612
11:00.8	1.2	0.009	112.621
11:06.4	1.1	0.009	112.630
11:12.0	1.1	0.009	112.639
11:17.6	1.1	0.008	112.647
11:23.1	1.0	0.008	112.656
11:28.7	1.0	0.008	112.663
11:34.3	1.0	0.008	112.671
11:39.9	0.9	0.007	112.678
11:45.5	0.9	0.007	112.685
11:51.1	0.9	0.007	112.692
11:56.7	0.8	0.006	112.698
12:02.3	0.8	0.006	112.705
12:07.9	0.7	0.006	112.710
12:13.5	0.7	0.006	112.716
12:19.1	0.7	0.005	112.721
12:24.7	0.6	0.005	112.726
12:30.3	0.6	0.005	112.731
12:35.9	0.6	0.004	112.736
12:41.5	0.5	0.004	112.740
12:47.1	0.5	0.004	112.744
12:52.7	0.5	0.004	112.747
12:58.2	0.4	0.003	112.751
13:03.8	0.4	0.003	112.754
13:09.4	0.3	0.003	112.757
13:15.0	0.3	0.003	112.759
13:20.6	0.3	0.002	112.762
13:26.2	0.2	0.002	112.764
13:31.8	0.2	0.002	112.765
13:37.4	0.2	0.001	112.767

Hydrograph # 3

Inflow H'graph: TOTAL FLOW INTO POINT C -100 YEAR, 6 HOUR

Time hr:min	Flow cfs	Change in Volume ac.ft.	Cummulative Volume ac.ft
13:43.0	0.0	0.001	112.767

Depth of runoff = 2.37 in.

APPENDIX O

0-1/8

```
**************************************************
* WATER SURFACE PROFILES                         *
* VERSION OF NOVEMBER 1976                       *
* UPDATED MAY 1984                               *
* IBM-PC-XT VERSION                              *
* RUN DATE  10/21/85  TIME  13:23:05             *
**************************************************
```

```
*************************************
* U.S. ARMY CORPS OF ENGINEERS      *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D        *
* DAVIS, CALIFORNIA 95616           *
* (916) 440-2105 (FTS) 448-2105     *
*************************************
```

```
X     X XXXXXXX  XXXXX           XXXXX
X     X X       X     X         X     X
X     X X       X                     X
XXXXXXX XXXX    X         XXXXX  XXXXX
X     X X       X               X
X     X X       X     X         X
X     X XXXXXXX  XXXXX          XXXXXXX
```

North Gully between Pond KZ and Highway 85
100yr, 6hr Storm Routing

0-2/8

```
                                                                  THIS RUN EXECUTED 10/21/85   13:23:13
**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
**************************************************


T1
T2
T3      NORTH GULLY BETWEEN POND K-2 AND HWY 85

J1  ICHECK    INQ      NINV     IDIR     STRT      METRIC    HVINS    Q        WSEL     FQ

       0.       2.       0.       0. -1.000000      .00       .0      0.   904.240     .000

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH     FN        ALLDC    IBW      CHNIM     ITRACE

     -1.000     .000   -1.000     .000     .000     .000   -1.000     .000     .000     .000


NC       .015      .015      .015      .300      .500      .000      .000      .000      .000      .000
QT      1.000   326.000      .000      .000      .000      .000      .000      .000      .000      .000
X1     99.000     4.000      .000    10.000      .000      .000      .000      .000      .000      .000
GR    926.040      .000   901.040      .000   901.040    10.000   926.040    10.000      .000      .000

X1    100.000     4.000      .000    10.000    60.000    60.000    60.000      .000      .000      .000
GR    907.710      .000   902.710      .000   902.710    10.000   907.710    10.000      .000      .000

NC       .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
X1      1.000     9.000    36.000   132.000   245.000   245.000   245.000      .000      .000      .000
GR    912.400      .000   911.200    36.000   908.400    52.000   907.900    61.000   908.400   100.000
GR    908.600   123.000   911.600   132.000   910.300   139.000   912.900   152.000      .000      .000

NC       .000      .000      .000      .100      .300      .000      .000      .000      .000      .000
X1      2.000    10.000    46.000   228.000   175.000   175.000   175.000      .000      .000      .000
GR    918.100      .000   917.900    38.000   917.500    46.000   911.200    61.000   911.100    67.000
GR    910.400   127.000   909.200   131.000   912.000   175.000   915.300   228.000   922.000   283.000

X1      3.000    13.000    35.000   250.000   230.000   120.000   175.000      .000      .000      .000
GR    923.600      .000   923.300    35.000   920.600    50.000   916.200    70.000   914.300   112.000
GR    914.500   117.000   915.500   150.000   915.200   171.000   914.600   172.000   915.100   173.000
GR    915.400   232.000   918.100   250.000   920.000   362.000      .000      .000      .000      .000

X1      4.000    10.000    52.000   220.000   225.000   225.000   225.000      .000      .000      .000
GR    937.500      .000   925.100    52.000   918.500    72.000   916.100   113.000   917.100   114.000
GR    915.000   116.000   918.300   120.000   918.700   184.000   926.200   220.000   930.000   365.000

X1      5.000     8.000    50.000   194.000   200.000   200.000   200.000      .000      .000      .000
GR    930.000      .000   921.500    50.000   920.900   115.000   920.000 ,  122.000   921.000   130.000
GR    921.900   140.000   926.500   194.000   934.600   240.000      .000      .000      .000      .000
```

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```
 1     6.000     8.000      .000   240.000   100.000   250.000   200.000      .000      .000      .000
GR   930.000      .000   926.900   141.000   925.900   215.000   925.300   219.000   926.900   225.000
GR   928.100   230.000   930.000   240.000   939.100   275.000      .000      .000      .000      .000

X1     7.000    10.000    21.000   190.000   260.000   260.000   260.000      .000      .000      .000
GR   940.200      .000   937.500    21.000   936.600    61.000   934.900    77.000   930.500   123.000
GR   929.900   123.000   931.100   129.000   930.700   144.000   934.000   190.000   940.000   235.000
EJ      .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
```

0.4/8

```
 SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
 Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
 TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
 SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .300 CEHV=    .500
*SECNO 99.000
3720 CRITICAL DEPTH ASSUMED
```

(Critical Depth = 3.2', Normal Depth = 1.75' (see app I, sht 15))

```
    99.00     3.20   904.24   904.24   904.24   905.85     1.61      .00      .00   906.04
     326.       0.     326.       0.       0.      32.       0.       0.       0.    906.04
      .00      .00    10.19      .00     .015     .015     .015     .000   901.04      .00
  .004341       0.       0.       0.        0        4        0      .00    10.00    10.00


*SECNO 100.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   100.00     3.20   905.91   905.91      .00   907.52     1.61      .30      .00   907.71
     326.       0.     326.       0.       0.      32.       0.       0.       0.    907.71
      .00      .00    10.19      .00     .015     .015     .015     .000   902.71      .00
  .004341      60.      60.      60.        0        5        0      .00    10.00    10.00


*SECNO 1.000

3301 HV CHANGED MORE THAN HVINS

     1.00     1.82   909.72   909.12      .00   909.85      .14     1.89      .44   911.20
     326.       0.     326.       0.       0.     110.       0.       0.       0.    911.60
      .02      .00     2.96      .00     .000     .050     .000     .000   907.90    44.45
  .017277     245.     245.     245.        2       10        0      .00    81.67   126.35


CCHV=    .100 CEHV=    .300
*SECNO 2.000
     2.00     2.79   911.99   911.05      .00   912.06      .07     2.20      .21   917.52
     326.       0.     326.       0.       0.     151.       0.       1.       1.    915.72
      .05      .00     2.16      .00     .000     .050     .000     .000   909.20    55.12
  .009572     175.     175.     175.        4        0        2      .00   115.84   174.94


*SECNO 3.000
     3.00     1.26   915.76   915.05      .00   916.21      .24     3.89      .25   [illegible]
     326.       0.     326.       0.       0.      82.       0.       1.       1.   [illegible]
      .06      .02     3.97      .02     .002     .002     .002     .000   914.50   [illegible]
  .006361     200.     175.     100.        2       17        2      .00   145.55   [illegible]
```

0-5/8

```
10/21/85    13:23:13

    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*SECNO 4.000
       4.00     2.76   919.86   919.82      .00   919.92      .06     3.89      .02   925.10
       326.       0.     326.       0.       0.     170.       0.       2.       2.    926.20
        .09      .02     1.92      .00     .000     .000     .000     .000   917.10    67.90
    .006923     225.     225.     225.        5       17        0      .00   121.63   189.53


*SECNO 5.000
       5.00     2.36   922.36   922.05      .00   922.56      .20     2.60      .04   921.90
       326.       1.     325.       0.       1.      91.       0.       3.       2.    920.00
        .11     1.26     3.56      .02     .000     .000     .000     .000   920.00    56.57
    .032059     200.     200.     200.        5       14        0      .00    87.05   143.62


*SECNO 6.000
       6.00     2.32   927.62   927.16      .00   927.74      .11     5.17      .01   938.00
       326.       0.     326.       0.       0.     121.       0.       3.       3.    938.00
        .13      .00     2.69      .00     .000     .000     .000     .000   925.30   100.00
    .020890     100.     200.     250.        5       14        0      .00   120.02   220.02


*SECNO 7.000
       7.00     2.50   932.40   931.66      .00   932.54      .14     4.79      .01   937.50
       326.       0.     326.       0.       0.     120.       0.       4.       3.    934.00
        .15      .00     3.01      .00     .000     .000     .000     .000   929.90    91.00
    .016397     260.     260.     260.        4       19        0      .00    75.83   167.63
```

0-6/8

```
                                                          THIS RUN EXECUTED 10/21/85   13:25:13
 ************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
 ************************************************


NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


NORTH GULLY BETWEEN POND

SUMMARY PRINTOUT TABLE  150


      SECNO     XLCH     ELTRD     ELLC     ELMIN       Q      CWSEL    CRIWS      EG      10K*S     VCH     AREA    .01K

*    99.000      .00      .00       .00    901.04   326.00   904.24   904.24   905.85    43.41    10.19    31.99   49.48

*   100.000    68.00      .00       .00    902.71   326.00   905.91   905.91   907.52    43.41    10.19    31.99   49.46

      1.000   245.00      .00       .00    907.90   326.00   909.72   909.12   909.85   172.77     2.96   109.96   24.80

      2.000   175.00      .00       .00    909.20   326.00   911.99   911.25   912.06    95.72     2.16   150.82   33.32

      3.000   175.00      .00       .00    914.50   326.00   915.76   915.75   916.01   983.61     3.97    82.11   10.39

      4.000   225.00      .00       .00    917.10   326.00   919.66   919.02   919.92    69.23     1.92   169.77   39.18

      5.000   200.00      .00       .00    920.00   326.00   922.36   922.05   922.56   320.59     3.56    92.02   17.98

      6.000   200.00      .00       .00    925.30   326.00   927.62   927.16   927.74   208.90     2.69   121.00   22.56

      7.000   262.00      .00       .00    929.92   326.00   932.42   931.66   932.54   163.97     3.01   106.37   25.46
```

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```
NORTH GULLY BETWEEN POND

SUMMARY PRINTOUT TABLE  150

        SECNO       Q       CWSEL    DIFWSP    DIFWSX    DIFKWS    TOPWID     XLCH

*      99.000    326.00    904.24       .00       .00       .00     10.00       .00

*     100.000    326.00    905.91       .00      1.67       .02     10.00     60.00

        1.000    326.00    909.72       .00      3.81       .00     81.87    245.00

        2.000    326.00    911.99       .00      2.27       .00    115.84    175.00

        3.000    326.00    915.76       .00      3.77       .02    145.58    175.00

        4.000    326.00    919.86       .00      4.10       .00    121.63    225.00

        5.000    326.00    922.36       .00      2.50       .00     87.05    200.00

        6.000    326.00    927.62       .00      5.26       .00    120.02    200.00

        7.000    326.00    932.40       .00      4.77       .00     75.63    260.00
```

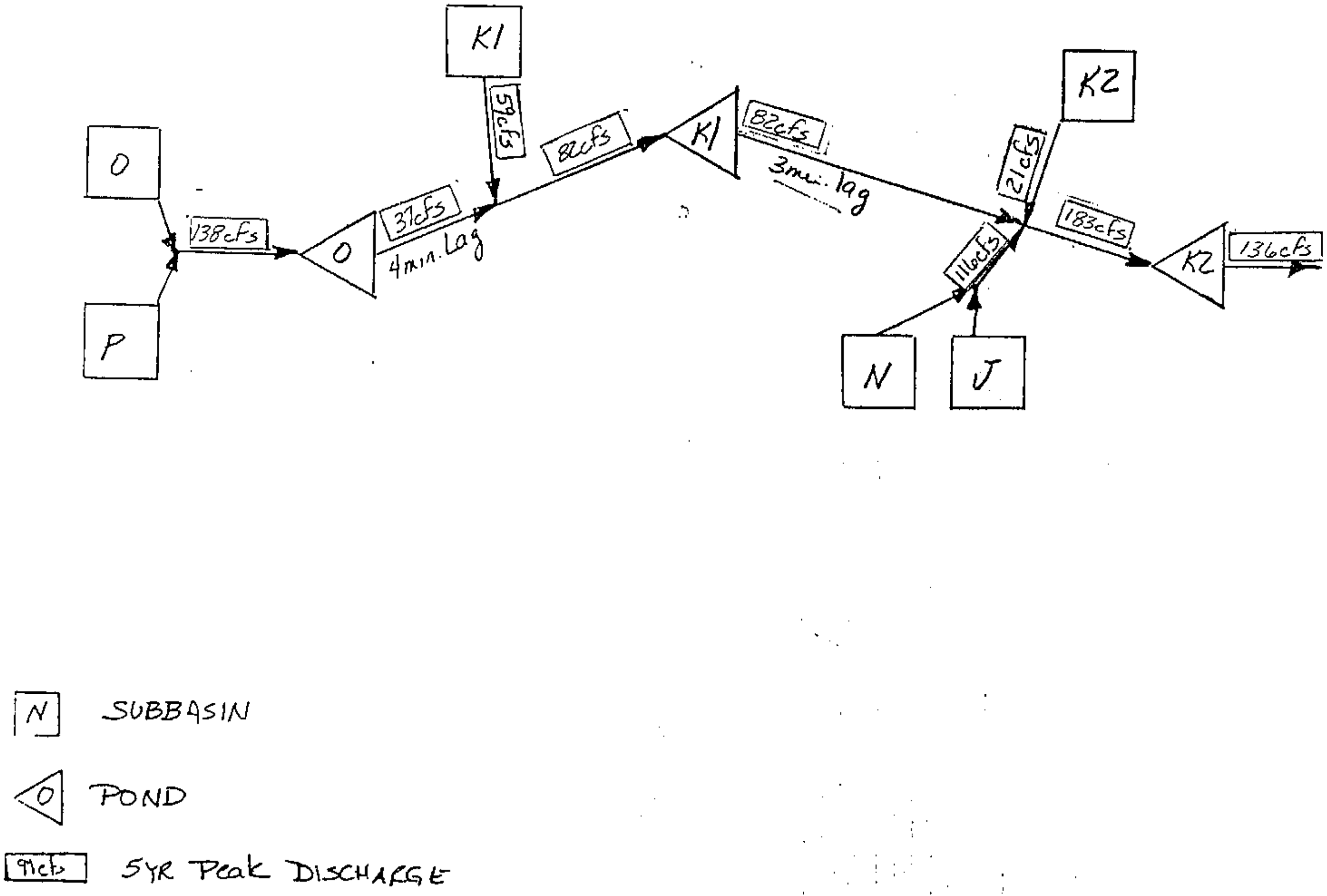
0-8/8

```
SUMMARY OF ERRORS AND SPECIAL NOTES


CAUTION  SECNO=     99.000  PROFILE= 1  CRITICAL DEPTH ASSUMED

CAUTION  SECNO=    100.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    100.000  PROFILE= 1  MINIMUM SPECIFIC ENERGY
```

APPENDIX P

BASIN ROUTING SCHEMATIC

5Yr. 24Hr Storm



DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project Cheyenne Mtn Ranch - 5yr, 24hr Storm

Client Datis

By DJT

Date 8/26/85

Job Nº E2825

P.1/28

Project Basins OrP, 5yr, 24hr

Job Nº E2669

Client Gatis

By DM

Date 10/4/85

Basins OrP

$CN = 71.8$, $T_c = 0.4$ hrs $A = 218.9$ Ac

$P = 2.7$ in

$Q = 0.64$ in from Tables-3, 'Peak Flows in Colorado', SCS, March 1980

$q_p = 630$ cfs/mi²·in

$$q = \frac{q_p}{640 Ac/mi^2} \times A_{(Ac)}\, Q_{(in)} = cfs$$

$$= 630 cfs/mi^2\text{-}in \times \frac{218.9 Ac}{640 Ac/mi^2} \times 0.64 in$$

$$q = 138 cfs$$

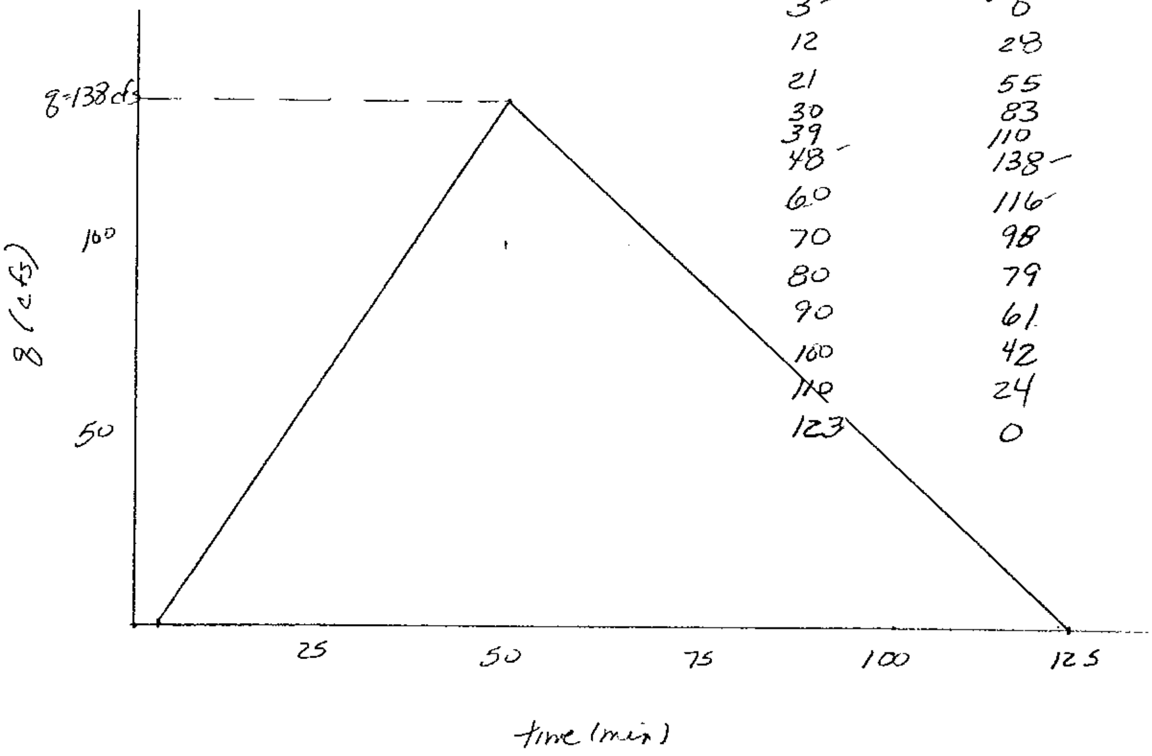
$$t_b = \frac{2AQ}{q} = \frac{2(218.9 Ac)\, 0.64 in}{138 cfs}$$

$$t_b = 2.0\ hr = 120\ min$$

$$D = 0.133 T_c = 0.133\,(0.4 hr) = 0.05 hr = 3 min$$

$$t_b = 2.67 t_p$$

$$t_p = \frac{2.0 hr}{2.67} = 0.75 hr = 45 min$$



time	q_t (cfs)
3	0
12	28
21	55
30	83
39	110
48	138
60	116
70	98
80	79
90	61
100	42
110	24
123	0

Project: Basin K1, 5yr, 24hr

Job Nº: E2669

Client: Gates

By: DJR

Date: 10/4/85

Basin K1

$CN = 73.0 \quad T_c \cdot 0.15hr \quad A = 62Ac \quad P = 2.7in$

$Q - 0.68in$

$q_p = 900\,csm/in$

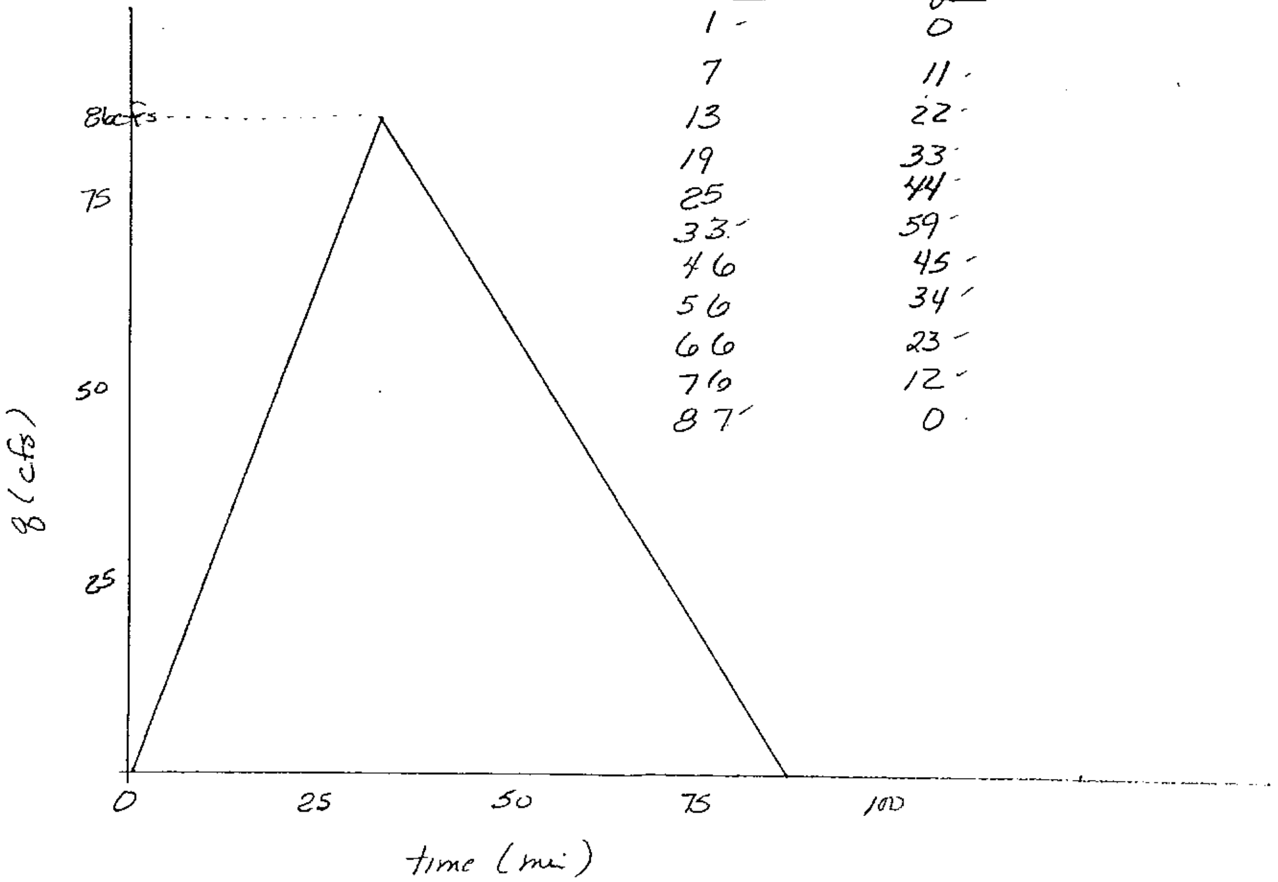
$q \cdot 900 \frac{cfs}{mi^2 in} \times \frac{62Ac}{640Ac/mi^2} \times 0.68in = 59cfs$

$t_b = \frac{2(62Ac)(0.68)in}{59cfs} - 1.43hr - 86min$

$D = 0.133(0.15) - 0.02hr - 1.2min$

$T_p \cdot \frac{1.43}{2.67} - 0.54hr - 32min$

time	q_t
1	0
7	11
13	22
19	33
25	44
33	59
46	45
56	34
66	23
76	12
87	0



Project: Basin K2, 5yr, 24hr

Job Nº: E2669

Client: Gates

By: DJR

Date: 10/4/85

Basin K2

$CN = 71.4, \quad T_c = 0.17\text{hr}, \quad A = 25\text{Ac}, \quad P = 2.7\text{in}$

$Q = 0.62\text{ in}$

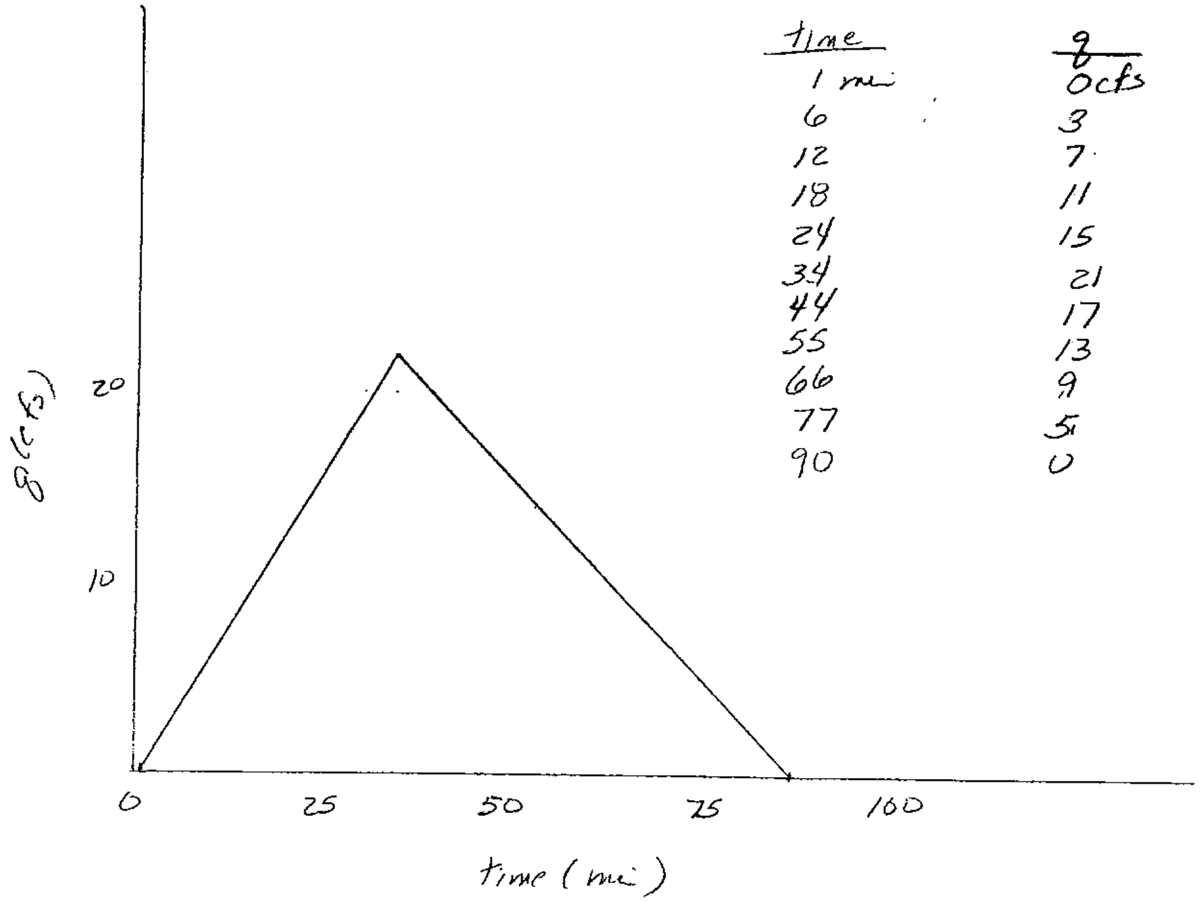
$q_p = 860\text{ csm/in}$

$$q = \frac{860\text{ cfs}}{\text{mi}^2\text{-in}} \times \frac{25\text{Ac}}{640\text{Ac/mi}^2} \times 0.62\text{in} = 21\text{ cfs}$$

$$t_b = \frac{2(25\text{Ac})\,0.62\text{in}}{21\text{ cfs}} \; 1.48\text{hr} = 89\text{ min}$$

$$D = 0.133(0.17\text{hr}) = 0.02\text{hr} = 1.4\text{min}$$

$$t_p = \frac{1.48\text{hr}}{2.67} = 0.55\text{hr} = 33\text{ min}$$



time	q
1 min	0 cfs
6	3
12	7
18	11
24	15
34	21
44	17
55	13
66	9
77	5
90	0

Project Basins N+J, 5yr, 24hr.

Job № E2669

Client Gates

By DJM

Date 10/4/85

Basins N+J

$CN = 75.7,\ T_c = 0.52\text{hr},\ A = 163\text{Ac},\ P = 2.7\text{in}$

$Q = 0.81\text{in}$

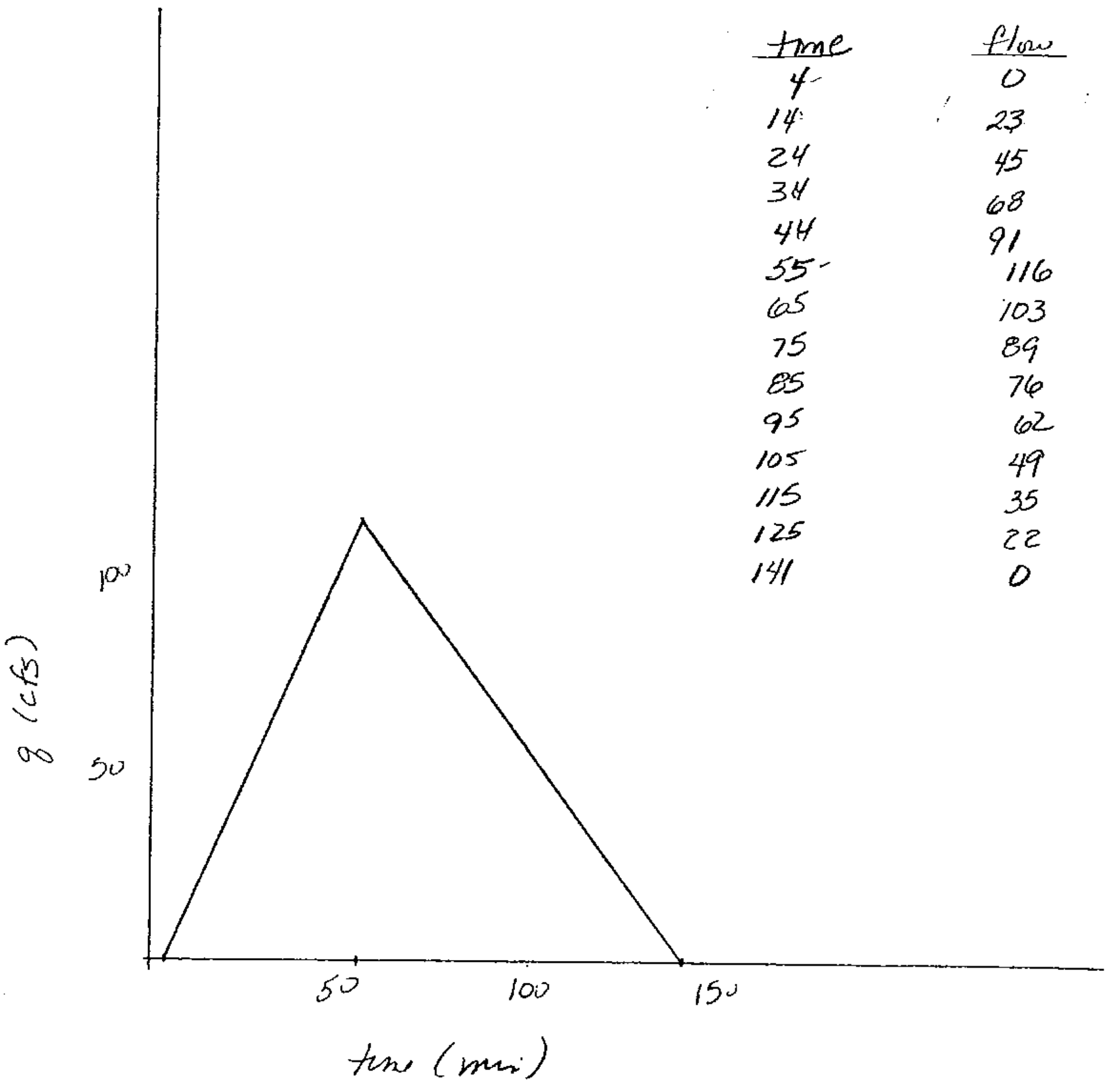
$q_P = 560 \frac{\text{cfs}}{\text{mi}^2\text{-in}}$

$q \quad \frac{560\text{cfs}}{\text{mi}^2\text{-in}} \times \frac{163\text{Ac}}{640\text{Ac}/\text{mi}^2} \times 0.81\text{in} = 116\text{cfs}$

$t_b = \frac{2(163\text{Ac})\,0.81\text{in}}{116\text{cfs}} = 2.28\text{hr} = 137\text{min}$

$D = 0.133\,(0.52\text{hr}) = 0.07\text{hr} = 4\text{min}$

$t_p = \frac{2.28\text{hr}}{2.67} = 0.85\text{hr} = 51\text{min}$



time	flow
4	0
14	23
24	45
34	68
44	91
55	116
65	103
75	89
85	76
95	62
105	49
115	35
125	22
141	0

O&P/5/24 — Hydrograph file

```
    Description of hydrograph :                                   Page   1

    BASINS O & P COMBINED, 5 YEAR, 24 HOUR
  Area =  218.90 ac.     Rational 'C'  = .##     Time of Concent. =  24 min.
                       Storm frequency, years =   5


   Time          Flow          Time          Flow          Time          Flow
  0:03.0  *    0.0 cfs       0:12.0  *   28.0 cfs       0:21.0  *   55.0 cfs
  0:30.0  *   83.0 cfs       0:39.0  *  110.0 cfs       0:48.0  *  138.0 cfs
  1:00.0  *  116.0 cfs       1:10.0  *   98.0 cfs       1:20.0  *   79.0 cfs
  1:30.0  *   61.0 cfs       1:40.0  *   42.0 cfs       1:50.0  *   24.0 cfs
  2:03.0  *    0.0 cfs       2:16.0  *    0.0 cfs       2:29.0  *    0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 4 ***

P.7/28

Date 10/03/85

Pond File : PONDO

RATING CURVE FOR POND O

Number	Elevation	Storage	Outflow
1	57.70	0.000	0.00
2	60.00	0.800	14.50
3	62.00	1.400	27.00
4	64.00	7.300	35.00
5	64.50	8.700	74.00
6	64.70	9.000	174.00
7	65.00	10.000	495.00

Routing of Hydrograph # 4

Description of hydrograph :

Page 1

BASINS O & P COMBINED, 5 YEAR, 24 HOUR
Area = 218.90 ac. Rational 'C' = .## Time of Concent. = 24 min.
Storm frequency, years = 5

Hydrograph # 5 - total outflow hydrograph
Description :
BASIN O&P ROUTED THROUGH POND O - 5 YEAR, 24 HOUR

Inflow H'graph: BASINS O & P COMBINED, 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	57.70	0.00
0:05.0	6.22	0.0084	57.72	0.15
0:07.0	12.44	0.0330	57.79	0.60
0:09.0	18.67	0.0732	57.91	1.33
0:11.0	24.89	0.1282	58.07	2.32
0:13.0	31.00	0.1971	58.27	3.57
0:15.0	37.00	0.2788	58.50	5.05
0:17.0	43.00	0.3728	58.77	6.76
0:19.0	49.00	0.4782	59.07	8.67
0:21.0	55.00	0.5947	59.41	10.78
0:23.0	61.22	0.7219	59.78	13.08
0:25.0	67.44	0.8595	60.20	15.74
0:27.0	73.67	1.0063	60.69	18.80
0:29.0	79.89	1.1615	61.21	22.03
0:31.0	86.00	1.3246	61.75	25.43
0:33.0	92.00	1.4974	62.03	27.13
0:35.0	98.00	1.6840	62.10	27.39
0:37.0	104.00	1.8865	62.16	27.66
0:39.0	110.00	2.1046	62.24	27.96
0:41.0	116.22	2.3388	62.32	28.27
0:43.0	122.44	2.5892	62.40	28.61
0:45.0	128.67	2.8557	62.49	28.97
0:47.0	134.89	3.1384	62.59	29.36
0:49.0	136.17 ◄	3.4303	62.69	29.75
0:51.0	132.50	3.7179	62.79	30.14
0:53.0	128.83	3.9943	62.88	30.52
0:55.0	125.17	4.2596	62.97	30.88
0:57.0	121.50	4.5138	63.06	31.22
0:59.0	117.83	4.7570	63.14	31.55
1:01.0	114.20	4.9893	63.22	31.87
1:03.0	110.60	5.2107	63.29	32.17
1:05.0	107.00	5.4214	63.36	32.45
1:07.0	103.40	5.6215	63.43	32.72
1:09.0	99.80	5.8108	63.50	32.98
1:11.0	96.10	5.9895	63.56	33.22
1:13.0	92.30	6.1572	63.61	33.45
1:15.0	88.50	6.3138	63.67	33.66
1:17.0	84.70	6.4593	63.72	33.86
1:19.0	80.90	6.5939	63.76	34.04
1:21.0	77.20	6.7176	63.80	34.21
1:23.0	73.60	6.8309	63.84	34.36
1:25.0	70.00	6.9338	63.88	34.50
1:27.0	66.40	7.0265	63.91	34.63
1:29.0	62.80	7.1089	63.94	34.74
1:31.0	59.10	7.1810	63.96	34.84
1:33.0	55.30	7.2425	63.98	34.92
1:35.0	51.50	7.2933	64.00	34.99
1:37.0	47.70	7.3323	64.01	35.90

Inflow H'graph: BASINS O & P COMBINED, 5 YEAR, 24 HOUR.

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:39.0	43.90	7.3585	64.02	36.63
1:41.0	40.20	7.3729	64.03	37.03
1:43.0	36.60	7.3765	64.03	37.13
1:45.0	33.00	7.3704	64.03	36.96
1:47.0	29.40	7.3551	64.02	36.53
1:49.0	25.80	7.3314	64.01	35.87
1:51.0	22.15	7.2998	64.00	35.00
1:53.0	18.46	7.2594	63.99	34.94
1:55.0	14.77	7.2090	63.97	34.88
1:57.0	11.08	7.1486	63.95	34.79
1:59.0	7.38	7.0783	63.92	34.70
2:01.0	3.69	6.9982	63.90	34.59
2:03.0	0.00	6.9081	63.87	34.47
2:05.0	0.00	6.8133	63.84	34.34
2:07.0	0.00	6.7189	63.80	34.21
2:09.0	0.00	6.6248	63.77	34.08
2:11.0	0.00	6.5311	63.74	33.96
2:13.0	0.00	6.4378	63.71	33.83
2:15.0	0.00	6.3447	63.68	33.70
2:17.0	0.00	6.2521	63.64	33.58
2:19.0	0.00	6.1597	63.61	33.45
2:21.0	0.00	6.0677	63.58	33.33
2:23.0	0.00	5.9761	63.55	33.20
2:25.0	0.00	5.8848	63.52	33.08
2:27.0	0.00	5.7938	63.49	32.96
2:29.0	0.00	5.7032	63.46	32.83
2:31.0	0.00	5.6129	63.43	32.71
2:33.0	0.00	5.5230	63.40	32.59
2:35.0	0.00	5.4334	63.37	32.47
2:37.0	0.00	5.3441	63.34	32.35
2:39.0	0.00	5.2551	63.31	32.23
2:41.0	0.00	5.1665	63.28	32.11
2:43.0	0.00	5.0782	63.25	31.99
2:45.0	0.00	4.9903	63.22	31.87
2:47.0	0.00	4.9026	63.19	31.75
2:49.0	0.00	4.8153	63.16	31.63
2:51.0	0.00	4.7284	63.13	31.51
2:53.0	0.00	4.6417	63.10	31.40
2:55.0	0.00	4.5554	63.07	31.28
2:57.0	0.00	4.4694	63.04	31.16
2:59.0	0.00	4.3837	63.01	31.05
3:01.0	0.00	4.2983	62.98	30.93
3:03.0	0.00	4.2133	62.95	30.81
3:05.0	0.00	4.1286	62.92	30.70
3:07.0	0.00	4.0441	62.90	30.59
3:09.0	0.00	3.9600	62.87	30.47
3:11.0	0.00	3.8763	62.84	30.36
3:13.0	0.00	3.7928	62.81	30.24

Inflow H'graph: BASINS O & P COMBINED, 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:15.0	0.00	3.7096	62.78	30.13
3:17.0	0.00	3.6268	62.75	30.02
3:19.0	0.00	3.5442	62.73	29.91
3:21.0	0.00	3.4620	62.70	29.80
3:23.0	0.00	3.3801	62.67	29.68
3:25.0	0.00	3.2984	62.64	29.57
3:27.0	0.00	3.2171	62.62	29.46
3:29.0	0.00	3.1361	62.59	29.35
3:31.0	0.00	3.0554	62.56	29.24
3:33.0	0.00	2.9750	62.53	29.14
3:35.0	0.00	2.8949	62.51	29.03
3:37.0	0.00	2.8150	62.48	28.92
3:39.0	0.00	2.7355	62.45	28.81
3:41.0	0.00	2.6563	62.43	28.70
3:43.0	0.00	2.5774	62.40	28.60
3:45.0	0.00	2.4987	62.37	28.49
3:47.0	0.00	2.4204	62.35	28.38
3:49.0	0.00	2.3424	62.32	28.28
3:51.0	0.00	2.2646	62.29	28.17
3:53.0	0.00	2.1871	62.27	28.07
3:55.0	0.00	2.1100	62.24	27.96
3:57.0	0.00	2.0331	62.21	27.86
3:59.0	0.00	1.9565	62.19	27.75
4:01.0	0.00	1.8802	62.16	27.65
4:03.0	0.00	1.8041	62.14	27.55
4:05.0	0.00	1.7284	62.11	27.45
4:07.0	0.00	1.6529	62.09	27.34
4:09.0	0.00	1.5777	62.06	27.24
4:11.0	0.00	1.5028	62.03	27.14
4:13.0	0.00	1.4282	62.01	27.04
4:15.0	0.00	1.3551	61.85	26.06
4:17.0	0.00	1.2853	61.62	24.61
4:19.0	0.00	1.2194	61.40	23.24
4:21.0	0.00	1.1571	61.19	21.94
4:23.0	0.00	1.0984	60.99	20.72
4:25.0	0.00	1.0429	60.81	19.56
4:27.0	0.00	0.9905	60.64	18.47
4:29.0	0.00	0.9411	60.47	17.44
4:31.0	0.00	0.8944	60.31	16.47
4:33.0	0.00	0.8503	60.17	15.55
4:35.0	0.00	0.8086	60.03	14.68
4:37.0	0.00	0.7692	59.91	13.94
4:39.0	0.00	0.7317	59.80	13.26
4:41.0	0.00	0.6961	59.70	12.62
4:43.0	0.00	0.6622	59.60	12.00
4:45.0	0.00	0.6299	59.51	11.42
4:47.0	0.00	0.5992	59.42	10.86
4:49.0	0.00	0.5700	59.34	10.33

Inflow H'graph: BASINS O & P COMBINED, 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:51.0	0.00	0.5423	59.26	9.83
4:53.0	0.00	0.5158	59.18	9.35
4:55.0	0.00	0.4907	59.11	8.89
4:57.0	0.00	0.4668	59.04	8.46
4:59.0	0.00	0.4441	58.98	8.05
5:01.0	0.00	0.4224	58.91	7.66
5:03.0	0.00	0.4019	58.86	7.28
5:05.0	0.00	0.3823	58.80	6.93
5:07.0	0.00	0.3637	58.75	6.59
5:09.0	0.00	0.3459	58.69	6.27
5:11.0	0.00	0.3291	58.65	5.96
5:13.0	0.00	0.3131	58.60	5.67
5:15.0	0.00	0.2978	58.56	5.40
5:17.0	0.00	0.2833	58.51	5.13
5:19.0	0.00	0.2695	58.47	4.88
5:21.0	0.00	0.2564	58.44	4.65
5:23.0	0.00	0.2439	58.40	4.42
5:25.0	0.00	0.2320	58.37	4.21
5:27.0	0.00	0.2207	58.33	4.00
5:29.0	0.00	0.2099	58.30	3.81
5:31.0	0.00	0.1997	58.27	3.62
5:33.0	0.00	0.1900	58.25	3.44
5:35.0	0.00	0.1807	58.22	3.28
5:37.0	0.00	0.1719	58.19	3.12
5:39.0	0.00	0.1636	58.17	2.96
5:41.0	0.00	0.1556	58.15	2.82
5:43.0	0.00	0.1480	58.13	2.68
5:45.0	0.00	0.1408	58.10	2.55
5:47.0	0.00	0.1339	58.09	2.43
5:49.0	0.00	0.1274	58.07	2.31
5:51.0	0.00	0.1212	58.05	2.20
5:53.0	0.00	0.1153	58.03	2.09
5:55.0	0.00	0.1097	58.02	1.99
5:57.0	0.00	0.1070	58.01	1.94
5:59.0	0.00	0.1043	58.00	1.89
6:01.0	0.00	0.1017	57.99	1.84
6:03.0	0.00	0.0990	57.98	1.79
6:05.0	0.00	0.0963	57.98	1.75
6:07.0	0.00	0.0936	57.97	1.70
6:09.0	0.00	0.0910	57.96	1.65
6:11.0	0.00	0.0883	57.95	1.60
6:13.0	0.00	0.0856	57.95	1.55
6:15.0	0.00	0.0829	57.94	1.50
6:17.0	0.00	0.0803	57.93	1.45
6:19.0	0.00	0.0776	57.92	1.41
6:21.0	0.00	0.0749	57.92	1.36
6:23.0	0.00	0.0722	57.91	1.31
6:25.0	0.00	0.0696	57.90	1.26

Inflow H'graph: BASINS O & P COMBINED, 5 YEAR, 24 HOUR:

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:27.0	0.00	0.0669	57.89	1.21
6:29.0	0.00	0.0642	57.88	1.16
6:31.0	0.00	0.0615	57.88	1.12
6:33.0	0.00	0.0589	57.87	1.07
6:35.0	0.00	0.0562	57.86	1.02
6:37.0	0.00	0.0535	57.85	0.97
6:39.0	0.00	0.0508	57.85	0.92
6:41.0	0.00	0.0482	57.84	0.87
6:43.0	0.00	0.0455	57.83	0.82
6:45.0	0.00	0.0428	57.82	0.78
6:47.0	0.00	0.0401	57.82	0.73
6:49.0	0.00	0.0375	57.81	0.68
6:51.0	0.00	0.0348	57.80	0.63
6:53.0	0.00	0.0321	57.79	0.58
6:55.0	0.00	0.0294	57.78	0.53
6:57.0	0.00	0.0268	57.78	0.48
6:59.0	0.00	0.0241	57.77	0.44
7:01.0	0.00	0.0214	57.76	0.39
7:03.0	0.00	0.0187	57.75	0.34
7:05.0	0.00	0.0161	57.75	0.29
7:07.0	0.00	0.0134	57.74	0.24
7:09.0	0.00	0.0107	57.73	0.19
7:11.0	0.00	0.0080	57.72	0.15
7:13.0	0.00	0.0054	57.72	0.10
7:15.0	0.00	0.0027	57.71	0.05
7:17.0	0.00	0.0000	57.70	0.00

K1/5/24 – Hydrograph file

```
     Description of hydrograph :                                    Page   1

     BASIN K1, 5 YEAR, 24 HOUR STORM
   Area =    62.00 ac.    Rational 'C'  = .##     Time of Concent. =   9 min.
                              Storm frequency, years =   5

    Time        Flow           Time        Flow           Time        Flow
   0:01.0  *   0.0 cfs       0:07.0  *  11.0 cfs       0:13.0  *  22.0 cfs
   0:19.0  *  33.0 cfs       0:25.0  *  44.0 cfs       0:33.0  *  59.0 cfs
   0:46.0  *  45.0 cfs       0:56.0  *  34.0 cfs       1:06.0  *  23.0 cfs
   1:16.0  *  12.0 cfs       1:27.0  *   0.0 cfs       1:38.0  *   0.0 cfs
   1:49.0  *   0.0 cfs       2:00.0  *   0.0 cfs       2:11.0  *   0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 6 ***

p.14/28

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Date 10/03/85
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Pond File : PONDK1

```
RATING CURVE FOR POND K1


           PIPES                               WEIRS
Str   Diam    Elev     #       Left  Length   Right   Elev   Height  Type
No.    in      ft              S/S     ft      S/S     ft      ft
 1  -  60    79.00     1  -                                           HP

     Number          Elevation          Storage          Outflow
       1               79.00             0.000             0.00
       2               84.00             0.137           139.42
       3               86.00             0.580           203.86
       4               88.00             1.652           242.26
       5               90.00             3.739           279.03
       6               94.00            10.929           348.02
```

Routing of Hydrograph # 6

```
  Description of hydrograph :                                Page   1

  BASIN K1 + LAGGED POND O OUTFLOW - 5 YEAR, 24 HOUR
Area =  280.90 ac.    Rational 'C'  = .##     Time of Concent. =  24 min.
                     Storm frequency, years =   5


  Hydrograph # 1  - total outflow hydrograph
  Description :
  BASIN K1 + LAGGED PONDO ROUTED TH. POND K1 - 5 YEAR, 24 HOUR
```

Inflow H'graph: BASIN K1 + LAGGED POND 0 OUTFLOW - 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	79.00	0.00
0:09.0	9.49	0.0101	79.37	2.15
0:11.0	18.98	0.0297	80.08	12.08
0:13.0	23.50	0.0423	80.54	21.26
0:15.0	28.01	0.0480	80.75	26.07
0:17.0	33.07	0.0535	80.95	31.01
0:19.0	38.13	0.0590	81.15	36.22
0:21.0	43.60	0.0644	81.35	41.62
0:23.0	49.08	0.0696	81.54	47.22
0:25.0	54.84	0.0748	81.73	52.95
0:27.0	60.91	0.0800	81.92	59.00
0:29.0	67.39	0.0854	82.12	65.42
0:31.0	74.09	0.0908	82.31	72.15
0:33.0	81.08	0.0961	82.51	79.11
0:35.0	81.63	0.0983	82.59	82.01
0:37.0	81.60	0.0979	82.57	81.50
0:39.0	79.87	0.0972	82.55	80.51
0:41.0	78.05	0.0957	82.49	78.51
0:43.0	76.19	0.0943	82.44	76.72
0:45.0	74.35	0.0929	82.39	74.86
0:47.0	72.52	0.0915	82.34	73.04
0:49.0	70.68	0.0900	82.29	71.21
0:51.0	68.86	0.0886	82.23	69.39
0:53.0	67.05	0.0871	82.18	67.58
0:55.0	65.24	0.0857	82.13	65.77
0:57.0	63.41	0.0842	82.07	63.95
0:59.0	61.57	0.0827	82.02	62.12
1:01.0	59.71	0.0811	81.96	60.28
1:03.0	57.84	0.0795	81.90	58.42
1:05.0	55.96	0.0779	81.84	56.55
1:07.0	54.06	0.0763	81.78	54.66
1:09.0	52.14	0.0746	81.72	52.76
1:11.0	50.22	0.0729	81.66	50.84
1:13.0	48.28	0.0712	81.60	48.91
1:15.0	42.58	0.0673	81.46	44.74
1:17.0	37.50	0.0620	81.26	39.21
1:19.0	33.69	0.0578	81.11	35.04
1:21.0	33.85	0.0563	81.05	33.59
1:23.0	34.03	0.0567	81.07	33.99
1:25.0	34.20	0.0569	81.07	34.14
1:27.0	34.36	0.0570	81.08	34.30
1:29.0	34.49	0.0572	81.09	34.44
1:31.0	34.62	0.0573	81.09	34.57
1:33.0	34.73	0.0574	81.10	34.69
1:35.0	34.83	0.0575	81.10	34.80
1:37.0	34.95	0.0576	81.10	34.90
1:39.0	35.13	0.0578	81.11	35.06
1:41.0	35.84	0.0583	81.13	35.55

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:43.0	36.53	0.0591	81.16	36.28
1:45.0	36.99	0.0596	81.18	36.84
1:47.0	37.04	0.0598	81.18	37.04
1:49.0	36.88	0.0597	81.18	36.95
1:51.0	36.53	0.0595	81.17	36.67
1:53.0	35.81	0.0589	81.15	36.09
1:55.0	35.27	0.0582	81.12	35.46
1:57.0	34.94	0.0578	81.11	35.05
1:59.0	34.87	0.0576	81.10	34.88
2:01.0	34.79	0.0576	81.10	34.82
2:03.0	34.69	0.0575	81.10	34.73
2:05.0	34.59	0.0574	81.09	34.63
2:07.0	34.47	0.0572	81.09	34.51
2:09.0	34.34	0.0571	81.08	34.39
2:11.0	34.21	0.0570	81.08	34.26
2:13.0	34.08	0.0569	81.07	34.13
2:15.0	33.96	0.0567	81.07	34.01
2:17.0	33.83	0.0566	81.07	33.88
2:19.0	33.71	0.0565	81.06	33.75
2:21.0	33.58	0.0563	81.06	33.63
2:23.0	33.45	0.0562	81.05	33.50
2:25.0	33.33	0.0561	81.05	33.38
2:27.0	33.21	0.0559	81.04	33.25
2:29.0	33.08	0.0558	81.04	33.13
2:31.0	32.96	0.0557	81.03	33.01
2:33.0	32.84	0.0555	81.03	32.88
2:35.0	32.71	0.0554	81.02	32.76
2:37.0	32.59	0.0553	81.02	32.64
2:39.0	32.47	0.0552	81.01	32.52
2:41.0	32.35	0.0550	81.01	32.39
2:43.0	32.23	0.0549	81.00	32.27
2:45.0	32.11	0.0548	81.00	32.15
2:47.0	31.99	0.0546	80.99	32.03
2:49.0	31.87	0.0545	80.99	31.91
2:51.0	31.75	0.0544	80.98	31.80
2:53.0	31.63	0.0543	80.98	31.68
2:55.0	31.51	0.0541	80.98	31.56
2:57.0	31.40	0.0540	80.97	31.44
2:59.0	31.28	0.0539	80.97	31.32
3:01.0	31.16	0.0538	80.96	31.21
3:03.0	31.05	0.0536	80.96	31.09
3:05.0	30.93	0.0535	80.95	30.98
3:07.0	30.81	0.0534	80.95	30.86
3:09.0	30.70	0.0533	80.94	30.74
3:11.0	30.59	0.0531	80.94	30.63
3:13.0	30.47	0.0530	80.93	30.52
3:15.0	30.36	0.0529	80.93	30.40
3:17.0	30.24	0.0528	80.93	30.29

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:19.0	30.13	0.0526	80.92	30.18
3:21.0	30.02	0.0525	80.92	30.06
3:23.0	29.91	0.0524	80.91	29.95
3:25.0	29.80	0.0523	80.91	29.84
3:27.0	29.68	0.0521	80.90	29.73
3:29.0	29.57	0.0520	80.90	29.62
3:31.0	29.46	0.0519	80.89	29.51
3:33.0	29.35	0.0518	80.89	29.40
3:35.0	29.24	0.0517	80.89	29.29
3:37.0	29.14	0.0515	80.88	29.18
3:39.0	29.03	0.0514	80.88	29.07
3:41.0	28.92	0.0513	80.87	28.96
3:43.0	28.81	0.0512	80.87	28.85
3:45.0	28.70	0.0511	80.86	28.75
3:47.0	28.60	0.0509	80.86	28.64
3:49.0	28.49	0.0508	80.86	28.53
3:51.0	28.38	0.0507	80.85	28.43
3:53.0	28.28	0.0506	80.85	28.32
3:55.0	28.17	0.0505	80.84	28.22
3:57.0	28.07	0.0504	80.84	28.11
3:59.0	27.96	0.0502	80.83	28.01
4:01.0	27.86	0.0501	80.83	27.90
4:03.0	27.75	0.0500	80.82	27.80
4:05.0	27.65	0.0499	80.82	27.69
4:07.0	27.55	0.0498	80.82	27.59
4:09.0	27.45	0.0497	80.81	27.49
4:11.0	27.34	0.0495	80.81	27.39
4:13.0	27.24	0.0494	80.80	27.28
4:15.0	27.03	0.0492	80.80	27.12
4:17.0	26.64	0.0489	80.78	26.81
4:19.0	25.85	0.0482	80.76	26.20
4:21.0	24.62	0.0470	80.71	25.16
4:23.0	23.28	0.0454	80.66	23.86
4:25.0	21.97	0.0439	80.60	22.54
4:27.0	20.76	0.0423	80.55	21.30
4:29.0	19.60	0.0409	80.49	20.13
4:31.0	18.49	0.0394	80.44	19.01
4:33.0	17.47	0.0381	80.39	17.96
4:35.0	16.50	0.0367	80.34	16.97
4:37.0	15.57	0.0354	80.29	16.03
4:39.0	14.73	0.0342	80.25	15.15
4:41.0	13.97	0.0331	80.21	14.36
4:43.0	13.28	0.0321	80.17	13.65
4:45.0	12.63	0.0311	80.13	12.98
4:47.0	12.02	0.0301	80.10	12.36
4:49.0	11.43	0.0292	80.07	11.76
4:51.0	10.87	0.0283	80.03	11.19
4:53.0	10.35	0.0275	80.00	10.65

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:55.0	9.84	0.0266	79.97	10.14
4:57.0	9.36	0.0258	79.94	9.65
4:59.0	8.91	0.0250	79.91	9.19
5:01.0	8.47	0.0243	79.89	8.75
5:03.0	8.06	0.0235	79.86	8.32
5:05.0	7.67	0.0228	79.83	7.92
5:07.0	7.29	0.0221	79.81	7.54
5:09.0	6.93	0.0215	79.78	7.18
5:11.0	6.60	0.0208	79.76	6.83
5:13.0	6.28	0.0202	79.74	6.50
5:15.0	5.97	0.0196	79.71	6.19
5:17.0	5.68	0.0190	79.69	5.89
5:19.0	5.41	0.0184	79.67	5.61
5:21.0	5.14	0.0178	79.65	5.34
5:23.0	4.89	0.0173	79.63	5.08
5:25.0	4.65	0.0168	79.61	4.84
5:27.0	4.43	0.0163	79.59	4.61
5:29.0	4.21	0.0158	79.58	4.39
5:31.0	4.01	0.0153	79.56	4.18
5:33.0	3.81	0.0148	79.54	3.98
5:35.0	3.62	0.0144	79.52	3.78
5:37.0	3.45	0.0139	79.51	3.60
5:39.0	3.28	0.0135	79.49	3.43
5:41.0	3.12	0.0131	79.48	3.27
5:43.0	2.97	0.0127	79.46	3.11
5:45.0	2.82	0.0123	79.45	2.96
5:47.0	2.69	0.0120	79.44	2.82
5:49.0	2.56	0.0116	79.42	2.68
5:51.0	2.43	0.0113	79.41	2.56
5:53.0	2.31	0.0109	79.40	2.43
5:55.0	2.20	0.0106	79.39	2.32
5:57.0	2.10	0.0103	79.37	2.21
5:59.0	2.01	0.0100	79.36	2.11
6:01.0	1.94	0.0097	79.36	2.03
6:03.0	1.89	0.0095	79.35	1.96
6:05.0	1.84	0.0094	79.34	1.90
6:07.0	1.79	0.0092	79.34	1.85
6:09.0	1.75	0.0090	79.33	1.80
6:11.0	1.70	0.0089	79.32	1.75
6:13.0	1.65	0.0087	79.32	1.70
6:15.0	1.60	0.0086	79.31	1.66
6:17.0	1.55	0.0084	79.31	1.61
6:19.0	1.50	0.0083	79.30	1.56
6:21.0	1.45	0.0081	79.30	1.51
6:23.0	1.41	0.0079	79.29	1.47
6:25.0	1.36	0.0078	79.28	1.42
6:27.0	1.31	0.0076	79.28	1.37
6:29.0	1.26	0.0075	79.27	1.32

Inflow H′graph: BASIN K1 + LAGGED POND O OUTFLOW - 5 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:31.0	1.21	0.0073	79.27	1.27
6:33.0	1.16	0.0071	79.26	1.23
6:35.0	1.12	0.0069	79.25	1.18
6:37.0	1.07	0.0068	79.25	1.13
6:39.0	1.02	0.0066	79.24	1.08
6:41.0	0.97	0.0064	79.23	1.04
6:43.0	0.92	0.0062	79.23	0.99
6:45.0	0.87	0.0060	79.22	0.94
6:47.0	0.82	0.0058	79.21	0.89
6:49.0	0.78	0.0056	79.21	0.85
6:51.0	0.73	0.0054	79.20	0.80
6:53.0	0.68	0.0052	79.19	0.75
6:55.0	0.63	0.0050	79.18	0.71
6:57.0	0.58	0.0048	79.18	0.66
6:59.0	0.53	0.0046	79.17	0.61
7:01.0	0.48	0.0044	79.16	0.57
7:03.0	0.44	0.0042	79.15	0.52
7:05.0	0.39	0.0039	79.14	0.47
7:07.0	0.34	0.0037	79.13	0.43
7:09.0	0.29	0.0034	79.13	0.38
7:11.0	0.24	0.0032	79.12	0.34
7:13.0	0.19	0.0029	79.11	0.29
7:15.0	0.12	0.0026	79.09	0.24
7:17.0	0.00	0.0022	79.08	0.18
7:19.0	0.00	0.0019	79.07	0.15
7:21.0	0.00	0.0017	79.06	0.12
7:23.0	0.00	0.0014	79.05	0.10
7:25.0	0.00	0.0012	79.04	0.07
7:27.0	0.00	0.0010	79.04	0.05
7:29.0	0.00	0.0007	79.03	0.03
7:31.0	0.00	0.0005	79.02	0.02
7:33.0	0.00	0.0002	79.01	0.01
7:35.0	0.00	0.0000	79.00	0.00

N&J/5/24 — Hydrograph file

```
   Description of hydrograph :                                  Page   3

   BASINS N & J COMBINED, 5 YEAR, 24 HOUR
 Area =  163.00 ac.    Rational 'C'  = .##    Time of Concent. =  31 min.
                      Storm frequency, years =   5


  Time         Flow           Time         Flow           Time         Flow
 0:04.0  *   0.0 cfs        0:14.0  *  23.0 cfs        0:24.0  *  45.0 cfs
 0:34.0  *  68.0 cfs        0:44.0  *  91.0 cfs        0:55.0  * 116.0 cfs
 1:05.0  * 103.0 cfs        1:15.0  *  89.0 cfs        1:25.0  *  76.0 cfs
 1:35.0  *  62.0 cfs        1:45.0  *  49.0 cfs        1:55.0  *  35.0 cfs
 2:05.0  *  22.0 cfs        2:21.0  *   0.0 cfs        2:37.0  *   0.0 cfs
 2:53.0  *   0.0 cfs        3:09.0  *   0.0 cfs        3:25.0  *   0.0 cfs
```

7.21/28

K2/5/24 — Hydrograph file

```
  Description of hydrograph :                                    Page   1

  BASIN K2 - 5 YEAR, 24 HOUR
Area =    25.00 ac.    Rational 'C'  = .##    Time of Concent. =  10 min.
                     Storm frequency, years =   5


 Time          Flow          Time          Flow          Time          Flow
0:01.0  *   0.0 cfs        0:06.0  *   3.0 cfs        0:12.0  *   7.0 cfs
0:18.0  *  11.0 cfs        0:24.0  *  15.0 cfs        0:34.0  *  21.0 cfs
0:44.0  *  17.0 cfs        0:55.0  *  13.0 cfs        1:06.0  *   9.0 cfs
1:17.0  *   5.0 cfs        1:30.0  *   0.0 cfs        1:43.0  *   0.0 cfs
1:56.0  *   0.0 cfs        2:09.0  *   0.0 cfs        2:22.0  *   0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 2 ***

P.22/28

```
Date 10/03/85
```

Pond File : NEWK2

```
*********TRIAL THREE*********



             PIPES                                 WEIRS
Str    Diam    Elev      #        Left   Length   Right    Elev    Height   Type
No.     in      ft                S/S      ft      S/S      ft       ft
 1  -   66    34.00      1   -                                                HP

     Number            Elevation           Storage            Outflow
       1                 34.00              0.000               0.00
       2                 35.00              0.121              11.56
       3                 36.00              0.730              35.06
       4                 38.00              3.492             106.30
       5                 40.00              7.569             203.37
       6                 42.00             12.299             265.49
       7                 42.60             13.938             278.92
```

Routing of Hydrograph # 2

```
  Description of hydrograph :                                      Page   1

  BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR
Area =  468.90 ac.    Rational 'C'  = .##     Time of Concent. =  31 min.
                     Storm frequency, years =   5


  Hydrograph # 3  - total outflow hydrograph
  Description :
  BASINS K2,N&J + LAGGED POND K1 ROUTED TH. POND K2 -5YR, 24HR
```

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED–5 YEAR,24 HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	34.00	0.00
0:06.0	4.60	0.0062	34.05	0.10
0:08.0	9.20	0.0239	34.20	0.86
0:10.0	13.80	0.0504	34.42	2.85
0:12.0	22.27	0.0868	34.72	6.80
0:14.0	32.59	0.1364	35.03	12.04
0:16.0	46.14	0.2085	35.14	14.34
0:18.0	57.36	0.3069	35.31	17.72
0:20.0	67.39	0.4240	35.50	22.07
0:22.0	77.02	0.5548	35.71	27.35
0:24.0	86.84	0.6966	35.95	33.54
0:26.0	96.85	0.8517	36.09	37.57
0:28.0	107.27	1.0243	36.21	41.23
0:30.0	117.92	1.2151	36.35	45.43
0:32.0	128.91	1.4234	36.50	50.18
0:34.0	140.24	1.6485	36.67	55.51
0:36.0	150.96	1.8886	36.84	61.42
0:38.0	157.98	2.1362	37.02	67.74
0:40.0	163.12	2.3829	37.20	74.27
0:42.0	166.91	2.6238	37.37	80.86
0:44.0	169.51	2.8554	37.54	87.39
0:46.0	172.27	3.0766	37.70	93.81
0:48.0	174.97	3.2879	37.85	100.09
0:50.0	177.68	3.4894	38.00	106.22
0:52.0	180.39	3.6843	38.09	110.34
0:54.0	183.12	3.8755	38.19	114.41
0:56.0	182.28	4.0581	38.28	118.36
0:58.0	177.87	4.2232	38.36	121.96
1:00.0	173.45	4.3668	38.43	125.13
1:02.0	169.02	4.4900	38.49	127.87
1:04.0	164.52	4.5939	38.54	130.20
1:06.0	160.02	4.6796	38.58	132.14
1:08.0	155.34	4.7478	38.62	133.69
1:10.0	150.65	4.7994	38.64	134.86
1:12.0	145.95	4.8353	38.66	135.68
1:14.0	141.04	4.8562	38.67	136.16
1:16.0	135.53	4.8619	38.67	136.29
1:18.0	129.28	4.8515	38.67	136.05
1:20.0	122.36	4.8242	38.65	135.42
1:22.0	116.37	4.7813	38.63	134.45
1:24.0	111.73	4.7268	38.61	133.21
1:26.0	108.70	4.6654	38.58	131.82
1:28.0	105.92	4.5999	38.54	130.34
1:30.0	103.29	4.5311	38.51	128.79
1:32.0	100.63	4.4594	38.47	127.19
1:34.0	98.00	4.3849	38.44	125.53
1:36.0	95.40	4.3078	38.40	123.82
1:38.0	92.90	4.2285	38.36	122.08

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:40.0	90.46	4.1472	38.32	120.30
1:42.0	88.11	4.0643	38.28	118.49
1:44.0	85.96	3.9801	38.24	116.67
1:46.0	83.78	3.8951	38.20	114.83
1:48.0	81.46	3.8088	38.16	112.99
1:50.0	78.85	3.7210	38.11	111.12
1:52.0	76.05	3.6308	38.07	109.21
1:54.0	72.94	3.5379	38.02	107.26
1:56.0	69.77	3.4424	37.96	104.78
1:58.0	66.63	3.3457	37.89	101.83
2:00.0	63.67	3.2487	37.82	98.91
2:02.0	60.86	3.1517	37.75	96.02
2:04.0	55.52	3.0515	37.68	93.07
2:06.0	39.71	2.9312	37.59	89.57
2:08.0	34.62	2.7923	37.49	85.59
2:10.0	34.51	2.6569	37.40	81.78
2:12.0	34.39	2.5313	37.30	78.31
2:14.0	34.26	2.4146	37.22	75.12
2:16.0	34.13	2.3058	37.14	72.21
2:18.0	34.01	2.2045	37.07	69.53
2:20.0	33.88	2.1098	37.00	67.06
2:22.0	33.75	2.0214	36.94	64.78
2:24.0	33.63	1.9386	36.88	62.68
2:26.0	33.50	1.8611	36.82	60.73
2:28.0	33.38	1.7884	36.77	58.93
2:30.0	33.25	1.7202	36.72	57.25
2:32.0	33.13	1.6560	36.67	55.69
2:34.0	33.01	1.5957	36.63	54.24
2:36.0	32.88	1.5389	36.59	52.89
2:38.0	32.76	1.4853	36.55	51.63
2:40.0	32.64	1.4348	36.51	50.45
2:42.0	32.52	1.3871	36.48	49.34
2:44.0	32.40	1.3420	36.44	48.30
2:46.0	32.27	1.2994	36.41	47.33
2:48.0	32.15	1.2590	36.38	46.42
2:50.0	32.03	1.2207	36.36	45.55
2:52.0	31.91	1.1844	36.33	44.74
2:54.0	31.80	1.1500	36.30	43.98
2:56.0	31.68	1.1172	36.28	43.26
2:58.0	31.56	1.0861	36.26	42.58
3:00.0	31.44	1.0565	36.24	41.93
3:02.0	31.32	1.0283	36.22	41.32
3:04.0	31.21	1.0014	36.20	40.74
3:06.0	31.09	0.9757	36.18	40.19
3:08.0	30.98	0.9512	36.16	39.67
3:10.0	30.86	0.9278	36.14	39.17
3:12.0	30.75	0.9054	36.13	38.70
3:14.0	30.63	0.8840	36.11	38.25

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:16.0	30.52	0.8634	36.10	37.82
3:18.0	30.40	0.8437	36.08	37.41
3:20.0	30.29	0.8248	36.07	37.01
3:22.0	30.18	0.8066	36.06	36.64
3:24.0	30.06	0.7892	36.04	36.28
3:26.0	29.95	0.7724	36.03	35.93
3:28.0	29.84	0.7562	36.02	35.60
3:30.0	29.73	0.7406	36.01	35.28
3:32.0	29.62	0.7258	35.99	34.87
3:34.0	29.51	0.7120	35.97	34.24
3:36.0	29.40	0.6996	35.95	33.68
3:38.0	29.29	0.6883	35.93	33.17
3:40.0	29.18	0.6781	35.91	32.71
3:42.0	29.07	0.6688	35.90	32.29
3:44.0	28.96	0.6603	35.89	31.91
3:46.0	28.85	0.6525	35.87	31.57
3:48.0	28.75	0.6454	35.86	31.25
3:50.0	28.64	0.6387	35.85	30.96
3:52.0	28.53	0.6326	35.84	30.69
3:54.0	28.43	0.6268	35.83	30.44
3:56.0	28.32	0.6215	35.82	30.20
3:58.0	28.22	0.6164	35.81	29.98
4:00.0	28.11	0.6117	35.81	29.78
4:02.0	28.01	0.6072	35.80	29.58
4:04.0	27.90	0.6030	35.79	29.40
4:06.0	27.80	0.5990	35.78	29.23
4:08.0	27.69	0.5951	35.78	29.06
4:10.0	27.59	0.5914	35.77	28.90
4:12.0	27.49	0.5879	35.77	28.75
4:14.0	27.38	0.5844	35.76	28.61
4:16.0	27.24	0.5811	35.76	28.46
4:18.0	27.03	0.5776	35.75	28.31
4:20.0	26.75	0.5739	35.74	28.16
4:22.0	25.96	0.5692	35.74	27.96
4:24.0	24.99	0.5627	35.73	27.68
4:26.0	23.84	0.5542	35.71	27.33
4:28.0	22.58	0.5435	35.69	26.88
4:30.0	21.34	0.5307	35.67	26.35
4:32.0	20.14	0.5161	35.65	25.74
4:34.0	19.05	0.5000	35.62	25.09
4:36.0	17.99	0.4829	35.59	24.40
4:38.0	16.98	0.4648	35.56	23.68
4:40.0	16.07	0.4462	35.53	22.94
4:42.0	15.20	0.4271	35.50	22.19
4:44.0	14.38	0.4077	35.47	21.45
4:46.0	13.68	0.3883	35.44	20.71
4:48.0	13.00	0.3690	35.41	19.98
4:50.0	12.37	0.3499	35.38	19.27

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:52.0	11.78	0.3310	35.34	18.58
4:54.0	11.21	0.3124	35.31	17.91
4:56.0	10.66	0.2941	35.28	17.26
4:58.0	10.16	0.2761	35.25	16.63
5:00.0	9.67	0.2584	35.23	16.02
5:02.0	9.20	0.2411	35.20	15.43
5:04.0	8.76	0.2241	35.17	14.86
5:06.0	8.33	0.2075	35.14	14.31
5:08.0	7.93	0.1912	35.12	13.77
5:10.0	7.55	0.1753	35.09	13.26
5:12.0	7.19	0.1597	35.06	12.77
5:14.0	6.84	0.1445	35.04	12.29
5:16.0	6.51	0.1297	35.01	11.83
5:18.0	6.20	0.1160	34.96	10.81
5:20.0	5.90	0.1051	34.87	9.23
5:22.0	5.62	0.0970	34.80	8.13
5:24.0	5.35	0.0909	34.75	7.32
5:26.0	5.09	0.0860	34.71	6.69
5:28.0	4.85	0.0819	34.68	6.19
5:30.0	4.61	0.0784	34.65	5.78
5:32.0	4.39	0.0754	34.62	5.43
5:34.0	4.18	0.0727	34.60	5.12
5:36.0	3.98	0.0702	34.58	4.84
5:38.0	3.79	0.0679	34.56	4.59
5:40.0	3.61	0.0658	34.54	4.36
5:42.0	3.43	0.0638	34.53	4.15
5:44.0	3.27	0.0618	34.51	3.95
5:46.0	3.11	0.0600	34.50	3.77
5:48.0	2.96	0.0582	34.48	3.59
5:50.0	2.82	0.0565	34.47	3.42
5:52.0	2.69	0.0549	34.45	3.27
5:54.0	2.56	0.0533	34.44	3.12
5:56.0	2.44	0.0518	34.43	2.98
5:58.0	2.32	0.0504	34.42	2.85
6:00.0	2.21	0.0489	34.40	2.72
6:02.0	2.12	0.0476	34.39	2.60
6:04.0	2.03	0.0463	34.38	2.49
6:06.0	1.96	0.0451	34.37	2.38
6:08.0	1.91	0.0440	34.36	2.29
6:10.0	1.85	0.0430	34.36	2.21
6:12.0	1.80	0.0420	34.35	2.13
6:14.0	1.75	0.0411	34.34	2.06
6:16.0	1.70	0.0403	34.33	1.99
6:18.0	1.66	0.0395	34.33	1.93
6:20.0	1.61	0.0388	34.32	1.87
6:22.0	1.56	0.0381	34.31	1.82
6:24.0	1.51	0.0374	34.31	1.77
6:26.0	1.47	0.0367	34.30	1.71

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:28.0	1.42	0.0360	34.30	1.66
6:30.0	1.37	0.0353	34.29	1.61
6:32.0	1.32	0.0347	34.29	1.56
6:34.0	1.27	0.0340	34.28	1.52
6:36.0	1.23	0.0333	34.28	1.47
6:38.0	1.18	0.0326	34.27	1.42
6:40.0	1.13	0.0320	34.26	1.38
6:42.0	1.08	0.0313	34.26	1.33
6:44.0	1.04	0.0306	34.25	1.28
6:46.0	0.99	0.0299	34.25	1.24
6:48.0	0.94	0.0292	34.24	1.19
6:50.0	0.89	0.0286	34.24	1.15
6:52.0	0.85	0.0279	34.23	1.10
6:54.0	0.80	0.0271	34.22	1.06
6:56.0	0.75	0.0264	34.22	1.01
6:58.0	0.71	0.0257	34.21	0.97
7:00.0	0.66	0.0250	34.21	0.93
7:02.0	0.61	0.0242	34.20	0.88
7:04.0	0.57	0.0235	34.19	0.84
7:06.0	0.52	0.0227	34.19	0.80
7:08.0	0.47	0.0220	34.18	0.75
7:10.0	0.43	0.0212	34.18	0.71
7:12.0	0.38	0.0204	34.17	0.67
7:14.0	0.34	0.0196	34.16	0.63
7:16.0	0.29	0.0188	34.16	0.59
7:18.0	0.24	0.0180	34.15	0.55
7:20.0	0.20	0.0171	34.14	0.51
7:22.0	0.15	0.0163	34.13	0.47
7:24.0	0.12	0.0154	34.13	0.43
7:26.0	0.07	0.0146	34.12	0.39
7:28.0	0.00	0.0136	34.11	0.35
7:30.0	0.00	0.0132	34.11	0.33
7:32.0	0.00	0.0127	34.10	0.31
7:34.0	0.00	0.0122	34.10	0.30
7:36.0	0.00	0.0118	34.10	0.28
7:38.0	0.00	0.0113	34.09	0.26
7:40.0	0.00	0.0108	34.09	0.24
7:42.0	0.00	0.0103	34.09	0.23
7:44.0	0.00	0.0099	34.08	0.21
7:46.0	0.00	0.0094	34.08	0.19
7:48.0	0.00	0.0089	34.07	0.18
7:50.0	0.00	0.0085	34.07	0.16
7:52.0	0.00	0.0080	34.07	0.15
7:54.0	0.00	0.0075	34.06	0.14
7:56.0	0.00	0.0071	34.06	0.12
7:58.0	0.00	0.0066	34.05	0.11
8:00.0	0.00	0.0061	34.05	0.10
8:02.0	0.00	0.0056	34.05	0.09

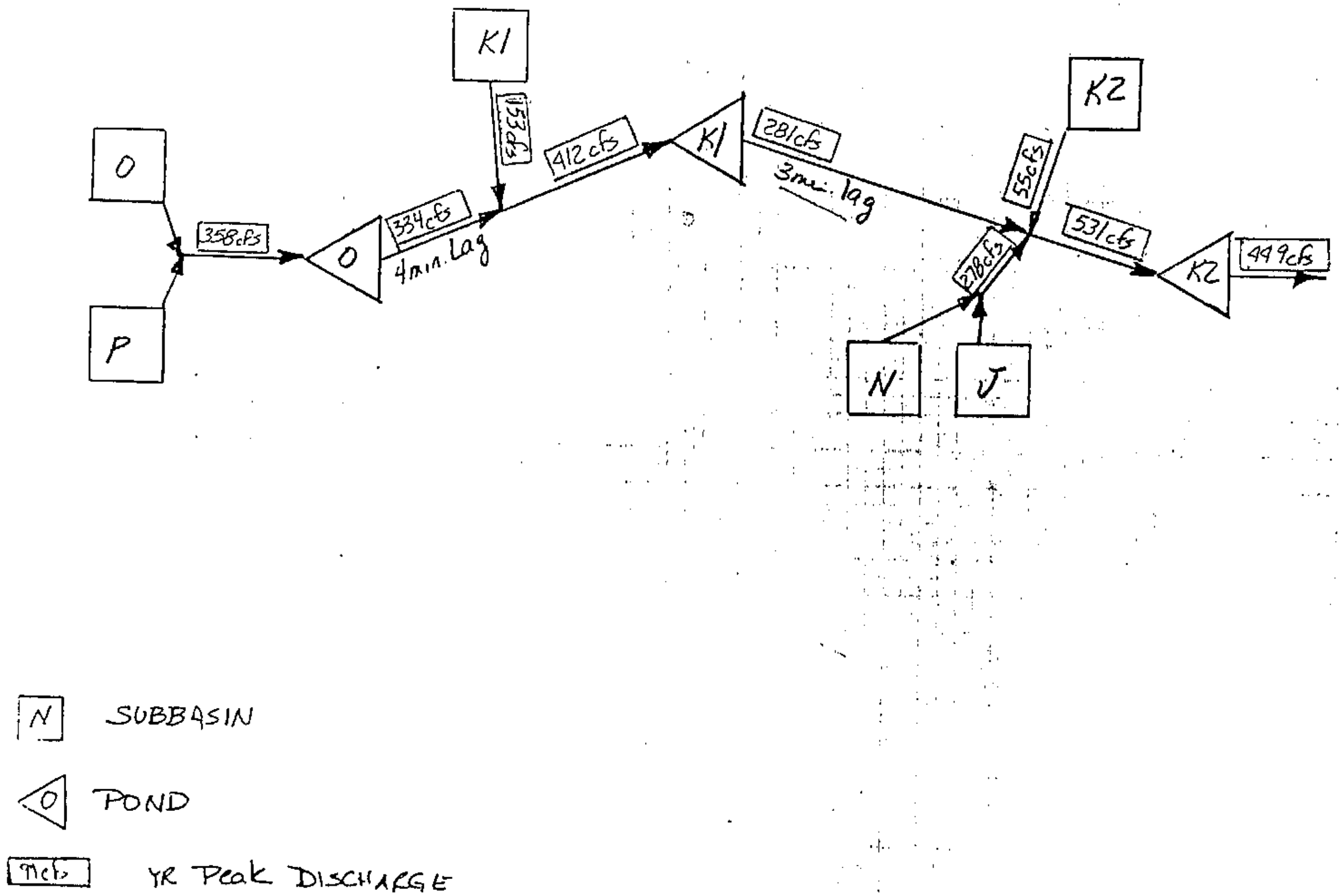
```
Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED-5 YEAR,24 HR
  Time            Inflow          Storage          Elevation          Outflow
 hr:min            cfs             ac ft              feet           cfs (Tot)

 8:04.0            0.00            0.0052            34.04              0.07
 8:06.0            0.00            0.0047            34.04              0.06
 8:08.0            0.00            0.0042            34.03              0.05
 8:10.0            0.00            0.0038            34.03              0.04
 8:12.0            0.00            0.0033            34.03              0.04
 8:14.0            0.00            0.0028            34.02              0.03
 8:16.0            0.00            0.0024            34.02              0.02
 8:18.0            0.00            0.0019            34.02              0.01
 8:20.0            0.00            0.0014            34.01              0.01
 8:22.0            0.00            0.0009            34.01              0.00
 8:24.0            0.00            0.0005            34.00              0.00
 8:26.0            0.00            0.0000            34.00              0.00
```

APPENDIX Q

BASIN ROUTING SCHEMATIC

100yr, 24hr. Storm

PURPOSE: TO INSURE ADEQUACY OF POND K2 VOLUME



DREXEL, BARRELL & CO.

LAND SURVEYORS
CIVIL ENGINEERS

Project: Cheyenne Mtn Ranch - 100YR. 24 HR ROUTING

Client: Datis

By: OJT

Date: 8/26/85

Job Nº: E2825

Q-1

DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS** Q-2 / 27

Project: BASINS OPP, 100 YR, 24 hr

Job Nº: E2669

Client: Gates

By: DJM

Date: 10/4/85

BASINS OPP

CN = 71.8, Tc = 0.4 hrs, A = 218.9 Ac, P = 4.3 in

Q = 1.66 in

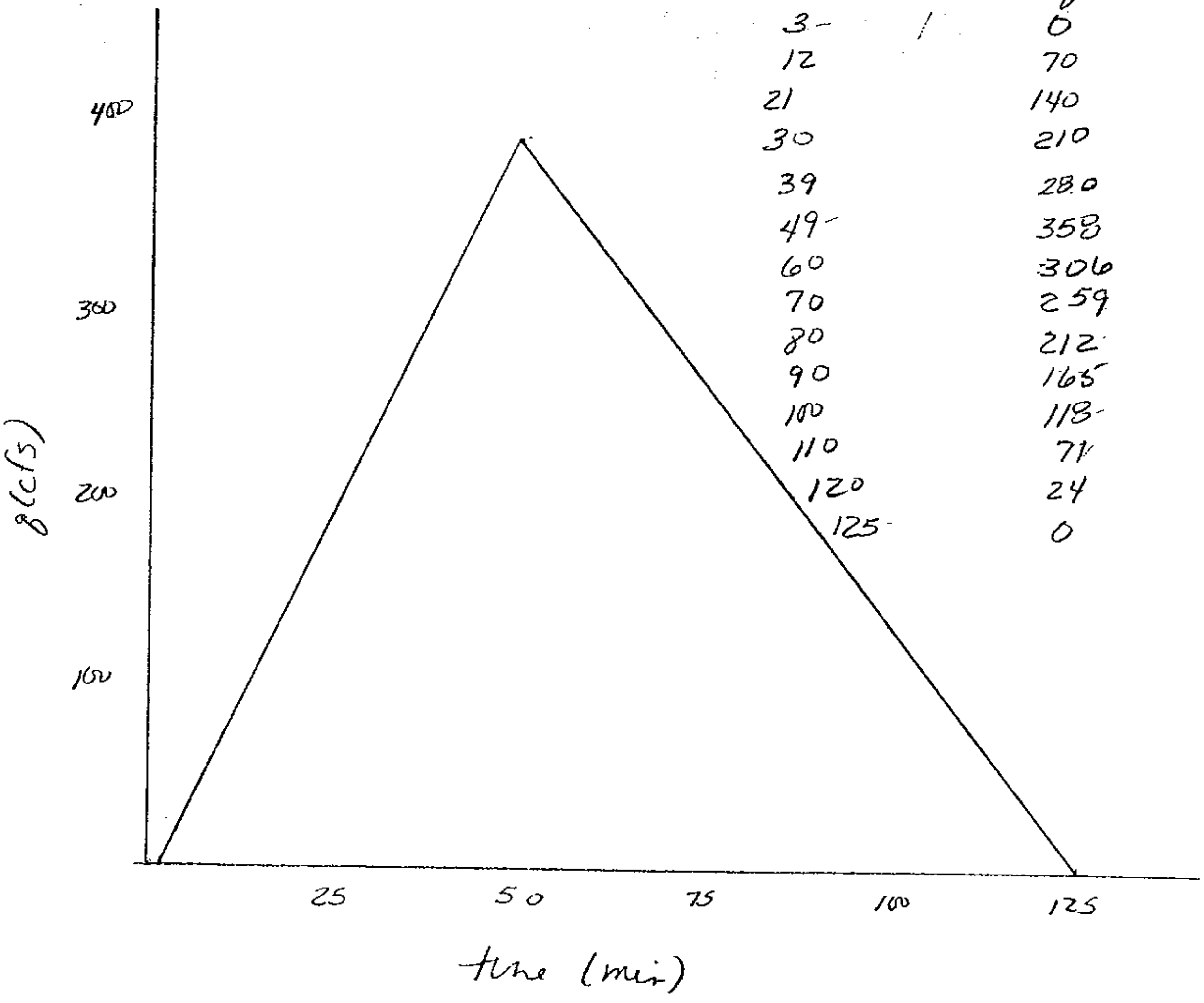
q_p = 630 cfs/mi²-in

$$q = 630 \frac{cfs}{mi^2 in} \times \frac{218.9 Ac}{640 Ac/mi^2} \times 1.66 in = 358 cfs$$

$$t_b = \frac{2(218.9)\,1.66}{358} = 2.03\ hr = 122\ min$$

D = 0.05 hr = 3 min

$$t_p = \frac{2.03 hr}{2.67} = 0.76 hr - 46 min$$



time	q
3	0
12	70
21	140
30	210
39	280
49	358
60	306
70	259
80	212
90	165
100	118
110	71
120	24
125	0

Q3/27

Project: BASIN K1, 100YR, 24hr

Job Nº: E2669

Client: Sates

By: DJR

Date: 10/4/85

BASIN K1

$CN = 73.0, \quad T_c = 0.15hr, \quad A = 62Ac, \quad P = 4.3in$

$Q = 1.75in$

$q_P = 900\ cfs/_{mi^2\text{-}in}$

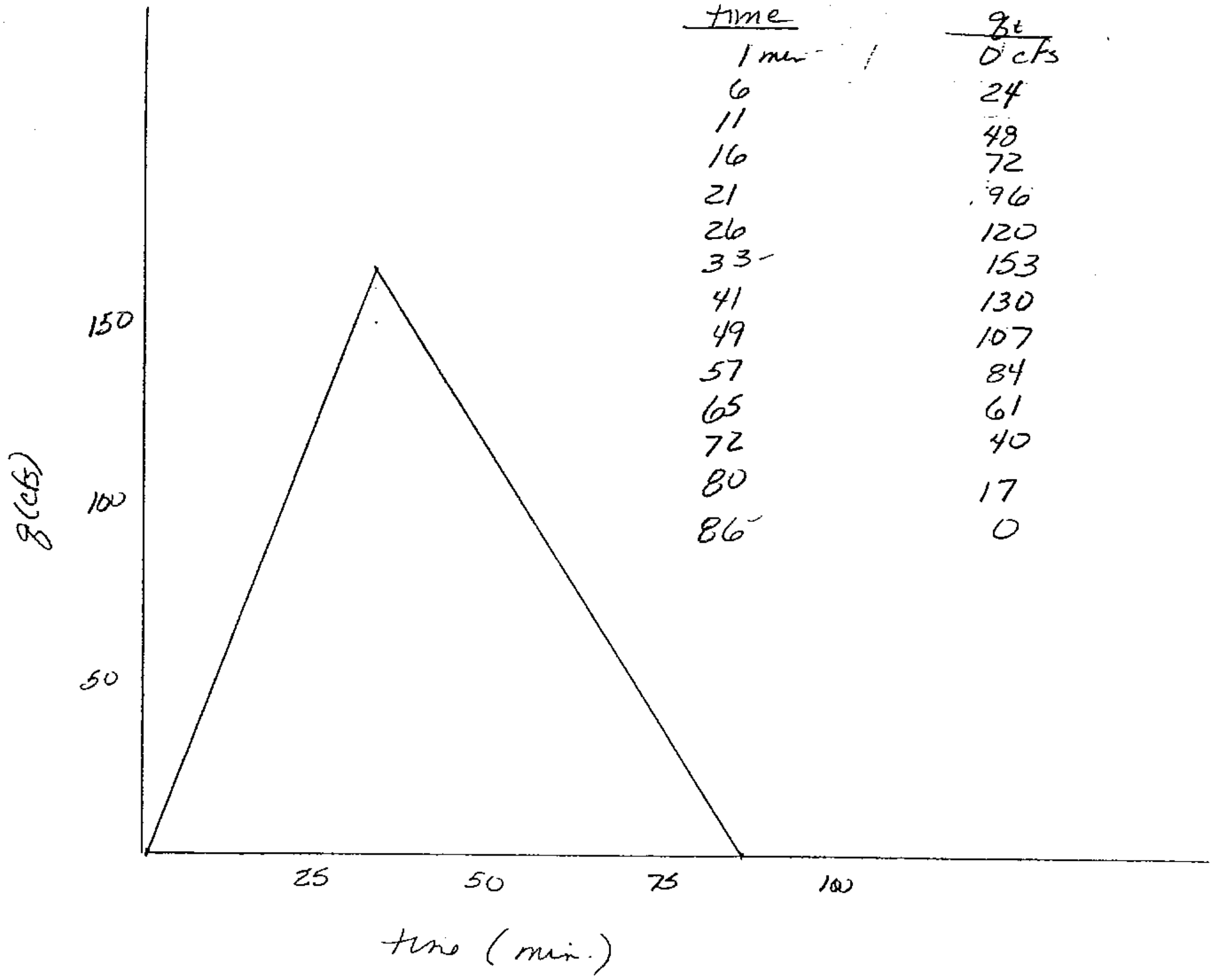
$q = 900\frac{cfs}{mi^2\text{-}in} \times \frac{62\ Ac}{640Ac/_{mi^2}} \times 1.75in = 153\ cfs$

$t_b = \frac{2(62Ac)\,1.75in}{153cfs} = 1.42hr = 85\ min$

$D = 0.02hr = 1.2\ min$

$t_p = \frac{1.42hr}{2.67} = 0.53hr = 32min$

time	q_t
1 min	0 cfs
6	24
11	48
16	72
21	96
26	120
33	153
41	130
49	107
57	84
65	61
72	40
80	17
86	0



DREXEL, BARRELL & CO. **LAND SURVEYORS CIVIL ENGINEERS**

Q-4/27

Project	Job №
BASINS N+J, 100yr, 24hr.	E2669

Client	By	Date
Gates	DJN	10/4/85

BASINS N+J

$CN = 75.7, \ T_c = 0.52hr, \ A = 163 ac, \ P = 4.3 in$

$Q = 1.95 in$

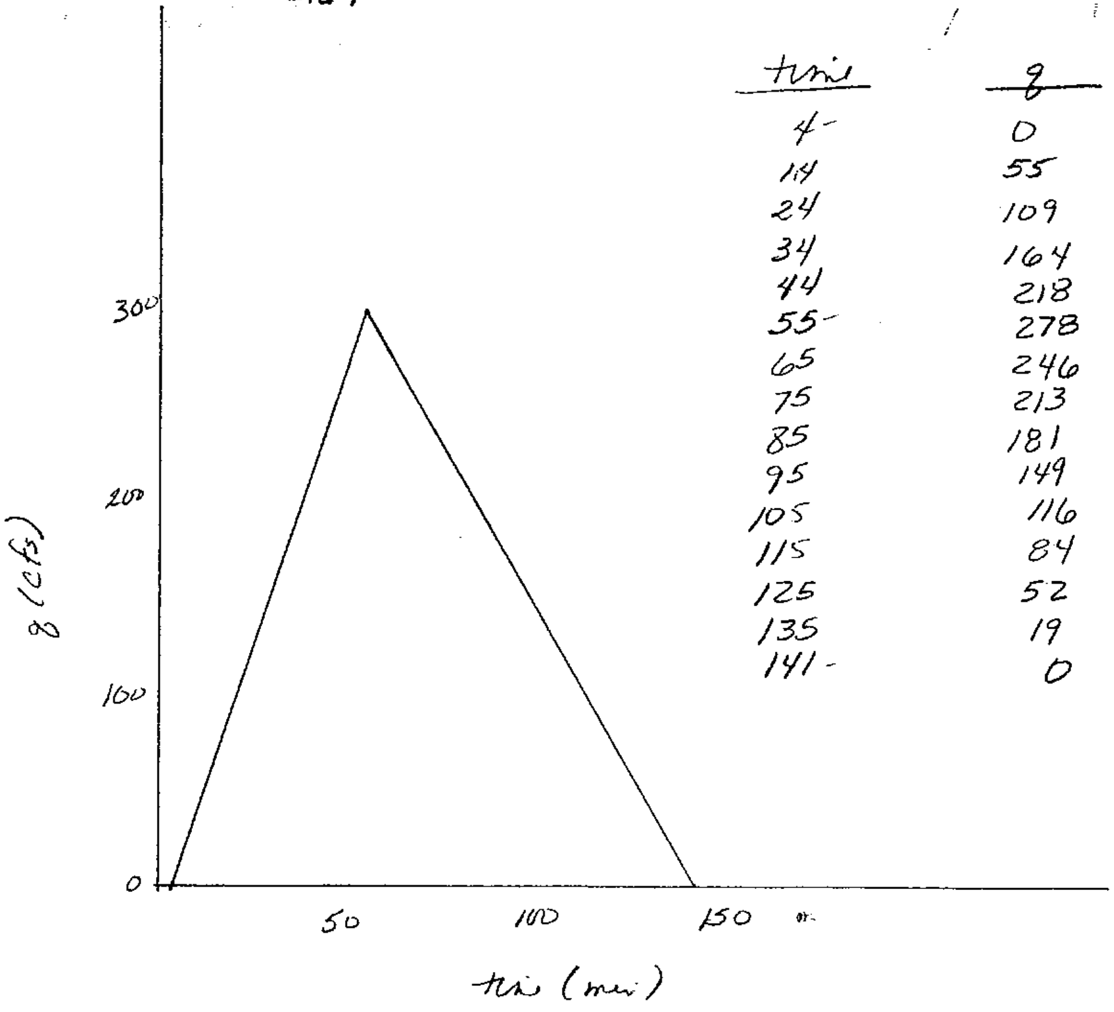
$q_p = 560 \, cfs/mi^2\text{-}in$

$$q = 560 \frac{cfs}{mi^2\text{-}in} \times \frac{163 ac}{640 ac/mi^2} \times 1.95 in = 278 cfs$$

$$t_b = \frac{2(163ac) \, 1.95 in}{278 cfs} = 2.29 hr = 137 min$$

$D = 0.07 hr = 4 min$

$$t_p = \frac{2.29 hr}{2.67} = 0.86 hr = 51 min$$



time	q
4	0
14	55
24	109
34	164
44	218
55	278
65	246
75	213
85	181
95	149
105	116
115	84
125	52
135	19
141	0

Q-5/27

Project: Basin K2, 100YR, 24hr

Job Nº: E2669

Client: Gates

By: OJN

Date: 10/4/85

Basin K2

$CN = 71.4, \quad T_c = 0.17hr, \quad A = 25\,Ac, \quad P = 4.3in$

$Q = 1.63in$

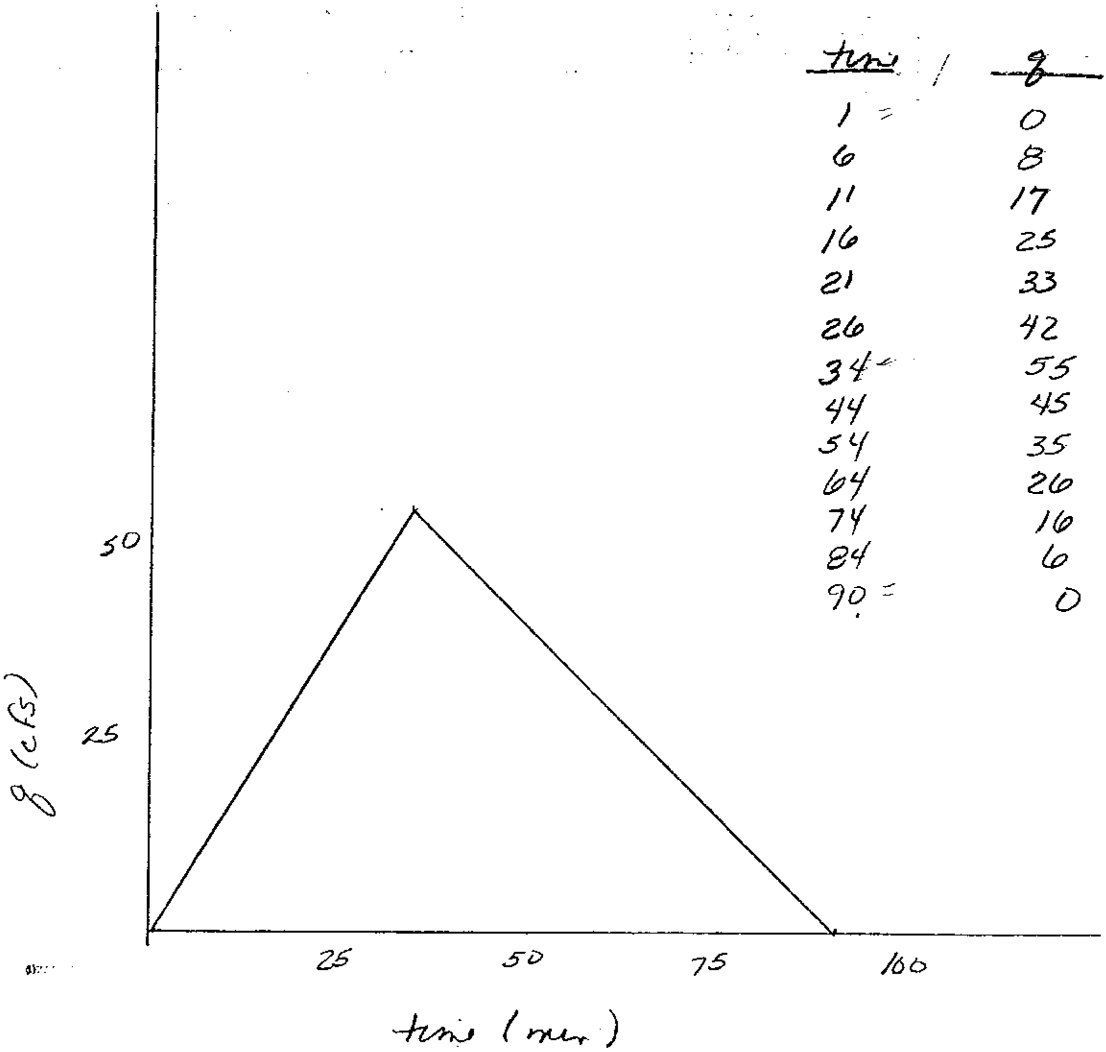
$q_P = 860 csm/in$

$$q = \frac{860 cfs}{mi^2\text{-}in} \times \frac{25\,Ac}{640\,Ac/mi^2} \times 1.63in = 55\ cfs$$

$$t_b = \frac{2(25\,Ac)(1.63in)}{55\ csm/in} = 1.48hr = 89min$$

$D = 0.02hr = 1.4min$

$$t_p = \frac{1.48hr}{2.67} = 0.55hr = 33min$$



time	q
1 =	0
6	8
11	17
16	25
21	33
26	42
34 ←	55
44	45
54	35
64	26
74	16
84	6
90 =	0

OP/10024 — Hydrograph file

```
    Description of hydrograph :                                   Page   4

    BASINS O & P COMBINED - 100 YEAR, 24 HOUR
  Area =  218.90 ac.    Rational 'C'  = .##     Time of Concent. =  24 min.
                        Storm frequency, years = 100


   Time        Flow            Time        Flow            Time        Flow
  0:03.0  *    0.0 cfs        0:12.0  *   70.0 cfs        0:21.0  * 140.0 cfs
  0:30.0  *  210.0 cfs        0:39.0  *  280.0 cfs        0:49.0  * 358.0 cfs
  1:00.0  *  306.0 cfs        1:10.0  *  259.0 cfs        1:20.0  * 212.0 cfs
  1:30.0  *  165.0 cfs        1:40.0  *  118.0 cfs        1:50.0  *  71.0 cfs
  2:00.0  *   24.0 cfs        2:05.0  *    0.0 cfs        2:10.0  *   0.0 cfs
  2:15.0  *    0.0 cfs        2:20.0  *    0.0 cfs        2:25.0  *   0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 4 ***

Q 7/27

Date 10/03/85

Pond File : PONDO

RATING CURVE FOR POND O

Number	Elevation	Storage	Outflow
1	57.70	0.000	0.00
2	60.00	0.800	14.50
3	62.00	1.400	27.00
4	64.00	7.300	35.00
5	64.50	8.700	74.00
6	64.70	9.000	174.00
7	65.00	10.000	495.00

Routing of Hydrograph # 4

Description of hydrograph :

BASINS O & P COMBINED - 100 YEAR, 24 HOUR
Area = 218.90 ac. Rational 'C' = .## Time of Concent. = 24 min.
Storm frequency, years = 100

Hydrograph # 5 - total outflow hydrograph
Description :
BASINS O & P ROUTED THROUGH POND O - 100 YEAR, 24 HOUR

Inflow H'graph: BASINS O & P COMBINED - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	57.70	0.00
0:05.0	15.56	0.0209	57.76	0.38
0:07.0	31.11	0.0826	57.94	1.50
0:09.0	46.67	0.1831	58.23	3.32
0:11.0	62.22	0.3205	58.62	5.81
0:13.0	77.78	0.4930	59.12	8.94
0:15.0	93.33	0.6990	59.71	12.67
0:17.0	108.89	0.9362	60.45	17.34
0:19.0	124.44	1.2022	61.34	22.88
0:21.0	140.00	1.4975	62.03	27.13
0:23.0	155.56	1.8293	62.15	27.58
0:25.0	171.11	2.2026	62.27	28.09
0:27.0	186.67	2.6172	62.41	28.65
0:29.0	202.22	3.0731	62.57	29.27
0:31.0	217.78	3.5700	62.74	29.94
0:33.0	233.33	4.1079	62.92	30.67
0:35.0	248.89	4.6866	63.11	31.46
0:37.0	264.44	5.3058	63.32	32.30
0:39.0	280.00	5.9655	63.55	33.19
0:41.0	295.60	6.6656	63.78	34.14
0:43.0	311.20	7.4023	64.04	37.85
0:45.0	326.80	8.1482	64.30	58.63
0:47.0	342.40	8.8283	64.59	116.78
0:49.0	358.00	9.2722	64.78	261.38
0:51.0	348.55	9.4477	64.83	317.73
0:53.0	339.09	9.4976	64.85	333.73
0:55.0	329.64	9.4988	64.85	334.12
0:57.0	320.18	9.4812	64.84	328.47
0:59.0	310.73	9.4564	64.84	320.49
1:01.0	301.30	9.4287	64.83	311.61
1:03.0	291.90	9.4000	64.82	302.41
1:05.0	282.50	9.3710	64.81	293.08
1:07.0	273.10	9.3418	64.80	283.71
1:09.0	263.70	9.3125	64.79	274.32
1:11.0	254.30	9.2833	64.78	264.93
1:13.0	244.90	9.2540	64.78	255.53
1:15.0	235.50	9.2247	64.77	246.13
1:17.0	226.10	9.1954	64.76	236.73
1:19.0	216.70	9.1661	64.75	227.33
1:21.0	207.30	9.1369	64.74	217.93
1:23.0	197.90	9.1076	64.73	208.53
1:25.0	188.50	9.0783	64.72	199.13
1:27.0	179.10	9.0490	64.71	189.73
1:29.0	169.70	9.0197	64.71	180.33
1:31.0	160.30	8.9905	64.69	170.85
1:33.0	150.90	8.9618	64.67	161.25
1:35.0	141.50	8.9333	64.66	151.78
1:37.0	132.10	8.9051	64.64	142.35

Inflow H'graph: BASINS O & P COMBINED - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:39.0	122.70	8.8768	64.62	132.94
1:41.0	113.30	8.8486	64.60	123.54
1:43.0	103.90	8.8204	64.58	114.14
1:45.0	94.50	8.7922	64.56	104.74
1:47.0	85.10	8.7640	64.54	95.34
1:49.0	75.70	8.7358	64.52	85.94
1:51.0	66.30	8.7076	64.51	76.54
1:53.0	56.90	8.6711	64.49	73.19
1:55.0	47.50	8.6154	64.47	71.64
1:57.0	38.10	8.5388	64.44	69.51
1:59.0	28.70	8.4430	64.41	66.84
2:01.0	19.20	8.3293	64.37	63.67
2:03.0	9.60	8.1985	64.32	60.03
2:05.0	0.00	8.0520	64.27	55.95
2:07.0	0.00	7.9036	64.22	51.81
2:09.0	0.00	7.7661	64.17	47.98
2:11.0	0.00	7.6388	64.12	44.44
2:13.0	0.00	7.5209	64.08	41.15
2:15.0	0.00	7.4117	64.04	38.11
2:17.0	0.00	7.3106	64.00	35.30
2:19.0	0.00	7.2139	63.97	34.88
2:21.0	0.00	7.1180	63.94	34.75
2:23.0	0.00	7.0225	63.91	34.62
2:25.0	0.00	6.9273	63.87	34.49
2:27.0	0.00	6.8324	63.84	34.37
2:29.0	0.00	6.7379	63.81	34.24
2:31.0	0.00	6.6438	63.78	34.11
2:33.0	0.00	6.5500	63.75	33.98
2:35.0	0.00	6.4565	63.71	33.86
2:37.0	0.00	6.3634	63.68	33.73
2:39.0	0.00	6.2707	63.65	33.60
2:41.0	0.00	6.1783	63.62	33.48
2:43.0	0.00	6.0862	63.59	33.35
2:45.0	0.00	5.9945	63.56	33.23
2:47.0	0.00	5.9032	63.53	33.11
2:49.0	0.00	5.8121	63.50	32.98
2:51.0	0.00	5.7214	63.46	32.86
2:53.0	0.00	5.6311	63.43	32.74
2:55.0	0.00	5.5411	63.40	32.62
2:57.0	0.00	5.4514	63.37	32.49
2:59.0	0.00	5.3620	63.34	32.37
3:01.0	0.00	5.2730	63.31	32.25
3:03.0	0.00	5.1843	63.28	32.13
3:05.0	0.00	5.0960	63.25	32.01
3:07.0	0.00	5.0080	63.22	31.89
3:09.0	0.00	4.9203	63.19	31.77
3:11.0	0.00	4.8329	63.16	31.65
3:13.0	0.00	4.7459	63.13	31.54

Inflow H'graph: BASINS O & P COMBINED - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:15.0	0.00	4.6592	63.10	31.42
3:17.0	0.00	4.5728	63.08	31.30
3:19.0	0.00	4.4867	63.05	31.19
3:21.0	0.00	4.4009	63.02	31.07
3:23.0	0.00	4.3155	62.99	30.95
3:25.0	0.00	4.2304	62.96	30.84
3:27.0	0.00	4.1456	62.93	30.72
3:29.0	0.00	4.0611	62.90	30.61
3:31.0	0.00	3.9770	62.87	30.49
3:33.0	0.00	3.8931	62.85	30.38
3:35.0	0.00	3.8096	62.82	30.27
3:37.0	0.00	3.7264	62.79	30.15
3:39.0	0.00	3.6434	62.76	30.04
3:41.0	0.00	3.5608	62.73	29.93
3:43.0	0.00	3.4785	62.70	29.82
3:45.0	0.00	3.3965	62.68	29.71
3:47.0	0.00	3.3149	62.65	29.60
3:49.0	0.00	3.2335	62.62	29.49
3:51.0	0.00	3.1524	62.59	29.38
3:53.0	0.00	3.0716	62.57	29.27
3:55.0	0.00	2.9911	62.54	29.16
3:57.0	0.00	2.9110	62.51	29.05
3:59.0	0.00	2.8311	62.49	28.94
4:01.0	0.00	2.7515	62.46	28.83
4:03.0	0.00	2.6722	62.43	28.73
4:05.0	0.00	2.5933	62.40	28.62
4:07.0	0.00	2.5146	62.38	28.51
4:09.0	0.00	2.4362	62.35	28.40
4:11.0	0.00	2.3581	62.32	28.30
4:13.0	0.00	2.2803	62.30	28.19
4:15.0	0.00	2.2027	62.27	28.09
4:17.0	0.00	2.1255	62.25	27.98
4:19.0	0.00	2.0485	62.22	27.88
4:21.0	0.00	1.9719	62.19	27.78
4:23.0	0.00	1.8955	62.17	27.67
4:25.0	0.00	1.8194	62.14	27.57
4:27.0	0.00	1.7436	62.12	27.47
4:29.0	0.00	1.6681	62.09	27.36
4:31.0	0.00	1.5929	62.07	27.26
4:33.0	0.00	1.5179	62.04	27.16
4:35.0	0.00	1.4432	62.01	27.06
4:37.0	0.00	1.3696	61.90	26.37
4:39.0	0.00	1.2990	61.66	24.90
4:41.0	0.00	1.2323	61.44	23.51
4:43.0	0.00	1.1694	61.23	22.20
4:45.0	0.00	1.1100	61.03	20.96
4:47.0	0.00	1.0538	60.85	19.79
4:49.0	0.00	1.0008	60.67	18.68

Inflow H′graph: BASINS O & P COMBINED - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:51.0	0.00	0.9508	60.50	17.64
4:53.0	0.00	0.9036	60.35	16.66
4:55.0	0.00	0.8589	60.20	15.73
4:57.0	0.00	0.8168	60.06	14.85
4:59.0	0.00	0.7770	59.93	14.08
5:01.0	0.00	0.7391	59.82	13.40
5:03.0	0.00	0.7031	59.72	12.74
5:05.0	0.00	0.6689	59.62	12.12
5:07.0	0.00	0.6363	59.53	11.53
5:09.0	0.00	0.6053	59.44	10.97
5:11.0	0.00	0.5758	59.36	10.44
5:13.0	0.00	0.5478	59.27	9.93
5:15.0	0.00	0.5211	59.20	9.44
5:17.0	0.00	0.4957	59.13	8.98
5:19.0	0.00	0.4715	59.06	8.55
5:21.0	0.00	0.4486	58.99	8.13
5:23.0	0.00	0.4267	58.93	7.73
5:25.0	0.00	0.4059	58.87	7.36
5:27.0	0.00	0.3862	58.81	7.00
5:29.0	0.00	0.3673	58.76	6.66
5:31.0	0.00	0.3494	58.70	6.33
5:33.0	0.00	0.3324	58.66	6.03
5:35.0	0.00	0.3162	58.61	5.73
5:37.0	0.00	0.3008	58.56	5.45
5:39.0	0.00	0.2935	58.54	5.32
5:41.0	0.00	0.2861	58.52	5.19
5:43.0	0.00	0.2788	58.50	5.05
5:45.0	0.00	0.2715	58.48	4.92
5:47.0	0.00	0.2641	58.46	4.79
5:49.0	0.00	0.2568	58.44	4.65
5:51.0	0.00	0.2495	58.42	4.52
5:53.0	0.00	0.2421	58.40	4.39
5:55.0	0.00	0.2348	58.38	4.26
5:57.0	0.00	0.2275	58.35	4.12
5:59.0	0.00	0.2201	58.33	3.99
6:01.0	0.00	0.2128	58.31	3.86
6:03.0	0.00	0.2054	58.29	3.72
6:05.0	0.00	0.1981	58.27	3.59
6:07.0	0.00	0.1908	58.25	3.46
6:09.0	0.00	0.1834	58.23	3.32
6:11.0	0.00	0.1761	58.21	3.19
6:13.0	0.00	0.1688	58.19	3.06
6:15.0	0.00	0.1614	58.16	2.93
6:17.0	0.00	0.1541	58.14	2.79
6:19.0	0.00	0.1467	58.12	2.66
6:21.0	0.00	0.1394	58.10	2.53
6:23.0	0.00	0.1321	58.08	2.39
6:25.0	0.00	0.1247	58.06	2.26

Inflow H′graph: BASINS O & P COMBINED – 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:27.0	0.00	0.1174	58.04	2.13
6:29.0	0.00	0.1101	58.02	1.99
6:31.0	0.00	0.1027	58.00	1.86
6:33.0	0.00	0.0954	57.97	1.73
6:35.0	0.00	0.0880	57.95	1.60
6:37.0	0.00	0.0807	57.93	1.46
6:39.0	0.00	0.0734	57.91	1.33
6:41.0	0.00	0.0660	57.89	1.20
6:43.0	0.00	0.0587	57.87	1.06
6:45.0	0.00	0.0514	57.85	0.93
6:47.0	0.00	0.0440	57.83	0.80
6:49.0	0.00	0.0367	57.81	0.66
6:51.0	0.00	0.0293	57.78	0.53
6:53.0	0.00	0.0220	57.76	0.40
6:55.0	0.00	0.0147	57.74	0.27
6:57.0	0.00	0.0073	57.72	0.13
6:59.0	0.00	0.0000	57.70	0.00

K1/10024 — Hydrograph file

```
    Description of hydrograph :                                    Page   1

    BASIN K1 - 100 YEAR, 24 HOUR
  Area =    62.00 ac.    Rational 'C'  = .##     Time of Concent. =   9 min.
                          Storm frequency, years = 100


   Time         Flow         Time         Flow         Time         Flow
  0:01.0  *    0.0 cfs      0:06.0  *   24.0 cfs      0:11.0  *   48.0 cfs
  0:16.0  *   72.0 cfs      0:21.0  *   96.0 cfs      0:26.0  *  120.0 cfs
  0:33.0  *  153.0 cfs      0:41.0  *  130.0 cfs      0:49.0  *  107.0 cfs
  0:57.0  *   84.0 cfs      1:05.0  *   61.0 cfs      1:12.0  *   40.0 cfs
  1:20.0  *   17.0 cfs      1:26.0  *    0.0 cfs      1:32.0  *    0.0 cfs
  1:38.0  *    0.0 cfs      1:44.0  *    0.0 cfs      1:50.0  *    0.0 cfs
```

Q14/27

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        ***    ROUTING OF HYDROGRAPH # 6         ***

     Date 10/03/85

          Pond File  :  PONDK1

  RATING CURVE FOR POND K1


               PIPES                           WEIRS
   Str    Diam    Elev      #        Left  Length  Right   Elev   Height  Type
   No.     in      ft                S/S     ft     S/S     ft      ft
    1  -   60    79.00      1   -                                           HP

        Number          Elevation           Storage          Outflow
          1               79.00              0.000             0.00
          2               84.00              0.137           139.42
          3               86.00              0.580           203.86
          4               88.00              1.652           242.26
          5               90.00              3.739           279.03
          6               94.00             10.929           348.02


        Routing of Hydrograph # 6

    Description of hydrograph :                                  Page   1

    BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 24 HOUR
  Area =  280.90 ac.    Rational 'C'  = .##     Time of Concent. =  24 min.
                        Storm frequency, years = 100


    Hydrograph # 1  - total outflow hydrograph
    Description :
    BASIN K1 + LAGGED POND O OUTFLOW ROUTED TH. POND K1-100YR/24
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Q-15/27

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
0:00.0	0.00	0.0000	79.00	0.00
0:08.0	22.00	0.0209	79.76	6.86
0:10.0	44.01	0.0562	81.05	33.50
0:12.0	55.58	0.0746	81.72	52.72
0:14.0	67.14	0.0837	82.05	63.39
0:16.0	79.81	0.0939	82.43	76.17
0:18.0	92.48	0.1036	82.78	89.10
0:20.0	106.63	0.1133	83.14	102.92
0:22.0	120.78	0.1231	83.49	117.43
0:24.0	135.18	0.1323	83.83	131.83
0:26.0	147.17	0.1453	84.04	141.09
0:28.0	157.26	0.1692	84.15	145.97
0:30.0	167.24	0.2041	84.30	153.19
0:32.0	177.26	0.2448	84.49	161.77
0:34.0	179.74	0.2804	84.65	169.41
0:36.0	174.70	0.2969	84.72	173.01
0:38.0	169.70	0.2952	84.71	172.63
0:40.0	164.76	0.2837	84.66	170.14
0:42.0	159.88	0.2671	84.59	166.55
0:44.0	156.01	0.2488	84.50	162.63
0:46.0	152.13	0.2306	84.42	158.75
0:48.0	166.08	0.2313	84.43	158.91
0:50.0	213.06	0.2965	84.72	172.92
0:52.0	285.45	0.4769	85.53	194.65
0:54.0	370.72	0.8197	86.45	212.61
0:56.0	402.95	1.2771	87.30	229.03
0:58.0	411.99	1.7480	88.09	243.99
1:00.0	406.56	2.1924	88.52	251.93
1:02.0	393.63	2.5908	88.90	259.00
1:04.0	379.68	2.9342	89.23	265.04
1:06.0	364.95	3.2228	89.51	270.08
1:08.0	349.71	3.4575	89.73	274.17
1:10.0	334.38	3.6401	89.91	277.33
1:12.0	319.08	3.7734	90.02	279.38
1:14.0	303.88	3.8606	90.07	280.26
1:16.0	288.73	3.9042	90.09	280.69
1:18.0	273.58	3.9054	90.09	280.70
1:20.0	257.27	3.8639	90.07	280.29
1:22.0	235.08	3.7712	90.02	279.36
1:24.0	222.63	3.6350	89.90	277.24
1:26.0	213.23	3.4754	89.75	274.48
1:28.0	203.83	3.2980	89.58	271.39
1:30.0	194.43	3.1036	89.39	268.00
1:32.0	185.01	2.8930	89.19	264.32
1:34.0	175.56	2.6670	88.97	260.34
1:36.0	166.05	2.4262	88.74	256.08
1:38.0	156.55	2.1713	88.50	251.56
1:40.0	147.08	1.9031	88.24	246.77

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
1:42.0	137.65	1.6231	87.95	241.25
1:44.0	128.24	1.3386	87.42	231.22
1:46.0	118.84	1.0559	86.89	221.13
1:48.0	109.44	0.7751	86.36	210.99
1:50.0	100.04	0.5018	85.65	196.89
1:52.0	90.93	0.2649	84.58	166.07
1:54.0	82.53	0.1199	83.38	112.65
1:56.0	75.37	0.0879	82.21	68.50
1:58.0	72.70	0.0934	82.41	75.54
2:00.0	70.40	0.0894	82.26	70.45
2:02.0	68.04	0.0882	82.22	68.89
2:04.0	65.10	0.0858	82.13	65.96
2:06.0	61.66	0.0832	82.03	62.72
2:08.0	57.91	0.0801	81.92	59.07
2:10.0	53.91	0.0768	81.80	55.18
2:12.0	50.03	0.0733	81.68	51.27
2:14.0	46.34	0.0699	81.55	47.55
2:16.0	42.86	0.0667	81.43	44.03
2:18.0	39.71	0.0636	81.32	40.79
2:20.0	37.23	0.0609	81.22	38.08
2:22.0	35.50	0.0589	81.15	36.10
2:24.0	34.87	0.0578	81.11	35.05
2:26.0	34.69	0.0575	81.10	34.74
2:28.0	34.56	0.0573	81.09	34.61
2:30.0	34.43	0.0572	81.09	34.48
2:32.0	34.30	0.0571	81.08	34.35
2:34.0	34.17	0.0569	81.08	34.22
2:36.0	34.05	0.0568	81.07	34.09
2:38.0	33.92	0.0567	81.07	33.97
2:40.0	33.79	0.0565	81.06	33.84
2:42.0	33.67	0.0564	81.06	33.72
2:44.0	33.54	0.0563	81.05	33.59
2:46.0	33.42	0.0562	81.05	33.46
2:48.0	33.29	0.0560	81.04	33.34
2:50.0	33.17	0.0559	81.04	33.22
2:52.0	33.04	0.0558	81.04	33.09
2:54.0	32.92	0.0556	81.03	32.97
2:56.0	32.80	0.0555	81.03	32.85
2:58.0	32.68	0.0554	81.02	32.72
3:00.0	32.55	0.0552	81.02	32.60
3:02.0	32.43	0.0551	81.01	32.48
3:04.0	32.31	0.0550	81.01	32.36
3:06.0	32.19	0.0549	81.00	32.24
3:08.0	32.07	0.0547	81.00	32.12
3:10.0	31.95	0.0546	80.99	32.00
3:12.0	31.83	0.0545	80.99	31.88
3:14.0	31.71	0.0543	80.98	31.76
3:16.0	31.60	0.0542	80.98	31.64

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW – 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
3:18.0	31.48	0.0541	80.97	31.52
3:20.0	31.36	0.0540	80.97	31.41
3:22.0	31.24	0.0538	80.97	31.29
3:24.0	31.13	0.0537	80.96	31.17
3:26.0	31.01	0.0536	80.96	31.06
3:28.0	30.90	0.0535	80.95	30.94
3:30.0	30.78	0.0533	80.95	30.83
3:32.0	30.67	0.0532	80.94	30.71
3:34.0	30.55	0.0531	80.94	30.60
3:36.0	30.44	0.0530	80.93	30.48
3:38.0	30.32	0.0528	80.93	30.37
3:40.0	30.21	0.0527	80.92	30.26
3:42.0	30.10	0.0526	80.92	30.14
3:44.0	29.99	0.0525	80.92	30.03
3:46.0	29.87	0.0524	80.91	29.92
3:48.0	29.76	0.0522	80.91	29.81
3:50.0	29.65	0.0521	80.90	29.70
3:52.0	29.54	0.0520	80.90	29.59
3:54.0	29.43	0.0519	80.89	29.48
3:56.0	29.32	0.0517	80.89	29.37
3:58.0	29.21	0.0516	80.88	29.26
4:00.0	29.10	0.0515	80.88	29.15
4:02.0	28.99	0.0514	80.88	29.04
4:04.0	28.89	0.0513	80.87	28.93
4:06.0	28.78	0.0511	80.87	28.82
4:08.0	28.67	0.0510	80.86	28.71
4:10.0	28.56	0.0509	80.86	28.61
4:12.0	28.46	0.0508	80.85	28.50
4:14.0	28.35	0.0507	80.85	28.40
4:16.0	28.25	0.0506	80.85	28.29
4:18.0	28.14	0.0504	80.84	28.18
4:20.0	28.04	0.0503	80.84	28.08
4:22.0	27.93	0.0502	80.83	27.97
4:24.0	27.83	0.0501	80.83	27.87
4:26.0	27.72	0.0500	80.82	27.77
4:28.0	27.62	0.0499	80.82	27.66
4:30.0	27.52	0.0497	80.82	27.56
4:32.0	27.41	0.0496	80.81	27.46
4:34.0	27.31	0.0495	80.81	27.35
4:36.0	27.21	0.0494	80.80	27.25
4:38.0	26.98	0.0492	80.80	27.08
4:40.0	26.42	0.0487	80.78	26.66
4:42.0	25.52	0.0478	80.75	25.90
4:44.0	24.20	0.0465	80.70	24.77
4:46.0	22.89	0.0450	80.64	23.45
4:48.0	21.60	0.0434	80.58	22.17
4:50.0	20.39	0.0419	80.53	20.93
4:52.0	19.26	0.0404	80.48	19.78

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
4:54.0	18.19	0.0390	80.42	18.69
4:56.0	17.17	0.0377	80.37	17.66
4:58.0	16.21	0.0363	80.33	16.68
5:00.0	15.33	0.0351	80.28	15.77
5:02.0	14.50	0.0339	80.24	14.92
5:04.0	13.75	0.0328	80.20	14.14
5:06.0	13.09	0.0318	80.16	13.44
5:08.0	12.45	0.0308	80.12	12.79
5:10.0	11.84	0.0298	80.09	12.17
5:12.0	11.26	0.0289	80.06	11.59
5:14.0	10.72	0.0281	80.02	11.03
5:16.0	10.19	0.0272	79.99	10.50
5:18.0	9.69	0.0264	79.96	9.99
5:20.0	9.22	0.0256	79.93	9.51
5:22.0	8.78	0.0248	79.91	9.05
5:24.0	8.34	0.0240	79.88	8.62
5:26.0	7.94	0.0233	79.85	8.20
5:28.0	7.55	0.0226	79.83	7.81
5:30.0	7.18	0.0219	79.80	7.43
5:32.0	6.83	0.0213	79.78	7.07
5:34.0	6.50	0.0206	79.75	6.73
5:36.0	6.19	0.0200	79.73	6.41
5:38.0	5.88	0.0194	79.71	6.10
5:40.0	5.62	0.0188	79.69	5.82
5:42.0	5.42	0.0183	79.67	5.58
5:44.0	5.25	0.0179	79.65	5.38
5:46.0	5.12	0.0176	79.64	5.23
5:48.0	4.99	0.0173	79.63	5.09
5:50.0	4.85	0.0170	79.62	4.96
5:52.0	4.72	0.0167	79.61	4.82
5:54.0	4.59	0.0164	79.60	4.69
5:56.0	4.46	0.0162	79.59	4.56
5:58.0	4.32	0.0159	79.58	4.43
6:00.0	4.19	0.0156	79.57	4.30
6:02.0	4.06	0.0153	79.56	4.17
6:04.0	3.92	0.0150	79.55	4.03
6:06.0	3.79	0.0147	79.53	3.90
6:08.0	3.66	0.0143	79.52	3.77
6:10.0	3.52	0.0140	79.51	3.64
6:12.0	3.39	0.0137	79.50	3.51
6:14.0	3.26	0.0134	79.49	3.38
6:16.0	3.13	0.0131	79.48	3.24
6:18.0	2.99	0.0127	79.46	3.11
6:20.0	2.86	0.0124	79.45	2.98
6:22.0	2.73	0.0120	79.44	2.85
6:24.0	2.59	0.0117	79.43	2.72
6:26.0	2.46	0.0113	79.41	2.59
6:28.0	2.33	0.0110	79.40	2.46

D19/27

Inflow H'graph: BASIN K1 + LAGGED POND O OUTFLOW - 100 YEAR, 24 HOUR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)
6:30.0	2.19	0.0106	79.39	2.33
6:32.0	2.06	0.0102	79.37	2.20
6:34.0	1.93	0.0099	79.36	2.07
6:36.0	1.80	0.0095	79.35	1.94
6:38.0	1.66	0.0091	79.33	1.81
6:40.0	1.53	0.0087	79.32	1.68
6:42.0	1.40	0.0082	79.30	1.55
6:44.0	1.26	0.0078	79.28	1.42
6:46.0	1.13	0.0074	79.27	1.29
6:48.0	1.00	0.0069	79.25	1.17
6:50.0	0.86	0.0064	79.23	1.04
6:52.0	0.73	0.0059	79.22	0.92
6:54.0	0.60	0.0054	79.20	0.79
6:56.0	0.47	0.0049	79.18	0.67
6:58.0	0.33	0.0043	79.16	0.55
7:00.0	0.18	0.0037	79.13	0.42
7:02.0	0.00	0.0029	79.11	0.29
7:04.0	0.00	0.0026	79.09	0.24
7:06.0	0.00	0.0022	79.08	0.19
7:08.0	0.00	0.0018	79.07	0.14
7:10.0	0.00	0.0015	79.05	0.10
7:12.0	0.00	0.0011	79.04	0.06
7:14.0	0.00	0.0007	79.03	0.03
7:16.0	0.00	0.0004	79.01	0.01
7:18.0	0.00	0.0000	79.00	0.00

NJ/10024 — Hydrograph file

```
    Description of hydrograph :                                      Page   3

    BASINS N & J COMBINED - 100 YEAR, 24 HOUR
  Area =  163.00 ac.     Rational 'C'  = .##     Time of Concent. =  31 min.
                              Storm frequency, years = 100


   Time          Flow            Time          Flow            Time          Flow
  0:04.0  *    0.0 cfs          0:14.0  *   55.0 cfs          0:24.0  * 109.0 cfs
  0:34.0  * 164.0 cfs           0:44.0  * 218.0 cfs           0:55.0  * 278.0 cfs
  1:05.0  * 246.0 cfs           1:15.0  * 213.0 cfs           1:25.0  * 181.0 cfs
  1:35.0  * 149.0 cfs           1:45.0  * 116.0 cfs           1:55.0  *  84.0 cfs
  2:05.0  *  52.0 cfs           2:15.0  *  19.0 cfs           2:21.0  *   0.0 cfs
  2:27.0  *   0.0 cfs           2:33.0  *   0.0 cfs           2:39.0  *   0.0 cfs
```

Q21/27

K2/10024 — Hydrograph file

```
   Description of hydrograph :                                  Page   2

   BASIN K2 - 100 YEAR, 24 HOUR
 Area =    25.00 ac.    Rational 'C'  = .##     Time of Concent. =  10 min.
                             Storm frequency, years = 100


  Time          Flow          Time          Flow          Time          Flow
 0:01.0  *    0.0 cfs        0:06.0  *    8.0 cfs        0:11.0  *   17.0 cfs
 0:16.0  *   25.0 cfs        0:21.0  *   33.0 cfs        0:26.0  *   42.0 cfs
 0:34.0  *   55.0 cfs        0:44.0  *   45.0 cfs        0:54.0  *   35.0 cfs
 1:04.0  *   26.0 cfs        1:14.0  *   16.0 cfs        1:24.0  *    6.0 cfs
 1:30.0  *    0.0 cfs        1:36.0  *    0.0 cfs        1:42.0  *    0.0 cfs
```

*** ROUTING OF HYDROGRAPH # 2 ***

Q22/27

Date 10/07/85

Pond File : NEWK2

TRIAL THREE - WITH BOTH PIPE AND OVERFLOW WEIR

	PIPES			WEIRS					
Str No.	Diam in	Elev ft	#	Left S/S	Length ft	Right S/S	Elev ft	Height ft	Type
1	66	34.00	1						HP
2				2.0	25.00	2.0	42.60	2.9	BC

Number	Elevation	Storage	Outflow
1	34.00	0.000	0.00
2	35.00	0.121	11.56
3	36.00	0.730	35.06
4	38.00	3.492	106.30
5	40.00	7.569	203.37
6	42.00	12.299	265.49
7	42.60	13.938	278.92
8	44.00	17.806	433.27
9	45.50	22.311	773.13

Routing of Hydrograph # 2

Description of hydrograph : Page 1

BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR
Area = 468.90 ac. Rational 'C' = .## Time of Concent. = 31 min.
Storm frequency, years = 100

Hydrograph # 3 - total outflow hydrograph
Description :
BASINS K2,N&J + LAGGED POND K1 OUTFLOW ROUTED THR. POND K2

Hydrograph # 4 - partial outflow hydrograph
Description :
POND K2 OUTFLOW

Q23/27

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
0:00.0	0.00	0.0000	34.00	0.00	0.00
0:08.0	26.69	0.0346	34.29	1.56	1.56
0:10.0	52.75	0.1258	35.01	11.71	11.71
0:12.0	77.97	0.2672	35.24	16.32	16.32
0:14.0	113.41	0.4752	35.58	24.09	24.09
0:16.0	147.71	0.7527	36.02	35.53	35.53
0:18.0	174.92	1.0894	36.26	42.65	42.65
0:20.0	202.06	1.4790	36.54	51.48	51.48
0:22.0	229.36	1.9168	36.86	62.13	62.13
0:24.0	257.81	2.3993	37.21	74.71	74.71
0:26.0	285.53	2.9218	37.59	89.30	89.30
0:28.0	312.71	3.4771	37.99	105.84	105.84
0:30.0	333.66	4.0586	38.28	118.37	118.37
0:32.0	354.70	4.6622	38.57	131.74	131.74
0:34.0	375.87	5.2858	38.88	146.12	146.12
0:36.0	392.42	5.9205	39.19	161.32	161.32
0:38.0	406.71	6.5552	39.50	177.08	177.08
0:40.0	417.30	7.1802	39.81	193.13	193.13
0:42.0	424.96	7.7873	40.09	208.40	208.40
0:44.0	431.30	8.3737	40.34	222.14	222.14
0:46.0	436.74	8.9388	40.58	235.68	235.68
0:48.0	442.89	9.4973	40.82	238.42	238.42
0:50.0	449.57	10.0622	41.05	243.94	243.94
0:52.0	465.73	10.6432	41.30	249.59	249.59
0:54.0	491.19	11.2654	41.56	255.60	255.60
0:56.0	511.07	11.9330	41.85	262.00	262.00
0:58.0	520.31	12.6234	42.12	268.17	268.17
1:00.0	527.45	13.3199	42.37	273.88	273.88
1:02.0	530.50	14.0145	42.63	279.82	279.54
1:04.0	530.46	14.6855	42.87	293.95	284.92
1:06.0	528.58	15.3082	43.10	313.06	289.89
1:08.0	525.58	15.8686	43.30	334.22	294.35
1:10.0	521.44	16.3606	43.48	355.65	298.24
1:12.0	516.04	16.7818	43.63	376.04	301.57
1:14.0	510.64	17.1345	43.76	394.54	304.35
1:16.0	503.30	17.4222	43.86	410.57	306.60
1:18.0	495.63	17.6488	43.94	423.80	308.38
1:20.0	487.62	17.8215	44.01	434.14	309.72
1:22.0	478.87	17.9469	44.05	441.28	310.63
1:24.0	468.19	18.0292	44.07	446.03 TOTAL	311.22
1:26.0	456.73	18.0711	44.09 POND	448.47 OUTFLOW	311.52
1:28.0	447.24	18.0800	44.09	449.00	311.58
1:30.0	437.76	18.0635	44.09 LEVEL	448.03 (PIPE &	311.46 PIPE OUTFLOW
1:32.0	428.18	18.0251	44.07	445.79 WEIR)	311.19
1:34.0	418.25	17.9675	44.05	442.46	310.77
1:36.0	407.85	17.8924	44.03	438.16	310.23
1:38.0	397.20	17.8013	44.00	432.99	309.57
1:40.0	386.27	17.6964	43.96	426.64	308.75

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
1:42.0	374.63	17.5788	43.92	419.65	307.83
1:44.0	362.23	17.4482	43.87	412.06	306.81
1:46.0	348.86	17.3037	43.82	403.87	305.67
1:48.0	332.39	17.1418	43.76	394.94	304.40
1:50.0	314.58	16.9585	43.69	385.15	302.96
1:52.0	295.16	16.7519	43.62	374.54	301.33
1:54.0	260.62	16.5025	43.53	362.32	299.37
1:56.0	219.15	16.1854	43.41	347.72	296.86
1:58.0	174.48	15.7925	43.27	331.14	293.74
2:00.0	148.14	15.3476	43.11	314.43	290.21
2:02.0	133.21	14.8893	42.94	299.66	286.55
2:04.0	124.55	14.4353	42.78	287.75	282.92
2:06.0	115.84	13.9851	42.62	279.44	279.30
2:08.0	106.27	13.5266	42.45	275.57	275.57
2:10.0	96.27	13.0518	42.28	271.68	271.68
2:12.0	85.98	12.5599	42.10	267.64	267.64
2:14.0	69.90	12.0437	41.89	263.06	263.06
2:16.0	55.39	11.4988	41.66	257.84	257.84
2:18.0	46.45	10.9362	41.42	252.42	252.42
2:20.0	42.61	10.3710	41.18	246.95	246.95
2:22.0	39.73	9.8117	40.95	241.49	241.49
2:24.0	37.26	9.2588	40.71	236.88	236.88
2:26.0	35.94	8.7161	40.49	230.31	230.31
2:28.0	35.09	8.1965	40.27	217.95	217.95
2:30.0	34.69	7.7079	40.06	206.57	206.57
2:32.0	34.55	7.2502	39.84	194.96	194.96
2:34.0	34.41	6.8234	39.63	183.90	183.90
2:36.0	34.29	6.4253	39.44	173.81	173.81
2:38.0	34.16	6.0535	39.26	164.58	164.58
2:40.0	34.03	5.7057	39.09	156.11	156.11
2:42.0	33.90	5.3799	38.93	148.34	148.34
2:44.0	33.78	5.0743	38.78	141.18	141.18
2:46.0	33.65	4.7873	38.64	134.58	134.58
2:48.0	33.53	4.5175	38.50	128.49	128.49
2:50.0	33.40	4.2635	38.38	122.85	122.85
2:52.0	33.28	4.0241	38.26	117.62	117.62
2:54.0	33.15	3.7983	38.15	112.76	112.76
2:56.0	33.03	3.5850	38.05	108.25	108.25
2:58.0	32.91	3.3849	37.92	103.02	103.02
3:00.0	32.78	3.1992	37.79	97.43	97.43
3:02.0	32.66	3.0279	37.66	92.38	92.38
3:04.0	32.54	2.8696	37.55	87.80	87.80
3:06.0	32.42	2.7229	37.44	83.63	83.63
3:08.0	32.30	2.5869	37.34	79.84	79.84
3:10.0	32.18	2.4605	37.25	76.37	76.37
3:12.0	32.06	2.3430	37.17	73.20	73.20
3:14.0	31.94	2.2335	37.09	70.29	70.29
3:16.0	31.82	2.1314	37.01	67.62	67.62

Inflow H′graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
3:18.0	31.70	2.0360	36.95	65.16	65.16
3:20.0	31.58	1.9468	36.88	62.88	62.88
3:22.0	31.47	1.8633	36.82	60.79	60.79
3:24.0	31.35	1.7850	36.76	58.84	58.84
3:26.0	31.23	1.7116	36.71	57.04	57.04
3:28.0	31.11	1.6426	36.66	55.37	55.37
3:30.0	31.00	1.5778	36.61	53.82	53.82
3:32.0	30.88	1.5168	36.57	52.37	52.37
3:34.0	30.77	1.4593	36.53	51.02	51.02
3:36.0	30.65	1.4051	36.49	49.76	49.76
3:38.0	30.54	1.3539	36.45	48.58	48.58
3:40.0	30.43	1.3056	36.42	47.47	47.47
3:42.0	30.31	1.2599	36.38	46.44	46.44
3:44.0	30.20	1.2167	36.35	45.46	45.46
3:46.0	30.09	1.1757	36.32	44.55	44.55
3:48.0	29.97	1.1369	36.29	43.69	43.69
3:50.0	29.86	1.1001	36.27	42.88	42.88
3:52.0	29.75	1.0651	36.24	42.12	42.12
3:54.0	29.64	1.0319	36.22	41.40	41.40
3:56.0	29.53	1.0003	36.20	40.72	40.72
3:58.0	29.42	0.9702	36.17	40.07	40.07
4:00.0	29.31	0.9416	36.15	39.46	39.46
4:02.0	29.20	0.9142	36.13	38.88	38.88
4:04.0	29.09	0.8882	36.11	38.33	38.33
4:06.0	28.98	0.8633	36.10	37.81	37.81
4:08.0	28.88	0.8395	36.08	37.32	37.32
4:10.0	28.77	0.8167	36.06	36.85	36.85
4:12.0	28.66	0.7950	36.05	36.40	36.40
4:14.0	28.55	0.7741	36.03	35.97	35.97
4:16.0	28.45	0.7541	36.02	35.56	35.56
4:18.0	28.34	0.7349	36.00	35.17	35.17
4:20.0	28.24	0.7169	35.98	34.47	34.47
4:22.0	28.13	0.7006	35.95	33.72	33.72
4:24.0	28.03	0.6860	35.93	33.06	33.06
4:26.0	27.92	0.6728	35.91	32.47	32.47
4:28.0	27.82	0.6609	35.89	31.94	31.94
4:30.0	27.71	0.6500	35.87	31.46	31.46
4:32.0	27.61	0.6402	35.85	31.02	31.02
4:34.0	27.51	0.6312	35.84	30.63	30.63
4:36.0	27.40	0.6230	35.82	30.27	30.27
4:38.0	27.29	0.6154	35.81	29.94	29.94
4:40.0	27.08	0.6082	35.80	29.63	29.63
4:42.0	26.74	0.6012	35.79	29.32	29.32
4:44.0	26.21	0.5938	35.78	29.00	29.00
4:46.0	25.21	0.5852	35.76	28.64	28.64
4:48.0	24.07	0.5748	35.75	28.20	28.20
4:50.0	22.81	0.5624	35.72	27.67	27.67
4:52.0	21.58	0.5482	35.70	27.07	27.07

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
4:54.0	20.39	0.5323	35.68	26.41	26.41
4:56.0	19.24	0.5151	35.65	25.70	25.70
4:58.0	18.20	0.4969	35.62	24.96	24.96
5:00.0	17.20	0.4779	35.59	24.20	24.20
5:02.0	16.24	0.4584	35.55	23.42	23.42
5:04.0	15.37	0.4385	35.52	22.64	22.64
5:06.0	14.57	0.4185	35.49	21.86	21.86
5:08.0	13.81	0.3984	35.46	21.09	21.09
5:10.0	13.13	0.3785	35.42	20.34	20.34
5:12.0	12.50	0.3588	35.39	19.60	19.60
5:14.0	11.89	0.3393	35.36	18.89	18.89
5:16.0	11.31	0.3202	35.33	18.19	18.19
5:18.0	10.77	0.3015	35.30	17.52	17.52
5:20.0	10.26	0.2830	35.27	16.87	16.87
5:22.0	9.75	0.2650	35.24	16.25	16.25
5:24.0	9.29	0.2473	35.21	15.64	15.64
5:26.0	8.84	0.2300	35.18	15.05	15.05
5:28.0	8.41	0.2131	35.15	14.49	14.49
5:30.0	8.01	0.1965	35.12	13.95	13.95
5:32.0	7.63	0.1804	35.10	13.42	13.42
5:34.0	7.26	0.1646	35.07	12.92	12.92
5:36.0	6.91	0.1492	35.05	12.44	12.44
5:38.0	6.58	0.1341	35.02	11.97	11.97
5:40.0	6.26	0.1197	34.99	11.37	11.37
5:42.0	5.97	0.1077	34.89	9.60	9.60
5:44.0	5.72	0.0990	34.82	8.39	8.39
5:46.0	5.50	0.0925	34.76	7.53	7.53
5:48.0	5.32	0.0875	34.72	6.89	6.89
5:50.0	5.16	0.0837	34.69	6.41	6.41
5:52.0	5.03	0.0806	34.67	6.03	6.03
5:54.0	4.89	0.0780	34.64	5.73	5.73
5:56.0	4.76	0.0759	34.63	5.48	5.48
5:58.0	4.63	0.0740	34.61	5.27	5.27
6:00.0	4.50	0.0723	34.60	5.08	5.08
6:02.0	4.36	0.0708	34.58	4.90	4.90
6:04.0	4.23	0.0693	34.57	4.74	4.74
6:06.0	4.10	0.0679	34.56	4.59	4.59
6:08.0	3.97	0.0666	34.55	4.45	4.45
6:10.0	3.84	0.0653	34.54	4.31	4.31
6:12.0	3.70	0.0640	34.53	4.17	4.17
6:14.0	3.57	0.0627	34.52	4.04	4.04
6:16.0	3.44	0.0614	34.51	3.91	3.91
6:18.0	3.31	0.0601	34.50	3.78	3.78
6:20.0	3.18	0.0588	34.49	3.65	3.65
6:22.0	3.05	0.0575	34.48	3.52	3.52
6:24.0	2.92	0.0562	34.46	3.39	3.39
6:26.0	2.79	0.0549	34.45	3.27	3.27
6:28.0	2.66	0.0536	34.44	3.14	3.14

Inflow H'graph: BASINS K2,N&J + LAGGED POND K1 OUTFLOW COMBINED - 100YR,24HR

Time hr:min	Inflow cfs	Storage ac ft	Elevation feet	Outflow cfs (Tot)	Outflow cfs (Part)
6:30.0	2.52	0.0522	34.43	3.02	3.02
6:32.0	2.39	0.0509	34.42	2.89	2.89
6:34.0	2.26	0.0495	34.41	2.77	2.77
6:36.0	2.13	0.0481	34.40	2.64	2.64
6:38.0	2.00	0.0467	34.39	2.52	2.52
6:40.0	1.87	0.0453	34.37	2.40	2.40
6:42.0	1.74	0.0438	34.36	2.28	2.28
6:44.0	1.62	0.0423	34.35	2.15	2.15
6:46.0	1.49	0.0408	34.34	2.03	2.03
6:48.0	1.36	0.0393	34.32	1.91	1.91
6:50.0	1.23	0.0378	34.31	1.80	1.80
6:52.0	1.10	0.0362	34.30	1.68	1.68
6:54.0	0.98	0.0346	34.29	1.56	1.56
6:56.0	0.85	0.0330	34.27	1.45	1.45
6:58.0	0.73	0.0313	34.26	1.33	1.33
7:00.0	0.61	0.0297	34.25	1.22	1.22
7:02.0	0.49	0.0280	34.23	1.11	1.11
7:04.0	0.37	0.0262	34.22	1.00	1.00
7:06.0	0.28	0.0245	34.20	0.90	0.90
7:08.0	0.21	0.0229	34.19	0.80	0.80
7:10.0	0.16	0.0213	34.18	0.72	0.72
7:12.0	0.12	0.0198	34.16	0.64	0.64
7:14.0	0.07	0.0184	34.15	0.57	0.57
7:16.0	0.00	0.0170	34.14	0.50	0.50
7:18.0	0.00	0.0163	34.14	0.47	0.47
7:20.0	0.00	0.0157	34.13	0.44	0.44
7:22.0	0.00	0.0150	34.12	0.41	0.41
7:24.0	0.00	0.0143	34.12	0.38	0.38
7:26.0	0.00	0.0136	34.11	0.35	0.35
7:28.0	0.00	0.0129	34.11	0.32	0.32
7:30.0	0.00	0.0123	34.10	0.30	0.30
7:32.0	0.00	0.0116	34.10	0.27	0.27
7:34.0	0.00	0.0109	34.09	0.25	0.25
7:36.0	0.00	0.0102	34.08	0.22	0.22
7:38.0	0.00	0.0095	34.08	0.20	0.20
7:40.0	0.00	0.0088	34.07	0.18	0.18
7:42.0	0.00	0.0082	34.07	0.15	0.15
7:44.0	0.00	0.0075	34.06	0.13	0.13
7:46.0	0.00	0.0068	34.06	0.12	0.12
7:48.0	0.00	0.0061	34.05	0.10	0.10
7:50.0	0.00	0.0054	34.05	0.08	0.08
7:52.0	0.00	0.0048	34.04	0.07	0.07
7:54.0	0.00	0.0041	34.03	0.05	0.05
7:56.0	0.00	0.0034	34.03	0.04	0.04
7:58.0	0.00	0.0027	34.02	0.03	0.03
8:00.0	0.00	0.0020	34.02	0.02	0.02
8:02.0	0.00	0.0014	34.01	0.01	0.01
8:04.0	0.00	0.0007	34.01	0.00	0.00

APPENDIX R

Bruce

E-2825 Bl/10
E-2669

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

District II
905 Erie - P.O. Box 536
Pueblo, Colorado 81002
(303) 544-6286

RECEIVED
AUG 8 1984
DREXEL BARRELL & CO

April 13, 1984

RECEIVED
APR 18 '84
GATES LAND COMPANY

Mr. Robert E. Svejkovsky
Gates Land Company
155 West Lake Avenue
Colorado Springs, CO 80906

Dear Mr. Svejkovsky:

As you discussed with Ray Brown on April 13, 1984, we approve of your proposed location and sizing for the 72 inch cross culvert under I-25. This location is approximately 50 feet north of the existing concrete box culvert used by vehicular traffic one mile south of Harrison Road.

It is our intention to initiate an agreement between Gates Development Company and this Department to establish a project for installation of this 72 inch pipe. We currently are planning to budget an Interstate 4R project in this area which could pay for our share of this construction and could be combined with the project covered by the agreement. We may be able to release portions of the existing drainage easement we possess on the west side of I-25.

We are awaiting the estimate from your Engineering Firm, Drexel, Barrell and Company before starting the agreement. ✓

Thank you for your consideration in this matter.

Sincerely,

R. L. CLEVENGER
Chief Engineer

By
FRANK L. SOLLEE
District Engineer

FLS:tlc

E-3234
E-2669

R2/10

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

District II
905 Erie - P.O. Box 536
Pueblo, Colorado 81002
(303) 544-6286

November 7, 1984

RECEIVED
NOV 8 '84
GATES LAND COMPANY

RECEIVED
AUG 29 1985
DREXEL BARRELL & CO

Mr. Robert F. Svejkovsky
Director of Engineering
Gates Land Company
155 West Lake Avenue
Colorado Springs, Co. 80906

Dear Mr. Svejkovsky:

This letter will serve as notification to Gates Land Company that your proposal to relocate the I-25 frontage road to follow Cheyenne Meadows Road as depicted on your map dated August 6, 1984 has been approved. Your proposal, which was approved, involves the following actions by the respective parties:

Gates Will:

1) Construct Cheyenne Meadows Road-Gates will design, dedicate, construct, gain acceptance by City including maintenance responsibilities, and open to traffic.

2) Grant access deed to Department of Highways from Cheyenne Meadows Road, along I-25 to Cheyenne Mountain Boulevard along State Highway 29.

Department of Highways Will:

1) Upon completion of Gates items #1 and 2; Department of Highways will execute a relinquishment of easement document where frontage road was on Gates property along State Highway 29.

2) Erect barricades for portion of frontage road removed from service and change signing as necessary.

We are in the process of preparing an access deed for execution by Gates Land Company. In order to facilitate preparation of the access deed we request that you furnish us with the following items:

1) Exact name under which you will convey the access rights.
2) A copy of the latest plat for Cheyenne Mountain Center.

If you need anything further, please advise.

Very truly yours,

Frank L. Sollee
District Engineer

FLS/SD/hw

R3/10

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COLORADO SPRINGS, COLO.
FEB 13 1985
AM 7,8,9,10,11,12,1,2,3,4,5,6 PM

February 11, 1985

Mr. Robert Adamczyk
City Engineering Division
Department of Public Works
30 S. Nevada, Suite 403
Colorado Springs, CO 80901

Re: Drainage Report for Cheyenne Mountain Center, Colorado Springs, Colorado, Master Report & Filing No. 1

Dear Mr. Adamczyk:

As a City imposed condition of the above referenced drainage report, we are submitting this letter. Gates Land Company agrees to accept and maintain flows, onto our property, from Cheyenne Mountain Center until such a time as permanent facilities have been constructed and the respective accompanying easements have been granted.

Very truly yours,

Robert F. Svejkovsky

Robert F. Svejkovsky
Director of Engineering

RFS/ak

GATES LAND COMPANY
155 WEST [illegible] [illegible] (303) 576 8600 8522

R4/10

DREXEL, BARRELL & CO.

ENGINEERS --- SURVEYORS

1700 38TH STREET
BOULDER, COLORADO 80301
(303) 442-4338

May 9, 1985

Chris Smith
Department of Public Works
City Engineering Division
30 S. Nevada, Suite 403
P.O. Box 1575
Colorado Springs, CO 80901

Re: Cheyenne Mountain Center Drainage Outfall at I-25 and Harrison School, Colorado Springs, Colorado

Dear Chris:

The purpose of this letter is to address the adequacy of the above mentioned outfall thru the property known as "Harrison School". This letter is written in conjunction with the Master Drainage Report for development of Cheyenne Mountain Center. The drainage outfall is located in the N1/2 of Section 33, T14S, R66W of the 6th P.M. Generally this area is East of I-25 and South of the above mentioned school An existing 100 year capacity channel, Harrison Creek Channel, drains East from the site to Fountain Creek. As we discussed the flow historically tributary to this path exceeds the peak flow now proposed.

Historically over 1.4 square miles are tributary to the Harrison School drainage outfall. This upstream area includes areas flowing to the North gully and to Quail Lake. These areas are basins D, I, K, L, M, N, O, P and the Northern half of Cheyenne Mountain Center as shown in the report entitled "Master Drainage Report" for a portion of Area II Cheyenne Mountain Ranch, Colorado Springs, Colorado dated October 15, 1982 prepared by Drexel, Barrell & Co. Flow from this contributing area is concentrated in a "U" shaped natural draw sloping east for the length in question. The 100 year peak discharge at this point is 760 cfs.

Construction of I-25 significantly changed the historical flow patterns downstream. The existing 10 X 8' high box culvert provided at I-25 limits the peak flow allowed to flow East from this point to 350 cfs. Reference "Master Drainage Plan, Harrison Street - I-25 vicinity, Cheyenne Mountain Ranch" dated November 15, 1973 prepared by Hartzell, Pfeinffenberger and Associates for details. As a result of this limitation and in conjunction with development of Cheyenne Mountain Center the majority of tributary area is being rerouted in a storm sewer to an existing underpass and proposed pipe at I-25 located about 2800' Southeast. See "Drainage Report for Cheyenne Mountain Center, Colorado Springs, Colorado" prepared by Drexel, Barrell & Co. last revised May 9, 1985. As a result of other developments upstream of I-25 an additional area of about 0.3 square miles is now tributary to the above mentioned box at I-25 and Harrison School. The flow from this area and directed to this box is limited to 350 cfs which is clearly well below the historic peak of 760 cfs at this same location.

R5/10

East of the above mentioned box culvert the flow crosses the frontage road and continues East for a reach of almost 900' within the school property before the improved 100 year capacity channel begins. A pilot channel was constructed by Gates Land Company for the 900' length. The capacity of this channel averages 150 cfs except where it has been blocked by improvements (grouted riprap) placed in the channel by the School District. No structures exist within this reach. Based on aerial topography and Mannings equation approximately a 100' wide path is subject to flooding by the 100 year storm. A small portion of Harrison Park Filing No. 9 is effected by this flow, but this could be eliminated by placement of a 2' to 3' berm at the North property* line. The remainder of the 100 year storm effects only the school property. Please see the attached Appendix E.

In summary the developed flow quantity, 350 cfs, tributary to the defined drainage way thru the Harrison School property is well below the historic amount of 760 cfs. This difference is due to construction upstream of the School site. Proposed development of Cheyenne Mountain Center will not increase flow in this drainage way to a level exceeding historic amounts. In fact construction of the development will redirect current off site tributary areas South and away from the reach in question and can be considered a benefit for storm water control.

If you have any questions or need additional information please call. Appendix E is attached for your review.

Sincerely yours,

Barbara Weiss Turner
Drexel, Barrell & Co.

*See Appendix L for clarification

cc: Bob Svejkovsky
Enclosure

BWT/ea
E-2669
(2094C)

R6/10

DREXEL, BARRELL & CO.

ENGINEERS — SURVEYORS

1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

August 5, 1985

Gary Haynes, City Engineer
Department of Public Works
P.O. Box 1575
Colorado Springs, CO 80901

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COLORADO SPRINGS, COLO.
AUG 07 1985
AM PM
7 8 9 10 11 12 1 2 3 4 5 6

Re: Supplemental Information For Master Drainage Report
Cheyenne Mountain Center, Colorado Springs, Colorado

Dear Gary:

This letter addresses the impact that the Cheyenne Mountain Center development will have on the "Harrison Creek" drainageway adjacent to the Harrison school. Cheyenne Mountain Center is located between I-25 and State Highway 85-87 and south of Lake Avenue. Harrison School is located directly east of the aforementioned site and east of I-25. The drainageway in question presently drains approximately 1.4 square miles from the west and is tributary to the "Harrison Creek" channel to the east which empties into Fountain Creek about 1/2 mile to the east.

The development of Cheyenne Mountain Center will conform to two master drainage reports previously approved by the City of Colorado Springs. The first is entitled "Master Drainage Report for a portion of Area II, Cheyenne Mountain Ranch, Colorado Springs, Colorado" dated October, 1982 and the second is called "Master Drainage Plan, Harrison Street - I-25 vicinity, Cheyenne Mountain Ranch" dated November 15, 1973. Most of the tributary area and historic flow to the reach in question will be diverted south along Highway 85-87 to the Sinton Outfall. As outlined in a previous letter to Chris Smith, City of Colorado Springs, dated May 9, 1985, 760 cfs was historically tributary to the drainageway in question for a 100 year storm. After development of Cheyenne Mountain Center only 350 cfs will reach the drainageway for a 100 year storm. As a result the 100 year flow designated for the "Harrison Creek" drainageway is decreased by over one half.

In summary, development of Cheyenne Mountain Center will generate a 100 year flow of 350 cfs in the "Harrison Creek" drainageway at the Harrison School in conformance with the two aforementioned master reports. This flow will cause no increase in damage to the drainageway as compared to historic conditions.

Sincerely,

Barbara Weiss Turner

Barbara W. Turner

cc: Bob Svejkovsky

BWT/ea
E-2669
(1909C)

R7/10

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

District II
905 Erie - P.O. Box 536
Pueblo, Colorado 81002
(303) 544-6286

September 9, 1985

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COLORADO SPRINGS, COLO.

SEP 10 1985
AM PM
7,8,9,10,11,12,1,2,3,4,5,6

City of Colorado Springs
Engineering Division
P.O. Box 1575
Colorado Springs, CO. 80901

Attn: Chris Smith

Dear Mr. Smith:

The Colorado Department of Highways has been working with the Gates Land Company on their proposed Cheyenne Mountain Center development in Colorado Springs and we have been requested by Gates to advise you of our comments on the master drainage plan for the development.

The "Drainage Report For Cheyenne Mountain Center" prepared by Drexel, Barrell and Co. and dated March 15, 1984 has been reviewed and is acceptable as a "master plan". Drexel, Barrell & Co. drawing No. 1Q249 was included as part of the submitted report. We have been requested to comment on several specific items contained in the report. Following are comments:

1) We approve the concept of carrying drainage within the highway right of way along the south side of State Highway 29 (Lake Avenue) and the west side of I-25 to the existing 6' high x 10' box culvert under I-25 at Harrison School. We realize that flow from the existing box will flow over the frontage road on the east side and that future improvements will probably be required, but we will not hold Gates Land Company responsible for those improvements. Flow above the capacity of the existing box culvert will continue south along the west side of I-25 in an open channel to a proposed 72" culvert under I-25. Gates Land Company has signed a contract with the State of Colorado to share in the cost of the 72" culvert. Construction of the culvert will be accomplished on an upcoming highway project. The 100-year flows on the west side of I-25 will be handled by the proposed 72" culvert, the existing drive-through box culvert, and an existing 48" culvert to the south. Flow from these structures will be directed to the proposed Sinton Outfall Channel (to be constructed by Gates Land Company) and carried to Fountain Creek. The Colorado Department of Highways will be responsible for the maintenance of the open drainage channel and structures within the State Highway 29 and I-25 rights of way.

2) The proposed storm sewer system paralleling State Highway 85 on the east side is also acceptable. Flow from the storm sewer will be directed towards I-25 and the structures mentioned above. The Colorado

R8/10

Department of Highways will be responsible for maintenance of structures crossing State Highway 85 but will not be responsible for the maintenance of the proposed storm sewer system.

The final drainage reports for the northwest portion of the Cheyenne Mountain Center and for Cheyenne Meadows Road are currently being reviewed. Comments on those reports will be sent as soon as possible.

If you have any questions or need any additional information, please contact Walt Pachak in Pueblo at 544-6286.

Sincerely,

R.Q. Brown

R.Q. Brown
District Preconstruction Engineer

RQB/WP/hw

cc: Bob Svejkovsky/Gates Land Co.
Bruce J. Buttner/Drexel, Barrell & Co.

R9/10

DREXEL, BARRELL & CO.
ENGINEERS — SURVEYORS
1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

July 29, 1985

Mr. Gary R. Haynes, P.E.
City Engineer
City Engineering Division
Department of Public Works
30 S. Nevada
Colorado Springs, CO 80901

RECEIVED
PUBLIC WORKS/ENGINEERING
COLORADO SPRINGS, COLO.
JUL 30 1985
AM PM
7 8 9 10 11 12 1 2 3 4 5 6

Re: Supplemental Information For Master Drainage
Report For Cheyenne Mountain Center

Dear Mr. Haynes:

As requested at our meeting on July 15, 1985, we are submitting the following documents for your review:

- Construction and land cost estimate for the Sinton Outfall Channel (part of letter dated July 23, 1985 from Barbara W. Turner to Bob Svejkovsky).
- Drainage plan (Sheet D1) and Cross-Sections (Sheet D2), Detention Pond K2 to Highway 85 (Drexel, Barrell & Co. Drawing No. 3D-651).
- Conceptual plan, Detention Pond K2 (Drexel, Barrell & Co. Drawing No. 3D 460).
- HEC-2 computer printout of 100-year backwater analysis from Highway 85 to Pond K2 (9 sheets).

Based upon the HEC-2 analysis of the 100-year storm from Pond K2 to Highway 85, we have determined that the maximum AVERAGE velocity within the existing channel would be 3.35 feet per second. ← see Appendix 'D'

As this velocity is lower than the maximum criterion of 5 feet per second discussed in our meeting, we anticipate that channel improvements will not be required. The 100-year water surface generated by the HEC-2 program is shown on the enclosed Drainage Plan and Cross-Sections, Detention Pond K2 to Highway 85.

We are presently preparing construction drawings for Pond K2 based upon the enclosed conceptual plan and will submit these drawings for your approval upon their completion.

R10/10

Please do not hesitate to contact us should you have any questions regarding this matter.

Very truly yours,

Bruce J. Buttner

Bruce J. Buttner, P.E.
Drexel, Barrell & Co.

cc: Bob Svejkovsky

Via Messenger
7 Copies of encl. as stated

BJB/ea
E-2669&E-2825
(1900C)

APPENDIX S

DRAINAGE IMPROVEMENTS COST ESTIMATE

CHEYENNE MOUNTAIN CENTER, FILING NO. 1 (PUBLIC-CITY OF COLORADO SPRINGS)

ITEM	UNIT	QUANTITY	UNIT COST	AMOUNT
Onsite:				
18" RCP (C-76, CL. III)	L.F.	330	$ 25.00	$ 8,250.00
36" RCP (C-76, CL. III)	L.F.	211	60.00	12,660.00
18" Flared end section	Each	1	300.00	300.00
Std. 6' manhole	Each	1	2,000.00	2,000.00
Std. 4' D-10-R inlet	Each	1	1,500.00	1,500.00
Std. 6' D-10-R inlet	Each	1	2,000.00	2,000.00
Std. 8' D-10-R inlet	Each	2	3,000.00	6,000.00
18" d_{50} riprap	C.Y.	30	30.00	900.00
Granular bedding for riprap	C.Y.	15	15.00	225.00
2' Grass lined channel	L.F.	530	10.00	5,300.00
			Sub-Total	$ 39,135.00
Harrison Creek Outfall:				
73"X55" CAP	L.F.	1000	$ 90.00	$ 90,000.00
73"X55" - 45° bend, fabric.	Each	2	450.00	900.00
Std. 4' manhole	Each	1	1,500.00	1,500.00
Std. 10' D-10-R inlet (modified)	Each	1	4,000.00	4,000.00
73"X55" Saddle headwall	Each	1	800.00	800.00
Offset tee	Each	2	1,000.00	2,000.00
18" d50 riprap	C.Y.	300	30.00	9,000.00
24" d50 riprap	C.Y.	200	30.00	6,000.00
Granular bedding for riprap	C.Y.	230	15.00	3,450.00
			Sub-Total	$117,650.00

52/7

DRAINAGE IMPROVEMENT COST ESTIMATE

CHEYENNE MOUNTAIN CENTER, FILING NO. 1 (PUBLIC - CITY OF COLORADO SPRINGS)
Continued

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Storm sewer along Highway 85 (Phase 1): (Includes storm sewer under Cheyenne Meadows Road at Highway 85)				
36" RCP	L.F.	33	$ 60.00	$ 1,980.00
66" RCP	L.F.	954	150.00	143,100.00
72" RCP	L.F.	106	180.00	19,080.00
84" RCP	L.F.	130	230.00	29,900.00
36" - 45° Bend	Each	1	600.00	600.00
66" - 45° Bend	Each	2	1,000.00	2,000.00
48" Offset tee	Each	2	1,000.00	2,000.00
84" Saddle headwall	Each	1	1,200.00	1,200.00
Junction box	Each	1	4,000.00	4,000.00
24" d50 riprap	C.Y.	200	50.00	10,000.00
Granular bedding for riprap	C.Y.	80	15.00	1,200.00
			Sub-Total	$215,060.00
Pond K2:				
Earthwork (cut & hauled offsite)	C.Y.	11,800	$ 2.00	$ 23,600.00
Earthwork (cut & compacted onsite)	C.Y.	3,400	1.00	3,400.00
Stripping (incl. in cut)		-	-	-
Clearing and grubbing	L.S.	L.S.	4,000.00	4,000.00
Reset sanitary sewer MH	Each	2	150.00	300.00
66" RCP	L.F.	77.1	140.00	10,794.00
12" Riprap (includes bedding)	C.Y.	28.3	45.00	1,275.00
18" Riprap (includes bedding)	C.Y.	77	45.00	3,465.00

DRAINAGE IMPROVEMENT COST ESTIMATE

CHEYENNE MOUNTAIN CENTER, FILING NO. 1 (PUBLIC - CITY OF COLORADO SPRINGS)
Continued

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Pond K2 (continued):				
66" RCP flared end section	Each	1	900.00	900.00
Concrete collar	C.Y.	1.43	250.00	360.00
Concrete liner Section D-D	C.Y.	60	175.00	10,500.00
Cutoff wall E-E	C.Y.	10.7	200.00	2,140.00
Cutoff wall F-F	C.Y.	10	200.00	2,000.00
Seeding	LB	110	18.00	1,980.00
Topsoil distribution	C.Y.	2700	1.50	4,050.00
Soil prep.	AC	3.5	125.00	440.00
Fertilizer	LB	770	1.00	770.00
			Sub-Total	$ 69,974.00
	Filing No. 1 (Public) Total			$441,819.00

CHEYENNE MOUNTAIN CENTER, FILING NO. 1 (PRIVATE-STATE HIGHWAY DEPARTMENT)

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Harrison Creek Outfall:				
24" CMP (extension of existing 24")	L.F.	18	$ 35.00	$ 630.00
Junction box at existing C.M.P.	Each	1	20,000.00	20,000.00
5' Grass-lined channel	L.F.	2150	18.00	38,700.00
Trash Rack	Each	1	3,500.00	3,500.00
	Filing No. 1 (Private) Total			$ 62,830.00
Storm Sewer Along Highway 85 (Phase 1):				
Plug existing 5'x20' box culvert	L.S.		1,300.00	1,300.00
Trash rack	Each	1	3,500.00	3,500.00
	Sub-Total			$ 4,800.00
	Filing No. 1 (Private) Total			$ 67,630.00

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DRAINAGE IMPROVEMENTS COST ESTIMATE

CHEYENNE MEADOWS ROAD (PRIVATE-STATE HIGHWAY DEPARTMENT)

ITEM	UNIT	QUANTITY	UNIT COST	AMOUNT
48" RCP (C-76, CL. III)	L.F.	140	$ 90.00	$12,600.00
18" d50 riprap	C.Y.	70	30.00	2,100.00
Granular bedding for riprap	C.Y.	10	15.00	150.00
Bituminous ditch pavement, 4" thick	S.Y.	40	7.00	280.00
			Total	$15,130.00

CHEYENNE MOUNTAIN CENTER (EXCLUSIVE OF FILING NO. 1) (PUBLIC)

- MASTER PLAN ONLY -

ITEM	UNIT	QUANTITY	UNIT COST	AMOUNT
Onsite:				
18" RCP (C-76, CL. III)	L.F.	20	$ 25.00	$ 500.00
24" RCP (C-76, CL. III)	L.F.	455	35.00	15,925.00
36" RCP (C-76, CL. III)	L.F.	760	60.00	45,600.00
42" RCP (C-76, CL. III)	L.F.	300	75.00	22,500.00
48" RCP (C-76, CL. III)	L.F.	525	90.00	47,250.00
42" Flared end section	Each	1	1,000.00	1,000.00
48" Flared end section	Each	1	1,200.00	1,200.00
Std. 6' manhole	Each	7	2,000.00	14,000.00
Std. 4' D-10-R inlet	Each	1	1,500.00	1,500.00
Std. 8' D-10-R inlet	Each	2	3,000.00	6,000.00
Std. 16' D-10-R inlet	Each	1	6,000.00	6,000.00
2' Grass swale	L.F.	280	10.00	2,800.00
			Sub-Total	$164,275.00
STORM SEWER ALONG HIGHWAY 85 (PHASE 2):				
72" RCP	L.F.	930	$ 180.00	$ 167,400.00
84" RCP	L.F.	745	230.00	171,350.00
48" Offset tee	Each	4	1,000.00	4,000.00
Junction box	Each	1	12,000.00	12,000.00
Stilling basin	L.S.		26,000.00	26,000.00
			Sub-Total	$ 380,750.00
			Total	$545,025.00
Alternate Concrete lined channel (from Cheyenne Meadows Rd to I-25)	L.F.	1900	120.00	$ 228,000.00

Note: Quantities are approximate only.

DRAINAGE IMPROVEMENTS COST ESTIMATE

IMPROVEMENTS ALONG HIGHWAY 85 (Private - State Highway Department)

- MASTER PLAN ONLY -

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
Inlet	Each	8	$ 5,000.00	$ 40,000.00
18" RCP	L.F.	50	25.00	1,250.00
24" RCP	L.F.	240	35.00	8,400.00
36" RCP	L.F.	50	60.00	3,000.00
78" RCP	L.F.	150	205.00	30,750.00
Box Culvert Ext. (West side)	L.S.		2,000.00	2,000.00
Manhole	Each	1	1,300.00	1,300.00
78" - 45° Bend	Each	1	1,000.00	1,000.00
78" headwall/wingwall/apron	L.S.		8,500.00	8,500.00
24" d50 riprap	C.Y.	550	30.00	16,500.00
Granular bedding for riprap	C.Y.	300	15.00	4,500.00
Trash Rack	Each	1	3,500.00	3,500.00
			Total	$ 120,700.00

Note: Quantities are approximate only

DRAINAGE IMPROVEMENTS COST ESTIMATE

SINTON OUTFALL (PRIVATE - EL PASO COUNTY)

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
CHANNEL COSTS				
Concrete channel (including earthwork)	L.F.	2100	$ 150.00	$315,000.00
Earth lined channel*	L.F.	1000	11.00	11,000.00
Concrete transition structure	Each	2	5,000.00	10,000.00
Concrete headwall	Each	2	5,000.00	10,000.00
27" x 43" CMPA (under driveway)	L.F.	200	50.00	10,000.00
Reseeding	Acre	4	1,000.00	4,000.00
				$360,000.00

*Allowed by El Paso County

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
LAND COSTS				
Land outside 100 year floodplain	S.F.	98,500	0.60	$ 59,100.00
Land within 100 year floodplain	S.F.	80,000	0.20	16,000.00
				$ 75,100.00
		Total		$435,100.00

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