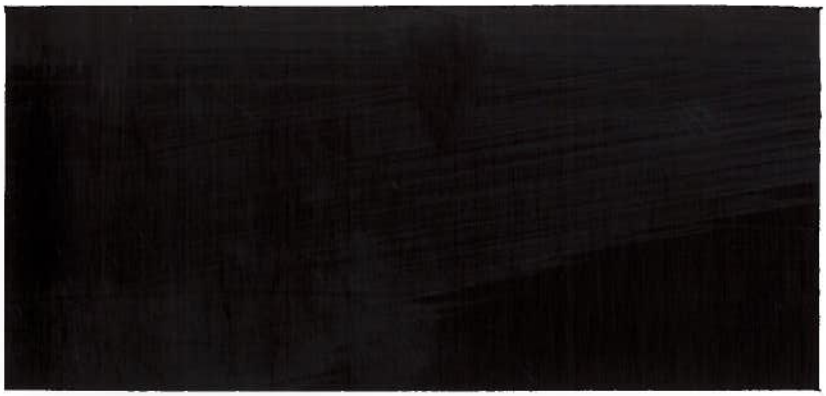
421



Greiner

PRELIMINARY DESIGN REPORT

for

AMOLE DEL NORTE
STORM DIVERSION FACILITIES
TIERRA BAYITA DRAINAGE FACILITIES

October 31, 1990

CITY PROJECT NO. 4076-01

Greiner Job No. G0001.01

Prepared for:

Public Works Department
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

Daniel L. Morehead, PE&PS
Associate Vice President

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Project Manager

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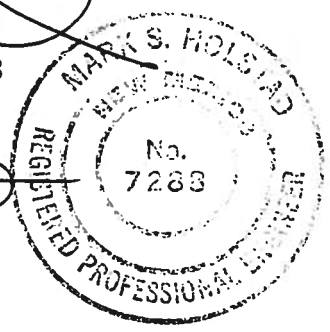
(505)345-3999



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Greiner

October 31, 1990

Mr. Loren D. Meinz, PE
Project Manager
Public Works Department
Planning Group/Hydrology Division
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

RE: PRELIMINARY DESIGN SUBMITTAL
AMOLE DEL NORTE STORM DIVERSION FACILITIES, PHASE III
PROJECT #4076-01

Dear Loren:

Greiner, Inc., is pleased to submit ten sets of the preliminary plans, preliminary estimates of cost associated calculations, and outline specifications in accordance with A/E Services Agreement 4076-01.

We appreciate the opportunity to work with the City of Albuquerque and look forward to the rapid completion of the design phase of this project.

Sincerely,

GREINER, INC.

Mark S. Holstad, PE
Project Manager

MSH:cs

JN G0001.01

AMOLE2

TABLE OF CONTENTS

GENERAL

On August 7, 1990, the Preliminary Analysis Report for Amole Del Norte Storm Diversion Facilities Tierra Bayita Facilities was submitted for review and comment. Preliminary construction plans were developed based on comments received and design guidance provided by the City. The purpose of this report is to document the analysis and decisions developed since the Preliminary Analysis Phase.

Funding is not available for the full project at this time. The project will therefore be broken into two phases, with construction of Phase IIIA as soon as the construction plans are approved and necessary easements and right-of-way can be acquired. Phase IIIB will be constructed later when funding becomes available. The breakdown between the phases is as follows (see Figure 1):

+Phase IIIA
- an open channel on the south side of Bridge Boulevard from Coors Boulevard to Unser Boulevard.
- pipe in Unser Boulevard from Bridge Boulevard to the SAD 214 Pond.
- associated rundowns, inlets and crossing structures.

+Phase IIIB
- pipe in Bridge Boulevard from Unser Boulevard to 90th Street, in 90th Street from Bridge Boulevard to north of Central Avenue and on the north side of Central Avenue from 90th to 98th.
- associated inlets.
- ponding facility north and west of 98th and Central. If design and land ownership issues can be resolved in a timely manner, this facility will be included as a part of Phase IIIA.
- flow collection and sediment removal facility at 90th and Volcano.

FUTURE SYSTEM 502.06 PER WEST BLUFF DRAINAGE PLAN

EXISTING S.D.

EXISTING SAD 214 RETENTION POND

FUTURE CONNECTION TO POND

FUTURE SYSTEM 500.02 PER WEST BLUFF DRAINAGE PLAN

PONDING LOCATION SUBJECT TO FURTHER ANALYSIS

PHASE III A

PHASE III B

NORTH/SOUTH COORS DETENTION POND

PIPE

CHANNEL

POSSIBLE PONDING or SEDIMENT BASIN

FUTURE SYSTEM

LOCATION MAP

FIGURE 1

Greiner

DESIGN CRITERIA DETERMINATIONS FROM PRELIMINARY ANALYSIS PHASE

GENERAL

There were many alternatives and recommendations presented in the Preliminary Analysis Phase report. The following decisions were reached by City Staff and/or Greiner and are used as basis for this Preliminary Design.

PIPE VERSUS CHANNEL

Channel was selected for the portion along Bridge Boulevard from the North/South Coors Detention Pond to Unser Boulevard. Pipe was selected for the remainder of the project. In each case, the selected treatment was less costly when all issues are considered, esp. right-of-way. Pipe also eliminated significant conflict with proposed roadway improvements and associated roadway access issues along Unser Boulevard north of Bridge Boulevard and along Bridge Boulevard west of Unser Boulevard.

ALIGNMENT

There were three alternate alignments presented in the Preliminary Design Analysis Report for the 90th and Central area. The selected alternate runs in Bridge to 90th, in 90th to Central and west along the north side of Central from 90th. This was identified as Alignment Alternate 2 in the Design Analysis Report. This was selected over Alternate 3, which was of roughly equivalent cost, because it only crosses Central Avenue once and does not require an easement be retained for the Bridge Boulevard alignment west of 90th. This is in accordance with the recommendation of the West Route 66 Sector Development Plan. Alternate 3 was rejected due to greater estimated cost.

CROSSING STRUCTURE TYPE

There will be channel crossing structures at Stinson Street and probably at Delgado's Wrought Iron Shop west of Stinson. The three options from the Design Analysis Report which were further considered are trapezoidal box culvert, prefabricated arch bridge and prestressed slab bridge. Trapezoidal box culvert was rejected as being not cost effective for this application. Con/Span Culvert Systems have proprietary rights to prefabricated arch bridges. Manufacturer's data give the maximum span as 24 feet, but a span of 28 feet is required for the flow depth at these locations. Additionally, the haunch of the arch interferes with the vertical profile of Stinson Street. Even if a special design were done to span 28 feet, the haunch height would increase and interfere more with the vertical profile. Prestressed slab bridges with auger

cast piles are becoming standard on City of Albuquerque drainage projects. Auger cast piles are an efficient foundation method which can be constructed in tight areas. The required span is easily obtainable with a prestressed slab bridge and are designed for low vertical clearance. Geotechnical drillings were accomplished on October 23 and 24 and preliminary indications are that either auger cast or spread footings are appropriate. The recommended design is prestressed slab with auger cast footings.

CENTRAL AVENUE FRONTAGE ROAD

The proposed storm drain west of 90th Street will be run along the alignment of the existing Central Avenue Frontage Road. The West Route 66 Sector Development Plan recommends against this frontage road, therefore it will not be replaced but instead driveways will be extended and consolidated in accordance with the West Route 66 Sector Development Plan.

PONDING ASSUMPTIONS

The Preliminary Analysis Report provided alternate hydrologic analyses comparing the use of detention ponds at 98th and Central and the existing SAD 214 Retention Pond on Unser north of Central. It has been determined to utilize both as the most cost effective means of providing storm drainage protection to the project area. The following items were considered in concluding that detention ponding areas were appropriate.

+98th and Central

- Detention ponding at this site was proposed in the original hydrologic analysis by Boyle.
- Downstream facilities are reduced in size, resulting in overall cost reduction and allowing the cost effective use of pipe where the lack of a pond would require an open channel. As noted in the previous "Pipe Versus Channel" section, an open channel has serious roadway design, right-of-way and access difficulties along Bridge Boulevard.
- It may be possible to install the ponding area initially as a retention pond prior to construction of the Phase IIIB pipe which would then convert the pond to a detention pond. This would provide significant protection to the areas east of 98th Street.
- It provides a logical location to remove a substantial sediment load from the system.

+SAD 214 Pond

- The pond is existing. The drainage easement states that City has "a permanent easement as right-of-way including the permanent right to enter upon the real estate hereinafter described at any time that it may see fit and construct, maintain and repair drainage easement ".

- Reduction of the peak flow rates made possible by a detention pond has a significant impact on downstream pipe sizes. The required 108" north of Central was reduced to 72" and the required 108" south of Central was reduced to 96". Also an extremely expensive 12'x6' concrete box culvert across Central Avenue was reduced to a 91"x58" elliptical pipe.

- Maximum existing flow, without connection to the SAD 214 Pond, to the Tierra Bayita System is the approximately 305 cfs of street flow in Unser Boulevard. The existing SAD 214 Pond is adequate for existing flows draining to it and will only be inadequate upon construction of Systems 502.06 and 500.02. These systems are proposed in the West Bluff Drainage Plan and are indicated in the Location Map. There is a significant cost savings, both initially and ultimately, to size the downstream pipe to initially handle the existing street flow in Unser Boulevard and in the future, to enlarge the SAD 214 Pond and connect to the Tierra Bayita System such that released flow rates will be substantially reduced. As indicated in the HYMO printout, a peak outflow under ultimate conditions is 311 cfs and a maximum water surface of 5097.2 will allow 2.2 feet of freeboard versus the spillway elevation of 5099.4.

- Necessary pond volume can be developed by lowering the bottom of pond elevation from 5095' to 5090' without enlarging the horizontal limits of the pond.

- It is recommended that the pipe in Unser be designed for the ultimate flow of 311 cfs. Since the existing pond is adequate until Systems 502.06 and 500.02 of the West Bluff System are constructed, it is recommended that the designer of the 500.02 System also design the pond modifications and connection to the Tierra Bayita

System. It is believed that the proposed Tierra Bayita design provides adequate flexibility to the future designer.

SEDIMENT REMOVAL AND CONTROL

Experience has shown a strong need for provisions to remove sediment in some locations and to keep the sediment in the flow in other locations. In accordance with the recommendations of the Preliminary Analysis Report, sediment will be removed at the following locations:

- the existing North/South Coors Detention Pond. This facility is already maintained, therefore this is the most efficient location to remove additional sediment.
- the proposed ponding facility at 98th and Central.
- possible sedimentation and flow collection facility at 90th and Volcano. This facility would be temporary and would be abandoned when allowed by upstream development and extensions of the storm drain. The Water Utilities Division is currently considering the use of City owned property at the southwest corner of 90th and Volcano for this drainage facility. If the City owned property is not available, then vacant property north of Volcano needs to be obtained for sediment removal.
- the existing SAD 214 Pond.

A "rundown inlet" has been developed for this project. The intent of this inlet is introduce the storm runoff into the storm drain without reducing the runoff velocity. The reduction in velocity caused by typical inlet or headwall design results in sediment being "dumped" at the inlet or headwall and the flow being plugged and/or rerouted. The swales graded to the rundown inlets are intended to be flat bottomed with a lower velocity in the swale than will be maintained within the storm drain. Typical design calculations are included in this report.

UNDEFINED ISSUES

CHANNEL ALIGNMENT DOWNSTREAM OF STINSON

Detailed discussion of options has not been accomplished by the City with the owner of Delgado's Wrought Iron Shop at 3720 Bridge Boulevard SW therefore the final channel alignment downstream of Stinson Street has not been set. There are unresolved issues relative to existing structures, however it is more likely that the

channel will have to be fit between the existing PNM power lines and the existing shop building. Discussions with two local contractors indicated that a minimum of at least 6' clear is necessary from the outside lip of the channel to an obstruction if a paving machine is to be used, therefore 8' clear to the centerline of pole (7.3'+/- net clear) was provided upstream of Stinson and would also be provided downstream if a portion of Delgado's shop can be relocated. Discussions with Blake Forbes of PNM indicate a minimum clearance requirement of 2'. This will require temporary guying by PNM during channel construction. This is constructable for the channel contractor but will require more expensive hand work. A sketch design downstream of Stinson Street is provided in the preliminary construction plans based on the assumption that the shop will remain. A crossing structure will most probably be required and is only shown schematically due to lack of input by the affected property owners.

LOCATION OF PONDING AT 98TH AND CENTRAL

Alternate layouts for ponding at 98th and Central are under consideration. A PNM power line easement on the east side of 102nd Street has been identified as a possible alternate ponding site. Preliminary contacts with PNM have been positive. This location may be less costly and have much less impact on local aesthetics. Final analysis and decisions are not possible until the City of Albuquerque completes title searches on the properties under consideration. If these issues are quickly resolved, this ponding will be included in Phase IIIA.

As is noted above, design and analysis of ponding alternates at 98th and Central is being delayed. The design impact to Phase IIIA, which will be constructed as soon as possible, is negligible since the City has made a commitment to the concept of flow attenuation at this site. Additionally, the only portion of Phase IIIA affected by the flow from 98th and Central is the open channel along Bridge Boulevard. Open trapezoidal channels are very forgiving of flows in excess of the design rate.

LOCATION OF SEDIMENT REMOVAL AND FLOW COLLECTION POND AT 90TH AND VOLCANO

As noted above, the precise location of the facility at 90th and Volcano is dependant on a determination of the Water Utilities Department of their need for existing City owned property at 90th and Volcano.

PRELIMINARY ESTIMATE OF COST

	Phase IIIA	Phase IIIB
Channel Paving	565,000	-0-
Earthwork	177,000	26,000
Storm Drain Pipe and Appurtenances	780,000	1,367,000
Inlets and Connector Pipe	178,000	64,000
Water and Sewer Relocations	43,000	-0-
Paving Replacement	135,000	113,000
Dry Utility Costs	*	*
Crossing Structures	230,000	-0-
Ponds	-0-	320,000
Sub-total	2,108,000	1,890,000
Contingencies-10%	210,800	189,000
Total Construction	2,318,800	2,079,000
Survey - 3%	69,564	62,370
Testing - 1%	23,188	20,790
Inspection - 2.5%	57,970	51,975
Legal, Administrative by City		
Right of Way, Easements	*	*
Total Costs	2,469,522	2,214,135

* Unknown. No cost included in estimate.

TECHNICAL SPECIFICATIONS

STANDARD SPECIFICATIONS

INCORPORATION OF CITY OF ALBUQUERQUE STANDARD SPECIFICATIONS: The City of Albuquerque Standard Specifications for Public Works Construction, 1986 Edition, General Conditions and Technical Specifications, as updated, are incorporated by reference, the same as if fully written herein and shall govern this Project except where revised, updated or supplemented by the Special Provisions and/or the Supplemental Technical Specifications.

The City of Albuquerque Standard Specifications for Public Works Construction, 1986 Edition, may be purchased separately by contacting the Engineering Group, Public Works Department, P.O. Box 1293, Albuquerque, New Mexico 87103.

Updates to the City of Albuquerque Standard Specifications for Public Works Construction, 1986 edition, are listed on page SS-2.

UPDATES
TO
STANDARD SPECIFICATIONS

The following is a list of Updates which have been issued to the City of Albuquerque Standard Specifications for Public Works Construction, 1986 Edition:

Update No.	Effective Date
One	March 25, 1987
Two	January 1, 1988
Three	July 1, 1988

HYDRAULIC CALCULATIONS

EXISTING LOCAL HYDROLOGY

1. SKYVIEW WEST SUBDIVISION
2. UNSER BLVD. BETWEEN CENTRAL AND BRIDGE

Greiner

Job Anvil Del Norte — Computed By SJ — Date 25 Jul 90
Description Hydrology - Skyview West Subdivision — Checked By [illegible] — Date
Sheet 1 of 2

Use Rational Method

Area = 71.8221 Ac (From planimeter of area using 1" = 1000' Topo map from Boyle report)

residential area C = .32 (From Boyle Report)

Intensity

Rainfall = 2.2" 100yr DPM Plate 22.2 D4
1.45 10yr
0.98 2yr

All flows drain to Bridge Blvd. Using Skyview West Drainage Report, divide area → Unit 1, Unit 2. Then divide Unit 1 into 2 areas (one draining to Bridge thru easmt btwn lots 67 + 68 + one draining to 75th St. (I also used topo from ~~Aron~~ Boyle report. Areas shown on Zone Atlas page Attached

① Area = 21.9 Ac L = 1600' S = .008 Tc = 15 min

② Area = 38.3 Ac L = 2000 S = .01 Tc = 16 min

③ Area = 11.6 Ac L = 950 S = .008 Tc = 10 min

$Tc = .0078 \frac{L^{.77}}{S^{.385}}$ DPM . 22.2 p. 3

Intensity = ① 1.75 (2.2) = 3.85
(1.45) = 2.54

plate 22.2 D2 ② 1.70 (2.2) = 3.74
(1.45) = 2.47

③ 2.17 (2.2) = 4.77
(1.45) = 3.14

Greiner

Job Arvale C 0001.01 Computed By [illegible] Date 26 July 90

Description _____ Checked By [illegible] Date _____

Sheet 2 of 2

$Q = C I A$

(1) $Q_{100} = (.83)(3.85)(21.9) = 70$

$Q_{10} = \text{"} (2.54) \text{"} = 46$

(2) $Q_{100} = (.83)(3.74)(38.3) = 119$

$Q_{10} = \text{"} (2.47) \text{"} = 79$

(3) $Q_{100} = (.83)(4.77)(11.6) = 46$

$Q_{10} = \text{"} (3.14) \text{"} = 30$

Greiner

Job AMOLE DEL NORTE Computed By EJ Date 27 Aug 90

Description Hydrology Checked By [illegible] Date

Revise Sky View West Subd. Flows to Sheet ___ of ___

2yr

Intensity

22.2
≈ 2

①	1.75	(.98)	=	1.72
②	1.70	(.98)	=	1.67
③	2.17	(.98)	=	2.13

$Q = C I A$

$Q_2 =$ ① (.83)(1.72)(21.9) = 31.3

② (.83)(1.67)(38.3) = 53.1

3 .83(2.13) 11.6 = 20.5

2yr flows

Swale Capacity use Section @ Sta 39+90

$N = .13$ $S = .008$

0	84.13
12	84.0
16	83.6
20	84.0
30	86.0

MAX Q = 12.5 cfs

12

@ R.P. :	43.8
@ 75th	96.9
@ Season	117.4

27 Aug 1990

SD

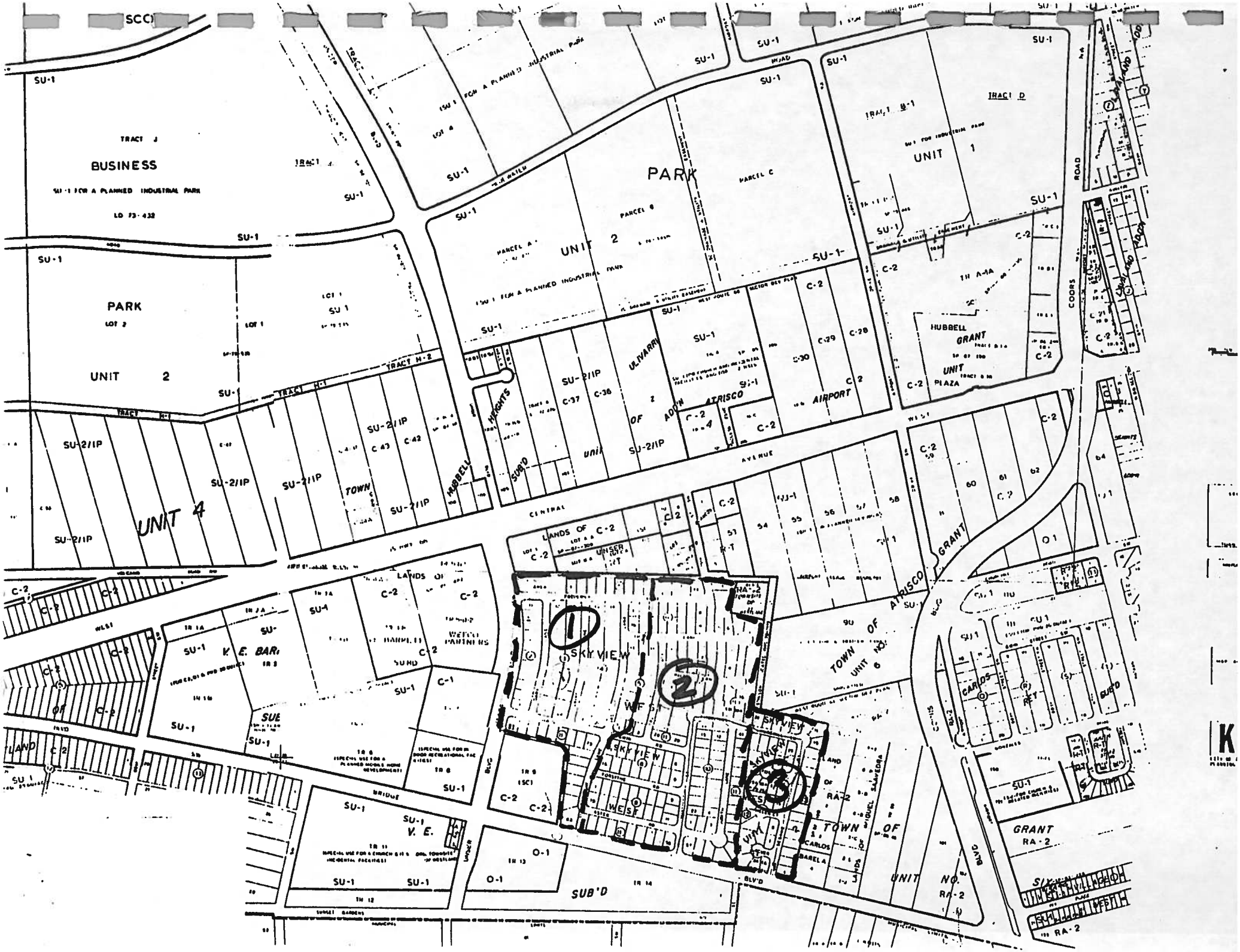
Rating curve for existing swale at Sta 34+00

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	84.13	.03
14	84	.03
24	83.6	.03
38	84	.03
30	86	.03

Channel Slope = .008 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
83.6	0	0	0	0	0	0	0
83.7	0	.2	6	.1	.6	.474	5.9
83.7	.1	1.1	12	1.1	.9	.533	11.9
83.9	.3	2.7	18	3.3	1.2	.57	18
84	.4	4.8	24	7.2	1.5	.598	24
84.1	.5	7.7	35.1	12.4	1.6	.6	34.3
84.2	.5	11.4	38.8	22.3	1.9	.624	37.2


SU-1
BUSINESS
PARK
UNIT 2
UNIT 4
UNIT 1
TRACT D
HUBBELL GRANT
UNIT PLAZA
AIRPORT
HEIGHTS
SUB'D
TOWN OF AIRISCO
AIRISCO GRANT
SKYVIEW
WEST
JUNIOR
CARLOS
GRANT
RA-2
C-2
SU-2/IP
O-1
SUB'D
BRIDGE
BLVD
AVENUE
ROAD
COORS

Greiner LINSER

Job Arroyo Del Norte — Computed By S Johnson — Date 4 Sept 90

Description Determine flow in Linser South of SAD 214 Pond to Central — Checked By [illegible] — Date ____ — Sheet ____ of ____

433 x 124 = 53,692
125 x 25 = 3,125
30 x 20 = 600
½(10) 37 = 185
70 x 40 = 2800
25 x 30 = 750
61,152

655 x 124 = 81,220
70 x 24 = 1680
130 x 66 = 11,390
130 x 50 = 6500

TOTAL AREA
162,432 ft² = 3.729 Ac

Use Rational to Determine Q_{100}

$Q = C I A$

$T_c = .0078 \frac{L^{.77}}{S^{.385}}$ — 2-SEGMENTS

① $L = 350$ $S = .0176$ $T_c = 13.36$

② $L = 718$ $S = .0043$ $T_c = 10.06$ min

13.4 min

INTENSITY - 6hr rainfall = 2.2"
dimensionless rainfall int = 1.9

$I_{100} = 2.2 \times 1.9 = 4.18$
$I_{10} = 1.45 \times 1.9 = 2.75$

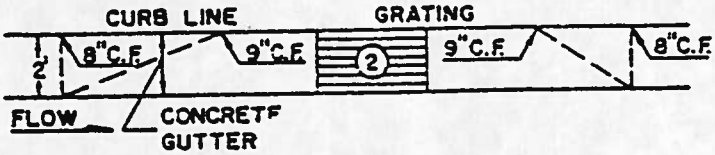
C = streets, drives, etc	0.95	3.160	.87 = COMPOSITE C
undeveloped	0.40	0.569	

Assume median will be 9' wide under fully developed conditions
use 7' on each side in R/W that is undeveloped
9 + 7 + 7 = 22 x 1068 = 24,796 ft² = 0.569 Ac
use 10' x 30' under @ Sarricino

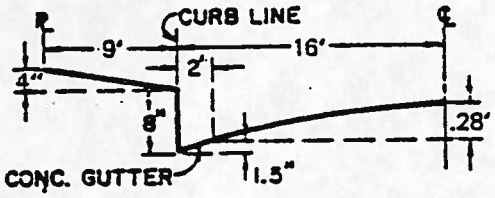
$Q_{100} = (.87)(4.18)(3.729) = 13.6$ cfs — assume 9 cfs each side d = .62
Q_{10} " (2.75) " = 3.9 cfs — assume 4.5 cfs each side d = .49

depth .49 leaves 7 clear ((curb - 1/2" → leaves d = .36) $\frac{.36}{.02} = 18$ 25-18 = 7')

GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

Greiner

Job Ansale Computed By SJohnson Date 19 Oct 90

Description C.B at Unser/Central Checked By MH Date

to pick up local flow in Unser (s. of pond) Sheet ___ of ___

Q_{100} = 13.6 cfs

Q_{10} = 8.9 cfs

existing road slope = 0.0043 (from SAD 214 plans As Builts)

existing CB type C

1/2 street is 24' wide

7 cfs in each side D = .55 (use DPM plate D-3 22.3 C or A)

cap = 6 cfs (DPM plate 22.3 D-5)

DROP INLETS

1. Sesame St.
2. 75th St.
3. Rundown
5. Unser Blvd (Neenah inlet)

CATCH BASIN CALCULATION SHEET

Sht___ of___

PROJECT Amole III A

DESIGN FREQUENCY As shown Sequoia St.

CALCULATED BY WAH

DATE 10/30/90

FLOW DIAGRAM (Indicate street slopes)	Sym.	Drain. Area	Q Total	Q Inter.	Cap. of ½ Street	Gutter "d"	C.B. No.	C.B. Size	Connector Pipe Head	Connector Pipe L	Connector Pipe Dia.	V Depth
			Q10 15	7.5		0.42	1	A				
			7.5	5.5		0.34	1	2C				
			2	2		0.23	1	2C				
			Q100 23	9		0.46	1	A				
			14	8		0.40	1	2C				
			6	5		0.32	1	2C				
			1									

4-82

80

PLATE 22.3 D-10

22.3

CATCH BASIN CALCULATION SHEET

Sht.___of___

PROJECT Anaheim III A — 75th St.

DESIGN FREQUENCY As shown

CALCULATED BY MAH

DATE 10/30/90

FLOW DIAGRAM (Indicate street slopes)	Sym.	Drain. Area	Q Total	Q Inter.	Cap. of ½ Street	Gutter "d"	C.B. No.	C.B. Size	Connector Pipe Head	Connector Pipe L	Connector Pipe Dia.	V Depth
			Q10 39	11		0.62	1	A				
			28	11		0.52	1	2C				
			17	8		0.47	1	2C				
			9	6		0.39	1	2C				
			3	2.5		0.26	1	2C				
			0.5									
			Q100 60	14		0.75	1	A				
			46	15		0.67	1	2C				
			31	12		0.58	1	2C				
			19	9		0.48	1	2C				
			10	6		0.39	1	2C				
			4									

4-82

80

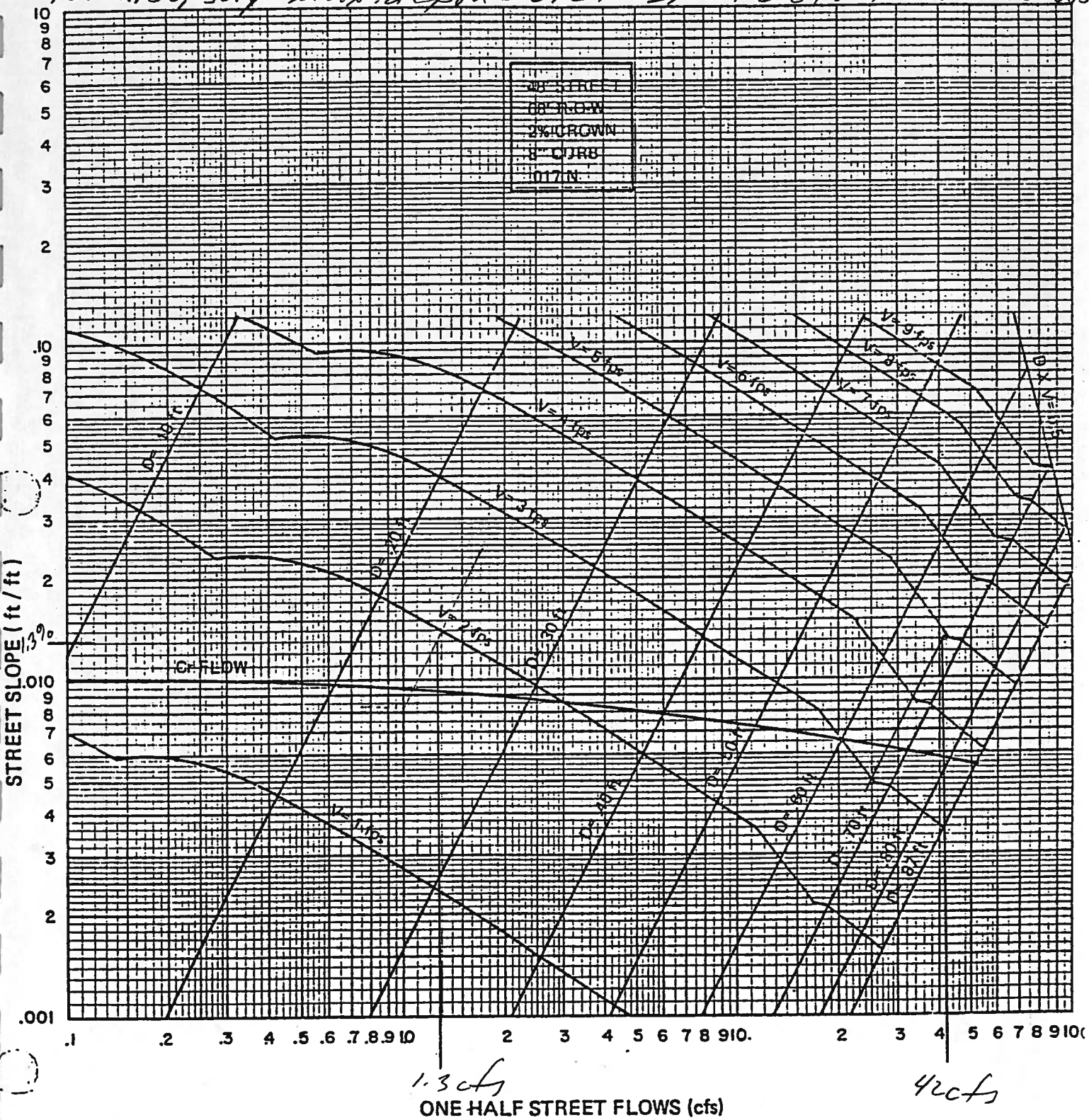
PLATE 22.3 D-10

22.3

Find max. flow in Bridge during Q_{10}. 22.3.
Keep one lane open ∴ max. depth = 12' x 2% = 0.24'
slope ≈ 1.3%

STREET CAPACITY

⇒ Allowable Q_{10} = 1.3 cfs in Bridge, each side
For Q_{100}, say max. depth ≈ 0.67' ⇒ 42 cfs each side Q_{100}



By: MAH 10/30/90

REV. 3-83

PLATE 22.3 D-3

Greiner

Job Annual 100 yr Computed By [illegible] Date 28 Aug 90

Description INLET CAPACITY Checked By [illegible] Date

Sheet ___ of ___

INLET CAPACITY IN SKYVIEW WEST 100 yr floods

At 75th St Q = 119 cfs 60 cfs each side of street S = 2% (approx - scale from 1"=100' topo)

to pick up 100 yr flow

A - 14 cfs S = 2% d = .75' Q = 60

B - 21 cfs S = 2% d = .67 Q = 46

B - 15 S = 2% d = .54 Q = 25

B - 8 S = 2% d = .4 Q = 10

AT SESAME STREET Q = 46 23 cfs each side of street S = 4% (approx

A - 9 cfs S = 4% d = .46 Q = 23

B - 10 S = 4% d = .40 Q = 14 → 4 to Bridge

or

C - 8 S = 4% d = .40 Q = 14 → 6

use 1-A & 1-C double = 28 cfs

each side

AT RUNDOWN Q_{100} = 70 cfs

need info

Greiner

Job _____ Computed By _____ Date 24 Oct 90

Description Inlets at Rundown Checked By _____ Date _____

to Ridge in Sky View Dr at Subd. Sheet ___ of ___

100 yr: Q = 70 cfs d = .64

10 yr: Q = 46 cfs d = .50

type D double CDA SD inlet @ sag

25 yr S = % d = .64 1 - 11.5 cfs × 3 = 34.5 → 70

35.5 d = .4

15 Q = 5 × 3

20.5 to bridge

10 year S = . d = .50 1 - 8 cfs × 3 = 24 → 46

22 d = 0.3

d = .3 1 - 3 cfs × 3 = 9

D - grate area 2' 1 1/2" × 6' 4 3/4"

2.125' 6.396'

vs 25" 2.08 3.33 6.396 use type D grate

1 - 2.08 × 3.33 13-1/2" bars 14-1/2" bars dimension

- .54 - .38 - .54' - .58'

1.54 × 2.95 = 4.5 1.54 5.81 = 8.9 ☐

use D = .6 Q = 34 cfs

use D = 1' Q = 43 cfs

use 3 single grates 4.5 D = .6 Q = 16 × 3 = 48 or × 4 = 64

D = 1' Q = 21 × 3 = 63 or × 4 = 84

Capacity at rundown in Sky View West Subd. to Bridge Blvd.

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	.67	.013
0	0	.013
10	0	.013
10	.67	.013

Channel Slope = .02 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
0	0	0	0	0	0	0	0
0	0	.5	10.1	1	2.1	1.72	10
.1	.1	1	10.2	3.4	3.4	1.92	10
.1	.1	1.5	10.2	6.7	4.4	2.04	10
.2	.2	2	10.4	10.8	5.4	2.12	10
.2	.2	2.5	10.5	15.5	6.2	2.19	10
.3	.3	3	10.6	20.9	6.9	2.24	10
.3	.3	3.5	10.7	26.9	7.6	2.29	10
.4	.4	4	10.7	33.4	8.3	2.32	10
.4	.4	4.5	10.9	40.4	8.9	2.36	10
.5	.5	5	11	47.9	9.5	2.38	10
.5	.5	5.5	11.1	55.8	10.1	2.41	10
.6	.6	6	11.2	64.1	10.6	2.43	10
.6	.6	6.5	11.2	72.8	11.2	2.45	10
.7	.7	0	0	0	11.2	2.45	0

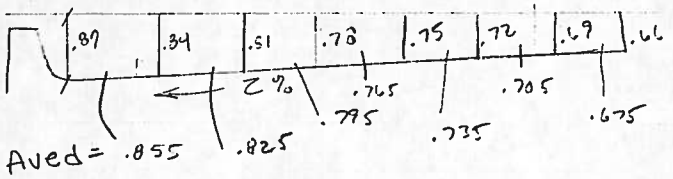
Greiner

Job Arnold Good101 Computed By SJohnson Date 19 Oct 99
Description Capacities for Checked By Date
Neenah grates at Outer Loop Detention Pond Sheet ___ of ___

Use R 3073 L at curb + R 3079-L across street
R 3580? p 211

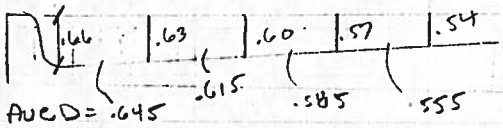
Street slope = 2%
cross slope = 2% cross slope = 1.4%

2% K = 24 – use chart for R 3079-L - same size as type grate
1.4% K = 22
$Q = K D^{5/3}$



Q = 305 cfs

	Q
24 (.855)$^{5/3}$	= 18.5
.825	= 17.4
.795	= 16.4
.765	= 15.4
.735	= 14.4
.705	= 13.4
.675	= 12.5
	108.0

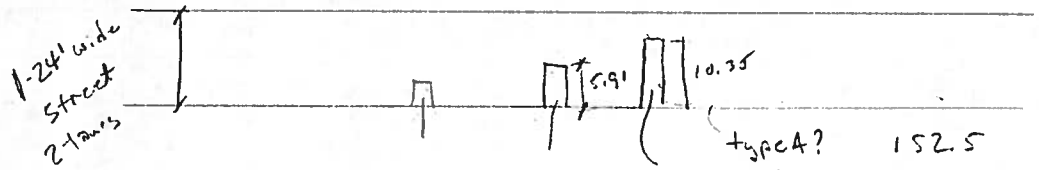


Q = 44.5
D = .66

each unit is 17 3/4" wide
or 1.48' use 7 – 10.35'

305

← 152.5



152.5
108 cfs
44.5

24 (.645)$^{5/3}$ = 11.5
.615 = 10.7
.585 = 9.8
.555 = 9.2
41

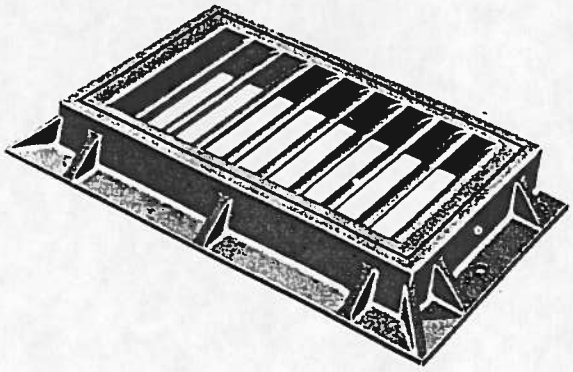
@ end
3.5 cfs S = 1.4% D = .32
cap = 3 cfs

OR

A @ Beginning D = .37 Q = 18 cfs
S = 2%

152.5 - 18
134.5 - 108
26.5 – use 3 at last end

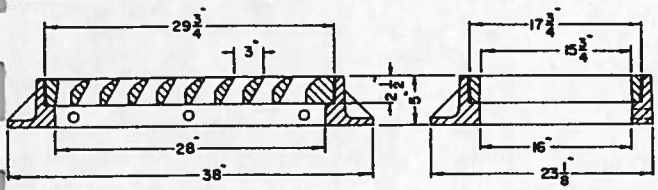
R-3076 3 Flange Gutter Inlet Frame and Grate



Heavy Duty

Total Weight 400 Pounds

For frame only — specify R-3076 frame only
For grate only — specify R-3076 grate only
Also available with Type L grate. See R-3079.



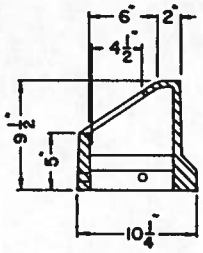
Curb Hoods

R-3076-4M

Heavy Duty

Total Weight 165 Pounds

Catalog # refers to hood only.



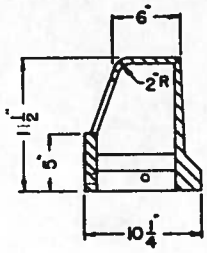
4" MOUNTABLE CURB HOOD

R-3076-6B

Heavy Duty

Total Weight 185 Pounds

Catalog # refers to hood only.



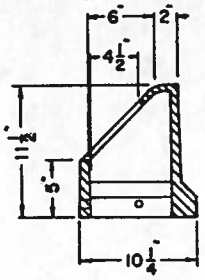
6" BARRIER CURB HOOD

R-3076-6M

Heavy Duty

Total Weight 180 Pounds

Catalog # refers to hood only.



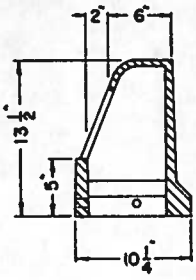
6" MOUNTABLE CURB HOOD

R-3076-8B

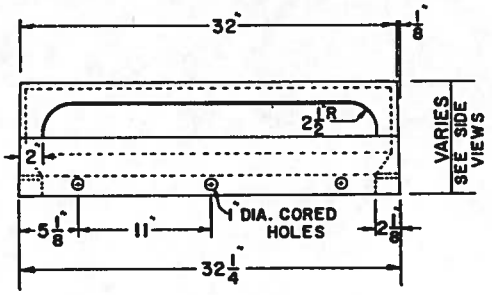
Heavy Duty

Total Weight 220 Pounds

Catalog # refers to hood only.



8" BARRIER CURB HOOD



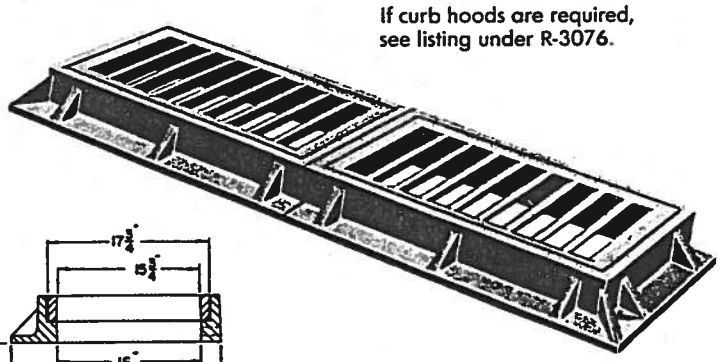
Front View

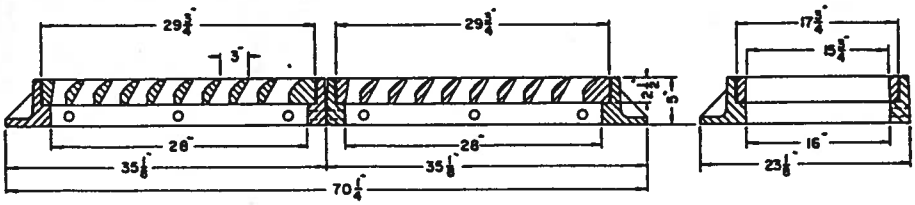
R-3077 Double Unit Inlet Frame and Grate

Heavy Duty Total Weight 750 Pounds

For full double unit — specify R-3077.
For left section (frame and grate) only — specify R-3077-L.
For left section frame only — specify R-3077-L frame only.
For right section (frame and grate) only — specify R-3077-R.
For right section frame only — specify R-3077-R frame only.
Grates are same as R-3076 unit.
Also available with Type L grate. See R-3079.

If curb hoods are required, see listing under R-3076.





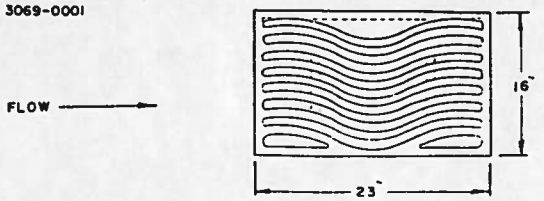
NEENAH FOUNDRY COMPANY

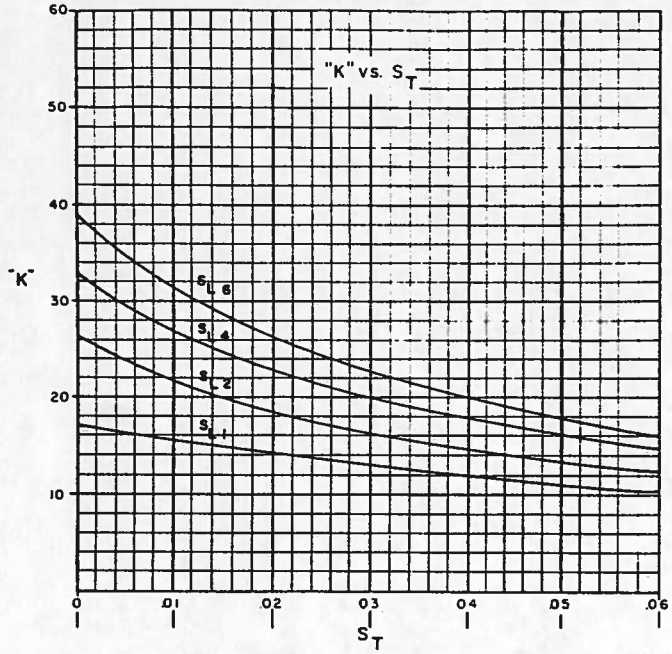
INLET GRATE CAPACITIES

FOR GUTTER FLOW and PONDED WATER

ENGINEERING

DESCRIPTION - TYPE S
COMP. CODE - 3069-0001



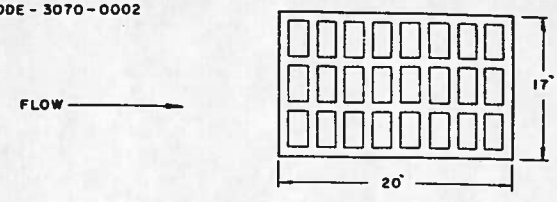


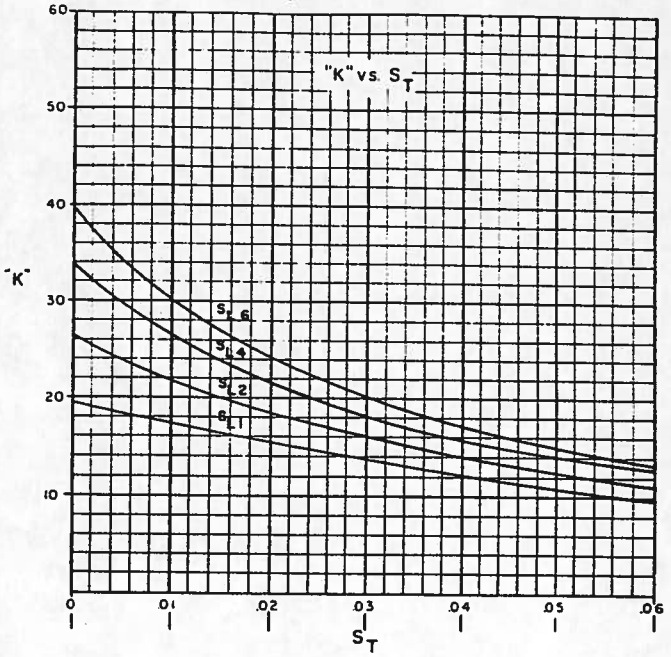
S_T = TRANSVERSE GUTTER SLOPE

S_L = LONGITUDINAL GUTTER SLOPE

K = GRATE INLET COEFFICIENT

DESCRIPTION - TYPE A
COMP. CODE - 3070-0002



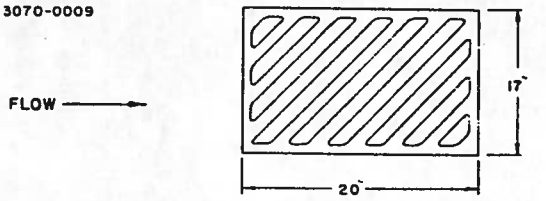


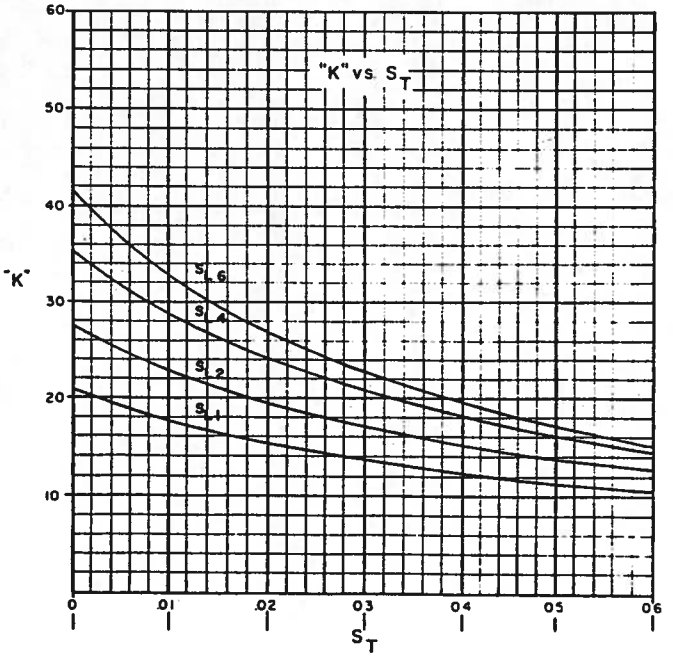
S_T = TRANSVERSE GUTTER SLOPE

S_L = LONGITUDINAL GUTTER SLOPE

K = GRATE INLET COEFFICIENT

CAT. NO. - R-3070
DESCRIPTION - DIAGONAL REVERSIBLE
COMP. CODE - 3070-0009



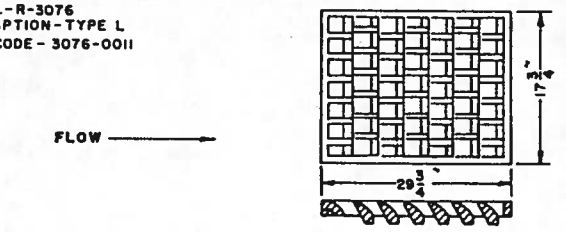


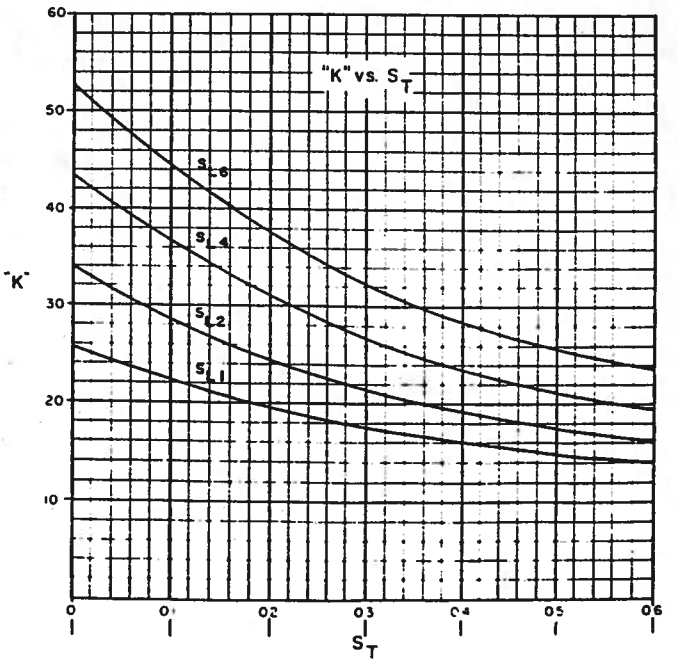
S_T = TRANSVERSE GUTTER SLOPE

S_L = LONGITUDINAL GUTTER SLOPE

K = GRATE INLET COEFFICIENT

CAT. NO. - R-3076
DESCRIPTION - TYPE L
COMP. CODE - 3076-0011





S_T = TRANSVERSE GUTTER SLOPE

S_L = LONGITUDINAL GUTTER SLOPE

K = GRATE INLET COEFFICIENT

RUNDOWN INLET

1. Basic Concept
2. Inlet at Bridge / Coors

Greiner

Job G0001.01 Computed By MSH Date 10-30-90
Description Rundown Inlet Checked By _____ Date _____
Sheet 1 of 12

Problem
There is a need for an inlet which can drain an earth lined swale without being plugged by sediment. Typical solutions are inadequate, ie,
- hustle back or bee hive inlet requires ponding around inlet during design flows. Ponding increases depth which decreases flow velocity which drops out the sediment before the inlet.
- headwall culverts. Same thing can and will happen, eg. 30" SD at 9th & Central on 8/22/90.

Individual sediment removal basins prior to each inlet would be a maintenance nightmare and would probably not be maintained.

Develop an inlet assuming:
- temporary in most but not all locations.
- will be converted to standard inlets when future street improvements are made.
- use standard construction materials that can be converted to a standard manhole and brought to grade for future road.

Greiner

Job _____ Computed By _____ Date _____

Description Rundown Inlet Checked By _____ Date _____

Sheet 2 of 12

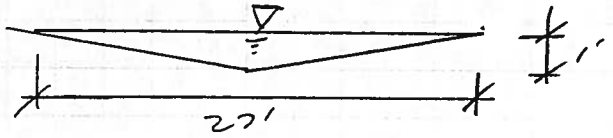
Given

Develop typical inlet based on existing swale on north side of Bridge Blvd. west of Coors. (Note: this location no longer requires an inlet due to recent installation of asphalt curb on the north side of Bridge. The concepts in the following calculations are still appropriate, however).

Develop details and present for review and comments.

Analysis

Existing earth lined swale on north side of Bridge. ± slope = 1.9%.



Q = 54 cfs } see attached rating sheet #11. // Greater flows will go south
V = 4.3 fps } over Bridge.

Collect flow with cut off wall & weir. Size minimize flow velocity disruptions. See details attached. See attached rating curve #11 Weir 12' wide and 1' deep.

Accelerate and converge flow in rundown sloped at 20°, with 6' throat. This allows use of standard 6'ID manhole barrels with modifications on top. Larger or smaller (4'ID or 8'ID) barrels may be used in

other locations. As shown in the attached rating curve #12, the flow will 0.46' ± (5.5") deep at the entry to the manhole.

Other Considerations

1) Include bars to prevent people being swept in.
2) Provide vented cover to provide air flow.
3) Detail floor to provide smooth transition to outlet pipe.
4) Check pipe velocities to assure that velocities are maintained that are greater than scale velocity for various flow rates. see attached sheet 4.
5) Check outlet pipe to assure that flow is not restricted. Rule of thumb is to check inlet control and verify that depth is less than or equal to 1.5 X pipe diameter. see attached sheet 5.

Greiner

Job Amole Coors | Bridge Fix Computed By [illegible] Date 10 oct 90

Description Check Pipe Velocities Checked By [illegible] Date

vs Ditch Velocities - to make sure pipe stays fast enough to carry sediment Sheet 4 of 12

42" RCP - max Q = 58 - S = 0.91%

Flow (cfs)	Depth (ft)	Velocity (fps)	Velocity in Channel
0	0	0	
10	.77	6.4	2.8
20	1.08	7.9	3.2
25	1.20	8.4	3.4
30	1.34	8.8	3.7
40	1.58	9.5	3.9
50	1.79	10.1	4.1
58	1.96	10.4	4.3

48" RCP - max Q = 116 S = 1%

Flow	Depth	Velocity
10	0.72	6.6
20	1.00	8.0
40	1.44	9.8
60	1.80	10.9
80	2.13	11.7
100	2.46	12.4
116	2.73	12.7

Channel velocities same as above

Greiner

Job Arvada - Bridge/Coors Fix Computed By L Johnson Date 10 Oct 90
Description Check inlet control Checked By _____ Date _____
for 42" + 48" pipes - Sheet 5 of 12

Check inlet control - see attached

36" ϕ SD Req'd Q = ≤ 58 cfs (per rating curve attached for ditch)
→ HW/D = 1.6
HW = 4.8 or 1.8 depth over pipe

48" ϕ SD Req'd Q = 116 cfs

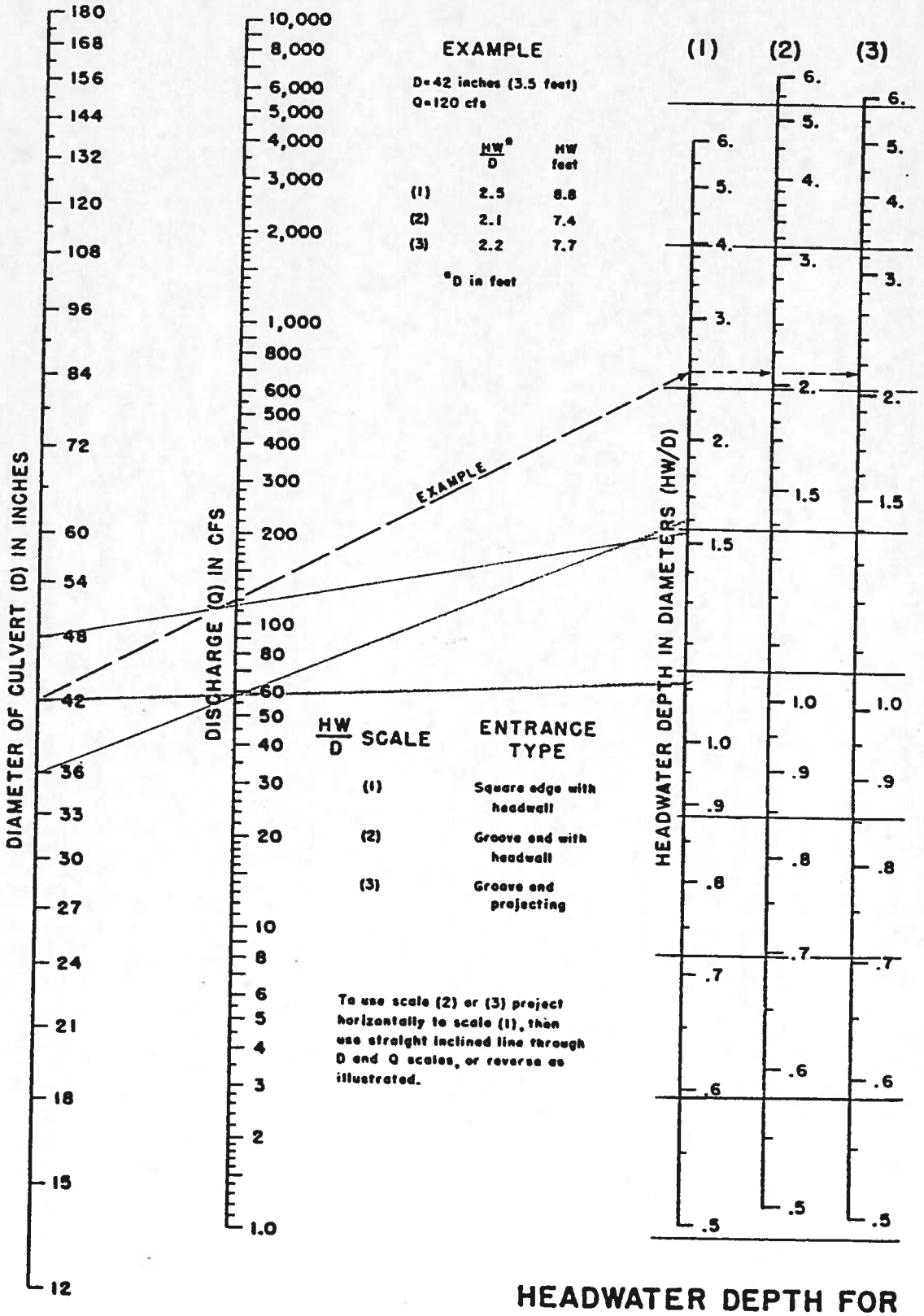
HW/D = 1.55
HW = 6.2 or 2.2' depth over pipe
(lower MH invert so 6.2 is ok)

use 42" ϕ SD @ Q = 58 cfs ← use 42" INSTEAD OF 36"

HW/D = 1.1
HW = 3.85

Check Inlet Control
Sheet 6 of 12

FIGURE 804-1D



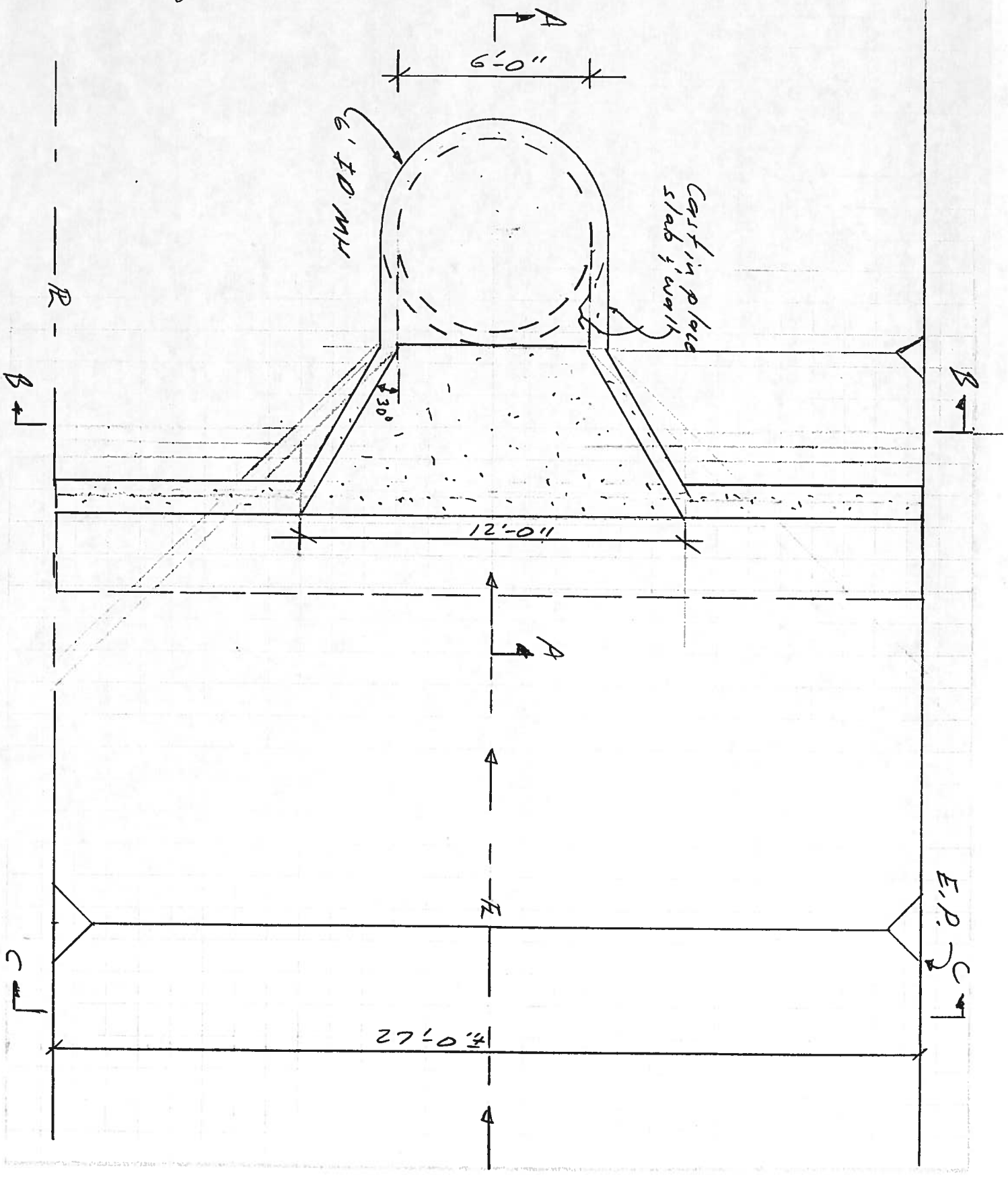
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

Greiner

Job G000103 Computed By MSH Date 10-3-90

Description Anode - Bridge Checked By Shi En Date 10/9/90

Drainage - Temp. Fix Sheet 7 of 12

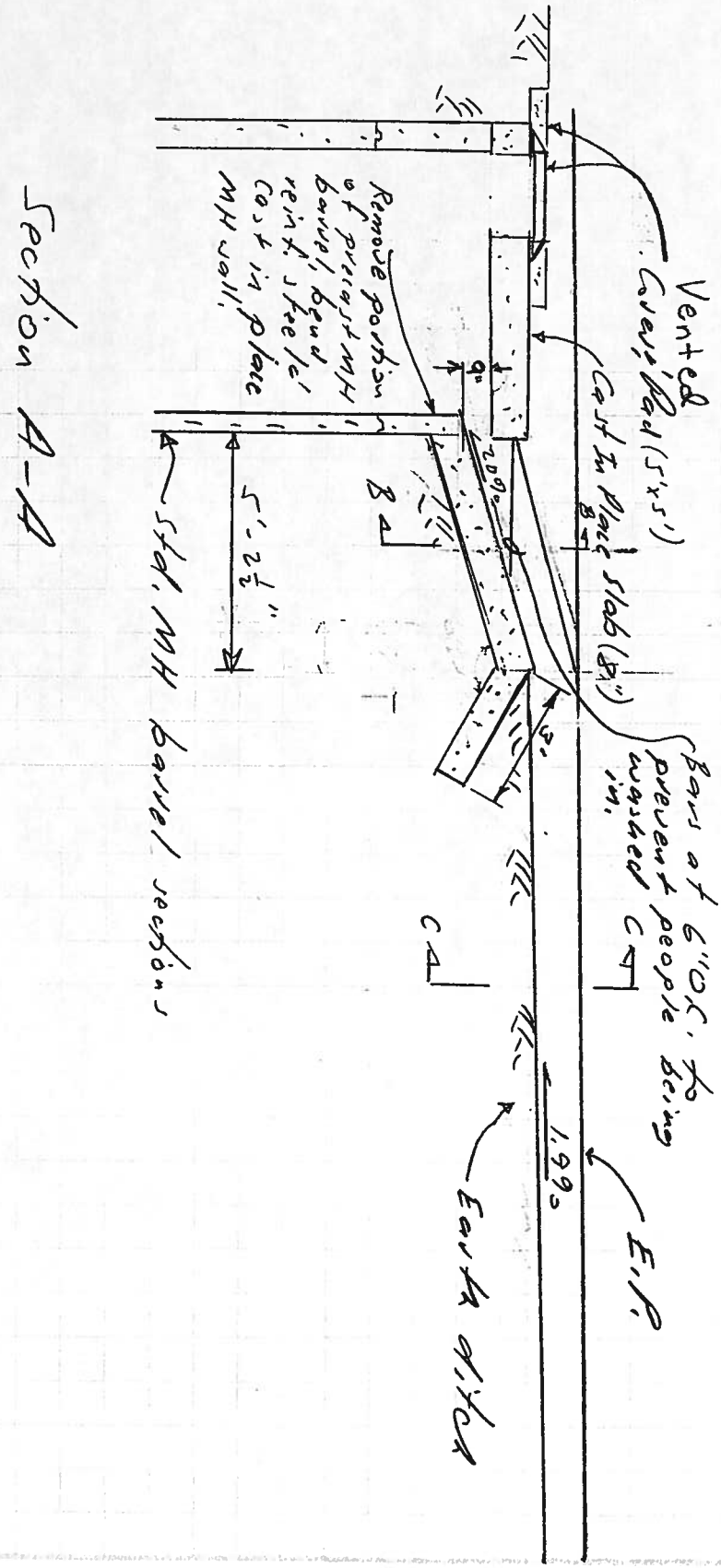


Greiner

Job _____ Computed By MSH Date 10-3-90

Description _____ Checked By SHiEn Date 10/9/90

Sheet 8 of 12



Section A-A

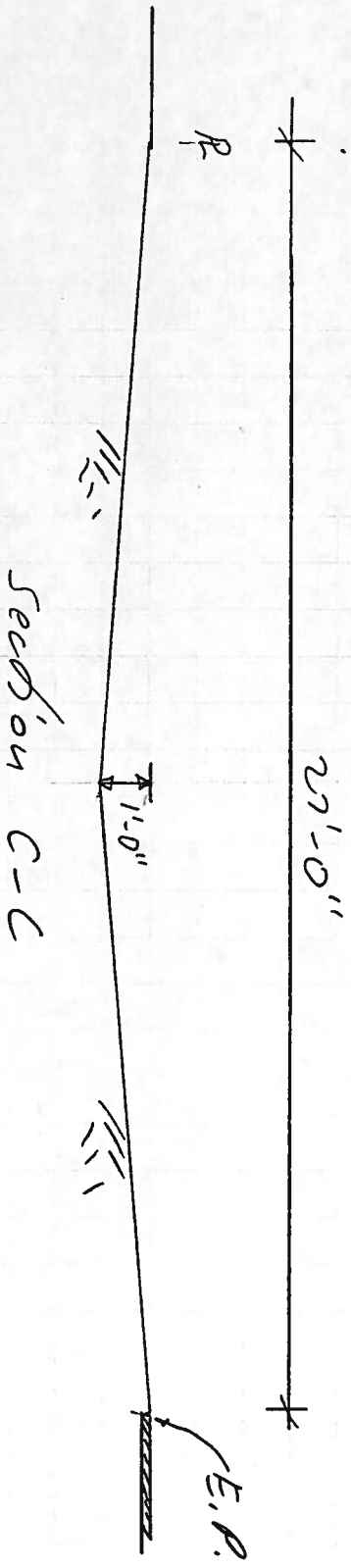
N.T.S.

Greiner

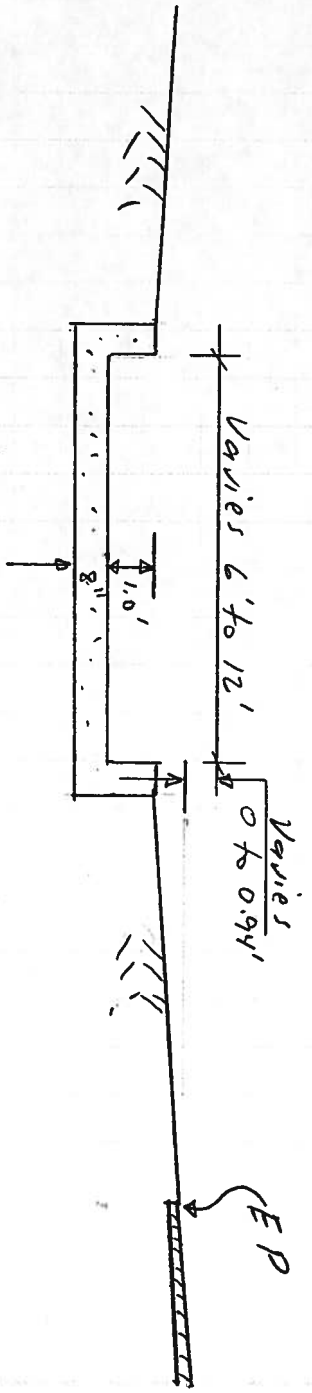
Job _____ Computed By MSH Date 10-3-90

Description _____ Checked By Shi En Date 10/9/90

Sheet 9 of 12



Section C-C



Section B-B

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	1	.03
13.5	0	.03
27	1	.03

Channel Slope = .019 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
0	0	0	0	0	0	0	0
.1	.1	.1	2.7	.1	.9	.73	2.7
.2	.2	.5	5.4	.7	1.4	.82	5.4
.3	.3	1.2	8.1	2.3	1.9	.877	8.1
.4	.4	2.1	10.8	5	2.3	.92	10.8
.5	.5	3.3	13.5	9.1	2.7	.955	13.5
.6	.6	4.8	16.2	14.8	3	.985	16.2
.7	.7	6.6	18.9	22.4	3.3	1.01	18.9
.8	.8	8.6	21.6	32	3.7	1.03	21.6
.9	.9	10.9	24.3	43.8	4	1.05	24.3
1	1	13.5	27	58.1	4.3	1.07	27

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	1	.017
0	0	.017
12	0	.017
12	1	.017

Channel Slope = .2 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
0	0	0	0	0	0	0	0
.1	.1	1.2	12.2	10	8.3	4.65	12
.2	.2	2.4	12.4	31.4	13.1	5.16	12
.3	.3	3.6	12.6	61.2	17	5.47	12
.4	.4	4.8	12.8	97.8	20.3	5.67	12
.5	.5	6	13	140.4	23.4	5.83	12
.6	.6	7.2	13.2	188.4	26.1	5.95	12
.7	.7	8.4	13.4	241.1	28.7	6.04	12
.8	.8	9.6	13.6	298.3	31	6.12	12
.9	.9	10.8	13.8	359.5	33.2	6.18	12
1	1	12	14	424.4	35.3	6.23	12

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	1	.017
0	0	.017
6	0	.017
6	1	.017

Channel Slope = .2 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
0	0	0	0	0	0	0	0
.1	.1	.6	6.2	4.9	8.2	4.6	6
.2	.2	1.2	6.4	15.4	12.8	5.06	6
.3	.3	1.8	6.6	29.6	16.4	5.3	6
.4	.4	2.4	6.8	46.9	19.5	5.45	6
.5	.5	3	7	66.8	22.2	5.55	6
.6	.6	3.6	7.2	88.8	24.6	5.61	6
.7	.7	4.2	7.4	112.8	26.8	5.65	6
.8	.8	4.8	7.6	138.5	28.8	5.68	6
.9	.9	5.4	7.8	165.6	30.6	5.69	6
1	1	6	8	194.1	32.3	5.7	6

SUMMARY OF HYDRAULIC CALCULATIONS

CLOSED CONDUIT

BY: [signature]
DATE: 27 Oct 90
SHEET: 1 OF: ____

PROJECT: Angle
LINE: Unser

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STATION	STRUCT	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	h_b	h_j	h_{mh}	h_f	h_{misc}	Σ	E.G.	h_v	H.G.
109+82.23	OUTLET																				
		84 96	616	42.173	14.61	—	.005	147.67												3.31	74.89
111+29.9	Bend								0												
		96	616	45.536	13.53			8													
111+37.9	Bend								15°												
		96	616	50.246	12.25	9120	.0046	16	2-15°			.07	.19 x2 .38					.45	79.74	2.33	77.41
111+53.9	END PIPE																		80.19	2.33	77.86
		96	616	50.246	12.25	9120	.0046	1402.1				6.45						6.45			
125+56	R/D inlet									4' MH	90			1.43				1.43	86.64	2.33	84.31
		96	539	50.246	10.72	9120	.0035	135				.47						.47	88.07	1.78	86.29
126+91	Junction		193							4'	45°			.49				.49	88.54	1.78	86.76
		72	311	28.274	11.00	4236	.0054	209				1.13						1.13	89.03	1.87	87.16
129+00	Trans.	to	elip.	pipe	(MH)										.09	.001		.09	90.16	1.87	88.29
		91x58	311	29.5	10.54	4236	.0054	240				1.30						1.30	90.25	1.73	88.52
131+40	Trans. to	72" ϕ	pipe	(MH)											.09	.003		.09	91.55	1.73	89.82
		72	311	28.274	11.00	4236	.0054	985				5.32						5.32	91.64	1.87	89.77
141+25																			96.96	1.87	95.09

Normal Depth = 6.26'
Inv = 68.63

Assume D = 6.80' (6.26 + .27 + .27)
Pipe seals in series of
15° Bends - Assume Soffit
at 111+37.9 (Inv = 69.41

use K for 72"

REMARKS:

MANNING'S n: _____

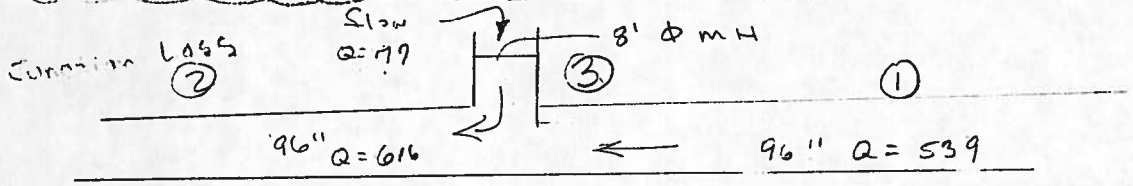
Greiner

Job Annie Oak Norte — Computed By S Johnson — Date 27 Oct 90

Description — Checked By MJ — Date

Sheet ___ of ___

125+56 - JUNCTION AT RUNDOWN INLET



② D=96
A=
V=12.25

① D=96
A=50.266
V=10.72

① D=90
A=
V=12.20
$\frac{V^2}{2g}$ = 2.31

* $h_j = \frac{V_2^2}{2g} - \left(0.5 \frac{V_1^2}{2g}\right) =$ ① 1.43 d=96, 1.17 d=90

* revision of formula in DPM to allow for 90° turn (from Shiau Shiau)

~~Transition Loss - expansion~~

$K_e = 3.50 (\tan \theta/2)^{1.22}$

$K_e = .35$

~~$\tan \theta/2 = .3125$~~
don't divide by 2 since all on one side

$h_t = K_e \frac{(V_1 - V_2)^2}{2g} =$ Ⓐ .03 Ⓑ .01

total h = 1.19 + .03 = 1.22

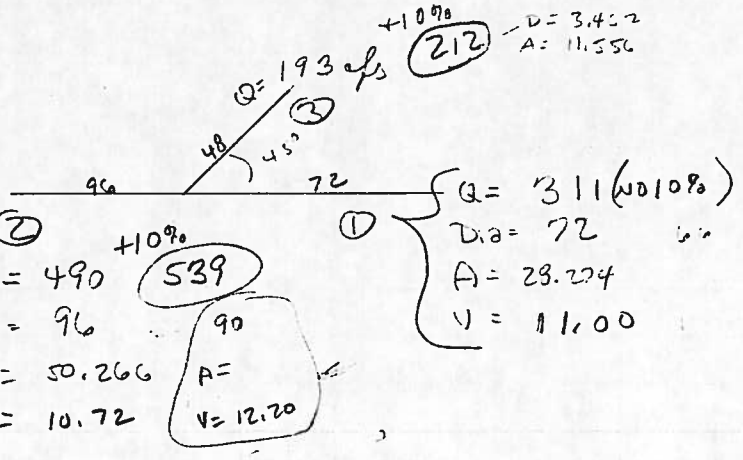
Greiner

Job ANGLE — Computed By S Johnson — Date 24 Oct 90

Description Junction Loss at Sta 126+91 — Checked By _____ — Date _____

Sheet ____ of ____

Sta 126+91



③ Q = 212
Dia = 48"
A = 12.566
V = 16.87

54 / 15.94 / 13.33

$$\Delta y = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 \cos\theta}{\frac{1}{2}(A_1 + A_2)\, g} = \quad (\theta = 45^\circ)$$

$$\frac{539(10.72\ \text{or}\ 12.20) - (311)(11.00) - 212(16.87)\cos 45^\circ}{\frac{1}{2}(50.266 + 28.274)\,32.2} = .49$$

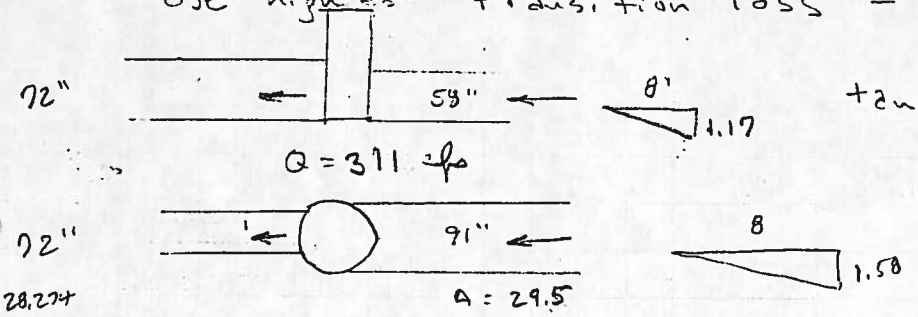
Greiner

Job _____ Computed By S Johnson Date 27 oct 90

Description _____ Checked By _____ Date _____

_____ Sheet ___ of ___

Sta 129+00 Junction Box - transition from 72" ⌀ pipe to 91 x 58 elliptical pipe - use highest transition loss - Ⓐ Q = 311



$\tan \theta/2 = 0.1463$
$K_e = .33$
$h_+ = .0005$

A = 28.274
V = 11.00

Q = 29.5
V = 10.54

$\tan \theta/2 = .1979$
$K_e = .49$
$h_+ = .0008$

Ⓒ transition 78" to 91 x 58 A = 33.183

$\tan \theta = .2083$ $\tan \frac{\theta}{2} = .0677$ V = 11.24 $h_{mH} = .12$

$K_e = .52$ $K_e = .13$

$h_+ = .02$ $h_+ = .004$

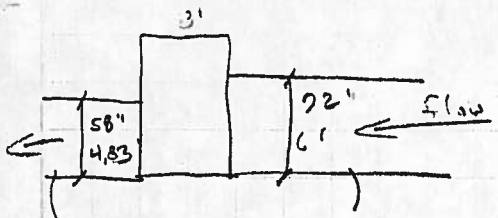
Greiner

Job Ainsle — Computed By S Johnson — Date 11 Oct 90
Description HGL Along Inser — Checked By — Date
Sheet 4 of 5

STA 131+40 JB - Change pipe size + shape
91x58 to 72" ϕ (A)+(B) (C) 91x58 to 78" ϕ
USE LARGEST

$h_{MH} = .14$

use transition loss DPM 22.3 p. 31 (plate B-2)

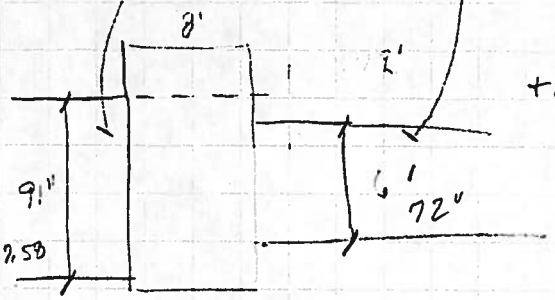


A = 29.5
V = 10.54
(3)

A = 28.274
V = 11.00
(D)

$$h_+ = K_c \frac{(V_1 - V_2)^2}{2g}$$

VERTICAL
tan ϕ = .1463
$K_c = .33$
exp. $h_+ = .001$



tan ϕ = 1.58/8 = 0.1975
$K_c = .48$
$h_+ = .003$

Sta 111+69.9 to 111+17.9 transition 72" to 96"
8' trans.

8 / .5

use DPM 22.3 p. 31 plate B-2
ϕ = 3-34-35
$K_c = .12$
$K_c = 3.50 (\tan \frac{\theta}{2})^{1.22}$
$h_+ = .005$
$h_+ = K_c \frac{(V_1 - V_2)^2}{2g}$

Sta 127+21 to
transition 96 to 78' in 8'
use DPM 22.3 p. 31 pl B-2

8' / 1.5

ϕ = 10-37-11
$K_c = .45$
$h_+ = .06$

SUMMARY OF HYDRAULIC CALCULATIONS

CLOSED CONDUIT

BY: SJohn
DATE: 30 oct
SHEET: 1 OF:

PROJECT: ANGLE
LINE: Bridge-Unser & Central

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STATION	STRUCT	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	LOSSES h_b	LOSSES h_j	LOSSES h_{mh}	LOSSES h_f	LOSSES h_{misc}	LOSSES Σ	E.G.	h_v	H.G.
46+10		7'	815	38.485	21.177	.6388	.0163		0	—	—		—	—	—	—	—		39.61	6.96	81.65
								908				14.30						14.30			
55+18	⊄PT	—	—	—	—	—	—	—	—	—	—								103.41	6.96	96.45
		7	815	23.54				42.2				7.20						7.20			
59+60			24																110.61	6.96	103.65
			811	39.435	21.07		.0161	450				7.25						7.25			
64+10																			117.86	6.90	110.96
		7'	811				.0161	450				7.25						7.25			
68+60																			125.11	6.90	118.21
			311				.0161	450				7.25						7.25			
73+19		36	83	7.068	11.74					36'	45			.78				.78	132.36	6.90	125.46
SEE SHEET 2																			133.14	5.58	127.58

REMARKS:

MANNING'S n: _____

MHD (6.90 - 5.58) .56

$\frac{-2(7.060)}{38.485}$ .2.14

cos 45°

SUMMARY OF HYDRAULIC CALCULATIONS

CLOSED CONDUIT 90th–Central to pond

PROJECT: Anole

LINE: Central–90th to 98th

BY: S Johnson

DATE: 30 Oct 1990

SHEET: 2 OF: 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STATION	STRUCT	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	h_b	h_{ij}	h_{mh}	h_j	h_{misc}	Σ	E.G.	h_v	H.G.
Central																					
73+14	MH																		133.14		
		2'	728	38.485	18.92	6388	.0130	411				5.34						5.34	138.48	5.56	132.92
77+25	trans															.005		.01	138.49	4.22	134.27
		90"	728	44.179	16.48	7677	.0090	39				.35						.35	138.83	4.22	134.61
77+64=10+00-1	JB													1.90				190	140.73	4.01	136.72
		66"	382	23.758	16.08	3358	.0129	122				1.57						1.57	142.30	4.01	138.29
11+22	JB								45°				.57		.2			.77	143.07	4.01	139.06
"	"	66"	382	11	17.32	11	.0129	355				4.58						4.58	147.65	4.0	143.64
90th																					
17+64	JB																		140.73		
		66	364		15.32		.0115	306				4.42						4.42	145.15	3.64	141.51

– pipe goes to normal depth in next segment

REMARKS:

MANNING'S n: _____

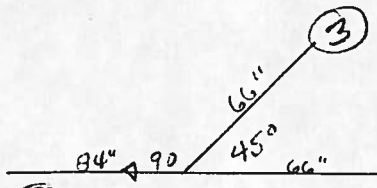
Greiner

Job AMOLE Computed By L. Johnson Date 30 Oct 90

Description _____ Checked By _____ Date _____

Sheet ____ of ____

Sta 77+64 JUNCTION



Q = 382
3 - D = 66
A = 23.758
V = 16.08

Q = 364
1 - D = 66 D = 60
A = 23.758
V = 15.32

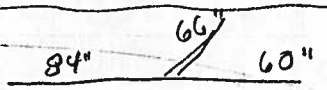
Q = 728
2 - D = 84
A = 38.485
V = 18.92

D = 90
A = 44.179
V = 16.48

$$\Delta y = \frac{728(18.92) - 364(15.32) - 382(16.08)\cos 45}{\frac{1}{2}(23.758 + 44.179)\,32.2}$$

$\Delta y = 3.85$ @ seg 2 = 84" $\Delta y = 1.90$ @ seg 2 = 90" @ Δ = 30° $\Delta y = 2.65$

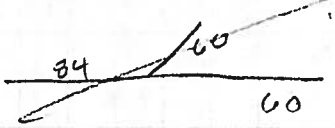
trans loss 84 → 90 .005



$\Delta y = 2.89$

$$\frac{728(18.92) - 364(18.54) - 382(16.08)\cos 45}{\frac{1}{2}(19.635 + 38.485)\,32.2}$$

NO



$\Delta = 1.89$ NO

MISCELLANEOUS

Greiner

Job AMOLE DEL NORTE Computed By L Johnson Date 30 Oct 90

Description Determine Pipe Class Checked By [illegible] Date ____

Conc. Pipe Design Manual 5th printing Sheet ___ of ___

June 1980 p. 45

Unser – use Sand + Gravel backfill - 110#/CF

Assume Type 2 Bedding - $B_f = 1.5$ (circular + elip.)

F.S. = 1.0

$$D_{0.01} = \frac{W_L + W_E}{B_f \times D} \times F.S.$$

TABLE 45

	D	H	W_E 100#/CF	W_E +10%	W_L	$D_{0.01}$	
96"	8'	8'	8937	9831	750	882	CL III
96"	8'	3'	5251	5776	1500	606	"
72"	6'	6'	5053	5558	880	715	"
91"x58"		8'/10'					
72"	6'	9'	8239	9063	540	1067	"

→

91x58	8'	11,000	12,100	810	974	CL III

Use Figure 155.1 →

$$D_{0.01} = \frac{W_L + W_E}{B_f \times S} \times FS = 974$$

S = 8.83 (add 7½" walls)

Bridge

	D	H	W_{E-100}	W_{E-110}	W_L	$D_{0.01}$	Class
84"	7'	6	5738	6312	960	693	III
84	7	9'	9242	10,166	600	1025	"
66	5.5	7'	5660	6226	700	840	"
60	5'	3'	3522	3874	1680	741	"
60	5'	7'	5268	5795	650	859	"
66	5.5	4'	3807	4188	1260	660	"

Greiner

Job ANDOLE DEL NORTE Computed By C. Johnson Date 30 Aug 1990

Description DO INLETS @ UNSER Checked By [signature] Date

+CENTRAL HAVE CAPACITY - HAVE TO PICK UP FLOW Sheet ___ of ___

PIPES ON CENTRAL WEST OF UNSER

pick up 13D 100yr flow (from Hyd) = 193.4 cfs

13D drains to 5 - 48" (4) ϕ RCP's - one pipe has 2.12' backslope

$\frac{193.4}{4}$ Assume 48.4 cfs to each pipe (excluding 1 with backslope)

S = Ave = 1.074

n = .013

Norm depth = 1.569

Area = 4.573 → V = 10.6 fps

THEREFORE - PIPES HAVE CAPACITY FOR 13D EASILY

MORE CAPACITY AVAILABLE

Greiner

Job _____ Computed By MSH Date 7-6-90

Description _____ Checked By BLC Date _____

Sheet 1 of ____

Size Unser Storm Drain

Due to lack of ponding and channel improvements west of Unser, it is very possible that the 42" SD may be running at full capacity and the street also be full to the top of sidewalk

Per attached sketch, with flow to back of sidewalk

$\Rightarrow$ $A = 52\ SF$

$WP = 98'$

At ponding area, street grade is 0.0105 ft/ft. Flow in excess of street capacity at this point will be intercepted by the pond and channel.

By Mannings

$$V = \frac{1.486}{0.017}\left(\frac{52}{98}\right)^{2/3}\sqrt{0.0105} = 5.86\ fps$$

$Q = VA = 5.86\ fps\ (52\ SF) = \underline{305}\ cfs$ street flow.

Unser SD $\Rightarrow$ 42" @ 0.00993 ft/ft

per DPM Plate 22.3 B-5, $K = 1006$

$Q = K\sqrt{S} = 1006\sqrt{0.00993} = \underline{100\ cfs}$

$\Rightarrow$ size Unser line for minimum of $305 + 100 = \underline{405\ cfs}$

NA due to ponding now 10/3/90

℄ Construction
See Sheet 2 for Layout

124'-0" Sta. 1+24 to Sta. 12+42 - VARIES - 124'-0" to 156'-0" Sta. 12+42 to Sta. 17+40

Varies - 62'-0" to 78'-0" - See Plans

Varies - 62'-0" to 78'-0" - See Plans

R/W*

R/W*

98'-0"

℄ Survey

℄ Construction
(Symmetrical about ℄)

See General Note 32

49'-0"

49'-0"

Limits of Payment for Grading

3½" Varies See Plans

6'-0" Side-walk

Varies

Grade to ... New Const... within Spe... Temporar... Construct... Easement...

Natural Ground

48'-0"

Profile Grade (Typ.)

10'-0" 10'-0" 4'-0" 4'-0" 10'-0" 10'-0"

Grade Natural Ground

Varies - See Plans

0.37'

1'-0"

+0.50'

25'-0"

Shoulder Stripe (by Others)

0.2'

S= 2%

7½"

¼"/ft.

+0.87'

Natural Ground

2:1 Max

0.0

4" Sidewalk

6" Compacted Subgrade

3½" Typical

Standard Curb & Gutter

0.67'

SEE DETAIL "A" (TYPICAL)

1½" Asphaltic Concrete Surface Course 1800# Stability (2")

Tack Coat (May Be Deleted By The Engineer)

2½" Asphaltic Concrete Base Course 1500 # Stability (2")

6" Cement Treated Base ~~or 4" Asphalt Treated Base~~

See General Note # 30

6" Compacted Subbase or 8" Compacted Subbase

6" Compacted Subgrade

$A = (24')(0.37') = 8.9\,SF$

$A = (25')\left(\frac{0.5+0.87}{2}\right) = 17.1\,SF$

$A = 2(8.9+17.1) = 52\,SF$

$WP = 2(49) = 98'$

1½" Asphaltic Concrete Surface Course

8" 4"

Asphalt Curb ... re called for Plans

Fill & Grade Natural Ground to Top of Curb Where Curb is Constructed, Otherwise Fill & Grade Natural Ground To Top of Surface Course

Step for Future Construction.

1½"

2½"

DETAIL "A"

TYPICAL SECTION WITHOUT BIKE LANE

NOT TO SCALE - CENTRAL AVENUE TO BLUEWATER ROAD

156'-0" Sta. 17+40 to Sta. 38+50

R/W*

78'-0"

78'-0"

98'-0"

49'-0"

49'-0"

Limits of Payment for Grading

℄ Survey

48'-0"

Profile Grade (Typ.)

10'-0" 10'-0" 4'-0"

℄ Construction

5'-0" 4'-0" 3'-0" 6'-0" 2'-0"

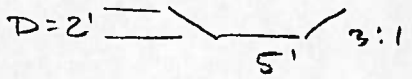
Bike Lane

Side-walk

7½"

Earth Ditch along Under just north of Bridge

STA(ft)	ELEV(ft)	MANNINGS n (to Next #)
0	3	.03
9	0	.03
14	0	.03
23	3	.03



Channel Slope = .003 ft./ft.

RATING CURVE

WSE(ft)	D(ft)	AREA-sf	WT.P-ft	Q-(cfs)	V-fps	Fr.#	TW(ft)
0	0	0	0	0	0	0	0
.1	.1	.5	5.6	.2	.5	.322	5.6
.2	.2	1.1	6.2	.9	.8	.357	6.2
.3	.3	1.7	6.8	1.9	1	.379	6.8
.4	.4	2.4	7.5	3.2	1.2	.394	7.4
.5	.5	3.2	8.1	4.7	1.4	.407	8
.6	.6	4	8.7	6.6	1.6	.417	8.6
.7	.7	4.9	9.4	8.8	1.7	.425	9.2
.8	.8	5.9	10	11.3	1.9	.433	9.8
.9	.9	6.9	10.6	14.1	2	.439	10.4
1	1	8	11.3	17.2	2.1	.445	11
1.1	1.1	9.1	11.9	20.7	2.2	.451	11.6
1.2	1.2	10.3	12.5	24.5	2.3	.456	12.2
1.3	1.3	11.5	13.2	28.7	2.4	.461	12.7
1.4	1.4	12.8	13.8	33.3	2.5	.465	13.4
1.5	1.5	14.2	14.4	38.3	2.6	.469	14
1.6	1.6	15.6	15.1	43.7	2.7	.473	14.6
1.7	1.7	17.1	15.7	49.4	2.8	.477	15.2
1.8	1.8	18.7	16.3	55.6	2.9	.481	15.8
1.9	1.9						

Greiner

Job ARNOLE DEL NORTE Computed By SJohn Date 28 Sept 1990

Description calc. Channel depths – add flow s. of Bridge (16, 20, 21 west) at Unsn Checked By [illegible] Date _____ Sheet 1 of ____

UNS/ BRIDGE ①

Q = ~~1693~~ 1603
+10% ~~1862~~ 1763
S = .004
D = 5.5'
V = 16.2

RUNDOWN/Bridge ②

Q = 1442 1667
1910 1834
ⓐ S = .004
D = 5.6
V = 16.3
ⓑ S = 1.47
D = 4.04
V = 26.22

Stinson/Bridge ③

use 1957 1705
Q = ~~1774~~ or 1779
~~1951~~ ~~1957~~
ⓐ S = 1.47 1876
D = 4.08
V = 26.37

Channel – 10' bottom/ 2:1 SS / SEE ATTACHED RATING CURVES

FB $0.7(2.0 + 0.025\sqrt{d^{1/3}})$ DPM 22.3 p. 61

① S = .004 FB = 1.90

② a) S = .004 FB = 1.91
b) S = .0147 FB = 2.13

③ a) S = 1.47 FB = 2.14

Super Elev $S = 1.3 \frac{V^2(b+2zD)}{gA}$ DPM 22.3 p. 59

① R = 3750 $1.3 \frac{16.2(10+2(2)5.5)}{32.2(3750)} = .006$

②a R = 3750 16.3 5.6 = .006

LE $L_E = 0.32(b+2zD)\frac{V}{\sqrt{D}}$ DPM 22.3 p. 61

① L_E = 70.73 } use 72' use R = 2(3750) = 7500
②a L_E = 71.4149 }

PRELIMINARY RESULTS OF GEOTECHNICAL INVESTIGATION FOR TWO CROSSING STRUCTURES

Vinyard & Associates, Inc.

4415-D Hawkins, NE
Albuquerque, New Mexico 87109
(505) 345-1937

Geotechnical Engineering • Materials Testing • Environmental Engineering

October 25, 1990

Greiner Engineering, Inc.
5971 Jefferson Street, NE
Suite 101
Albuquerque, New Mexico 87109

Attention: Mr. Mark Holstead

Subject: Preliminary Results of Geotechnical Investigation for Two Crossing Structures Associated with the Amole del Norte Storm Diversion Facilities, Phase III, Vinyard & Associates' Project No.: 90-1-81

Gentlemen:

Vinyard & Associates, Inc. has completed the field investigation for the proposed crossing structures over the Amole del Norte Storm Diversion Channel. This letter presents the results of our field investigation and preliminary recommendations for crossing structure foundation design. At the time this letter was prepared, a final decision if the crossing structures were to be bridges or box culverts had not been made.

To evaluate subsurface conditions, two test holes were drilled. One test hole was located near the intersection of Bridge Boulevard and Stinson Street and a second near 3720 Bridge Boulevard, SW (Delgado's Wrought Iron Shop). Both test holes were advanced to a depth of forty feet.

The soils encountered at both sites were very similar. The soil profile consisted of silty to very silty fine sands with some slightly gravelly lenses. The soils were loose near the ground surface and medium dense at greater depths. Soils were slightly moist. No groundwater or bedrock was encountered.

If a box culvert is constructed the structure may be supported on compacted natural ground or conventional spread footings as appropriate.

If a bridge is constructed the proposed structure may be supported on either augered, pressure grouted piles or conventional spread footings bearing on a minimum of four feet of compacted fill. Either foundation system will provide stable support.

Selection of a foundation system may be based upon cost and speed of construction.

Detailed results of our investigation and complete geotechnical recommendations for design will be presented in our forthcoming geotechnical report for the project. In the interim should any questions arise, please call.

Sincerely,
Vinyard & Associates, Inc.

Martin D. Vinyard, P. E.

File: 90-1-81.pre

MINUTES - CENTRAL AVENUE FRONTAGE ROAD MEETING

Greiner

Grein Inc.
5971 Jefferson Blvd., N.E.
Suite 101
Albuquerque, New Mexico 87109
(505) 345-3999
FAX: (505) 345-8393

Minutes

Time: 10:00 AM to 11:00 AM

Date: 9/14/90

Place: Public Works Conference Room, 5th Floor
City/County Building

Topic: Amole Del Norte Drainage
Facilities, Phase III
Central Avenue Frontage Road

Attendance: Jerold Widdison, Transportation Planning
Richard Dourte, Public Works
Loren Meinz, Hydrology Division
Kapil Goyal, Hydrology Division
Mark Holstad, Greiner, Inc.

Discussion:

1. Reviewed recommendations of the West Route 66 Sector Development Plan. Pertinent items were: (italics added for emphasis)

   a) Page 47,

   "The Segment Two portion of the roadway is a raised rural section with drainage culvert under the road. There is a fragment of a frontage road existing between Unser Boulevard and approximately 106th Street on the north side of Central Avenue. This frontage road lies below the grade of Central Avenue and inappropriately acts as a drainage ponding area during heavy storms. This *frontage road is not constructed as a permanent facility. Changes* to the existing frontage road will not occur immediately and *will be handled on a case-by-case basis* as properties develop or redevelop."

   b) Page 48,

   "The ultimate design for Central Avenue is recommended to be an urban section with curb, gutter, and sidewalk. It will include a six-lane divided roadway from the river to Unser Boulevard, and a *four-lane divided roadway west of Unser to the I-40 interchange with possible expansion to six lanes beyond the normal 20-year planning horizon.*"

c) Page 49,

"Central Avenue's *ultimate design* in Segment Two will require median cuts at 1/8-mile intervals and *driveway consolidation to the maximum extent possible* as determined on a case-by-case basis by the Transportation Development Division of the Albuquerque Public Works Department."

2. Determined to remove frontage road and to not replace it where the new storm drain will be run. Extend and consolidate driveways to provide access to adjoining properties.

3. Review NMSHTP authority to affect street design in this section.

Distribution: Attendees

Note: Please comment immediately if discrepancies are noted.

Prepared by Mark Holstad, 9/21/90

AMOLE/minutes

PRELIMINARY PLANS DRAWING LIST

INDEX TO DRAWINGS

DRAINAGE EASEMENT - SAD 214 POND

TAX CODE NO: NONE

LEGAL: TRACT A-1
ATRISCO BUSINESS PARK

GRANTOR/GRANTEE: WESTLAND DEVELOPMENT
CO. INC.

PROJECT NAME: DRAINAGE EASEMENT

FILE NO.: K-10-128

FOR
DRAINAGE

THIS INDENTURE made and executed this 12th day of February Inc., 1984 by and between WESTLAND DEVELOPMENT CO., INC. in the County of Bernalillo and State of New Mexico hereinafter called the Grantors and THE CITY OF ALBUQUERQUE, NEW MEXICO, a municipal corporation, hereinafter called Grantee.

WITNESSETH, that for valuable considerations the receipt of which is hereby acknowledged the Grantors have this day bargained and sold and by these presents do sell, convey and deliver unto the City of Albuquerque a permanent easement as right-of-way including the permanent right to enter upon the real estate hereinafter described at any time that it may see fit and construct, maintain and repair drainage easement across, through, and under the lands hereinafter described and the further right to remove trees, bushes, undergrowth and obstructions interfering with the location, construction and maintenance of said easement.

The land affected by the grant of this easement and right-of-way is located in the County of Bernalillo and State of New Mexico and is more particularly described as follows:

SEE ATTACHED EXHIBITS "A" AND "A-1"

TO HAVE AND TO HOLD the said right and easement for the uses and purposes aforesaid, unto Grantee its successors and assigns for so long as said easement shall not be abandoned for use as a right-of-way for aforesaid drainage. In the event other drainage facilities replace this easement, this easement will be relinquished by Grantee.

The Grantors do hereby covenant with Grantee that they are lawfully seized and possessed of the real estate above described and that they have a good and lawful right to convey it or any part hereof, that it is free from all encumbrances except those of record and taxes due and owing the Treasurer of Bernalillo County and that they will forever warrant and defend the title thereto against the lawful claims of all persons whomsoever.

As a part of the consideration for this grant, the Grantors do hereby release any and all claims for damages for whatsoever cause incidental to the exercise of the rights herein granted provided, however, that the Grantee agrees to save Grantors harmless from any and all liability that may arise as a result of the construction and use of the easement for the purposes set forth.

IN WITNESS WHEREOF, the parties have set their hands and seals this ____ day of ______________, 1984.

WESTLAND DEVELOPMENT CO. INC.

BY: ______________________

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

The foregoing instrument was acknowledged before me this ____ day of ______________, 1984 by ______________________

____

____
Notary Public

My Commission Expires:

____

'84 FEB 16 A8 :06

9DA 527-531

That certain parcel of land situate within projected Sections 21 and 22, T 10 N, R 2E, N.M.P.M., Town of Atrisco Grant, City of Albuquerque, Bernalillo County, New Mexico being comprised of the north 130 feet of the south 205 feet more or less of Parcel "A-1" as shown and designated on the plat entitled "Replat of Parcel "A" Tracts G, an Un-named tract, K, L, and Portions of Bluewater Road NW, and Unser Boulevard NW, Unit No. 2, Atrisco Business Park" as filed for Public Record in the office of the Bernalillo County Clerk on July 19, 1982.

BEGINNING at the southeast corner of said Tract "A-1",

Thence N 14° 59' 00" W along the east property line of said Parcel "A-1" a distance of 75.00 feet to the POINT OF BEGINNING;

Thence S 75° 13' 20" W along the northern boundary of 75 foot drainage easement on the south 75 feet of Parcel "A-1" a distance of 950.82 feet;

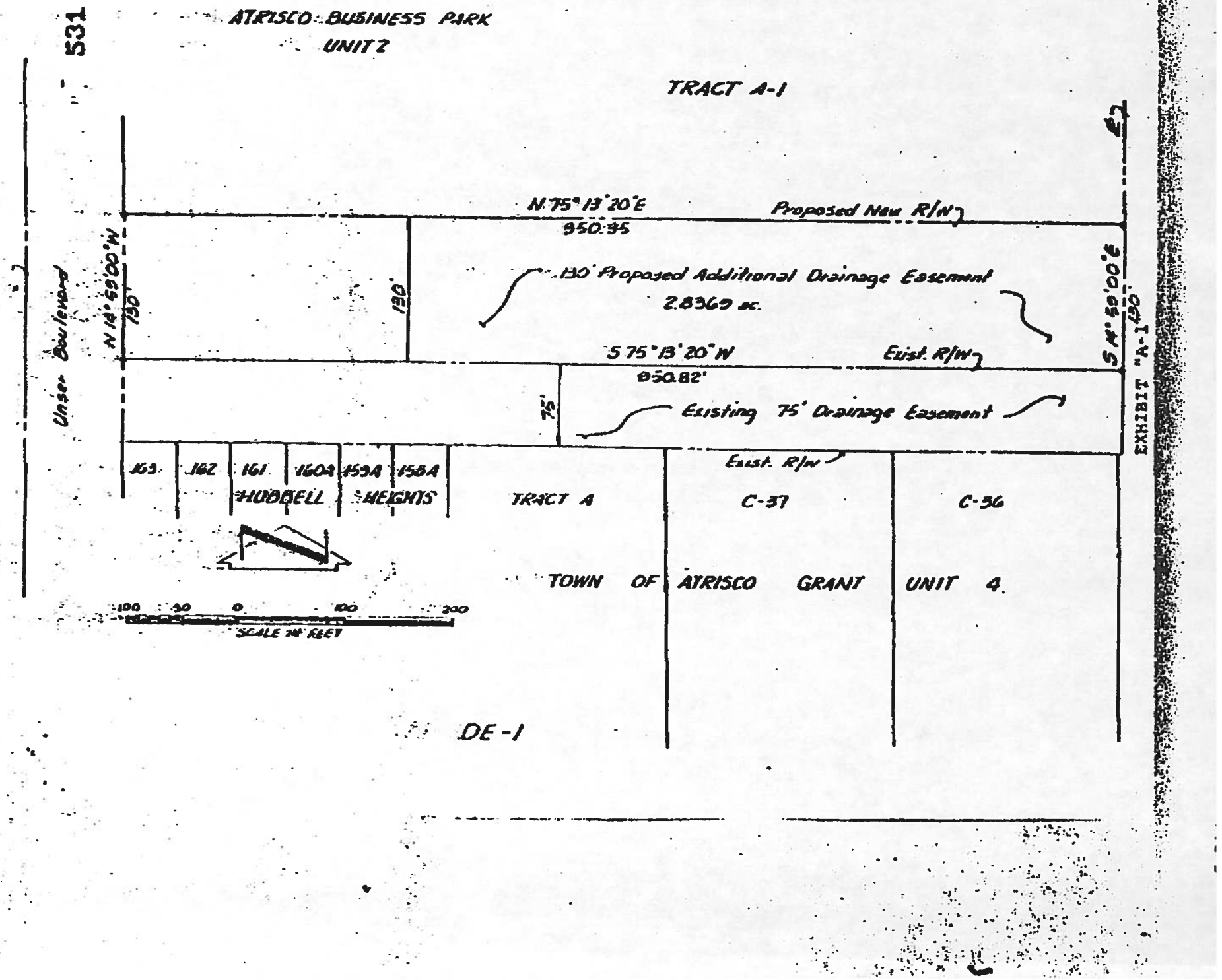
Thence N 14° 48' 40" W along the west boundary of Parcel "A-1", also being the east right-of-way line of Unser Boulevard a distance of 130.00 feet.

Thence N 75° 13' 20" E along a line parallel with the south boundary of Parcel "A-1" a distance of 950.35 feet;

Thence S 14° 59' 00" E along the east boundary of Parcel "A-1" a distance of 130.00 feet to the POINT OF BEGINNING.

The above delineated property parcel of land contains 2.8369 acres, more or less. Said parcel is known as "additional easement required for the Unser Boulevard temporary retention pond."

EXHIBIT "A"


ATRISCO BUSINESS PARK
UNIT 2
531
TRACT A-1
N 75° 13' 20" E
950.35
Proposed New R/W
130' Proposed Additional Drainage Easement
2.8369 ac.
N 14° 59' 00" W
130'
130'
Unser Boulevard
S 75° 13' 20" W
950.82'
Exist. R/W
S 14° 59' 00" E
1320'
EXHIBIT "A-1"
75'
Existing 75' Drainage Easement
163
162
161
160A
153A
158A
HUBBELL HEIGHTS
TRACT A
Exist. R/W
C-37
C-36
TOWN OF ATRISCO GRANT UNIT 4
100 50 0 100 200
SCALE IN FEET
DE-1