

K12/D5

Atrisco Plaza
SHOPPING CENTER
3 Plans

DRAINAGE REPORT

8/12/05

ATRISCO PLAZA SHOPPING CENTER

The land parcel under consideration is located on Central Avenue West, bounded by Central, Atrisco Drive, N.W., and the M.R.G.C.D. Isleta Drain Eastment. Zoning atlas reference is K-12-Z.

The land is presently largely undeveloped and bare. The slope is flat, approximately 3' in 1000', and drainage was formerly into the Isleta Drain. By agreement the open ditch was replaced by storm sewer and use of the easement granted for parking, landscaping and utilities. Permission was given by M.R.G.C.D. to allow storm water flow into the new storm sewer.

At the request of Bruno Conegliano, City Hydrology Engineer, the grading plan was revised to restrict the flow into the Isleta Drain to a minimum.

The total land area, including the M.R.G.C.D. easement is 17.37 acres or 756,864 sq. ft. This area includes 68,632 sq. ft. of landscaping consisting of grassed areas with trees and shrubs. The retention volume required is:

Landscaped Area $V = 0.18 \times 68,632 \times .4 = 4,942 \text{ cu. ft.}$

Balance $V = 0.18 \times 688,232 = \frac{123,882 \text{ cu. ft.}}{128,824 \text{ cu. ft.}}$

This volume is for the 100 year storm, and no comprehensive values being available, it was decided to allow the accumulated storm water to dissipate over a 24 hour period. The ponding areas are lettered and the area inlets numbered. (See Grading Plan). The volume retention values are tabulated on the following page.

<u>POND</u>	<u>AREA S.F.</u>	<u>OVERFLOW ELEVATION</u>	<u>GRATE ELEVATION</u>	<u>VOLUME C.F.</u>
A	85,500	99.25	97.50	74,800
B	36,560	99.70	97.20	30,462
C	11,625	99.00	97.29	9,940
D	21,375	98.70	97.50	12,825
E	7,250	96.74	96.16	2,175

*Flow thru to Isleta drain 5,472 c.f. x 6 hours 32,832 C.F.

TOTAL VOLUME REQUIRED TO FILL PONDS 163,034 c.y.

All pipe runs for the storm sewer are to be corrugated metal pipe. Flow quantities are computed by the Manning formula with an "N" value = 0.021.

Flow quantities are as shown below:

<u>PIPE RUN</u>	<u>ACCUMULATED VOLUME C.F.</u>	<u>MAX. Q CFS</u>	<u>PIPE SIZE</u>	<u>GRADIENT</u>	<u>COMPUTED Q CFS</u>
MH #1 - MH #2	87,625	1.01	10"	0.30%	0.75
MH #2 - Inlet #1	87,625	1.01	10"	0.30%	0.75
Inlet #1 - Inlet #4	12,825	0.15	6"	0.22%	0.16

Drainage thru the area inlets is controlled by orifice plates, with 1-1/8" diameter drilled orifices, placed on the inlet structure. Design for the required perforations is as tabulated below:

<u>AREA INLET</u>	<u>VOLUME C.F.</u>	<u>RELEASE TIME</u>	<u>RELEASE RATE CFS</u>	<u>FLOW RATE PER ORIFICE CPS</u>	<u>PERFORATION</u>
1	74,800	24 Hrs.	0.87	0.019	46
2	30,462	24 Hrs.	0.35	0.019	18
3	9,940	24 Hrs.	0.12	0.019	6
4	12,825	24 Hrs.	0.15	0.019	8
5	2,175	24 Hrs.	0.03	0.019	2

*Flow rate through orifice to Isleta drain, 5,472 cu. ft. per hour.

DRAINAGE REPORT

ATRISCO PLAZA SHOPPING CENTER

The land parcel under consideration is located on Central Avenue West, bounded by Central, Atrisco Drive, N.W., and the M.R.G.C.D. Isleta Drain Easement. Zoning atlas reference is K-12-Z.

The land is presently largely undeveloped and bare. The slope is flat, approximately 3' in 1000', and drainage was formerly into the Isleta Drain. By agreement the open ditch was replaced by sotrm sewer and use of the easement granted for parking, landscaping and utilities. Permission was given by M.R.G.C.D. to allow storm water flow into the new storm sewer.

At the request of Mr. Bruno Conegliano, City Hydrology Engineer, the grading plan was revised to restrict the flow into the Isleta Drain to a minimum.

The total land area, including the M.R.G.C.D. easement is 17.37 acres or 756,864 sq. ft. This area is reduced by 68,632 sq. ft. of landscaping. The retention volume required is:

$$V = 0.18 \times 688,232 = 123,882 \text{ cu. ft.}$$

This volume is for the 100 year sotrm, and no comprehensive values being available, it was decided to allow the accumulated storm water to dissipate over a 24 hour period. The ponding areas are lettered and the area inlets numbered. (See Grading Plan). The volume retention values are tabulated below.

POND	AREA S.F.	OVERFLOW ELEVATION	GRATE ELEVATION	HEAD OVER GRATE	VOLUME C.F.
A	85,500	99.25	97.50	1.75	74,800
B	36,560	99.70	97.20	2.50	30,462
C	11,625	99.00	97.29	1.71	9,940
D	21,375	98.70	97.50	1.20	12,825
E	7,250	96.74	96.16	0.58	2,175
TOTAL VOLUME					130,202 C.F.

Total capacity 130,202 cu. ft. plus flow through of 5,472 cu. ft. per hour times duration of rainfall.

All pipe runs for the storm sewer are to be corrugated metal pipe. Flow quantities are computed by the Manning formula with an "N" value = 0.021. Flow quantities are as shown below:

PIPE RUN	ACCUMULATED VOLUME-C.F.	MAX. Q CFS	PIPE SIZE	GRADIENT	COMPUTED Q CFS
MH #1 - MH #2	87,625	1.01	10"	0.30%	0.75
MH #2 - Inlet #1	87,625	1.01	10"	0.30%	0.75
Inlet #1 - Inlet #4	12,825	0.15	6"	0.22%	0.16

Drainage thru the area inlets is controlled by orifice plates, with 1-1/8" diameter drilled orifices, placed on the inlet structure. Design for the required perforations is as tabulated below:

	AREA INLET	VOLUME C.F.	RELEASE TIME	RELEASE RATE CFS	FLOW RATE PER ORIFICE CFS	PERFORATION
A	1	74,800	24 Hrs.	0.87	0.019	46
B	2	30,462	24 Hrs.	0.35	0.019	18
C	3	9,940	24 Hrs.	0.12	0.019	6
D	4	12,825	24 Hrs.	0.15	0.019	8
E	5	2,175	24 Hrs.	0.03	0.019	2
				1.52		

Flow rate into Isleta drain 5,472 cubic feet per hour.

ORIFICE CALCULATIONS

USE .61 (SEE KING'S HANDBOOK 4-6)

$$Q = C A \sqrt{2gh}$$

$$\text{AREA OF } 1\frac{1}{8}" \text{ DIA HOLE} = \pi \frac{D^2}{4} = \pi \frac{(1.125")^2}{4} = .994 \text{ INCHES SQUARED} = .0069 \text{ ft}^2$$

AREA INLET	HEAD	DISCHARGE 1 1/8" DIA HOLE	TOTAL # of HOLES
1	1.75	$Q = .61 (.0069 \text{ ft}^2) \sqrt{2g(1.75)} = .045 \text{ cfs}$	$\frac{.045 \text{ cfs}}{\text{HOLE}} \times 46 \text{ HOLES} = 2.1 \text{ cfs}$
2	2.50	$Q = .61 (.0069 \text{ ft}^2) \sqrt{2g(2.50)} = .053 \text{ cfs}$	$.053 \times 18 \text{ HOLES} = .96$
3	1.71	$Q = .61 (.0069) \sqrt{2g(1.71)} = .044$	$.044 \times 6 \text{ HOLES} = .26$
4	1.2	$Q = .61 (.0069) \sqrt{2g(1.2)} = .037$	$.037 \times 8 \text{ HOLES} = .30$
5	.58	$Q = .61 (.0069) \sqrt{2g(.58)} = .026$	$.026 \times 2 \text{ HOLES} = .05$
			<u>3.67</u> cfs

DRAINAGE REPORT

ATRISCO PLAZA SHOPPING CENTER

The land parcel under consideration is located on Central Avenue West, bounded by Central, Atrisco Drive, N.W., and the M.R.G.C.D. Isleta Drain Easement. Zoning atlas reference is K-12-Z.

The land is presently largely undeveloped and bare. The slope is flat, approximately 3' in 1000', and drainage was formerly into the Isleta Drain. By agreement the open ditch was replaced by storm sewer and use of the easement granted for parking, landscaping and utilities. Permission was given by MRGCD to allow storm water flow into the new storm sewer.

At the request of Mr. Bruno Conegliano, City Hydrology Engineer, the grading plan was revised to restrict the flow into the Isleta Drain to a minimum.

The total land area, including the M.R.G.C.D. easement is 18.18 acres or 791,921 sq. ft. The retention volume required is:

$$V = 0.18 \times 791,921 = 142,546 \text{ cu. ft.}$$

This volume is for the 100 year storm, and no comprehensive values being available, it was decided to allow the accumulated storm water to dissipate over a 24 hour period. The ponding areas are lettered and the area inlets numbered. (See Grading Plan). The volume retention values are tabulated below.

POND	AREA S.F.	OVERFLOW ELEVATION	GRATE ELEVATION	VOLUME C.F.
A	85,500	99.25	97.50	74,800
B	41,125	99.58	97.42	44,415
C	11,625	99.00	97.29	9,940
D	21,375	98.70	97.50	12,825
E	7,250	96.74	96.16	2,175

TOTAL VOLUME

144,155 C.F.

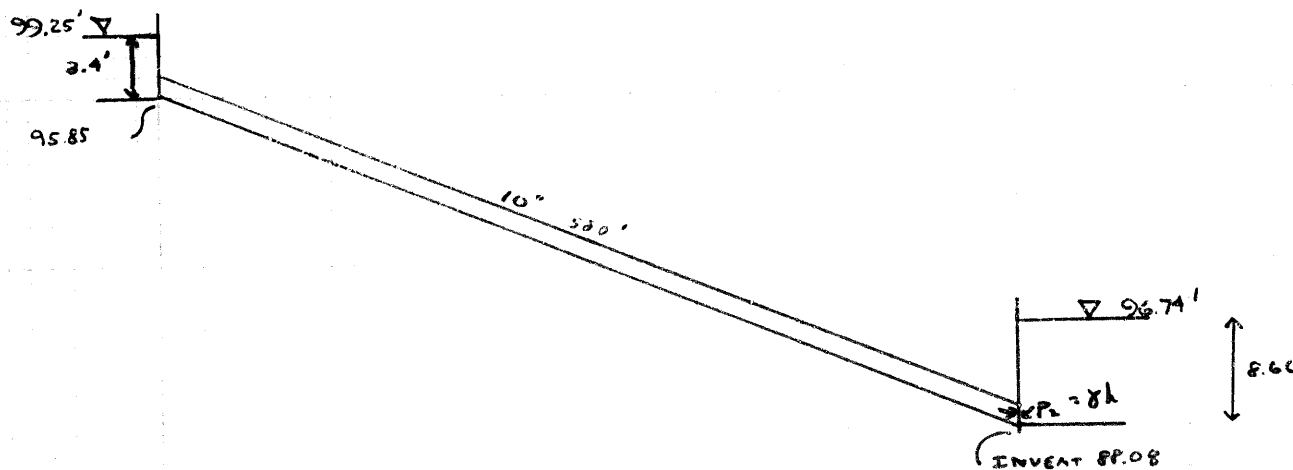
All pipe runs for the storm sewer are to be corrugated metal pipe. Flow quantities are computed by the Manning formula with an "N" value = 0.021.

Flow quantities are as shown below:

<u>PIPE RUN</u>	<u>ACCUMULATED VOLUME-C.F.</u>	<u>MAX. Q CFS</u>	<u>PIPE SIZE</u>	<u>GRADIENT</u>	<u>COMPUTED Q CFS</u>
MH #1 - MH #2	87,625	1.01	10"	0.30%	0.75
MH #2 - Inlet #1	87,625	1.01	10"	0.30%	0.75
Inlet #1 - Inlet #4	12,825	0.15	6"	0.22%	0.16

Drainage thru the area inlets is controlled by orifice plates, with 1-1/8" diameter drilled orifices, placed on the inlet structure. Design for the required perforations is as tabulated below:

<u>AREA INLET</u>	<u>VOLUME C.F.</u>	<u>RELEASE TIME</u>	<u>RELEASE RATE CFS</u>	<u>FLOW RATE PER ORIFICE CFS</u>	<u>PERFORATION</u>
1	74,800	24 Hrs.	0.87	0.019	46
2	44,415	24 Hrs.	0.51	0.019	27
3	9,940	24 Hrs.	0.12	0.019	6
4	12,825	24 Hrs.	0.15	0.019	8
5	2,175	24 Hrs.	0.03	0.019	2



USING ENERGY EQ

ASSUME NO HEAD LOSS

$$\frac{P_1}{\gamma} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + H_L + Z_2$$

$$Z_1 = \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + Z_2$$

$$\sqrt{(Z_1 - Z_2 - \frac{P_2}{\gamma}) 2g} = V$$

$$\sqrt{(99.25 - 88.08 - 8.66) 2g} =$$

$$12.7 = V$$

$$Q = VA$$

$$\text{Area of 10" DIA PIPE} = \pi \left(\frac{10 \frac{\text{in}}{12}}{4} \right)^2 = .55 \text{ ft}^2$$

$$\therefore Q = 12.7 \text{ fps} \times .55 \text{ ft}^2 = 6.9 \text{ cfs}$$

POND D

$$\begin{array}{rcl} \text{OVERFLOW} & 98.70 & \\ \text{INVERT} & \underline{96.35} & \\ & 2.35' & \end{array}$$

ORFICE CALCULATION

$$C = .61$$

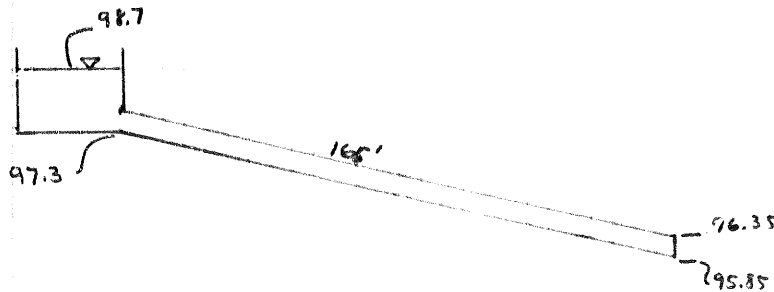
$$\text{DIA / OPENING} = 1\frac{1}{8}" = 1.13" = .094 \text{ ft}$$

$$\text{TOTAL AREA OF OPENING} = \left(\frac{.094}{4}\right)^2 \pi \times 8 \text{ OPENINGS} = .056 \text{ ft}^2$$

$$Q = .61 (.056) \sqrt{2g (2.35)} = .42 \text{ cfs}$$

PIPE CALCULATIONS BY BERNOULLI (ASSUME A FREE OUTFALL)

$$\frac{P_1}{\gamma} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + Z_2 + h_L$$



$$\sqrt{(Z_1 - Z_2) 2g} = V$$

$$\sqrt{(98.7 - 96.35)(2)(32.2)} = V$$

$$1.23 = V$$

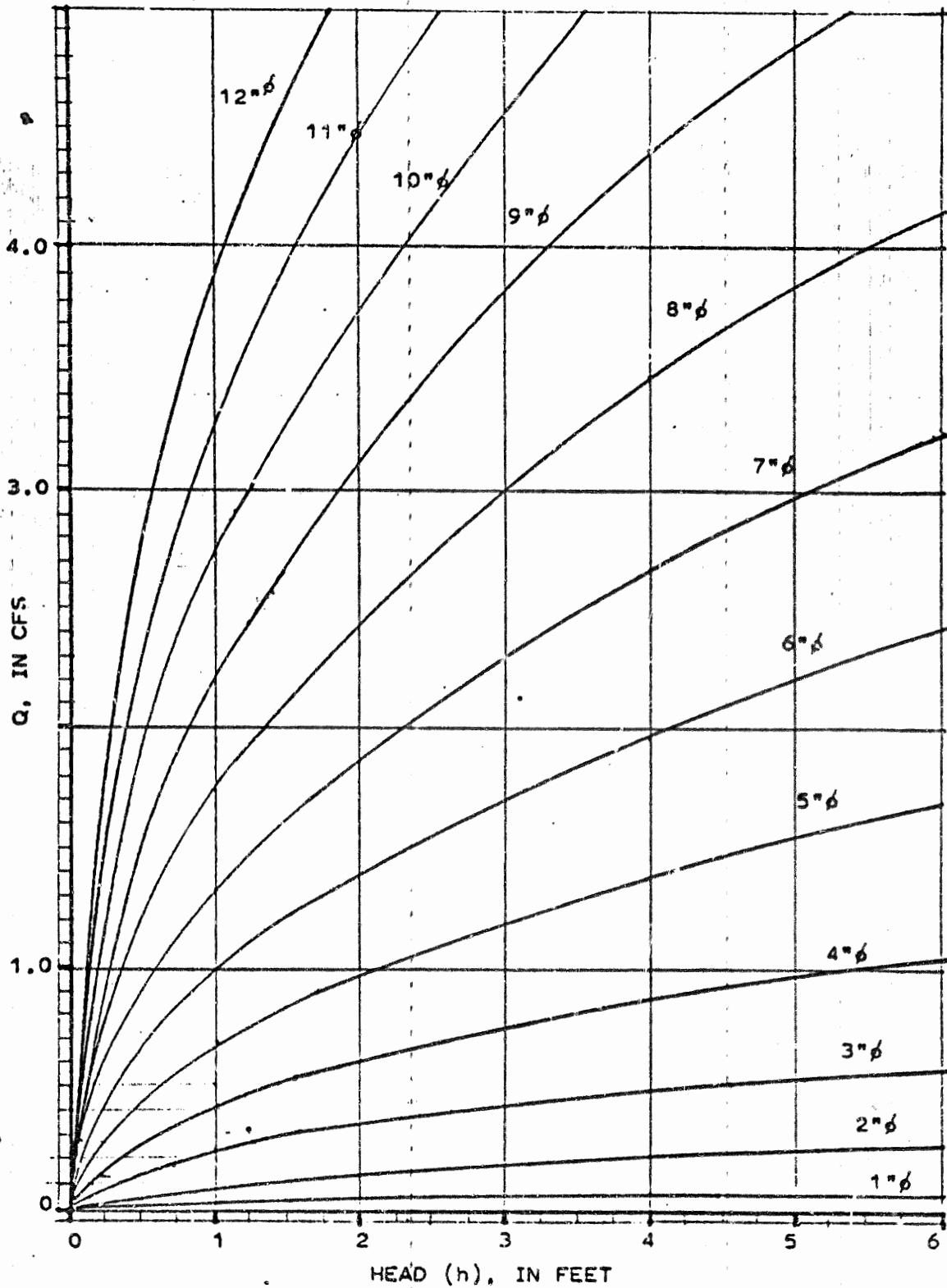
$$\frac{(1.23)^2}{2g} = \frac{V^2}{2g}$$

$$2.35' = \frac{V^2}{2g}$$

$$Q = VA$$

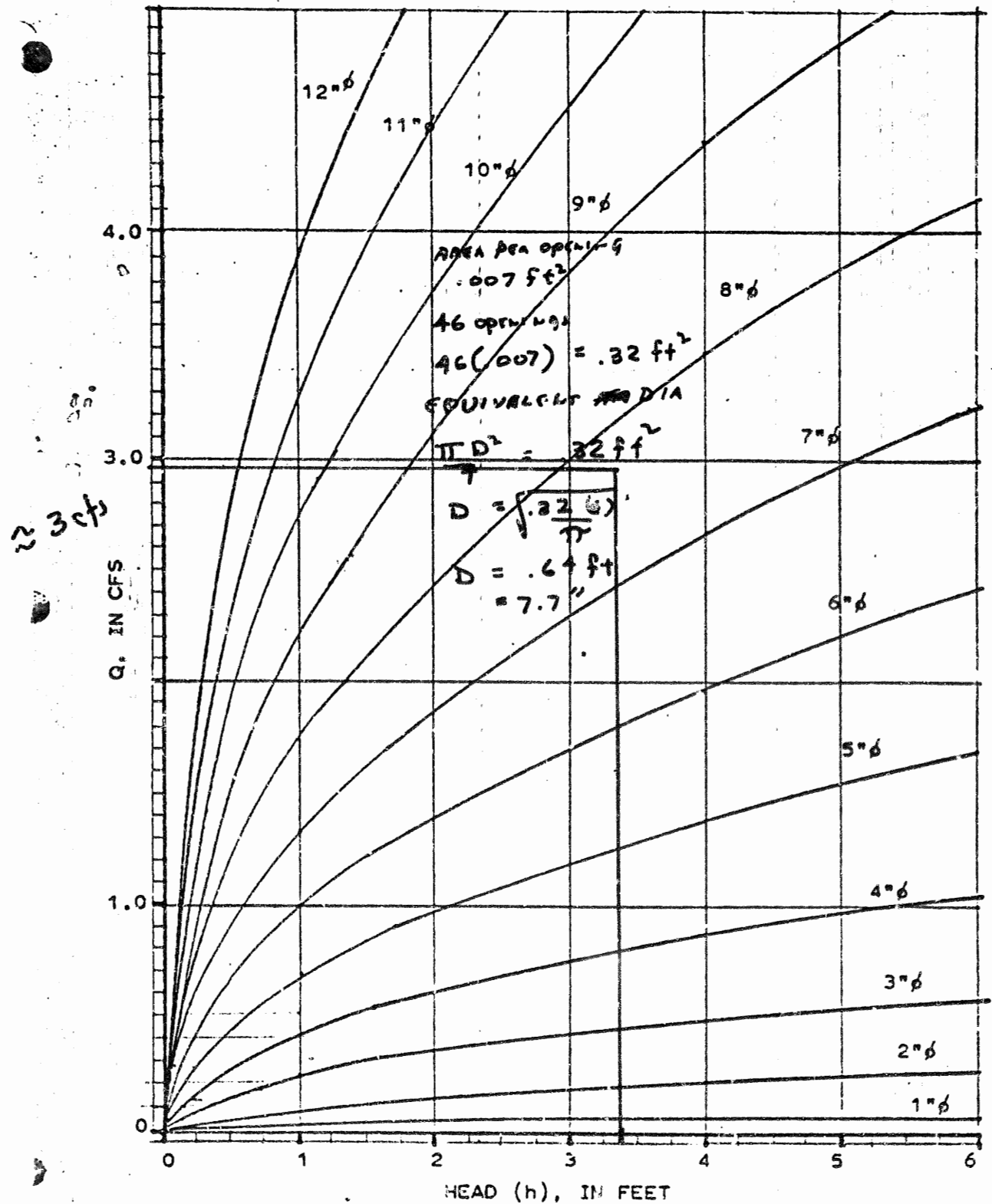
$$= (1.23) \pi \left(\frac{.5}{4}\right)^2 = .24 \text{ cfs}$$

DISCHARGE PIPE SIZES

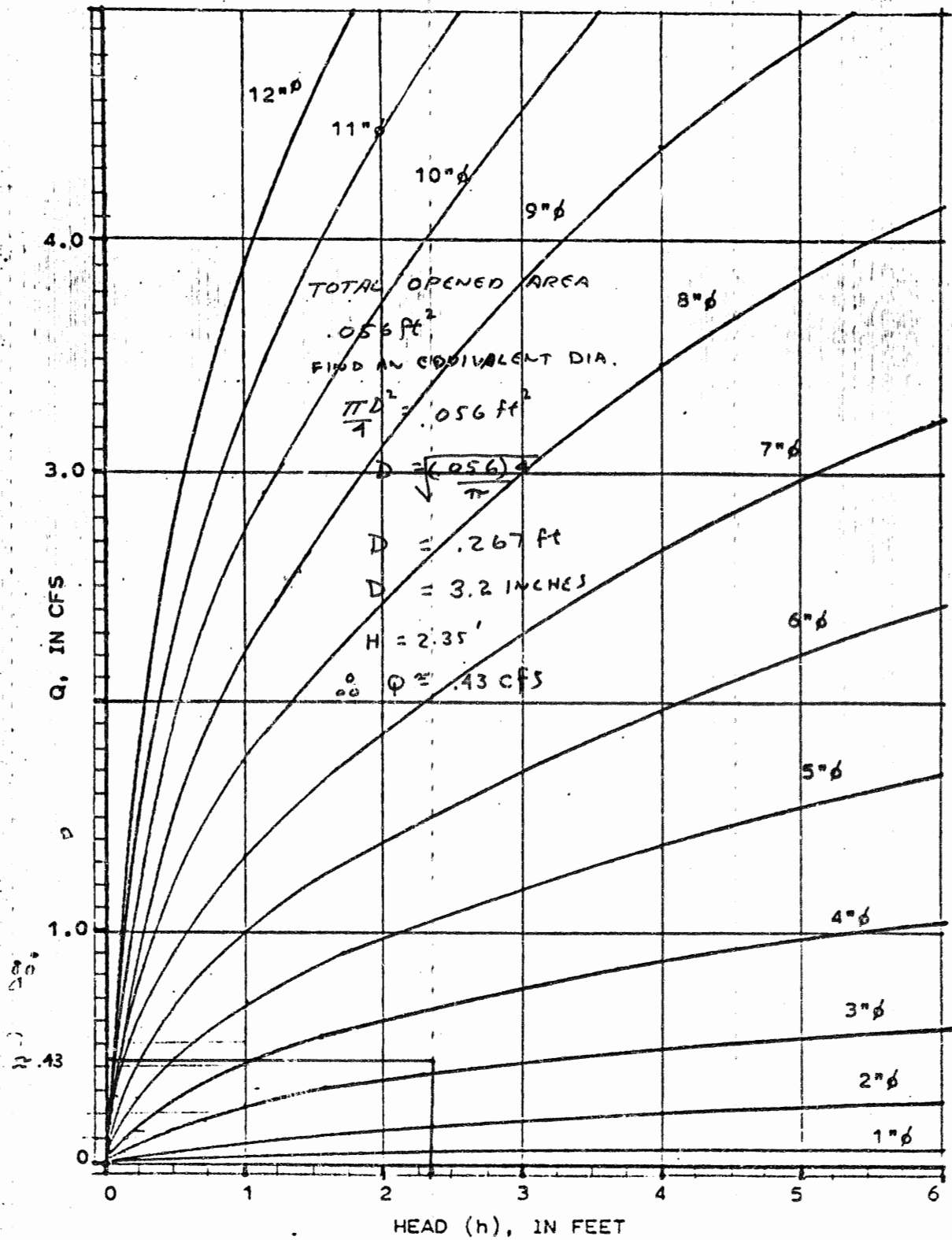


$$\text{AREA REQ'D} = 0.2 \times Q \times 1/\sqrt{h}$$

DISCHARGE PIPE SIZES



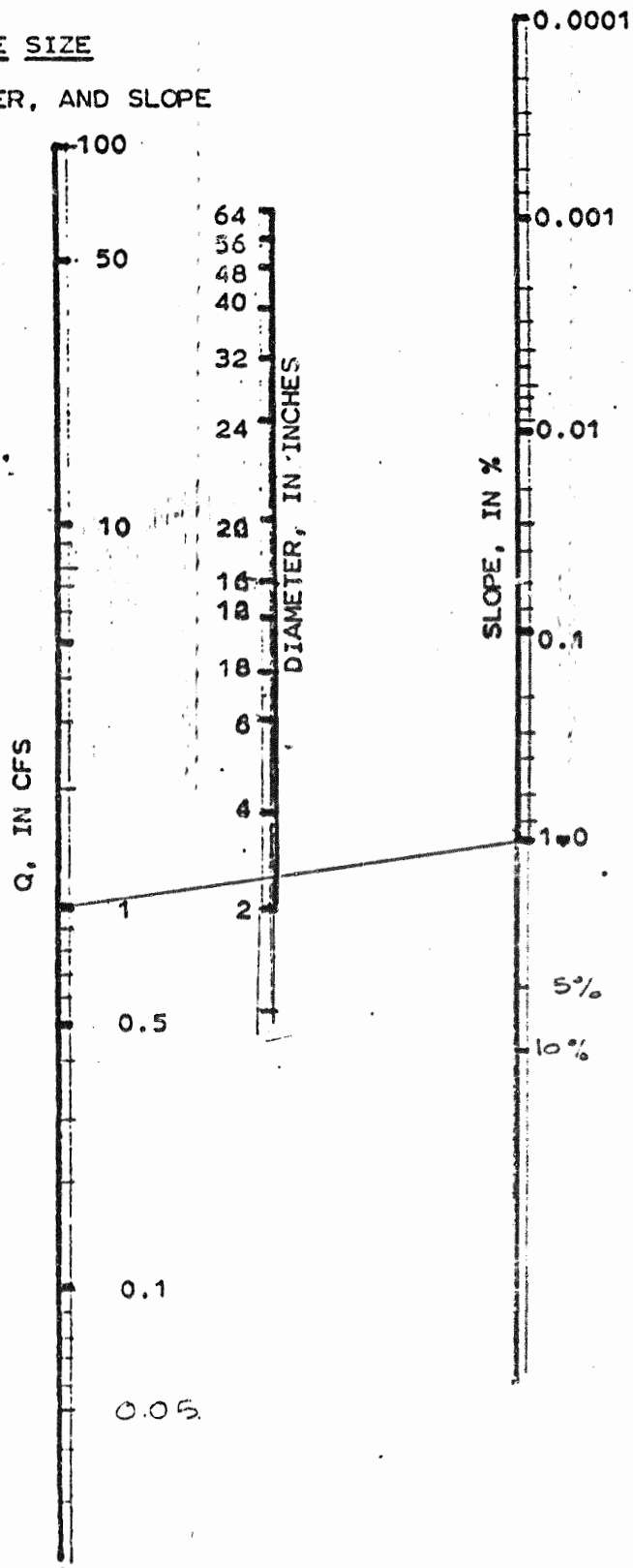
DISCHARGE PIPE SIZES



$$\text{AREA REQ'D} = 0.2 \times Q \times 1/\sqrt{h}$$

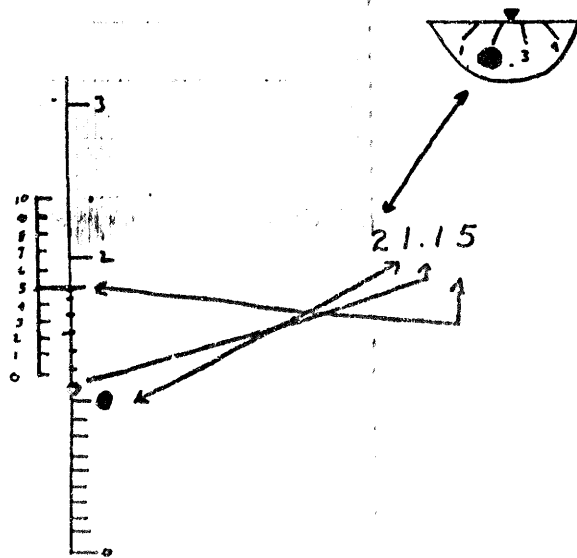
DRAINAGE PIPE SIZE

BY Q, DIAMETER, AND SLOPE



G-11

J-14



READING IN DIRECT SQUARE INCHES FROM PLANIMETER

21.15 SQ INCHES

TO FIND ACTUAL SQUARE FEET

ASSUME $1" = 200 \text{ ft}$

$$\therefore 1 \text{ in}^2 = 40,000 \text{ ft}^2 \quad [(200 \text{ ft} \times 200 \text{ ft}) = 40,000 \text{ ft}^2]$$

MULTIPLY READING IN SQUARE INCHES TIMES THE SCALE SQUARED

$$21.15 \text{ sq-inches} (40,000 \text{ ft}^2) = 846,000 \text{ ft}^2$$