HYDROLOGY G10/D4 ONE PLAN

G10-D4

1 PLAN

RICHARD E. LEONARD
EXECUTIVE ENGINEER

S. H. SWINBURNE, CHAIRMAN
WILLIAM V. HEREFORD, VICE-CHAIRMAN
FRANCES McCOY, SECRETARY-TREASURER
VERNON DOAK, DIRECTOR
ELESTON LAWS, DIRECTOR

Albuquerque Metropolitan Arroyo Flood Control Authority
3600 PROSPECT AVE. N.E.
P. O. BOX 25651 - ALBUQUERQUE, N. M. 87125
TELEPHONE 344-3816

RECEIVED
DEC 21 1979
CITY ENGINEER

September 27, 1979

C.C.I.C., Inc.
3500 Indian School Road, NE
Albuquerque, NM 87106
Attn: Fred C. Arfman

Re: Flamingo Heights Subdivision

Dear Sir:

We have reviewed the flood flows at the various drop inlets shown in your report and find them to be in accordance with those previously approved on August 22, 1978.

We have no objections to that portion of the drainage report.

In connection with this project, I had spoken to you previously regarding the cleanup of the drop inlets at Sta. 268+09 and Sta. 275+50 and the pipes which enter the Rinconada Channel at Sta. 105+66. Reference your letter of August 10, 1978. This work has not been done as of this date. Please have your contractor do this work immediately.

Sincerely,

Dan Sabo

Dan Sabo
Engineer

Isaacson & Arfman, P.A.

Consulting Engineering Associates

G10 D4

RECEIVED DEC 02 1983 ENGINEERING

Letter of Transmittal

To CITY HYDROLOGY
2ND & CENTRAL

Date 12-2-83

Job No. 1804

Attn: JOHN ARMSTRONG

Reference FLAMINGO HEIGHTS S/D

Gentlemen:

We transmit to you 2 copy(ies) of the following

- [ ] _____ Plats
- [ ] _____ Plans
- [ ] Specifications
- [ ] _____ Report
- [ ] Shop Drawings
- [ ] Submittals
- [ ] Material Specifications
- [ ] Copy of Letter
- [x] REVISED DRAINAGE EXHIBIT & GRADING PLAN
- [ ] _____

This information is transmitted:

- [x] As per your request
- [ ] For your review & approval
- [ ] For your information
- [ ] For your attention
- [x] For your signature
- [ ] _____
- [x] FOR SIGN OFF OF CONST. PLANS
- [x] For your files
- [ ] For your use
- [ ] Please review & return
- [ ] For return to your files
- [ ] Please advise

Remarks: _____

By: FRED C. ARFMAN

Copies To JOB FILE
CC: CODA ROBERSON

128 Monroe, NE • Albuquerque, NM 87108 • (505) 268-8828

Isaacson & Arfman, P.A.

Consulting Engineering Associates

Letter of Transmittal

To CITY HYDROLOGY

Date 2-16-84

Job No. ?

CITY NO. 1804

Attn: JOHN ARMSTRONG

Reference FLAMINGO HEIGHTS S/D ~~G11-D~~ ORG10-D4

Gentlemen:

We transmit to you 1 copy(ies) of the following

- [ ] _____ Plats
- [ ] _____ Plans
- [ ] Specifications
- [ ] _____ Report
- [x] DRAINAGE SUPPORT DATA & DETAILS
- [ ] _____
- [ ] Shop Drawings
- [ ] Submittals
- [ ] Material Specifications
- [ ] Copy of Letter

This information is transmitted:

- [ ] As per your request
- [x] For your review & approval
- [ ] For your information
- [ ] For your attention
- [ ] For your signature
- [ ] _____
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- [ ] For return to your files
- [x] Please advise

RECEIVED FEB 17 1984 HYDROLOGY SECTION

Remarks: WE REQUEST TO SUBSTITUTE SINGLE 'D' CATCH BASINS FOR THE ORIGINALLY DESIGN SINGLE 'C' CBC'S DUE TO A CHANGE IN PUBLIC CURBS, FROM STANDARD TO MOUNTABLE ROLL-TYPE.

By: FRED C. ARFMAN

Copies To JOB FILE

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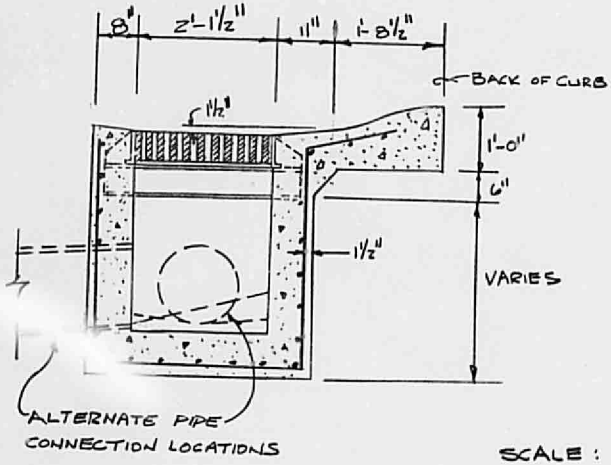
SINGLE OR DOUBLE "D" CATCH BASINS

RECEIVED
FEB 17 1984
HYDROLOGY SECTION



SCALE : 1" = 2'-0"

MODIFIED WALL OF SECTION B-B OF STANDARD DWG. K-6-2

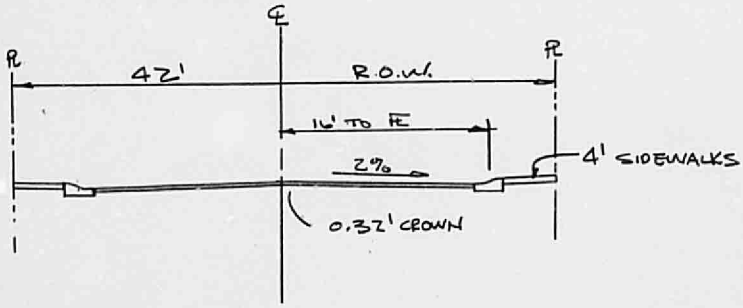
NOTES.

1. PROVIDE 3 FEET CURB AND GUTTER TRANSITION ON EACH SIDE OF CATCH BASIN
2. 15" CONDUIT MAY ENTER EITHER SIDE OR FRONT OF CATCH BASIN DEPENDING ON PROXIMITY.

Isaacson & Arfman, P.A.
Consulting Engineering Associates

SUBJECT FLAMINGO HEIGHTS S/D JOB NO. ___
BY FCA DATE 2/84 SHEET NO. 1 OF 3

TYPICAL STREET SECTION



STREET DATA:

SLOPE = 0.4%
CURB TYPE: MOUNTABLE ROLL-TYPE
MAX. DEPTH: USE 0.45'

FROM PLATE 22.3 D-1
THE ONE-HALF STREET FLOW = 3.1 CFS

MAX. AREA CONTRIBUTING TO ONE-HALF STREET FLOWS
= 110' x 330' = 36,300 S.F. = 0.833 AC.

SOLVE FOR CONTRIBUTING Q:
'C' = 0.62 (FROM DRAINAGE PLAN)
Q = CIA (0.62)(4.73)(0.833)
= 2.44 CFS

NOTE: BY COMPARING 3.1 > 2.44, THE STREET HAS SUFFICIENT FLOW CARRYING CAPACITY.

RECEIVED
FEB 17 1984
HYDROLOGY SECTION

CATCH BASIN ANALYSIS

CB-1; NORTH MOST BASIN
LARGEST CONTRIBUTING BASIN (110' x 530') = 58,300 S.F.
= 1.34 AC.

'C' = 0.62
I = 4.73 } FROM S/D DRAINAGE PLAN

Q_{100} = (0.62)(4.73)(1.34)
= 3.92 CFS

CB-2; SOUTHWEST DRAINAGE BASIN (85' x 330') = 28,050 S.F.
= 0.64 AC

Q_{100} = (0.62)(4.73)(0.64)
= 1.89 CFS

CB-3; SOUTHEAST CONTRIBUTING BASIN (85' x 200') = 17,000 S.F
= 0.39 AC

Q_{100} = (0.62)(4.73)(0.39)
= 1.14 CFS

FEB 17 1984
HYDROLOGY SECTION

ANALYZE A SINGLE 'D' BASIN

DATA: DEPTH OF FLOW ABOVE BASIN = 0.45 (ABOVE FL)
0.13 (SUMP)
0.58 FT.

FROM PLATE 22.3, D-S
FOR S = 0.004
D = 4.3 (DUE TO EXTRA 1" SUMP
THEN Q = 3.5 CFS

ACTUAL CONDITIONS
1. IN LOW POINT OF V.C.
2. +0.2 @ PL.
∴ TOTAL DEPTH = 1½" + 4" + ~2" = 7½" = 6.25'

THEN FROM PLATE 22.3, D-S
Q = ~7 CFS

THEREFORE: A SINGLE 'D' CATCH BASIN MAY BE USED AS AN ALTERNATE TO ALL THREE OF THE ORIGINALLY DESIGN TYPE 'C' BASINS.

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 15, 1984

Mr. Fred C. Arfman, P.E.
Isaacson & Arfman, P.A.
128 Monroe NE
Albuquerque, New Mexico 87108

RE: FLAMINGO HEIGHTS DRAINAGE PLAN (G10-D4)

Dear Fred:

The request to change the three catch basins from "C" to "D", in order to accomodate roll curb, is hereby approved.

In future submittals please refer to the drainage file number if one exists.

If you should have any questions, please feel free to contact me.

Thank you,

John Armstrong, P.E.
Civil Engineer Hydrology

JA/ca

DRAINAGE STUDY

FOR

FLAMINGO HEIGHTS

SUBDIVISION

Prepared By:

CHAMBERS, CAMPBELL, ISAACSON, CHAPLIN, INC.
3500 Indian School Road N.E.
Albuquerque, New Mexico

August 1979

INTRODUCTION

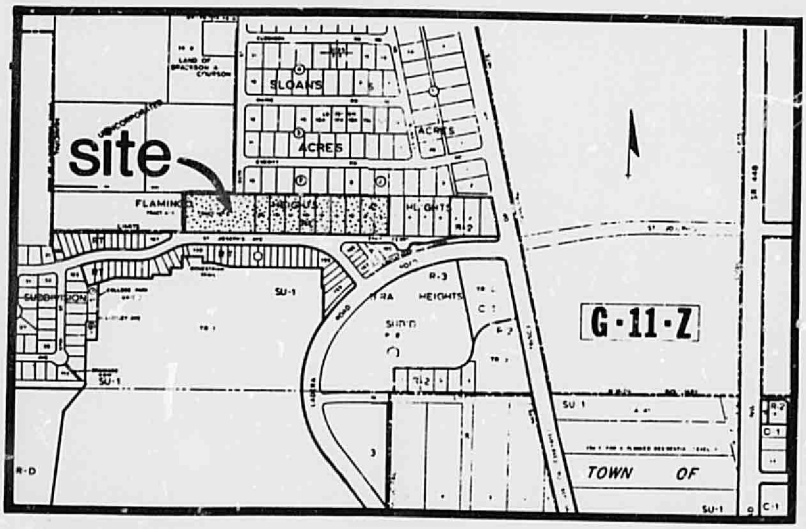
At the request of Don Zachary, owner of the Flamingo Heights Subdivision, CCIC has investigated the storm drainage characteristics for the site. This investigation addresses itself to the subject property in its undeveloped condition and analyses the internal flows in its developed state with recommendations for compliance to the City of Albuquerque and AMAFCA requirements and the area's characteristics.

Careful attention has been given to how the proposed storm water runoff will act in conjunction with the runoff from the surrounding areas.

SITE LOCATION AND TOPOGRAPHY

Flamingo Heights Subdivision is located on Albuquerque's west mesa. More precisely, this site is to the north of St. Joseph's Ave. and to the east of 65th Street. The site borders the 60 inch. drain for the Ladera Storm Water Detention Facility.

Ground topograph is typical of the area, very flat land with irregular contour patterns. The overall site consist of 7 acres that is covered with stage brush and native grasses. The soils, surface and subsurface are comprised of a very fine granular sand.



LOCATION MAP

DESIGN CRITERIA

Engineering Parameters: For calculation of composite coefficients of runoff, the following values of "C" were taken for the indicated land coverages:

(a)	Streets, driveways, roofs	0.90
(b)	landscaped areas	0.15
(c)	natural ground	0.25

In addition, all runoff volume calculations have been based on a 100 year-6 hour rainfall of 2.2" as per AMAFCA requirements. Rate of runoff calculations have been based on the frequency-intensity-duration relationship for a 100 year storm as presented by Gordon-Herkenhoff and Associate in their 1963 Master Plan of Drainage for the City of Albuquerque. This relationship is expressed by the following equation:

$$I = 189/(T_C + 25)$$

Flood Control Regulations: The drainage plan presented in this report has been designed to comply with the Memorandum of Agreement between the City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority, dated February 22, 1979. Referring to paragraph 5, of page 2 of the above mentioned memorandum, it states, "The Drainage Regulation permits discharge into a storm drainage facility, provide downstream capacity is adequate."

Based on the above regulation, it is our intent to force all street runoff into the existing 60 inch storm drain. Because of the short "time of concentration" of the developed flows in Flamingo Heights, the added runoff should be into and cleared out of the drainage system long before it has to carry its maximum flows from the detention area.

COMPUTATIONAL PROCEDURES

Hydrological flow rate calculations are based on the rational runoff method. Time of concentrations were calculated using the Overland Time of Travel for undeveloped areas and open channel velocities for street flows. Estimates were made in percents of areas covered by each coverage type described in the above section for each drainage sub-area.

Volume calculation for sizing individual backyard ponds shall be based on a percentage of area to be ponded for each lot. In determining the net volumes of discharge for the entire site in both natural and developed states were performed by multiplication of the applicable "C" factor times the 100 year-6 hour rainfall (0.217) times the appropriate area to obtain cubic feet of water.

OFFSITE DRAINAGE

Flamingo Heights lies between two natural retention areas. To the south is the Ladera Detention Facility/Golf Course. This basin can now be classified as a detention area because of the 60" drain that provides relief for the storm runoff that is contained within the facilities' boundaries. This 60" drain shall be a major factor in the development of this site's drainage solution.

To the north is Sloan's Acres and a minor natural retention area. To the east is a developed residential lot and to the west is 65th Street. None of the area's offsite flows enter onto the site and no provisions will be made to accept any.

ONSITE DRAINAGE

Exhibit I delineates the internal patterns of drainage of the site. Even though it is understood that onsite ponding is not a requirement to meet with AMAFCA regulations, it is still desirable on certain lots to backyard pond in order to have a more workable and realistic grading plan.

Storm water runoff will leave the site at two distinct locations; southward at 63rd and 61st Streets. Flow patterns and discharge value are found on Exhibit I.

Developed Drainage Conditions: Grading for this site shall be done in such a way as to meet the following conditions:

1. Lots shall be graded to provide backyard ponding where indicated (Exhibit I).
2. All pads shall conform to the natural topography as much as possible.
3. Grade western most lots such that 65th Street will deflect all sheet flows.

RECOMMENDATIONS

1. No individual street is required to handle a large flow rate, but the minimum grade as per City Standards should be 0.5%. For a 32' FF street, 4" curb, 4" crown and no overflow, the maximum capacity is equal to 11 cfs at the top of curbs. See Appendix for street carrying capacity computations.

2. Rear yard ponding will require a minimum of 16% of the area drained to the pond. This will allow a maximum depth of 0.5'. The limits of the pond waters should be kept a minimum distance of 5' away from any walls and 15' away from any house foundations. These general recommendations are only intended to call the developer's attention to potential settlement problems in the area. A qualified soils engineer should prepare specific guidelines for ponding water around structures.

3. Where flows from the western section leave the site at 63rd Street; they shall empty into the existing double drop inlet in St. Joseph's Avenue. This area shall contribute 6 cfs of storm runoff. See Appendix for support calculations for this drop inlet.

4. The developed flows from the eastern section shall be controlled by two combination inlets at the intersection of 61st Street and Zachary Place. This storm drain system is necessary since the amount of earthmoving to create surface runoff is uneconomical and undesirable. The storm water runoff is then emptied into the 60" dia. storm drain that runs adjacent to the subdivisions southern boundary. This storm drain collection system is capable of handling all developed runoff, therefore rear yard ponding is not required. But rear yard pond may be desirable in some cases to avoid potential grading problems.

5. Lots located east of 63rd Street and south of Zachary Place, may have their rear yards sheet flows exist onto St. Joseph's Court. There exists a double drop inlet capable of accepting 21 cfs of flow.

CONCLUSION

All runoff from this site shall enter into the AMAFCA 6" storm drain which empties the Ladera Detention Facility. Since this is the case, it was recommended that this study be submitted to the AMAFCA authorities for their approval of the drainage concept as well as to secure AMAFCA's permission to connect to and improve existing AMAFCA facilities.

APPENDIX

Composite "C" Calculations

Runoff Computations

Street Carrying Capacities

Inlet Capacities

- Combination
- Drop Inlets

Rear Yard Ponding

COMPOSITE "C" CALCULATIONS

Refer to Area A as an example:

Step #1: Determine Area subject to runoff = 1.55 acres

Step #2: Determine Hard Surface Area

(a) Streets and Walks (33' BB, 2-4' Sidewalks)

Length = 495'

Width = 41'

Area = (495)(41) = 20.295 $ft.^2$

(b) Driveway

Length = 20'

Width = 18'

Area = (20')(18') = 360 ft^2 x No. of Units

= 360 ft^2 x 19 = 6.840 ft^2

(c) Roofs - Typical Roof = 35' x 40'

Ponded Lots - 1/2 roof drains to street

(1) Area of Roof x No. of Units

(35') x (20') = 700 $ft.^2$ x 19 ponded lots

= 13300 $ft.^2$

(d) Total Hard Surface Area

a) 20,295 $ft.^2$

b) 6,840 $ft.^2$

c) 13,300 $ft.^2$

d) = 40,435 $ft.^2$ = 0.93 acres

Step #3: Determine unsurface area which drains to the street.

1.55 acres

- 0.93 acres

0.62 acres = Unsurfaced area

Step #4: Calculate composite "C"

$$0.90 \left(\frac{1.93}{1.55}\right) = 0.54$$

$$0.20 \left(\frac{0.62}{1.55}\right) = 0.08$$

0.62

The composite "C" value for the portion of area B whose flows enter onto the right-of-way; shall also be a 0.62.

RUNOFF COMPUTATIONS

PROJECT: FLAMINGO HGHTS DATE: 8-31-79

Drainage Area: A

Area = 1.55 Acres

c = 0.62

t_c = 10 min.

I = $\frac{189}{10+25}$ = $\frac{189}{35}$ = 5.4 in./hr.

D = 2.2 in.

Q = CIA = (0.62) (5.4) (1.55) = 5 cfs

Vol. = CDA = 1/12 (0.62) (2.2) (67,500) = 7,670 cu.ft.

Comments: Flows exit southward on 63RD St. on enter into 60" storm drain by means of double drop inlet.

Com. by FCA

Ck. by

CHAMBERS - CAMPBELL
ISAACSON - CHAPLIN, INC.
ARCHITECTS · ENGINEERS · PLANNERS

RUNOFF COMPUTATIONS

PROJECT: FLAMINGO HGHTS DATE: 8-31-79

Drainage Area: B

Area = 3.0 Acres

c = 0.62

t_c = 10 min.

I = $\frac{189}{10+25}$ = $\frac{189}{35}$ = 5.4 in./hr.

D = 2.2 in.

Q = CIA = (0.62) (5.4) (2.0) = 7 cfs

Vol. = CDA = 1/12 (0.62) (2.2) (130,680) = 14,850 cu.ft.

Comments: Flows exit site @ 61ST ST. by means of storm sewer system attached to 60" AMAFCA storm drain.

Com. by FCA.

Ck. by

CHAMBERS - CAMPBELL
ISAACSON - CHAPLIN, INC.
ARCHITECTS · ENGINEERS · PLANNERS

STREET CAPACITY

Street carrying capacities for 32' FF with standard 4" crown and with no overflow at a 0.5% slope are shown below.

Cross-sectional area = (16')(0.33')(0.5)(2) = 5.28 ft.^{2}

W.P. = 33 ft.

$Q = \frac{1.486}{n} \times \frac{d^{5/3}}{p^{2/3}} \times S^{1/2}$, where n = .015

$Q = \frac{1.486}{.015} \times \frac{(5.28)^{1.67}}{33^{0.67}} \times S^{1/2}$, where S = 0.5%

= 94.07 x 1.546 x 0.07

Q = 10.83 cfs. Use 11 cfs - o.k.

Velocity = Q/A = 11/5.28 = 2.1 ft./sec.

COMBINATION INLETS

Design Information:

Inlets will be located in a 4" sump and will be of single inlet design, capable of handling 10 cfs.

Solution:

Q = 10 cfs

Q/2 = 5 cfs (two inlets)

Cimbination Inlet in 4" depression and no overflow.

Curb open length = 3 feet

Curb open height = 6 inches

Grate clear opening = 3 sq.ft.

(1) Allowable ponding depth over grate = 4"(curb) + 4" (sump) = 8"

(2) Grate Capacity = 3 ft.^{2} x 3.8 = 11.4 cfs (figure).

(3) Curb opening capacity = 3'-0" x 0.75 cfs/ft. = 2.25 cfs.

(4) Total theoretical capacity of inlet = (11.4 + 2.25)

= 13.65 cfs

(5) Reduction factor = 0.65, 0.65 x 13.65 = 8.87 cfs

(6) Check 8.87 > 5.0 cfs -- o.k.

DROP INLETS

Design Information: Flow line elevation is 5108.26. Inlets are located in a sag (low point of the street's vertical curve), therefore a ponding depth of 8" is allowable within the limits of the 60' R.O.W.

Total opening = 14.5 sq. ft.

Clear open area = 10.9 sq. ft.

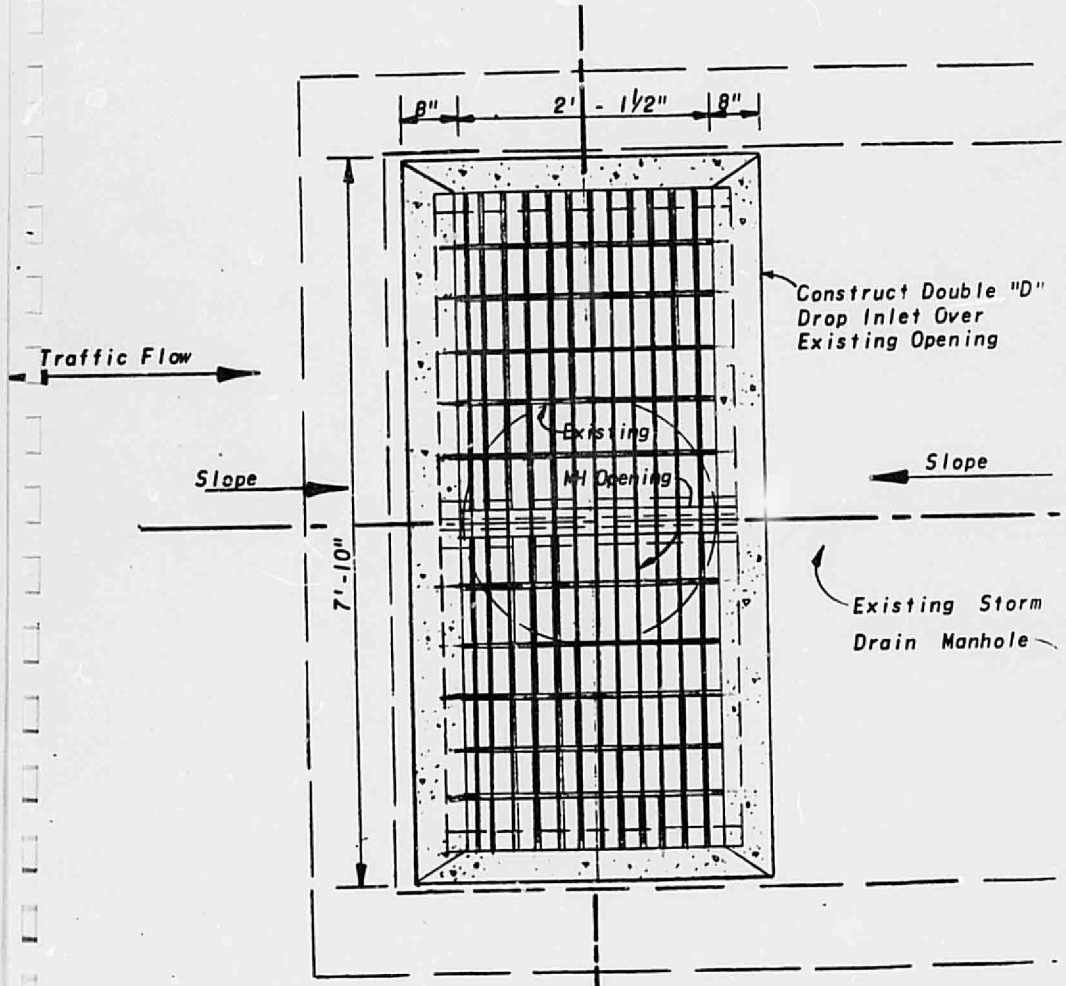
So

Grate Capacity equals 10.9 $ft.^2$ x 3.8 $cfs/ft.^2$ (capacity per square foot for 8 inch head from accompanying chart) - 10.9 $ft.^2$ x 3.8 $cfs/ft.^2$ = 41.4 cfs

From Table 2-1 (attached) (Reduction Factors to Apply to Inlets) a 50% reduction must be applied against the theoratical capacity.

Design Capacity:

41.4 x 0.50 = 20.7 cfs



PLAN

No Scale

CONVERSION OF EXISTING
MANHOLE TO DROP INLET
St. Joseph's Avenue
St. Joseph's Court

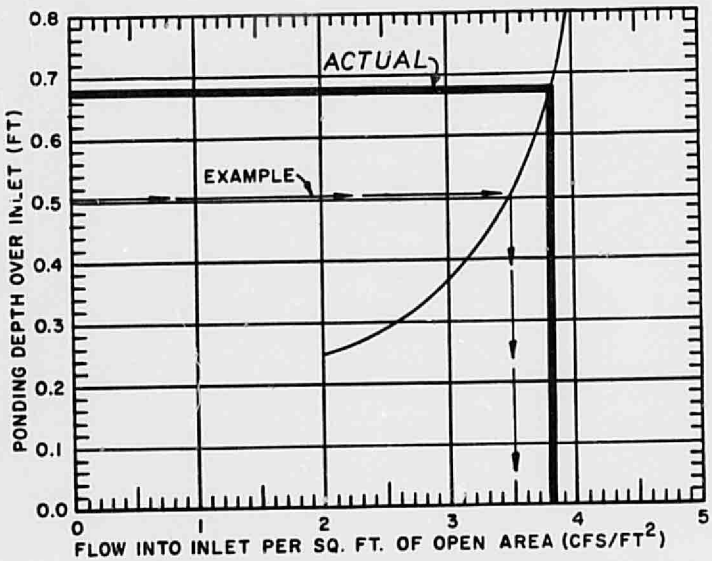


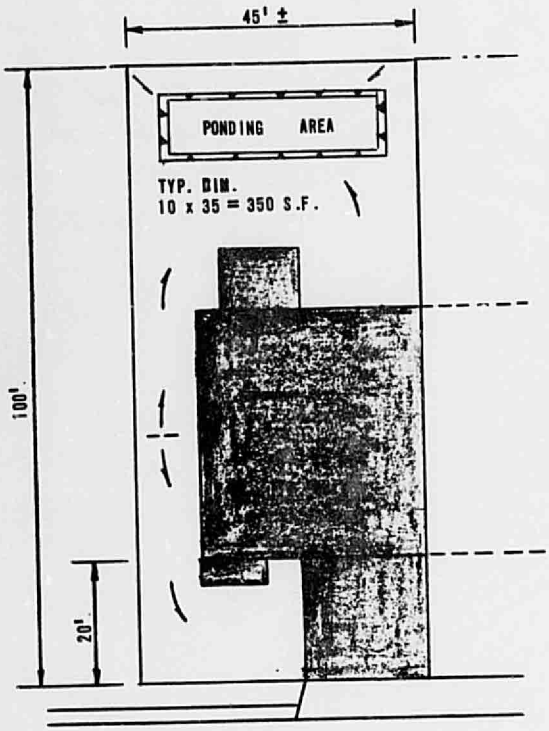
FIGURE 4-1. CAPACITY OF GRATED INLET IN SUMP

TABLE 2-1
REDUCTION FACTORS TO APPLY TO INLETS

Condition (1)	Inlet Type (2)	Percentage of Theoretical Capacity Allowed (3)
Sump	Curb Opening	80%
Sump	Grated	50%
Sump	Combination	65%
Continuous Grade	Curb Opening	80%
Continuous Grade	Deflector	75%
Continuous Grade	Longitudinal Bar Grated	60%
Continuous Grade	Transverse Bar Grate or Longitudinal Bar Grate incorporating transverse bars	50%
Continuous Grade	Combination	110% of that listed for type of grate utilized

REAR YARD POND CALCULATIONS

Typical Lot Size = 45 x 100



Area Drainage to Rear Yard
35'x45' = 2475 sq. ft.
Roof Area = 35'x20'
= 700 sq. ft.
Patio (typ) = $(10.0)^2$ = 100 sq.ft.

Composite "C"

$0.9\ (\frac{800}{2475}) = 0.29$

$0.2\ (\frac{800}{2475}) = \underline{0.14}$

0.43

Volume of Runoff

D = 2.2"

Vol = (Area)(2.2")(C)(1/12) =
= (2475)(2.2)(0.43)(1/12) =

195 cu. ft.

at 0.5' depth in the ponding Area, the Area required = 390 sq.ft

% of Area = $\frac{390}{2475}$ = 16%