HYDROLOGY F18/D16 NO PLANS

F 18- D 16

No Plans

ATRIUM ONE

November 25, 1970

City Engineering Department
City of Albuquerque
400 Marquette Ave. N.W.
Albuquerque, New Mexico

Re: Proposed Imperial House Apartments
6000 Topke Place N.E.

Gentlemen:

Enclosed are three prints of grading and drainage plan for subject project. Also enclosed is copy of drainage report prepared for this site by Wilson and Company, Engineers.

The drainage of Topke Place and the westerly extension thereof meet the requirements of the drainage report and the slopes exceed that of the existing easterly portion of Topke.

The drainage channel at the southerly boundry of the project is designed in accordance with requirements of your drawings ME 508, 3 sheets, obtained from Mr. Frank Bailey.

We will appreciate your review of our drawing and approval of the concept and finish grades.

Very truly yours,

ARTHUR W. DEKKER

AWD:dd

cc: F.H.A. Mr. Chester Kite
Imperial House Company

ENGINEER'S REPORT

ON

DRAINAGE AFFECTING IMPERIAL HOUSE APARTMENTS

6000 TOPEK PLACE NE, ALBUQUERQUE, NEW MEXICO

WILSON & COMPANY

ALBUQUERQUE, NEW MEXICO

18 NOVEMBER 1970

ENGINEER'S REPORT
ON
DRAINAGE AFFECTING IMPERIAL HOUSE APARTMENTS
6000 TOPEKA PLACE NE., ALBUQUERQUE, NEW MEXICO

PURPOSE: The purpose of this report is to analyze the amount of run-off entering the study area and the carrying capacities of the existing and proposed streets, ditches and structures. A 100-year design rainfall was used to determine the run-off.

CLIMATOLOGICAL INFORMATION: The City of Albuquerque has adopted a drainage master plan which gives the following formula for calculating the intensity of rainfall that is probable for a 100-year design storm:

$$i_{100} = \frac{189}{t_c + 25}$$

i_{100} = rainfall inches per hour

t_c = time of concentration in minutes

RUN-OFF CALCULATION: The Rational Method was used to calculate the run-off from the study area. The Rational formula is as follows:

$Q = CiA$

Q = Quantity of run-off in cubic feet per second

C = Coefficient of run-off expressed in a ratio of rainfall to run-off

i = Rainfall expressed in inches per hour

A = Drainage area expressed in acres

The value used for the coefficient C was 0.55.

DISCUSSION: Three distinct drainage areas enter or parallel the site of the proposed improvements.

Area A_1 has a drainage area of 94 acres. This drainage will be handled by an earth ditch along the south side of the property. The flow at the east line of the property is 228 cfs. The capacity of the proposed ditch is 617 cfs.

Area A_2 has a drainage area of 61 acres. This drainage enters the property on Tophs Place NE. The flow at this point is 158 cfs. The existing street is 40 feet wide, face of curb to face of curb, and has a crown of 6 inches. The capacity of the existing improvement is 142 cfs. The 100-year flow exceeds the capacity of the street, curb full. The surrounding property is built above the street, and the extra flow will not cause a serious flooding condition of the improvements. The proposed section for Tophs Place to be constructed on the site of the improvements is 40 feet wide, face of curb to face of curb, and will have an inverted crown of 4 inches. The capacity of the designed section is 455 cfs.

Area A_3 has a drainage area of 64 acres and enters the property at the northwest corner. The flow at this point is 158 cfs. This flow can either be discharged into the proposed improvement of Tophs Place NE or diverted to the west into the grassed waterway along the east boundary of the golf course.

The flow from area A_2 will be discharged into the grassed waterway along the east boundary of the golf course which is a graded swale with a dike along the west side of the swale which drains the water to the south boundary of the golf course at which point the flow discharges into the ditch

along the south boundary of the property. A toe wall should be constructed at the west end of Topke Place to prevent undercutting and erosion of the proposed street improvements.

The site will be graded with a ridge running east and west in the middle of the property. The north half will drain to the northwest and the south half will drain to the southwest.

The total drainage area at the point of discharge is 228 acres with a design discharge of 552 cfs. The capacity of the proposed ditch is 617 cfs.

The only point of flooding that might occur is on Topke Place NE as it enters the development site. This flooding is minor, and the proposed section of Topke Place is capable of taking care of this flooding condition.

All on-site parking lots should be constructed with an inverted crown with the low point in the center of the parking lot. The two parking areas on the west should drain to the west to the grassed waterway on the golf course. The northeast lot should drain east and then north to Topke Place. The center lot on the east should drain east and then south to the southeast parking lot. The southeast lot should drain west and then south to the proposed ditch. See attached site layout sketch for general drainage pattern.

CORP. RFS

OK.

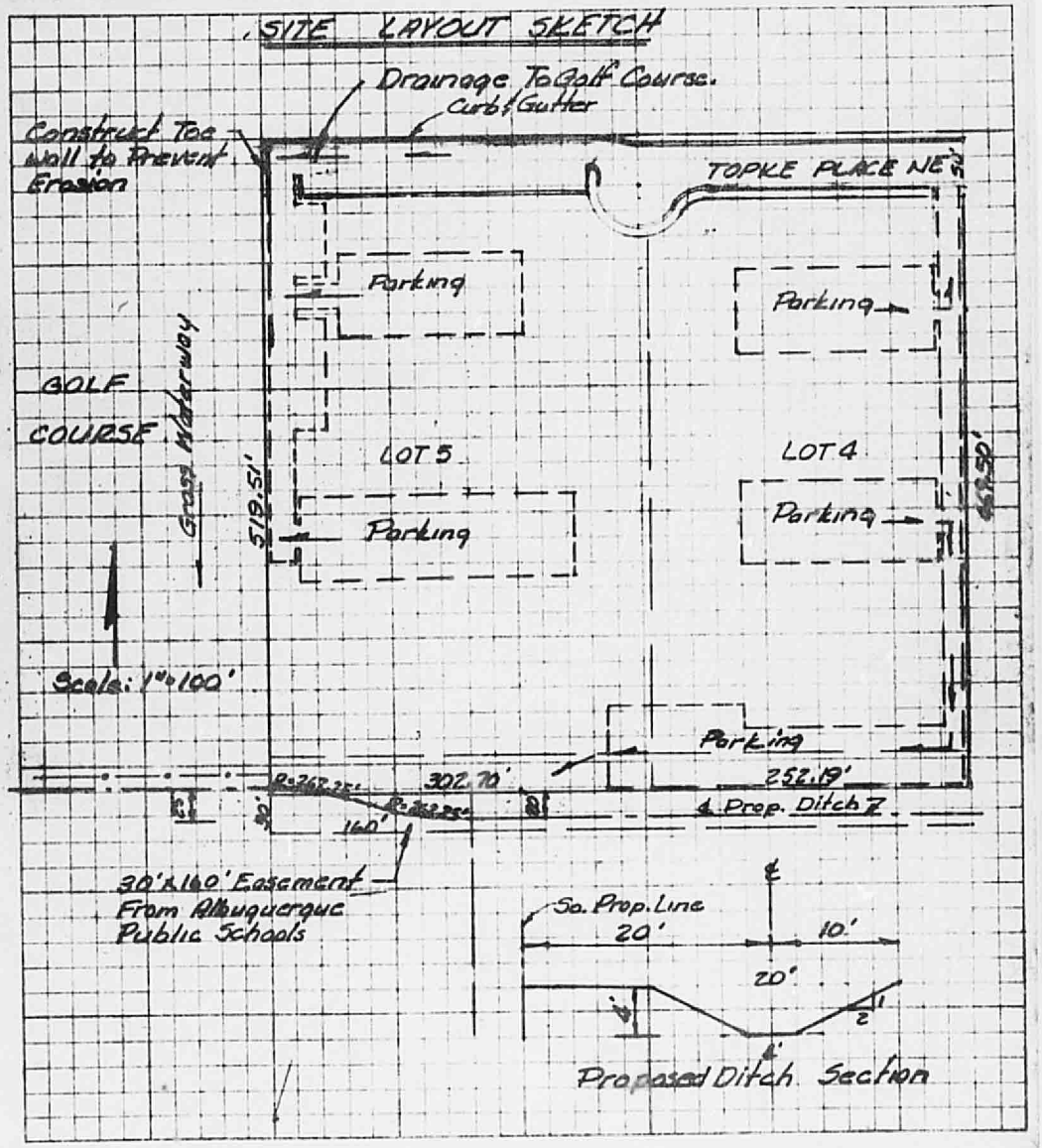
DATE 17 Nov 70

WILSON & COMPANY
ENGINEERS & ARCHITECTS
BOX 3308
ALBUQUERQUE
NEW MEXICO

LOC. Albuquerque FILE 70-531

PROJ. Imperial House SHEET 6

SUBJ. Drainage OF 6



FROM RFS

DATE 17 Nov 70

WILSON & COMPANY
ENGINEERS & ARCHITECTS
BOX 3306
ALBUQUERQUE
NEW MEXICO

LOC. Albuquerque FILE 70-531
PROJ. Imperial House SHEET 5
SUBJ. Drainage OF 6

Total Discharge Leaving Property

$A = A_1 + A_2 + A_3 + A_4$.

$A = 99 + 61 + 64 + 9 = 228 Ac$

$i = \frac{189}{10+25} = 4.4$

$C = 0.55$

$Q = CiA = .55 \times 4.4 \times 228 = 552$ cfs

Capacity Ditch = 617 cfs.

COORD. RFS

CK.

DATE 13 Nov 70

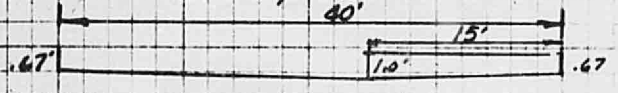
WILSON & COMPANY
ENGINEERS & ARCHITECTS
BOX 3308
ALBUQUERQUE
NEW MEXICO

LOC. Albuquerque FILE 70-531

PROJ. Imperial House SHEET 4

SUBJ. Drainage OF 6

Proposed Section Topke Place along North side of Development.



Proposed Section

Area = (40 x .67) + (33 x 20) = 26.8 + 6.7 = 33.5 sq. ft.

Hyd Rad. (full) = $R = \frac{A}{WP} = \frac{33.5}{41.34} = .81$

$R^{2/3} = .869$

S = Design Slope = .025 ft/ft

$S^{1/2} = .158$ use n = .015

Velocity = $V = \frac{1.486}{n} \times R^{2/3} S^{1/2}$. $\frac{1.486}{0.015} \times .869 \times .158$

V = 13.60 ft/sec

Q = AV = 33.5 x 13.6 = 455 cfs.

Capacity required if drainage from NW enters.

$Q_{req} = A_2 .158 + A_3 .158 = 316$ cfs.

Capacity Design Section is adequate.

COMP. RFS

CK.

DATE 13 Nov 70

WILSON & COMPANY ENGINEERS & ARCHITECTS
BOX 3388
ALBUQUERQUE NEW MEXICO

LOC. Albuquerque FILE 70-531

PROJ. Imperial House SHEET 3

SUBJ. Drainage OF 6

Drainage Area A_3 Entering at NW cor Property.

$Q = CiA$ $C = 0.55$ Area = 64 Acres

$i_{100} = \frac{189}{t_c + 25}$

$K = \frac{L}{\sqrt{S}}$ $S = \frac{18}{360} = .0200$ ft

$L = 4000$

$K = \frac{L}{\sqrt{S}} = \frac{4000}{\sqrt{.02}} = \frac{4000}{.173} = 23{,}100$

$t_c = 17$ min

$i_{100} = \frac{189}{t_c + 25} = \frac{189}{17 + 25} = \frac{189}{42} = 4.5$ in/hr

$Q = CiA = .55 \times 4.5 \times 64 = 158$ cfs.

Discharge Leaving Property

$A_{T20} = A_1 + A_2 + A_3 +$ Area Development + Area to South

Area = 70 + 50 + 70 + 6 + 9 = 205 Acres

$Q = CiA$: $C = 0.55$, $i = 4.5$ for 15 min

$Q = CiA = .55 \times 4.5 \times 205 = 509$ cfs.

Q Proposed Ditch = 617 cfs (sheet 1)

Ditch is adequate.

COMP. RFS

CK.

DATE 12 Nov 70

WILSON & COMPANY ENGINEERS ARCHITECTS
BOX 3338
ALBUQUERQUE NEW MEXICO

LOC. Albuquerque FILE 70-531

PROJ. Imperial House SHEET 2

SUBJ. Drainage OF 6

Drainage Area A_2 Entering on Topke Place:

$Q = CiA$

$C = 0.55$

$i_{100} = \frac{189}{tc+25}$

$K = \frac{L}{\sqrt{S}} =$ $S = \frac{10}{500} = .0200$ ft/ft

$L = 3100$ ft

$K = \frac{L}{\sqrt{S}} = \frac{3100}{\sqrt{.02}} = \frac{3100}{.173} = 17,900$

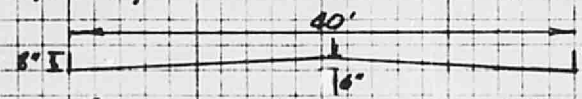
$tc = 15$ min

$i_{100} = \frac{189}{15+25} = \frac{189}{40} = 4.7$ in/hr.

Area = 61 Ac.

$Q_{100} = CiA = .55 \times 4.7 \times 61 = 150$ cfs.

Capacity 40' face-face street with 6" crown.



Area = $.167 \times 40 + 0.5 \times 20 = 6.68 + 10 = 16.68$ sq. ft.

Wetted Perimeter = $40 + 1.67 = 41.67$

R = Hydraulic Radius = $\frac{A}{WP} = \frac{16.68}{41.67} = .40$ $\quad R^{2/3} = .543$

S = slope = .0250 ft/ft. $\quad S^{1/2} = .158$

$V = \frac{1.486}{n} \times R^{2/3} \times S^{1/2}$ $\quad n = .015$

$V = \frac{1.486}{.015} \times .543 \times .158 = 8.5$ ft/sec

$Q = AV = 16.68 \times 8.5 = 142$ cfs.

COMP. RFS.

DT.

DATE 12 Nov 70

WILSON & COMPANY
ENGINEERS & ARCHITECTS
BOX 3388
ALBUQUERQUE
NEW MEXICO

LOC. Albuquerque FILE 70-531.

PROJ. Imperial House SHEET 1

SUBJ. Drainage OF 6

Drainage Area A, Along So. Boundary

Rational Method - $Q = CiA$

C = coef. of runoff = 0.55

i = intensity of rainfall inches/hr

$i_{100} = \frac{189}{t_c + 25}$ City manual for drainage

PCA handbook (page 43)

K = [illegible] $S = \frac{10}{500} = .0200$ ft/ft

$L = 4320$ ft.

$K = \frac{L}{T_c} = \frac{4320}{.175} = 24{,}200$

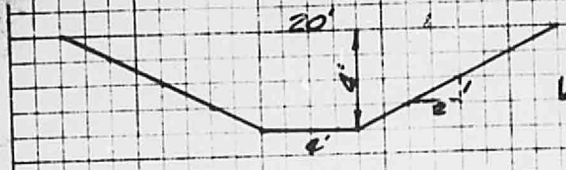
$t_c = 18$ min

$i_{100} = \frac{189}{t_c + 25} = \frac{189}{18+25} = \frac{189}{43} = 4.4$ in/hr

Area - A = 98 Acres (City Map)

$Q_{100} = CiA = .55 \times 4.4 \times 98 = 228$ cfs

Proposed Ditch By City



$\text{Area} = \left(\frac{20+4}{2}\right) \times 4 = 48$ sq. ft.

$\text{Velocity} = \frac{1.486}{n} \times r^{2/3} S^{1/2}$

n = 0.03 dirt channel

$r = \frac{\text{Area}}{\text{Wet Per}} = \frac{48}{21.38} = 2.19$

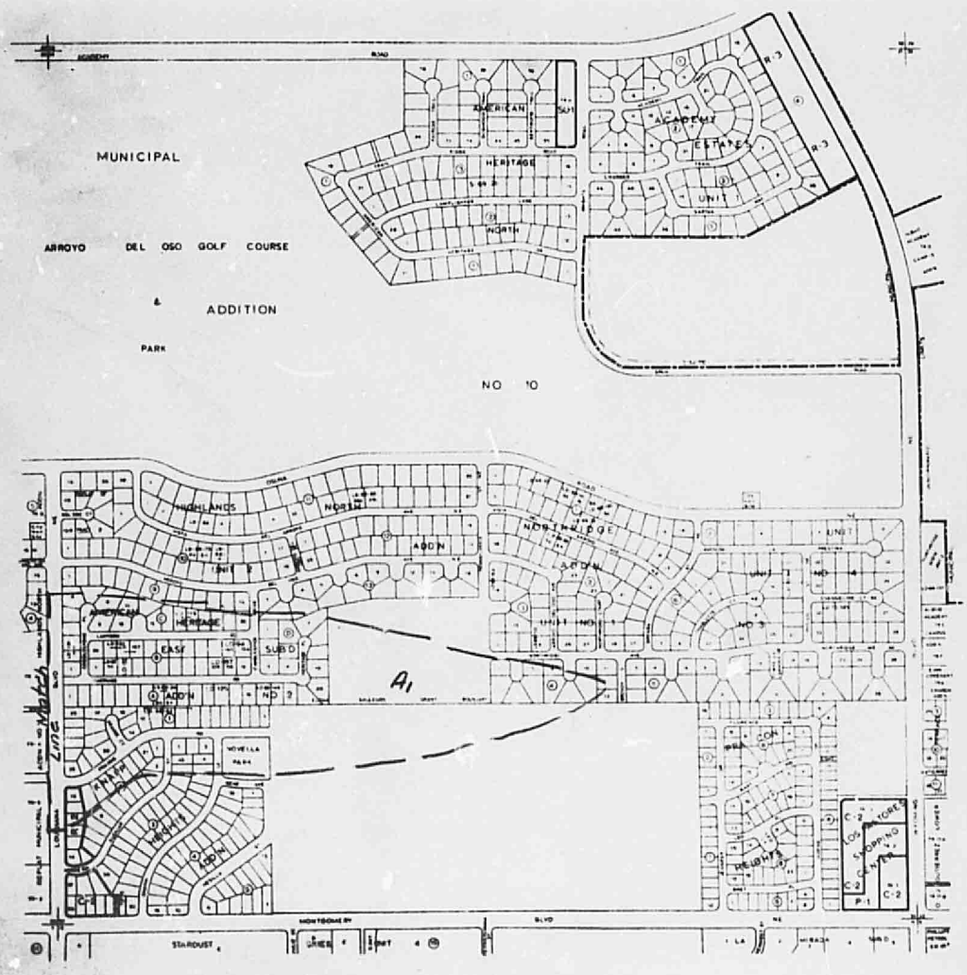
$r^{2/3} = 1.686$

S = .0218 city plan

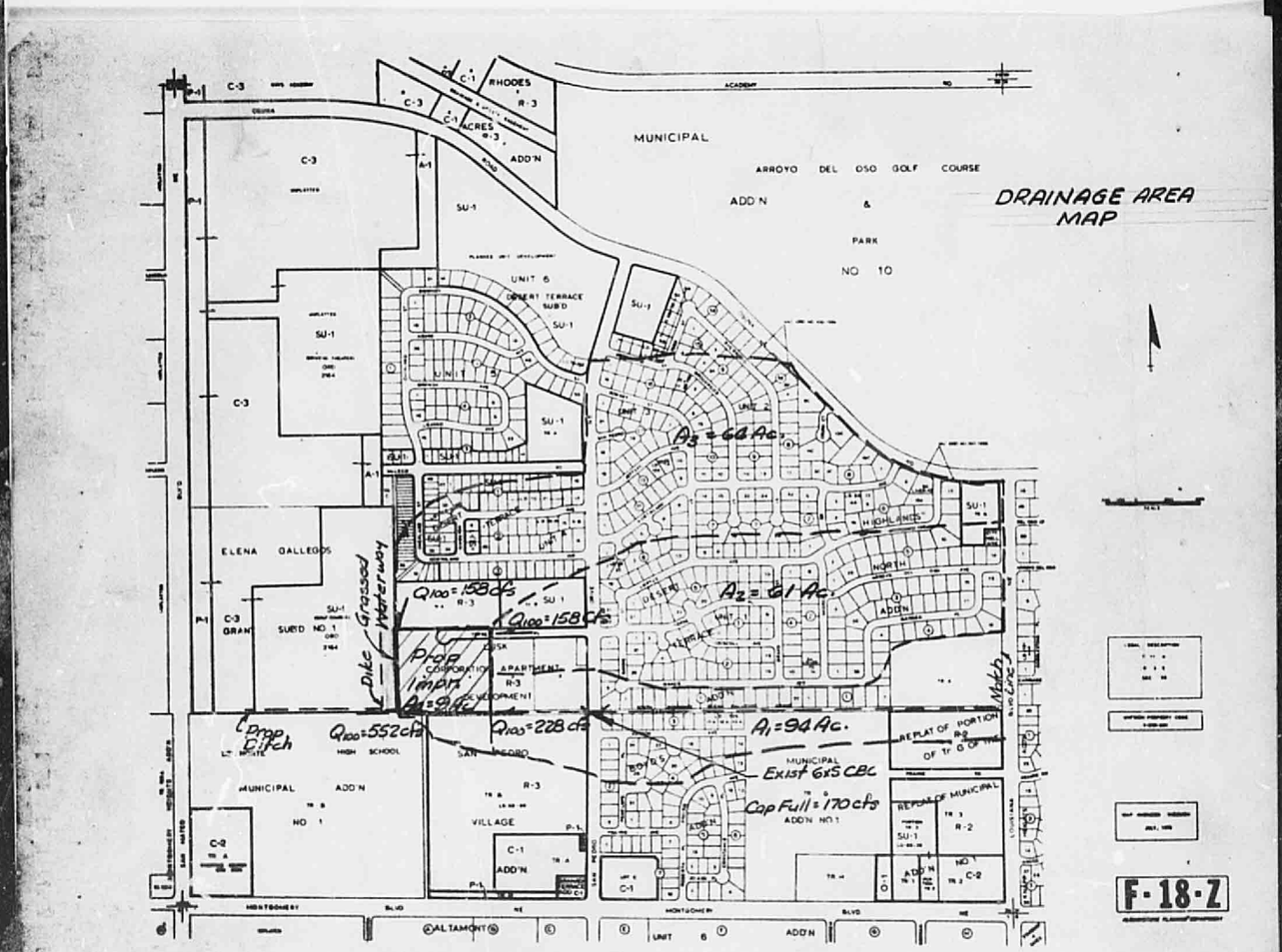
$S^{1/2} = .148$

$V = \frac{1.486}{.03} \times 1.686 \times .148 = 12.36$ Ft./sec

$Q = AV = 48 \times 12.86 = 617$ cfs


MUNICIPAL
ARROYO DEL OSO GOLF COURSE
&
ADDITION
PARK
NO 10
ACADEMY
ROAD
AMERICAN HERITAGE
ACADEMY ESTATES
UNIT
NORTH
HIGHLANDS
NORTHRIDGE
ADDN
EAST
SUBD
A1
MOVIELA PARK
STARDUST
BLVD
LOW SHOPPING
HEIGHTS

F-19-Z


DRAINAGE AREA MAP
MUNICIPAL
ARROYO DEL OSO GOLF COURSE & PARK NO 10
ADD'N
RHODES ACRES ADD'N
UNIT 6 DESERT TERRACE SUBD
ELENA GALLEGOS
MUNICIPAL ADD'N NO 1
VILLAGE
HIGHLANDS NORTH
REPLAT OF MUNICIPAL
ADD'N NO 1
ALTAMONT
MONTGOMERY BLVD NE
A3 = 6.6 Ac.
A2 = 6.1 Ac.
A1 = 9.4 Ac.
Q100 = 158 cfs
Q100 = 158 cfs
Q100 = 552 cfs
Q100 = 228 cfs
Prop. Grassed Waterway
Prop. Ditch
Prop. Apartment Development
Dike
Exist 6'x5' CBC
Cap Full = 170 cfs
F-18-Z

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