HYDROLOGY K20/D1 1 PLAN

K20/D1

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1 Plan

January 11, 1977

Mr. Robert F. Sykes, P.E.
Wilson & Co.
1321 San Pedro N.E.
P. O. Box 3305
Albuquerque, N.M. 87110

SUBJECT: LOS ALTOS TOWERS APARTMENTS, DRAINAGE REPORT

The drainage report submitted by your letter of December 23, 1976 is approved. The developer is requested to insure that lawn irrigation water does not continuously discharge into Wyoming Blvd.

Sincerely,

V. M. Kimmick
City Engineer

VMK/fs

cc: Bob Kielich
Drainage File

WILSON & COMPANY
ENGINEERS & ARCHITECTS

P.O. BOX 3305

1321 SAN PEDRO N.E. ▪ ALBUQUERQUE, NEW MEXICO 87110

505 255-4350

ENGINEERS
ARCHITECTS
PLANNERS

December 23, 1976

Mr. V. M. Kimmick
City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

DEC 27 1976
CITY ENGINEERS

Re: Drainage Report Los Altos Towers Apartments

Dear Mr. Kimmick:

Enclosed are two copies of the drainage report for the above referenced project for your review and comment and your approval if found to be satisfactory.

The developer for this project is:

Mr. Robert E. Davis
Suite 112
1330 Louisiana N.E.
Albuquerque, NM 87110

We would be glad to discuss this report with you or your representative at any time.

Very truly yours,
WILSON & COMPANY

Robert F. Sykes, P.E.

cc: Mr. Robert E. Davis

Enclosures

-sp

ENGINEER'S DRAINAGE REPORT

FOR

LOS ALTOS TOWERS
APARTMENTS

NEAR

WYOMING BLVD. AT LOMAS BLVD. NE

ALBUQUERQUE, NEW MEXICO

WILSON & COMPANY

ENGINEERS & ARCHITECTS

DECEMBER 1976

ENGINEER'S DRAINAGE REPORT
FOR
LOS ALTOS TOWERS APARTMENTS
NEAR
WYOMING BLVD. AT LOMAS BLVD. NE
ALBUQUERQUE, NEW MEXICO

PURPOSE: The purpose of this report is to analyze the amount of run-off that is being discharged from the property in its undeveloped state and compare it with the amount of run-off that can be expected from the property when it is developed as an apartment complex. Then discuss what measures may be taken to reduce the run-off from the developed property so it does not exceed the run-off from the property as it now exists.

CLIMATOLOGICAL INFORMATION: A 100 year design frequency has been used to calculate the flow. The City of Albuquerque has adopted a drainage master plan which presents the following formula for calculating the probable intensity of rainfall for a 100 year design storm:

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

i_{100} = Rainfall intensity inches per hour

t_c = Time of concentration in minutes

Certain climatological information was obtained from the U.S. Department of Agriculture, Soil Conservation Service publication, "Peak Rates of Discharge For Small Watersheds", Chapter 2, Revised 10/73 for New Mexico, Engineer Field Manual For Conservation Practices.

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

$Q = CiA$

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 intensity expressed in inches per hour

A = Drainage area expressed in acres

DISCUSSION: The calculated rate of storm water discharge from the project site in undeveloped condition is 9.7 c.f.s. If controlled procedures are not incorporated as a part of the site development plan, the maximum rate of storm water discharge from the developed site is 26.5 c.f.s.

The maximum controlled storm water discharge from the site is 12.9 c.f.s. In order to reduce the maximum rate of discharge, the following design features are incorporated as a part of the site development plan.

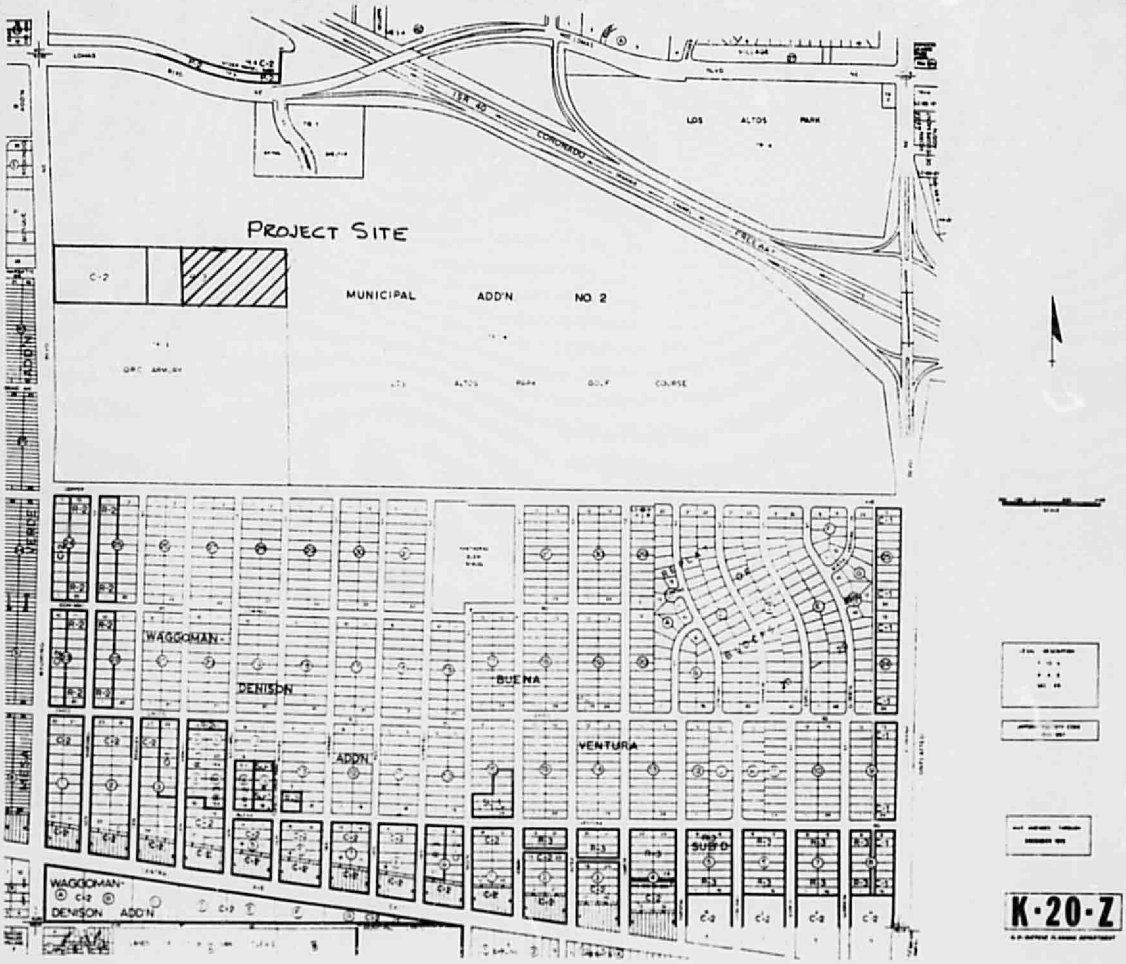
1. The north two-thirds of the property and all of the east parking lot will drain to the northwest corner of the north parking lot. The northwest corner of the parking lot will serve as a detention pond with a controlled discharge rate of 6.47 c.f.s. The critical storm duration is 17 minutes with a required storage of 4,252 cu. ft. The available storage volume at elevation 80 is 4,582 cu. ft.

2. The south one-third of the property, including the lake, will drain to the southwest corner of the west parking lot. That portion of the west parking lot south of the tennis courts will serve as a detention pond with a controlled discharge rate of 1.50 c.f.s. The critical storm duration is 35 minutes with a required storage of 4,506 cu. ft. The available storage volume at elevation 81 is 4,787 cu. ft.

3. The drainage from the south parking area will drain towards Wyoming Blvd. via the proposed access road. The maximum rate of discharge is 4.9 c.f.s. This run-off will be intercepted before it reaches Wyoming Blvd. by inlets and discharged to the 60-inch storm sewer that is located along the east side of Wyoming.

The offsite drainage is intercepted along the east property fence and diverted to the north property fence thence west towards Wyoming Blvd. Thus offsite drainage does not cross the proposed project site.

The calculations and site location and plan are attached as a part of this report.



LOCATION MAP

COMP RFS
CK
DATE 14 Dec. 1976

WILSON & COMPANY
ENGINEERS & ARCHITECTS
BOX 1351
ALBUQUERQUE
NEW MEXICO

LOC Albuquerque FILE 76-525
PROJ Los Altos Towers SHEET 1
SUBJ Drainage Report

Site = Tract "A" within Municipal Addition No. 2

Area = $388.88 \times 654.20 \times \frac{1}{43560}$ = 5.8345 Ac.

Slope = $\frac{11}{745}$ = 1.48%

Classify as short grass pasture
SCS chart flow velocity = 0.85 ft/sec

Time of Concentration = t_c = $\frac{745}{0.85}$ = 876 sec = 14.6 minutes

Albuquerque 1954 Drainage Report

$i_{100} = \frac{189}{t_c+25} = \frac{189}{14.6+25} = 4.77$

Runoff coefficient undeveloped = C = 0.35

$Q_{100} = CiA = 0.35 \times 4.77 \times 5.83 = 9.73$ cfs

Using New Mexico SCS Method.

Ploofor 24 Hrs = 3.4 in - 1hr rainfall/24 hr rainfall = 0.75

Soil = Type B Herbaceous Cover = 30%
Curve No = 75

Direct Runoff = 1.3 inches
Time Concentration = 14.6 × 1/60 = .24 Hr.
cfs/ac/in = 1.43

Q_{100} = 1.3 × 1.43 × 5.83 = 10.84 cfs

<u>Run off From Developed Property</u>

Roofs = 0.92 Ac
Parking = 2.60
Tennis Ct. = 0.36
Walk = 0.22
Lake = 0.10
Grass 1.63 Σ = 5.83 Ac

COMP RFS

CK.

DATE 14 Dec 76

WILSON & COMPANY

LOC Albuquerque JOB 76-525

PROJ Los Altos Towers SHEET 2

SUBJ Drainage Report

Runoff Factor C For developed property

Roofs = $\frac{.92}{5.83} \times .9 = .14$

Parking = $\frac{2.60}{5.83} \times .9 = .40$

Tennis Ct = $\frac{.36}{5.83} \times .9 = .06$

Walk = $\frac{.22}{5.83} \times .9 = .03$

Lake = $\frac{0.10}{5.83} \times .9 = .00$

Grass = $\frac{1.63}{5.83} \times .3$ .08

$\Sigma = .71$

Maximum Time Concentration For Parking Lot.

Slope = $\frac{9}{630} = .0143$ ft/ft. V = 2.3 ft/sec

t_c $\frac{630}{2.3} \times \frac{1}{60} = 4.6$ min

$i_{100} = \frac{189}{t_c + 25} = \frac{189}{4.6 + 25} = 6.39$

$Q = CiA = .71 \times 6.39 \times 5.83 = 26.5$ cfs

Diff Developed - Undeveloped = 26.5 - 9.7 = 16.8 cfs.

COMP RFS

CK.

DATE 10 Dec 1976

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ENGINEERS & ARCHITECTS
BOX 1351
ALBUQUERQUE
NEW MEXICO

LOC. Albuquerque FILE 76-525
PROJ. Los Altos Towers SHEET 3
SUBJ. Drainage Report OF

Storm Sewer

INLET No 1

Drainage Area

$64 \times 325 = 20,800$
$165 \times 164 = 27,060$
$111 \times 210 = 23,310$
$307 \times 240 = 73,680$
$\Sigma = \frac{144,850}{43,560} = 3.33$ Ac

$t_c = \frac{630}{2.3} \times \frac{1}{60} = 4.6$

$i_{100} = \frac{189}{t_c + 25} = \frac{189}{29.6} = 6.39$

$Q = CiA = .71 \times 6.39 \times 3.33 = 15.11$ cfs

$n = .015$ 24"Φ $s = .006$ ft/ft

24" Pipe $Q_{cap} = \frac{1.486}{.015} \times \left(\frac{\pi r^2}{2r\pi}\right)^{2/3} \times .006^{1/2} \times \pi r^2$

$Q_{cap} = 99.07 \times .63 \times .08 \times \pi = 15.69$ cfs

time Inlet No 1 to Inlet No 2

Length = 250'

$t = \frac{250}{V} = \frac{250}{\frac{1.486}{.015} \times \left(\frac{\pi}{2\pi}\right)^{2/3} \times (.006)^{1/2}} = \frac{250}{4.99} = .83$ min

INLET No 2

Drainage Area

$300 \times 88 = 26,400$
$111 \times 116 = 12,876$
$167 \times 164 = 27,388$
$\Sigma = \frac{66,664}{43,560} = 1.53$ Ac

$s = \frac{8}{560} = 1.43$ $V = 1.8$ ft/sec $t = \frac{560}{1.8} \times \frac{1}{60} = 5.19$ min

$i_{100} = \frac{189}{t_c + 25} = \frac{189}{5.19 + 25} = 6.26$

$Q_{100} = CiA = .71 \times 6.26 \times 1.53 = 6.80$ cfs

COMP RFS

CK

DATE 15 Dec 1976

WILSON & COMPANY

LOC Albuquerque FILE 76-525

PROJ Los Altos Towers SHEET 4

SUBJ Drainage Report OF

South Parking Lot.

Area = .87 Ac L = 660 S = $\frac{8}{660}$ = 1.21% V = 2.2 ft/sec

$t = \frac{660}{2.2} \times \frac{1}{60} = 5$ min

$i_{100} = \frac{189}{t_c+25} = \frac{189}{30} = 6.3$ C = .90

Q = CiA = .90 × 6.3 × .87 = 4.93 cfs uncontrolled to be put in storm sewer

North Ponding Area
Drainage Area = 140,850 ft² = 3.33 Ac.

t_c $\frac{810}{2.3} \times \frac{1}{60} = 5.9$ min

$i_{100} = \frac{189}{t_c+25} = \frac{189}{30.9} = 6.11$ C = .71

Q = CiA = .71 × 6.11 × 3.33 = 14.45 cfs Alowable = 6.47 cfs

South Ponding Area
Drainage Area = 1.63 Ac

L = 580 S = $\frac{8}{580}$ = 1.38 V = 1.8 ft/sec (Grass)

$t_c = \frac{580}{1.8} \times \frac{1}{60} = 5.4$ min

$i_{100} = \frac{189}{t_c+25} = \frac{189}{30.4} = 6.22$ C = .71

Q = CiA = .71 × 6.22 × 1.63 = 7.20 Alowable 1.50 cfs

COMP RFS

CK

DATE 15 Dec 1976

WILSON & COMPANY ENGINEERS & ARCHITECTS ROM SZAN ALBUQUERQUE NEW MEXICO

LOC Albuquerque FILE 76-525

PROJ Los Altos Towers SHEET 5

SUBJ Drainage Report OF

North Ponding Area

Storage Volume = $\frac{(0+1098)}{2}(.5) + \frac{1}{3}(1098 + 8604 + \sqrt{1098 \cdot 8604})(1)$

$V = 274 + 4258 = 4532$ cfs

Alowable Release Rate = 6.47 cfs Area = 3.33 Ac. C = .71

tc	i	Q	(V) Storm Runoff	(V) Release Flow	(V) Rest Storage
5.9	6.11	13.45	5115	2290	2824
10	5.40	12.76	7660	3882	3778
15	4.72	11.17	10054	5823	4231
20	4.20	9.93	11916	7764	4152
25	3.78	8.94	13405	9705	3700
30	3.44	8.12	14624	11646	2978
40	2.91	6.87	16499	15528	971
45	2.70	6.38	17235	17469	–
50	2.52	5.96	17874	19410	–
55	2.36	5.58	18432		–
60	2.22	5.25	18925		–
16	4.61	10.90	10862	6211	4250
17	4.50	10.64	10852	6599	4252 ←
18	4.40	10.39	11221	6988	4233

Max Storage Reqd = 4252 cu. ft

Storage Available = 4.32 cu ft

COMP RFS

CK

DATE 15 Dec 1976

WILSON & COMPANY ENGINEERS & ARCHITECTS ALBUQUERQUE NEW MEXICO

JOB Albuquerque JOB NO. 76-525

PROJ Las Altos Towers SHEET 6

SUBJ Drainage Report

South Ponding Area

$$\text{Storage Volume} = \left(\frac{0+1530}{2}\right)(.5) + \frac{1}{3}\left(1530 + 8150 + \sqrt{1530 \times 8150}\right)1$$

$$V = 382 + 4405 = 4787 \text{ ft}^3$$

Allowable Release Rate = 1.50 cfs Area = 1.63 Ac C = 0.71

t_c	i_{100}	Q_{100}	Storm Runoff	Release Flow	Reqd. Storage
5.4	6.22	7.20	2331	485	1845
10.0	5.40	6.25	3750	900	2850
15	4.72	5.47	4921	1350	3571
20	4.20	4.86	5832	1800	4032
25	3.78	4.37	6562	2250	4312
30	3.44	3.98	7158	2700	4458
35	3.15	3.65	7656	3150	4506 ←
40	2.91	3.37	8076	3600	4476
45	2.70	3.12	8437	4050	4387
50	2.52	2.92	8749	4500	4249
60	2.22	2.57	9263	5400	3863
70	1.99	2.30	9670	6300	3370
80	1.80	2.08	9999	7200	2799
90	1.64	1.90	10270	8100	2170
36	3.10	3.59	7745	3240	4505
34	3.20	3.71	7562	3060	4502

Max Storage Reqd = 4506 cu ft

Storage Available = 4787 cu ft

RFS

20 Dec. 1976

WILSON & COMPANY

Albuquerque 76-525
Los Altos Towers 7
Drainage R

Opening Reqd. To Control Discharge Rate

North Detention Pond

Size

$S = 0.005$ ft/ft $\quad n = 0.015$

$$V = \frac{1.486}{n}(r)^{2/3}(s)^{1/2} = \left(\frac{1.486}{.015}\right)\left(\frac{1.5 \times 1.12}{4.12}\right)^{2/3}(.005)^{1/2}$$

$V = 3.81$ ft/sec

$A = 1.5 \times 1.12 = 1.68$ ft²

$Q = AV = 1.68 \times 3.81 = 6.40$ ft³/sec

South Detention Pond

Size

$S = 0.003$ ft/ft $\quad n = 0.015$

$$V = \frac{1.486}{n}(r)^{2/3}(s)^{1/2} = \left(\frac{1.486}{.015}\right)\left(\frac{1.5 \times .5}{3.5}\right)^{2/3}(.003)^{1/2}$$

$V = 1.94$ ft/sec

$A = 1.5 \times .5 = .75$ ft²

$Q = AV = .75 \times 1.94 = 1.46$ cu ft/sec