HYDROLOGY K15/D4 2 PLANS

K15/D4

2 Plans

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ENGINEER'S DRAINAGE REPORT

FOR

LOBO MALL
2100 BLOCK OF EAST CENTRAL
ALBUQUERQUE, NEW MEXICO

FINAL APPROVAL OF
DRAINAGE REPORT
Bruce Conplin ACC 4/5/77
To be attached to final construction plans which must contain detailed grading site information

W. R. UNDERWOOD, JR.
ALBUQUERQUE, NEW MEXICO

March 3, 1977

ENGINEER'S DRAINAGE REPORT
FOR
LOBO MALL
2100 BLOCK OF EAST CENTRAL
ALBUQUERQUE, NEW MEXICO

1. PURPOSE

A. To analyse the amount of run-off, due to rainfall, originating from the area in consideration.

B. To design facilities to limit the run-off to the undeveloped site peak flow.

A one hundred year frequency rain storm has been used in these determinations.

2. PROJECT DESCRIPTION

Site of the proposed development is located on Tract "A", Block One (1) of Buena Vista Heights Addition, City of Albuquerque, which is in the 2100 Block of East Central Avenue. The property contains .3667 Acres, and is presently used as a parking lot. The area is a well compacted gravel surface, having been filled, compacted and graded for its present use. The slopes vary from 0.8 percent to 1.3 percent.

The proposed development plans to cover approximately 93 percent of the site with buildings and asphalt pavement. The remaining areas will be landscaped. An open area of approximately 13 percent of the total site is to be depressed some four feet below City sidewalk level. This area, with the exception of some small planting areas, will be paved.

3. CONCEPT OF DESIGN

Run-off from the new development shall be limited to that of the existing site from a 100 year frequency rain storm. To accomplish this, planting and ponding areas will be constructed to retain a portion of the run-off, and limit the discharge rate. Deep wells will be constructed to pond the balance of the excess run-off, allowing this to percolate into the sand and gravel sub-soil.

These retention facilities will be sized according to the

modified rational method of analysis per "Practices in Detention of Urban Stormwater Runoff", published by the American Public Works Assoc.

4. CLIMATOLOGICAL INFORMATION

The City of Albuquerque's "MASTER PLAN OF DRAINAGE, 1963", prepared by Gordon Herkenhoff & Associates, provides the formula for calculating probable rainfall intensity for a 100 year design storm.

$i_{100} = 189/t_c + 25$

i_{100} = rainfall intensity, inches per hour

t_c = time of concentration in minutes

Time of concentration is derived from Seelye's DESIGN, Volume One:

$T_c = \text{Log}^{-1} \left[0.3641\ (B) + 0.3854\ \text{Log}(L) - 0.197\ \text{Log}(S) - 0.3613\right]$

B = Ground Factor = 1.75

L = Length of Flow Path = 180 ft.

S = Slope of Flow Path = Varies 0.08% to 1.3%

T_c = Time of Concentration

The existing surface is slightly impervious with a run-off coefficient between 0.35 and 0.55. A coefficient of 0.45 is assumed for this study.

A run-off coefficient of 0.95 is assumed for the paved areas of the developed project.

5. DESIGN METHODS

The discharge from a 100 year storm from the total existing site was calculated, using above data.

The developed project area was then analyzed. As indicated in Section 2, 93 percent was considered as paved, and 7 percent as landscaped. Time of concentration for the developed project was taken as ten (10) minutes. The peak discharge and run-off volume therefrom for a 100 year storm was calculated with varying durations of 5 minute intervals.

Storage volumes were calculated by deducting the pre-development peak run-off volumes from the corresponding run-off volumes from the developed site. These calculations show the maximum required storage capacity.

Run-off from the landscaped areas in the parking lot will not occur until after the peak conditions have been met, and the intensity of the storm has diminished.

While it is believed a good percolation rate will exist at the deep wells, no allowance has been made for this in determining required storage volumes.

6. CONCLUSIONS

Calculation sheets, attached hereto, indicate the storage areas required and proposed to retain the increased run-off.

Attached plans indicate the proposed development, including the retention facilities determined necessary by this study.

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Lobo Mall - Drainage Study -
H. Wm Fanning - Architect

2/28/77
WRU

Site:

Present is gravel surface parking Lot; this would indicate a slightly pervious to impervious soil. The slope is approximately 1%. A "C" value of 0.45 is considered reasonable.

New construction will cover 93% of area with roofed buildings or asphalt paved parking lot.
.07 x .45 + .93 x .95 = .915 - USE developed C = .915

Site Area = 112.5' x 142' = 15975 SF or .3667 Acres
Location Block 1, Buena Vista Heights Add.
2100 Blk., East Central Ave, Albuquerque.

1. Existing Runoff: 100 YR. Storm

$T_c = Log^{-1}[.3641 (B) + .3854 Log (L) - .197 Log (S) - .3613]$

B = Ground Factor = 1.75
L = Length of Flow Path = 180 Ft.
S = Slope of Flow Path = (100.10 - 98.65)/180 = 0.8% USE 1%
T_c = Time of Concentration

$T_c = Log^{-1}[(.3641 \times 1.75) + (.3854 Log 180) - (.197 Log 1.0 - .3613]$
$= Log^{-1}[(.6371) + (.385 \times 2.25527) - (.197 \times 0) - .3613]$
$= Log^{-1}[.6371 + .8683 - 0 \quad -.3613] = Log^{-1}[$ [illegible] $]$
= 13.94 Min. USE 14

Q = CiA

C = Runoff Coeff. (use 0.4)
i = Rainfall intensity in/hr
from Master Plan of Drainage (Herkenhoff 1963)
$i = 189/(t_c + 25) = 189/(14+25) = 4.85''$

A = Area, Acres = .3667
Q = Runoff, CFS

Q = 0.45 (4.85) .3667 = .80 CFS = Runoff from Existing Site.

Lobo Mall - Drainage Study

2. Runoff from New Improvements on Site:
100 YR DESIGN STORM

Time of Concentration = 7+; thus use $T_c = 10$

$Q = CiA$

C from pg. 1 = 0.915

$i = 189/(10+25) = 5.4$ in/hr

$Q = .915 \times 5.4 \times .3667 = 1.81$ CFS = Runoff from site after developement - 100 yr Storm -

$\Delta Q = .915 \times .3667 \times i = .335i$

3. Ponding Requirements:

100 YR. STORM DURATION	INTENSITY (in/hr)	PEAK FLOW Rt. (CFS)	STORM RUNOFF VOL. (Ft)³	RELEASE FLOW (Ft)³	STORAGE VOL. (Ft)³
10 Min.	5.4	1.81	1087	480	607
15 Min.	4.73	1.58	1426	720	706
20 "	4.2	1.41	1688	960	728 *
25 "	3.78	1.27	1899	1200	699
30 "	3.44	1.15	2074	1440	634
35 "	3.15	1.05	2246	1680	536
40 "	2.91	0.97	2340	1920	420
45 "	2.70	0.90	2440	2160	280

* = Max. Storage Requirement

If 4' dia. conc. cylinders are used & set to a depth of 12 feet in the parking lot & 8 feet in the plaza

$4'\phi = 12.57\ \# \times 12' = 150\ F^3$ Ea

$\times 8' = 100\ F^3$ Ea.

13% of Area is depressed & Paved - All water must be retained. Thus $0.95 \times (.3667 \times .13) \times 4.2 \times 1200 = 228$ cu. Ft.

Hence use 3- deep wells in this area = $300\ F^3$

$728 - 228 = 500\ F^3$ - Retain on Parking Lot.

Soil is gravel sand combination. No percolation tests have been made, but rate should be good in this type soil.

Lobo Mall - Drainage Study

Parking Lot Planting & Ponding Areas 3/2/77

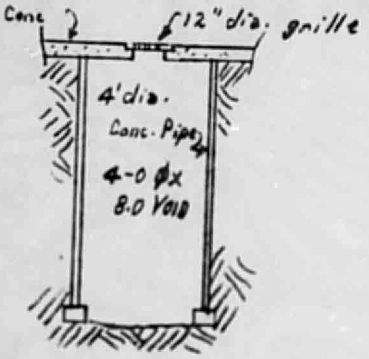
Planting 5 x 80 = 400 SF
Ponding 4 x 50 = 200 SF > 600 SF

These Areas will be excavated 24 inches below finish pavement grade & back filled 18 inches with cobble stone. This will provide a free area 6 inches deep for a total of 300 cu. ft. & void area in the 18 inches of cobble will provide more than the required additional 150 cu. ft. of Retention volume

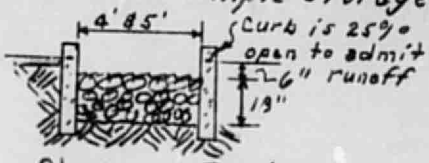
HENCE:

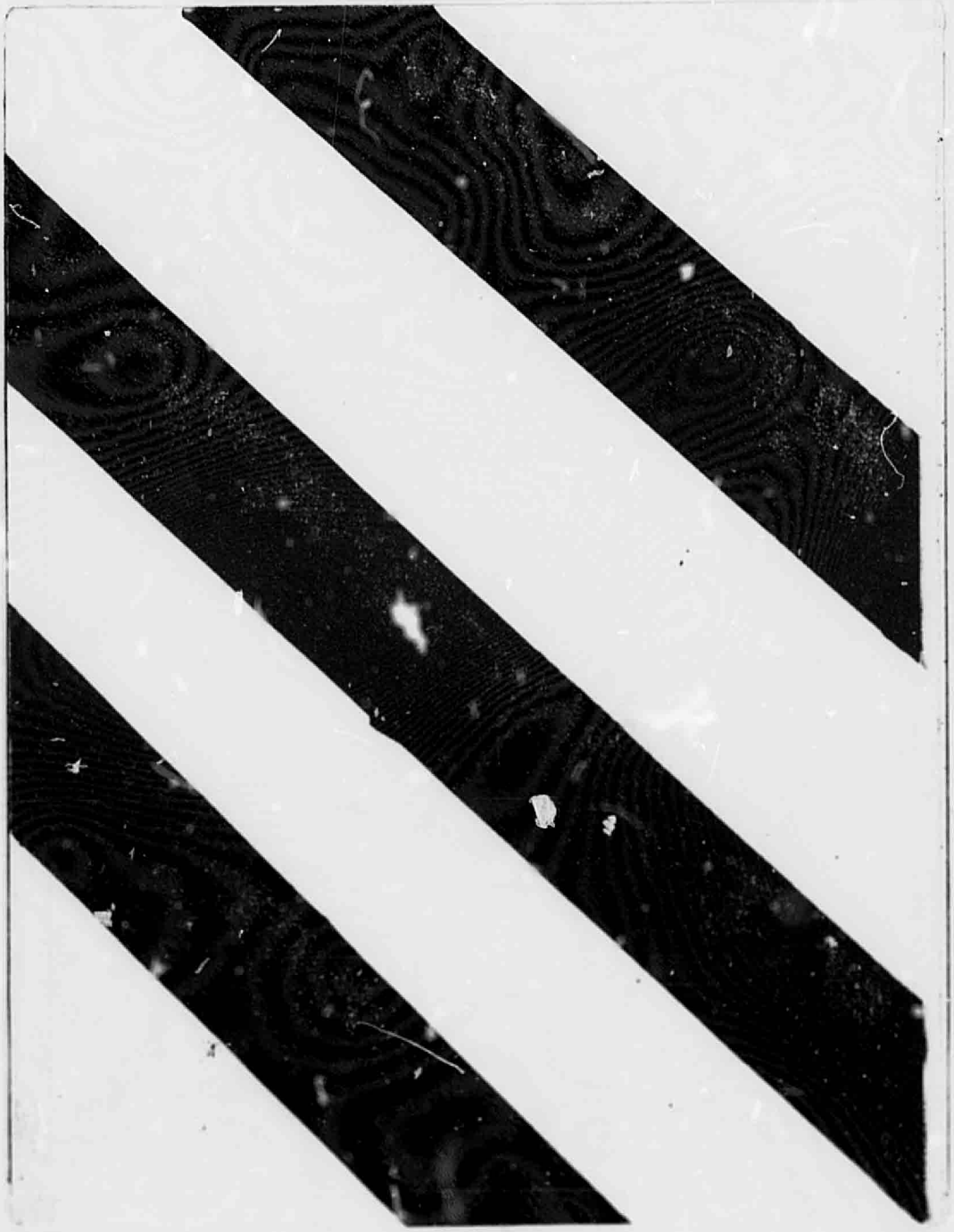
3-4' ϕ x 8' Deep wells	300 F^3
Ponding Area	330
Planting Area	170
Total Storage	800 F^3 > 728 F^3

This allows void volume of 1/3 rd. it probably will be 40 to 50 % - Hence we have ample storage



Deep Well



Planter & Ponding

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