HYDROLOGY E22/D2 THREE PLANS

E 22/D2

3 PLANS

community sciences corporation

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ADMINISTRATION BUILDING SITE

FOR

HORACE F. MCKAY, JR.

DRAINAGE MANAGEMENT PLAN

Prepared For:

Horace F. McKay, Jr.

Prepared By:

COMMUNITY SCIENCES CORPORATION

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NO. 6170
REGISTERED PROFESSIONAL ENGINEER

October 1979

Kent M. Whitman

Kent M. Whitman, P.E.

SURVEYING
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A) PURPOSE AND SCOPE

Horace F. McKay, Jr. is currently planning to develop a 1.56 acre tract of land on a portion of Albuquerque Ranch Estates. The development consists of the construction of a combined office and residence building with onsite parking and residential type streets.

This report presents a drainage management plan for the proposed development site. Consideration has been given to on-site drainage for the developed condition and to the potential for off-site drainage to flow onto and through the site.

The drainage management plan and report have been prepared for submittal to the City of Albuquerque and to the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) for their review and approval as provided for by the State of New Mexico statutes.

B) SITE LOCATION AND TOPOGRAPHY

The 1.56 acre tract proposed for development is a portion of Albuquerque Ranch Estates in Northeast Albuquerque, located on the west side of Tramway Boulevard, approximately 1 1/4 miles north of Montgomery Boulevard. See Plate 3, Location Map.

The land slopes from east to west at an approximate rate of 4 percent.

Soils consist mostly of alluvial sands and silts with decomposed granite the major soil constituent.

C) DESIGN CRITERIA

1) Engineering Parameters

For calculation of runoff rates and required storage volumes a C of 0.95 has been used for developed areas; 0.40 was used for undeveloped areas, and 0.25 for lawn and landscaped areas.

All runoff calculations have been based on a 100 year 6 hour rainfall of 2.8" (0.22') 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 Associates in their 1963 Master Plan of Drainage for the City of Albuquerque. This relationship is expressed by the following equation: $I = 189/(Tc+25)$

2) Flood Control Regulations

The drainage plan presented in this report has been designed to comply with the 1972 AMAFCA Resolution in regard to rate and volume of runoff leaving the site. That Resolution has been interpreted to say that the rate and volume of runoff allowed to leave the site after development shall be no greater than

2) Flood Control Regulations (con.)

the rate and volume running off prior to development.

D) COMPUTATIONAL PROCEDURES

Appendix A contains samples of the various types of hydraulic calculations performed.

Hydrological flow rate calculations are based on the rational runoff method. Times of concentration were calculated using the Kirpich Nomograph for Overland Flow and the Manning Equation for estimating swale capacities.

E) OFF-SITE DRAINAGE

The subject tract fronts on Tramway Boulevard. The surface drainage is from east to west; toward the subject tract. Shown on Plate I is an off-site drainage area which would drain onto the proposed development tract if not intercepted by Tramway Boulevard.

Tramway Boulevard is an improved street with an approximately 24' wide pavement and with road side swales each side of centerline. In the vicinity of the proposed development tract Tramway Boulevard slopes from north to south at approximately 1/2 percent.

The runoff from the drainage area east of Tramway Boulevard has been calculated at 16.56 cubic feet per second. The roadside swale has been calculated to have a capacity of 18.0 cfs. Therefore the roadside swales are adequate to prevent off-site runoff from draining onto the tract. See Appendix A, Calculations Part 1 and 2 for off-site runoff volume and roadside swale capacity.

F) ON-SITE DRAINAGE

On-site drainage calculations are shown in Apperdix A, Calculations 3-11, inclusive.

A Composite coefficient of runoff was calculated to be 0.54 for the proposed development. By the rational method of analysis the required ponding volume was determened to be 2061 cubic feet for a 100 year - 6 hour rainfall of 2.8 inches (0.22 feet). Accordingly, a circular detention pond with 2061 cubic feet capacity is shown on the Drainage Plan, Plate II.

Runoff from the paved street and adjacent on-site property along the south boundary of the tract is proposed to be allowed to leave the tract. The remainder of the runoff is directed to the detention pond.

The runoff from the building and paved areas(which is directed to the detention pond via the swales "A" shown on the Drainage Plan, Plate II)has been calculated to amount to 3765 cubic feet. This amount of runoff which is greater than the 2061 cubic feet of ponding required assures that the ponding requirement is satisfied.

Minimum street slopes of 1/2 percent may be used as their capacity greatly exceeds the 2.15 cfs which has been calculated to flow in the streets.

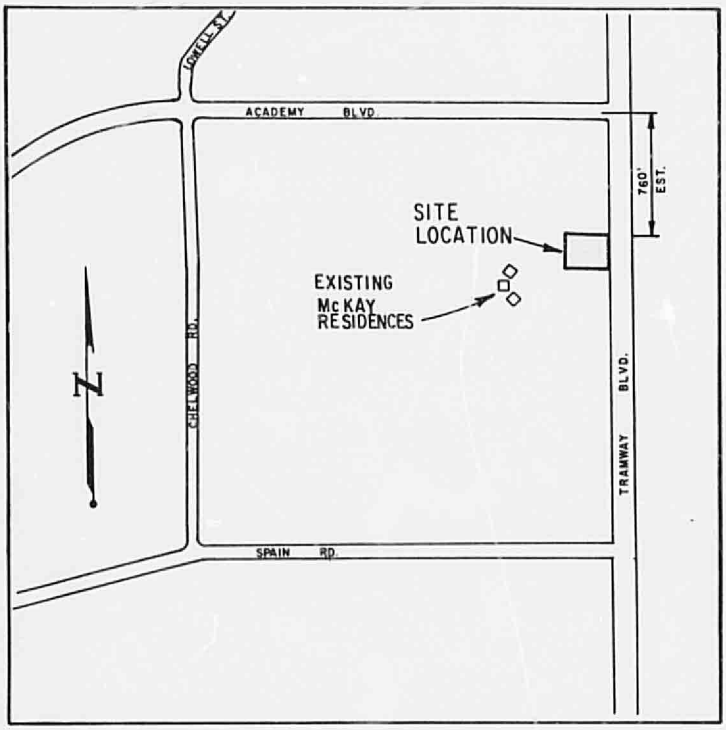

PLATE 3

LOCATION MAP

SCALE: 1" = 800' (APPROX)

APPENDIX A

CALCULATIONS

1. OFFSITE DRAINAGE

$H = 69'$
$= 1600'$
From Kirpich Nomograph Tc = 14.4 min.

$$I_{100} = 5.4 \frac{189}{(14.4 + 25)} = 4.8 \text{ inches /hr.}$$

$Q = CIA$
$= 0.40 \times 4.8 \times 8.63$
$= 16.56$ cfs

2. CAPACITY ROADSIDE SWALE EAST SIDE OF TRAMWAY BLVD.

$S = .005$ ft/ft
Sides Lope Left = 3:1
Sides Lope Right = 8:1
Depth = 1.0'
n = .02
By Manning Equation Capacity Q = 18.0 cfs.

Conclusion: Roadside swale is adequate to convey OFFSITE Drainage away from proposed development tract.

3. COMPOSITE C

Total Area = 1.56 Acres
Building & Paving = 0.42 Acres
Lawn & Landscaping = 0.05 Acres
Natural Landscape = 1.09 Acres

Composite $C = 0.42 \times 0.95 + 0.25 \times 0.05 + 0.40 \times 1.09/1.56 = 0.54$

4. ONSITE RUNOFF VOLUME FOR PONDING

Tc 10 min.
$Q = 2.6/12 \times (0.54 - 0.40) \times 1.56 \times 43{,}560$
$= 2061$ cubic feet

5: RUNOFF FOR ON SITE AREA 1

$A = 1888 \text{ ft}^2$
$Q = 2.6/12 \times (.95 - .40) \times 1888 = 225$ C.F.

6. ONSITE POND

REQD. VOL. = 2061 cubic feet
2 (Avg. Area) = 2061 cubic feet
$2\ (\pi D^2/4) = 2061$ cubic

$$D = \frac{(2061 \times 4)}{2\pi}^{1/2}$$

$$= 36'$$

D @ Top = 42'

& D @ Bottom = 30'
for circular pond with 3:1 sideslopes and 2' depth.

7. RUNOFF VOLUME FROM BUILDING & PAVED AREAS

A = 0.42 Acres

$Q = 2.6/_{12} \times 0.95 \times 0.42 \times 43{,}560$

= 3765 cubic feet

8. RUNOFF RATE FROM BUILDING & PAVED AREAS

$Q = .95 \times 5.4 \times 0.42$

= 2.15 cfs

9. SWALE "A" CAPACITY

6:1 sideslopes each side

.02 ft/ft slope

0 bottom width

.02 n

.5' depth

$Q = 6.21$ cfs O.K. $> 2.15/_2$

10. SWALE "B" RUNOFF

Assume area equals 1.09/4 = 0.27 Acres

$Q = 0.40 \times 5.4 \times .27 = 0.58$ cfs

11. SWALE "B" CAPACITY

8:1 sideslopes each side

.01 ft/ft slope

0 bottom width

.5 depth

.02 n

Q = 5.9 cfs O.K. > 0.58 cfs

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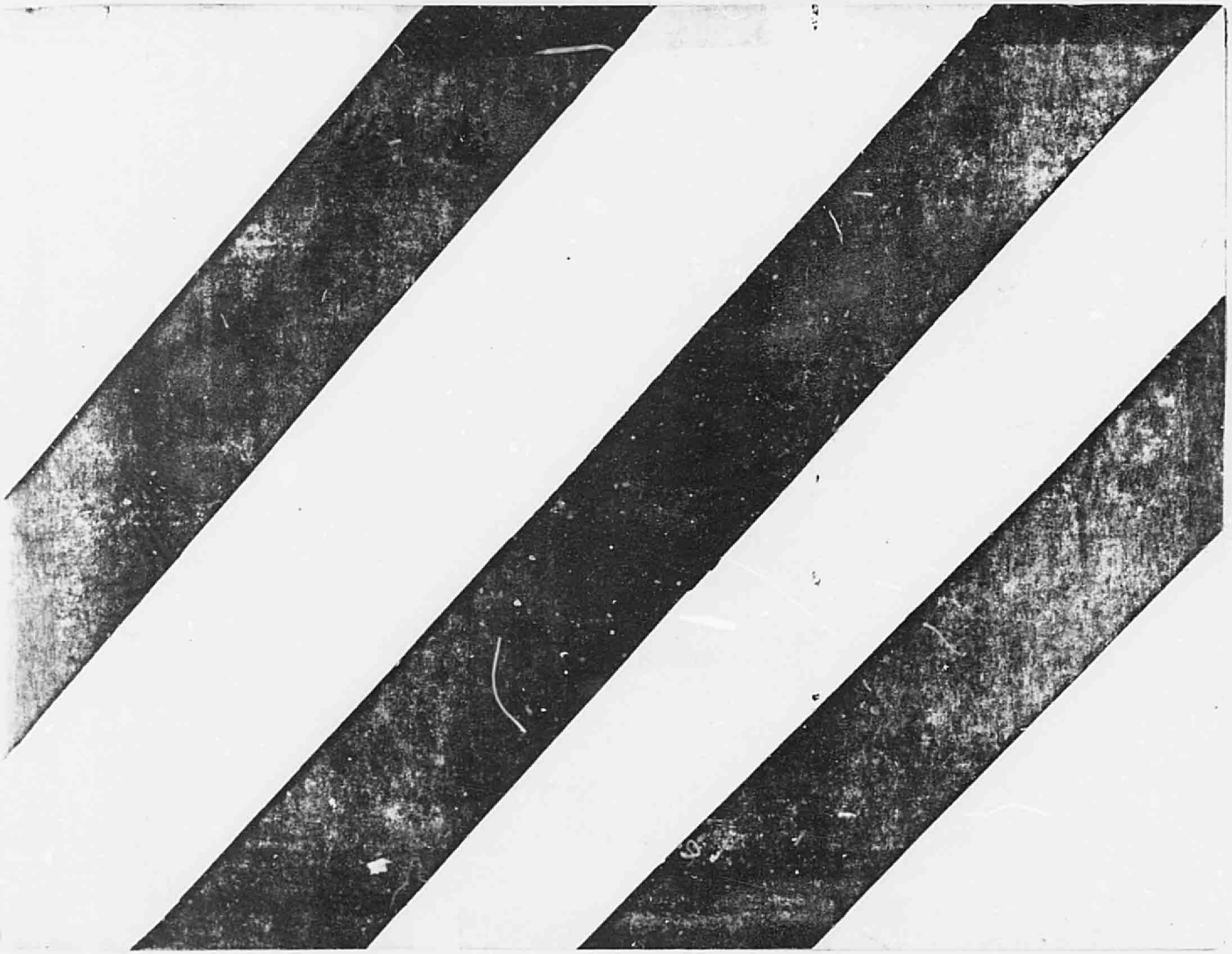
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