HYDROLOGY G17/D5 2 PLANS

G17/D5

2 Plans

Bob —

Approved w/ changes as noted
J. P. McCall
9-9-74

I approved.
K. Sinnel
9-9-74

ENGINEER'S DRAINAGE REPORT

FOR

CRESTVIEW MEDICAL CENTER
LOTS 18 & 23 BLOCK 5
ALBUQUERQUE, NEW MEXICO

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

September 6, 1974

ENGINEER'S DRAINAGE REPORT
FOR
CRESTVIEW MEDICAL CENTER
LOTS 18 & 23 BLOCK 5
ALBUQUERQUE, NEW MEXICO

PURPOSE: This Report is to analyze the amount of run-off entering the area in consideration. A 100-year design rainfall has been used to determine the run-off.

CLIMATOLOGICAL INFORMATION: The City of Albuquerque's adopted master drainage plan 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 intensity inches per hour

t_c = time of concentration in minutes

RUN-OFF CALCULATIONS: The Rational Method is used to calculate run-off in this Report. This formula is:

$Q = CiA$ where

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 considered in acres

DISCUSSION: It is proposed to use the property covered by this Report for a parking lot to serve adjacent and nearby buildings.

The tract is 240 ft. long, north-south, and 60 ft. wide, east-west. It fronts on Ponderosa Avenue, NE, for 60 ft. on the north,

and on Palo Duro Avenue, NE, for approximately 62 ft. on the south. It presently slopes to the north and south from a high point near the center of the tract at about a 1.5% grade. It is bounded on the west by residential lots, and on the east by commercial lots which are partially developed. The presently developed property drains an area of 3600 sq. ft. to the tract herein considered.

It is planned to construct ponding areas along the westerly boundry and within the property. A slight mound will be constructed near the north boundry to prevent northerly discharge of most of the run-off. This will result in all increased run-off being retained on the property in ponding areas - being allowed to percolate into the ground. The soil is composed primarily of decomposed granite - having a good percolation rate.

All calculations have been based on a 2.6 inch rain in a 6-hour period, with 80% falling in a 40-minute period.

Calculations and the proposed plan are attached.

REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW MEXICO
NO. 357
UNDERWOOD, JR.

9/5/74

Calculations: Crestview Med. Center

Total Area: 60 x 233.25 = 13995 SF = 0.32 AC

Proposed Paved Area = 11,575 SF =

Drainage to tract from other Areas 3600 SF

Equivalent Total Paved Area = 15,175 SF = 0.348 Ac.

Assume 'C' for undeveloped land as $.35 \times \frac{.32}{.32} = 0.35$

'C' for Paved Areas $0.95 \times \frac{.348}{.32} = 1.088$

Average 'C' then is 1.438

then $Q = 1.438 \times 6 \times 0.32 = 2.76$ cfs = max. runoff

Max. rainfall expected = 2.6" from 100 yr storm

Quantity of water from 2.6" rain = $\frac{2.6}{12} \times 1.438 \times 0.32 \times 43560$

= 4343 cu. ft.

If 'C' for undeveloped land = 0.35 the increased quantity due to improvements = $\frac{1.438 - 0.35}{1.438} \times 4343 = 3286$ cu. ft.

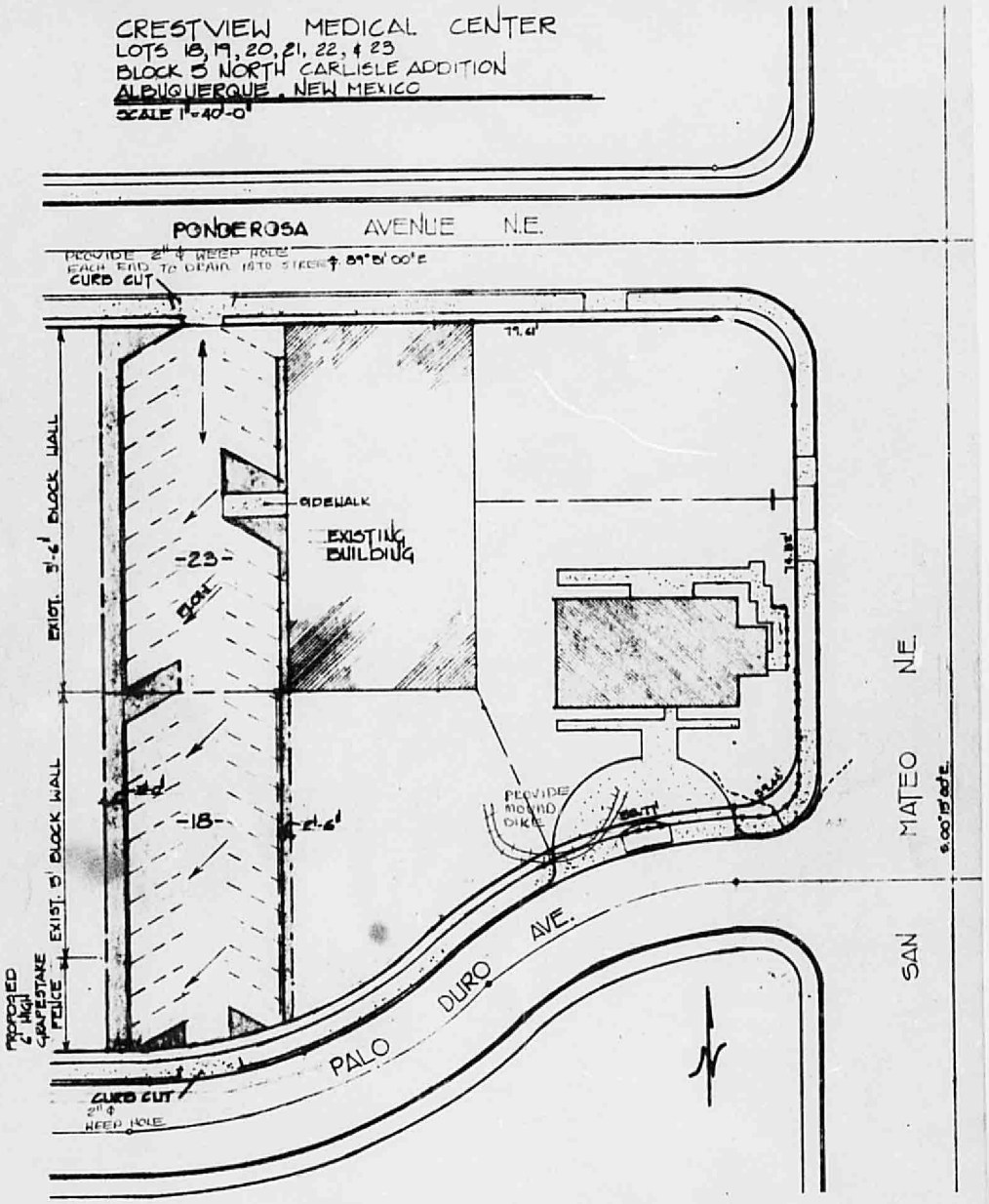
It is further assumed that 80% of above will fall in a 40 minute period thus .80 x 3286 = 2628 cu. ft. will collect during the maximum intensity period.

If this amount is ponded, percolation into the soil should take the remaining runoff.

With ponding areas totaling 2420 sq. ft. a depth of $\frac{2625}{2420} = 1.085$ ft or 13 inches will be required.

This will be accomplished by excavating the ponding areas 10" below the adjacent areas & pouring a 6" high curb on the low sides, allowing water to enter from the high side.

CRESTVIEW MEDICAL CENTER
LOTS 18, 19, 20, 21, 22, & 23
BLOCK 5 NORTH CARLISLE ADDITION
ALBUQUERQUE, NEW MEXICO
SCALE 1"=40'-0"



LEGEND & DESCRIPTIVE INFORMATION

Shaded areas indicate ponding areas 10 inches below pavement.
Dashed lines indicate parking lanes.
Concrete curbs to be constructed around ponding areas to retain water to a maximum depth of 16 inches.
Precast concrete bumpers will be installed at high side of ponding areas to permit water flow into areas, and obstruct traffic from areas.
Block wall or grapestake fence will be installed at north end of property from driveway to west property line. Wall presently exists at east side of driveway.
Ponding areas will be planted with evergreen trees and shrubs, and partially filled with large gravel.

NOTE: In order to comply with above, it is necessary to remove existing paving on Lot 23, and regrade to provide proper drainage.

G17/D6

3 Plans

A&E ENGINEERING INC.
CIVIL ENGINEERING, LAND PLANNING, AND SURVEYING

July 5, 1974

Mr. V. M. Kimmick
City Engineer
City of Albuquerque
Albuquerque, New Mexico

Dear Mr. Kimmick:

Transmitted herewith for your review and approval is a copy of the Drainage Report for the Del Norte Plaza Shopping Center. Del Norte Plaza Shopping Center is located along the south side of Montgomery Boulevard, N.E., between Monroe Street, N.E. and San Mateo Blvd., N.E.

Your review and approval at your earliest convenience will be greatly appreciated.

Sincerely,

A&E ENGINEERING, INC.

John F Esquibel

John F. Esquibel

JFE:jg

APPROVED FOR DRAINAGE
22 aug 74
DATE
J Kikel ACE
TITLE
CONTINGENCIES

4100 SILVER S.E. ALBUQUERQUE, NEW MEXICO 87108 505/266-8791

Skaggs- Montgomery & San Mateo

Drainage Ponds

Area No. 1 - Storage Volumne - 9758 cf - page 10 Drainage Rpt.

Rear Gravel Bed - 19' wide x 68' avg length - Dtl. 03A20

Long Bed - 4' wide x 24.5' avg length - Dtl. 03A20

Area in contour 88

38' wide x 135' = 5130 sq ft
24' wide x 65' = 1560
6690

Slope 88 to 87'-3" with drop + 87'-6" - Avg water depth = 8"

Vol. = 6690 x $\frac{8}{12}$ = 4460 cf.

Vol. - Top of gravel - 88.0 - 86'8" = 1.33'

Vol. = 19 x (68)(1.33) + 4(245)(1.33) = 3022 cf

Area of bed = 19(68) + 4(245) = 2272

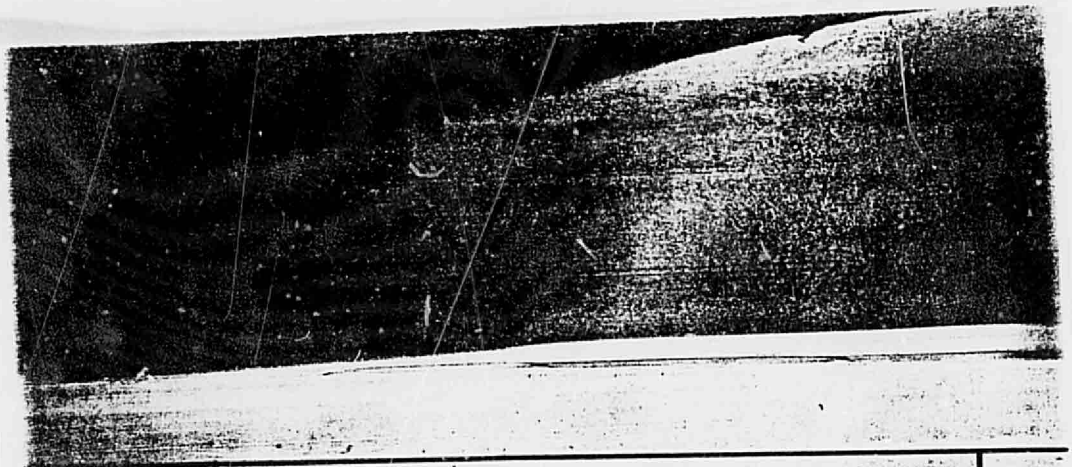
Vol. = .8(2272)(.33) d = 9758 - 4460 - 3022 = 2276

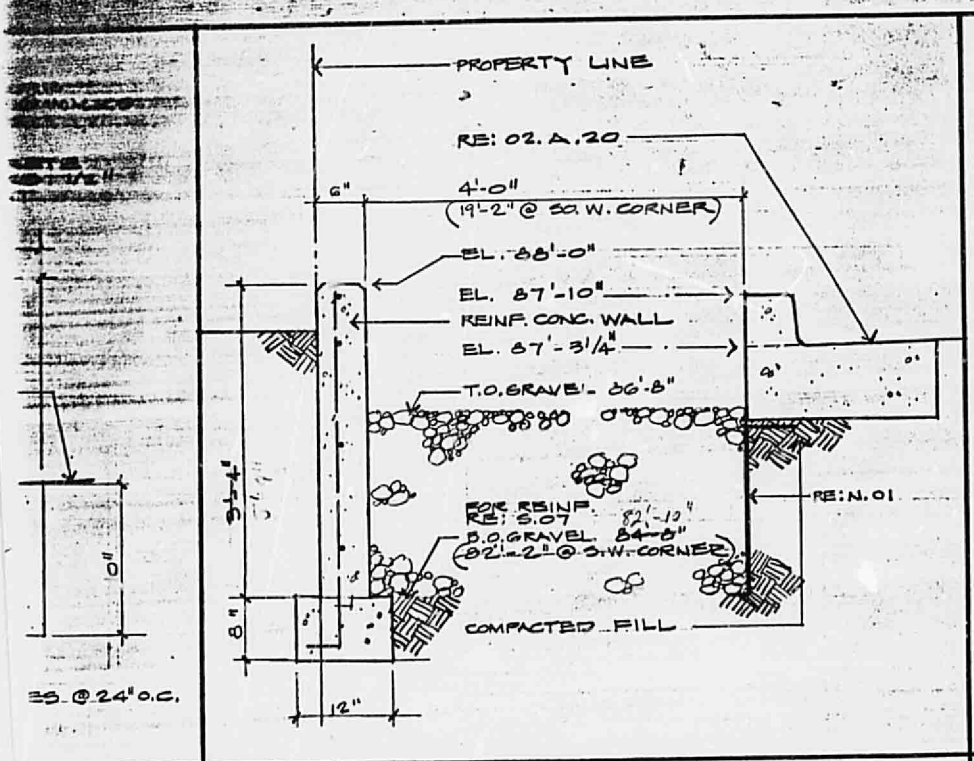
d = 3.79' or Gravel elevation = 86'-8" - 3'-10"
= 82'-10"

Note: Change - gravel depth to 3'-10" - on site plan
Change - B.o. Gravel to 82'-10" - on Dtl. 03A20
Change - Wall length from 3'-4" to 5'-9" - on Dtl. 03A20

Proj. Skaggs Page 1
By KGV Date 3/7/78
Chk. Date

CVA Cottrell/Vaughan & Associates Inc.
Engineers Architects





GUTTER

03. WATER RETENTION TRENCH
3/4" = 1' - 0"

0

Pond & Storage No. 2 – Vol. required – pg. 16 = 27,614 cf

Note site plan not to scale = controlling dimension is 81'-6" from property line to back of turn in curb

For long side pond – width

W = 81'-6" – 12'-6" – 44' = 25'-6" – 6" = 24'

L = 166' wide bed – 80' tapered = Total 246'

North pond – W = 16' x Avg length = 76'

Dtl – 05 A20 Applies – Contours on site plan are correct as to elevation but no plan

Gravel starts @ elev. 88 – slopes 1/1 to 86

hence bed width = 20' min – elev. 86 down – west side

= 16' – 4' = 12' – north

Top of Curbs = 88'-6"

Volumnes

Paved Area – contour 89 + 88'-6" – Avg width ≅ 20'

Avg length ≅ 210'

Vol. = ½ x 20 x 210 = 2100 cf.

North Pond

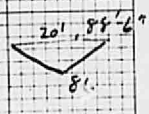
Vol = 88'-6" – 86 (Avg width = 12' + 4') (76') = 2660 cf.

West Pond

Vol. = 88'-6" – 86 (Avg width = 20' + 12') (166')

+ 88'-6" – 86 (½ x 20)(80')

= 11,130 cf



Vol. for gravel = 27,614 – 2100 – 2660 – 11,130

= 11,724 cf.

Bed areas – North = 76' x 12' = 912 } 5832

West = (166 + 80) x 20' = 4920

.8 (5832)(.33) d = 11,724 ⇒ d = 7.61' or 7'8"

Note: Change on dtl 05-A20 d = 7'8"

Add " " " 24' side pond – 16' north pond

Notes on site plan – water retention area N.T.S.

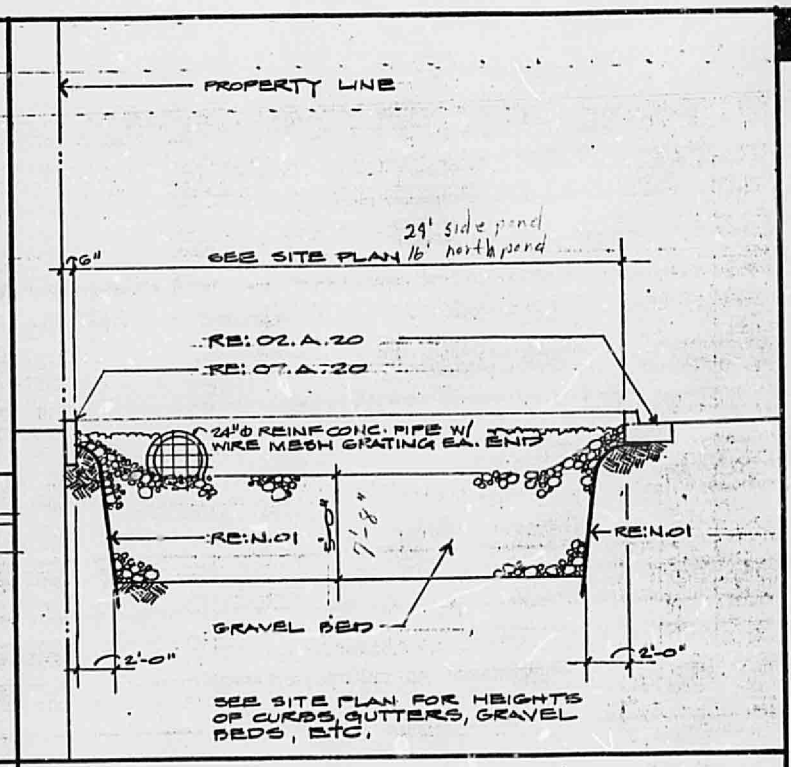
Use detail 05-A20 & Grave 7'8" deep.

Cottrell/Vaughan & Associates Inc.
Engineers — Architects

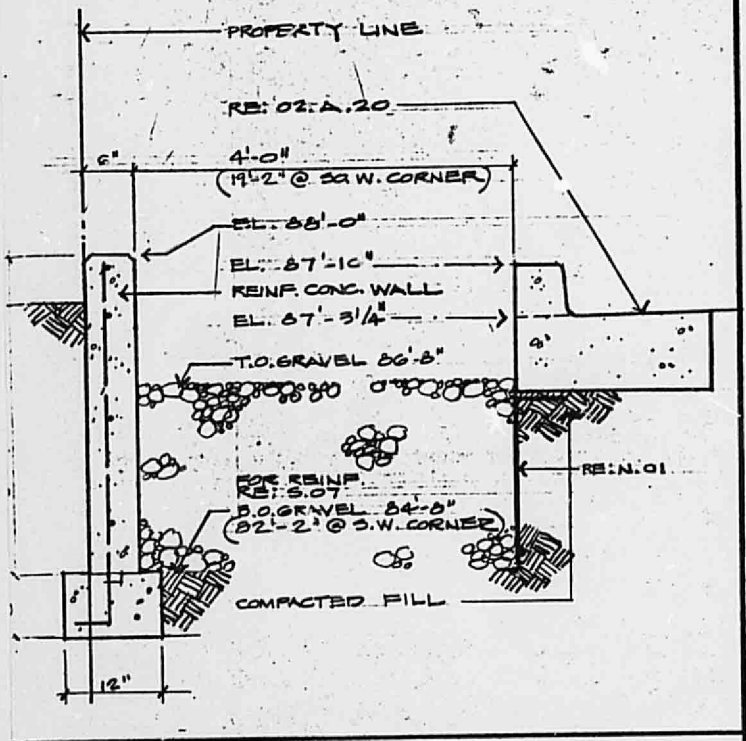
Proj. Sknaas Page 2

By RGV Date 3/7/78

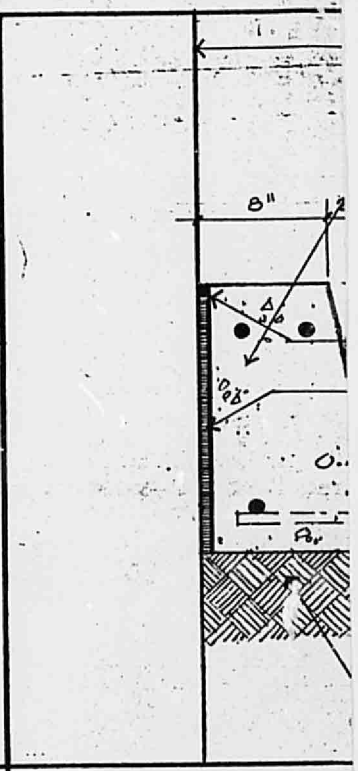
Chk. Date



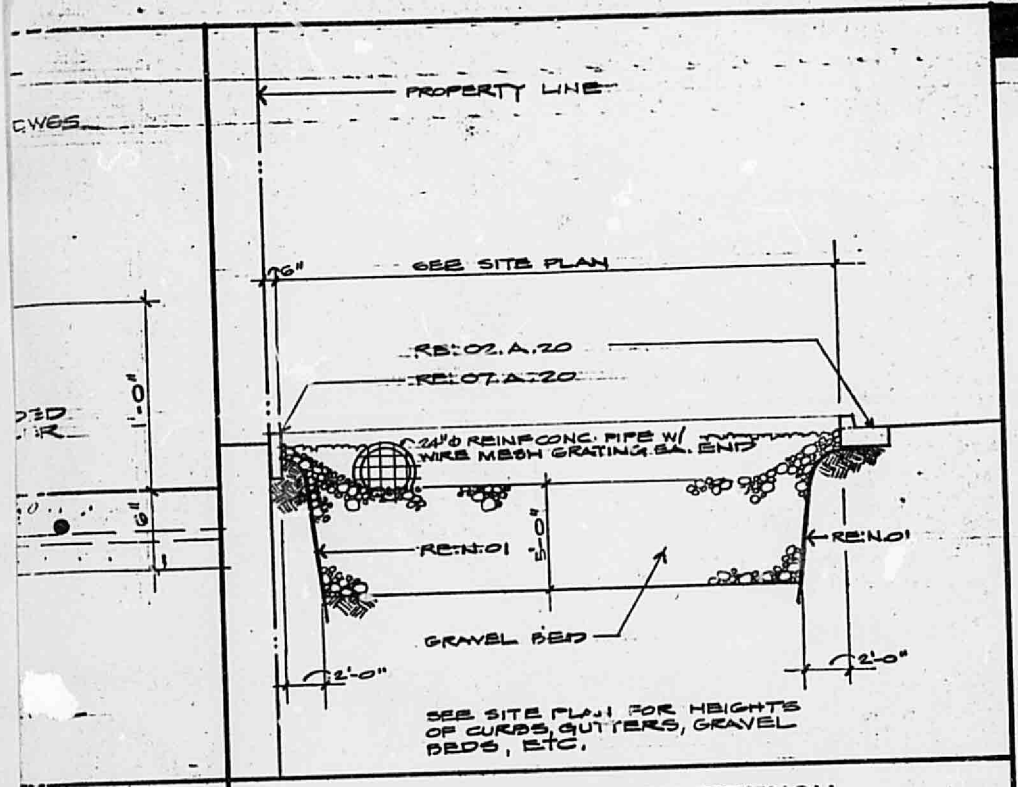
05. WATER RETENTION TRENCH
3/16" = 1'-0"



03. WATER RETENTION TRENCH
3/4" = 1'-0"



04. CURB AT
11/2" = 1'-0"



OCK

05. WATER RETENTION TRENCH

3/16" = 1'-0"

RECEIVED
FEB 22 1978
CITY ENGINEERS

DRAINAGE REPORT

FOR

THE PORTION OF THE VISTA GRANDE LAND CO. ADDITION
AT T10N, R3E, Sec. 2

WHICH IS THE SITE FOR THE
PROPOSED SKAGGS SHOPPING CENTER @ MONTGOMERY & SAN MATEO

NOVEMBER, 1977

PREPARED FOR

MR. STANLEY C. EVANS, ARCHITECT
2000 EMIGRATION CANYON
SALT LAKE CITY, UTAH 84108

PREPARED BY

COTTRELL/VAUGHAN & ASSOCIATES, INC.
4125 CARLISLE BLVD. N.E.
ALBUQUERQUE, NEW MEXICO 87107

COTTRELL / VAUGHAN & ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS

DRAINAGE REPORT

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TABLE OF CONTENTS

	PAGE
PURPOSE	1
LOCATION & PROJECT DESCRIPTION	1
HYDROLOGY	2
UNDEVELOPED CONDITIONS	2
DEVELOPED CONDITIONS	2

APPENDIX

CALCULATIONS

PLATES

PLATE I SITE DEVELOPMENT PLAN

DRAINAGE REPORT

FOR

THE PORTION OF THE VISTA GRANDE LAND CO. ADDITION
AT T10N, R3E, Sec. 2

WHICH IS THE SITE FOR THE
PROPOSED SKAGGS SHOPPING CENTER & MONTGOMERY & SAN MATEO

PURPOSE

The purpose of this study is to determine the storm drainage characteristics of the proposed site under existing conditions and after development. This study was made within the guidelines of the "Drainage Resolution 1972-2" as resolved by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMFCA). The requirements of the resolution direct that all new construction and improvements within the area must not increase the rate or volume of discharge of storm waters from the property above what exists before the development takes place.

LOCATION & PROJECT DESCRIPTION

This drainage study is for the portion of the Vista Grande Land Co. Addition which is the site for the proposed Skaggs Shopping Center at Montgomery and San Mateo. The proposed development consists of 6.74 acres (more or less) made up of open typical Albuquerque east mesa land with minimal vegetation.

The soil survey of Bernalillo County by U.S. Department of Agriculture indicates the site soil to be a gravelly fine sandy loam. The soil is moderately alkaline. Permeability is moderate in the upper 20 inches and very rapid below. The property is zoned C-2 and the development is expected to be accomplished within the established zoning guidelines.

The property is bounded by Montgomery Blvd. on the north, by San Mateo on the east, by a private road and undeveloped O-1 property on the south, and by undeveloped C-2 property on the west.

HYDROLOGY

The rational formula was used to determine peak flow rates resulting from the maximum storm which could be expected to occur within a 100 year period. Rainfall intensities were determined from the Intensity Duration Frequency Curves presented in the Master Plan of Drainage for the City of Albuquerque and its environs. Rainfall volumes were determined from the 100-year 6-hour precipitation map of Albuquerque.

UNDEVELOPED

The site currently has surface runoff from its eastern property line to its western property line. An east to west sloping earth swale which slopes approximately 2% is located at the northerly portion of the site. This swale collects a portion of the overland sheet flow and discharges the storm runoff onto the westerly properties via the swale at the northwest corner of the site. The remaining site runoff sheet flows from the site to the westerly properties uniformly over the western property line.

DEVELOPED CONDITIONS

Development plans include a 55,227 square foot building, approximately 217,880 square feet of asphalt pavement, and approximately 20,559 square feet of landscaping.

The developed site will be graded to uniformly slope at 2% from its eastern property line to the storm runoff retention basins located along the western property line. Storm runoff will essentially be by sheet flow into the retention basins.

The roof drainage of the south half of the building and the paved areas delineated on Sheet No. 11 of the analysis will drain into the southwest ponding area. This retention basin will pond water to elevation 88. The asphalt within contour 88 will have a maximum of 8" of standing water while the landscaped area will have a maximum of 2 feet of standing water. Additionally a 4 foot deep gravel storage bed within the landscaped areas will store approximately 2,245 cf. The total storage capacity of the southwest retention basin will be approximately 9,758 cf. Surplus runoff will uniformly overflow the west curb of the ponding basin at a maximum rate of 4.28 cfs.

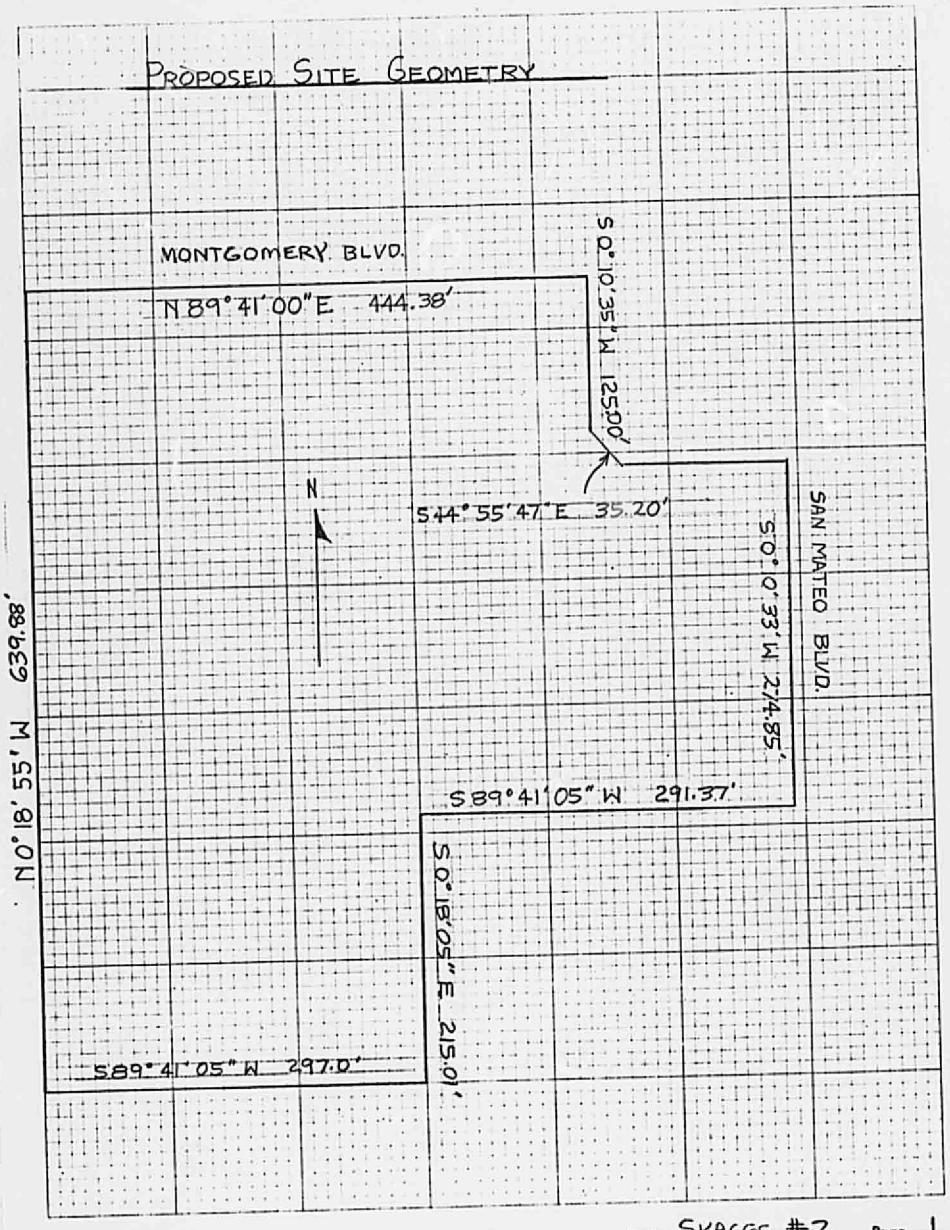
The north half of the building and the remaining paved and landscaped areas delineated on Sheet No. 11 of the analysis will drain into the northwest landscaped areas. The landscaped area will store a maximum of 2 feet of standing water and 4'-6" of additional water contained within a gravel storage bed. The total storage capacity of the northwest ponding areas is 27,614 cf. A 24" R.C.P. is to be installed between the ponding areas to allow discharge of the southerly area into the northerly retention basin. The northerly retention basin will then discharge approximately 12,228 cf of surplus runoff at a maximum rate of 10.47 cfs onto Montgomery Blvd. via curb cuts at the east end of the northerly retention basin. Additionally, a 6" bleeder pipe will be installed to slowly drain the 2 feet of standing water from the ponding areas into the curb storm inlet on Montgomery Blvd.

Curb cuts 6" wide at 10' o.c. will be installed in the retention basins' curbs adjacent to the uphill drainage areas to allow the runoff to enter the storage basin.

A fabric liner will be installed at the gravel storage beds to reduce erosion of the adjacent earth into the gravel storage bed. Use of the Marafi 140 fabric as manufactured by the Celanese Fibers Marketing Company is recommended. This fabric will reduce soil erosion while allowing infiltration of the storm water into the adjacent soil.

APPENDIX

CALCULATIONS



CVA Cottrell/Vaughan & Associates Inc.
Engineers — Architects

Proj. SKAGGS #2 Page 1
By D.L.P. Date Nov 1977
Chk. Date

CALCULATION OF AREAS BY COORDINATES

CALCULATE PAVED AREAS + LANDSCAPED AREAS

POINT	DISTANCE	BEARING	NORTH + SOUTH -	EAST + WEST -	COORDINATES X	COORDINATES Y	DOUBLE AREA
SW CORNER					100.00	101.64 100.00	-63823
NW CORNER	639.88	N 00°-18'-55"W	+639.87	-3.52	96.48	739.87	-61972
NE CORNER	444.38	N89°-41'-00"E	+ 2.46	+444.37	540.85	742.33	+66276
	125.00	S00°-10'-33"W	-125.00	-0.38	540.47	617.33	+81027
	35.20	S41°-55-47 E	-24.92	+24.86	565.33	592.41	+13698
	125.01	N89°-41-00 E	+0.69	+125.01	690.34	593.10	+189264
	274.85	S0°-10-33 W	-274.85	-0.84	689.50	318.25	+190612
SE COR	291.37	S89°-41-05 W	-1.60	-291.37	398.13	316.65	+86239
	215.01	S00°-18-05 E	-215.01	+1.13	397.00	101.64	+86010
	297.0	S89°-41-05 W	-1.63	-297.00		100.00	
SW CORNER							

DOUBLE AREA = 587331
÷ 2
293666 SF
÷ 43560
6.74 ACRES

Proj. SKAGGS #2 Page 2
By D.L.P Date Nov 1977
Chk. Date

CVA Cottrell/Vaughan & Associates Inc.
Engineers Architects

CALCULATION OF AREAS

CALCULATE BLDG AREA

BLDG AREA = 55227 SF

CALCULATE LANDSCAPED AREA

$A_1 = 5 \times 295 = 1475$
$= 15 \times 10 \times 0.5 = 75$
$A_2 = 20 \times 245 = 4900$
$A_3 = 78 \times 30 = 2340$
$A_4 = 160 \times 9 = 1440$
$= (4+13) \times 0.5 \times 20 = 170$
$= 15 \times 20 \times 0.5 = 150$
$A_5 = 130 \times 9 = 1170$
$= (4+13) \times 0.5 \times 20 = 170$
$= 11 \times 20 \times 0.5 = 110$
$= 12 \times 20 = 240$
$= 20 \times (20+9) \times 0.5 = 290$
$= 5 \times 116 = 580$
$= 25 \times (35+20) \times 0.5 = 688$
$= (22+8) \times 0.5 \times 25 = 500$
$= 8 \times 125 = 1000$
$= 40 \times 5 = 700$
$= 15 \times 20 \times 0.5 = 150$
$A_6 = 5 \times 92 = 460$
$= 20 \times 0.5 \times (2+12) = 140$
$= (23+10) \times 0.5 \times 20 = 330$
$A_7 = 37 \times 17 = 629$
$= 31 \times 92 = 2852$

20559 SF

CALCULATE PAVED AREAS

PAVEMENT AREA = 293666 SF − 55227 SF − 20559 SF = 217880 SF

CALCULATION OF AREAS

CALCULATE DRAINAGE AREA #1

DRAINAGE AREA #1 = 315 × 297 − 1790 = 91765 SF

LANDSCAPED AREA IN D.A. #1 = 5×295 + 10×15×0.5 = 1400 SF

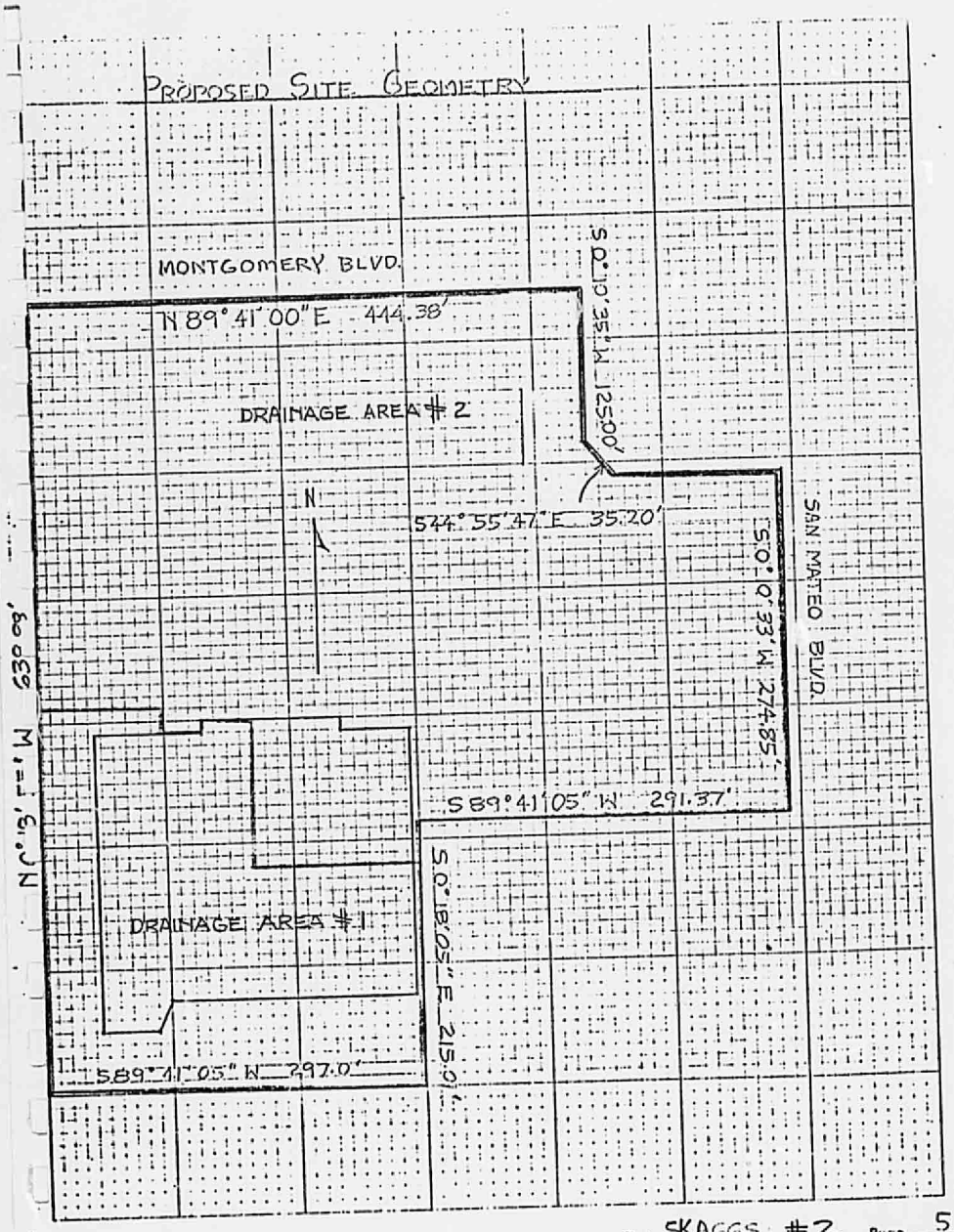
PAVING + BLDG AREA IN D.A #1 = 90365 SF

CALCULATE DRAINAGE AREA #2

DRAINAGE AREA #2 = 293666 − 91765 = 201901 SF

LANDSCAPED AREA IN D.A. #2 = 20559 − 1400 = 19159 SF

PAVING + BLDG AREA IN D.A. #2 = 182742 SF



Proj. SKAGGS #2 Page 5

By D.L.P. Date Nov 1977

CVA Cottrell/Vaughan & Associates Inc.
Engineers — Architects

ANALYSIS

SITUATION:

1. THE EXISTING SITE CONSISTS OF 6.74 ACRES OF OPEN TYPICAL ALBUQUERQUE EAST MESA LAND WITH MINIMAL VEGITATION. THE EXISTING TOPOGRAPHY IS RELATIVELY FLAT SLOPING FROM EAST TO WEST AT APPROXIMATELY 2%

2. THE DEVELOPED SITE WILL CONSIST OF A 55,227 SF SKAGGS SUPERCENTER, APPROXIMATELY 20559 SF OF LANDSCAPING AND APPROXIMATELY 217,880 SF OF ASPHALT PAVEMENT. THE FINAL TOPOGRAPHY WILL REMAIN RELATIVELY FLAT WITH AN APPROXIMATE 2% SLOPE FROM EAST TO WEST

ANALYSIS METHOD:

1. USING THE RATIONAL FORMULA $Q = C i A$

WHERE Q = RUNOFF RATE

C = RUNOFF COEFFICIENT = $\frac{\text{RUNOFF}}{\text{RAINFALL}}$

i = RAINFALL INTENSITY

SURFACE	C
CONC & ASPHALT	0.95
ROOFS	0.95
UNDEVELOPED	0.45
GRASS	0.4

ANALYSIS UNDER EXISTING CONDITIONS

ANALYSIS:

A. DETERMINE i & VOLUME

1. FROM THE 100 YR – 6 HOUR PRECIPITATION MAP

TOTAL RAINFALL ≈ 2.45"

2. CALCULATE TIME OF CONCENTRATION T_c = DURATION & RATE (Q)

a.) FOR DRAINAGE AREA #1 THE LONGEST FLOW PATH IS APPROX. 310' OF SHEET FLOW AT 2.2%

FROM THE NOMOGRAPH (SEE LYE) FOR SHEET FLOW, THE TIME OF CONCENTRATION ≈ 11.0 MINUTES

FROM THE INTENSITY-DURATION CURVE

$i = 5.3$ INCHES/HR.

THEREFORE $Q = \frac{91765}{43560} \times 0.45 \times 5.3 = 5.02$ CFS

b.) FOR DRAINAGE AREA #2 THE LONGEST FLOW PATH IS AT THE NORTH CENTRAL SECTION OF THE SITE WHICH TRAVERSES 620'± AND FALLS 12'± IN ELEVATION. SLOPE = 12/620 = 2.0%

FROM THE NOMOGRAPH (SEE LYE) FOR SHEET FLOW THE TIME OF CONCENTRATION ≈ 15 MINUTES.

FROM THE INTENSITY-DURATION CURVE

$i = 4.7$ INCHES/HR

THEREFORE $Q = \frac{201901}{43560} \times 0.45 \times 4.7 = 9.8$ CFS

SUMMARY OF EXISTING CONDITIONS

DESCRIPTION	AREA	C	RAINFALL	TOTAL VOL.	RUNOFF VOL.	EVAP & INFILT	RATE Q
DRAINAGE AREA #1	91765	0.45	2.45	18735	8431	10304	5.02
DRAINAGE AREA #2	201901	0.45	2.45	41221	18549	22672	9.8
	293666 SF			59956 cf	26980 cf	32976 cf	14.82 CFS

ANALYSIS UNDER PROPOSED CONDITION

ANALYSIS:

A. DETERMINE i & VOLUME

1. FROM 100 YR. - 6 HOUR PRECIPITATION MAP

TOTAL RAINFALL ≈ 2.45"

2. CALCULATE TIME OF CONCENTRATION (T_c) - DURATION & RATE (Q)

a.) FOR DRAINAGE AREA #1 THE LONGEST FLOW PATH IS SHEET FLOW OVER THE ROOF AT 2% TO THE SOUTHEAST CANALYE THEN 297' OVER ASPHALT AT 2% SLOPE TO THE PONDING AREA

FROM THE NOMOGRAPH (SEELYE) FOR SHEET FLOW, THE TIME OF CONCENTRATION ≤ 10 MIN (USE T_c = 10 MIN)

FROM THE INTENSITY-DURATION CURVE FOR T_c = 10 MIN

$i = 5.4$ INCHES/HOUR

THEREFORE $Q = \frac{90365}{43560} \times 0.95 \times 5.4 + \frac{1400}{43560} \times 0.45 \times 5.4 = 10.7$ CFS

b) FOR DRAINAGE AREA #2 THE LONGEST FLOW PATH IS AT THE CENTER OF THE SITE. THIS PATH IS APPROX 590' LONG WITH A ELEVATION DROP OF APPROX 11'. SLOPE = $\frac{11}{590}$ = 1.9%

FROM THE NOMOGRAPH (SEELYE) FOR SHEET FLOW OVER PAVEMENT, THE TIME OF CONCENTRATION ≈ 7.6 MINUTES (∴ USE T_c = 10 MINUTES)

FROM THE INTENSITY-DURATION CURVE FOR T_c = 10 MINUTES

$i = 5.4$ INCHES/HOUR

THEREFORE $Q = \frac{182742}{43560} \times 0.95 \times 5.4 + \frac{19159}{43560} \times 0.45 \times 5.4 = 22.6$ CFS

SUMMARY OF PROPOSED CONDITIONS

DESCRIPTION	AREA	C	RAINFALL	TOTAL VOL.	RUNOFF VOL.	EVAP & INFILT	RATE Q
DRAINAGE AREA #1	1400 90365	0.45 0.95	2.45" 2.45	286 184450	129 175527	157 923	10.7 CFS
DRAINAGE AREA #2	19159 182742	0.45 0.95	2.45 2.45	3912 37310	1760 35444	2152 1866	22.6 CFS
				59958	54860	5098	33.3

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Proj. SKAGGS #2 Page 8

By D. L. P. Date NOV 1977

Chk. Date

ADJUSTMENT TO DRAINAGE AREAS

DRAIN THE NORTHWEST QUADRANT OF THE BLDG. ROOF INTO THE NORTHWEST SITE PONDING AREA. (SEE SHEET NO.)

THIS CHANGE INVOLVES 13600SF. THIS AREA CHANGES FROM A RUNOFF COEFFICIENT OF 0.45 TO 0.95.

CHANGES TO EXISTING ANALYSIS

$Q = \frac{13600}{43560} \times 0.45 \times 5.3 = \langle 0.74 \text{ CFS} \rangle$ FOR DR. AREA 1 "BEFORE"

$Q = \frac{13600}{43560} \times 0.45 \times 4.7 = 0.66 \text{ CFS}$ FOR DR. AREA 2 "BEFORE"

$Q = \frac{13600}{43560} \times 0.95 \times 5.4 = \langle 1.6 \text{ CFS} \rangle$ FOR DR. AREA 1 "AFTER"

$Q = \frac{13600}{43560} \times 0.95 \times 5.4 = 1.6 \text{ CFS}$ FOR DR. AREA 2 "AFTER"

NEW PONDING VOLUMES REQ'D

FOR DRAINAGE AREA #1 FOR $Q < 5.02 - 0.74 = 4.28$ CFS

$$\therefore i = \frac{4.28}{\left(\frac{1400 \times 0.45 + 76765 \times 0.95}{43560}\right)} = 2.53$$

FROM INTENSITY-DURATION CURVE FOR $i \leq 2.53$ INCHES/HR IMPLIES $T_c \geq 48$ MIN

$\therefore T_{PONDING} = 48 - 10 = 38$ MIN

VOLUME OF POND REQ'D $= 38 \times 4.28$ CFS $\times 60 = 9758$ CF

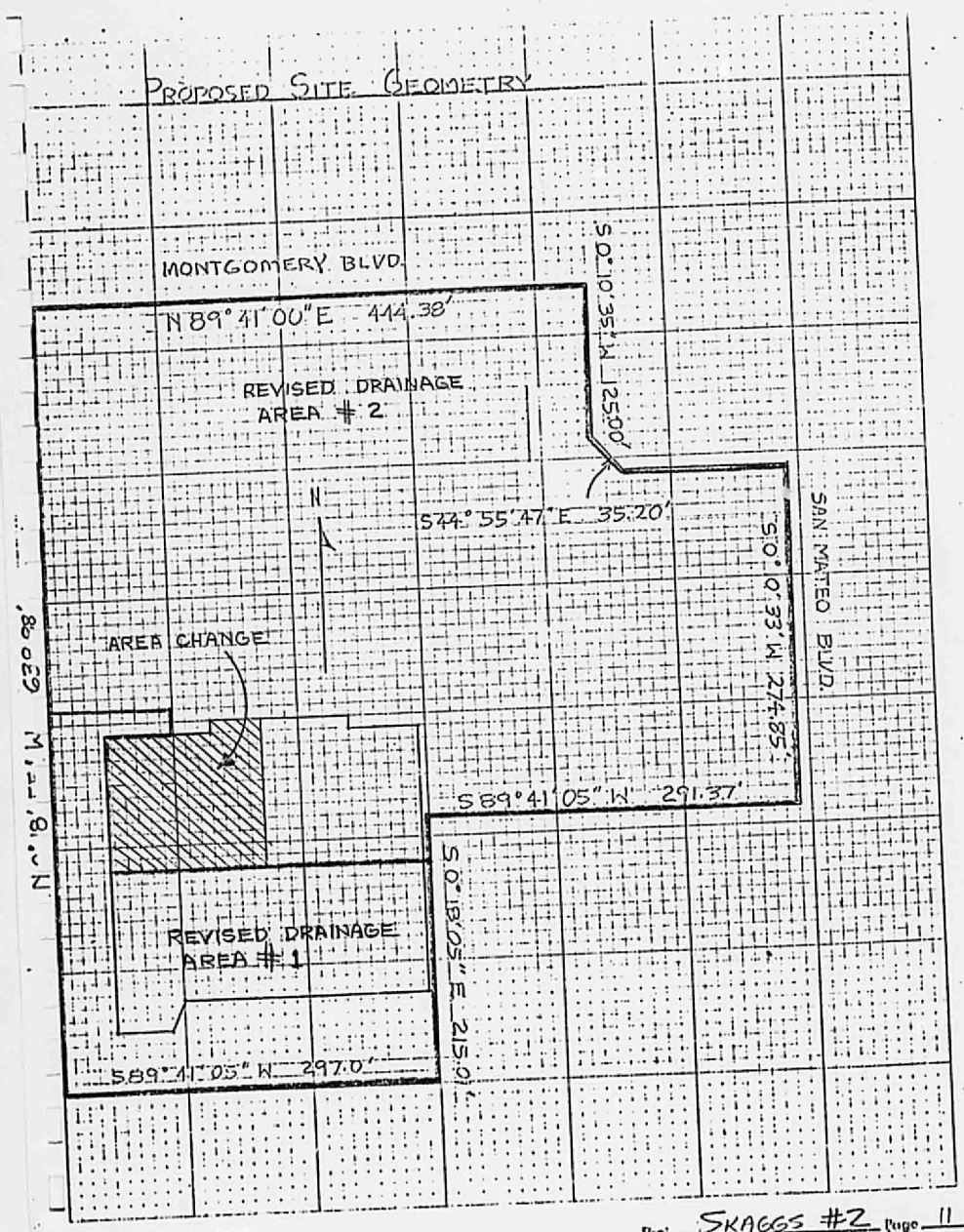
FOR DRAINAGE AREA #2 FOR $Q < 9.8 + 0.66 = 10.46$ CFS

$$\therefore i \leq \frac{10.46}{\left(\frac{19159 \times 0.45 + 196342 \times 0.95}{43560}\right)} = 2.34 \text{ INCHES/HOUR}$$

FROM INTENSITY-DURATION CURVE FOR $i < 2.34$ INCHES/HOUR IMPLIES $T_c \geq 54$ MINUTES

$\therefore T_{PONDING} = 54 - 10 = 44$ MINUTES

VOLUME OF POND REQ'D $= 44$ MIN $\times 10.46 \times 60 = 27614$ CF



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Proj. SKAGGS #2 Page 11
By D. L. P. Date Nov 1977

SUMMARY OF EXISTING VS. PROPOSED CONDITION

			EXISTING					PROPOSED				
DESCRIPTION	AREA	RAIN-FALL	C	TOTAL VOL.	RUNOFF VOL.	EVAP & INFILT.	RATE	C	TOTAL VOL.	RUNOFF VOL.	EVAP & INFILT	RATE
	S.F.	INCHES		C.F.	C.F.	C.F.	C.F.S		C.F.	C.F.	C.F.	CFS.
DRAINAGE AREA #1.												
LANDSCAPED	1400	2.45	0.45	286	129	157		0.45	286	129	157	
PAVED/BLDG	90365	2.45	0.45	18450	8303	10147	5.02	0.95	18450	17527	923	10.7
AREA CHANGE	<3600>	2.45	0.45	<2777>	<1250>	<527>	<0.74>	0.95	<2777>	<2638>	<139>	<1.6>
PONDING										<9758>	9758	<4.82>
SUBTOTAL	78165			15959	7182	8777	4.28		15959	5260	10699	4.28
DRAINAGE AREA #2												
LANDSCAPED	19159	2.45	0.45	3912	1760	2152		0.45	3912	1760	2152	
PAVED/BLDG	182742	2.45	0.45	37310	16790	20520	9.8	0.95	37310	35444	1866	22.6
AREA CHANGE	13600	2.45	0.45	2777	1250	1527	0.66	0.95	2777	2638	139	1.6
PONDING										<27614>	27614	<13.74>
SUBTOTAL	215501			43999	19800	24199	10.46		43999	12228	31771	10.46
TOTAL	293666			59958	26982	32976	14.74		59958	17488	42470	14.74

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Proj. SKAGGS #2 Page 12
By D. L. P. Date NOV. 1977
Chk. _____ Date _____

CALCULATION OF PONDING VOLUMES

DRAINAGE AREA #1

LANDSCAPED AREA = 23 × 64 + 4 × 154 = 2088 SF

AREA WITHIN CONTOUR 88 = 32 × 222 = 7104 SF

VOLUME FROM PONDING 8" WATER WITHIN CONTOUR 88 = 7104 × $\frac{8}{12}$ = 4736 CF

VOLUME FROM PONDING ADDITIONAL OF WATER IN LANDSCAPED AREAS
= 2088 × 1.33 = 2777 CF

REQ'D STORAGE IN GRAVEL STORAGE BED = 9758 − 4736 − 2777 = 2245 CF

∴ REQ'D DEPTH OF GRAVEL BED = $\frac{2245 \text{ CF}}{0.8 \times 2396 \times \frac{1}{3}}$ = 3.52 FT

∴ USE A 4' DEEP GRAVEL STORAGE BED

DRAINAGE AREA #2

LANDSCAPED AREA = 246 × 24 + 30 × 77 = 8214 SF

VOLUME OF WATER STORED BY PONDING OF WATER OVER
GRAVEL STORAGE BED = 0.9 × 8214 × 2.5 = 18482 CF

REQ'D STORAGE IN GRAVEL STORAGE BED = 27614 − 18482 = 9132 CF

∴ REQ'D DEPTH OF GRAVEL BED = $\frac{9132}{0.8 \times 8214 \times \frac{1}{3}}$ = 4.17 FT

∴ USE A 4'6" DEEP GRAVEL STORAGE BED

POND DISCHARGE SCHEME

PONDING AREA #1 DISCHARGES ITS SURPLUS RUNOFF UNIFORMLY OVER THE TOP OF CURB SET AT ELEV 88.

PONDING AREA #2 HAS TWO PONDS. THE POND RUNNING ALONG THE WEST BOUNDARY HAS AN OVERFLOW PIPE TO THE NORTHWEST PROPERTY CORNER POND. THIS PIPE IS A 24" ϕ REINF. CONC. PIPE AT A SLOPE OF 0.007 % WITH A DISCHARGE CAPACITY OF 15 CFS SEE PIPE CAPACITY CHART "SEEYLE: DESIGN DATA BOOK FOR CIVIL ENGINEERS".

THE DISCHARGE OF 14.74 CFS FROM THE NW PROPERTY CORNER POND TO THE STREET GUTTER FLOW LINE WILL BE ACCOMPLISHED VIA 6" x 12" CURB CUTS AT ELEV 87.5 IN THE EAST CURB OF SAID POND. THE DISCHARGED WATER WILL THEN FLOW ONTO MONT. BLVD. AND INTO THE STORM SEWER VIA THE EXISTING CURB INLETS. A 6" ϕ BLEEDER PIPE WILL BE INSTALLED TO DISCHARGE INTO THE EXISTING CURB INLET BOX TO SLOWLY DRAIN THE PONDS OF STANDING WATER.

PLATES

PLATE I SITE DEVELOPMENT PLAN

DRAINAGE REPORT
for
DEL NORTE PLAZA SHOPPING CENTER
in
ALBUQUERQUE, NEW MEXICO

Prepared by
A & E Engineering

DRAINAGE REPORT
FOR
DEL NORTE PLAZA SHOPPING CENTER

PREPARED FOR:

DYER McCLERNON ARCHITECTS PLANNERS
6320 D Linn, N.E.
Albuquerque, New Mexico

PREPARED BY:

A & E ENGINEERING, INC.
5823 Lomas, N.E.
Albuquerque, New Mexico
June, 1974

Theodore M. Conrardy
P.E. & L.S. No. 2933

REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
No. 2933
NEW MEXICO
T. M. CONRARDY

A&E ENGINEERING INC.
CIVIL ENGINEERING, LAND PLANNING, AND SURVEYING

July 3, 1974

Mr. Pat McClernon
Dyer-McClernon Architects Planners
6320 Linn, N.E.
Albuquerque, New Mexico

Dear Mr. McClernon:

We are submitting this Drainage Report to you on the Del Norte Plaza Shopping Center. The control of the runoff shall comply with the requirements of the Albuquerque Metropolitan Arroyo Flood Control Authority and with present City of Albuquerque policies.

We do appreciate this opportunity to serve you. If any questions develop, we will be available to assist you in your response.

Sincerely,

A&E ENGINEERING, INC.

John F. Esquibel

John F. Esquibel jg

JFE:jg

4100 SILVER S.E. ALBUQUERQUE, NEW MEXICO 87108 505/266-8791

TABLE OF CONTENTS

	PAGE
General	i
Location and Description	1
Development	1
Proposed Onsite Drainage Plans	2
Undeveloped Runoff Calculations	2
Developed Runoff Calculations	3
Onsite Drainage Calculations	3
Conclusion	5

Plates
Location Plan
Ponding Detail
Drainage Plan

GENERAL

This report consists of a hydrologic study of a probable 100-year storm affecting this proposed development being within Block A of the Vista Grande Addition, Unit One, City of Albuquerque and referred to herein as the Del Norte Plaza.

LOCATION AND DESCRIPTION

The Del Norte Plaza parcel is a proposed development of 9.5 acres as a shopping center situated in the Northeast 1/4 of Section 2, Township 10 North, Range 3 East, N.M.P.M., being a portion of Lots 2, 3, 4, and 6 in Block "A" of Vista Grande Addition, Unit One, to the City of Albuquerque, designated on a plat filed in the office of the County Clerk of Bernalillo County, New Mexico on January 31, 1963. The development is located along the south side of Montgomery Boulevard, N.E. between Monroe Street, N.E. and San Mateo Blvd. N.E.

Since the natural terrain slopes westerly, southwesterly and the development parcel is bounded on the north and east by Montgomery and San Mateo Boulevards, there is no offsite contributing drainage.

DEVELOPMENT

This parcel of land is to be developed into a shopping center beginning with an Albertson's Food Center, Store No.837. The area will be paved, landscaped, and ponding depressions constructed so that the volume of water ponded will exceed the increased volume runoff resulting from the development. The architect has designed the roofs to drain the water onto the parking area and ponding areas.

PROPOSED ONSITE DRAINAGE PLANS

The shopping center's area is proposed to be graded so that the total drainage area will be divided into four drainage areas. These drainage areas, "A" through "E", sheet flow across the paved parking lot into ponding depressions on the north and west side of the development as can be seen on the Drainage Plan. The sheet flow generated onsite is conveyed to the ponding depressions by 10' wide by 1' deep paved swales within the 16 parking areas.

The entire 9.50 acres of the development is considered as the total drainage area. There are some planter areas within the development which are designed to retain the amount of flow generated within these limits as well as pond some of the sheet flow that is generated within the site.

We can assume that 90% of the total area (9.5 acres) will produce or cause to generate sheet flow. Therefore, 9.50 acres x .90 = 8.6 acres will generate the total amount which must be controlled.

The following calculations for runoff will determine the amount of runoff that will be contained by ponding and the total amount which may sheet flow off into the street.

UNDEVELOPED RUNOFF CALCULATIONS

Perculation factor	40%
Undeveloped area (acres)	9.5 acres
The 100-year 6 hour precipitation factor for subject area	2.5 in.
Runoff factor	60%
Runoff	51,727 cu. ft.

$$\left(9.5 \text{ acres} \times \frac{43{,}560 \text{ sq ft}}{1 \text{ acre}} \times \frac{2.5 \text{ in}}{1 \text{ hr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times 0.60 = 51{,}727 \text{ cu ft}\right)$$

DEVELOPED RUNOFF CALCULATIONS

Perculation factor	10%
Area generating runoff	9.5 acres
The 100-year 6 hour precipitation factor for subject area	2.5 in.
Runoff factor	90%
Runoff	77,591 cu. ft.

$$(9.5 \text{ ac.} \times \frac{43{,}560 \text{ sq ft.}}{1 \text{ ac.}} \times \frac{2.5 \text{ in.}}{1 \text{ hr.}} \times \frac{1 \text{ ft.}}{12 \text{ in.}} \times 0.90 = 77{,}591 \text{ cu.ft.})$$

Additional runoff due to the development is equal to 25,864 cu. ft. (77,591 cu. ft. - 51,727 cu. ft.)

The additional runoff that will be generated by this development shall be contained by ponding depressions within the limits of this development.

ONSITE DRAINAGE CALCULATIONS

The following calculations will determine the amount for each of the onsite drainage areas "A" through "E", respectively. These computations will determine the size of the ponding depressions for each respective drainage area.

Drainage Area "A":

Developed area generating runoff	1.9 acres
100 year in/hr precipitation factor for subject area	2.5 in/hr
Undeveloped runoff factor	60%
Developed runoff factor	90%
Undeveloped runoff	10,346 cu. ft.

$$(1.9 \text{ ac} \times \frac{43{,}560 \text{ sq ft}}{1 \text{ acre}} \times \frac{2.5 \text{ in}}{1 \text{ hr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times 0.60 = 10{,}345 \text{ cu.ft.})$$

Developed Runoff	15,518 cu. ft.

$$(1.9 \text{ ac} \times \frac{43{,}560 \text{ sq ft}}{1 \text{ acre}} \times \frac{2.5 \text{ in}}{1 \text{ hr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times 0.90 = 15{,}518 \text{ cu.ft.})$$

Runoff (15,518 - 10,346)	5,172 cu. ft.

Drainage Area "A" continued:

The pond size shall be as per plan and detail as shown in this report.

Depth of Pond	3.0'
Side of Slopes	3:1
Length of Pond	120'
Width of Pond	25'
Total Capacity	5,330 cu. ft.

Drainage Area "B" and "C":

Developed area generating runoff	1.3 acres
100 year in/hr precipitation factor for subject areas	2.5 in/hr
Undeveloped runoff factor	60%
Developed runoff factor	90%
Undeveloped runoff	7,079 cu. ft.
Developed runoff	10,618 cu. ft.
Runoff (10,618 - 7,079)	3,539 cu. ft. (Each area)
Total runoff for Area "B" & "C"	7,078 cu. ft.

The pond size shall be as per plan and detail as shown in this report.

Depth of Pond	2.5'
Side Slopes	3:1
Length of Pond	240'
Width of Pond	22'
Total Capacity	8,700 cu. ft.

Drainage Area "D":

Developed area generating runoff	2.1 acres
100 year in/hr precipitation factor for subject area	2.5 in/hr
Undeveloped runoff factor	60%
Developed runoff factor	90%
Undeveloped Runoff	11,435 cu. ft.
Developed Runoff	17,152 cu. ft.
Runoff (17,152 - 11,435)	5,717 cu. ft.

Drainage Area "D": continued

The pond size shall be as per plan and detail as shown in this report.

Depth of Pond	3.0'
Side Slopes	3:1
Length of Pond	140'
Width of Pond	25'
Total Capacity	6,300 cu. ft.

Drainage Area "E":

Developed area generating runoff	2.9 acres
100 year in/hr precipitation factor for subject area	2.5 in/hr
Undeveloped runoff factor	60%
Developed runoff factor	90%
Undeveloped Runoff	15,791 cu. ft.
Developed Runoff	23,686 cu. ft.
Runoff (23,686 - 15,791)	7,895 cu. ft.

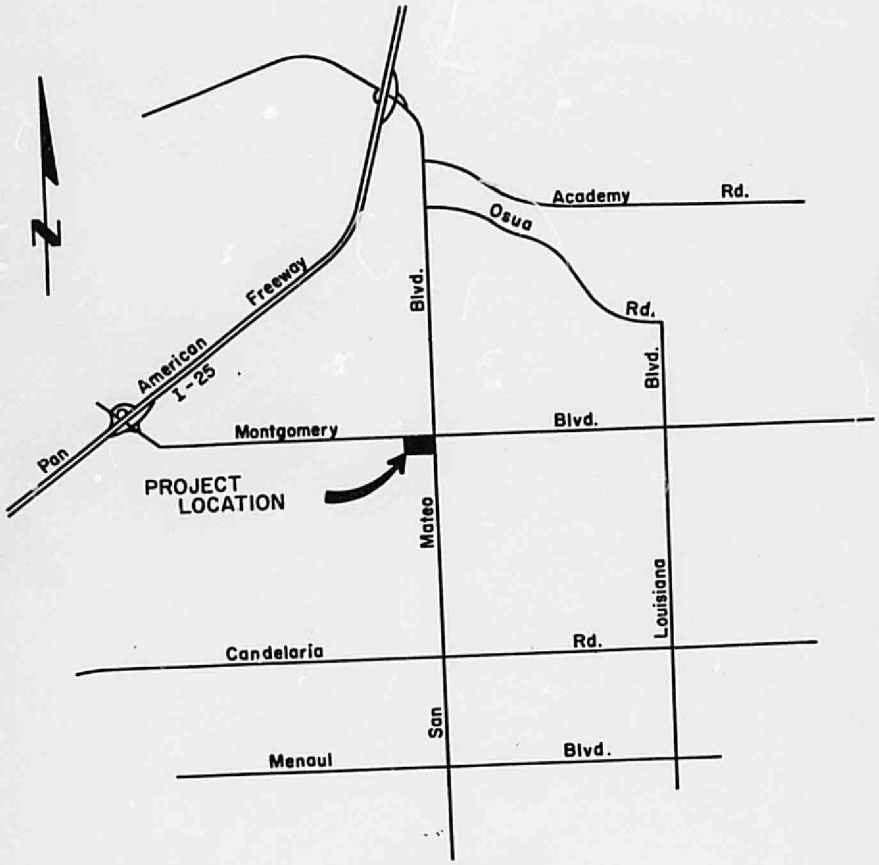
The pond size shall be as per plan and detail as shown in this report.

Depth of Pond	3.0'
Side Slopes	3:1
Length of Pond	175'
Width of Pond	35'
Total Capacity	11,025 cu. ft.

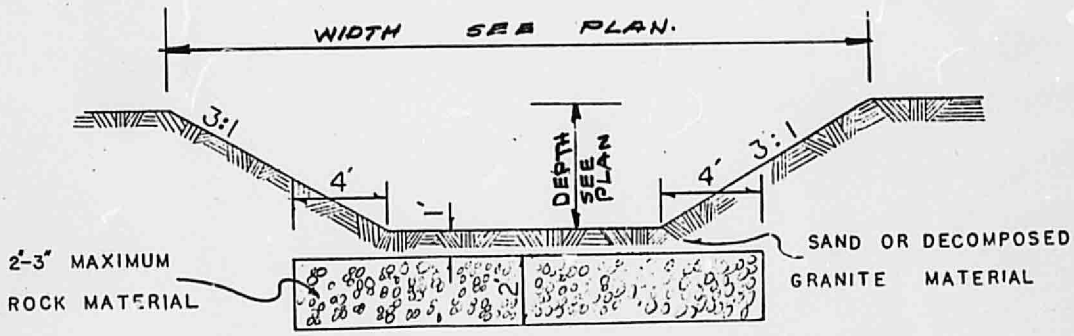
CONCLUSION

The total amount of runoff that has been generated due to the development of this parcel of land is 25,862 cu. ft., and the total amount of runoff that will be ponded and contained onsite is 31,355 cu. ft.

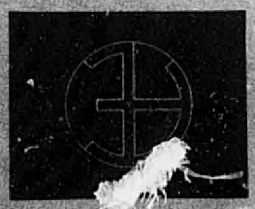
Therefore, the runoff after development will be less than the runoff before development.



LOCATION MAP



PONDING CROSS SECTION

NO SCALE

PONDING DETAIL TYPE