HYDROLOGY L20/D1 TWO PLANS

L20/D1

2 PLANS

DESIGN PROFESSIONALS, INC.
4125 CARLISLE, NE, ALBUQUERQUE, N.M 87107 (505) 881-6336

Date June 28, 1977 Project No. 7707.6
Project WA-CO OFFICE & WAREHOUSE

To: City Hydrology Department
City of Albuquerque

Attention: Fred Agara

☑ Transmittal
☐ Memorandum
☐ Shop Drawing No.
Quantity

Attached are three copies of the revised site plan for the above project indicating top of curb elevations proposed for Southern, S.E. As can be seen, our original grading plan & drainage report tie in very well with the proposed top of curb elevations.

Please advise if you have any questions

Signed: Richard A. Allen, PE

cc: File: 7707.6

ARCHITECTS / ENGINEERS

DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD, NE/ALBUQUERQUE, NEW MEXICO 87107/(505) 881-6336

January 11, 1980

Mr. Fred Aguirre
City of Albuquerque Drainage Department
Post Office Box 1293
Albuquerque, New Mexico 87103

SUBJECT: Drainage for WA-CO Heating and Air Conditioning Facility
600 Moon, SE
Albuquerque, New Mexico

Dear Aguirre:

The owner of the subject property herein agrees to modify the on-site drainage ponds in order to comply with the basic intent of the original drainage report accepted by your office. Design Professionals, Inc. will prepare a revised ponding layout which will reflect modifications discussed with you per telecon on January 11, 1980 and will submit same to you for approval. This submittal will reflect the final as-built conditions of the ponds. The revised ponds will, when constructed by the owner, retain the volumes of run-off stated in DPI's original drainage report.

It is understood that the agreement on the part of the owner to modify the ponds in accordance with DPI's recommendations will suffice to cause removal of your department's objection to the issuance of a final Certificate of Occupancy for the subject project.

I will personally present and discuss the subject modifications with you as soon as the revised drawing is completed.

Please advise if you have any questions.

Sincerely,

DESIGN PROFESSIONALS, INC.

Richard H. Allen

RICHARD H. ALLEN, P.E.
Vice President

RHA:ch

ACCEPTED BY: _____
ROBERT UNTHANK, President
WA-CO Heating and Air Conditioning

ACCEPTED BY: Fred Aguirre
FRED AGUIRRE
City of Albuquerque Drainage Department

ARCHITECTS/ENGINEERS

GEORGE H. BOLLING
ROBERT L. ROCHELEAU
JOHN PETER VARSA

RICHARD H. ALLEN
HOWARD S. COTTRELL
RICHARD G. VAUGHAN

Revisions to Ponds @ S.W. corner.

• Triangular section

Original Vol. contained ≅ 616 CF

Assume 1.5' of water above gravel.

$V_w = 15'(8')(1.5') = 180$ CF

Areas on Nicon. and Southern are larger than originally drawn:

(original vol.) (extra capacity)

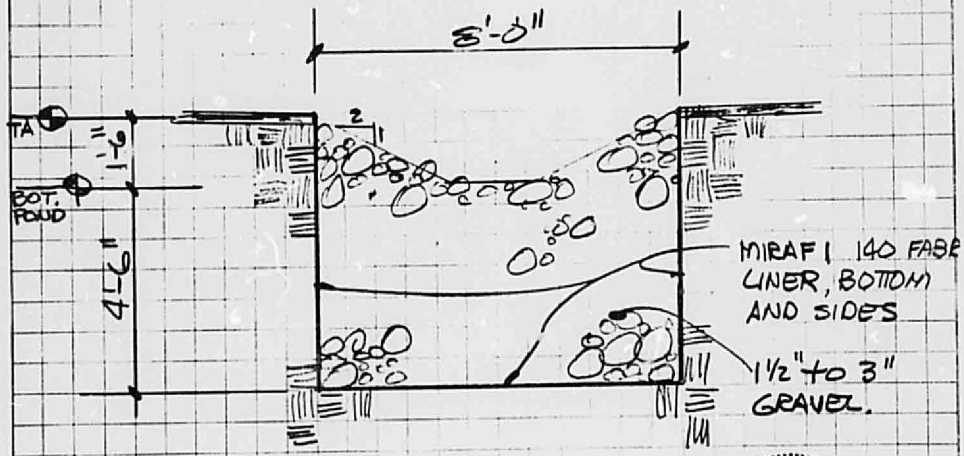
Areas = $[95(7) + 62(7)](1/2)(1.5) - (537) = 287$ Cu Ft.

$924 - 537 = 287$

∴ Capacity of gravel storeage bed must be equal to:

$616 - (180 + 287) \cong 149$ CU FT.

Gravel depth w/vertical sides = $\frac{149}{(120\phi)(.8)(1/3)} \cong 4.5'$



SECTION (1)

SCALE: 3/3" = 1'

REGISTERED ENGINEER STATE OF NEW MEXICO No. 5290 RICHARD H. ALLEN

APPROVED FOR DRAINAGE

2-8-80

DATE

SIGNATURE TITLE

ADVISE DRAINAGE INSPECTOR WHEN GRADING EXECUTED

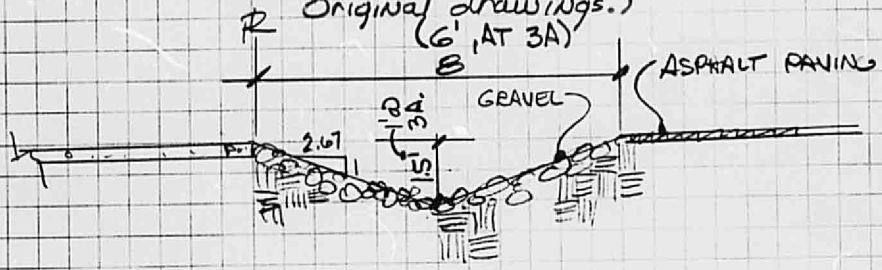
DESIGN PROFESSIONALS, INC.

Carlisle Boulevard N.E.
Albuquerque, New Mexico
(505) 881-6338 87107

JOB V.K-CO	JOB # 7907
BY RH ALLEN	DATE 1/22/80
CHK.	DATE
SCALE	SHEET NO. 1 OF 3

Deduction for Driveway on Moon.
$24'(7)(1/2)(1.5) = \underline{126}\ FT.^3$

Actual width of pond along Moon = 8' in lieu of original of 7'.
Additional capacity provided:
$= 1'(160')(1/2)(1.5) = 120\ FT^3 \cong 126\ FT^3$ Ok
(See Section 1/1 on Original drawings.)
(6', AT 3A)



SECTION 3 & 3A

SECTION 2 SAME AS ORIGINAL DRAWING W/O CURB. DEPTH ≈ 1' TO 1.5' W/GRAVEL LINING.

• AT N-W CORNER:
New pond area: $= 26(18) + 1/2(13)(20) = 598\ \phi\ @\ 1.33'$ ave
$+ 1/2(2.5)(1)(2)(70) + 65(6) = 565\ \phi\ @\ 1.25'$ ave
Vol. $= 775\ FT^3 + 706 = 1501\ FT^3$
Original area: $24(23) + 1/2(21)(18) = 742\ \phi\ @\ 1.33'$
$1/2(5)(75)(2) = 375\ \phi\ @\ 1'$
Vol. $= 987 + 375 = 1362\ FT^3$
$1501 > 1362$ ∴ Ok.

REGISTERED PROFESSIONAL ENGINEER STATE OF No. 5290 HUGH ALLEN

Approved

DESIGN PROFESSIONALS, INC.
Carlisle Boulevard N.E.
Albuquerque, New Mexico
(505) 881-6338 87107

JOB WA-CO	JOB # 7907
BY RH ALLEN	DATE 1/26/80
CHK	DATE
SCALE	SHEET NO 2 OF 3

• VOL. LOST ALONG SANTA CLARA
(From Drainage Report)

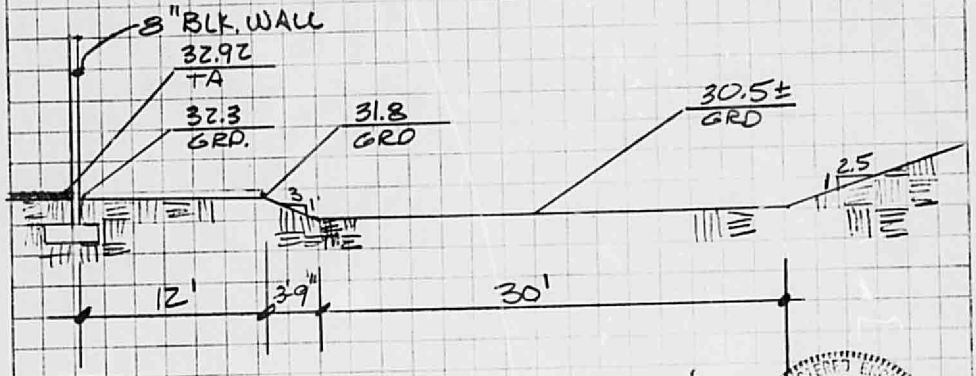
At 5' wide pond	510 FT^3
At 20' " pond	660 FT^3
TOTAL	= 1170 FT^3

This volume will be handled by large pond located east of CMU wall!

Volume of retention req'd in pond east of block wall: 6132 FT^3 (See page 8 of 12 in original report)
+ 441 ← (AREA 3)
6573 FT^3

NOTE:
Pond may be deeper than 1.5' since entire area wherein pond is located is fenced w/ 6' chainlink and barbed wire. Pond is ON WA-CO property.

Area of pond = 30'(175') = 5250 ϕ
Depth req'd = $\frac{6573}{5250}$ = 1.25' (1'-3" ±)



SECTION 4

SCALE: 1/8" = 1'-0"

REGISTERED ENGINEER STATE OF NEW MEXICO No. 5290 RICHARD H. ALLEN

DESIGN PROFESSIONALS, INC.
Carlisle Boulevard N.E.
Albuquerque, New Mexico 87107
(505) 881-6338

JOB WA-CO	JOB # 7107
BY RH ALLEN	DATE 1/26/80
CHK	DATE
SCALE	SHEET NO. 3 OF 3

DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD, NE/ALBUQUERQUE, NEW MEXICO 87107/(505) 881-6336

January 29, 1980

L 20/D1

Mr. Fred Aguirre
City of Albuquerque Drainage Department
Post Office Box 1293
Albuquerque, New Mexico 87103

SUBJECT: AS-BUILT Drainage Plan for WA-CO Heating and Air Conditioning, Inc.
600 Moon, S.E.
Albuquerque, New Mexico

Dear Mr. Aguirre:

Attached are five copies of the As-Built drainage plan and revised calculations for the referenced project. These changes were discussed during our meeting in your office on January 28, 1980. If the revisions are acceptable, please initial and date three copies and return same to me at your earliest convenience.

The enclosed drawings and calculations are being submitted to you pursuant to my letter to you of January 11, 1980.

Please advise if you have any questions.

Sincerely,

DESIGN PROFESSIONALS, INC.

Richard H. Allen

RICHARD H. ALLEN, P.E.
Vice President

RHA:ch

ARCHITECTS/ENGINEERS
GEORGE H. BOLLING
ROBERT L. ROCHELEAU
JOHN PETER VARSA
RICHARD H. ALLEN
HOWARD S. COTTRELL
RICHARD G. VAUGHAN

DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD, NE/ALBUQUERQUE, NEW MEXICO 87107/(505) 881-6336

January 29, 1980

Mr. Fred Aguirre
City of Albuquerque Drainage Department
Post Office Box 1293
Albuquerque, New Mexico 87103

L 20/D1

SUBJECT: AS-BUILT Drainage Plan for WA-CO Heating and Air Conditioning, Inc.
600 Moon, S.E.
Albuquerque, New Mexico

Dear Mr. Aguirre:

Attached are five copies of the As-Built drainage plan and revised calculations for the referenced project. These changes were discussed during our meeting in your office on January 28, 1980. If the revisions are acceptable, please initial and date three copies and return same to me at your earliest convenience.

The enclosed drawings and calculations are being submitted to you pursuant to my letter to you of January 11, 1980.

Please advise if you have any questions.

Sincerely,

DESIGN PROFESSIONALS, INC.

Richard H. Allen

RICHARD H. ALLEN, P.E.
Vice President

RHA:ch

ARCHITECTS/ENGINEERS
GEORGE H. BOLLING
ROBERT L. ROCHELEAU
JOHN PETER VARSA
RICHARD H. ALLEN
HOWARD S. COTTRELL
RICHARD G. VAUGHAN

600 MOON S.E.

DRAINAGE REPORT

FOR

BLOCK 56-A OF SKYLINE HEIGHTS SUBDIVISION
ALBUQUERQUE, NEW MEXICO

MARCH 28, 1979

RECEIVED
APR 11 1979
CITY ENGINEERS

PREPARED BY

DESIGN PROFESSIONALS, INC.
4125 CARLISLE BLVD. N.E.
ALBUQUERQUE, NEW MEXICO 87107

PREPARED FOR

WA-CO HEATING AND AIR COOLING, INC.
610 GENERAL PATCH S.E.
ALBUQUERQUE, NEW MEXICO 87123

DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD, NE/ALBUQUERQUE, NEW MEXICO 87107/(505) 881-6336

ARCHITECTS/ENGINEERS

GEORGE H. BOLLING
ROBERT L. ROCHELEAU
JOHN PETER VARSA

RICHARD H. ALLEN
HOWARD S. COTTRELL
RICHARD G. VAUGHAN

TABLE OF CONTENTS

		PAGE
1.	PURPOSE	1
2.	LOCATION	1
3.	HYDROLOGY	1
4.	PROJECT DESCRIPTION	
	A. EXISTING CONDITION	2
	B. PROPOSED DEVELOPMENT	2&3
5.	LEGAL DESCRIPTION OF PROPERTY	4
6.	PROPERTY PLAT	5
7.	APPENDIX	
	A. CALCULATIONS (SHEETS 1 - 12)	
	B. INTENSITY DURATION FREQUENCY CURVES	
	C. 100-YEAR 6-HOUR PRECIPITATION MAP	
	D. SEELYE'S OVERLAND FLOW TIME NOMOGRAPH	
	E. SITE PLAN (ATTACHED TO REPORT)	

DRAINAGE REPORT

FOR

BLOCK 56-A OF SKYLINE HEIGHTS
ALBUQUERQUE, NEW MEXICO

1. PURPOSE

The purpose of this study is to determine the storm characteristics of the referenced site both under existing conditions and under proposed development. The study was conducted within the guidelines established in Drainage Resolution 1972-2 of the Albuquerque Metropolitan Arroyo Flood Control Authority.

2. LOCATION

The drainage study is for Block 56-A of Skyline Heights Subdivision located in Albuquerque, New Mexico. Said Block is a combination of Blocks 56 and 57 of the Skyline Heights Subdivision including the elimination of lot lines, vacation of a portion of Erbbe Street, S.E. and the release of certain easements, all of which are described in the legal description for the new plat contained in this report. The property is bounded by Moon Street, S.E. on its west side which is the only paved street adjoining the property. Right of way lines for streets on the three remaining adjoining sides of the property have been established but are as yet undeveloped. Grades for the proposed streets, top of curb elevations, etc... are not available and therefore only estimates could be made as to these future improvements in the development of the drainage report.

3. HYDROLOGY

The Rationale Formula was used in calculating peak flow rates based on the 100 year storm. Design aids used in the analysis included the Intensity Duration Frequency Curves for the Albuquerque area developed by Gordon Herkenhoff and Associates, the 100-Year 6-Hour Precipitation Map for the City of Albuquerque (June 1967) and various charts and graphs illustrated in the Data Book for Civil Engineers, Volume I by Elwyn E. Seelye.

4. PROJECT DESCRIPTION

A. Existing Condition: The piece of property under study slopes at 2% from east to west. Water is conveyed as sheet flow across the property. Some grading of the site has occured since the topo map was prepared but no radical deviations from the topo map are apparent. There is a temporary structure currently on the site which will be removed prior to the completion of construction. Existing soils are basically silty sands and clayey sands. Soil borings have been taken in the area proposed for the main building structure.

B. Proposed Development: The westerly two-thirds of the parcel of land under study will contain an office/warehouse complex of approximately 24,378 SF, asphalt parking areas of approximately 41,413 SF, minor landscaping of 1,814 SF and ponding areas totaling approximately 11,928 SF. Sheet flow will generally be maintained across the paved areas to the holding ponds. Slopes will vary but in most cases will be approximately 2%. Twelve inch wide curb cuts will allow water to pass from paved areas into the holding ponds.

The developed site has been divided into four drainage areas. Each area will drain to the holding ponds for that area. A total volume of 9546 cubic feet (CF) will be stored in the ponding areas with some ponds capable of holding more run-off than that required by analysis. The depth of standing water in all ponds will be 1.5 feet or less. Surplus run-off along the west side of the developed property may overflow the holding ponds and flow to the street at a maximum rate of 1.2 cfs.

Gravel storage beds will be utilized for the ponds along the east side of the property. The three triangular shaped ponds near the southwest corner and the narrow 3 foot wide pond along the south property line will also utilize gravel storage beds. The maximum free standing water depth in these ponds will be 1.5 feet. Gravel depth varies from 1.5 feet to 4.0 feet. It is recommended that a fabric drainage liner be installed at the sides and bottom of all gravel storage beds to separate the gravel from the surrounding soil. A product similar to Mirafi 140 or 140S as manufactured by Celanese Fibers Marketing Company would be suitable for this installation.

Listed below is a summary of the anticipated run-off from each of the four drainage areas together with the storage volume available at each of the ponding areas:

Drainage Area	Storage Required	Storage Available
1	1823 CF	1863 CF 2500 ft
2	1150 CF	1352 CF
3	441 CF	450 CF
4	6132 CF	6487 CF
TOTALS	9546 CF	10152 CF

The portion of the property to the east of the referenced construction will remain undeveloped. A ponding area will be provided along the west boundary of the undeveloped site to intercept water from as far as to the east as proposed Altez Street S.E. and thus prevent excessive run-off from reaching the developed site. A total run-off of 4140 CF is anticipated. The planned pond area has a capacity of 4662 CF±.

PLAT OF

BLOCK 56-A

SKYLINE HEIGHTS

Albuquerque, New Mexico

DESCRIPTION:

Summary Plat to be eliminate Lot Lines and to waive and release 10 foot Public Utility Easements centered on rear Lot Lines of Lots 1 thru 9, Block 57 and Lots 1 thru 8, Block 56 and the Southerly 5 foot Public Utility Easement of Blocks 56 and 57 of SKYLINE HEIGHTS, and to vacate a Southerly Portion of Erbbe St. SE. A certain Tract of Land, being all of Block numbered Fifty-six (56) and Fifty-seven (57) of SKYLINE HEIGHTS, a Subdivision in the City of Albuquerque, New Mexico, as the same is shown and designated on the Plat of said Subdivision, filed in the office of the County Clerk of Bernalillo County, New Mexico, on December 1, 1948, together with a portion of Erbbe St. SE, vacated by Ordinance No. 2664, adopted June 15, 1965, and that portion of said Erbbe St. SE, to be vacated by the filing of this Plat, and the entire Tract of Land being more particularly described as follows: BEGINNING at the Southwesterly Corner being a point of curve on the Northerly right-of-way line of Southern Ave. SE, and running thence, on a curve to the right having a radius of 25.00 feet, 39.52 feet of arc to a point of tangent on the Easterly right-of-way line of Moon St. SE; THENCE, N. 00 deg. 23' E., 210.06 feet along said Easterly right-of-way line to a point of curve; THENCE, on a curve to the right having a radius of 25.00 feet, 42.24 feet of arc to a point of tangent on the Southerly right-of-way line of Santa Clara Dr. SE; THENCE, S. 82 deg. 47' E., 502.54 feet along said Southerly right-of-way line to a point of curve; THENCE, on a curve to the right having a radius of 25.00 feet, 36.30 feet of arc to a point of tangent on the Westerly right-of-way line of Altez St. SE; THENCE, S. 00 deg. 25' W., 145.35 feet along said Westerly right-of-way line to a point of curve; THENCE, on a curve to the right having a radius of 25.00 feet, 39.02 feet of arc to a point of tangent on said Northerly right-of-way line of Southern Ave. SE; THENCE, S. 89 deg. 50' W., 560.02 feet along said Northerly right-of-way line to the Point of Beginning and Containing 2.8647 acres, more or less, and now being Block 56-A, SKYLINE HEIGHTS.

FREE CONSENT, DEDICATION:

We, the owners of the property described hereon, do hereby consent to the replatting of said property as shown hereon and the same is in accordance with our desires.

Robert C. Unthank

Robert M. Unthank

ACKNOWLEDGEMENT:

STATE OF NEW MEXICO }
COUNTY OF BERNALILLO } SS

On this 15 day of September, 1978 the foregoing instrument was acknowledged before me.

My commission expires 8-12-80

Samuel H. Lanza
Notary Public

SURVEYOR'S CERTIFICATE:

I, Verlon E. Hall, licensed under the laws of the State of New Mexico, do hereby certify that this Plat was prepared by me or under my supervision and is true and correct to the best of my knowledge and belief.

Verlon E. Hall
N.M.L.S. No. 3241

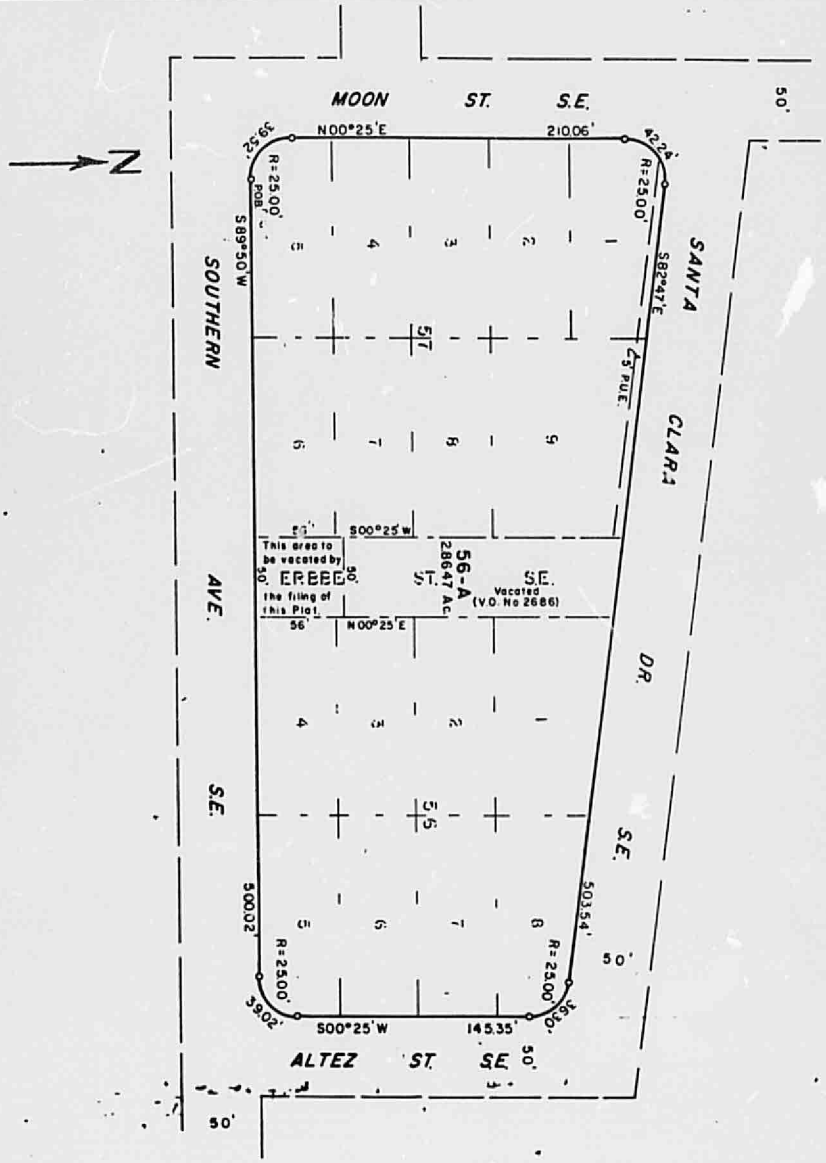
REGISTERED LAND SURVEYOR STATE OF NEW MEXICO NO. 3241 VERLON E. HALL

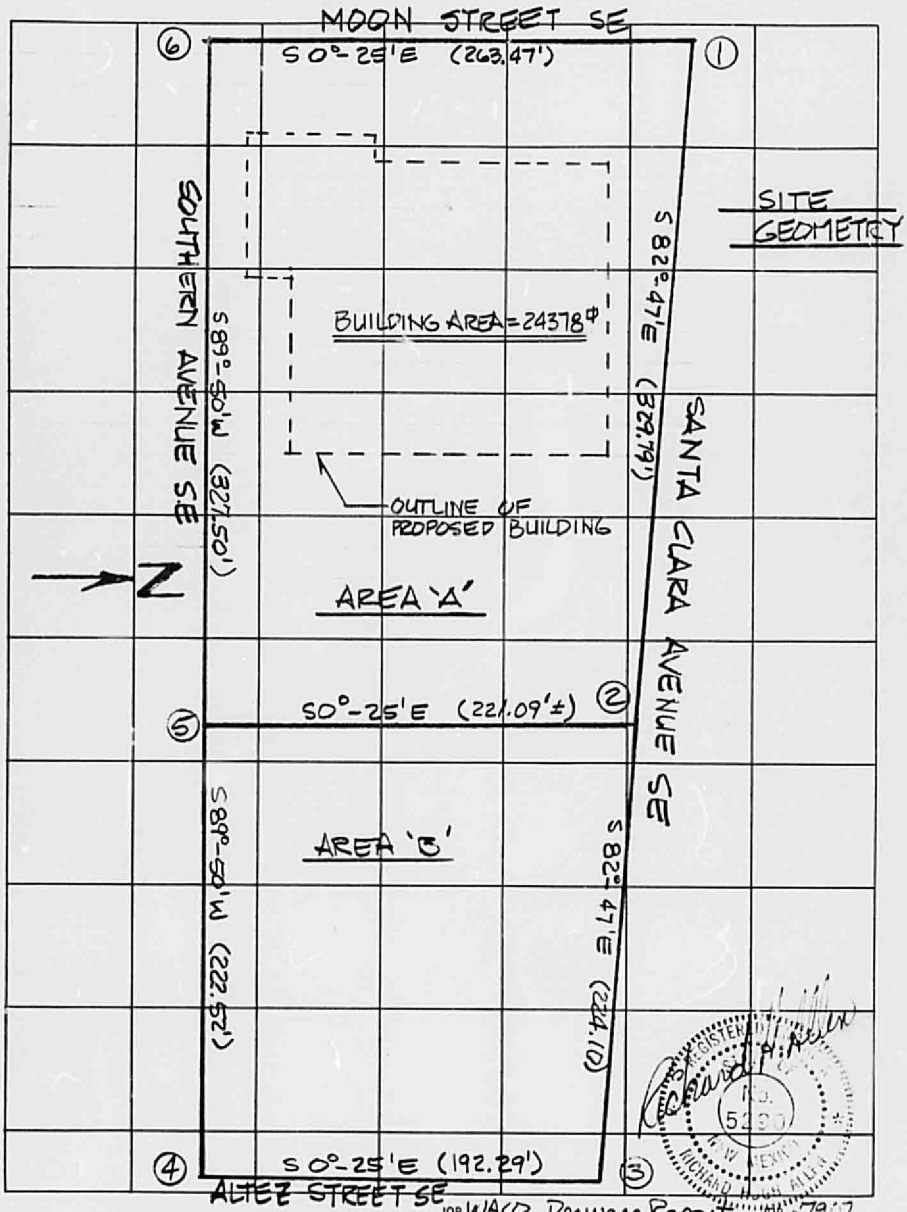
Bernalillo County, N.M.

APPROVED AND ACCEPTED BY:

Planning Director, City of Albuquerque, NM	Date	Number-Zone Atlas L-20	
Traffic Engineer, City of Albuquerque, NM	Date	Property Management	Date
Public Service Company of New Mexico	Date	Gas Company of New Mexico	Date
Mountain States Telephone & Telegraph Co.	Date	Water Resources Dept., City of Albuquerque, N.M.	Date

HALL SURVEYING CO.
511 San Mateo Blvd. N.E.
Albuquerque, New Mexico
Phone 266-0400
JULY 1978


MOON ST. S.E.
N00°25'E
210.06'
R=25.00'
S82°47'E
SANTA CLARA DR. S.E.
43' PUE.
S00°25'W
This area to be vacated by the filing of this Plat.
56'
50'
ERBEE ST. S.E.
56-A
2.8647 Ac.
Vacated (V.O. No 2686)
N00°25'E
S00°25'W
145.35'
R=25.00'
S89°50'W
POB
SOUTHERN AVE. S.E.
500.02'
503.54'
ALTEZ ST. S.E.
50'
Z



ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE. ALBUQUERQUE.
(505) 881-6336

JOB WACO Drainage Report JOB # 7907
BY R.H. Allen DATE 3/26/73
CHK. DATE
SCALE 1" = 60' SHEET NO 1 OF 12

AREA CALCULATIONS

1. Building area = 24,378 SF

2. AREA 'A': (By Coordinates) See Sheet 1 of 12

Pt.	Distance	Bearing	North+ South-	East+ West-	Coordinates X	Coordinates Y	Double Area
1					1000.0	1000.0	+327810.
	329.79	S82°-47'E					
2			-41.43	+327.18	1327.18	958.57	+315168.
	221.09	S0°-25'E					
5			-221.08	+1.61	1328.79	734.49	-239363.
	327.50	S89°-50'W					
6			+0.95	-327.50	1001.29	738.44	-243257.
	263.47	N0°-25'W					
1			+263.46	-1.92	999.37	1001.90	-1292.
					Double Area =		159066.
					Area =		79533 ☐
							(1.826 Ac)
3. AREA 'B':							
2					500.0	500.0	+111365
	224.01	S82°47'E					
3			-28.14	+222.24	722.24	471.86	+105527
	192.29	S0°-25'E					
4			-192.28	+1.40	723.64	279.58	-61321
	222.52	S89°-50'W					
5			-0.65	-222.52	501.12	278.93	-62517.
	221.09	N0°-25'W					
2			+221.08	+1.61	499.51	500.01	-560.
					Double Area =		91996.
					Area =		45997 ☐
							(1.056 Ac)
Total Site Area = 125530 ☐ = 2.882 Acre							

Richard R. Allen

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE,
(505) 881-6336

JOB WACO Drainage Report JOB # 79-27
BY R. Allen DATE 3/20/79
CHK DATE
SCALE SHEET NO. 2 OF 12

AREA CALCULATIONS (CONTINUED)

4. Landscaped areas (AREA 'A' Only)

$(11)(25') + \frac{1}{2}(11')(16') + (7)(65') + .67(10)^2 + 22'(7')$
$+ (25')(7') + (40')(15') = \underline{1814\ \Phi}$

5. Asphalt paved parking areas:

Areas reserved for ponding, slopes, etc....:

$(28')(220') + (3')(50') + \frac{1}{2}(20' + 40')(20') + (31')(20')$
$+ (160')(5') + (5')(75') + (30')(30') + \frac{1}{2}(30')(18')$
$+ (125')(5') + (20')(9') + (73')(5') + \frac{1}{2}(20')(10')$
$+ (2')(50') + \frac{1}{2}(18')(23') + (2')(173') + \frac{1}{2}(20')(13') = 11928\ \Phi$

Total Area 'A'	=	79533
Building		<24378>
Landscape		<1814>
Other (Salvage)		<11928>

Total paved and covered areas = $\underline{\underline{41413\ \Phi}}$

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE,
(505) 881-6336

JOB WACO Drainage Report JOB # 7907
BY RH Allen DATE 3/26/79
CHK DATE
SCALE SHEET NO. 5 OF 12

ANALYSIS OF EXISTING SITE

1. Slope of existing site is East to West with a grade of ± 2%±
2. Assumptions:
   - Area 'A' will be treated separately and calculations will allow for ponding due to hard surfaced areas only in Area 'A'
   - Area 'B' will be treated separately. Since slope is from East to West, ponding will be provided along the west side of Area 'B' to intercept run-off. (Both Area 'A' and Area 'B' are owned by one individual.)
   - "C" = Coefficient of run-off = 0.40 (open land with minimal vegetation; gentle slope ≈ 2% from East to West)

Analysis of Area 'A'

1. Determine intensity (i), inches per hour
   A. From 100 year – 6 hour precipitation map (Rainfall Frequency Maps for New Mexico, June 1967);
      Total Rainfall (R_T) = 2.7"
   B. Time of concentration (T_c)
      - Path of flow ≈ 330 FT. (Sheet Flow) S = 2%
      - Using Nomograph from Seelye's "Data Book for Civil Engineers", Vol. 1, page 18-01:
        T_c = 11.7 Minutes
        From Henkenhoff Intensity Duration Curves,
        i = 5.1"/hr.
2. Total Volume = Q = ACi
   Q = (1.836 Acre)(0.40)(5.1) = 3.7 c-s
   - Total Volume = [(2.7")/12"] x [79533] = 17895 CF
   - Infiltration & evaporation = (1.-.40)(17895) = 10737 CF
   - Run off = 17895 - 10737 = 7158 CF

Richard N. Allen
REGISTERED ENGINEER
STATE OF NEW MEXICO
No. 2290

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE.
(505) 881-6336

JOB WKCO Drainage Report JOB # 7917
BY RN Allen DATE 3/26/79
CHK. DATE
SCALE SHEET NO 4 OF 12

ANALYSIS OF PROPOSED SITE

(See assumptions listed on sheet No. 6)

1. For total AREA 'A' determine intensity (i) & volume.
   Total rainfall = 2.7" = R_T

2. Time of concentration = Tc
   - L ≈ 70' (roof) (sheet flow w/slope of 2% on roof
   - L ≈ 100' (pavt) area and 2.5% (ave) on pavement)
   - Seelye's Nomograph, Tc = 5.5 Min.

   Use min. Tc = 10 Min.

   From Intensity curve, i = 5.3"/hr.

3. Total Volume:
   Q = ACi

   C = 0.9 for bldg & pavt.
   C = 0.4 for pond areas.

   $Q = (67605/43560)(0.9)(5.3) + (11928/43560)(0.4)(5.3)$
   $Q = 7.4 + 0.58 = \underline{7.98 \text{ cfs}}$

	Area	R_T	Vol Ⓐ	Vol Ⓑ	Vol. Ⓒ	Q
Bldg/Pavt	67605 ϕ	2.7"	15211.	13690.	1521.	7.4 cfs
Ponds	11928 ϕ	2.7"	2684.	1074.	1610.	0.58 cfs
TOTALS	79533	—	17895 CF	14764 CF	3131 CF	7.98 cfs

For storm conditions assumed, all water will be stored on site in ponds.

Richard H. Allen
No. 5290
Registered Professional Engineer

JOB WACO Drainage Report JOB # 7907
BY RH Allen DATE 3/27/79
CHK DATE
SCALE SHEET NO 5 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE. ALBUQUERQUE
(505) 881-6336

ANALYSIS OF PROPOSED SITE (Continued)

Assumptions:

1. Developed site will contain a warehouse/office area of approximately 24378 SF, landscaped areas of approximately 18814 SF and asphalt paved parking areas of approximately 41413 SF.
2. Slopes in paved areas will vary. All paved areas will be sheet flow or will allow for gentle swales to ponding areas on site.
3. Sections of building and paved areas will be drained to specific ponding areas.
4. "C" for hard-surfaced areas = 0.90.

A. Determine size of pond required to extend T_c such that Q is limited to 3.7 cfs for total site:

1. For Area 'A':

$$i_{req'd} \leq \frac{3.7}{\frac{[(11928)\times(.40)+67605(.9)]}{43560}} \leq 2.46 \text{ in/hr.}$$

From rainfall intensity curve, $T_c \geq 53$ Minutes

$\therefore T_{ponding} = 53 - 10 = 43$ Minutes

2. Volume of pond required (TOTAL)

Vol. = 43 (60 sec./min)(3.7) = 9543 CF

B. Determine size of ponds for specified drained areas within AREA 'A'

Drained areas ①, ②, ③ & ④

$A_① = 9642 + \text{paving} + \text{pond} = 9642 + 2821 + 2725 = 15188 \text{ SF}$

$A_② = 3480 + \text{paving} + \text{pond} = 3480 + 5113 + 991 = 9584 \text{ SF}$

$A_③ = (65)(31) + \frac{1}{2}(31)(65) - \frac{1}{2}(13)(20) + 390 + \frac{1}{2}(13)(20) = 3152 + 520 = 3672 \text{ SF}$

$A_④ = 79533 - (15188 + 9584 + 3672) = 51089 \text{ SF}$

Richard H. Allen

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE
(505) 881-6336

JOB WACO Drainage Report JOB # 7907
BY RH Allen DATE 3/26/79
CHK. DATE
SCALE SHEET NO. 6 OF 12

• Pond sizes for Drained areas based on proportion of area drained:

$V_{(N)}$ = Vol. of pond = (Total Vol.) $\frac{(\text{Drained area})}{(\text{Total area})}$

$V_{(1)}$ = (9546) (15188/79533) = 1823 CF
$V_{(2)}$ = (9546) (9584/79533) = 1150 CF
$V_{(3)}$ = (9546) (3672/79533) = 441 CF
$V_{(4)}$ = (9546) (51089/79533) = 6132 CF

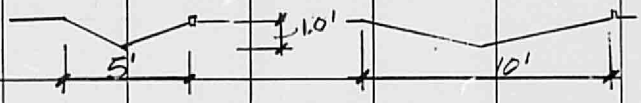
9546

Note: The preceeding calculations ignore storage/ponding at landscape areas adjacent to building.

C. Pond depths to provide required volumes

1. Pond for (1):

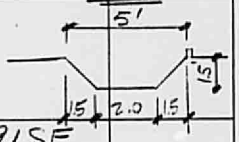
Required volume = 1823 CF
Surface area available ≅ 2725 SF



Volume available = ½(1.0)(2.5)(2)(115) + ½(4.5')(1.0')(2)(20') + (24')(23')(1.33') + ½(21')(13')(1.0') + ½(5)(1)(2)(75) = 1863 CF

$V_{(1)\,AVAIL.} > V_{(1)\,REQ'D}$ OK

2. Pond for (2):



Required volume = 1150 CF
Surface area available = 991 SF
Volume available:
• At 3' wide pond: ½(1')(1.5)(2)(42+25') = 201
• At 5' wide pond: [½(1.5)(1.5)2 + (2)(1.5)]64' = 336
• At triangular areas (Try 2' depth w/ 1 on 1 side slopes)
½(11')(20')(2') + ½(10')(20')(2') + ½(2')(2')(50'+48') = 616

1153 CF

$V_{(2)\,AVAIL} > V_{(2)\,REQ'D}$ OK

Richard H. Allen

JOB WACO Drainage Report JOB # 7907
BY EK NICH DATE 3/27/79
CHK DATE
SCALE SHEET NO 7 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE. ALBUQUERQUE.
(505) 881-6336

3. Pond for ③:

Required Volume = 441 CF

Surface Area Available 520 SF

Volume available:

- At 3' wide pond: ½(1')(1.5')(180') = 135
- At triangular area: (2.5 depth)
  ½(16.5)(2.5)(8.5) + ½(2.5)(2.5)(42) = 306

441 CF

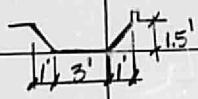
$V_{③\,AVAIL} = V_{③\,REQD}$ OK

4. Pond for ④:

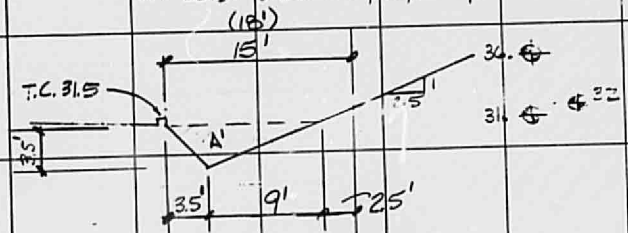
Required volume = 6132 CF

Surface Area Available = 7692 SF

Volume available:



- At 5' wide pond: [½(1.5')(1') + 3(1.5)]85' = 510 CF
- At 20' wide area: (Assume depth = 1.5')
  [(22')(14') + ½(14')(10')] 1.5' + ½(1.5)²(83') = 660 CF
- At East side of property:



A' = ½(3.5)(12.5) = 21.88 □

Volume = (21.88 □)(110') = 2407 CF

At 18' Section:

Area = ½(3.5')(3.5') + 3'(3.5') + ½(9')(3.5') = 32.38 □

Volume = (32.38 □)(24') = 777 CF

At 40' Section:

Surface area = (24)(13) + ½(25)(24) = 612 □

Side (x-sect) Area ① = ½(3.5)(3.5) = 6.13 □

Area ② = ½(9)(2.5) = 11.25 □

Volume = (612 □)(3.5') + (6.13 □)(63') + 11.25 □(44') = 3023 CF

$V_{④} = 7577$ CF

$V_{④\,AVAIL} > V_{④\,REQD}$ OK

Richard H. Allen
No. 5299
Registered Professional Engineer

JOB WKCO Drainage Report JOB # 7907

BY R.H. Allen DATE 3/27/07

CHK DATE

SCALE SHEET NO 8 OF 12

ARCHITECTS/ENGINEERS

DESIGN PROFESSIONALS, INC.

4125 CARLISLE BOULEVARD NE, ALBUQUERQUE,

(505) 881-6336

RECAP SUMMARY

Description	Area (SF)	R_T (IN)	EXISTING C	EXISTING V_T (CF)	EXISTING V_R (CF)	EXISTING V_I (CF)	EXISTING Q (cfs)	PROPOSED C	PROPOSED V_T (CF)	PROPOSED V_R (CF)	PROPOSED V_I (CF)	PROPOSED Q (cfs)
Area 'A' less ponds	67605	2.7	0.40	15211.	6084.	9127.	3.14	0.90	15211.	13690.	1521.	7.40
Proposed pond/land	11928	2.7	0.40	2684.	1074.	1610.	0.56	0.40	2684.	1074.	1610.	0.58
Pond Inv: For ①										(1873.)	1873.	(4.28)
For ②										(1150.)	1150.	
For ③										(441.)	441.	
For ④										(6132.)	6132.	
TOTALS	79533			17895.	7158.	10737.	3.70		17895.	5218.	12677.	3.70

1. V_R of proposed developed site < V_R of existing site — OK
2. Q of proposed developed site is ≤ Q of existing site — OK

LEGEND:

R_T = Rainfall
C = Coefficient of runoff
Q = Rate of flow

V_T = Total Volume
V_R = Volume of Runoff
V_I = Volume of Infiltration &/or Evaporation

JOB WAKO Drainage Report JOB # 7957
BY RH Allen DATE 3/27/07 CHK DATE
SCALE SHEET NO. 9 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE, N.M.
(505) 881-6336

REFINEMENT AND SUMMARY OF POND DEPTHS FOR AREA 'A'

1. Pond for ①:

- West side of property: 5' & 9' widths are 1.0' deep
- North west corner: pond is 1.33' deep
- North side: 10' width is 1.0' deep

2. Pond for ②:

- West side: 5' width is 1.5' deep
- South side: 3' width is 1.5' deep
- Triangular areas - Modify as follows:
  - Excavate ponds with vertical sides and fill with rock & gravel.
    (Required Volume ≅ 616 CF)
  - (Assume 1.5' of water stored above bed)
    $V_w = [\frac{1}{2}(20)(13)+\frac{1}{2}(14)(24)]1.5 = 447 CF$
    Req'd storage in gravel bed = 616 − 447 = 169 CF
    Depth of gravel $= \frac{169}{298^{\#}(.8)(1/3)} = 2.13'$

Use gravel depth of 2'-6"

3. Pond for ③:

- South side: 3' width is 1.5' deep
- Triangular area - Modify as follows:
  - Excavate pond w/ vertical sides and fill w/ gravel & rock.
    (Required volume ≅ 306 CF
  - (Assume 1.5' of water stored above bed)
    $V_w = [\frac{1}{2}(20)(12)]1.5 = 180 CF$
    Req'd storage in gravel = 306 − 180 = 126 CF
    Depth of gravel $= \frac{126}{120^{\#}(.8)(1/3)} = 3.9'$

Use gravel depth of 4'-0"

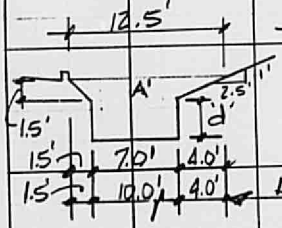
Richard H. Allen
No 5290
NEW MEXICO
RICHARD HUGH ALLEN

JOB WACO Drainage Report JOB # 1757
BY RH Allen DATE 3/27/79
CHK. DATE
SCALE SHEET NO 12 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE.
(505) 881-6336

4. Pond for ④:

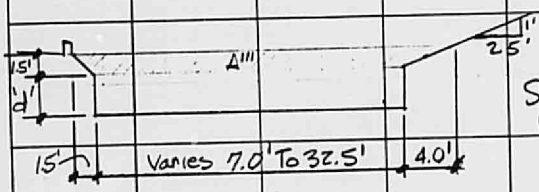
- North side: 5' & 20' widths are 1.5' deep.
- East side - Modify as follows:
  - Excavate pond with vertical sides and fill with rock and gravel.
    Required Volume = 6132 − 1170 = 4962 CF
  - Assume 1.5' of water stored above pond.



$A' = \frac{1}{2}(7+12.5)(1.5) = \underline{14.63\ SF}$

$A'' = \frac{1}{2}(10+15.5)(1.5) = \underline{19.13\ SF}$

AT 15.5' wide section



$A'''_{32.5} = \frac{1}{2}(38+32.5)(1.5) = \underline{52.88\ SF}$

Surface area for section between 7' width & 32.5' width:

$A_4 = \frac{1}{2}(10.75+35.25)(26) = \underline{598\ \square}$

$V_W = (14.63)(110') + (19.13)(24') + (52.88)(13') + 598(1.5) = 3652$

Req'd storage in gravel = 4962 − 3652 = 1310 CF

$1997\ CF = [(7')(110')(d) + (10')(24')(d) + (32.5)(13)d + \frac{1}{2}(7+32.5)(26)(d)](0.8)(1/3)$

$d = \frac{1997}{1946(.8)(1/3)} = \frac{1997}{518.93} = 3.85'$

Use a depth of gravel = $\underline{\underline{4'-0''}}$

Richard H. Allen

JOB WACO Drainage Report JOB # 7907.
BY RH Allen DATE 3/27/79
CHK. DATE
SCALE SHEET NO 11 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE. ALBUQUERQUE.
(505) 881-6336

ANALYSIS OF EXISTING AREA 'B'

1. Since Area 'B' is owned by the same individual who plans to develop Area 'A', an analysis will be made of Area 'B' in order to determine pond sizes for storage of run-off from this area. By ponding run-off on Area 'B' excessive overflow on to the developed site will be held to a minimum. Also, run-off to adjacent site & proposed streets will be curtailed.

2. Assumptions:
- Area 'B' slopes East to West at 2% slope ±
- "C" = 0.40 (Open land with minimal vegetation)

ANALYSIS

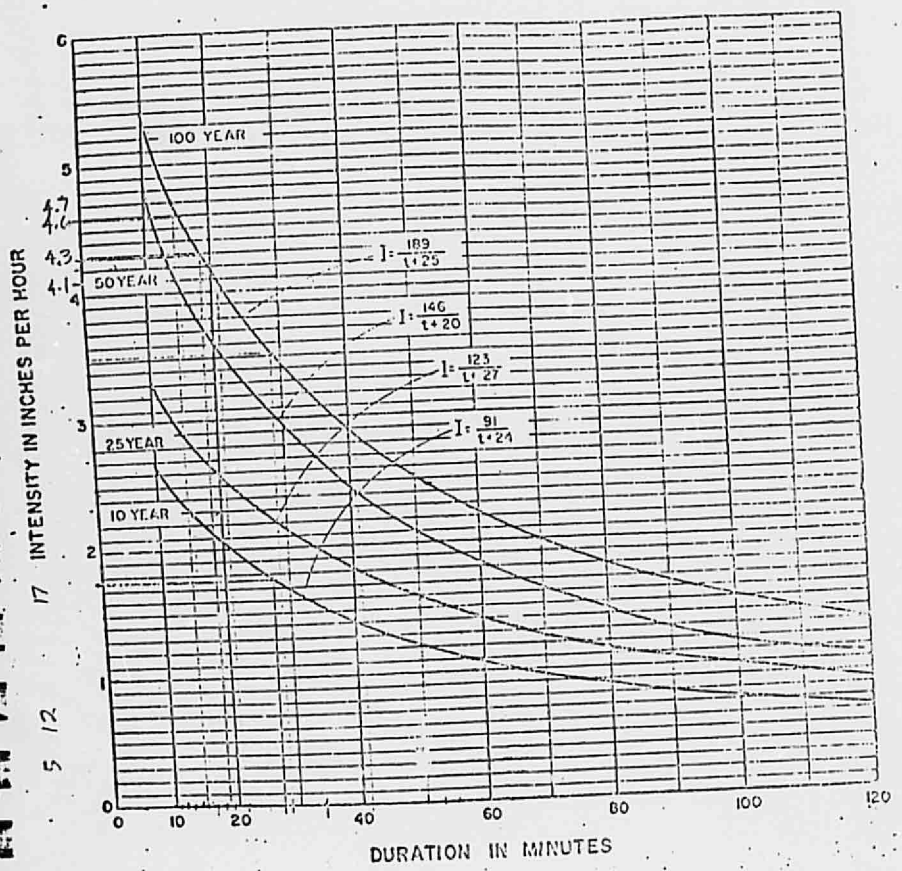
1. Determine intensity (i)
   A. From 100 year - 6 hour map, R_T = 2.7"
   B. Time of concentration (T_c)
      - Path of flow ≅ 225' ± (sheet flow @ 2% ±)
      - Using Seelye's nomograph, T_c = 10 minutes
      - From Intensity Duration curves, i = 5.3"/hr.
   C. Total Rate $Q = ACi$
      $Q = (1.056)(0.40)(5.3) = 2.24$ c.f.s.
   D. Volume calculations:
      $V_T = (2.7)/12\ (45997) = 10349$ CF
      $V_I = (0.6)(10349) = 6209$ CF
      V_R = Required site storage = 4140 CF

2. Pond size
   - Assume width ≅ 200'
     Cross sectional area = (4140) ÷ 200 = 20.7 □
   - Assume triangular shape w/ 'h' = 1.0'
     1/2(b)(h) = 20.7 ∴ b = 41.4'

Richard H. Allen

JOB WKCD Drainage Report JOB # 7907
BY RH Allen DATE 3/23/77
CHK DATE
SCALE SHEET NO 12 OF 12

ARCHITECTS/ENGINEERS
DESIGN PROFESSIONALS, INC.
4125 CARLISLE BOULEVARD NE, ALBUQUERQUE,
(505) 881-6336



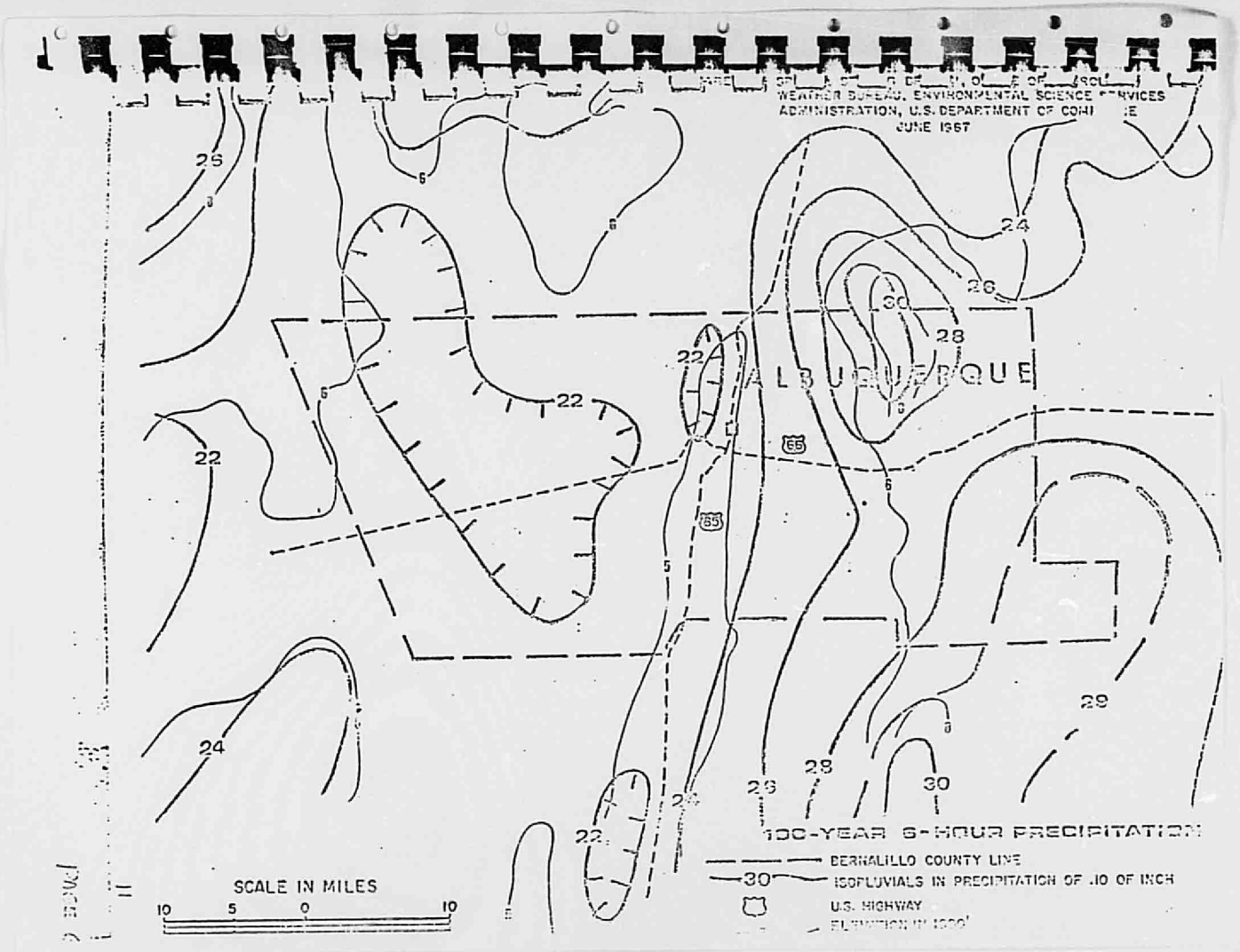
MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERRENSCHMIDT & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART 1


WEATHER BUREAU, ENVIRONMENTAL SCIENCE SERVICES
ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE
JUNE 1967
ALBUQUERQUE
25
24
26
30
28
22
29
100-YEAR 6-HOUR PRECIPITATION
BERNALILLO COUNTY LINE
30 ISOPLUVIALS IN PRECIPITATION OF .10 OF INCH
U.S. HIGHWAY
SCALE IN MILES
10 5 0 10

DRAINAGE — RUNOFF — I

FIG. A. – ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 2 YEARS.

FIG. B. – ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 10 YEARS.

FIG. C. – ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 50 YEARS.

FIG. D. – ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 5 YEARS.

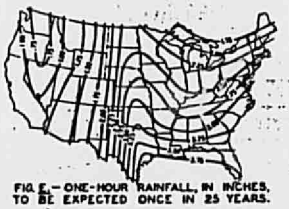


FIG. E. – ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 25 YEARS.

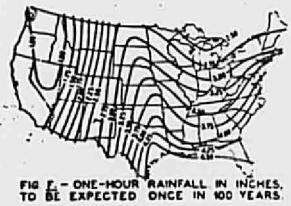


FIG. F. – ONE-HOUR RAINFALL IN INCHES, TO BE EXPECTED ONCE IN 100 YEARS.

COMPUTATION OF i IN RATIONAL FORMULA.

EXAMPLE: Assume expectancy period = 5 years, see Fig. D, assume locality, find 1 hour intensity = 1.75 in. per hour.

FIG. G-INTENSITY EXPECTATION FOR ONE-HOUR RAINFALL*.

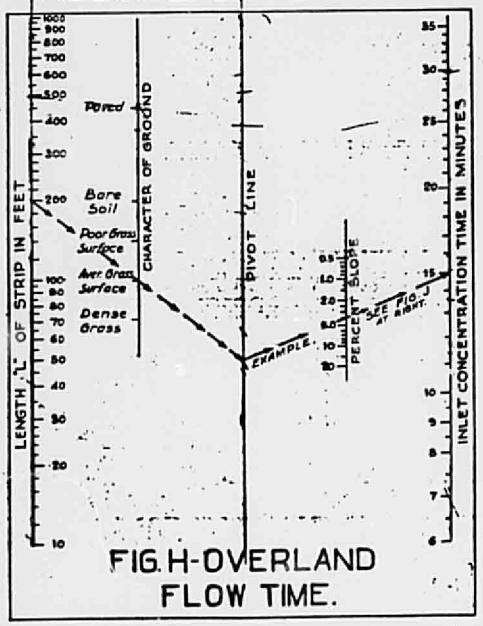


FIG. H-OVERLAND FLOW TIME.

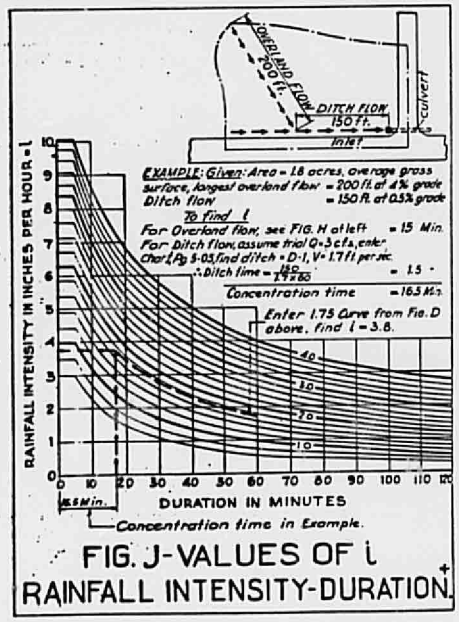


FIG. J-VALUES OF i RAINFALL INTENSITY-DURATION.+

*Reproduced from Miscellaneous Publication No. 204, U.S. Dept. of Agriculture, by David L. Yarnell.
+ Adopted from Engineering Manual of the War Department, Part XIII, Chap I, Dec 45