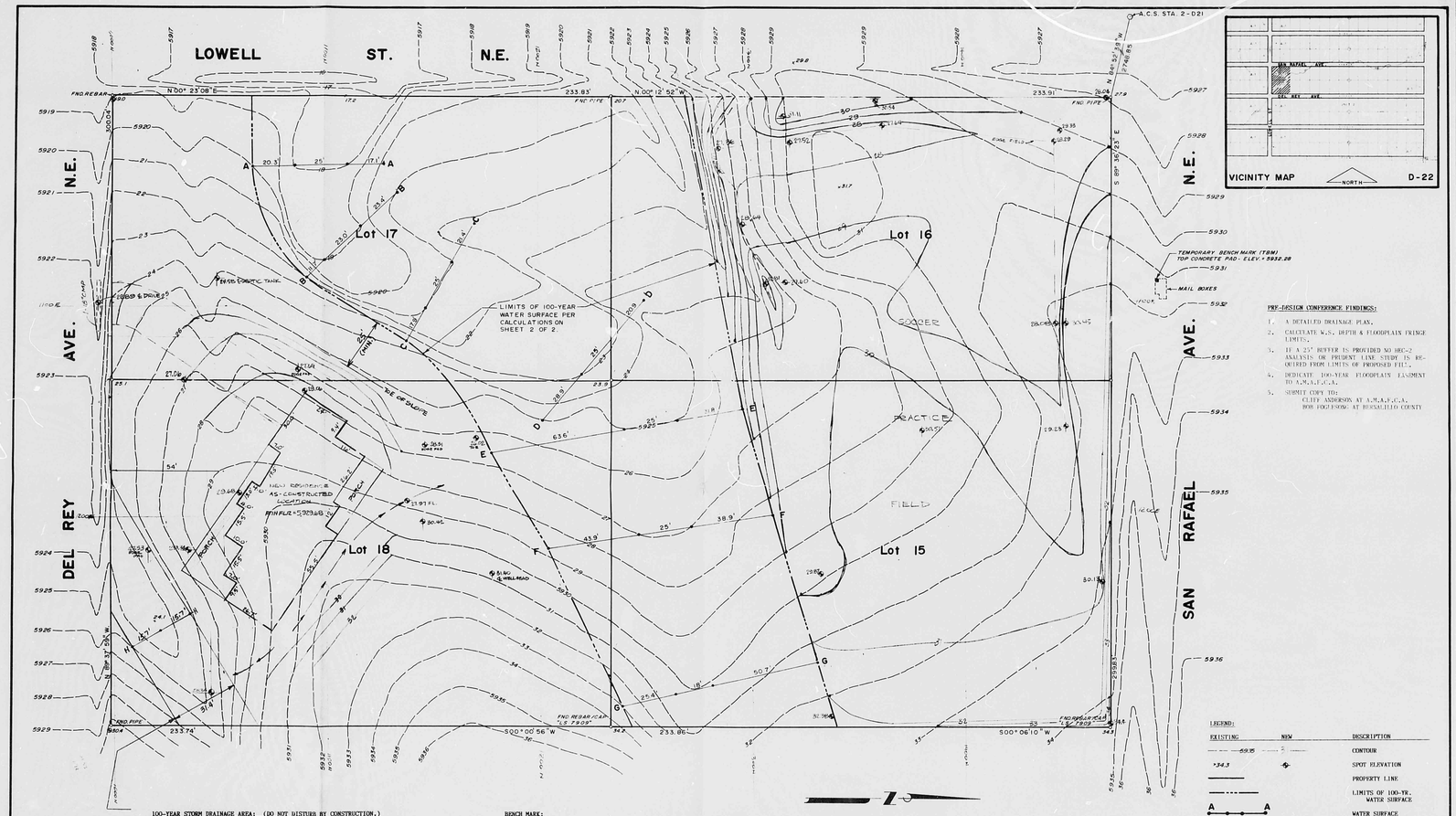


PRE-DESIGN CONFERENCE FINDINGS:

1. A DETAILED DRAINAGE PLAN.
2. CALCULATE W.S. DEPTH & FLOODPLAIN FRINGE LIMITS.
3. IF A 25' BUFFER IS PROVIDED NO HEC-2 ANALYSIS OR FRUDENT LINE STUDY IS REQUIRED FROM LIMITS OF PROPOSED FILL.
4. DEDICATE 100-YEAR FLOODPLAIN EASEMENT TO A.M.A.F.C.A.
5. SUBMIT COPY TO:
   CLIFF ANDERSON AT A.M.A.F.C.A.
   BOB FOGELSONG AT BERNALILLO COUNTY

LEGEND:

| EXISTING | NEW | DESCRIPTION |
|---|---|---|
| 5915 | | CONTOUR |
| *34.3 | | SPOT ELEVATION |
| | | PROPERTY LINE |
| | | LIMITS OF 100-YR. WATER SURFACE |
| A — A | | WATER SURFACE CROSS SECTION |

100-YEAR STORM DRAINAGE AREA: (DO NOT DISTURB BY CONSTRUCTION.)

DO NOT RESTRICT FLOW BY PLACEMENT OF WALLS, OR SOLID WOOD OR CHAIN LINK FENCES. ANY WALLS AND FENCES SHOULD PROVIDE 1.0 FOOT CLEARANCE ABOVE THE 100-YEAR FLOW DEPTH (D = 0.74 FT.)

CERTIFICATION:

Having completed an on-site inspection of the site, I hereby certify that this as-constructed grading and drainage plan is in substantial compliance with the approved grading and drainage plan revised April 19, 1990.

Timothy P. Fitzpatrick (Signature) — October 10, 1990 (Date)

BENCH MARK:

ELEVATIONS SHOWN HEREON ARE BASED ON A.C.S. STATION "2-D21", LOCATED AT BROWNING STREET AND SAN RAFAEL AVENUE, ELEVATION 5827.414 (SLD 1929).

BASIS OF BEARINGS:

BEARINGS SHOWN ARE BASED ON STATE PLANE GRID BEARING OF N. 46°51'32"E., BETWEEN A.C.S. STATION "2-D21" AND STATION "KOAT".

LEGAL DESCRIPTION:

LOTS 15, 16, 17, AND 18, BLOCK 15, TRACT 2, UNIT 2, NORTH ALBUQUERQUE ACRES, BERNALILLO COUNTY, NEW MEXICO.

REVISED 10/10/90
REVISED 4/19/90
REVISED 4/17/90
REVISED 4/9/90

RECEIVED OCT 11 1990 HYDROLOGY DIVISION

AS-CONSTRUCTED

SHEET 1 of 2

GRADING AND DRAINAGE PLAN
TIMOTHY FITZPATRICK RESIDENCE
DEL REY AVE. & LOWELL ST., N.E.
BERNALILLO COUNTY, NEW MEXICO

D-22/D005

REF 21 DATE 2-24-93 BY ESP

CITY OF ALBUQUERQUE

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PLANS/PLATS ON FILE

FILE DESC: D-22 /D005

# PLANS/PLATS 2

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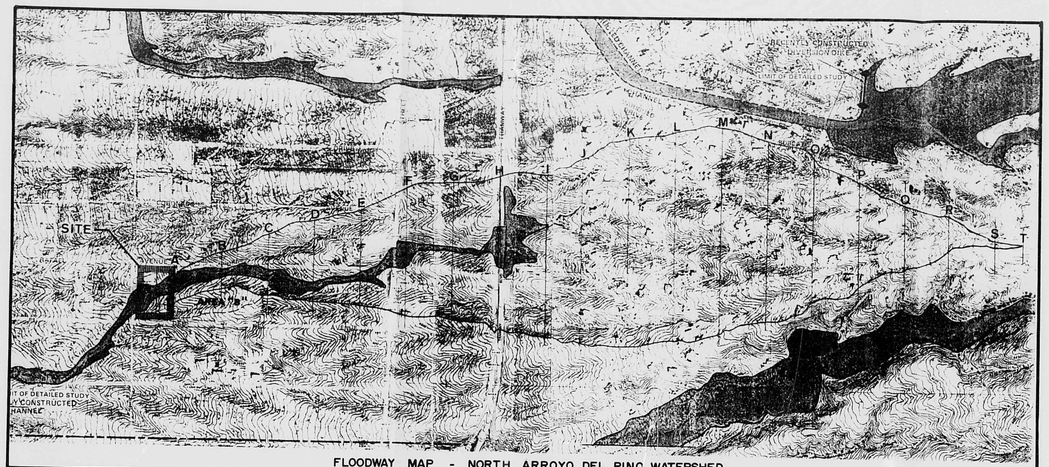
CITY OF ALBUQUERQUE

C D F




FLOODWAY MAP - NORTH ARROYO DEL PINO WATERSHED

**NORTH ARROYO DEL PINO WATERSHED AREA:**

| X-SEC | L (FT.) | AVE. L | DIST. | AREA (SF) | X-SEC | L (FT.) | AVE. L | DIST. | AREA (SF) |
|---|---|---|---|---|---|---|---|---|---|
| A | 260 | | | | K | 1810 | | | |
| | | 290 | 400 | 116000 | | | 1815 | 400 | 726000 |
| B | 320 | | | | L | 1820 | | | |
| | | 425 | 400 | 170000 | | | 1810 | 400 | 724000 |
| C | 530 | | | | M | 1800 | | | |
| | | 620 | 400 | 248000 | | | 1685 | 400 | 674000 |
| D | 710 | | | | N | 1570 | | | |
| | | 775 | 400 | 310000 | | | 1410 | 400 | 564000 |
| E | 840 | | | | O | 1250 | | | |
| | | 985 | 400 | 394000 | | | 1080 | 400 | 432000 |
| F | 1130 | | | | P | 916 | | | |
| | | 1165 | 400 | 466000 | | | 730 | 400 | 292000 |
| G | 1200 | | | | Q | 550 | | | |
| | | 1270 | 400 | 508000 | | | 435 | 400 | 174000 |
| H | 1340 | | | | R | 320 | | | |
| | | 1380 | 400 | 552000 | | | 190 | 400 | 76000 |
| I | 1420 | | | | S | 60 | | | |
| | | 1515 | 400 | 606000 | | | 30 | 240 | 7200 |
| J | 1610 | | | | T | 0 | | | |
| | | 1710 | 400 | 684000 | | | | | |
| K | 1810 | | | | | | | | |

TOTAL AREA (SF) 7723200
TOTAL AREA (ACRES) 7723200/43560 = 177.3

**GENERAL INFORMATION:**

THE SITE IS LOCATED ON THE NORTH ARROYO DEL PINO APPROXIMATELY 1200 FEET WEST OF TRAMWAY BLVD. THE ARROYO CROSSES PORTIONS OF ALL FOUR LOTS. HALF OF THE SITE IS ON THE CORNER OF SAN RAFAEL AVENUE AND LOWELL STREET AND THE OTHER HALF IS ON THE CORNER OF DEL REY AVENUE AND LOWELL STREET. THE AREA OF WATERSHED DRAINING TO THE NORTH ARROYO DEL PINO UPSTREAM FROM THE SITE IS APPROXIMATELY 177.3 ACRES. THE WATERSHED EXTENDS EAST OF TRAMWAY BOULEVARD APPROXIMATELY 4600 FEET. ANOTHER SMALL WATERSHED GENERATES OFF-SITE FLOW.

**DRAINAGE CRITERIA:**

THE CALCULATION OF PEAK RUNOFF RATES AND RUNOFF VOLUMES SHOWN ON THIS PLAN HAS BEEN BASED ON "DRAFT REVISION OF SECTION 22.2, D.P.M. BY THE DEVELOPMENT PROCESS MANUAL DRAINAGE DESIGN COMMITTEE.

**PRECIPITATION ZONE:**

THE SITE IS EAST OF EUBANK BOULEVARD AND NORTH OF INTERSTATE 40 AND IS THEREFORE LOCATED IN ZONE FOUR (4).

**OFF-SITE WATERSHED "A" - NORTH ARROYO DEL PINO:**

FOR THE PURPOSE OF CALCULATING FLOODPLAIN LIMITS, THE TOTAL DISCHARGE IS CALCULATED USING SECTION A.7.

**TIME OF CONCENTRATION:**

$Tc = LV$, WHERE L IS THE LENGTH OF WATERSHED AND V IS THE AVERAGE VELOCITY. $V = K \sqrt{S}$, WHERE S IS THE SLOPE IN PERCENT OF THE WATERSHED BETWEEN THE HIGHEST AND LOWEST POINT ALONG THE DRAINAGE WAY AND K IS THE CONVEYANCE FACTOR. IN THIS CASE, L = 7400; $S = (6280-5934)/7400 = 0.0468$ (4.68%); $K = 2$ (SMALL UPLAND GULLIES); $V = 2 \sqrt{4.68} = 4.33$

$Tc = L/V = 7400/(4.33 \times 60) = 28.48$ MIN.

**RAINFALL INTENSITY:**

THE INTENSITY IS COMPUTED USING THE TIME OF CONCENTRATION, Tc, AND THE 60-MINUTE RAINFALL DEPTH, $P_{60}$, IN THE FOLLOWING FORMULA:

$I = 0.722 \times LOG_{10}(0.42 \times Tc)(60/Tc) \times P_{60}$; FOR ZONE 4, $P_{60} = 2.23$

$I = 0.722 \times LOG_{10}(0.42 \times 28.48)(60/28.48)(2.23) = 3.66$ IN./HR.

**LAND TREATMENT:**

THE TOTAL AREA OF THE NORTH ARROYO DEL PINO WATERSHED UPSTREAM FROM THE SITE IS 177.3 ACRES. THE PERCENTAGES OF DEVELOPED LAND TREATMENT AREAS ARE ASSUMED TO BE AS FOLLOWS:

TREATMENT A 50% (88.65 ACRES) TREATMENT B 10% (17.73 ACRES)
TREATMENT C 20% (35.46 ACRES) TREATMENT D 20% (35.46 ACRES)

**RUNOFF COEFFICIENTS:**

USE TABLE 11; "C" = 0.37, 0.51, 0.65, AND 0.95 FOR TREATMENT AREAS A, B, C, AND D, RESPECTIVELY.

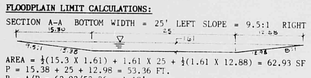
**PEAK DISCHARGE:**

$Q = C_A IA + C_B IA_B + C_C IA_C + C_D IA_D$

$Q = (0.37 \times 3.66 \times 88.65) + (0.51 \times 3.66 \times 17.73) + (0.65 \times 3.66 \times 35.46) + (0.95 \times 3.66 \times 35.46) = 360.8$ CFS

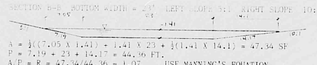
**FLOODPLAIN LIMIT CALCULATIONS:**

SECTION A-A BOTTOM WIDTH = 25' LEFT SLOPE = 9.5:1 RIGHT SLOPE 8:1



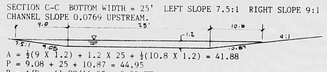
$A = \frac{1}{2}(15.3 \times 1.61) + 1.61 \times 25 + \frac{1}{2}(1.61 \times 12.88) = 62.93$ SF
$P = 15.38 + 25 + 12.98 = 53.36$ FT.
$R = A/P = 62.93/53.36 = 1.18'$
$V = 1.486/NR^{2/3}S^{1/2}$ $N = 0.045$ $S = 0.025$
$V = (1.486/0.045)(1.18)^{2/3}(0.025)^{1/2} = 5.83$ FPS
$Q = AV = 62.93 \times 5.83 = 366.88 > 360.8$
CHECK WAVE DEPTH $D = V^2/2G = 5.83^2/(2 \times 32.2) = 0.53'$
TOTAL DEPTH = 1.61 + 0.53 = 2.14' DIST. TO LEFT = 9.5 X 2.14 = 20.33'
DIST. TO RIGHT = 8.0 X 2.14 = 17.12'

SECTION B-B BOTTOM WIDTH = 23' LEFT SLOPE 9:1 RIGHT SLOPE 10:1



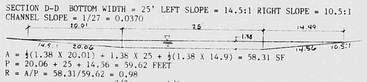
$A = \frac{1}{2}(7.05 \times 1.41) + 1.41 \times 23 + \frac{1}{2}(1.41 \times 14.1) = 47.34$ SF
$P = 7.14 + 23 + 14.17 = 44.36$ FT.
$A/P = R = 47.34/44.36 = 1.07$ USE MANNING'S EQUATION.
$V = (1.486/0.045)(1.07)^{2/3}(0.05)^{1/2} = 7.72$ FPS
$Q = AV = 47.34 \times 7.72 = 365.46 > 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 7.72^2/(2 \times 32.2) = 0.93$ FT.
TOTAL DEPTH = 1.41 + 0.93 = 2.34 FT.
DIST. TO LEFT = 2.34 X 5 = 11.7' DIST. TO RIGHT = 2.34 X 10 = 23.4'

SECTION C-C BOTTOM WIDTH = 25' LEFT SLOPE 7.5:1 RIGHT SLOPE 9:1
CHANNEL SLOPE 0.0769 UPSTREAM.



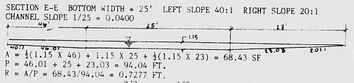
$A = \frac{1}{2}(9 \times 1.2) + 1.2 \times 25 + \frac{1}{2}(10.8 \times 1.2) = 41.88$
$P = 9.08 + 25 + 10.87 = 44.95$
$R = A/P = 41.88/44.95 = 0.93$ FT.
$V = (1.486/0.045)(0.93)^{2/3}(0.0769)^{1/2} = 8.72$
$Q = AV = 41.88 \times 8.72 = 365.19$ CFS $> 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 8.72^2/(2 \times 32.2) = 1.18$ FT.
TOTAL DEPTH = 1.2 + 1.18 = 2.38 FT.
DIST. TO LEFT = 2.38 X 7.5 = 17.85' DIST. TO RIGHT = 2.38 X 9 = 21.42'

SECTION D-D BOTTOM WIDTH = 25' LEFT SLOPE = 14.5:1 RIGHT SLOPE = 10.5:1
CHANNEL SLOPE = 1/27 = 0.0370



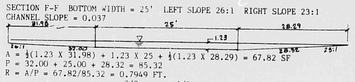
$A = \frac{1}{2}(1.38 \times 20.01) + 1.38 \times 25 + \frac{1}{2}(1.38 \times 14.9) = 58.31$ SF
$P = 20.06 + 25 + 14.96 = 59.62$ FEET
$R = A/P = 58.31/59.62 = 0.98$
$V = (1.486/0.045)(0.98)^{2/3}(0.0370)^{1/2} = 6.27$ FPS
$Q = AV = 58.31 \times 6.27 = 365.60$ CFS $> 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 6.27^2/(2 \times 32.2) = 0.61$ FT.
TOTAL DEPTH = 1.38 + 0.61 = 1.99
DIST. TO LEFT = 1.99 X 14.5 = 28.85 FT. DIST. TO RIGHT. = 1.99X10.5=20.9

SECTION E-E BOTTOM WIDTH = 25' LEFT SLOPE 40:1 RIGHT SLOPE 20:1
CHANNEL SLOPE 1/25 = 0.0400



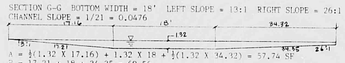
$A = \frac{1}{2}(1.15 \times 46) + 1.15 \times 25 + \frac{1}{2}(1.15 \times 23) = 68.43$ SF
$P = 46.01 + 25 + 23.03 = 94.04$ FT.
$R = A/P = 68.43/94.04 = 0.7277$ FT.
$V = (1.486/0.045)(0.7277)^{2/3}(0.0400)^{1/2} = 5.34$ FPS
$Q = AV = 68.43 \times 5.34 = 371.57$ CFS $> 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 5.34^2/(2 \times 32.2) = 0.44$ FT.
TOTAL DEPTH = 1.15 + 0.44 = 1.59 FT.
DIST. TO LEFT = 1.59 X 40 = 63.6' DIST. TO RIGHT = 1.59 X 20 = 31.8'

SECTION F-F BOTTOM WIDTH = 25' LEFT SLOPE 26:1 RIGHT SLOPE 23:1
CHANNEL SLOPE = 0.037



$A = \frac{1}{2}(1.23 \times 31.98) + 1.23 \times 25 + \frac{1}{2}(1.23 \times 28.29) = 67.82$ SF
$P = 32.00 + 25.00 + 28.32 = 85.32$
$R = A/P = 67.82/85.32 = 0.7949$ FT.
$V = (1.486/0.045)(0.7949)^{2/3}(0.0370)^{1/2} = 5.45$ FPS
$Q = AV = 67.82 \times 5.45 = 369.62$ CFS $> 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 5.45^2/(2 \times 32.2) = 0.46$
TOTAL DEPTH = 1.23 + 0.46 = 1.69 FT.
DIST. TO LEFT = 1.69 X 26 = 43.9' DIST. TO RIGHT = 1.69 X 23 = 38.9'

SECTION G-G BOTTOM WIDTH = 18' LEFT SLOPE = 13:1 RIGHT SLOPE = 26:1
CHANNEL SLOPE = 1/21 = 0.0476



$A = \frac{1}{2}(1.32 \times 17.16) + 1.32 \times 18 + \frac{1}{2}(1.32 \times 34.32) = 57.74$ SF
$P = 17.21 + 18 + 34.35 = 69.56$
$R = A/P = 57.74/69.56 = 0.83$
$V = (1.486/0.045)(0.83)^{2/3}(0.0476)^{1/2} = 6.36$ FPS
$Q = AV = 57.74 \times 6.36 = 367$ CFS $> 360.8$ CFS
WAVE DEPTH $D = V^2/2G = 6.36^2/(2 \times 32.2) = 0.63$
TOTAL DEPTH = 1.32 + 0.63 = 1.95'
DIST. TO LEFT = 1.95 X 13 = 25.35 DIST. TO RIGHT = 1.95 X 26 = 50.70'

**OFF-SITE WATERSHED "B":**

**AREA:**

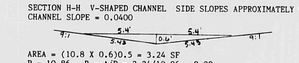
$A = \frac{1}{2}(140 + 200)200 + \frac{1}{2}(200 + 210)200 + \frac{1}{2}(210 + 150)200 + \frac{1}{2}(150 + 0)160 = 123000$ SF $= 2.82$ ACRES. USE THE SAME PERCENTAGES OF LAND TREATMENT AS FOR WATERSHED "A".

**PEAK DISCHARGE, CFS PER ACRE:**

| LAND TREATMENT | AREA (ACRES) | PEAK DISCHARGE/ACRE 100-YEAR | 10-YEAR | PEAK DISCHARGE RATE 100-YEAR | 10-YEAR |
|---|---|---|---|---|---|
| A | 1.41 | 2.26 | 0.99 | 3.19 | 1.40 |
| B | 0.28 | 3.05 | 1.61 | 0.85 | 0.45 |
| C | 0.56 | 3.94 | 2.29 | 2.21 | 1.28 |
| D | 0.56 | 5.74 | 3.91 | 3.21 | 2.19 |
| TOTAL | | | | 9.46 | 5.32 |

**WATERWAY LIMIT CALCULATIONS:**

SECTION H-H V-SHAPED CHANNEL SIDE SLOPES APPROXIMATELY 9:1
CHANNEL SLOPE = 0.0400



AREA = (10.8 X 0.6)0.5 = 3.24 SF
P = 10.86 R = A/P = 3.24/10.86 = 0.30
$V = (1.486/0.045)(0.30)^{2/3}(0.04)^{1/2} = 2.95$ FPS
Q = AV = 3.24 X 2.95 = 9.56 CFS > 9.46 CFS
WAVE DEPTH $D = V^2/2G = 2.95^2/(2 \times 32.2) = 0.14$ FT.
TOTAL DEPTH = 0.6 + 0.14 = 0.74 FT.
USE 1.0' FREEBOARD
DIST. TO LEFT AND RIGHT = 1.74 X 9 = 15.7 FT.

**ON-SITE PEAK DISCHARGE:**

**AREA:**

$[\ldots 200/36 \times 66/36] = 140273$ SF = 3.22 AC.
ROOF IS APPROXIMATELY 3600 SF. ASSUME TOTAL TREATMENT D = 10% TO INCLUDE DRIVEWAYS AND PARKING FOR SOCCER, ETC. ASSUME 15% TREATMENT B, SOCCER FIELD AND LANDSCAPING. ASSUME 20% TREAT. C, LEAVING 55% TREATMENT A.

| LAND TREATMENT | % | AREA | Q/ACRE 100-YEAR | 10-YEAR | TOTAL Q 100-YEAR | 10-YEAR |
|---|---|---|---|---|---|---|
| A | 55 | 1.77 | 2.26 | 0.99 | 4.00 | 1.75 |
| B | 15 | 0.48 | 3.05 | 1.61 | 1.46 | 0.77 |
| C | 20 | 0.65 | 3.94 | 2.29 | 2.52 | 1.47 |
| D | 10 | 0.32 | 5.74 | 3.91 | 1.84 | 1.25 |
| TOTAL | | | | | 9.82 | 5.24 |

**ON-SITE VOLUME:**

| LAND TREAT. | EXCESS PRECIPITATION (E) 100-YEAR | 10-YEAR |
|---|---|---|
| A | 0.66 | 0.27 |
| B | 0.85 | 0.38 |
| C | 1.13 | 0.55 |
| D | 2.57 | 1.60 |

**WEIGHTED EXCESS PRECIPITATION:**

100-YEAR, 6-HOUR:

$$E_W = \frac{(0.66 \times 1.77 + 0.85 \times 0.48 + 1.13 \times 0.65 + 2.57 \times 0.32)}{3.22} = 0.97''$$

10-YEAR, 6-HOUR:

$$E_W = \frac{(0.27 \times 1.77 + 0.38 \times 0.48 + 0.55 \times 0.65 + 1.60 \times 0.32)}{3.22} = 0.47''$$

**ON-SITE VOLUME:**

100-YEAR $V_{360} = (0.97/12)140273 = 11339$ CF

10-YEAR $V_{360} = (0.47/12)140273 = 5494$ CF

**DRIVEWAY CULVERT DESIGN:**

CULVERT TO BE SIZED FOR OFF-SITE AREA "B" PLUS APPROXIMATELY 60,000 SF OF AREA THAT DRAINS INTO DEL REY AVENUE. TOTAL AREA = 123000 + 60000 = 183,000 SF = 4.20 ACRES. USE THE SAME PERCENTAGES OF LAND TREATMENT AS FOR OFF-SITE AREA "B".

| LAND TREATMENT | % | (ACRES) | PEAK DISCHARGE PER ACRE 100-YEAR | 10-YEAR | PEAK DISCHARGE RATE 100-YEAR | 10-YEAR |
|---|---|---|---|---|---|---|
| A | 50 | 2.10 | 2.26 | 0.99 | 4.75 | 2.08 |
| B | 10 | 0.42 | 3.05 | 1.61 | 1.28 | 0.68 |
| C | 20 | 0.84 | 3.94 | 2.29 | 3.31 | 1.92 |
| D | 20 | 0.84 | 5.74 | 3.91 | 4.82 | 3.28 |
| TOTALS | | | | | 14.16 | 7.96 |

USE INLET CONTROL NOMOGRAPH (BPR JA[illegible]) TO [illegible] 48" CMP, PROJECTING END, HW/D = 1.5 CAPACITY = 9.0 CFS

REVISED 4/9/90

APR 10 1990
HYDROLOGY DIVISION

SHEET 2 of 2

FRANK D. LOVATO NEW MEXICO 6512 REGISTERED PROFESSIONAL ENGINEER 3/28/90

DRAINAGE CALCULATIONS
**TIMOTHY FITZPATRICK RESIDENCE**
DEL REY AVE. & LOWELL ST., N.E.
BERNALILLO COUNTY, NEW MEXICO

D-22/D005

THIS PLAN SHOT TWICE ONCE ON LIGHT AND ONCE ON DARK.

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Norberta Sanchez

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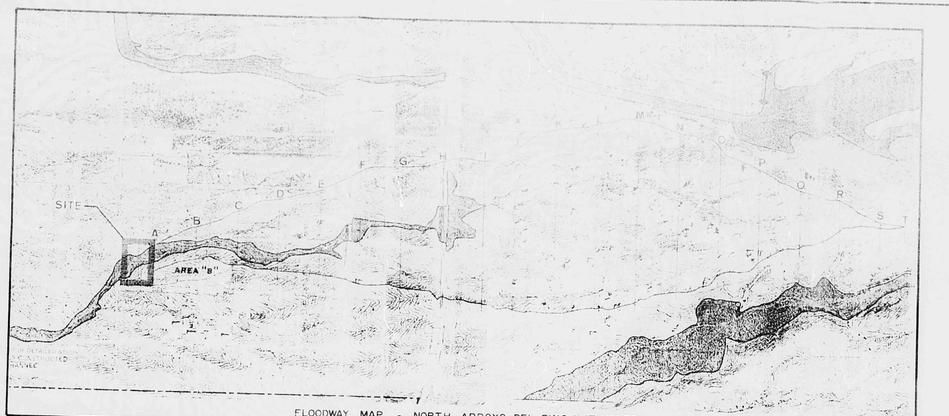


FLOODWAY MAP - NORTH ARROYO DEL PINO WATERSHED

REVISED 4/3/90

DRAINAGE CALCULATIONS

TIMOTHY FITZPATRICK RESIDENCE

DEL REY AVE. & LOWELL ST., N.E.

BERNALILLO COUNTY, NEW MEXICO

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