DRAINAGE STUDY

FOR THE

PUERTA DEL SOL APARTMENTS

BERNALILLO COUNTY NEW MEXICO

AUGUST , 1984

Approved at meeting
Any AMAFCA Requirements
Dan Soto
10/19/84

D. Mark Goodwin & Associates, P.A.
Consulting Engineers
P.O. BOX 90606, ALBUQUERQUE,NM 87199
(505) 828-2200 FAX 797-9539

November 30, 2007

Mr. Brad Bingham
Hydrology Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Paradise North Commerce Center

Dear Mr. Bingham:

This package is in reference to the proposed commercial development entitled "Paradise North Commerce Center". This site is located on Golf Course Road approximately 1000 feet south of the intersection of Golf Course and McMahon Boulevard.

I am sending you a copy of the Conceptual Grading & Drainage Plan that was submitted to, and approved by EPC, as well as pertinent information pertaining to the hydrological conditions of the area. We are requesting a Conceptual Grading & Drainage Plan Approval from hydrology in order to obtain Site Pan Approval at DRB.

Off-Site Flows:
The site has one off-site flow source, located to the northwest from the Puerta Del Sol Apartments. The Drainage Study for Puerta Del Sol Apartments (1984), identifies a small portion of the roof drainage from the rear of the apartments (Sub-Basin 6), as draining toward the Paradise North site. The area and land treatment stated in the report was used to develop a new AHYMO model, and a 100-Year flow of 0.5 cfs was calculated exiting the apartments. Approximately 1.0 cfs, was identified on the Conceptual Grading & Drainage Plan as entering our site. It is intended that the final design of the Paradise North site will provide adequate conveyance within the parking area for the 1.0 cfs. A copy of the AHYMO model and an excerpt from the Puerta Del Sol report is included in this package.

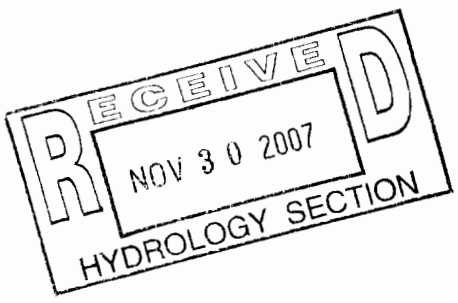
Currently, a Smith's Food and Drug is being constructed to the north of the site. Per the Storm Water Analysis for Smith's #463 (2005), all on-site drainage from Smith's will either be contained in an underground pipe system or will drain to McMahon Boulevard to the east. No drainage was identified as leaving the Smith's site to the south.

On-Site Flows:
In order to determine the 100-Year flow for the entire site, the total site area was combined with the flow from the apartments in the AHYMO model. Under developed conditions, a total of 58.5 cfs will approach the site's southern border. The flow will then enter a grated inlet / pipe system, and discharge directly to the Calabacillas Arroyo at one point. It is expected that upon the final design of this site, a second inlet and connector pipe may be needed. However, the single discharge point into the arroyo is not expected to change.

Please feel free to contact our office with any questions you may have.

Sincerely,

MARK GOODWIN & ASSOCIATES, PA



Tom Gattis
Project Engineer

TG/tg

F:\1-Projects\2007\A07059 - Paradise North Commerce\Drainage Ltr.doc

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*S***** BASIN 1 - ONSITE DEVELOPED 13.55 ACRES

COMPUTE NM HYD       ID=1 HYD NO=101 AREA=0.0212 SQ MI
                     PER A=0 PER B=6 PER C=9 PER D=85
                     TP=0.1333 HR MASS RAINFALL=-1

     K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =   71.144    CFS   UNIT VOLUME =    .9992       B =   526.28      P60 = 1.9500
     AREA =      .018020 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033300


     K =   .116607HR    TP =   .133300HR    K/TP RATIO =   .874771     SHAPE CONSTANT, N =  4.059460
     UNIT PEAK =   8.5670    CFS   UNIT VOLUME =    .9989       B =   359.12      P60 = 1.9500
     AREA =      .003180 SQ MI    IA =    .41000 INCHES    INF =    .99800 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033300

PRINT HYD            ID=1 CODE=24

                                  PARTIAL HYDROGRAPH   101.00

     TIME      FLOW          TIME      FLOW          TIME      FLOW          TIME      FLOW          TIME      FLOW
      HRS       CFS           HRS       CFS           HRS       CFS           HRS       CFS           HRS       CFS
      .000       .0          1.998      13.7         3.996        .3         5.994        .4
      .666       .0          2.664       1.2         4.662        .3         6.660        .0
     1.332      16.1         3.330        .4         5.328        .3

    RUNOFF VOLUME =     1.86768 INCHES      =       2.1117 ACRE-FEET
    PEAK DISCHARGE RATE =      57.97 CFS  AT   1.499 HOURS   BASIN AREA =   .0212 SQ. MI.


*S
*S*****COMPUTE FLOW FROM SOUTHERN APARTMENTS OF PUERTA DEL
*S*****SOL APARTMENTS

COMPUTE NM HYD       ID=2 HYD NO=102 AREA=0.0002 SQ MI
                     PER A=0 PER B=32.5 PER C=0 PER D=67.5
                     TP=0.1333 HR MASS RAINFALL=-1

     K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
     UNIT PEAK =   .53299    CFS   UNIT VOLUME =    .9785       B =   526.28      P60 = 1.9500
     AREA =      .000135 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033300


     K =   .131364HR    TP =   .133300HR    K/TP RATIO =   .985475     SHAPE CONSTANT, N =  3.583083
     UNIT PEAK =   .15913    CFS   UNIT VOLUME =    .9160       B =   326.34      P60 = 1.9500
     AREA =      .000065 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
     RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033300
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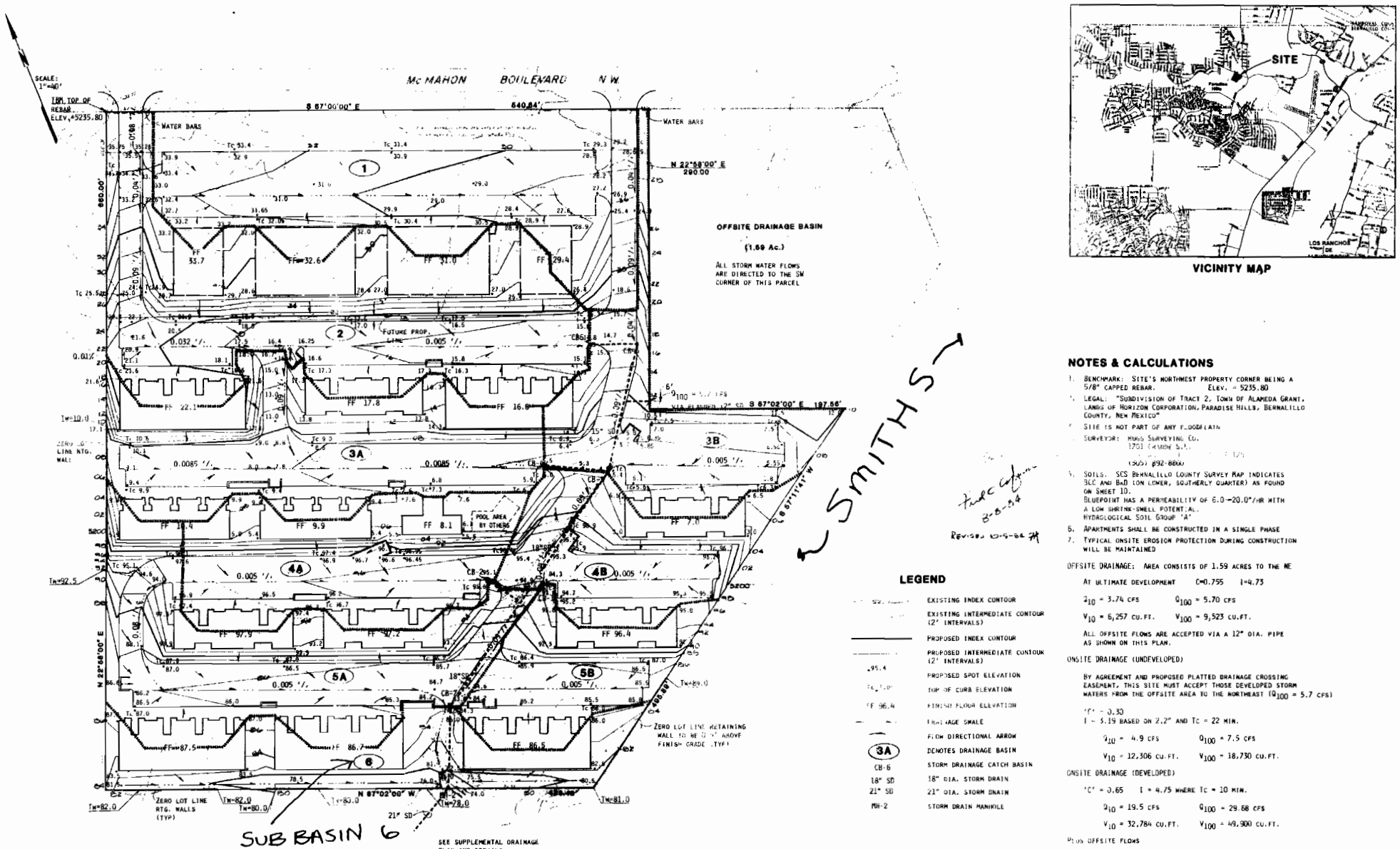
    AHYMO PROGRAM (AHYMO_97) -                          - Version:  1997.02d
         RUN DATE (MON/DAY/YR) = 09/24/2007
         START TIME (HR:MIN:SEC) = 16:19:11     USER NO.= AHYMO-I-9702dGoodwinM-AH
         INPUT FILE = F:\TomG\PARADI~1\PARADI~1.TXT

*S    AHYMO_97 MODEL FOR: PARADISE NORTH COMMERCE CENTER
*S    PREPARED FOR:  TG
*S    PREPARED BY:  MARK GOODWIN & ASSOCIATES
*S
*S    MODEL DESCRIPTION -
*S 1. 100-YEAR 6-HOUR RAINFALL EVENT
*S 2. THIS MODEL ASSUMES DEVELOPED CONDITIONS
*S
START              TIME=0.0
*S***** AHYMO -MCT. DAT
*S***** August 24, 2007
*S***** HYDROLOGY FOR PNCC DEVELOPED ONSITE

RAINFALL           TYPE=1 RAIN QUARTER=0.0 IN
                   RAIN ONE=1.95 IN RAIN SIX=2.27 IN
                   RAIN DAY=2.67 IN DT=0.0333 HR


               COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
               DT =     .033300 HOURS       END TIME =     5.994000 HOURS
                  .0000   .0015   .0030   .0045   .0061   .0077   .0093
                  .0110   .0127   .0145   .0163   .0181   .0200   .0220
                  .0240   .0261   .0282   .0304   .0327   .0351   .0375
                  .0401   .0427   .0455   .0483   .0513   .0544   .0577
                  .0612   .0648   .0686   .0740   .0797   .0859   .0986
                  .1277   .1726   .2372   .3256   .4417   .5900   .7747
                 1.0002  1.2168  1.3056  1.3803  1.4467  1.5071  1.5627
                 1.6143  1.6624  1.7076  1.7501  1.7902  1.8281  1.8639
                 1.8979  1.9301  1.9606  1.9896  2.0172  2.0246  2.0304
                 2.0359  2.0411  2.0461  2.0509  2.0555  2.0600  2.0642
                 2.0683  2.0723  2.0761  2.0799  2.0835  2.0870  2.0904
                 2.0937  2.0970  2.1001  2.1032  2.1063  2.1092  2.1121
                 2.1149  2.1177  2.1204  2.1231  2.1257  2.1282  2.1307
                 2.1332  2.1356  2.1380  2.1404  2.1427  2.1450  2.1472
                 2.1494  2.1516  2.1537  2.1558  2.1579  2.1599  2.1620
                 2.1640  2.1659  2.1679  2.1698  2.1717  2.1736  2.1754
                 2.1773  2.1791  2.1809  2.1826  2.1844  2.1861  2.1878
                 2.1895  2.1912  2.1928  2.1945  2.1961  2.1977  2.1993
                 2.2009  2.2024  2.2040  2.2055  2.2070  2.2086  2.2100
                 2.2115  2.2130  2.2144  2.2159  2.2173  2.2187  2.2201
                 2.2215  2.2229  2.2243  2.2256  2.2270  2.2283  2.2297
                 2.2310  2.2323  2.2336  2.2349  2.2362  2.2374  2.2387
                 2.2399  2.2412  2.2424  2.2437  2.2449  2.2461  2.2473
                 2.2485  2.2497  2.2508  2.2520  2.2532  2.2543  2.2555
                 2.2566  2.2578  2.2589  2.2600  2.2611  2.2622  2.2633
                 2.2644  2.2655  2.2666  2.2677  2.2687  2.2698
```



VICINITY MAP

NOTES & CALCULATIONS

1. BENCHMARK: SITE'S NORTHWEST PROPERTY CORNER BEING A 5/8" CAPPED REBAR. ELEV. = 5235.80
2. LEGAL: "SUBDIVISION OF TRACT 2, TOWN OF ALAMEDA GRANT, LANDS OF HORIZON CORPORATION, PARADISE HILLS, BERNALILLO COUNTY, NEW MEXICO"
3. SITE IS NOT PART OF ANY FLOODPLAIN
4. SURVEYOR: HUGG SURVEYING CO. 1701 TRAMORE S.W. (505) 892-8800
5. SOILS: SCS BERNALILLO COUNTY SURVEY MAP INDICATES BLC AND BxD (ON LOWER, SOUTHERLY QUARTER) AS FOUND ON SHEET 10. BLUEPOINT HAS A PERMEABILITY OF 6.0-20.0"/HR WITH A LOW SHRINK-SWELL POTENTIAL. HYDROLOGICAL SOIL GROUP 'A'
6. APARTMENTS SHALL BE CONSTRUCTED IN A SINGLE PHASE
7. TYPICAL ONSITE EROSION PROTECTION DURING CONSTRUCTION WILL BE MAINTAINED

OFFSITE DRAINAGE: AREA CONSISTS OF 1.59 ACRES TO THE NE

AT ULTIMATE DEVELOPMENT C=0.755 I=4.73

Q_{10} = 3.74 CFS Q_{100} = 5.70 CFS

V_{10} = 6,257 CU.FT. V_{100} = 9,523 CU.FT.

ALL OFFSITE FLOWS ARE ACCEPTED VIA A 12" DIA. PIPE AS SHOWN ON THIS PLAN.

ONSITE DRAINAGE (UNDEVELOPED)

BY AGREEMENT AND PROPOSED PLATTED DRAINAGE CROSSING EASEMENT, THIS SITE MUST ACCEPT THOSE DEVELOPED STORM WATERS FROM THE OFFSITE AREA TO THE NORTHEAST (Q_{100} = 5.7 CFS)

'C' = 0.30
I = 5.19 BASED ON 2.2" AND Tc = 22 MIN.

Q_{10} = 4.9 CFS Q_{100} = 7.5 CFS

V_{10} = 12,306 CU.FT. V_{100} = 18,730 CU.FT.

ONSITE DRAINAGE (DEVELOPED)

'C' = 0.65 I = 4.75 WHERE Tc = 10 MIN.

Q_{10} = 19.5 CFS Q_{100} = 29.68 CFS

V_{10} = 32,784 CU.FT. V_{100} = 49,900 CU.FT.

PLUS OFFSITE FLOWS

Q_{10} = 23.25 CFS Q_{100} = 35.38 CFS

V_{10} = 39,040 CU.FT. V_{100} = 59,423 CU.FT.

ALL STORM WATERS ARE ACCEPTED INTO THE STORM DRAIN SYSTEM.

Revised 10-5-84

LEGEND

522	EXISTING INDEX CONTOUR
	EXISTING INTERMEDIATE CONTOUR (2' INTERVALS)
	PROPOSED INDEX CONTOUR
	PROPOSED INTERMEDIATE CONTOUR (2' INTERVALS)
95.4	PROPOSED SPOT ELEVATION
Tc 97.0	TOP OF CURB ELEVATION
FF 96.4	FINISH FLOOR ELEVATION
	DRAINAGE SWALE
	FLOW DIRECTIONAL ARROW
3A	DENOTES DRAINAGE BASIN
CB-6	STORM DRAINAGE CATCH BASIN
18" SD	18" DIA. STORM DRAIN
21" SD	21" DIA. STORM DRAIN
MH-2	STORM DRAIN MANHOLE

SITE DRAINAGE

EXHIBIT 1

AREA 5A: $(75 \times 95) + (345 \times 105) + \frac{1}{2}(65 \times 35) - 4000 + 2704 + 860 =$
$45677\,\text{sf} = 1.05\,\text{acre}$

PAVED $(2800 \times 2) + 2704 + 560 + (85 \times 24) + (45 \times 24) +$
$(335 \times 42) + (75 \times 24) = 28154\,\text{sf} = 0.646\,\text{ac}$

% IMPERVIOUS = $.646 \div 1.05 =$ **61.6%**

5B: $(190 \times 100) - 2060 + 2704 = 19644\,\text{sf} = 0.451\,\text{ac}$

PAVED $2860 + 2704 + (165 \times 42) = 12494\,\text{sf} = 0.287\,\text{ac}$

%IMPERVIOUS = $0.287 \div 0.451 =$ **63.6%**

6: $(140 \times 65) - 2704 = 5996\,\text{sf} = 0.138\,\text{ac}$ ←

PAVED $4056\,\text{sf} = 0.093$

% IMPERVIOUS = $0.093 + 0.138 =$ **67.5%** ←

7: $(165 \times 65) - 860$ $9865\,\text{sf} = 0.226$ acre

PAVED $2660\,\text{sf} = 0.061\,\text{ac}$ %IMPERVIOUS = $0.061 \div 0.226 =$ **27%**

8: $(135 \times 65) - 2680 = 6095\,\text{sf} = 0.140$ acre

Paved $3380\,\text{sf} = 0.078\,\text{ac}$ % IMPERVIOUS = $.078 - .140 =$ **55.7%**

9: $(75 \times 60) = 4500\,\text{sf} = 0.103$ acre

PAVED $676\,\text{sf} = 0.016\,\text{ac}$ % IMPERVIOUS = $.016 \div .103 =$ **15.1%**

OFFSITE (a): $(275 \times 252) = 69300\,\text{sf} = 1.591$ acre

assume fully developed $C = 0.65$

```
PRINT HYD           ID=2 CODE=24
```

PARTIAL HYDROGRAPH 102.00

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
.000	.0	1.332	.1	2.664	.0	3.996	.0	5.328	.0
.666	.0	1.998	.1	3.330	.0	4.662	.0	5.994	.0

RUNOFF VOLUME = 1.61003 INCHES = .0172 ACRE-FEET
PEAK DISCHARGE RATE = .50 CFS AT 1.499 HOURS BASIN AREA = .0002 SQ. MI.

```
*S
*S ADD THE ROUTED FLOW FROM APARTMENTS AND PARADISE COMMERCE
*S TO DETERMINE TOTAL FLOW INTO STORM DRAIN
*S
ADD HYD                     ID=3 HYD=103 I=1 II=2
PRINT HYD               ID=3 CODE=10
```

PARTIAL HYDROGRAPH 103.00

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
.000	.0	1.665	29.9	3.330	.4	4.995	.3	6.660	.0
.333	.0	1.998	13.8	3.663	.3	5.328	.3	6.993	.0
.666	.0	2.331	2.9	3.996	.3	5.661	.3		
.999	.0	2.664	1.2	4.329	.3	5.994	.4		
1.332	16.2	2.997	.6	4.662	.3	6.327	.0		

RUNOFF VOLUME = 1.86525 INCHES = 2.1289 ACRE-FEET
PEAK DISCHARGE RATE = 58.47 CFS AT 1.499 HOURS BASIN AREA = .0214 SQ. MI.

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FINISH

    NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 16:19:11
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