# DRAINAGE STUDY/HYDRAULIC CALCULATIONS FOR TM 5243 BEAVERCREEK LANE FALLBROOK,CA.

## OWNER:

STEVEN J. VANDE VEGTE, ET. AL.
495 BEAVERCREEK LANE
FALLBROOK,CA. 92028

## PREPARED BY:


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9/09/2009

PATRICK W. HARRISON, RCE 29241
MY CURRENT REGISTRATION EXPIRES 3-31-2011

PROJECT # 1102SUB

SEPTEMBER 7,2001

REVISED DECEMBER 12,2004

REVISED AUGUST 18, 2008

REGISTERED PROFESSIONAL ENGINEER
PATRICK W. HARRISON
No. 29241
Exp. 3-31-2011
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## HYDRAULIC CALCULATIONS AND RECOMMENDATIONS:

**DRAINAGE AREA "A":**

LAND AREA = 217 ACRES
DELTA 'H' = 311 FEET
LENGTH = 7200 FEET/ 1.36 MILES
TIME OF CONCENTRATION = 34 MINUTES
COEFFICIENT OF RUNOFF C= 0.40 (SOIL GROUP "C")
INTENSITY = 2.30 INCHES/HOUR FOR Q-100
Q-100 = 200 CFS

**RECOMMENDATIONS FOR DRAINAGE AREA "A":**

DRAINAGE AREA "A" ENTERS THE NORTHERLY BOUNDARY OF TM 5243 NEAR THE NORTHEAST CORNER OF LOT 3 AND TRAVELS SOUTHERLY NEAR THE EASTERLY BOUNDARY OF LOTS 3,4 AND 5. IT EXITS NEAR THE SOUTHWEST CORNER OF LOT 5 AT THE FUTURE EXTENSION OF FALLBROOK STREET. THIS AREA IS AN EXISTING OPEN SPACE EASEMENT GRANTED BY PARCEL MAP 18202. THE DRAINAGE COURSE SHOULD REMAIN IN ITS NATURAL CONDITION. THE CROSSING AT FALLBROOK STREET HAS BEEN DESIGNED PER THE IMPROVEMENT PLANS FOR TM 5166 AND CONSISTS OF 2-54" RCP CULVERTS WITH A "L" HEADWALL AT THE ENTRANCE AND RIP-RAP AT THE OUTLET.

**DRAINAGE AREA "B":**

LAND AREA = 172 ACRES
DELTA 'H' = 295 FEET
LENGTH = 6200 FEET/ 1.17 MILES
TIME OF CONCENTRATION = 32 MINUTES
COEFFICIENT OF RUNOFF C= 0.40 (SOIL GROUP "C")
INTENSITY = 2.39 INCHES/HOUR FOR Q-100
Q-100 = 164 CFS

RECOMMENDATIONS FOR DRAINAGE AREA 'B':

DRAINAGE AREA 'B' CROSSES THE BOUNDARY OF TM 5243 AT THE SOUTHWEST CORNER OF LOT 7. THIS AREA IS AN EXISTING OPEN SPACE EASEMENT GRANTED BY PARCEL MAP 18202. NO IMPROVEMENTS ARE RECOMMENDED TO DRAINAGE AREA 'B'. THE DRAINAGE COURSE SHOULD REMAIN IN ITS NATURAL CONDITION.

**DRAINAGE AREA "C":**

LAND AREA = 20 ACRES
DELTA 'H' = 150 FEET
LENGTH = 2300 FEET/ 0.44 MILES
TIME OF CONCENTRATION = 19 MINUTES
COEFFICIENT OF RUNOFF C= 0.40 (SOIL GROUP "C")
INTENSITY = 3.34 INCHES/HOUR FOR Q-100
Q-100 = 26.7 CFS

**RECOMMENDATIONS FOR DRAINAGE AREA "C":**

DRAINAGE AREA "C" ENTERS THE NORTHERLY BOUNDARY OF TM 5243 NEAR THE NORTHWEST CORNER OF LOT 1 AND TRAVELS SOUTHERLY THROUGH PORTIONS OF LOTS 2,6,7 AND 8. THIS AREA FOR THE MOST PART IS AN EXISTING OPEN SPACE EASEMENT GRANTED BY PARCEL MAP 18202. THE DRAINAGE COURSE SHOULD REMAIN IN ITS NATURAL CONDITION EXCEPT WHERE IT CROSSES THE PRIVATE JOINT-USE DRIVEWAY PROVIDING ACCESS TO LOTS 7 AND 8 AND FALLBROOK STREET. A 24" CSP CULVERT SHOULD BE INSTALLED WHERE DRAINAGE AREA "C" CROSSES THE JOINT-USE DRIVEWAY. A 30" CSP CULVERT SHOULD BE INSTALLED WHERE DRAIANGE AREA "C" CROSSES FALLBROOK STREET. THE ESTIMATED INCREASE IN POST-CONSTRUCTION PEAK RUNOFF FLOW RATE VS THE PRE-CONSTRUCTION LEVELS IS 3.35% (SEE CALCULATIONS IN "GENERAL RECOMMENDATIONS AND DISCUSSION"). THE POST-CONSTRUCTION "Q-100" WOULD INCREASE FROM 26.7 CFS TO 27.6 CFS. AT THE SOUTHERLY END OF BASIN "C" (THE ENTRANCE POINT OF THE PROPOSED 30" CULVERT THAT CROSSES FALLBROOK STREET) THE PRE-CONSTRUCTION PEAK FLOW VELOCITY FOR Q-100 IS ESTIMATED AT 4.16 FPS. THE POST-CONSTRUCTION PEAK FLOW VELOCITY FOR Q-100 IS ESTIMATED AT 4.21 FPS. THE INCREASE IN PEAK FLOW VELOCITY WOULD BE 1.20%. I WOULD CONSIDER THIS INCREASE IN THE FLOW RATE AS INSIGNIFICANT. THE EXISTING FLOW VELOCITY AND FUTURE FLOW VELOCITY ARE QUITE SLOW AND SCOURING OR EROSION SHOULD NOT BE A PROBLEM.

**GENERAL RECOMMENDATIONS AND DISCUSSION:**

A) THE PROJECT (TM 5243) CONSISTS OF 13.24 ACRES BEING SUBDIVIDED INTO 8 LOTS. 5.20 AREAS OF BIOLOGICAL OPEN SPACE EXIST ON THIS SITE BEING GRANTED PER PARCEL MAP 18202. THE FUTURE EXTENSION OF FALLBROOK STREET TRAVERSES THIS SITE. A PORTION OF BEAVERCKEER LANE WILL BE CONSTRUCTED FORM THE EXISTING CUL-DE-SAC TO FALLBROOK STREET WITH 24' WIDE AC PAVING. FALLBROOK STREET ONSITE WITH BE CONSTRUCTED WITH 40' WIDE AC PAVING. LOT 1 HAS AN EXISTING RESIDENCE AND DRIVEWAY. LOTS 2 THROUGH 6 WILL BE SERVED BY A SINGLE 16' WIDE AC DRIVEWAY. LOTS 7 AND 8 WILL HAVE A 24' WIDE JOINT USE DRIVEWAY. FOR THE DESIGN PURPOSE LOTS 2 THROUGH 8 WILL HAVE A SINGLE FAMILY DWELLING FOOT PRINT OF 3600 S.F. OF IMPERVIOUS SURFACES. THE COEFFICIENT OF RUNOFF ('C' FACTOR) IS 0.95 FOR THE DRIVEWAYS AND ADDITIONAL IMPERVIOUS SURFACES. IF CONSTRUCTED THIS WILL INCREASE THE OVERALL RUNOFF COEFFICIENT TO THE DRAINAGE AREAS AS FOLLOWS:

**DRAINAGE AREA "A":**

NO CHANGE--NO CONSTRUCTION AFFECTING THIS DRAINAGE AREA

**DRAINAGE AREA "B":**
TOTAL LAND AREA 172 ACRES AT ORIGINAL "C" OF 0.40
NEW "C"=[(172-0.80)(0.40)+(0.80)(0.95)]/172= 0.4044

% OF INCREASE IN THE RUNOFF FOR DRAINAGE AREA "B" IS 1.1 %

**DRAINAGE AREA "C":**
TOTAL LAND AREA 26.7 ACRES AT ORIGINAL "C" OF 0.40
NEW "C"=[(26.7-0.65)(0.40)+(0.65)(0.95)]/26.7= 0.4134

% OF INCREASE IN THE RUNOFF FOR DRAINAGE AREA "C" IS 3.35%

B) ALL BMP'S SHALL BE CONSTRUCTED, INSTALLED OR PLACED IN ACCORDANCE WITH THE CURRENT DESIGN STANDARDS TO PREVENT ANY POLLUTANTS FROM EXITING THE PROPOSED DEVELOPMENT. AT A MINIMUM THE FOLLOWING CALTRANS BMP DETAILS SHALL BE USED:

CD7(2), CD8(2), CD9(2), CD10(2), CD12(2), CD13(2), CD16(2), CD17(2), CA18(2), CD19(2), CD20(2), CD24B(2), CD26A(2), CDB26(2), CD29A(2), CD29B(2), CD31(2), CD33A(2), CD33B(2), CD36(2) AND CD38(2)

ALL BMP'S SHALL BE SUBJECT TO APPROVAL BY THE DIRECTOR OF PUBLIC WORKS AND A PLAN TO MONITOR THE EFFECTIVENESS OF THESES BMP'S AFTER CONSTRUCTION IS RECOMMENDED.

C) OWNERS OF INDIVIDUAL LOTS THAT HAVE PROPOSED GRAVEL DRAINS AND RIP-RAP PADS LOCATED ON THEM WILL BE RESPONSIBLE FOR THE MAINTENENACE OF THOSE FACILITIES. ANY BMP'S LOCATED ALONG AND WITHIN BEAVERCREEK LANE WILL BY MAINTAINED BY A PRIVATE ROAD MAINTENANCE AGREEMENT BY THE OWNERS OF LOTS 1 THROUGH 8. THE COUNTY OF SAN DIEGO WILL BE RESPONSIBLE FOR THE MAINTENENACE OF FALLBROOK STREET, CURB INLETS, BIO FILTERS , SLOPES AND ANY OTHER FACILITY LOCATED WITHIN THE PUBLIC RIGHT-OF-WAY.

PATRICK W. HARRISON, RCE
*Subdivisions, Parcel Maps, Grading Plans*
*Waterlines, Boundary Surveys*

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## HYDROLIC CALCULATIONS

AREA "A"
AREA 217 ACRES
ΔH= 311 FT
L= 7200 FT
TC= 34 MIN
AF= 1.00 C= 0.40
IN/HR= 2.30
Q100 = 200 CFS

AREA "B"
AREA 172 ACRES
ΔH= 295 FT
L= 6900 FT
TC= 32 MIN
AF= 1.00 C= 0.40
IN/HR= 2.39
Q100 = 1.64 CFS

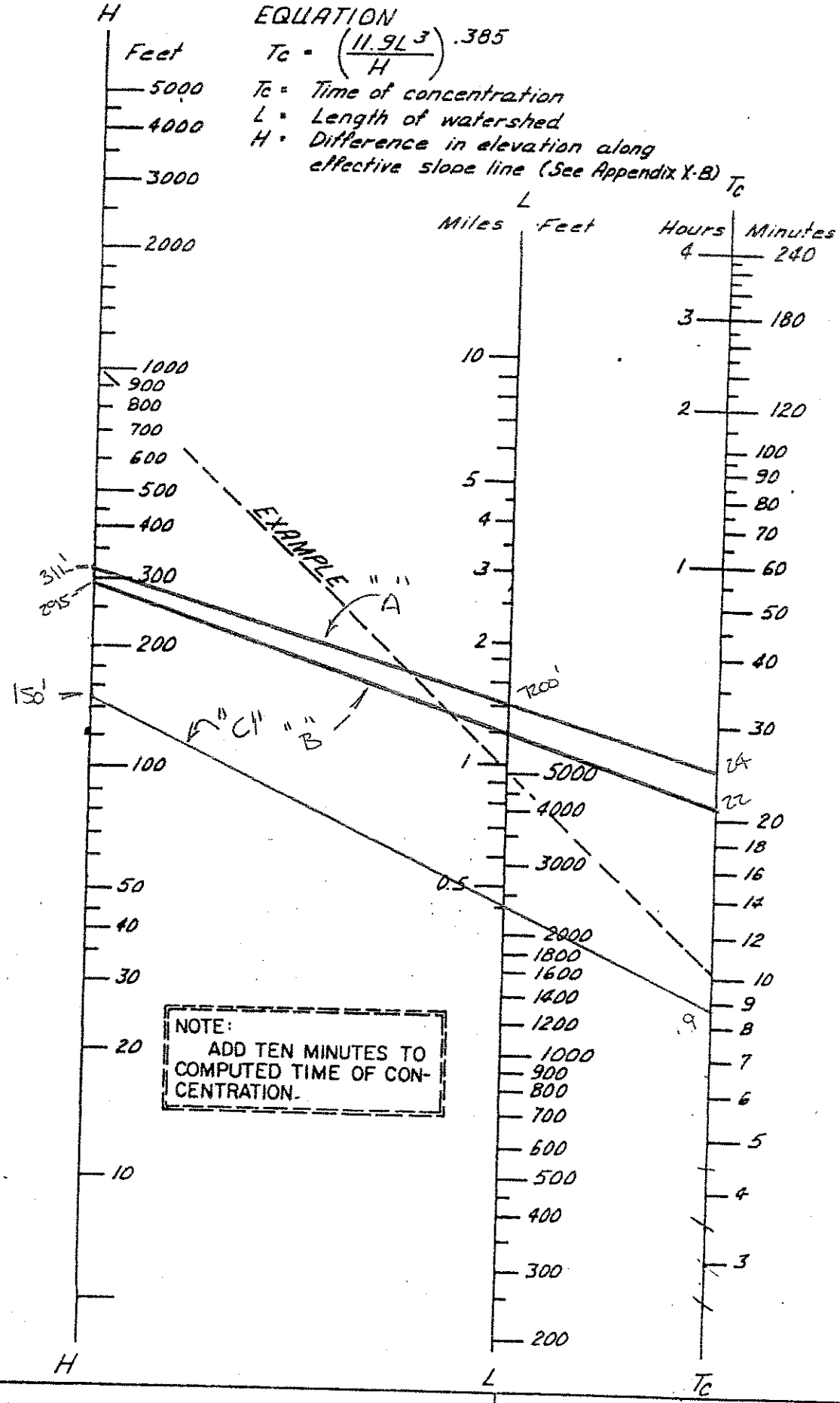
AREA "C"
AREA 20.0 ACRES
ΔH= 150 FT
L= 2300 FT
TC= 19 MIN
AF= 1.00 C= 0.40
IN/HR= 3.34
Q100 = 26.7 CFS

AREA
AREA ACRES
H= FT
L= FT
TC= MIN
AF= C=
IN/HR=
Q = CFS

EQUATION

$$T_c = \left(\frac{11.9L^3}{H}\right)^{.385}$$

$T_c$ = Time of concentration
$L$ = Length of watershed
$H$ = Difference in elevation along effective slope line (See Appendix X-B)

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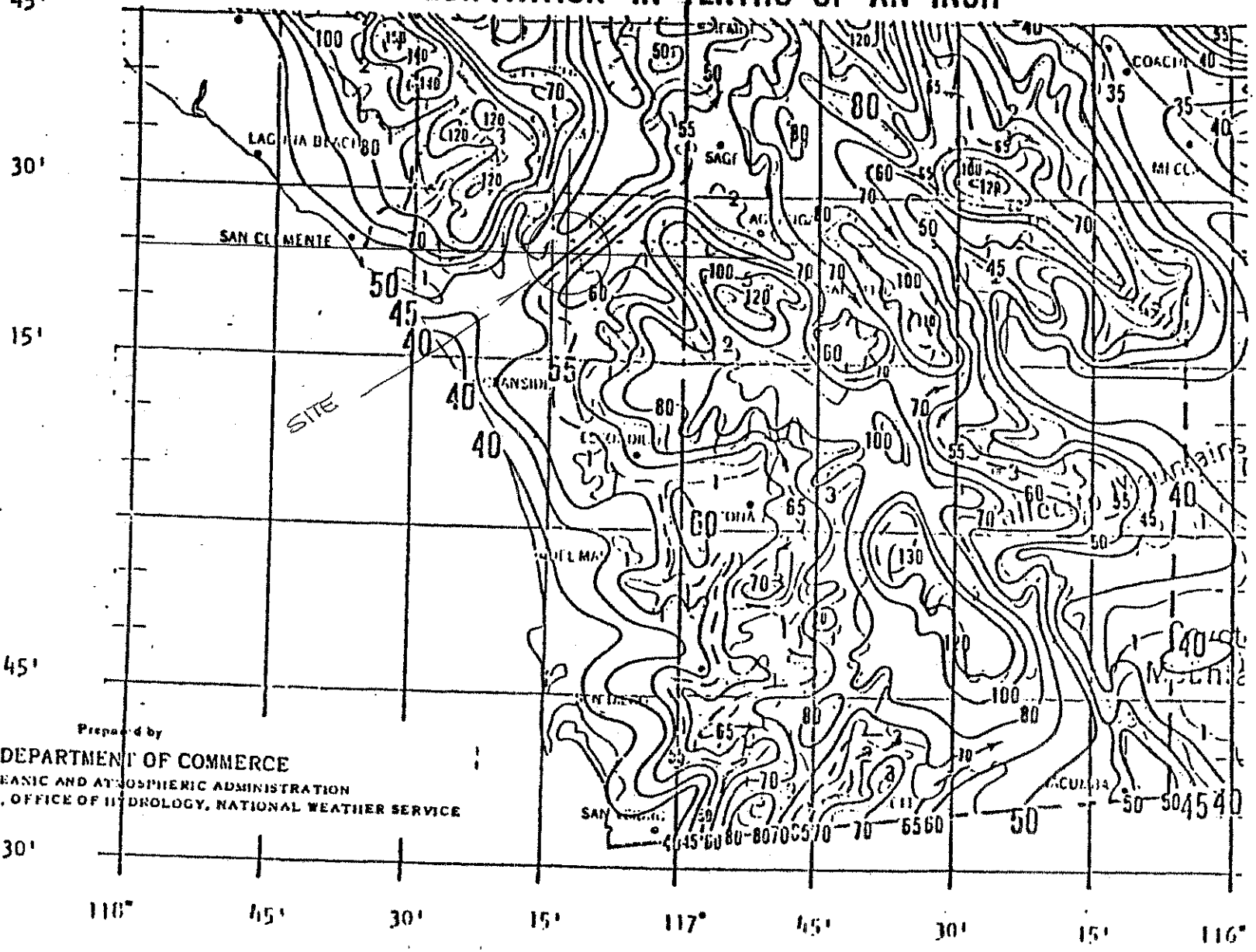
|---|---|
| SAN DIEGO COUNTY<br>DEPARTMENT OF SPECIAL DISTRICT SERVICES<br>DESIGN MANUAL<br>APPROVED J. H. Hoffmaster | NOMOGRAPH FOR DETERMINATION OF TIME OF CONCENTRATION (Tc) FOR NATURAL WATERSHEDS<br>DATE 12/1/69 |
| | APPENDIX X-A |

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

# 100-YEAR 24-HOUR PRECIPITATION

## 20 ISOPLUVIALS OF 100-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH

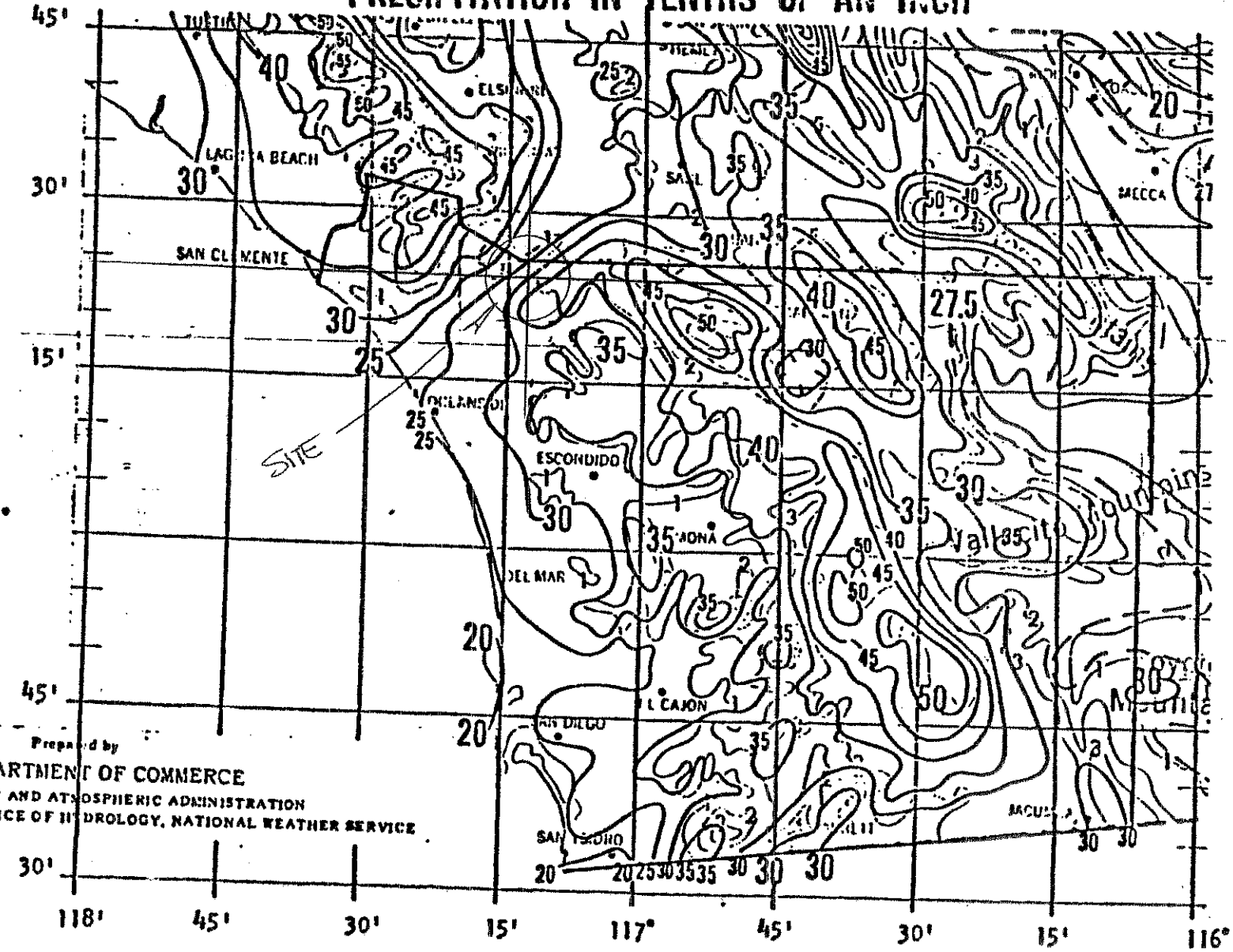



Prepared by
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

# 100-YEAR 6-HOUR PRECIPITATION

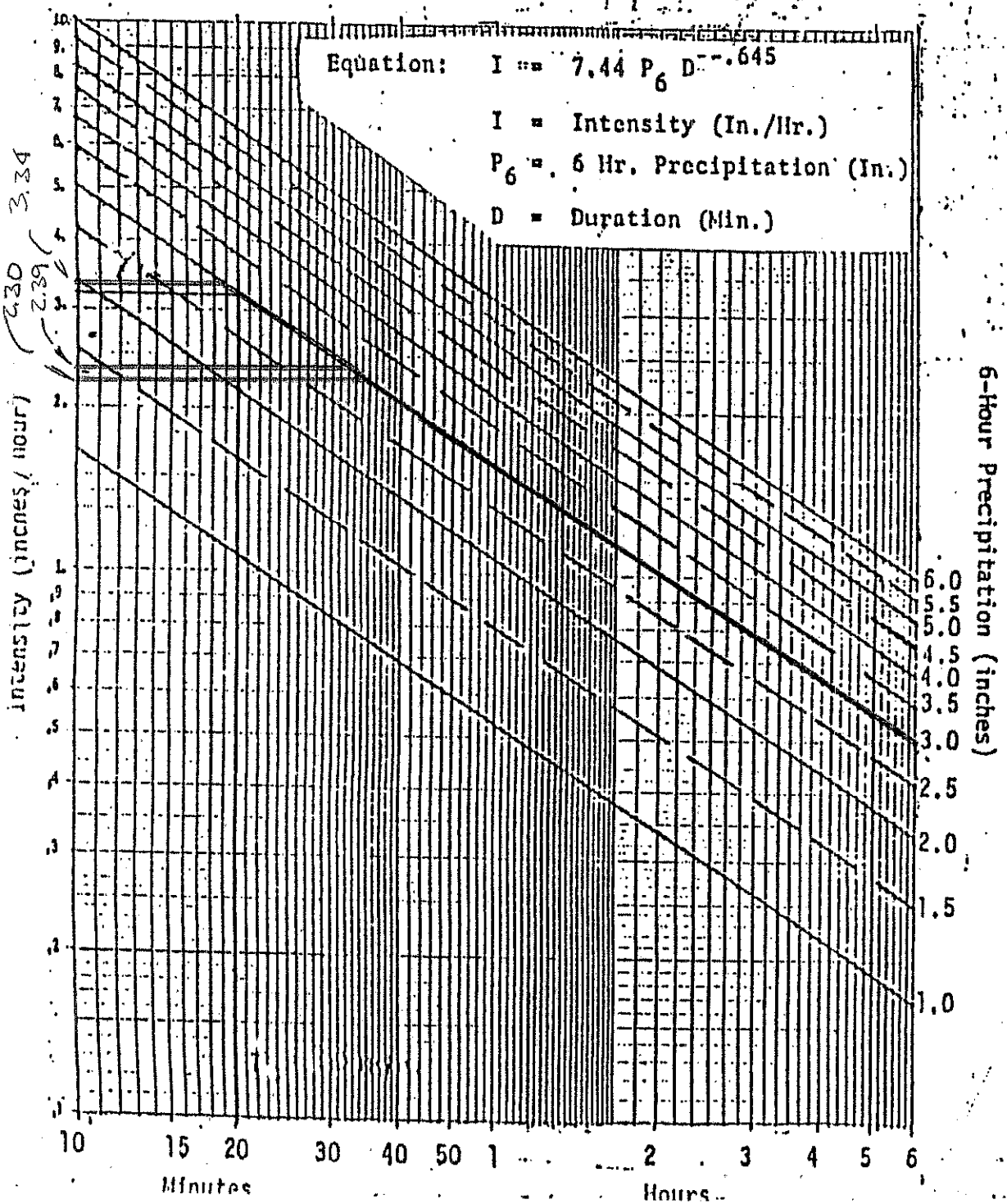
## 20 ISOPLUVIALS OF 100-YEAR 6-HOUR PRECIPITATION IN TENTHS OF AN INCH




Prepared by
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

# INTENSITY-DURATION DESIGN CHART

1984




Directions for Application:

1) From precipitation maps determine 6 hr. and 24 hr. amounts for the selected frequency. These maps are printed in the County Hydrolo Manual (10, 50 and 100 yr. maps included in Design and Procedure Manual).

2) Adjust 6 hr. precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr. precipitation. (Not applicable to Desert)

3) Plot 6 hr. precipitation on the right side of the chart.

4) Draw a line through the point parallel to th plotted lines.

5) This line is the intensity-duration curve fo the location being analyzed.

Application Form:

0) Selected Frequency 100 yr.

1) $P_6$ = 3.00 in., $P_{24}$ = 5.00, $\frac{{}^*P_6}{P_{24}}$ = 60 %*

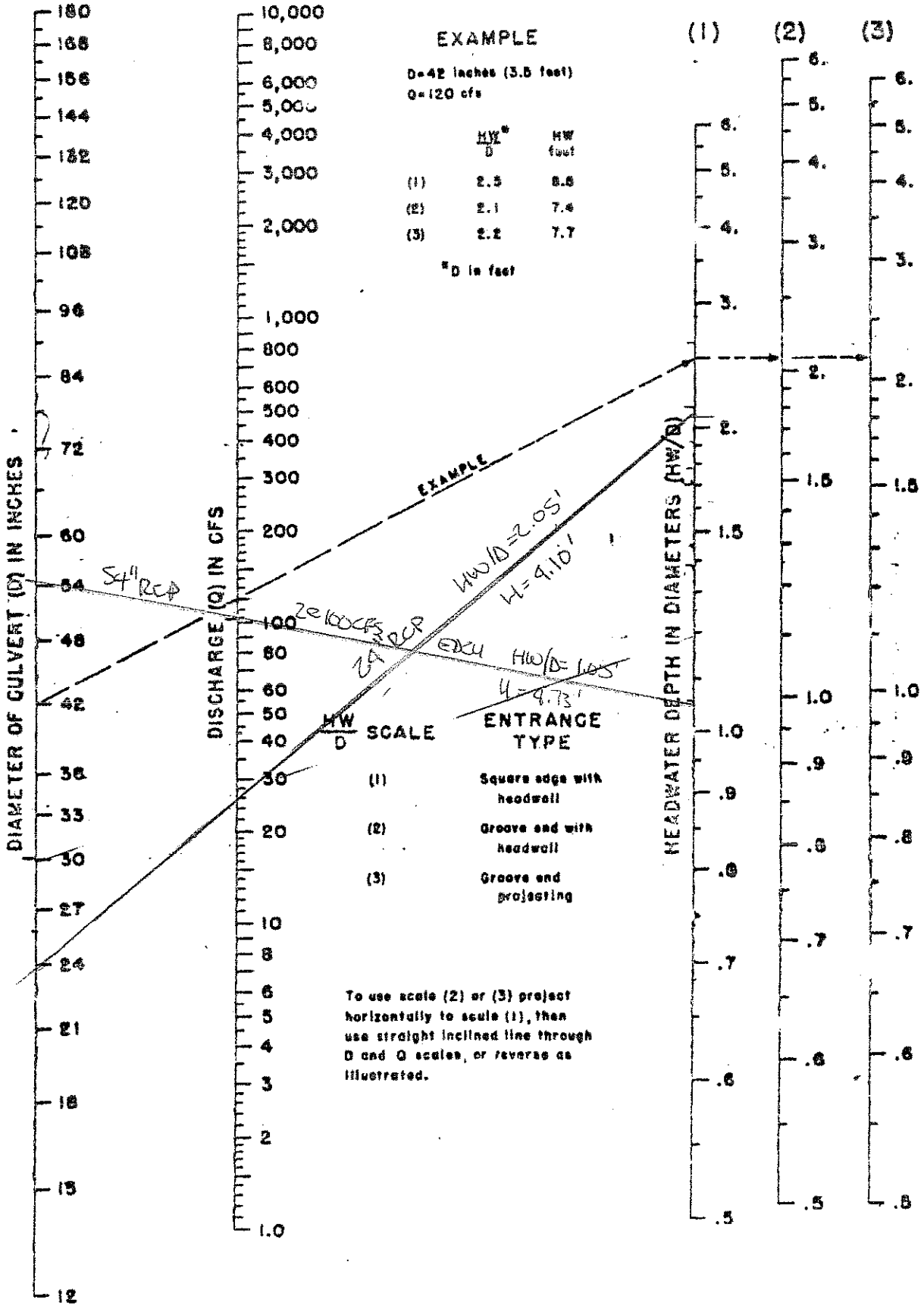
2) Adjusted $^*P_6$ = 3.00 in.

3) $t_c$ = 39/32/19 min.

4) I = 2.30/2.39/3.34 in/hr.

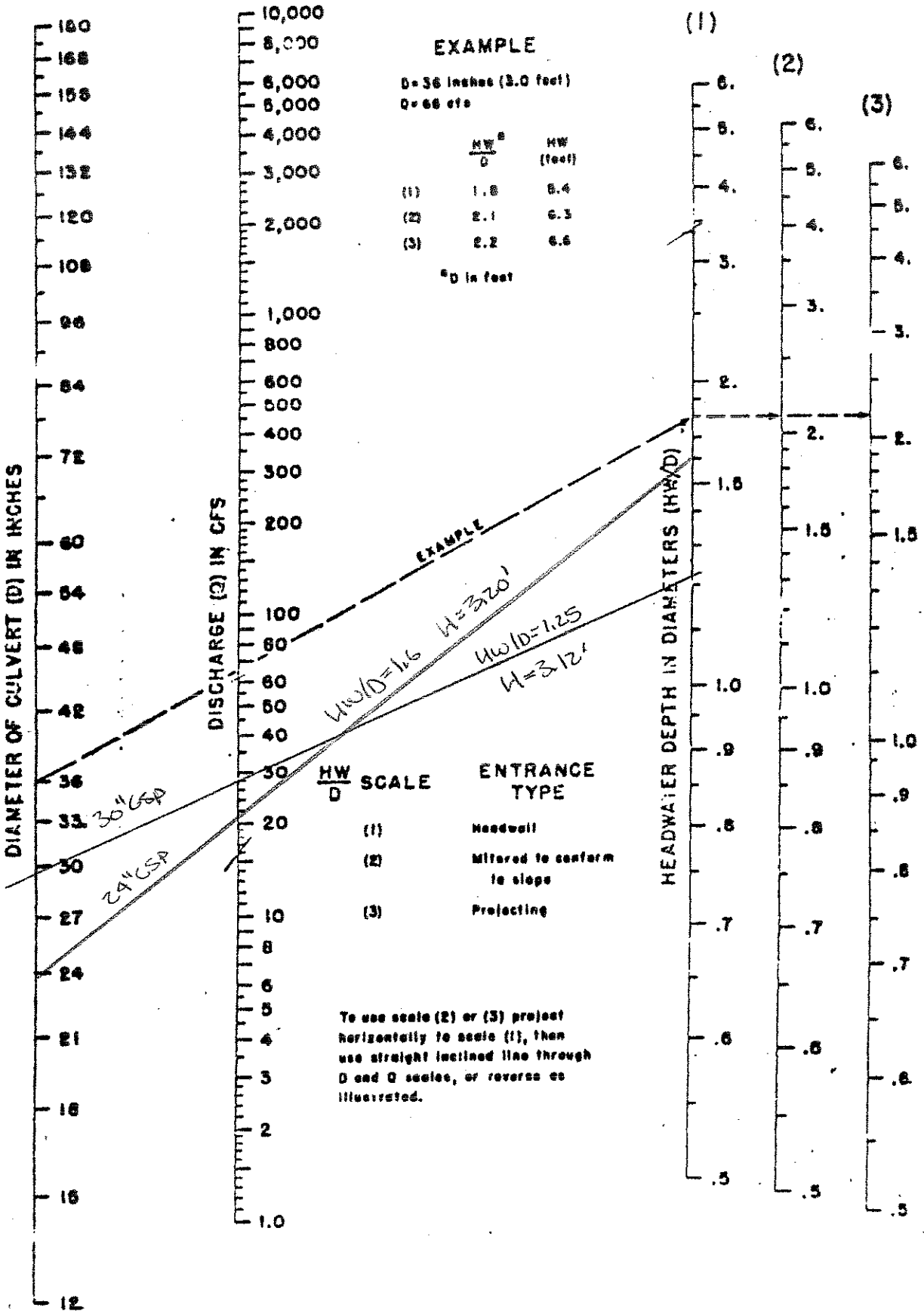
*Not Applicable to Desert Region

This chart replaces the Intensity-Duration-Frequency curves used since 1965.




HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH ENTRANCE CONTRC

Plate 2.6-0616




HEADWATER DEPTH FOR C.M. PIPE CULVERTS WITH ENTRANCE CONTROL

Plate 2.6-0617

TOPOGRAPH
FALLBROOK
ORCHARD
CULTIVATED
BRUSH
TREES
DAM