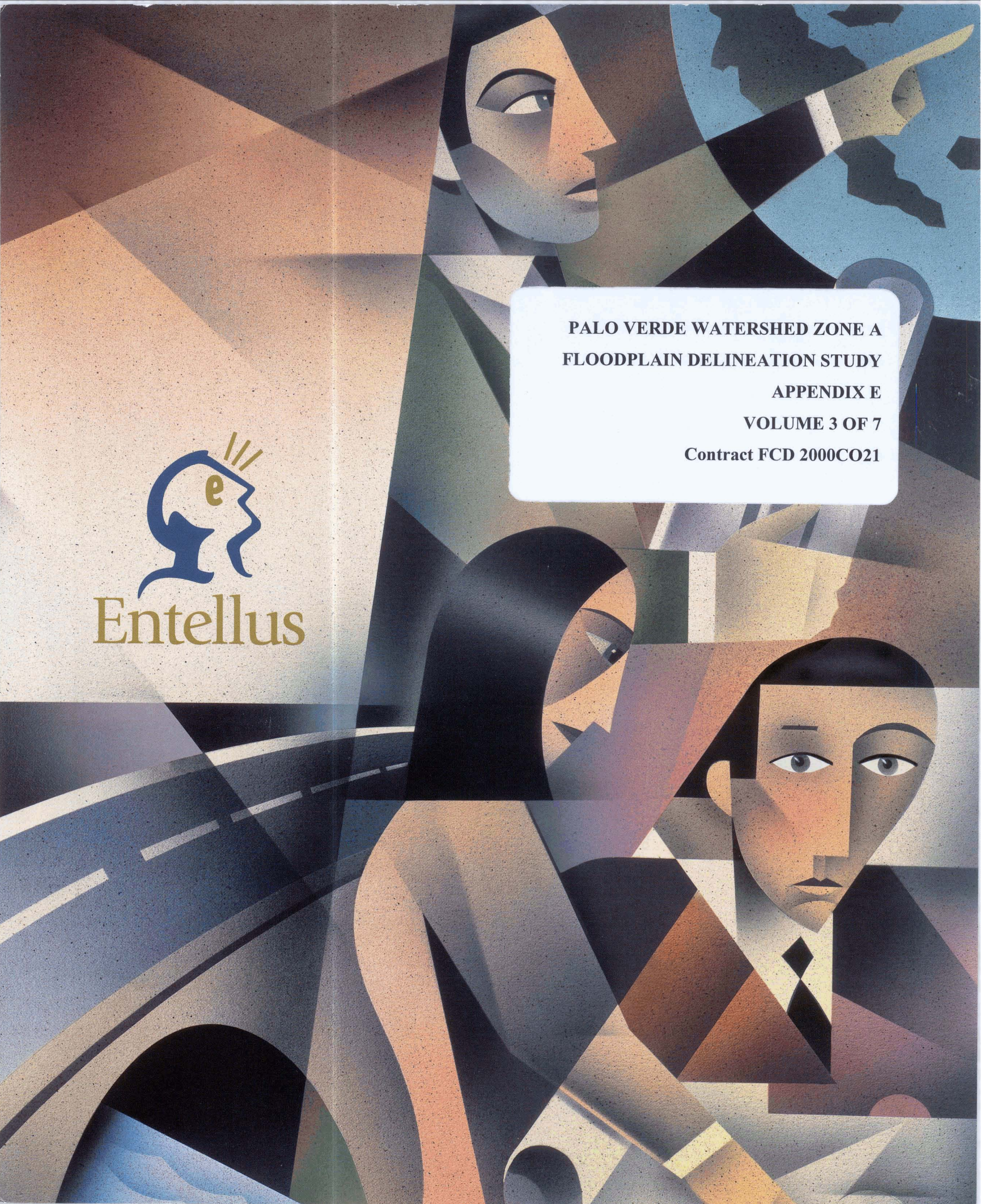

PALO VERDE WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY

APPENDIX E

VOLUME 3 OF 7

Contract FCD 2000CO21

Entellus

PALO VERDE WATERSHED ZONE A

FLOODPLAIN DELINEATION STUDY

TECHNICAL DATA NOTEBOOK

Contract FCD 2000CO21

Volume 3 of 7

MAY 3 0 2003

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Environmental *Solutions*

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PALO VERDE WATERSHED ZONE A FLOODPLAIN DELINEATION STUDY

FCD 2000CO21

TECHNICAL DATA NOTEBOOK

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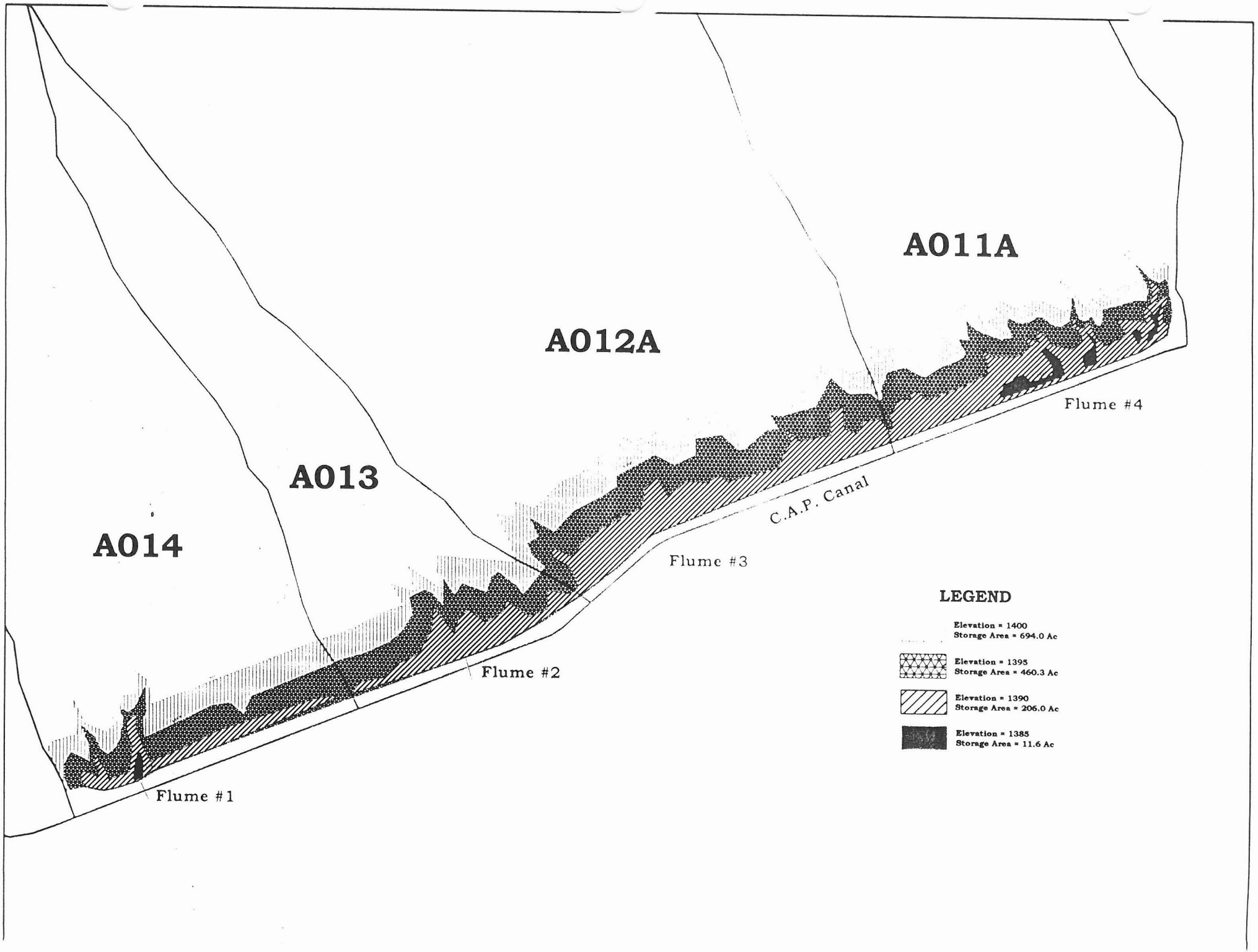
APPENDIX E. HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION

E.1 CAP Canal Impoundment Analysis

CAP Impoundment Analysis

Flumes 1-4


A011A
A012A
A013
A014
Flume #4
C.A.P. Canal
Flume #3
Flume #2
Flume #1
LEGEND
Elevation = 1400
Storage Area = 694.0 Ac
Elevation = 1395
Storage Area = 460.3 Ac
Elevation = 1390
Storage Area = 206.0 Ac
Elevation = 1385
Storage Area = 11.6 Ac

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SHEET _____ OF _____

BY _____ DATE _____

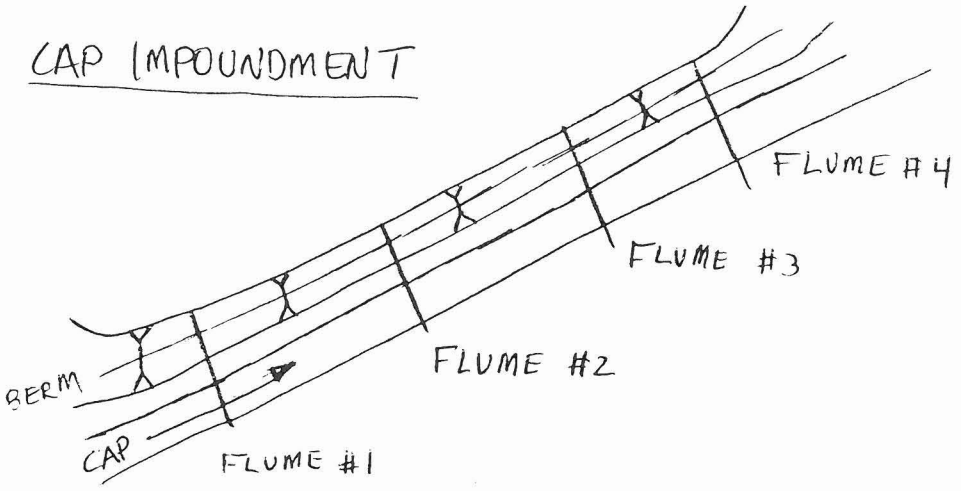
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. _____

CAP IMPOUNDMENT



FLUME #1 - 72" RCP
Invert Elevation = 1383.40
Berm elevation = 1400.90

FLUME #2 - 72" RCP
Invert elevation = 1383.00
Berm elevation = 1400.40

FLUME #3 - 72" RCP
Invert elevation = 1383.00
Berm elevation = 1400.40

FLUME #4 - 72" RCP
Invert elevation = 1382.06
Berm elevation = 1400.80

Storage at 1385

FLUME #1 $h/d = 0.27$ Q_1 (from Chart 1 attached) = 10 cfs (estimated)
FLUME #2 $h/d = 0.33$ $Q_2 = 40$ cfs
FLUME #3 $h/d = 0.33$ $Q_3 = 40$ cfs
FLUME #4 $h/d = 0.50$ $Q_4 = 65$ cfs

$Q_{total} = 155$ cfs
Storage Area = 11.6 acres

Storage at 1390

FLUME #1 $h/d = 1.01$ $Q_1 = 220$ cfs
FLUME #2 $h/d = 1.02$ $Q_2 = 250$ cfs
FLUME #3 $h/d = 1.02$ $Q_3 = 250$ cfs
FLUME #4 $h/d = 1.33$ $Q_4 = 280$ cfs

$Q_{total} = 1000$ cfs
Storage Area = 206 acres

Note: Elevations were obtained from Survey Report.
Storage areas were estimated using topographic maps.

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BY _____ DATE _____

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CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____

Storage at 1395

FLUME #1 h/d = 1.933 Q_1 = 395 cfs

FLUME #2 h/d = 2.00 Q_2 = 400 cfs

FLUME #3 h/d = 2.00 Q_3 = 400 cfs

FLUME #4 h/d = 2.17 Q_4 = 430 cfs

Q_{total} = 1625 cfs

Storage Area = 460.3 ac

Storage at 1400

FLUME #1 h/d = 2.8 Q_1 = 520 cfs

FLUME #2 h/d = 2.8 Q_2 = 520 cfs

FLUME #3 h/d = 2.8 Q_3 = 520 cfs

FLUME #4 h/d = 3.0 Q_4 = 540 cfs

Q_{total} = 2100 cfs

Storage Area = 694 ac

INTERPOLATED HYDROGRAPH (see HEC-1 output attached)

CUMULATIVE AREA = 50.55 SQ MI

Stage at 30 SQMI = 1394.45

Stage at 60 SQMI = 1393.94

$$-\left(\frac{50.55-30}{60-30}\right) * (1394.45 - 1393.94) + 1393.94 = \underline{\underline{1394.3}}$$

Maximum Stage = 1394.3

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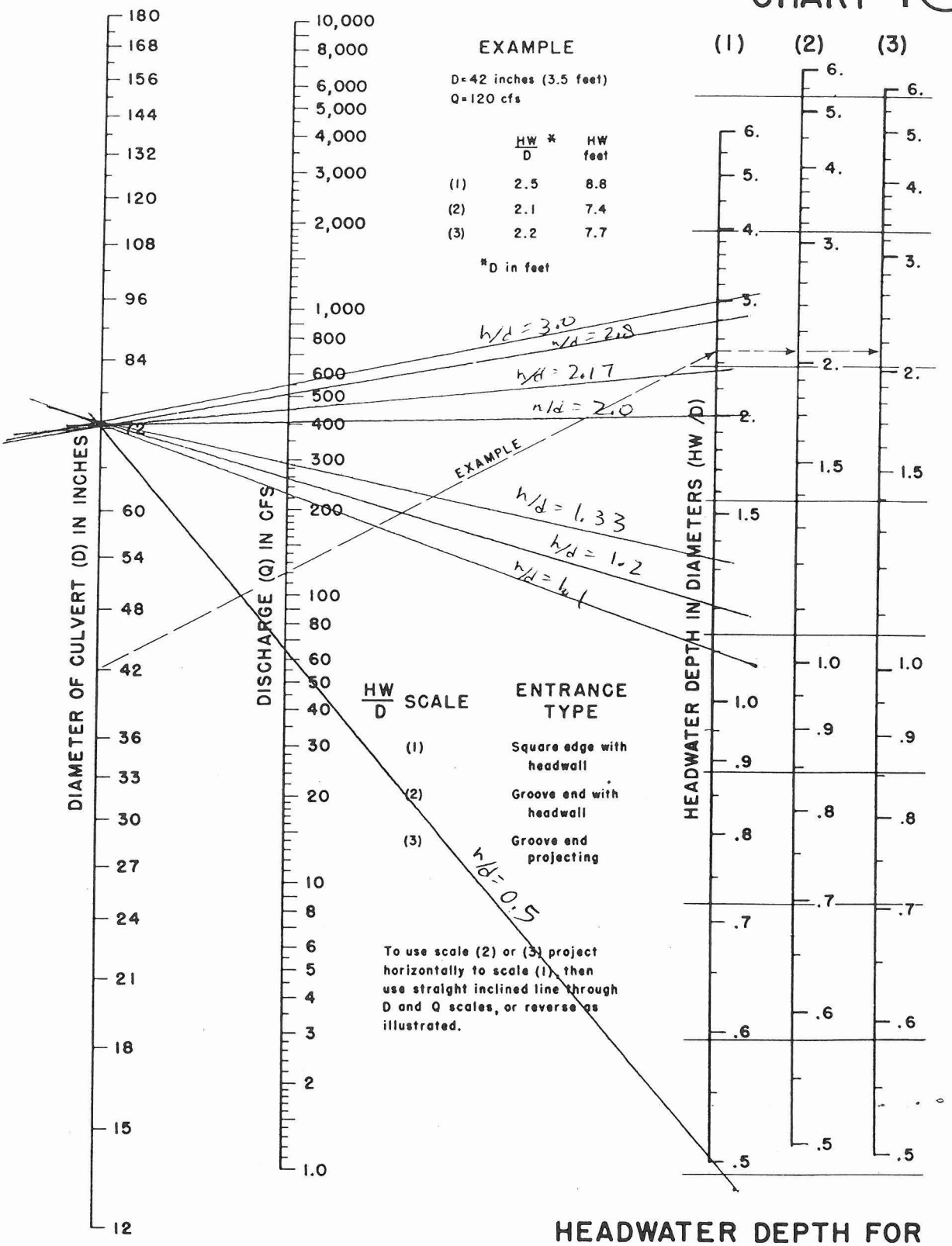
CLIENT FCDMC OVERSHOOT CALCULATIONS

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

*** ***

```
          **************
          *            *
 10 KK    *    WEST    *
          *            *
          **************
```

211 KO — OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

212 RS — STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

213 SA	AREA	11.6	206.3	460.3	694.0
214 SE	ELEVATION	1385.00	1390.00	1395.00	1400.00
215 SQ	DISCHARGE	155.	1000.	1625.	2100.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	444.70	2069.29	4935.12
ELEVATION	1385.00	1390.00	1395.00	1400.00

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 0.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.58-HR
1666.	17.25	(CFS)	1647.	1385.	938.	938.
		(INCHES)	0.303	1.019	1.195	1.195
		(AC-FT)	817.	2747.	3222.	3222.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	41.58-HR
2319.	17.25	2208.	1465.	884.	884.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	41.58-HR
1395.44	17.25	1395.24	1393.09	1390.10	1390.10

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.58-HR
1620.	17.17	(CFS)	1580.	1305.	869.	869.
		(INCHES)	0.291	0.960	1.107	1.107
		(AC-FT)	783.	2589.	2985.	2985.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	41.58-HR
2057.	17.17	1951.	1256.	751.	751.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	41.58-HR
1394.96	17.17	1394.64	1392.46	1389.60	1389.60

TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
(CFS)	(HR)					
		(CFS)				
1451.	17.17		1416.	1130.	739.	739.
		(INCHES)	0.260	0.831	0.942	0.942
		(AC-FT)	702.	2241.	2540.	2540.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1618.	17.17	1525.	920.	542.	542.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.61	17.17	1393.32	1391.18	1388.69	1388.69

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1437.	17.17		1402.	1114.	728.	728.
		(INCHES)	0.258	0.819	0.928	0.928
		(AC-FT)	695.	2209.	2502.	2502.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1581.	17.17	1490.	893.	526.	526.

AK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.50	17.17	1393.22	1391.06	1388.62	1388.62

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1398.	17.17		1364.	1066.	696.	696.
		(INCHES)	0.251	0.785	0.887	0.887
		(AC-FT)	676.	2115.	2392.	2392.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1478.	17.17	1390.	817.	479.	479.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.18	17.17	1392.91	1390.73	1388.40	1388.40

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				

+ 1366.	17.17		1333.	1028.	670.	670.
		(INCHES)	0.245	0.756	0.854	0.854
		(AC-FT)	661.	2039.	2303.	2303.

STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
(AC-FT)	(HR)					
1396.	17.17		1310.	758.	443.	443.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1392.93	17.17		1392.66	1390.46	1388.22	1388.22

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT WEST

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1508.	17.17		1471.	1193.	784.	784.
		(INCHES)	0.271	0.877	0.999	0.999
		(AC-FT)	729.	2365.	2694.	2694.

CUMULATIVE AREA = 50.55 SQ MI

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1556.	17.17		1517.	1243.	821.	821.
		(INCHES)	0.279	0.914	1.046	1.046
		(AC-FT)	752.	2465.	2820.	2820.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1889.	17.17	1789.	1127.	670.	670.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1394.45	17.17	1394.14	1391.99	1389.26	1389.26

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1492.	17.17		1456.	1176.	772.	772.
		(INCHES)	0.268	0.865	0.984	0.984
		(AC-FT)	722.	2333.	2652.	2652.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1725.	17.17	1629.	1001.	592.	592.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.94	17.17	1393.65	1391.51	1388.92	1388.92

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1470.	17.17		1434.	1152.	754.	754.
		(INCHES)	0.264	0.847	0.962	0.962
		(AC-FT)	711.	2284.	2593.	2593.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1668.	17.17	1574.	958.	565.	565.

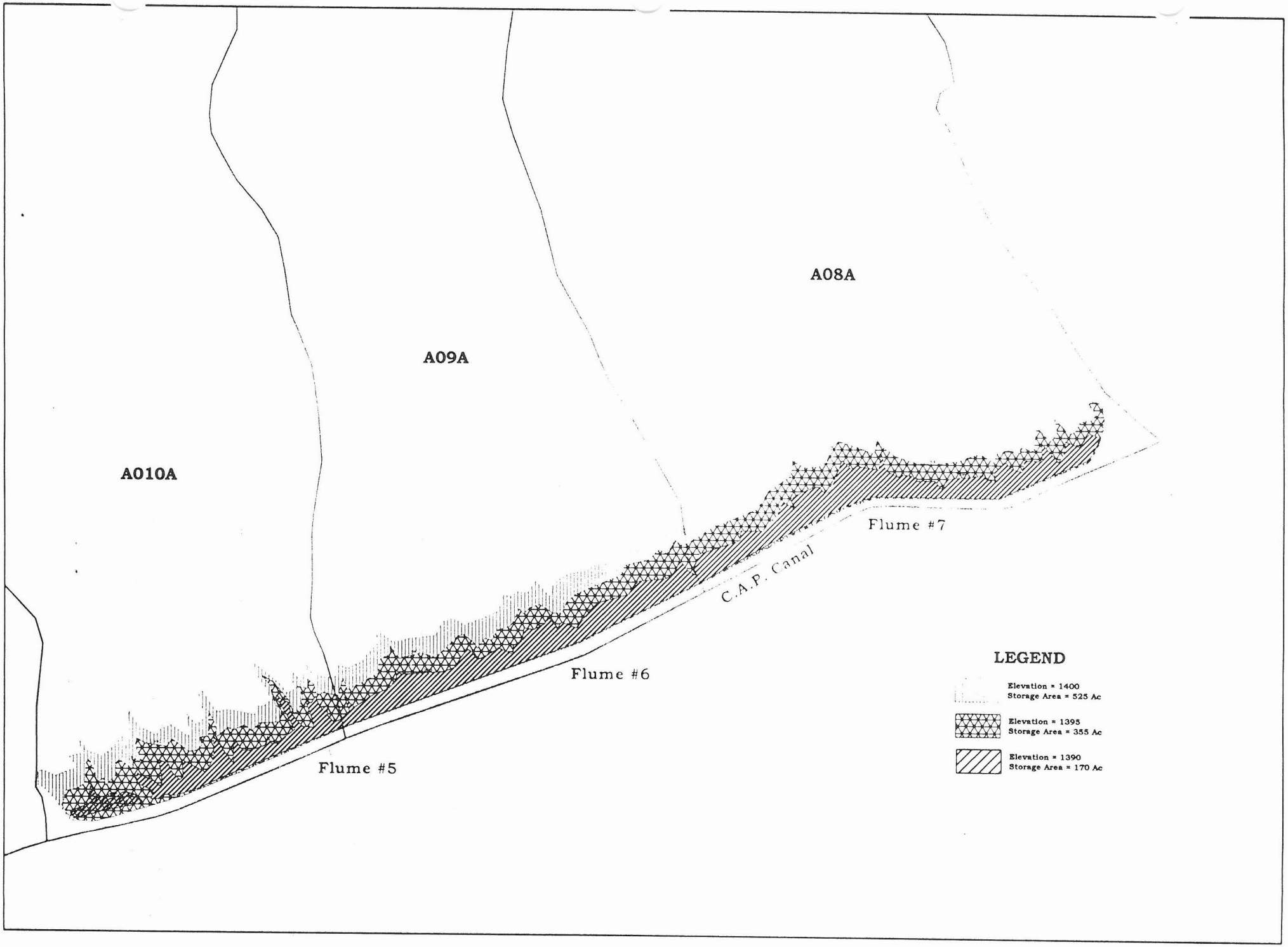
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.76	17.17	1393.47	1391.33	1388.80	1388.80

CUMULATIVE AREA = 50.55 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WEST

Flumes 5-7


A08A
A09A
A010A
Flume #7
C.A.P. Canal
Flume #6
Flume #5
LEGEND
Elevation = 1400
Storage Area = 525 Ac
Elevation = 1395
Storage Area = 355 Ac
Elevation = 1390
Storage Area = 170 Ac

Entellus™

SHEET _____ OF _____

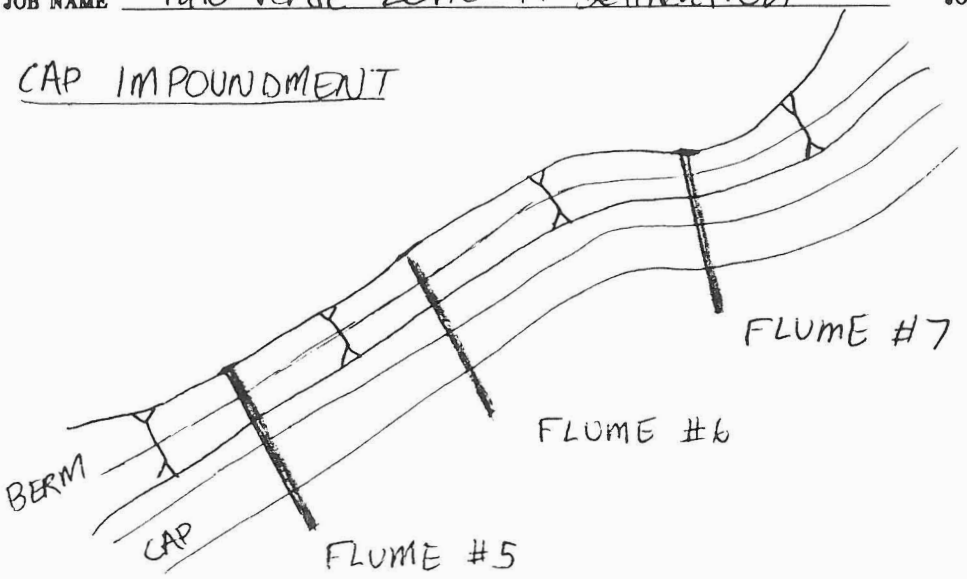
BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____

CAP IMPOUNDMENT



FLUME #5 - 72" RCP
Invert elevation = 1381.60
Berm elevation = 1398.50

FLUME #6 - 72" RCP
Invert elevation = 1381.50
Berm elevation = 1399.80

FLUME #7 - 72" RCP
Invert elevation = 1385.50
Berm elevation = 1401.30

Storage at 1385

FLUME #5 $h/d = 0.56$ Q_5 (from Chart 1 attached) = 85 cfs
FLUME #6 $h/d = 0.58$ $Q_6 = 85$ cfs
FLUME #7 $h/d = 0$ $Q_7 = 0$

$Q_{total} = 170$ cfs
Storage Area = 0 ac

Storage at 1390

FLUME #5 $h/d = 1.40$ $Q_5 = 300$ cfs
FLUME #6 $h/d = 1.42$ $Q_6 = 300$ cfs
FLUME #7 $h/d = 0.75$ $Q_7 = 130$ cfs

$Q_{total} = 730$ cfs
Storage Area = 170 ac

Note: Elevations were obtained from Survey Report.
Storage Areas were estimated using topographic maps.

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SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT _____

JOB NAME _____ JOB NO. _____

Storage at 1395

FLUME #5 $h/d = 2.23$ $Q_5 = 430$ cfs $Q_{total} = 1200$ cfs

FLUME #6 $h/d = 2.25$ $Q_6 = 430$ cfs Storage Area = 35 5 ac

FLUME #7 $h/d = 1.60$ $Q_7 = 340$ cfs

Storage at 1400

FLUME #5 $h/d = 2.82$ $Q_5 = 500$ cfs $Q_{total} = 1500$ cfs

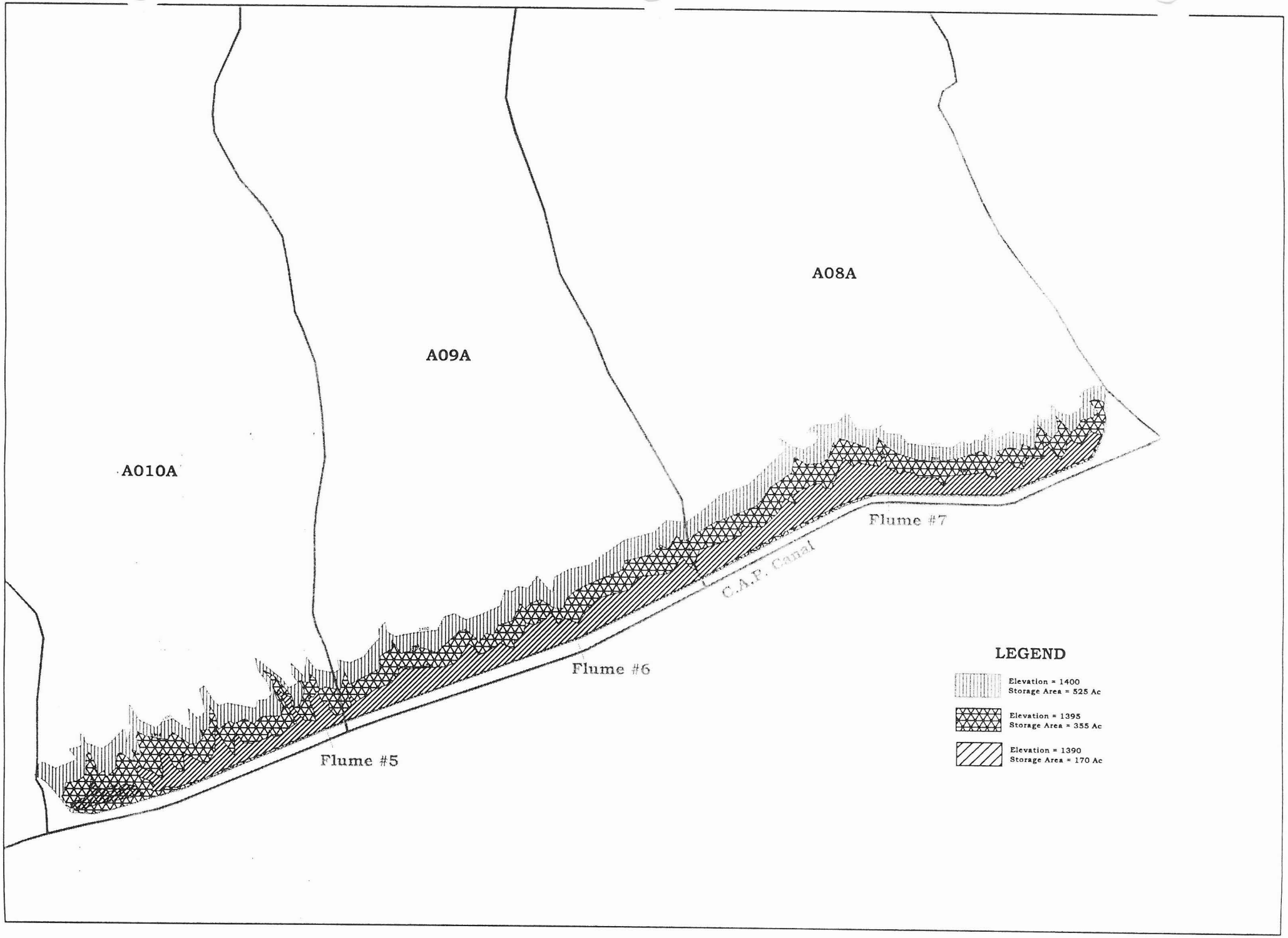
FLUME #6 $h/d = 3.05$ $Q_6 = 540$ cfs Storage Area = 525 ac

FLUME #7 $h/d = 2.42$ $Q_7 = 460$ cfs

INTERPOLATED HYDROGRAPH (see HEC-I Output attached)

CUMALITIVE AREA = 29.52 SQMI (USED INFO FROM 30SQMI)

Maximum Stage = 1394.00


A08A
A09A
A010A
Flume #7
C.A.P. Canal
Flume #6
Flume #5
LEGEND
Elevation = 1400
Storage Area = 525 Ac
Elevation = 1395
Storage Area = 355 Ac
Elevation = 1390
Storage Area = 170 Ac

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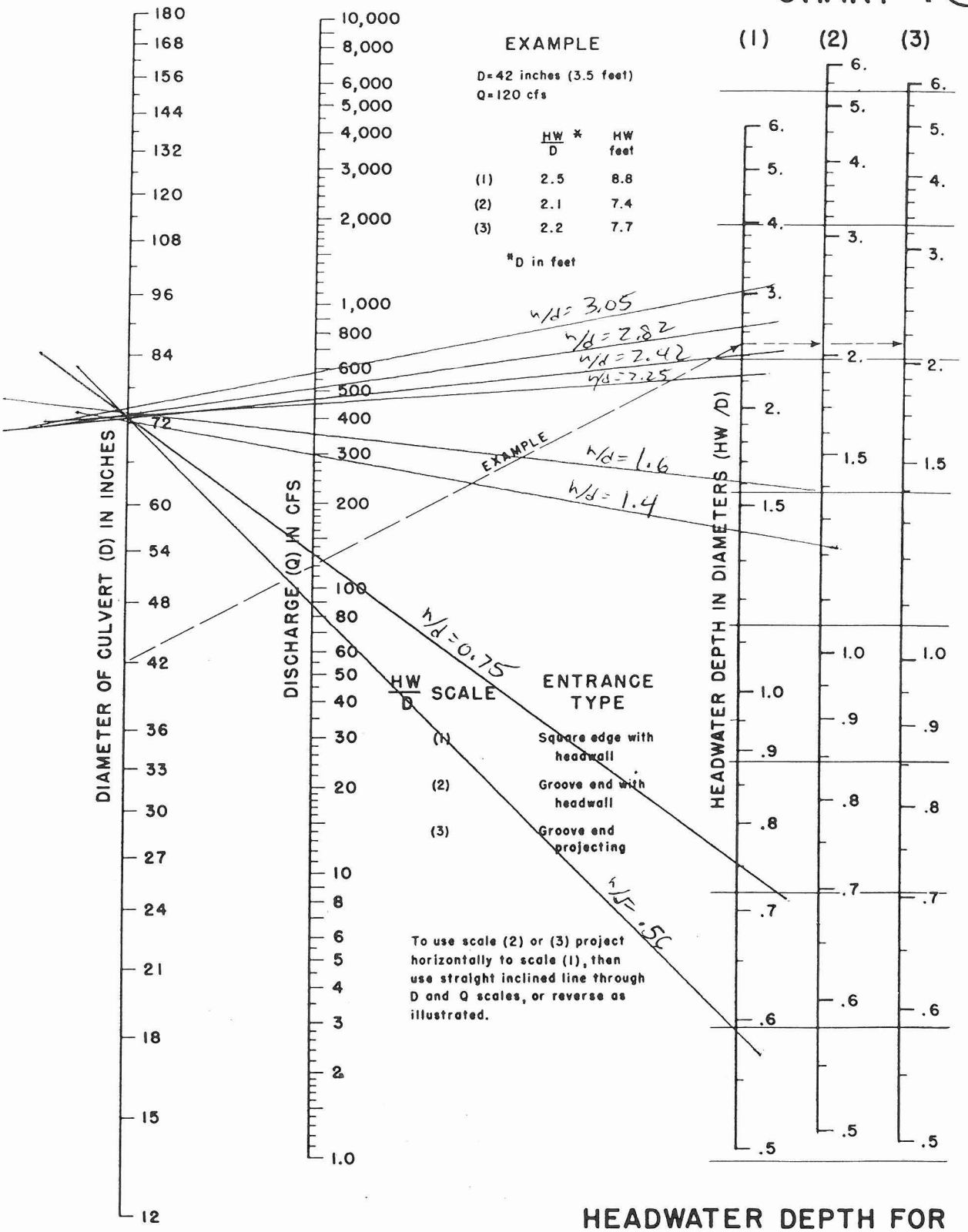
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC OVERSHOT CALCULATIONS

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

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          **************
          *            *
297 KK    *       MID  *
          *            *
          **************
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298 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

299 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

300 SA	AREA	0.0	170.0	355.0	525.0
301 SE	ELEVATION	1385.00	1390.00	1395.00	1400.00
302 SQ	DISCHARGE	170.	730.	1200.	1500.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	283.33	1567.77	3753.96
ELEVATION	1385.00	1390.00	1395.00	1400.00

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 0.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1201.	15.92		1166.	955.	650.	650.
		(INCHES)	0.367	1.203	1.419	1.419
		(AC-FT)	578.	1894.	2234.	2234.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1575.	15.92	1476.	914.	541.	541.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1395.02	15.92	1394.64	1392.41	1389.52	1389.52

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1142.	15.92		1108.	893.	603.	603.
		(INCHES)	0.349	1.125	1.316	1.316
		(AC-FT)	549.	1772.	2072.	2072.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
AC-FT)	(HR)				
1409.	15.92	1315.	786.	461.	461.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				

1394.38	15.92	1394.02	1391.78	1389.05	1389.05

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1102.	15.92		1069.	849.	571.	571.
		(INCHES)	0.337	1.069	1.246	1.246
		(AC-FT)	530.	1684.	1962.	1962.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
1299.	15.92		1210.	703.	410.	410.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1393.96	15.92		1393.61	1391.34	1388.74	1388.74

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1062.	15.92		1031.	802.	539.	539.
		(INCHES)	0.325	1.010	1.178	1.178
		(AC-FT)	511.	1591.	1854.	1854.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
1191.	15.92		1105.	623.	362.	362.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1393.54	15.92		1393.20	1390.88	1388.44	1388.44

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1049.	15.92		1017.	785.	529.	529.
		(INCHES)	0.320	0.989	1.154	1.154
		(AC-FT)	505.	1557.	1817.	1817.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
1154.	15.92		1069.	595.	345.	345.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
3.39	15.92		1393.06	1390.71	1388.33	1388.33

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
(CFS)	(HR)					
		(CFS)				
+ 1037.	15.92		1006.	770.	519.	519.
		(INCHES)	0.317	0.970	1.133	1.133
		(AC-FT)	499.	1528.	1784.	1784.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1121.	15.92	1037.	571.	331.	331.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.26	15.92	1392.93	1390.56	1388.24	1388.24

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1028.	15.92		997.	759.	512.	512.
		(INCHES)	0.314	0.956	1.118	1.118
		(AC-FT)	495.	1506.	1760.	1760.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1097.	15.92	1014.	554.	321.	321.

AK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.17	15.92	1392.84	1390.46	1388.17	1388.17

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1003.	15.92		973.	727.	492.	492.
		(INCHES)	0.307	0.916	1.075	1.075
		(AC-FT)	483.	1442.	1692.	1692.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
1029.	15.92	948.	506.	292.	292.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1392.90	15.92	1392.59	1390.15	1387.98	1387.98

CUMULATIVE AREA = 29.52 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION MID
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)				

		(CFS)				
+ 983.	15.92		954.	701.	477.	477.
		(INCHES)	0.300	0.883	1.041	1.041
		(AC-FT)	473.	1391.	1638.	1638.

STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
975.	15.92		896.	468.	270.	270.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1392.69	15.92		1392.38	1389.89	1387.83	1387.83

CUMULATIVE AREA = 29.52 SQ MI

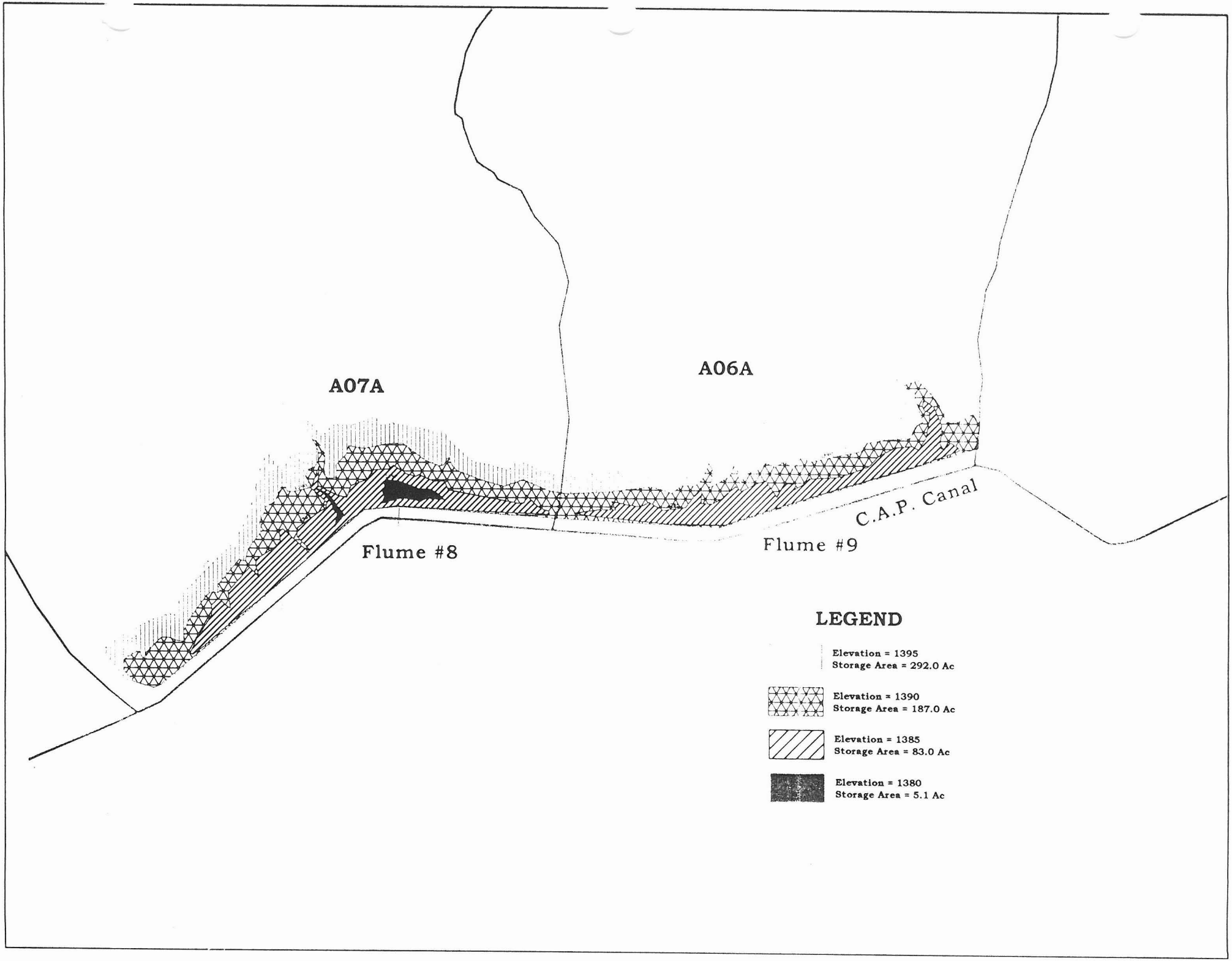
*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT MID

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1102.	15.92		1070.	849.	571.	571.
		(INCHES)	0.337	1.070	1.247	1.247
		(AC-FT)	530.	1685.	1964.	1964.

CUMULATIVE AREA = 29.52 SQ MI

Flumes 8-9


A07A
A06A
Flume #8
Flume #9
C.A.P. Canal
LEGEND
Elevation = 1395
Storage Area = 292.0 Ac
Elevation = 1390
Storage Area = 187.0 Ac
Elevation = 1385
Storage Area = 83.0 Ac
Elevation = 1380
Storage Area = 5.1 Ac

Entellus™

SHEET _____ OF _____

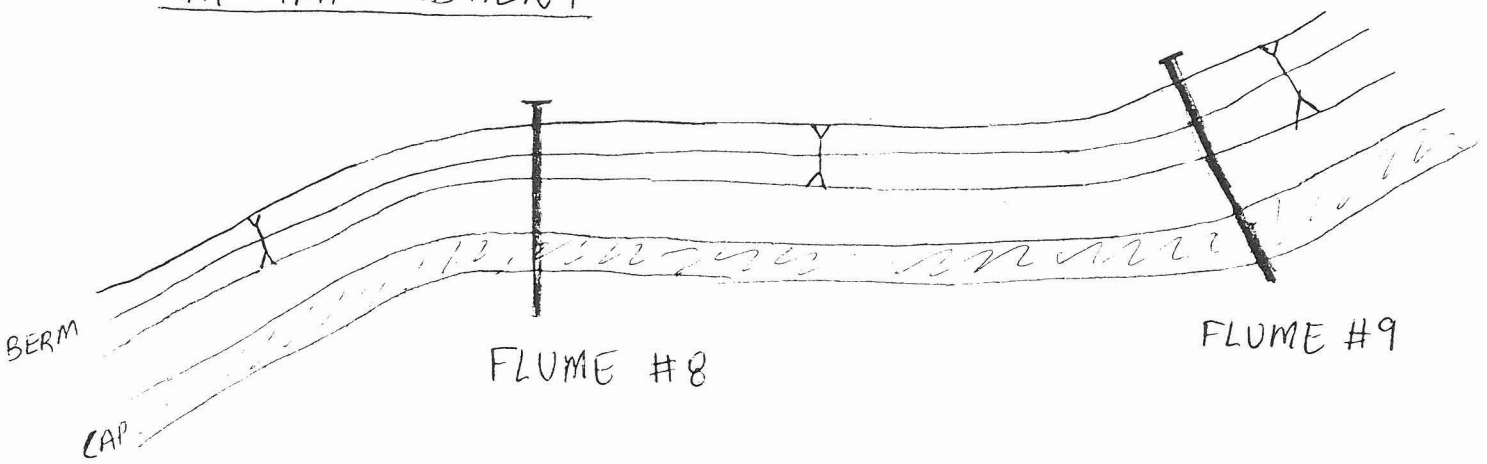
BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____

CAP IMPOUNDMENT



FLUME #8 - 72" RCP
INVERT ELEVATION = 1383.50
BERM ELEVATION = 1398.50

FLUME #9 - 72" RCP
INVERT ELEVATION = 1388.20
BERM ELEVATION = 1399.30

Storage at 1380

FLUME #8 $h/d = 0$ $Q_8 = 0$

FLUME #9 $h/d = 0$ $Q_9 = 0$

Storage Area = 5.1 ac

Storage at 1385

FLUME #8 $h/d = 1.5/6 = 0.25$ Q_8 (see Chart 1a Hached) = 45cfs

FLUME #9 $h/d = 0$ $Q_9 = 0$

Q_{total} = 45cfs

Storage Area = 83 ac

Storage at 1390

FLUME #8 $h/d = \frac{6.5}{6.0} = 1.1$ $Q_8 = 225$cfs $Q_{total} = 270$cfs

FLUME #9 $h/d = \frac{1.8}{6.0} = 0.3$ $Q_9 = 45$cfs Storage Area = 187ac

Note: Elevations were obtained from Survey Report.
Storage Areas were estimated using topographic maps.

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____

Storage at 1395

FLUME #8 $h/d = \frac{11.5}{6} = 1.9$ $Q_8 = 390$ cfs $Q_{total} = 615$ cfs

FLUME #9 $h/d = \frac{6.8}{6.0} = 1.1$ $Q_9 = 225$ cfs Storage Area = 292 ac

Storage at 1400

FLUME #8 $h/d = \frac{16.5}{6.0} = 2.75$ $Q_8 = 500$ cfs $Q_{total} = 900$ cfs

FLUME #9 $h/d = \frac{11.8}{6.0} = 2.0$ $Q_9 = 400$ cfs Storage Area = 39

INTERPOLATED HYDROGRAPH (see HEC-I Output Attached)

CUMULATIVE AREA = 12.74 SQ MI

Stage at 10 SQMI = 1389.97

Stage at 30 SQMI = 1389.59

$-\left(\frac{12.74-10}{30-10}\right)(1389.97-1389.59) + 1389.97 = 1389.9$

Maximum Stage = 1389.92

Entellus™

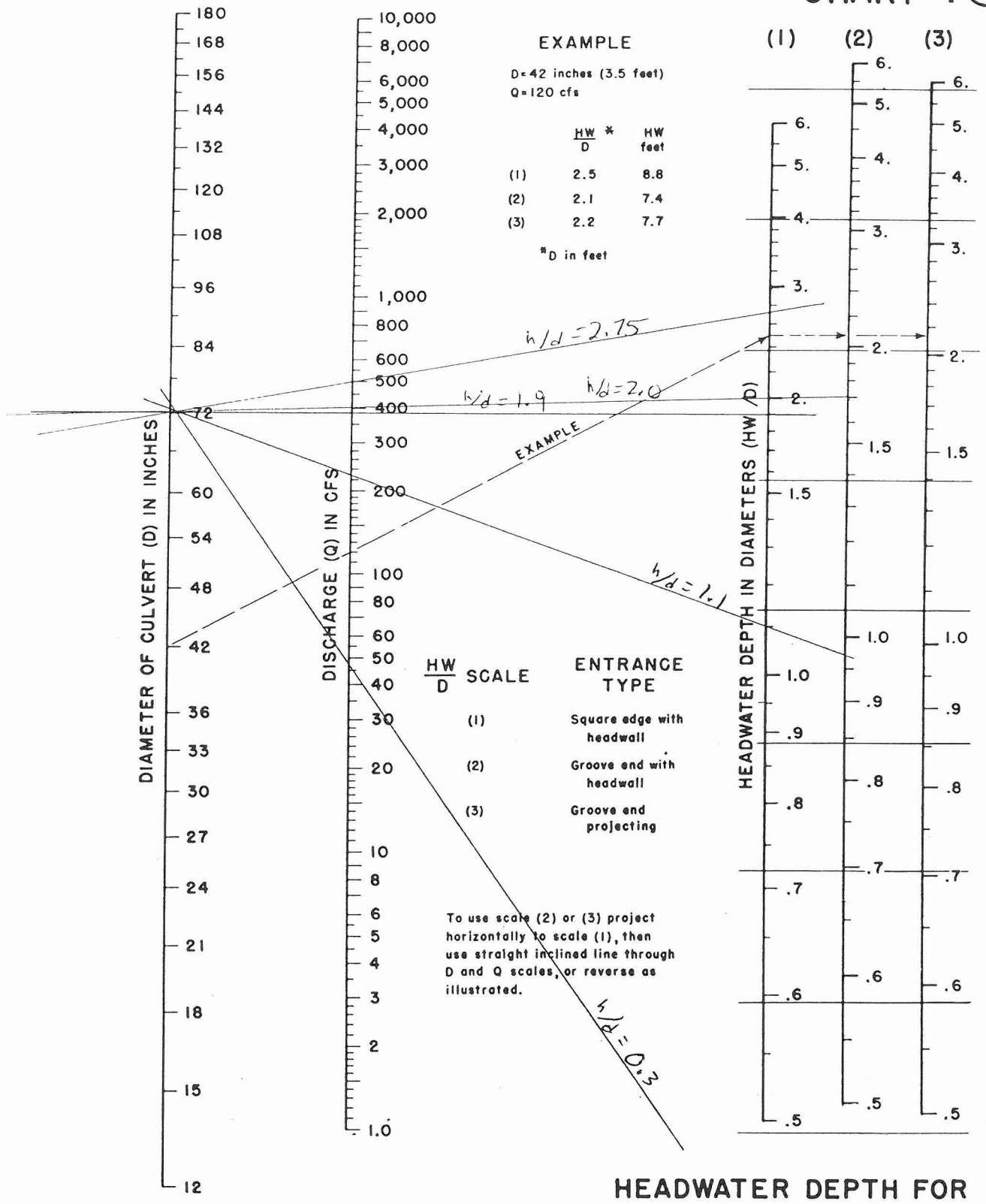
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT _____

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

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          **************
          *            *
 7 KK     *   EASTD    *
          *            *
          **************

318 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

319 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X       0.00 WORKING R AND D COEFFICIENT

320 SA              AREA         5.1      83.0     187.0     292.0     399.0

321 SE            ELEVATION   1380.00  1385.00  1390.00  1395.00  1400.00

322 SQ            DISCHARGE        0.       45.      270.      615.      900.
                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

                STORAGE       0.00    181.12    838.76   2026.55   3747.11
              ELEVATION    1380.00   1385.00   1390.00   1395.00   1400.00

     ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION    EASTD
                        TRANSPOSITION AREA      0.0 SQ MI

 AK FLOW     TIME                              MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     41.58-HR
   (CFS)      (HR)
                              (CFS)
    292.     15.42                     284.        239.        159.        159.
                            (INCHES)   0.208       0.697       0.806       0.806
                            (AC-FT)    141.        474.        547.        547.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     41.58-HR
  (AC-FT)       (HR)
     914.     15.42                     889.        749.        504.        504.

 PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     41.58-HR
  (FEET)        (HR)
  1390.32     15.42                  1390.21     1389.28     1386.51     1386.51

                          CUMULATIVE AREA =   12.74 SQ MI

     ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION    EASTD
                        TRANSPOSITION AREA     10.0 SQ MI

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     41.58-HR
  (CFS)         (HR)
                              (CFS)
    269.     15.42                     261.        218.        145.        145.
                            (INCHES)   0.190       0.636       0.735       0.735
                            (AC-FT)    129.        432.        499.        499.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     41.58-HR
  (AC-FT)       (HR)
     835.     15.50                     812.        686.        462.        462.

 PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     41.58-HR
  (FEET)        (HR)
  1389.97     15.42                  1389.80     1388.84     1386.20     1386.20
```

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 252.	15.50		244.	204.	136.	136.
		(INCHES)	0.178	0.596	0.689	0.689
		(AC-FT)	121.	405.	468.	468.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
785.	15.50	764.	646.	435.	435.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1389.59	15.50	1389.43	1388.54	1385.99	1385.99

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 234.	15.50		228.	190.	127.	127.
		(INCHES)	0.166	0.556	0.643	0.643
		(AC-FT)	113.	378.	437.	437.

STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
735.	15.50	715.	606.	408.	408.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1389.21	15.50	1389.06	1388.23	1385.78	1385.78

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 228.	15.50		222.	186.	124.	124.
		(INCHES)	0.162	0.542	0.627	0.627
		(AC-FT)	110.	368.	426.	426.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
717.	15.50	698.	592.	399.	399.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1389.08	15.50	1388.93	1388.13	1385.71	1385.71

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD

TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
(CFS)	(HR)					
		(CFS)				
223.	15.50		217.	181.	121.	121.
		(INCHES)	0.158	0.530	0.613	0.613
		(AC-FT)	108.	360.	416.	416.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
702.	15.50	683.	580.	391.	391.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1388.96	15.50	1388.82	1388.03	1385.64	1385.64

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 219.	15.50		213.	178.	119.	119.
		(INCHES)	0.156	0.521	0.602	0.602
		(AC-FT)	106.	354.	409.	409.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
691.	15.50	673.	571.	385.	385.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1388.87	15.50	1388.74	1387.97	1385.60	1385.60

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 208.	15.50		203.	170.	113.	113.
		(INCHES)	0.148	0.495	0.573	0.573
		(AC-FT)	100.	337.	389.	389.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
659.	15.50	642.	546.	368.	368.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1388.63	15.50	1388.50	1387.77	1385.46	1385.46

CUMULATIVE AREA = 12.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION EASTD
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				

+							
+	200.	15.58		194.	163.	109.	109.
			(INCHES)	0.142	0.475	0.550	0.550
			(AC-FT)	96.	323.	373.	373.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
C-FT)	(HR)					
633.	15.58		617.	525.	354.	354.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1388.44	15.58		1388.31	1387.62	1385.36	1385.36

CUMULATIVE AREA = 12.74 SQ MI

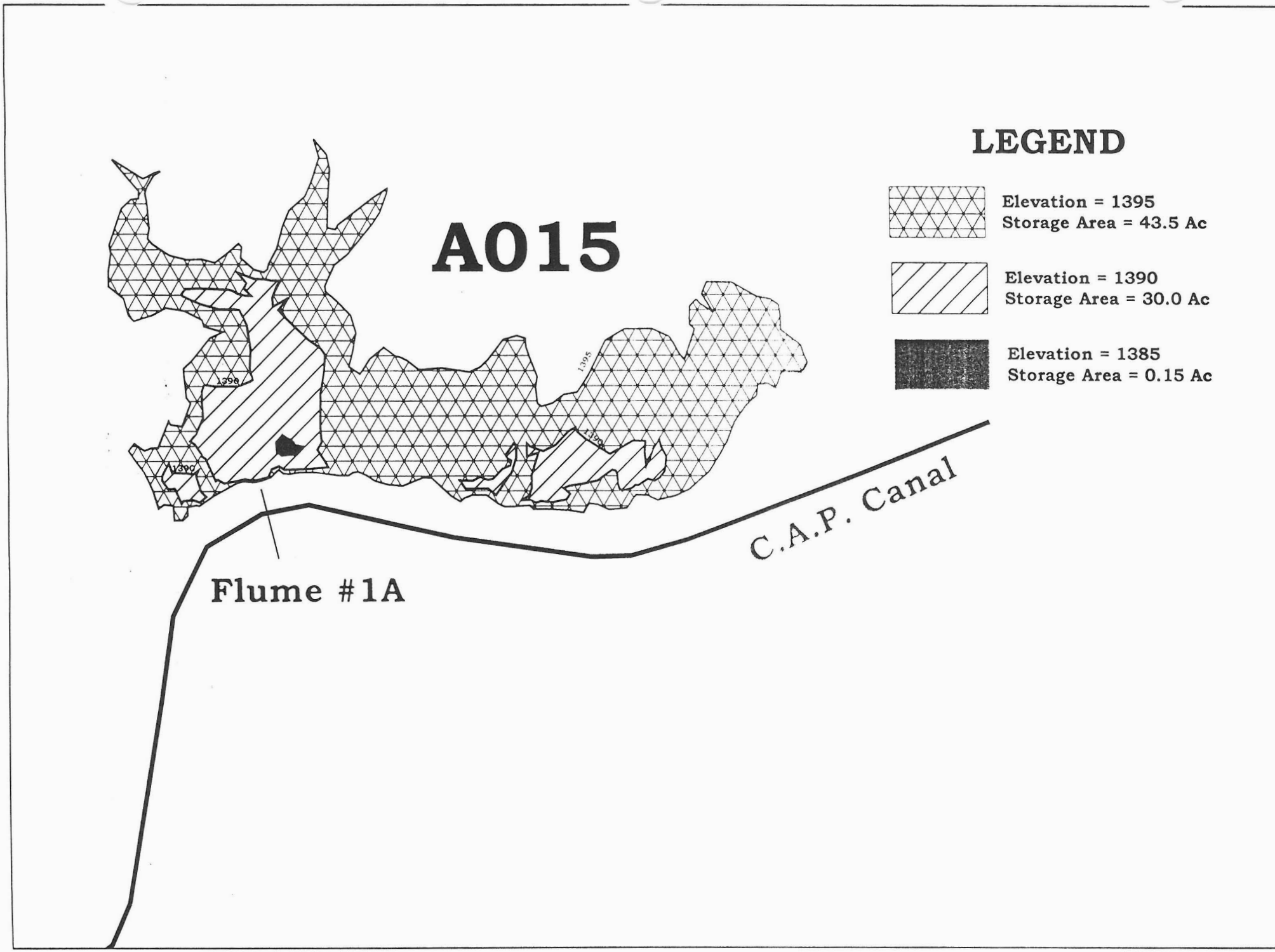
*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT EASTD

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 265.	15.50		257.	215.	143.	143.
		(INCHES)	0.188	0.627	0.725	0.725
		(AC-FT)	128.	426.	493.	493.

CUMULATIVE AREA = 12.74 SQ MI

Flume 1A


A015
LEGEND
Elevation = 1395
Storage Area = 43.5 Ac
Elevation = 1390
Storage Area = 30.0 Ac
Elevation = 1385
Storage Area = 0.15 Ac
1395
1390
1390
1395
C.A.P. Canal
Flume #1A

Entellus™

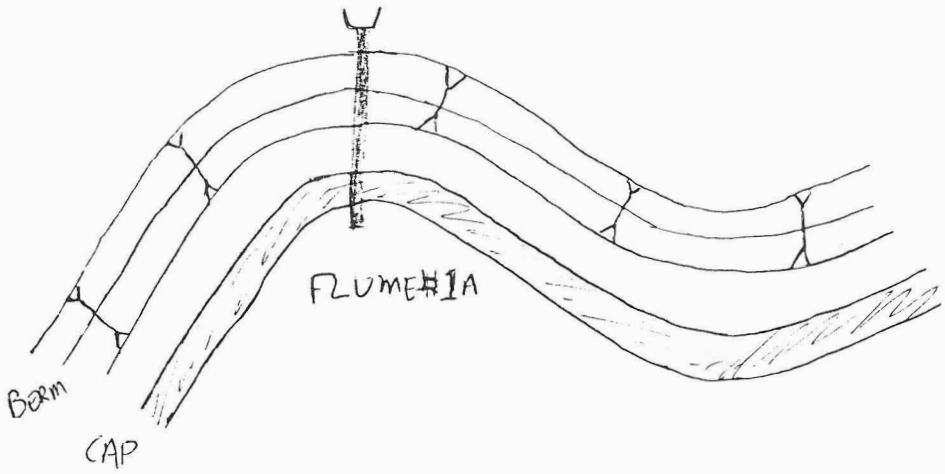
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____



FLUME #1A - 72" RCP

Invert Elevation = 1383.70
Berm Elevation = 1391.80

Storage at 1385

FLUME #1A $h/d = \frac{1.3}{6.0} = 0.2$

Q_{1A} = 38cfs (from Chart 1 inclu

Storage Area = 0.2ac

Storage at 1390

FLUME #1A $h/d = \frac{6.3}{6.0} = 1.1$

Q_{1A} = 225cfs

Storage Area = 9.8ac

Storage at 1392

FLUME #1A $h/d = \frac{8.3}{6.0} = 1.4$

Height Over Berm 1392 - 1391.8 = 0.2

assumed Length = 500'

$Q = CLH^{3/2}$ C=2.7

$Q_{weir} = 2.7(500)(0.2)^{3/2} = 121$cfs

Q_{1A} = 295cfs

$Q_{total} = Q_{1A} + Q_{weir} = 295 + 121 = 416$

Storage Area = 23.3 acres
(interpolated from topo)

Note: Elevations were assumed from Survey Report.
Storage areas were estimated using topographic maps.

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SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____

Storage at 1393

FLUME #1A $h/d = \frac{9.3}{6.0} = 1.6$

Height Over Berm 1393 - 1391.8 = 1.2

Assumed Length = 500'

$Q_{weir} = CLH^{3/2} = 2.7(500)(1.2)^{3/2} = 1775 cfs$

$Q_{1A} = 345 cfs$

$Q_{total} = Q_{1A} + Q_{weir} = 1775 + 345$

$Q_{total} = 2120 cfs$

Storage Area = 30 acres (interpolated from topo.)

Storage at 1395

FLUME #1A $h/d = \frac{11.3}{6} = 1.9$

$H = 1395 - 1391.8 = 3.2$

$L = 500'$

$Q_{weir} = CLH^{3/2} = 2.7(500)(3.2)^{3/2} = 7730 cfs$

$Q_{1A} = 390 cfs$

$Q_{total} = 7730 + 390 = 8120 cfs$

Storage Area = 43.5 ac

INTERPOLATED HYDROGRAPH (see HEC-I Output attached)

Cummalitive Area = 6.24 SQMI

Stage at 0 SQMI = 1393.33

Stage at 10 SQMI = 1393.22

$$-\left(\frac{6.24-0}{10-0}\right) * (1393.33 - 1393.22) + 1393.33 = 1393.26$$

Maximum Stage = 1393.3

Entellus™

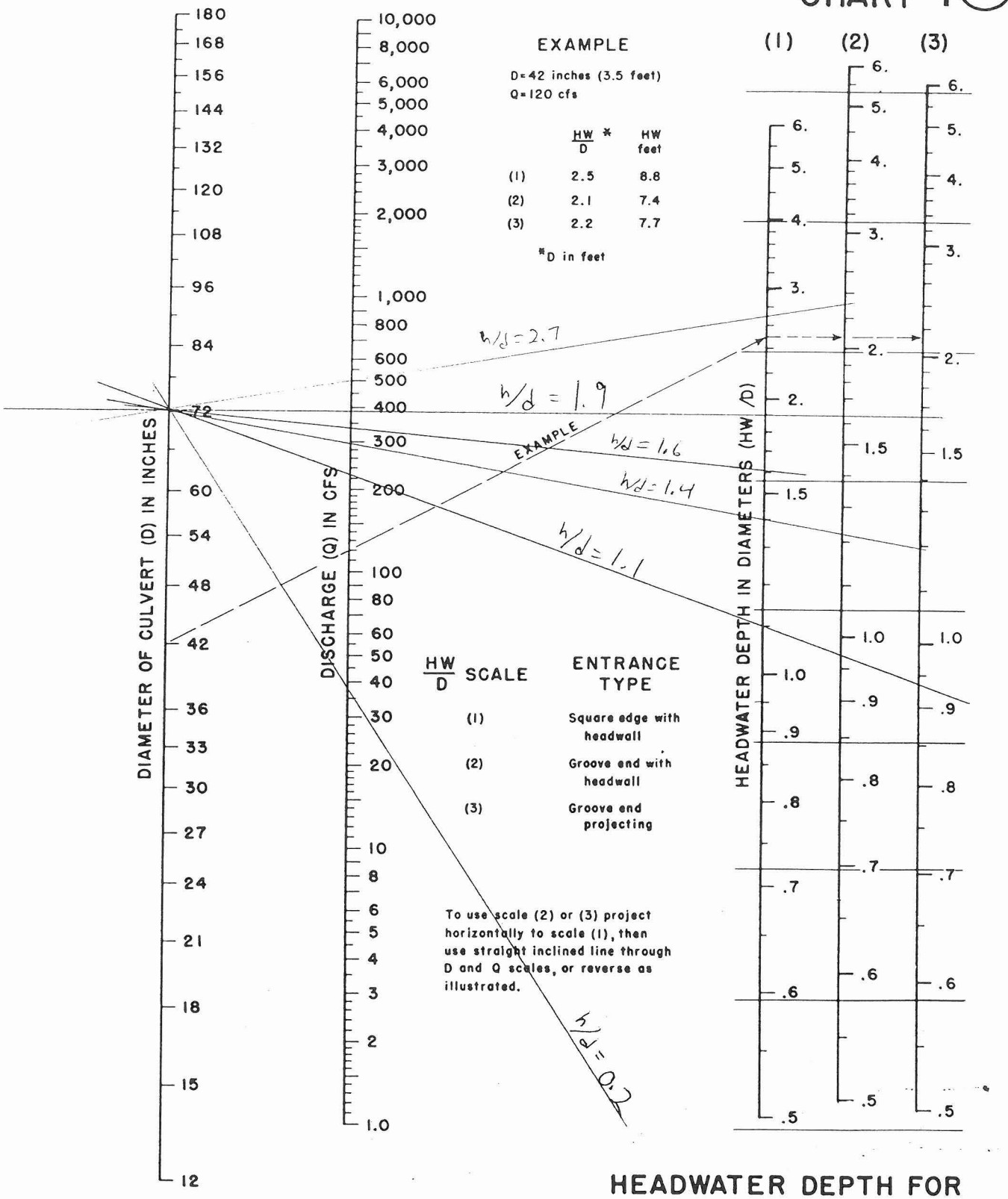
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC Palo Verde Zone A Delineation

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

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          **************
          *            *
    KK    *    DA015   *
          *            *
          **************
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356 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

357 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

358 SA	AREA	0.2	9.8	23.3	30.0	43.5
359 SE	ELEVATION	1385.00	1390.00	1392.00	1393.00	1395.00
360 SQ	DISCHARGE	38.	225.	416.	2120.	8120.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	19.00	51.14	77.72	150.80
ELEVATION	1385.00	1390.00	1392.00	1393.00	1395.00

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15
TRANSPOSITION AREA 0.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
(CFS)	(HR)					
		(CFS)				
3100.	13.17		822.	238.	154.	154.
		(INCHES)	1.225	1.421	1.586	1.586
		(AC-FT)	408.	473.	528.	528.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
(AC-FT)	(HR)				
90.	13.17	45.	12.	7.	7.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
(FEET)	(HR)				
1393.33	13.17	1391.21	1386.67	1385.96	1385.96

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
(CFS)	(HR)					
		(CFS)				
2780.	13.17		746.	219.	142.	142.
		(INCHES)	1.111	1.303	1.468	1.468
		(AC-FT)	370.	434.	489.	489.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
(AC-FT)	(HR)				
86.	13.17	43.	11.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
(FEET)	(HR)				
1393.22	13.17	1391.08	1386.62	1385.93	1385.93

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2552.	13.17		694.	205.	135.	135.
		(INCHES)	1.034	1.224	1.389	1.389
		(AC-FT)	344.	407.	462.	462.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
83.	13.17		42.	11.	6.	6.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1393.14	13.17		1390.99	1386.58	1385.91	1385.91

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2306.	13.25		642.	192.	127.	127.
		(INCHES)	0.956	1.144	1.309	1.309
		(AC-FT)	318.	381.	436.	436.

K STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
80.	13.25		41.	10.	6.	6.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1393.06	13.25		1390.88	1386.55	1385.89	1385.89

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2227.	13.25		624.	187.	124.	124.
		(INCHES)	0.929	1.116	1.281	1.281
		(AC-FT)	309.	371.	426.	426.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
79.	13.25		40.	10.	6.	6.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1393.04	13.25		1390.84	1386.53	1385.89	1385.89

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO15

TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
2155.	13.25		608.	183.	122.	122.
		(INCHES)	0.905	1.091	1.256	1.256
		(AC-FT)	301.	363.	418.	418.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
78.	13.25	40.	10.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1393.01	13.25	1390.80	1386.52	1385.88	1385.88

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA015
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2103.	13.25		596.	180.	120.	120.
		(INCHES)	0.888	1.073	1.239	1.239
		(AC-FT)	295.	357.	412.	412.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
77.	13.25	39.	10.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1392.99	13.25	1390.78	1386.51	1385.87	1385.87

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA015
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1963.	13.25		562.	171.	115.	115.
		(INCHES)	0.838	1.022	1.187	1.187
		(AC-FT)	279.	340.	395.	395.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
75.	13.25	38.	10.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1392.91	13.25	1390.69	1386.49	1385.86	1385.86

CUMULATIVE AREA = 6.24 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA015
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				

+ 1849.	13.25		536.	165.	111.	111.
		(INCHES)	0.798	0.981	1.147	1.147
		(AC-FT)	266.	327.	382.	382.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
AC-FT)	(HR)					
73.	13.25		37.	10.	5.	5.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1392.84	13.25		1390.62	1386.46	1385.85	1385.85

CUMULATIVE AREA = 6.24 SQ MI

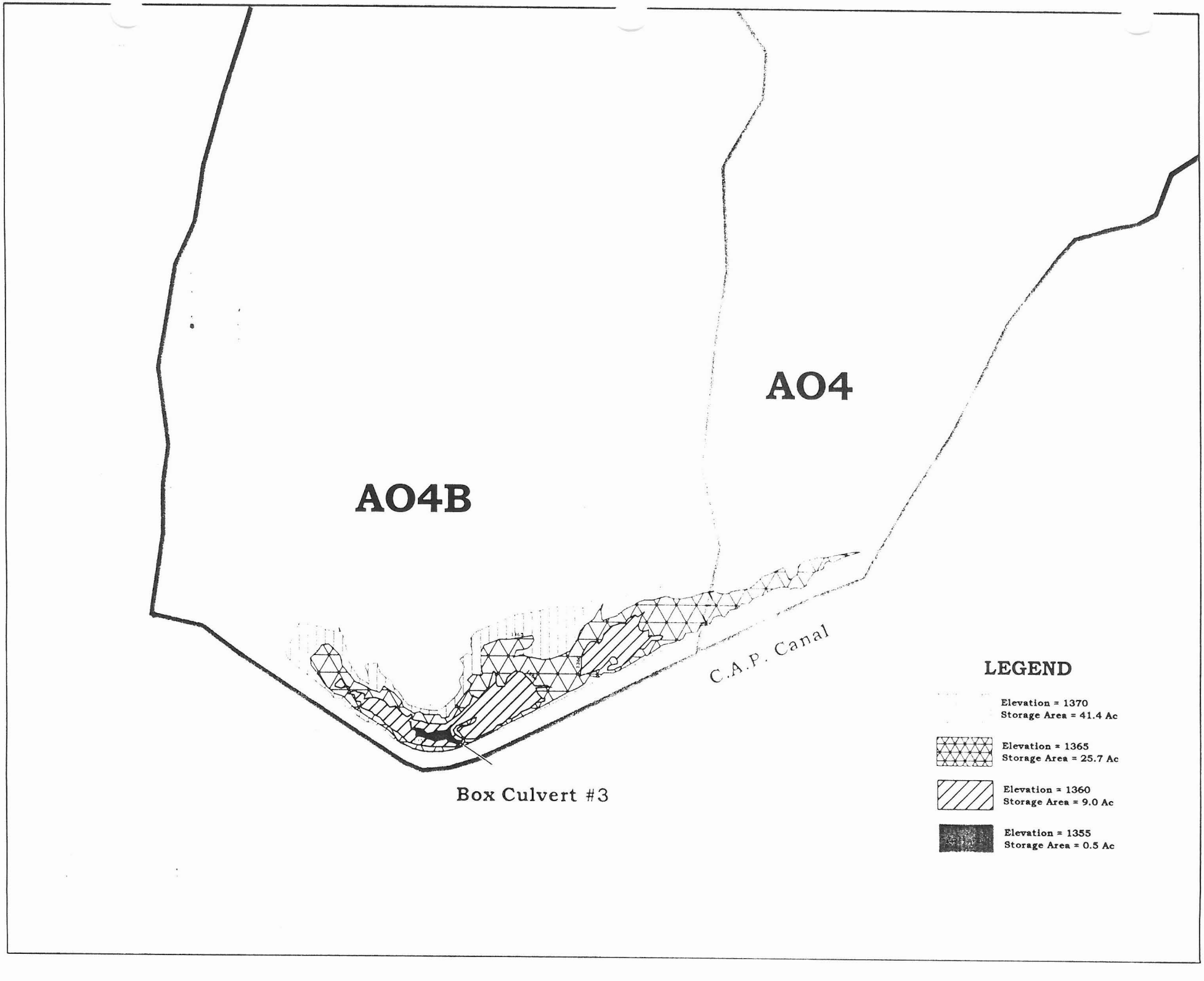
*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT DA015

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2801.	13.17		751.	220.	143.	143.
		(INCHES)	1.119	1.311	1.476	1.476
		(AC-FT)	372.	436.	491.	491.

CUMULATIVE AREA = 6.24 SQ MI

Box Culvert 3


AO4
AO4B
C.A.P. Canal
Box Culvert #3
LEGEND
Elevation = 1370
Storage Area = 41.4 Ac
Elevation = 1365
Storage Area = 25.7 Ac
Elevation = 1360
Storage Area = 9.0 Ac
Elevation = 1355
Storage Area = 0.5 Ac

Entellus™

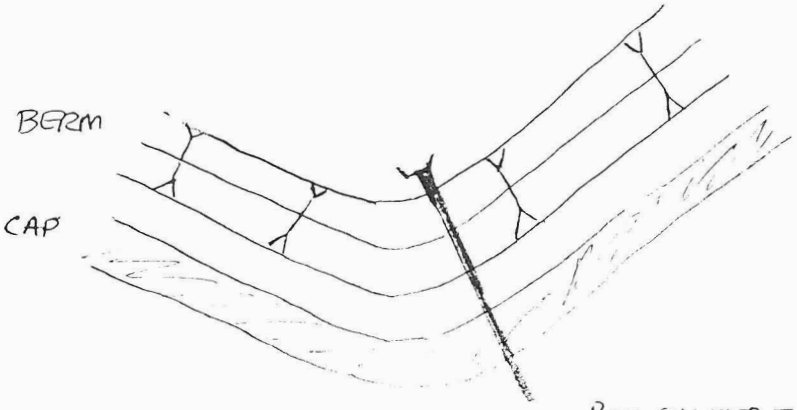
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____



BOX CULVERT #3 - 2-8'x8' RCB's
Invert Elevation = 1346.4
Berm Elevation = 1380.0

Storage at 1355

Box Culvert #3 $h/d = \frac{8.6}{8.0} = 1.1$

$Q_3 = 75 \text{ cfs/ft}$ (see chart 8) $\times 16 \text{ ft} = 1200 \text{ cfs}$

Storage Area = 0.5 ac

Storage at 1360

Box Culvert #3 $h/d = \frac{13.6}{8.0} = 1.7$

$Q_3 = 120 \text{ cfs/ft} \times 16 \text{ ft} = 1920 \text{ cfs}$

Storage Area = 9.0 ac

Storage at 1365

Box Culvert #3 $h/d = \frac{18.6}{8.0} = 2.3$

$Q_3 = 150 \text{ cfs/ft} \times 16 \text{ ft} = 2400 \text{ cfs}$

Storage Area = 25.7 ac

Storage at 1370

Box Culvert #3 $h/d = \frac{23.6}{8.0} = 3.0$

$Q_3 = 180 \text{ cfs/ft} \times 16 \text{ ft} = 2880 \text{ cfs}$

Storage Area = 41.4 ac

INTERPOLATED HYDROGRAPH (See HEC-I Output included)

Cumulative Area = 3.81 SQ MI

Stage at 0 SQ MI = 1362.70

Stage at 10 SQ MI = 1361.99

$-\left(\frac{3.81-0}{10-0}\right) + (1362.7 - 1361.99) + 1362.7$

Maximum Stage = 1362.43 ft

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

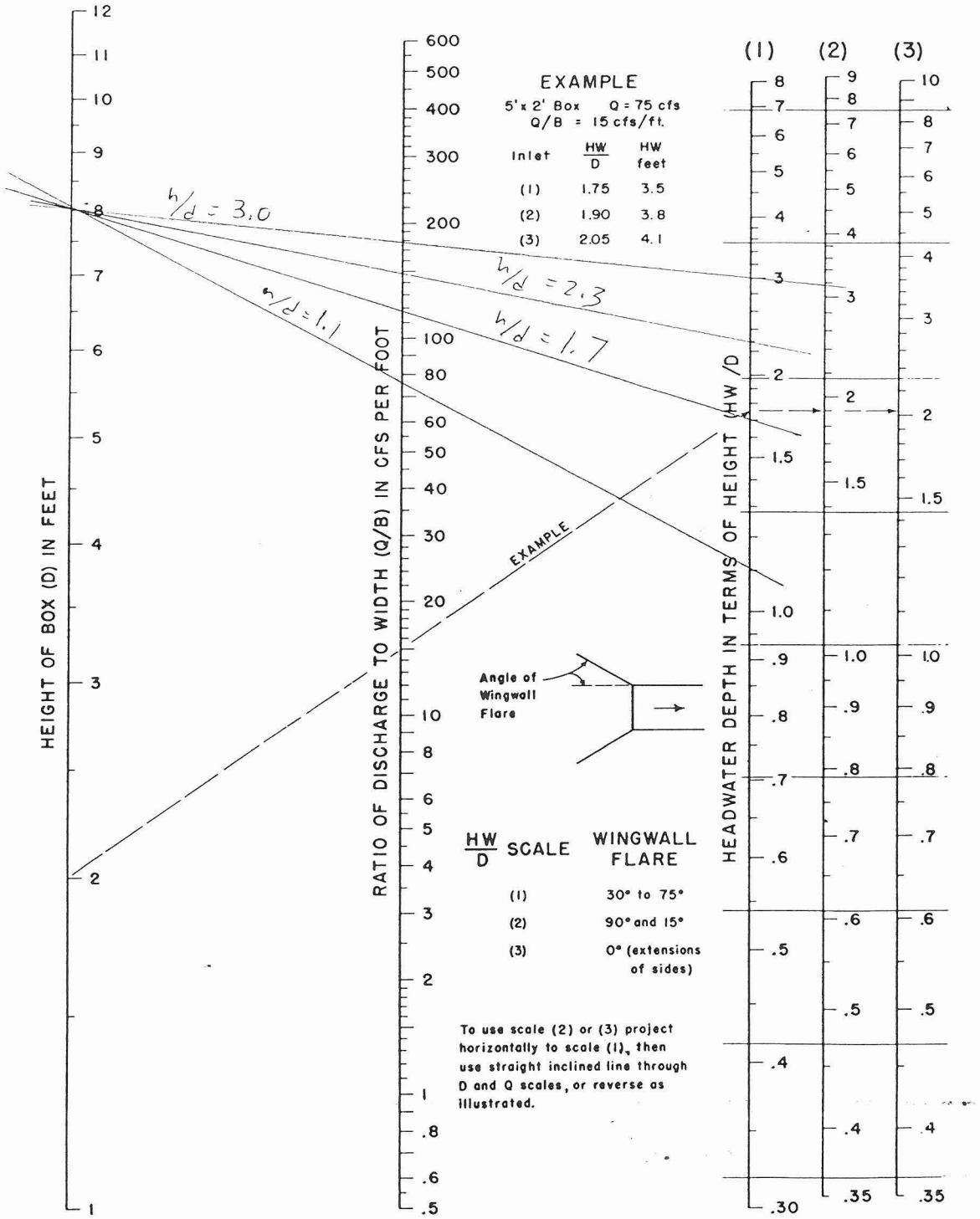
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. _____

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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          **************
          *            *
    KK    *    DAO4    *
          *            *
          **************
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344 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

345 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

346 SA	AREA	0.5	9.0	25.7	41.4
347 SE	ELEVATION	1355.00	1360.00	1365.00	1370.00
348 SQ	DISCHARGE	1200.	1920.	2400.	2880.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	19.37	102.55	268.75
ELEVATION	1355.00	1360.00	1365.00	1370.00

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4
TRANSPOSITION AREA 0.0 SQ MI

% FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2179.	12.75		1369.	1242.	1223.	1223.
		(INCHES)	3.338	12.114	20.666	20.666
		(AC-FT)	679.	2464.	4204.	4204.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
64.	12.75		5.	0.	0.	-3.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1362.70	12.75		1356.27	1355.32	1355.18	1355.18

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2111.	12.67		1342.	1236.	1219.	1219.
		(INCHES)	3.273	12.048	20.601	20.601
		(AC-FT)	666.	2451.	4190.	4190.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
52.	12.67		3.	0.	0.	-3.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
1361.99	12.67		1356.05	1355.26	1355.15	1355.15

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2068.	12.67		1326.	1231.	1217.	1217.
		(INCHES)	3.232	12.008	20.560	20.560
		(AC-FT)	657.	2443.	4182.	4182.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
45.	12.67	2.	0.	0.	-3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1361.55	12.67	1355.92	1355.23	1355.13	1355.13

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2028.	12.67		1309.	1227.	1215.	1215.
		(INCHES)	3.192	11.968	20.520	20.520
		(AC-FT)	649.	2434.	4174.	4174.

K STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
38.	12.67	1.	0.	0.	-3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1361.12	12.67	1355.79	1355.20	1355.11	1355.11

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2013.	12.67		1303.	1226.	1214.	1214.
		(INCHES)	3.177	11.953	20.506	20.506
		(AC-FT)	646.	2431.	4171.	4171.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
36.	12.67	0.	0.	0.	-3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1360.97	12.67	1355.74	1355.18	1355.11	1355.11

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO4

TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2001.	12.67		1299.	1225.	1213.	1213.
		(INCHES)	3.165	11.941	20.494	20.494
		(AC-FT)	644.	2429.	4169.	4169.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
33.	12.67	0.	0.	0.	-4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1360.84	12.67	1355.70	1355.18	1355.10	1355.10

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA04
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1992.	12.67		1295.	1224.	1213.	1213.
		(INCHES)	3.157	11.933	20.485	20.485
		(AC-FT)	642.	2427.	4167.	4167.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
32.	12.67	0.	0.	0.	-4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1360.75	12.67	1355.67	1355.17	1355.10	1355.10

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA04
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1967.	12.58		1284.	1221.	1211.	1211.
		(INCHES)	3.130	11.906	20.459	20.459
		(AC-FT)	637.	2422.	4162.	4162.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
27.	12.58	0.	0.	0.	-4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1360.49	12.58	1355.59	1355.15	1355.09	1355.09

CUMULATIVE AREA = 3.81 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DA04
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				

+ 1950.	12.58		1276.	1219.	1210.	1210.
		(INCHES)	3.110	11.885	20.438	20.438
		(AC-FT)	633.	2418.	4157.	4157.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
AC-FT)	(HR)				
25.	12.58	0.	0.	0.	-4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1360.32	12.58	1355.53	1355.13	1355.08	1355.08

CUMULATIVE AREA = 3.81 SQ MI

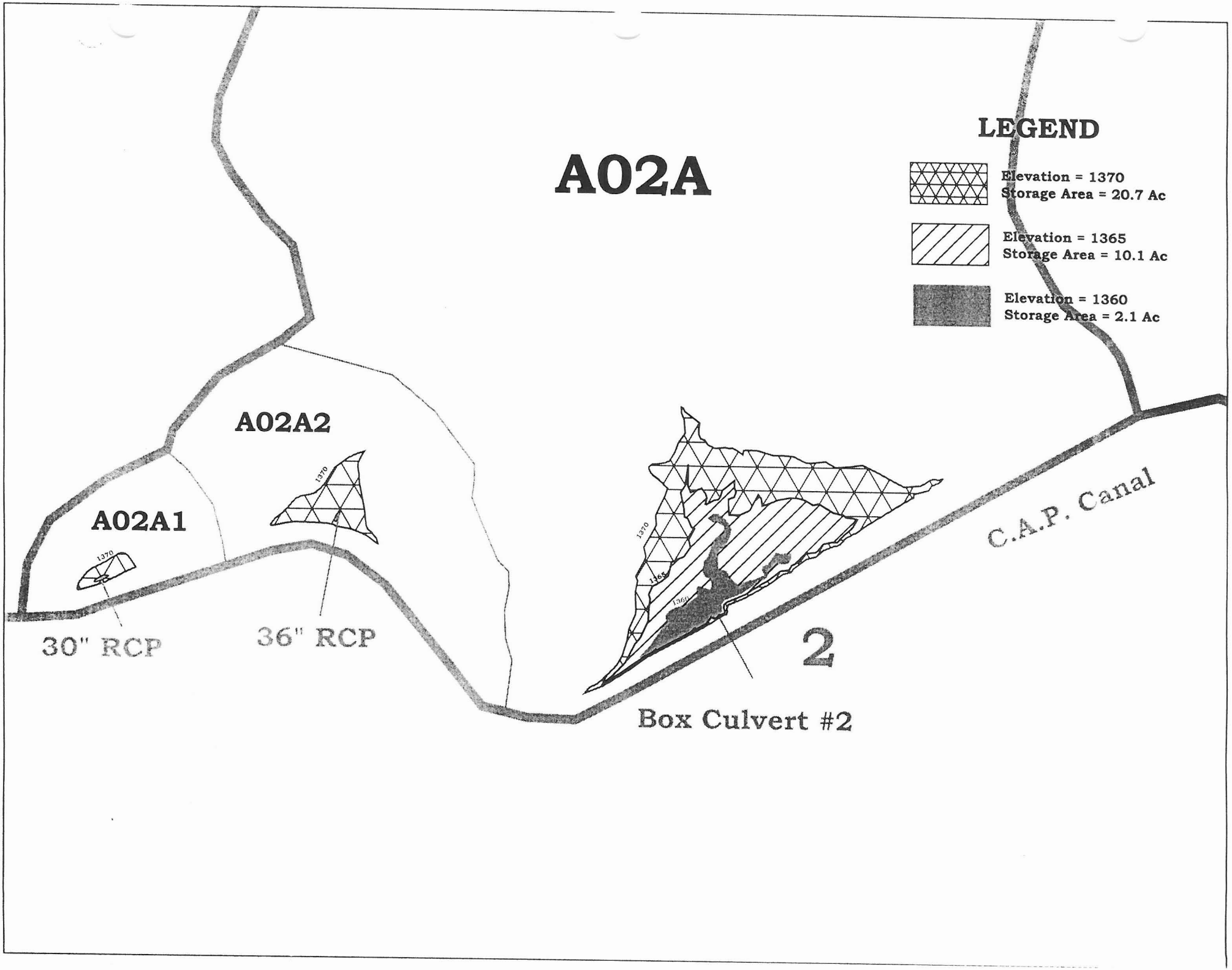
*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT DAO4

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)				
		(CFS)			
+ 2120.	12.67	1346.	1237.	1220.	1220.
		(INCHES) 3.282	12.058	20.610	20.610
		(AC-FT) 668.	2453.	4192.	4192.

CUMULATIVE AREA = 3.81 SQ MI

Box Culvert 2


A02A
LEGEND
Elevation = 1370
Storage Area = 20.7 Ac
Elevation = 1365
Storage Area = 10.1 Ac
Elevation = 1360
Storage Area = 2.1 Ac
A02A2
A02A1
1370
1370
1370
1365
1360
30" RCP
36" RCP
C.A.P. Canal
2
Box Culvert #2

Entellus™

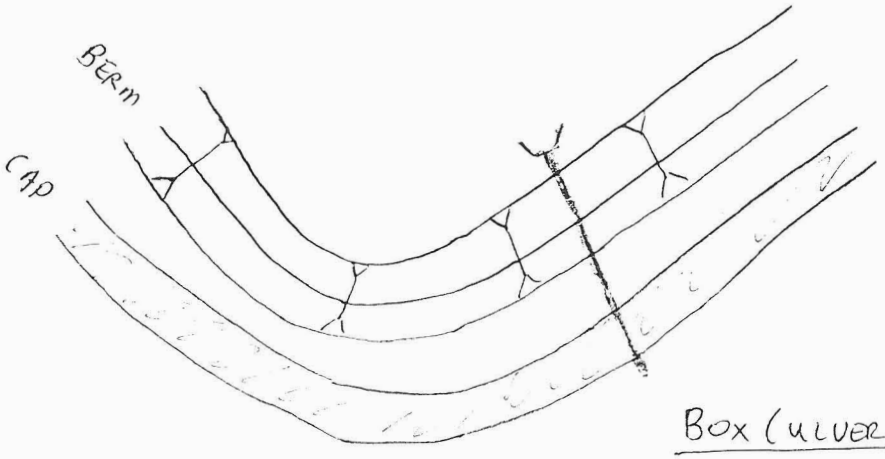
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. _____



Box Culvert #2 2-48" RCP's
Invert Elevation = 1351.4
Berm Elevation = 1375.0

Storage at 1360

Box Culvert #2 $^{h}/_{d} = \frac{8.6}{4.0} = 2.2$

Q_2 (see chas+1) = 150 cfs x 2 = 300 cfs
Storage Area = 2.1 ac

Storage at 1365

Box Culvert #2 $^{h}/_{d} = \frac{13.6}{4.0} = 3.4$

Q_2 = 205 cfs x 2 = 410 cfs
Storage Area = 10.1 ac

Storage at 1370

Box Culvert #2 $^{h}/_{d} = \frac{18.6}{4.0} = 4.7$

Q_2 = 250 cfs x 2 = 500 cfs
Storage Area = 20.7 ac

INTERPOLATED HYDROGRAPH (See HEC-I Output Included)
Cumulative Area = 0.74 SQMI

Stage at 0 SQMI = 1363.79
Stage at 10 SQMI = 1363.20

$-\left(\frac{.74-0}{10-0}\right) * (1363.79-1363.2) + 1363.7$

Maximum Stage = 1363.7

Entellus™

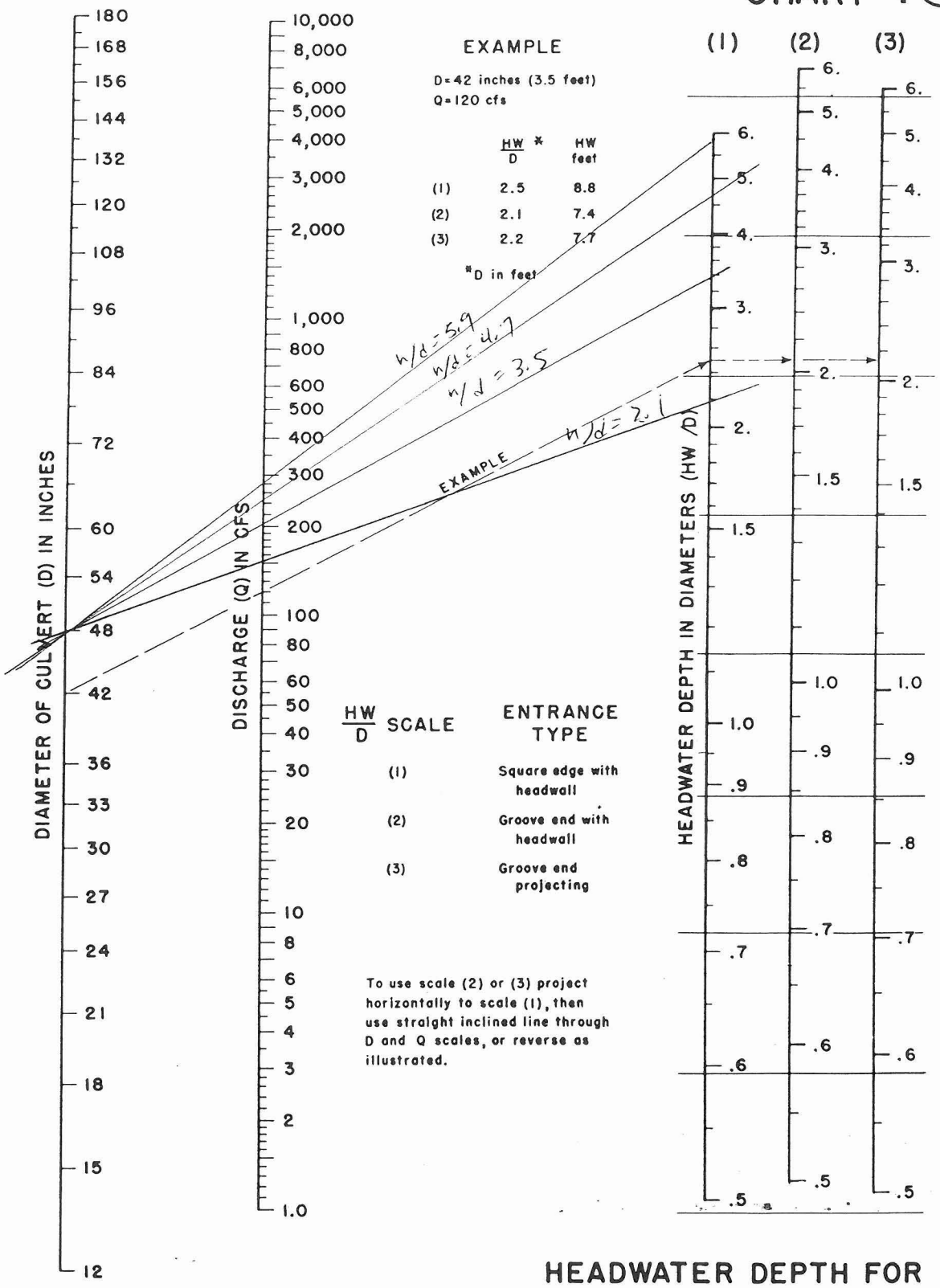
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC Palo Verde Zone A Delineation

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

*** ***

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          **************
          *            *
 35 KK    *    DAO2A   *
          *            *
          **************
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356 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

357 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

358 SA	AREA	2.1	10.1	20.7	33.8
359 SE	ELEVATION	1360.00	1365.00	1370.00	1375.00
360 SQ	DISCHARGE	300.	410.	500.	570.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	28.01	103.44	238.36
ELEVATION	1360.00	1365.00	1370.00	1375.00

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 0.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.58-HR
383.	12.58	(CFS)	312.	303.	301.	301.
		(INCHES)	3.950	15.335	26.430	26.430
		(AC-FT)	155.	601.	1036.	1036.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	41.58-HR
21.	12.58	2.	0.	0.	-1.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	41.58-HR
1363.79	12.58	1360.56	1360.14	1360.08	1360.08

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.58-HR
370.	12.50	(CFS)	310.	302.	301.	301.
		(INCHES)	3.915	15.300	26.395	26.395
		(AC-FT)	153.	600.	1035.	1035.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	41.58-HR
18.	12.50	2.	0.	0.	-1.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	41.58-HR
1363.20	12.50	1360.43	1360.11	1360.06	1360.06

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 363.	12.50		308.	302.	301.	301.
		(INCHES)	3.895	15.280	26.375	26.375
		(AC-FT)	153.	599.	1034.	1034.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
16.	12.50	1.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.84	12.50	1360.36	1360.09	1360.05	1360.05

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 355.	12.50		306.	302.	301.	301.
		(INCHES)	3.877	15.261	26.356	26.356
		(AC-FT)	152.	598.	1033.	1033.

STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
14.	12.50	1.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.49	12.50	1360.29	1360.07	1360.04	1360.04

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 352.	12.50		306.	302.	301.	301.
		(INCHES)	3.871	15.256	26.351	26.351
		(AC-FT)	152.	598.	1033.	1033.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
13.	12.50	1.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.38	12.50	1360.27	1360.07	1360.04	1360.04

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A

TRANSPOSITION AREA 120.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
350.	12.50		306.	301.	301.	301.
		(INCHES)	3.866	15.251	26.346	26.346
		(AC-FT)	152.	598.	1033.	1033.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
13.	12.50	1.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.28	12.50	1360.26	1360.06	1360.04	1360.04

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 150.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 349.	12.50		305.	301.	300.	300.
		(INCHES)	3.863	15.248	26.343	26.343
		(AC-FT)	151.	598.	1033.	1033.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
12.	12.50	1.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.21	12.50	1360.25	1360.06	1360.04	1360.04

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 300.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 344.	12.50		305.	301.	300.	300.
		(INCHES)	3.854	15.239	26.333	26.333
		(AC-FT)	151.	597.	1032.	1032.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
11.	12.50	0.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1362.00	12.50	1360.21	1360.05	1360.03	1360.03

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION DAO2A
TRANSPOSITION AREA 500.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				

+ 341.	12.50		304.	301.	300.	300.
		(INCHES)	3.847	15.232	26.326	26.326
		(AC-FT)	151.	597.	1032.	1032.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
C-FT)	(HR)				
10.	12.50	0.	0.	0.	-1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1361.84	12.50	1360.19	1360.05	1360.03	1360.03

CUMULATIVE AREA = 0.74 SQ MI

*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT DAO2A

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)				
		(CFS)			
+ 375.	12.58	311.	303.	301.	301.
		(INCHES) 3.929	15.313	26.408	26.408
		(AC-FT) 154.	600.	1035.	1035.

CUMULATIVE AREA = 0.74 SQ MI

Entellus™

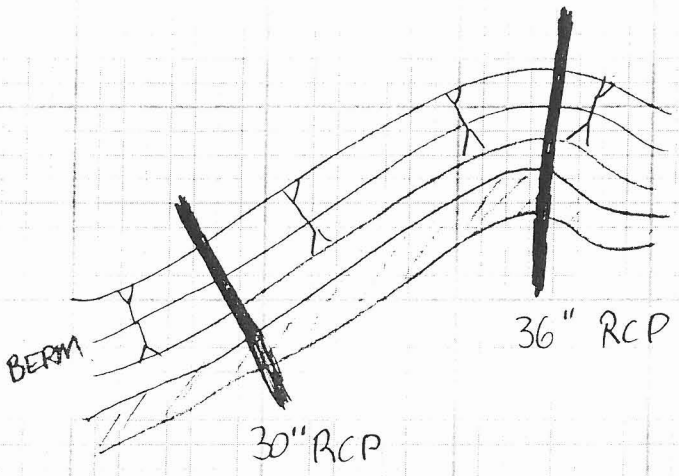
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019



30" RCP

Invert Elevation = 1359.0

Berm Elevation = 1380.0

36" RCP

Invert Elevation = 1360

Berm Elevation = 1380

Q@30" RCP = 39 cfs (see Hec-I attached)

storage at 1371

30" RCP = h/d = 11/2.5 = 4.4 Q = 76 cfs

WSEL = 1371

Q@36" RCP = 24 cfs (see Hec-I attached)

Storage at 1375

36" RCP = h/d = 15/3 = 5 Q = 130 cfs

WSEL = 1375

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             MAY  1991                 *
*          VERSION 4.0.1E               *
*     Lahey F77L-EM/32 version 5.01     *
*       Dodson & Associates, Inc.       *
*  RUN DATE  04/14/03  TIME  17:21:57   *
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 551-1748              *
*                                       *
*****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID   Project ID: PALO VERDE - Major Basin: 01 - Return Period: 100 Years
   2          ID
   3          IT       5                    2000
   4          IO       3
   5          IN      15
   6          JD    4.10    0.01
   7          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
   8          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
   9          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  10          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  11          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  12          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  13          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  14          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  15          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  16          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  17          JD   3.854   10.00
  18          JD   3.690   30.00
  19          JD   3.526   60.00
  20          JD   3.469   90.00
  21          JD   3.419  120.00
  22          JD   3.383  150.00
  23          JD   3.280  300.00
  24          JD   3.198  500.00
              *
  25          KK   AO2A1   BASIN
  26          BA    .020
  27          LG   0.15    0.35    4.15    0.44       0
  28          UC  0.146   0.090
  29          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  30          UA    100
              *
  31          KK   AO2A2   BASIN
  32          BA    .060
  33          LG   0.15    0.35    4.15    0.44       0
  34          UC  0.162   0.067
  35          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  36          UA    100
  37          ZZ
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

ME OF M TAGE	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE
+	HYDROGRAPH AT	AO2A1	39.	12.00	2.	1.	0.	0.02	
+	HYDROGRAPH AT	AO2A2	124.	12.00	7.	2.	1.	0.06	

*** NORMAL END OF HEC-1 ***

Entellus™

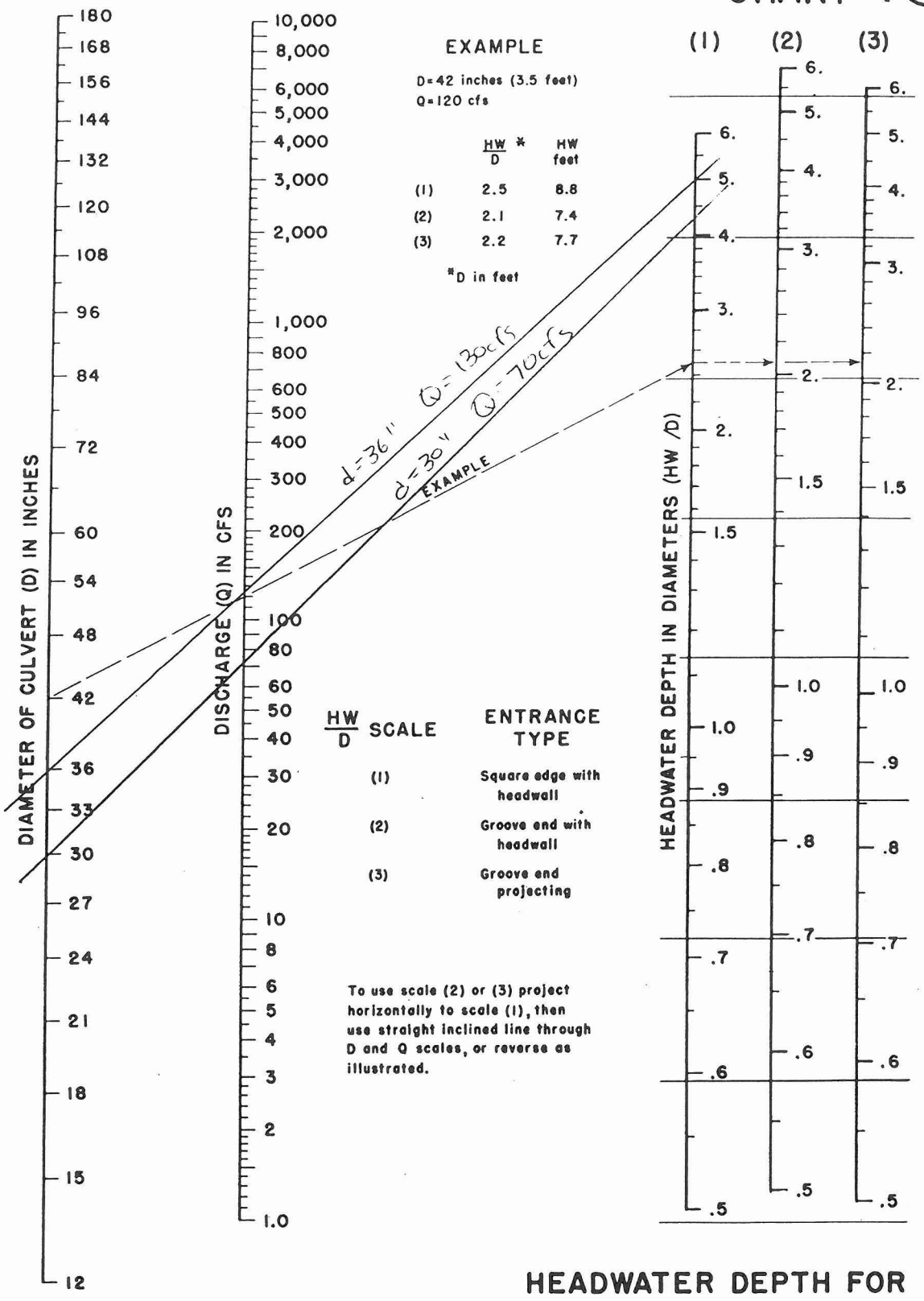
SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

CLIENT Palo Verde Zone A Delineation

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

Box Culvert 2, 1-30" RCP, and 1-36" RCP

E.2 I-10 Impoundment Analysis

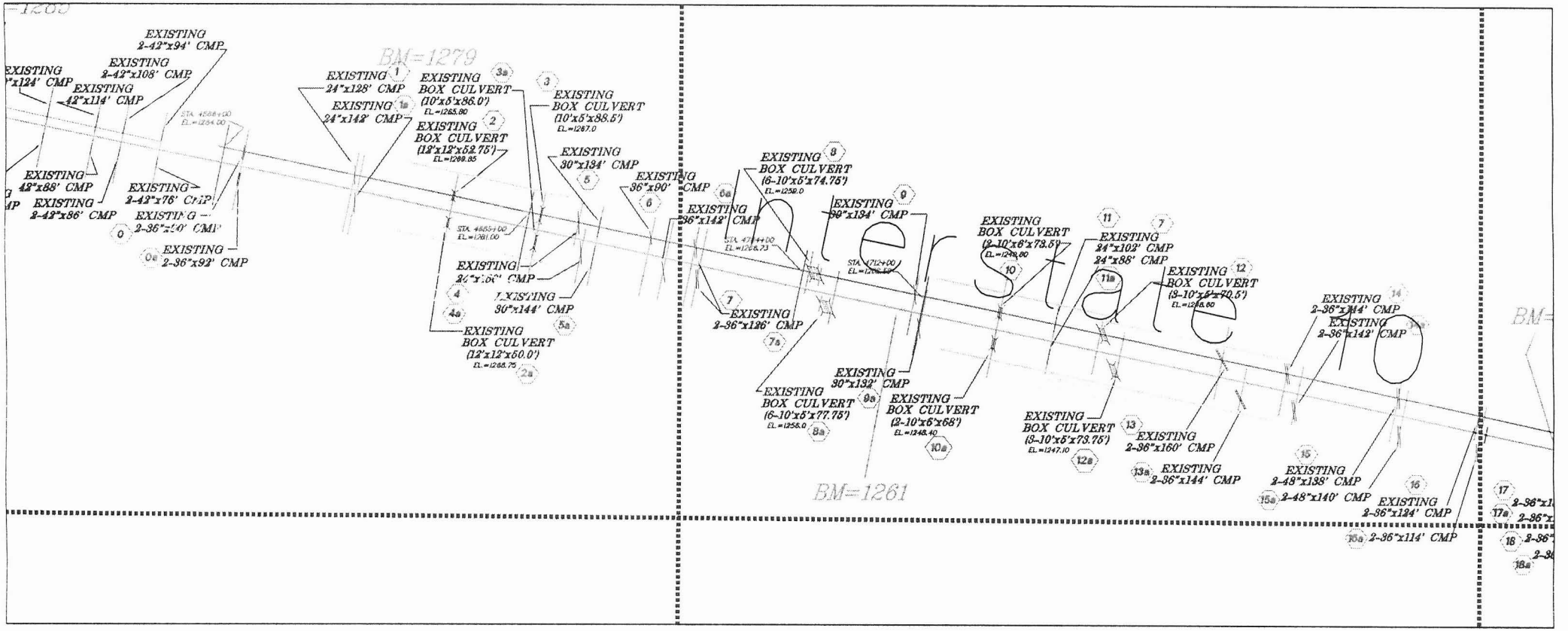
E.2 I-10 Impoundment Analysis

Methodology for I-10 Impoundment Analysis

The culvert analysis along I-10 deal with types of culverts ranging from Box Culverts, CMP's, RGRCP's, and CMP Arch's. All culverts less than 24" in diameter were ignored since they cannot convey significant amount of flow. Flows reaching I-10 either cross the roadway at the numbered culverts within the study area, or flow mostly southeast along the roadway embankment. Therefore, the analysis was started at the west side and proceed eastward. The area contributing flow to each culvert was determined based on topographic information and delineation of upstream basins. These areas, shown in acres, are seen on the spreadsheet in the "Area Associated to Culvert Inlet" column. In addition, any flow from adjacent culverts flowing along the embankment towards the culvert were added in column "Total Accumulated Area."

An aerial photo plot along with contours are shown for each culvert and it's associated sub-basin. This plot shows the associated area and calculates flow based on Area/Runoff Relationship [Flow=510 x Area (s.mi)], (see Section 4). There is an additional aerial photo plot that shows a close up of the culvert being analyzed, this plot was used to approximate the general slope around the culvert. From reviewing survey and aerial photographs, the best approach to the analysis of the culverts bypass flow was selected from either Manning's Equation or Weir Analysis (due to a berm or obstruction). FHWA Inlet Control Nomographs were used to estimate the flows through the culvert. Flow along the roadway (bypass) was based on a cross section representing either the typical conveyance path or the weir configuration. These cross sections are provided at each analysis point along with relevant calculations.

Along the two Traffic Interchanges (T.I.) located within the study area, additional analysis was required because the access ramps crossings have less capacity than the freeway crossings. The analysis sheets for these locations explain the procedures used.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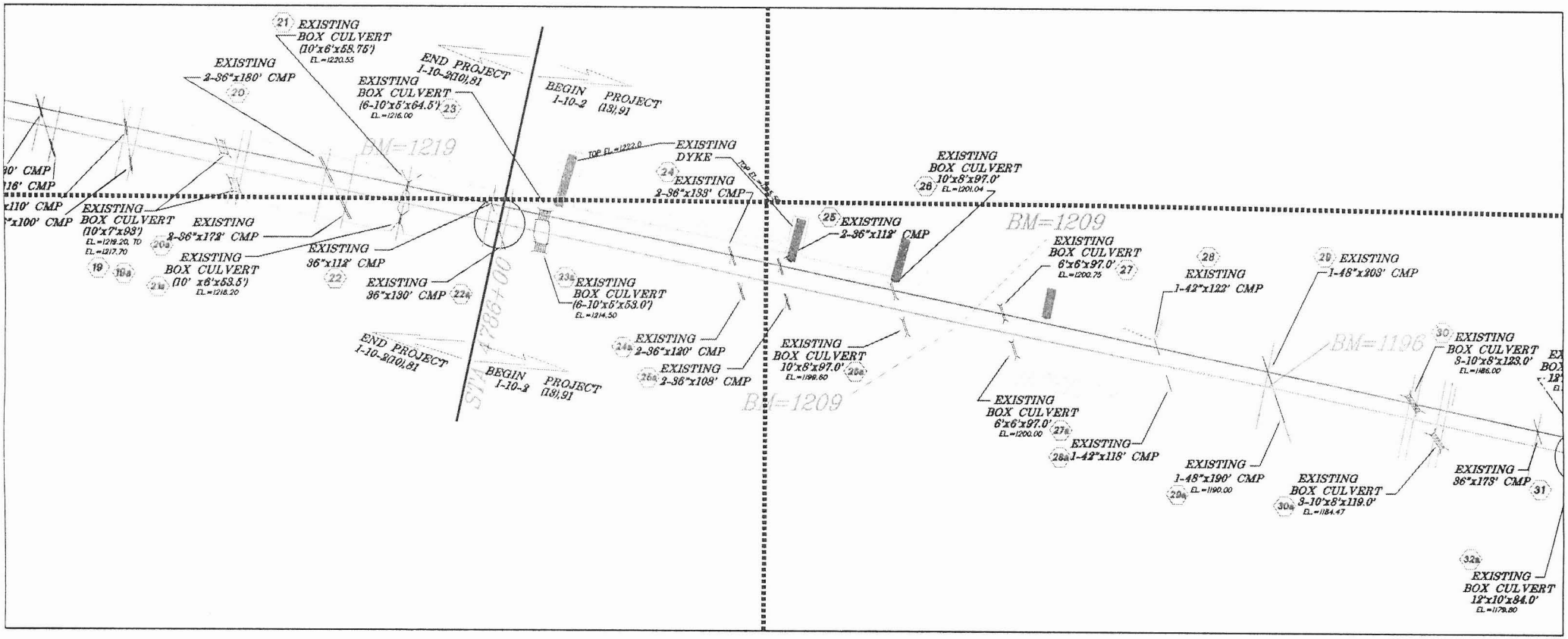
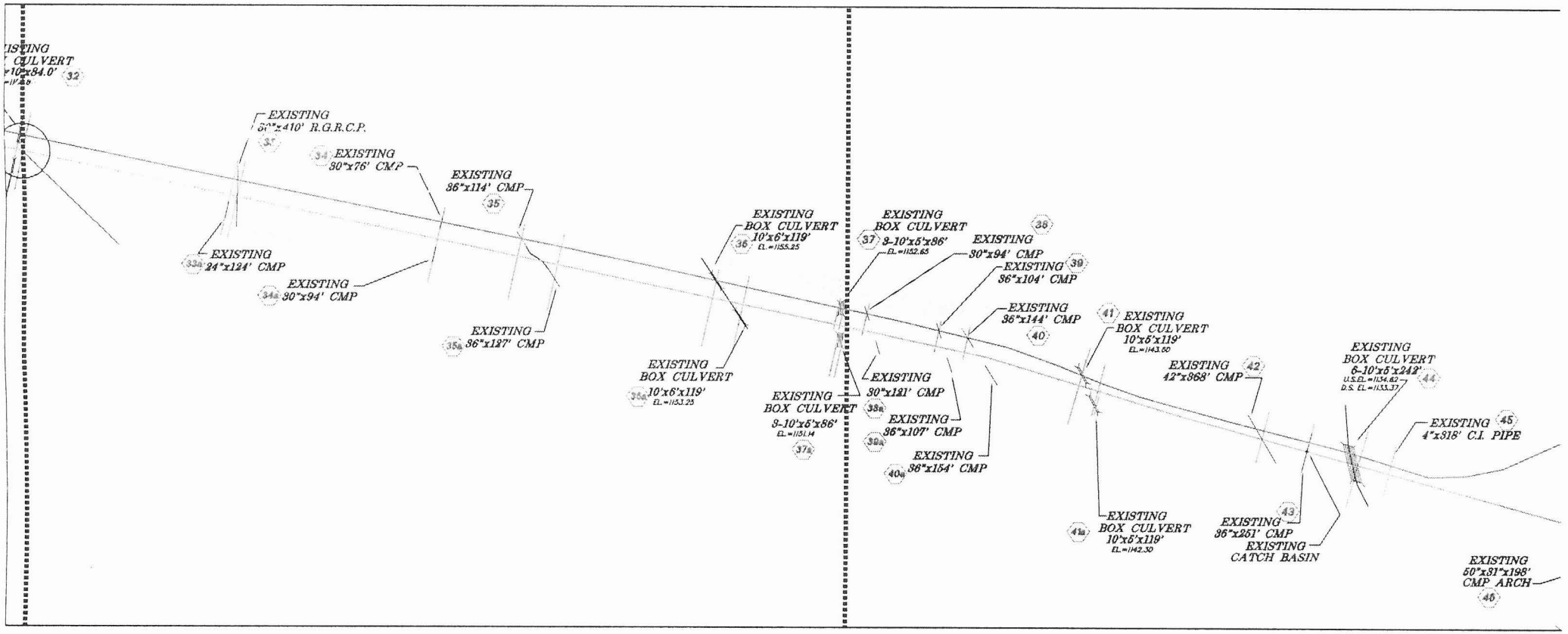
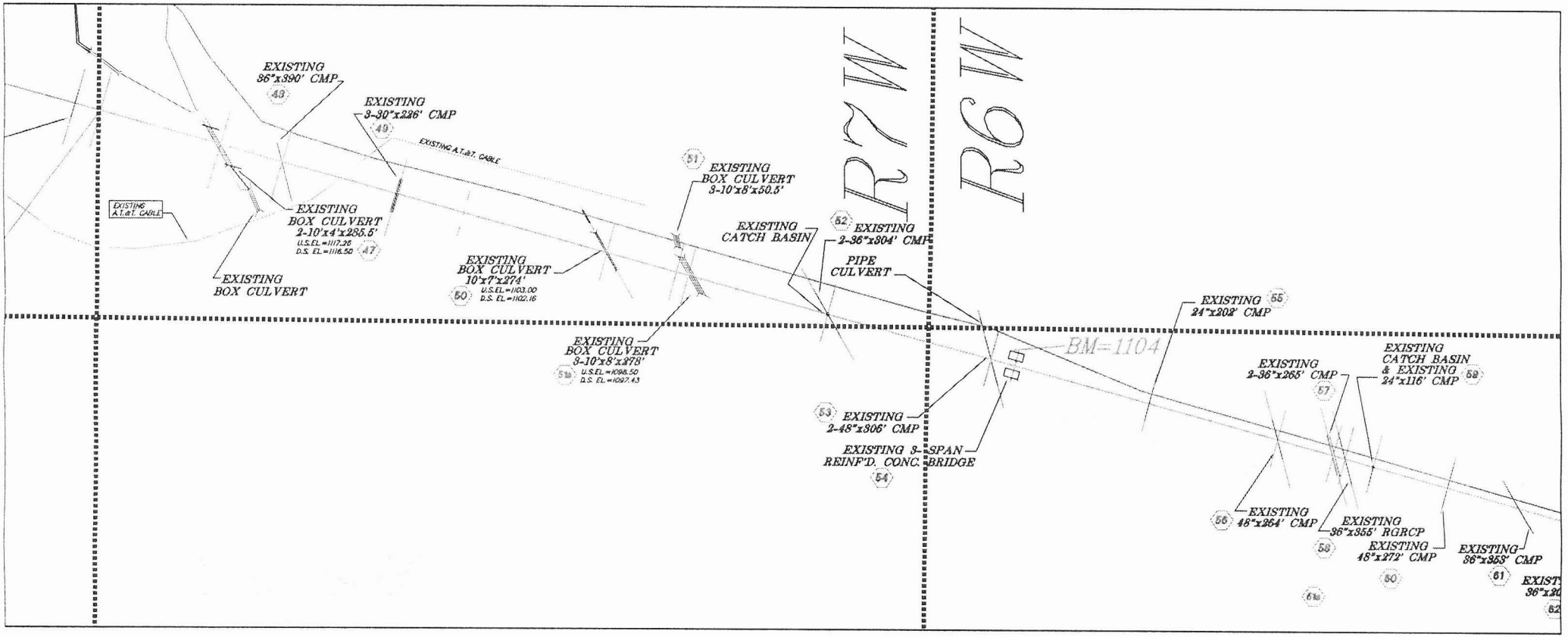
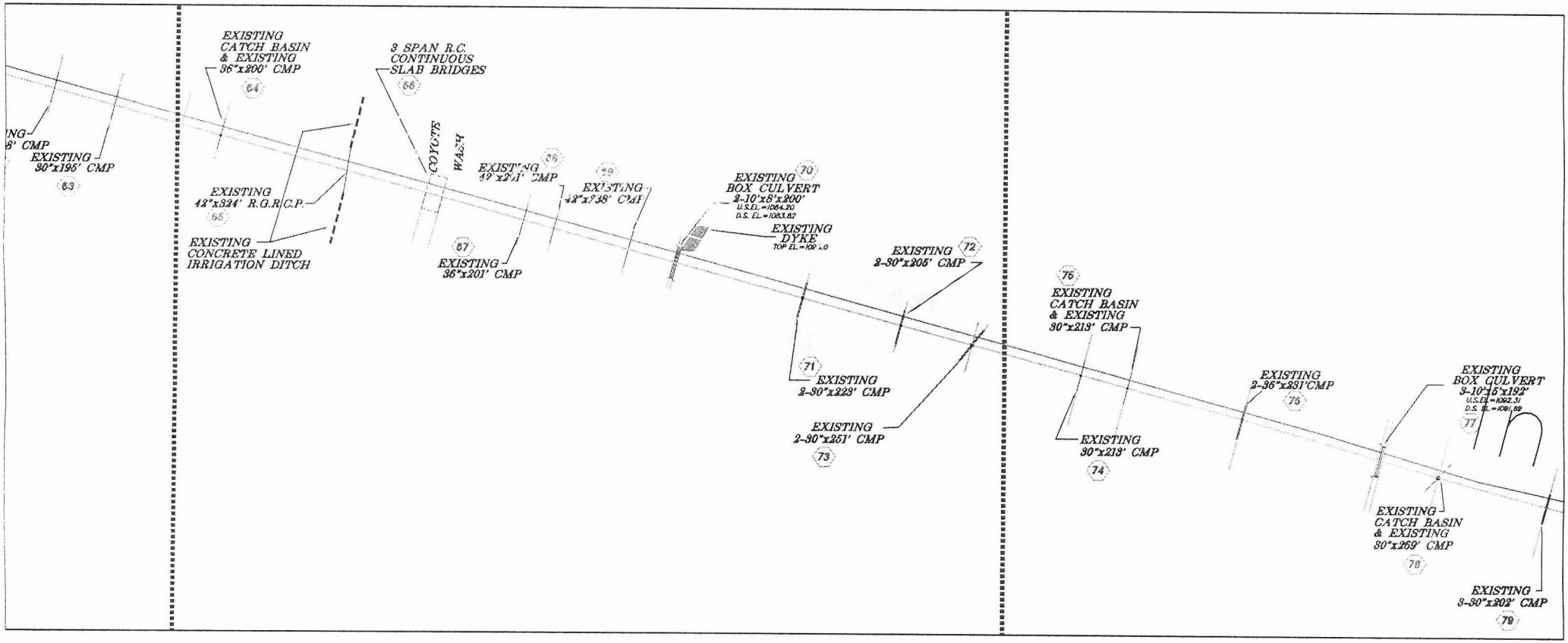
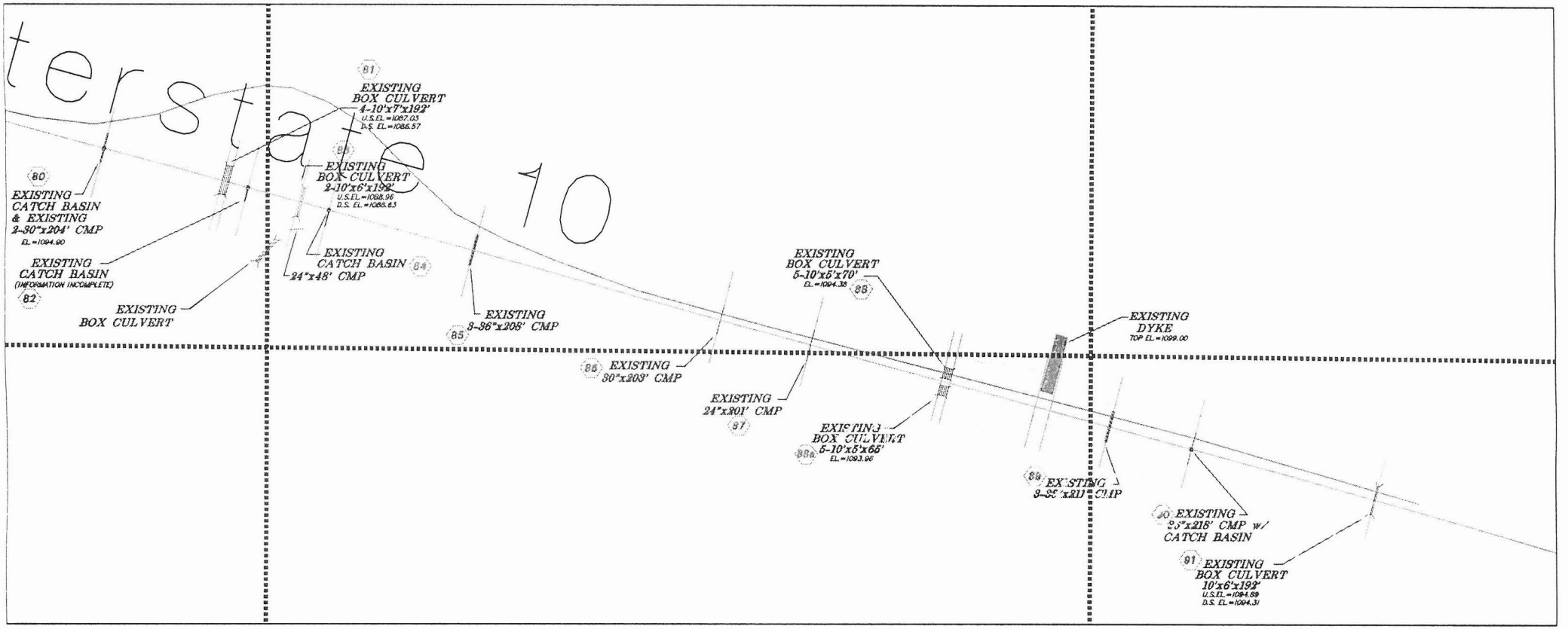
EXISTING 2-42"x108' CMP
EXISTING 42"x114' CMP
EXISTING 42"x88' CMP
EXISTING 2-42"x86' CMP
EXISTING 2-42"x76' CMP
EXISTING 2-36"x40' CMP
EXISTING 2-36"x92' CMP
BM=1279
EXISTING 24"x128' CMP
EXISTING 24"x142' CMP
EXISTING BOX CULVERT (10'x5'x86.0')
EL.=1265.80
EXISTING BOX CULVERT (12'x12'x52.75')
EL.=1269.85
EXISTING BOX CULVERT (10'x5'x88.5')
EL.=1267.0
EXISTING 30"x134' CMP
EXISTING 36"x90' CMP
EXISTING 36"x142' CMP
EXISTING 2-36"x126' CMP
EXISTING 30"x144' CMP
EXISTING BOX CULVERT (12'x12'x60.0')
EL.=1268.75
EXISTING BOX CULVERT (6-10'x6'x74.75')
EL.=1258.0
EXISTING 30"x194' CMP
EXISTING BOX CULVERT (6-10'x6'x77.75')
EL.=1256.0
EXISTING 30"x132' CMP
EXISTING BOX CULVERT (2-10'x6'x68')
EL.=1248.40
EXISTING BOX CULVERT (2-10'x6'x73.5')
EL.=1249.60
EXISTING 24"x102' CMP
24"x88' CMP
EXISTING BOX CULVERT (3-10'x6'x75.75')
EL.=1247.10
EXISTING BOX CULVERT (3-10'x6'x70.5')
EL.=1248.60
EXISTING 2-36"x144' CMP
EXISTING 2-36"x142' CMP
EXISTING 2-36"x160' CMP
EXISTING 2-36"x144' CMP
EXISTING 2-48"x138' CMP
2-48"x140' CMP
EXISTING 2-36"x124' CMP
2-36"x114' CMP
BM=1261
nterstate


EXISTING CMP
EXISTING BOX CULVERT (10'x7'x93')
EL.=1218.20, TO EL.=1217.70
19
19a
EXISTING BOX CULVERT (10' x6'x53.5')
EL.=1218.20
20a
EXISTING 2-36"x172' CMP
EXISTING 36"x112' CMP
22
21
EXISTING BOX CULVERT (10'x6'x58.75')
EL.=1220.55
EXISTING 2-36"x180' CMP
20
END PROJECT I-10-2(10),81
EXISTING BOX CULVERT (6-10'x5'x64.5')
EL.=1216.00
23
BEGIN PROJECT I-10-2 (13),91
BM=1219
TOP EL.=1222.0
EXISTING DYKE
24
EXISTING 2-36"x133' CMP
EXISTING 36"x130' CMP
22a
23a
EXISTING BOX CULVERT (6-10'x5'x53.0')
EL.=1214.50
STA. 1786+00
END PROJECT I-10-2(10),81
BEGIN PROJECT I-10-2 (13),91
24a
EXISTING 2-36"x140' CMP
25a
EXISTING 2-36"x108' CMP
BM=1209
EXISTING BOX CULVERT 10'x8'x97.0'
EL.=1201.04
26
25
EXISTING 2-36"x112' CMP
EXISTING BOX CULVERT 10'x8'x97.0'
EL.=1199.60
26a
EXISTING BOX CULVERT 6'x6'x97.0'
EL.=1200.75
27
28
EXISTING 1-42"x122' CMP
EXISTING BOX CULVERT 6'x6'x97.0'
EL.=1200.00
27a
EXISTING 1-42"x118' CMP
28a
29 EXISTING 1-48"x203' CMP
BM=1196
30 EXISTING BOX CULVERT 8-10'x8'x123.0'
EL.=1186.00
EXISTING 1-48"x190' CMP
EL.=1190.00
29a
EXISTING BOX CULVERT 3-10'x8'x119.0'
EL.=1184.47
30a
EXISTING 36"x178' CMP
31
32a
EXISTING BOX CULVERT 12'x10'x84.0'
EL.=1179.80


EXISTING
CULVERT
10'x84.0'
32
EXISTING
36"x410' R.G.R.C.P.
34
EXISTING
30"x76' CMP
EXISTING
36"x114' CMP
35
33a
EXISTING
24"x124' CMP
34a
EXISTING
30"x94' CMP
35a
EXISTING
36"x127' CMP
EXISTING
BOX CULVERT
10'x6'x119'
36
EL.=1155.25
35a
EXISTING
BOX CULVERT
10'x6'x119'
EL.=1153.25
EXISTING
BOX CULVERT
3-10'x5'x86'
37
EL.=1152.65
EXISTING
30"x94' CMP
38
EXISTING
36"x104' CMP
39
EXISTING
36"x144' CMP
40
EXISTING
30"x121' CMP
38a
EXISTING
36"x107' CMP
38a
EXISTING
36"x154' CMP
40a
EXISTING
BOX CULVERT
3-10'x5'x86'
EL.=1151.14
37a
41
EXISTING
BOX CULVERT
10'x6'x119'
EL.=1143.50
EXISTING
42"x868' CMP
42
EXISTING
BOX CULVERT
10'x6'x119'
EL.=1142.30
41a
EXISTING
36"x251' CMP
43
EXISTING
CATCH BASIN
EXISTING
BOX CULVERT
6-10'x5'x242'
U.S.EL.=1134.62
D.S. EL.=1133.37
44
EXISTING
4'x818' C.I. PIPE
45
EXISTING
50"x81"x198'
CMP ARCH
46


EXISTING
96"x390' CMP
48
EXISTING
3-30"x236' CMP
49
EXISTING A.T.&T. CABLE
EXISTING
A.T.&T. CABLE
EXISTING
BOX CULVERT
2-10'x4'x285.5'
U.S. EL.=1117.26
D.S. EL.=1116.50
47
EXISTING
BOX CULVERT
EXISTING
BOX CULVERT
10'x7'x274'
U.S. EL.=1103.00
D.S. EL.=1102.16
50
51
EXISTING
BOX CULVERT
3-10'x8'x50.5'
EXISTING
BOX CULVERT
3-10'x8'x278'
U.S. EL.=1098.50
D.S. EL.=1097.43
51a
EXISTING
CATCH BASIN
52
EXISTING
2-36"x804' CMP
PIPE
CULVERT
R7W
R6W
EXISTING
24"x202' CMP
55
BM=1104
EXISTING
2-36"x265' CMP
57
EXISTING
CATCH BASIN
& EXISTING
24"x116' CMP
59
53
EXISTING
2-48"x306' CMP
EXISTING 3-SPAN
REINF'D. CONC.
BRIDGE
54
56
EXISTING
48"x264' CMP
EXISTING
96"x355' RGRCP
58
EXISTING
48"x272' CMP
60
EXISTING
96"x353' CMP
61
61a


EXISTING
CATCH BASIN
& EXISTING
36"x200' CMP
64
3 SPAN R.C.
CONTINUOUS
SLAB BRIDGES
66
COYOTE
WASH
EXISTING
30"x195' CMP
63
EXISTING
42"x324' R.G.R.C.P.
65
EXISTING
CONCRETE LINED
IRRIGATION DITCH
67
EXISTING
36"x201' CMP
68
EXISTING
42"x238' CMP
69
EXISTING
BOX CULVERT
2-10'x8'x200'
U.S.EL.=1084.20
D.S. EL.=1083.82
70
EXISTING
DYKE
TOP EL.=1091.0
71
EXISTING
2-30"x223' CMP
72
EXISTING
2-30"x205' CMP
73
EXISTING
2-30"x251' CMP
76
EXISTING
CATCH BASIN
& EXISTING
30"x218' CMP
74
EXISTING
30"x213' CMP
75
EXISTING
2-36"x231'CMP
77
EXISTING
BOX CULVERT
3-10'x5'x192'
U.S.EL.=1092.31
D.S. EL.=1091.89
78
EXISTING
CATCH BASIN
& EXISTING
30"x269' CMP
79
EXISTING
3-30"x202' CMP


terstate 10
81
EXISTING
BOX CULVERT
4-10'x7'x192'
U.S. EL. = 1087.03
D.S. EL. = 1086.57
80
EXISTING
CATCH BASIN
& EXISTING
2-30"x204' CMP
EL. = 1084.90
EXISTING
BOX CULVERT
2-10'x6'x192'
U.S. EL. = 1088.96
D.S. EL. = 1088.63
EXISTING
CATCH BASIN
(INFORMATION INCOMPLETE)
82
EXISTING
BOX CULVERT
24"x48' CMP
84
EXISTING
8-36"x208' CMP
85
EXISTING
80"x203' CMP
86
EXISTING
24"x201' CMP
87
EXISTING
BOX CULVERT
5-10'x6'x70'
EL. = 1094.38
88
EXISTING
BOX CULVERT
5-10'x5'x65'
EL. = 1093.96
88a
EXISTING
DYKE
TOP EL. = 1099.00
89
EXISTING
8-36"x211' CMP
90
EXISTING
36"x218' CMP w/
CATCH BASIN
91
EXISTING
BOX CULVERT
10'x6'x192'
U.S. EL. = 1084.89
D.S. EL. = 1094.31

Area Associated to Culvert Inlet Spreadsheet

Concentration Point Identifier	Total Area Associated to Concentration Point* (s.mi)	Total Area Associated to Concentration Point (acres)	Culvert ID	Area Associated to Culvert Inlet (acres)	Total Accumulated Area (acres)
C01-03	1.997	**1278.080**			
			0	271.000	271.000
			1	10.000	281.000
			2 (A1)	66.292	347.292
			3 (B1)	20.480	367.772
			4 and 5	4.410	372.182
			6	5.010	377.192
			7	8.880	386.072
			8 (C1)	889.508	1275.580
			9	2.500	**1278.080**
C06-03	0.749	**479.360**			
			10 (1A)	479.360	**479.360**
C09-03	0.729	**466.560**			
			11	15.438	15.438
			12 (2A)	451.122	**466.560**
C84-03	0.220	**140.800**			
			13	30.109	30.109
			14	18.255	48.364
			15	57.888	106.251
			16	22.606	128.858
			17	11.942	**140.800**
C12-03	2.611	**1671.040**			
			18	7.938	7.938
			19 (3A)	1663.102	**1671.040**
C87-03	0.578	**369.92**			
			20	30.868	30.868
			21 (4A)	313.260	344.128
		(This area will be included with C30-03 Analysis)	22	25.79192700872	**369.920**
C30-03	1.662	**1063.68**			
		(Area not included in C87-03 is added in here)	22	25.792	25.792
			23 (A5)	**1063.680**	1089.472
C90-03	0.329	**210.56**			
			24	37.664	37.664
			25	6.993	44.656
			26 (6A)	132.773	177.429
			27	33.131	**210.560**
C33-03	1.682	**1076.48**			
			28	27.013	27.013
			29	236.760	263.773
			30 (8A)	812.707	**1076.480**
C94-03	0.337	**215.68**			
			31 and 32 (9A)	63.174	63.174
			33	103.020	166.194
			34	8.824	175.018
			35	40.662	**215.680**
C36-03	1.923	**1230.72**			
			36 (10A)	1230.720	**1230.720**
C114-03	0.395	**252.8**			
			37 (11A) and 38	73.782	73.782
			39 and 40	11.804	85.586
			41 (12A)	98.187	183.773
			42	54.458	238.231
		(This area will be included with C39-03 Analysis)		14.569	**252.800**
C39-03	2.382	**1524.48**			
		(Area not included in C114-03 is added in here)		14.569	14.569

Concentration Point Identifier	Total Area Associated to Concentration Point* (s.mi)	Total Area Associated to Concentration Point (acres)	Culvert ID	Area Associated to Culvert Inlet (acres)	Total Accumulated Area (acres)
			43 and 44 (13)	**1524.480**	1539.049
C48-03	0.416	**266.24**			
			**43" x 27" CMP-Arch	25.755	25.755
			**5' x 8' RCB	135.657	161.412
			**cattle guard	86.524	247.936
(The three culverts above all direct their flow to #46-50"x31" CMP Arch or an 8' x 5' RCB)					
			**4' x 10' RCB	18.304	**266.240**
C51-03	0.383	**245.12**			
			49	93.395	93.395
			50 (15)	151.725	**245.120**
C54-03	5.677	**3633.28**			
			51 (16)	3633.280	**3633.280**
C116-03	0.054	**34.56**			
			52	21.472	21.472
	(This area will be included with C66-03;C57-03; and C63-03 Analysis)			13.088	**34.560**
C66-03	13.942	**8922.88**			
C57-03	2.567	**1642.88**			
C63-03	0.162	**103.68**			
	Total Area (acres)	**10669.44**			
		(Area not included in C116-03 is added in here)		13.088	13.088
			53 and 54 (17)	**10669.440**	10682.528
C81-03	0.898	**574.72**			
			55	30.106	30.106
			56	31.735	61.841
			57 and 58	45.226	107.067
			60	54.571	161.638
			61	140.334	301.971
			62	53.395	355.367
			63	219.353	**574.720**
D01-03	12.915	**8265.6**			
			64	15.269	15.269
			65	29.608	44.878
			66 (18A)	8220.722	**8265.600**
D03-03	9.31	**5958.4**			
			67 and 68	20.200	20.200
			69 and 70 (19)	5938.200	**5958.400**
D102-03	0.054	**34.56**			
			79	27.148	27.148
		(This area will be included with D45-03)	80	7.412	**34.560**
D42-03	0.174	**111.36**			
			78 and 77 (20)	111.360	**111.360**
D39-03	0.826	**528.64**	76	528.640	**528.640**
D99-03	0.029	**18.56**			
			74 and 75	18.560	**18.560**
D23--03	4.133	**2645.12**			
			73	2645.120	**2645.120**
D33-03	0.416	**266.24**			
			71	210.395	210.395
			72	55.845	**266.240**
D45-03	9.877	**6321.28**			
		(Area not included in D102-03 is added in here)		7.412	7.412
			81 (21)	**6321.280**	6328.692

Concentration Point Identifier	Total Area Associated to Concentration Point* (s.mi)	Total Area Associated to Concentration Point (acres)	Culvert ID	Area Associated to Culvert Inlet (acres)	Total Accumulated Area (acres)
(The area shown here is the southeast corner of an off ramp location-see aerial photograph)				14.200	6342.892
D60-03	0.234	**149.76**			
			85	118.170	118.170
		(This area will be included with D29-03 and D57-03)		31.590	**149.760**
D29-03	1.19	**761.6**			
D57-03	1.317	**842.88**			
	Total Area (acres)	**1604.48**			
		(Area not included in D60-03 is added in here)		31.590	31.590
			83	**1604.480**	1636.070
D63-03	0.07	**44.8**			
			86	24.388	24.388
			87	11.159	35.546
		(This area will be included with D69-03)		9.254	**44.800**
D69-03	4.001	**2560.64**			
		(Area not included in D63-03 is added in here)		9.254	9.254
			88 (23A)	**2560.640**	2569.894
D105-03	0.325	**208**			
			89	166.589	166.589
			90	41.411	**208.000**
D75-03	0.383	**245.12**			
			91	245.120	**245.120**

*The Associated Area can be seen on the Area Flow Calculations in Appendix D.

**These culverts are located on the I-10 off ramp see aerial photographs.

Interstate 10 Flow Calculations for Culverts

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
0	2-36" CMP	271	0	271	216						bottom slope	0.0036						
											side slope (right) [Z:1]	158.000						
											side slope (left) [Z:1]	6.000						
		Wsel = 1286.9									bottom width (ft)	0.00						
						1284				**	normal depth at elev >	1285.5						
						1285.5	1.5	0.50		22.4								**22**
						1286	2	0.67		38	20.5	82.04	11.18					**49**
						1286.5	2.5	0.83		52	82.0	164.09	71.01					**123**
						1286.7	2.7	0.90		62	118.1	196.90	115.47					**177**
						1286.8	2.8	0.93		64	138.6	213.31	142.95					**207**
						1286.9	2.9	0.97		68	160.7	229.72	174.19					**242**
						1287	3	1.00		70	184.5	246.13	209.38					**279**
							**These flows are doubled because											
							there are two culverts											
1	1-24" CMP	10	186	196	156						bottom slope	0.0906						
											side slope (right) [Z:1]	140.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1275.5						
		Wsel = 1276.3				1275												
						1276	1	0.50		4.2	18.3	73.04	49.93					**54**
						1276.2	1.2	0.60		5.7	35.8	102.26	122.48					**128**
						1276.3	1.3	0.65		6.5	46.7	116.87	174.88					**181**
						1276.6	1.6	0.80		9.3	88.3	160.69	408.88					**418**
						1277	2	1.00		13	164.3	219.13	935.05					**948**
2 (A1)	1-12' x 12' RCB	66	188	254	203		Bottom Width (ft)		12.00		normal depth at elev >	1280						
						1272												
						1276	4	0.33	20.00	480								**480**
		Wsel = 1276.0				1278	6	0.50	45.00	540								**540**
						1280	8	0.67	70.00	840								**840**
3 (B1)	1-5' x 10' RCB	20	0	20	16		Bottom Width (ft)		10.00					weir flow depth at elev >	1280.00			
						1270												
						1272	2	0.40	8.40	84								**84**
						1273	3	0.60	15.20	152								**152**
		Wsel = 1272.0				1274	4	0.80	23.00	230								**230**
						1275	5	1.00	33.00	330								**330**
4 and 5	1-24" CMP	4	0	4	4						bottom slope	0.00595						
	1-30" CMP										side slope (right) [Z:1]	230.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1275.5000						
		Wsel = 1275.5				1274				**								
						1275.5	1.5	0.60		18.2								**18**
						1276	2	0.80		29	29.50	118.04	20.69					**50**
							**These flows are for both culverts											
							added together											
6	1-36" CMP	5	0	5	4						bottom slope	0.00595						
											side slope (right) [Z:1]	148.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1275.5						
		Wsel = 1275.5				1274												
						1275.5	1.5	0.50		11								**11**
						1276	2	0.67		18.5	19.25	77.04	13.50					**32**
7	2-36" CMP	9	0	9	7						bottom slope	0.006						
											side slope (right) [Z:1]	227.000						
											side slope (left) [Z:1]	6.000						

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
											bottom width (ft)	0.00						
		Wsel = 1273.9									normal depth at elev >	1273.5						
						1273				**								
						1273.9	0.9	0.30		11								**11**
						1274	1	0.33		13.4	29.13	116.54	20.42					**34**
							**These flows are doubled because											
							there are two culverts											
8 (C1)	6-5' x 10' RCB	890	0	890	709		Bottom Width (ft)		10.00					weir flow depth at elev >		1265.40		
						1262				**								
						1264	2	0.40	8.50	510								**510**
		Wsel = 1265				1265	3	0.60	15.50	930								**930**
							**These flows are multiplied by											
							6 for 6-box culverts											
9	1-30" CMP	3	0	3	2						bottom slope	0.00350						
											side slope (right) [Z:1]	153.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1261.5						
						1261												
		Wsel = 1261.8				1261.75	0.75	0.30		3.4	4.97	39.77	1.68					**5**
						1262	1	0.40		5	19.88	79.54	10.69					**16**
						1262.1	1.1	0.44		6	28.62	95.45	17.38					**23**
						1262.5	1.5	0.60		10	79.50	159.09	67.88					**78**
10 (1A)	2-6' x 10' RCB	479	0	479	382		Bottom Width (ft)		10.00					weir flow depth at elev >		1259.40		
						1252.5				**								
						1254.5	2	0.33	8.00	160								**160**
						1255.5	3	0.50	15.50	310								**310**
		Wsel = 1256.5				1256.5	4	0.67	24.00	480								**480**
						1257.5	5	0.83	33.00	660								**660**
							**These flows are doubled because											
							there are two culverts											
11	1-24" CMP	15	0	15	12						bottom slope	0.00273						
											side slope (right) [Z:1]	150.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1256.5						
						1256				**								
		Wsel = 1257.5				1257.5	1.5	0.75		8.5	78.00	156.09	58.82					**67**
						1258	2	1.00		13	175.50	234.13	173.44					**186**
						1258.3	2.3	1.15		15.5	252.72	280.95	282.04					**298**
						1258.4	2.4	1.20		15.5	281.58	296.56	325.79					**341**
						1258.5	2.5	1.25		16.5	312.00	312.17	373.55					**390**
12 (2A)	3-5' x 11' RCB	451	5	456	363		Bottom Width (ft)		11.00					Length (L) of berm (ft)		265.00		
						1251.6				**				weir flow depth at elev >		1257.50		
						1253.6	2	0.40	8.50	280.5				side slope (right) [Z:1]		276.00		**281**
						1254.6	3	0.60	15.50	511.5								**512**
		Wsel = 1254.6				1255.6	4	0.80	23.50	775.5								**776**
						1256.6	5	1.00	33.00	1089								**1089**
						1257.6	6	1.20	40.00	1320				0.07	27.60	0.10	23.81	**1320**
							**These flows are tripled because											
							there are three box culverts											
13	2-36" CMP	30	0	30	24						bottom slope	0.00413						
											side slope (right) [Z:1]	91.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1252.5						
						1252				**								
		Wsel = 1253.1				1253	1	0.33		12	12.13	48.54	7.08					**19**
						1253.1	1.1	0.37		14	17.46	58.25	11.52					**26**
						1253.5	1.5	0.50		22	48.50	97.09	44.97					**67**

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
							**These flows are doubled because											
							there are two culverts											
14	2-36" CMP	18	13	31	25						bottom slope	0.00413						
											side slope (right) [Z:1]	76.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1248.5						
						1248				**								
		Wsel = 1249.2				1249	1	0.33		12	10.25	41.04	5.99					**18**
						1249.1	1.1	0.37		14	14.76	49.25	9.73					**24**
						1249.2	1.2	0.40		16	20.09	57.46	14.68					**31**
						1249.5	1.5	0.50		22	41.00	82.09	38.01					**60**
							**These flows are doubled because											
							there are two culverts											
15	2-48" CMP	58	11	69	55						bottom slope	0.00400						
											side slope (right) [Z:1]	250.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1243.5						
		Wsel = 1244.2				1243				**								
						1244.2	1.2	0.30		22	62.72	179.26	45.13					**67**
						1245	2	0.50		46	288.00	384.13	344.56					**391**
							**These flows are doubled because											
							there are two culverts											
16	2-36" CMP	23	41	64	51						bottom slope	0.004						
											side slope (right) [Z:1]	156.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1242.5						
						1242				**								
						1243	1	0.33		12	20.25	81.04	11.64					**24**
						1243.1	1.1	0.37		14	29.16	97.25	18.93					**33**
		Wsel = 1243.3				1243.2	1.2	0.40		16	39.69	113.46	28.56					**45**
						1243.3	1.3	0.43		22.2	51.84	129.67	40.77					**63**
						1243.5	1.5	0.50		22.4	81.00	162.09	73.93					**96**
						1244	2	0.67		37.4								**37**
							**These flows are doubled because											
							there are two culverts											
17	2-36" CMP	12	36	48	38						bottom slope	0.007						
											side slope (right) [Z:1]	174.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1239						
		Wsel = 1239.5				1238				**								
						1239.5	1.5	0.50		22.2	22.50	90.04	17.11					**39**
						1240	2	0.67		38	90.00	180.09	108.68					**147**
							**These flows are doubled because											
							there are two culverts											
18	2-36" CMP	8	20	28	22						bottom slope	0.007						
											side slope (right) [Z:1]	132.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1239						
						1238				**								
						1239	1	0.33		12								
		Wsel = 1239.4				1239.3	1.3	0.43		17.6	6.21	41.43	3.36					**21**
						1239.4	1.4	0.47		20.2	11.04	55.23	7.23					**27**
						1239.5	1.5	0.50		22	17.25	69.04	13.12					**35**
						1240	2	0.67		38	69.00	138.09	83.31					**121**
19 (3A)	4-7' x 10' RCB	1663	2	1665	1327		Bottom Width (ft)		10.00		normal depth at elev >	1230						
						1223.5				**								

							Culvert Flow				Manning's Equation for flow along highway			Weir Flow over obstruction				
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	**Target Flow (cfs)**	Elevation (ft)	HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
						1226	2.5	0.36	11.90	476								**476**
						1227	3.5	0.50	20.00	800								**800**
		Wsel = 1230				1227.5	4	0.57	24.00	960								**960**
						1228	4.5	0.64	28.00	1120								**1120**
						1230	6.5	0.93	47.00	1880								**1880**
							**These flows are multipliled by 4 because											
							there are four box culverts											
20	2-36" CMP	31	0	370	**295**						normal depth at elev >	1230						
						1228				**								
		Wsel = 1230				1229.1	1.1	0.37		14								**14**
				25 cfs		1229.3	1.3	0.43		17								**17**
						1229.4	1.4	0.47		20								**20**
						1229.5	1.5	0.50		22.2								**22**
						1230	2	0.67		37								**37**
							**These flows are doubled because											
							there are two culverts											
21 (4A)	1-6' x 10' RCB	313	0	339	**270**		Bottom Width (ft)		10.00					weir flow depth at elev >		1227.30		
				% of split=	**25%**	1223												
		Wsel = 1226		split flow calculations=	**68**	1226	3	0.50	15.60	156								**156**
						1227	4	0.67	24.00	240								**240**
22 and	1-36" CMP	26	0	1064	**848**		Bottom Width (ft)		10.00					weir flow depth at elev >		1223.40		
23 (5A)	6-5' x 10' RCB	1064		25% split flow added=	**68**													
				split flow calculations=	**916**	1219				**								
						1222	3	0.60	15.30	953								**953**
						1222.2	3.2	0.64	16.90	1051								**1051**
						1222.9	3.9	0.78	22.30	1385								**1385**
		Wsel = 1222.2					**These flows are for both culverts											
							added together											
24	2-36" CMP	38	0	38	**30**						bottom slope	0.00550						
											side slope (right) [Z:1]	182.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1218						
		Wsel= 1218.5				1217				**								
						1218.3	1.3	0.43		17.4	8.46	56.43	4.06					**21**
						1218.4	1.4	0.47		20	15.04	75.23	8.74					**29**
						1218.5	1.5	0.50		22.2	23.50	94.04	15.84					**38**
						1219	2	0.67		38	94.00	188.09	100.62					**139**
							**These flows are doubled because											
							there are two culverts											
25	2-36" CMP	7	10	20	**16**									weir flow depth at elev >		1217.60		
						1216				**								
		Wsel= 1217.2				1217	1	0.33		12								**12**
						1217.2	1.2	0.40		16								**16**
						1217.5	1.5	0.50		22.2								**22**
							**These flows are doubled because											
							there are two culverts											
26 (6A)	1-8' x 10' RCB	133	0	133	**106**		Bottom Width (ft)		10.00		normal depth at elev >	1213						
						1203.6												
		Wsel= 1206				1206	2.4	0.30	11.20	112								**112**
						1207	3.4	0.42	19.00	190								**190**
27 (7A)	1-6' x 6' RCB	33	0	33	**26**		Bottom Width (ft)		6.00					weir flow depth at elev >		1209.90		
						1203.1												
		Wsel= 1205				1205	1.9	0.32	7.70	46.2								**46**
						1206	2.9	0.48	14.40	86.4								**86**
28	1-42" CMP	27	0	27	**22**						bottom slope	0.00520						
											side slope (right) [Z:1]	169.000						
											side slope (left) [Z:1]	6.000						
		Wsel= 1206.5									bottom width (ft)	0.00						

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
											normal depth at elev >	1206						
						1205												
						1206.3	1.3	0.37		10	7.87	52.53	3.67					**14**
						1206.4	1.4	0.40		11.5	14.00	70.03	7.91					**19**
						1206.5	1.5	0.43		12.5	21.88	87.54	14.34					**27**
29	1-48" CMP	237	11	248	**198**						bottom slope	0.005						
											side slope (right) [Z:1]	175.000						
											side slope (left) [Z:1]	6.000						
	Wsel= 1202.8										bottom width (ft)	0.00						
											normal depth at elev >	1201.5						
						1200												
						1201.6	1.6	0.40		16	0.91	18.11	0.20					**16**
						1202	2	0.50		23	22.63	90.54	14.83					**38**
						1202.7	2.7	0.68		38	130.32	217.30	153.17					**191**
						1202.8	2.8	0.70		40	152.94	235.41	189.62					**230**
						1203.5	3.5	0.88		60	362.00	362.17	598.20					**658**
30 (8A)	3-8' x 10' RCB	813	198	1011	**805**		Bottom Width (ft)		10.00					weir flow depth at elev >		1195.00		
						1188.3				**								
						1190.7	2.4	0.30	11.20	336								**336**
	Wsel= 1193					1192	3.7	0.46	21.00	630								**630**
						1193	4.7	0.59	31.00	930								**930**
							**These flows were multiplied by 3 because												
							there are three box culverts											
31 and	1-36" CMP	63	0	216	**172**		Bottom Width (ft)		12.00					weir flow depth at elev >		1188.40		
32 (9A)	1-10' x 12' RCB					1183.4				**								
						1185.5	2.1	0.21	9.90	138.8								**139**
	Wsel = 1185.5			Q = 125cfs here the rest om 33-35		1187	3.6	0.36	20.00	285								**285**
						1188	4.6	0.46	29.00	408								**408**
							**These flows are for both culverts											
							added together											
33	1-30" CMP	103	0	103	**82**						bottom slope	0.00700						
											side slope (right) [Z:1]	220.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1183						
						1182				**								
	Wsel = 1183.8					1183.5	1.5	0.60		10	28.25	113.04	21.49					**31**
						1183.7	1.7	0.68		12	55.37	158.26	52.71					**65**
						1183.8	1.8	0.72		13.2	72.32	180.87	75.26					**88**
						1184	2	0.80		16	113.00	226.09	136.46					**152**
34	1-30" CMP	9	86	95	**76**									Length (L) of berm (ft)		45.00		
														weir flow depth at elev >		1176.40		
														side slope (right) [Z:1]		262.00		
						1175												
	Wsel = 1176.8					1176.5	1.5	0.60		10				0.07	26.20	0.09	5.00	**15**
						1176.7	1.7	0.68		12				0.20	78.60	0.24	38.36	**50**
						1176.8	1.8	0.72		13				0.27	104.80	0.31	68.71	**82**
						1177	2	0.80		16				0.40	157.20	0.44	161.80	**178**
35	1-36" CMP	41	79	120	**95**									Length (L) of berm (ft)		270.00		
														weir flow depth at elev >		1166.20		
														side slope (right) [Z:1]		213.00		
						1164.5												
	Wsel = 1166.5					1166	1.5	0.50		11								**11**
						1166.3	1.8	0.60		15				0.07	21.30	0.10	23.97	**39**
						1166.4	1.9	0.63		16.5				0.13	42.60	0.19	70.41	**87**
						1166.5	2	0.67		18.5				0.20	63.90	0.28	134.19	**153**
36 (10A)	1-5' x 15' RCB	1231	96	1327	**1058**		Bottom Width (ft)		14.80		bottom slope	0.006						

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
											side slope (right) [Z:1]	175.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
		Wsel = 1163									normal depth at elev >	1161						
						1157.6												
						1160	2.4	0.48	11.00	162.8								**163**
						1161	3.4	0.68	18.50	273.8								**274**
						1162	4.4	0.88	27.00	399.6	90.50	181.09	97.74					**497**
						1162.5	4.9	0.98	32.00	473.6	203.63	271.63	288.22					**762**
						1162.8	5.2	1.04	34.00	503.2	293.22	325.95	468.71					**972**
						1162.9	5.3	1.06	34.50	510.6	326.71	344.06	541.41					**1052**
						1163	5.4	1.08	35.00	518	362.00	362.17	620.78					**1139**
						1163.1	5.5	1.10	37.00	547.6	399.11	380.28	707.05					**1255**
37 (11A)	3-5' x 10' RCB	74	677	751	**598**		Bottom Width (ft)		10.00					Length (L) of berm (ft)		595.00		
(and 38)	(30" CMP)													weir flow depth at elev >		1159.40		
														side slope (right) [Z:1]		210.00		
		Wsel = 1159				1155.4				**								
						1157	1.6	0.32	6.00	180								**180**
						1158	2.6	0.52	12.20	366								**366**
						1159	3.6	0.72	20.00	600								**600**
						1159.5	4.1	0.82	24.00	720				0.07	21.00	0.10	51.70	**772**
						1160	4.6	0.92	29.00	870				0.40	126.00	0.57	826.85	**1697**
							**These flows were multiplied by 3 because											
							there are three box culverts											
39 and	1-36" CMP	12	0	12	**9**						bottom slope	0.006						
40	1-36" CMP										side slope (right) [Z:1]	206.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1156.5						
						1155				**								
						1156.4	1.4	0.47		20								**20**
		Wsel = 1156.4				1156.5	1.5	0.50		22								**22**
						1156.6	1.6	0.53		25	1.06	21.21	0.26					**25**
						1157	2	0.67		38	26.50	106.04	18.66					**57**
							**These flows are doubled because											
							there are two culverts											
41 (12A)	1-5' x 14.8' RCB	98	0	253	**202**		Bottom Width (ft)		14.80					weir flow depth at elev >		1150.60		
			Q=125 here and the rest to the east			1145.7												
		Wsel = 1148				1148	2.3	0.46	10.20	150.96								**151**
						1149	3.3	0.66	18.00	266.4								**266**
42	1-42" CMP	54	0	54	43						bottom slope	0.003						
											side slope (right) [Z:1]	205.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1145.5						
						1144												
		Wsel = 1146.1				1145.5	1.5	0.43		12								**12**
						1146	2	0.57		20	26.38	105.54	13.13					**33**
						1146.1	2.1	0.60		22	37.98	126.65	21.36					**43**
						1146.3	2.3	0.66		26	67.52	168.87	46.00					**72**
						1146.5	2.5	0.71		30	105.50	211.09	83.40					**113**
43 and	1-36" CMP	1539	27	1566	**1248**		Bottom Width (ft)		11.65					weir flow depth at elev >		1143.10		
44 (13)	6-5' x 12' RCB																	
						1137				**								
						1139	2	0.40	8.50	594.15								**594**
		Wsel = 1140.3				1140	3	0.60	15.50	1083.45								**1083**
						1140.3	3.3	0.66	18.00	1258.2								**1258**

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
						1141	4	0.80	23.80	1663.62								**1664**
						1142	5	1.00	33.00	2306.7								**2307**
							**These flows were multiplied by 6 because											
							there are six box culverts											
45	1-4" C.I. Pipe	0	0	0	0													
	* This culvert is ignored																	
46	1-50" x 31"	248	0	266	**212**		(Chart 34)							weir flow depth at elev >		1155.00		
	CMP-Arch			% of split=	**25%**	1130.5												
(Three culverts are flowing into these two				split flow calculations=	**53**	1133	2.5	0.97		40								**40**
culverts, look at aerial photos)						1133.5	3	1.16		50								**50**
						1134	3.5	1.36		58								**58**
	Wsel = 1133.5					1134.3	3.8	1.47		63								**63**
						1134.8	4.3	1.67		72								**72**
							**These flows are for both culverts											
							added together											
46A	36"	26	0	26	**21**									weir flow depth at elev >		1155.00		
	CMP					1130.5												
						1133	2.5	0.83		28								**28**
						1133.5	3	1.00		35								**35**
						1134	3.5	1.17		44								**44**
	Wsel = 1133.5					1134.5	4	1.33		50								**50**
						1135.5	5	1.67		62								**62**
						1136.5	6	2.00		70								**70**
46D	1-4' x 8'	248	0	248	**198**		Bottom Width (ft)		8.00					weir flow depth at elev >		1155.00		
	Box Culvert			75% Split Flow added=	**148**													
(Three culverts are flowing into these two				split flow calculations=	**148**	1129												
culverts, look at aerial photos)						1131	1	0.25	3.00	30								**30**
						1132	2	0.50	9.00	90								**90**
						1133	3	0.75	15.00	150								**150**
	Wsel = 1133.0					1134	4	1.00	17.00	170								**170**
						1135	5	1.25	30.00	300								**300**
46B	1-4' x 8'	136	0		**108**		Bottom Width (ft)		8.00					weir flow depth at elev >		1155.00		
	Box Culvert																	
						1130												
						1132	2	0.40	6.00	48								**48**
						1133	3	0.60	11.00	88								**88**
						1133.5	3.5	0.70	14.00	112								**112**
	Wsel = 1133.5					1134	4	0.80	17.00	136								**136**
						1135	5	1.00	24.00	192								**192**
46C	1-2' x 4'	87	0	87	**69**		Bottom Width (ft)		10.00					weir flow depth at elev >		1126.00		
	Cattle Guard																	
						1130	0											
	Wsel = 1134.5					1132	2	1.00	8.00	32								**32**
						1134	4	2.00	17.00	68								**68**
						1136	6	3.00	22.00	88								**88**
47	1-4' x 10'	18	0	18	**15**		Bottom Width (ft)		10.00					weir flow depth at elev >		1126.00		
	Box Culvert	50-50 Split Flow to be added from Flow to Culvert 49			**37**													
				Total Flow	**52**													
						1122.3												
	Wsel = 1123.8					1123.8	1.5	0.38	5.80	58								**58**
						1124	1.7	0.43	6.50	65								**65**
						1124.8	2.5	0.63	13.00	130								**130**
49	3-30" CMP	93	0	93	**74**						normal depth at elev >	1124.5						
				50-50 Split Flow to be subtracted	**37**													

							Culvert Flow				Manning's Equation for flow along highway			Weir Flow over obstruction				
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Avg. height HW (fl)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
				Total Flow	37													
	Wsel = 1123.8					1122				**								
						1123.5	1.5	0.60		29.7								**30**
						1123.8	1.8	0.72		39.6								**40**
						1124	2	0.80		48								**48**
							**These flows were multiplied by 3 because											
							there are three CMP culverts											
50 (15)	1-7' x 10' RCB	152	0	152	121		Bottom Width (ft)		10.00		normal depth at elev >	1114.5						
						1110												
						1112.3	2.3	0.33	10.30	103								**103**
						1112.8	2.8	0.40	14.00	140								**140**
	Wsel = 1112.8					1113.3	3.3	0.47	17.50	175								**175**
						1114.3	4.3	0.61	26.00	260								**260**
51 (16)	3-8' x 10' RCB	3633	0	3633	2895		Bottom Width (ft)		10.00					Length (L) of berm (ft)		138.00		
														weir flow depth at elev >		1111.00		
														side slope (right) [Z:1]		258.00		
						1101.5				**								
						1105	3.5	0.44	19.00	570								**570**
	Wsel = 1111.7					1108	6.5	0.81	48.00	1440								**1440**
						1110	8.5	1.06	70.00	2100								**2100**
						1111	9.5	1.19	80.00	2400								**2400**
						1111.1	9.6	1.20	81.00	2430				0.07	25.80	0.09	12.90	**2443**
						1111.2	9.7	1.21	81.50	2445				0.13	51.60	0.18	39.70	**2485**
						1111.3	9.8	1.22	82.00	2460				0.20	77.40	0.26	78.92	**2539**
						1111.7	10.2	1.28	87.00	2610				0.47	180.60	0.57	367.98	**2978**
							**These flows were multiplied by 3 because											
							there are three box culverts											
52	2-36" CMP	21	358	379	302						bottom slope	0.002						
											side slope (right) [Z:1]	233.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1107						
						1106				**								
	Wsel = 1109					1107.5	1.5	0.50		22	29.88	119.54	12.15					**34**
						1107.7	1.7	0.57		28	58.56	167.36	29.79					**58**
						1108	2	0.67		37	119.50	239.08	77.14					**114**
						1109	3	1.00		70	478.00	478.17	489.91					**560**
							**These flows are doubled because											
							there are two culverts											
54 (17)	2-14' x 27' &	10683	292	10974	8745		Bottom Width 1 (ft)		27.20					weir flow depth at elev >		1106.80		
(and 53)	1-14' x 34' RCB						Bottom Width 2 (ft)		33.90									
	(and 2-48"CMP)						Bottom Width 3 (ft)		27.00									
						1091.7				**								
						1095	3.3	0.24	30.00	2643								**2643**
	Wsel = 1102					1100	8.3	0.59	71.00	6255.1								**6255**
	(Berm to the east preventing flow from going to culvert #55)					1102	10.3	0.74	100.00	8810								**8810**
						1103	11.3	0.81	112.00	9867.2								**9867**
							**This is a three box culvert											
							with different width dimensions											
55	1-24" CMP	30	0	30	24						bottom slope	0.002						
											side slope (right) [Z:1]	237.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1105						
						1103												
	Wsel = 1105.5					1104.5	1.5	0.75		8.3								**8**
	(Berm to the West preventing mix flow with Culvert 54 and 53)					1105	2	1.00		12.8								**13**
						1105.2	2.2	1.10		14.5	4.86	48.62	1.07					**16**
						1105.4	2.4	1.20		16	19.44	97.23	6.81					**23**

							Culvert Flow				Manning's Equation for flow along highway			Weir Flow over obstruction				
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
						1105.5	2.5	1.25		17	30.38	121.54	12.35					**29**
56	1-48" CMP	32	9	41	**32**						bottom slope	0.00200						
											side slope (right) [Z:1]	334.000						
											side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
											normal depth at elev >	1105						
		Wsel = 1105.3				1103												
						1105	2	0.50		22.3								**22**
						1105.1	2.1	0.53		24	1.70	34.01	0.24					**24**
						1105.3	2.3	0.57		28	15.30	102.03	4.42					**32**
						1105.5	2.5	0.63		34	42.50	170.04	17.28					**51**
57	2-36" CMP	45	5	51	**40**						bottom slope	0.00100						
58	1-36" RGRCP										side slope (right) [Z:1]	164.000						
											side slope (left) [Z:1]	6.000						
		Wsel = 1103.6									bottom width (ft)	0.00						
											normal depth at elev >	1103						
						1102												
						1103.5	1.5	0.50		33.3	21.25	85.04	6.11					**39**
						1103.6	1.6	0.53		36.6	30.60	102.05	9.93					**47**
						1104	2	0.67		55	85.00	170.09	38.79					**94**
						1105	3	1.00		105	340.00	340.17	246.38					**351**
60	1-48" CMP	55	5	199	**159**						bottom slope	0.00100						
61	1-36" CMP	140									side slope (right) [Z:1]	164.000						
											side slope (left) [Z:1]	6.000						
These two culverts were analyzed together.											bottom width (ft)	0.00						
											normal depth at elev >	1100						
						1098				**								
		Wsel = 1103				1100	2	0.50		58								**58**
		(See Analysis for 60, 61, 62, and 63 together below)				1101	3	0.75		96	85.00	170.09	38.79					**135**
						1101.3	3.3	0.82		106	143.65	221.11	78.10					**184**
						1102	4	1.00		132	340.00	340.17	246.38					**378**
							**These flows are doubled because											
							there are two culverts											
62	1-36" CMP	53	66	338	**270**									weir flow depth at elev >		1110.00		
63	1-30" CMP	219																
These two culverts were analyzed together.																		
						1096												
						1098	2	0.80		34.5								**35**
						1100	4	1.60		88								**88**
						1101.3	5.3	2.12		120								**120**
The Hydraulic Calculations at EL > 1101.3 (Which is now a mixed flow with Culvert 60 and 61) is shown below																		
60 and 61	1-48" CMP and	(66 acres already		188	**150**													
	1-36" CMP	added to #62 and 63)								**								
62 and 63	1-36" CMP and	188				1096												
	1-30" CMP					1103	7	2.33		294								**294**
						1105	9	3.00		371								**371**
		Wsel = 1103																
		(This Wsel is for Culverts 60, 61, 62 and 63)																
							**These flows are for four culverts											
							added together											
64	1-36" CMP	15	0	15	**12**						bottom slope	0.001						
											side slope (right) [Z:1]	160.000						
											side slope (left) [Z:1]	6.000						

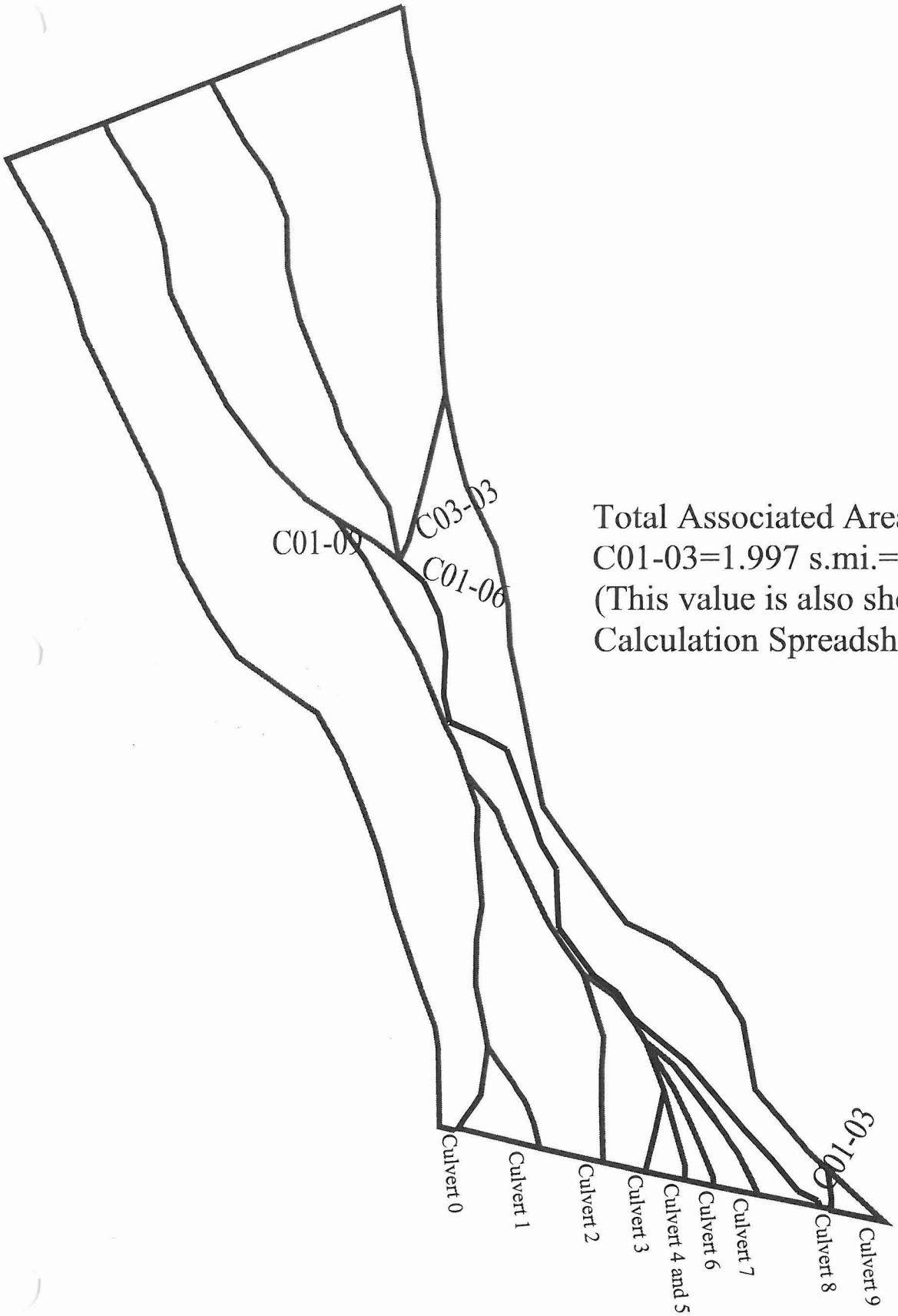
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. Height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
											bottom width (ft)	0.00						
											normal depth at elev >	1100						
						1095												
						1098	3	1.00		35								**35**
		Wsel = 1098				1099	4	1.33		50								**50**
						1100	5	1.67		61								**61**
						1101	6	2.00		70	83.00	166.09	37.88					**108**
						1101.5	6.5	2.17		75	186.75	249.13	111.70					**187**
						1102	7	2.33		80	332.00	332.17	240.58					**321**
65	1-42" RGRCP	30	0	30	**24**									weir flow depth at elev >	1100.00			
		Wsel = 1093.3				1091												
		(Berm to the east preventing flow from going to Culvert #66)				1093	2	0.57		20.5								**21**
						1093.3	2.3	0.66		26								**26**
						1095	4	1.14		60								**60**
						1097	6	1.71		95								**95**
						1098	7	2.00		105								**105**
66 (18A)	2-8' x 31' RCB	8221	0	8221	**6551**		Bottom Width 1 (ft)		31.30		normal depth at elev >	1100						
	1-8' x 40' RCB						Bottom Width 2 (ft)		38.90									
							Bottom Width 3 (ft)		31.30									
						1091				**								
		Wsel = 1099.5				1093.2	2.2	0.28	10.60	1075.9								**1076**
		(There is a berm at EL=1100 West of Culvert 66, so there is no				1095	4	0.50	24.00	2436								**2436**
		flow mixing with Culvert #65)				1097	6	0.75	44.00	4466								**4466**
						1098	7	0.88	55.00	5582.5								**5583**
						1099	8.00	1.00	66.00	6699								**6699**
						1099.5	8.50	1.06	70.00	7105								
						1100.5	9.50	1.19	82.00	8323								
							**This is a three box culvert											
							with different dimensions											
67	1-36" CMP	20	0	20	**16**									weir flow depth at elev >	1096.80			
68	1-42" CMP													(Just east of Culverts 69 and 70)				
						1092			36" CMP	42" CM	**							
						1094	2	0.67	19	27	46							**46**
		Wsel = 1099.5				1094.5	2.5	0.83	26	39	65							**65**
		(See Analysis for Culverts 67 through 78 together below)				1095	3	1.00	35	52	87							**87**
						1097	5	1.67	60	90	150							
						1098	6	2.00	70	106	176							
						1099	7	2.33	80	118	198							
						1099.5	7.5	2.50	82	123	205	205						
						1100.5	8.5	2.83	86	129	215							
							**These flows are added together for both											
							culverts, look at spreadsheet for individual											
							culvert flows											
69 and	1-42" CMP	5938	0	5938	**4732**		Bottom Width (ft)		10.00					weir flow depth at elev >	1096.80			
70 (19)	2-8' x 10' RCB																	
								HW/D for box	Cfs/foot Box	42"CMP								
		Wsel = 1099.5																
		(See Analysis for Culverts 67 through 78 together below)				1086				**								
				Culvert @ 1088		1086.8												
				Box is @ 1086.8		1090.8	4	1.14		540								**540**
				Weir is 1097		1094.8	8	2.29		1623								**1623**
						1097	10.2	2.91	172.00	3440								**3440**
					Top EL of Weir	1097.5	10.7	3.06	182.00	131 3640								
				Look at Culverts 78 through 71 for more Hydraulic Calculations		1098	11.2	3.20	190.00	136 4036		3800 cfs + 136 for 42"						
						1099	12.2	3.49	196.00	144 4064		3920 cfs + 144 for 42"						

							Culvert Flow					Manning's Equation for flow along highway			Weir Flow over obstruction				
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)		Q-culvert (cfs)	Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	**Q-total (cfs)**
						1099.5	12.7	3.63	200.00	149	**4149**	4149							
						1100	13.2	3.77	204.00	154	4234		4080 cfs + 154 for 42"						
							**These flows are added together for three												
							culverts, look at spreadsheet for individual												
							culvert flows												
The following culverts (78 to 71) are on a (+) Slope, flowing towards Culvert 71							HW								weir flow depth at elev >		1096.80		
							(ft)	HW/D	Cfs/foot	30"CMP					(Just east of Culvert 71)				
78 and	1-30" CMP	111	0	111	**89**			for box	Box										
77 (20)	3-5' x 10' RCB																		
						1094.5					**								
See Culverts 78 through 71 Analysis below)						1096.5	2	0.40	8.00		240								
				Box is @ 1094.6		1098.5	4	0.80	24.00		720								
				Culvert @ 1097		1099.5	5	1.00	33.00	22.00	1012	1012							
						1100.5	6	1.20	40.00	40.00	1240								
		Road Surface is 1102.5				1101.5	7	1.40	48.00	48.00	1488								
						1102.5	8	1.60	55.00	50.00	1700								
		Wsel = 1102.5					**These flows are added together for two												
		(See Analysis for Culverts 67 through 78 together below)					culverts, look at spreadsheet for individual												
							culvert flows												
76	2-36" CMP	529	0	529	**421**										weir flow depth at elev >		1096.80		
															(Just east of Culvert 71)				
See Culverts 78 through 71 Analysis below)																			
								HW/D		Flow									
		Wsel = 1099.5						fo CMP		cfs									
		(See Analysis for Culverts 67 through 78 together below)																	
						1092					**								
						1094	2	0.67		19.00	38								
				Culvert @ 1092		1095	3	1.00		35.00	70								
						1098	6	2.00		70.00	140								
						1099	7	2.33		80.00	160								
						1099.5	7.5	2.50		83.00	166	166							
						1100	8	2.67		88.00	176								
							**These flows are doubled because there												
							are two culverts												
75 and 74	1-30" CMP	19	0	19	**15**										weir flow depth at elev >		1096.80		
	1-30" CMP														(Just east of Culvert 71)				
See Culverts 78 through 71 Analysis below)																			
		Wsel = 1099.5																	
		(See Analysis for Culverts 67 through 78 together below)				1092					**								
						1094	2	0.80		16.00	32								
						1095	3	1.20		28.00	56								
				Culvert @ 1092		1098	6	2.40		51.00	102								
						1099	7	2.80		57.00	114								
						1099.5	7.5	3.00		60.00	**120**	120							
						1100	8	3.20		62.00	124								
							**These flows are doubled because												
							there are two culverts												
73	2-30" CMP	2645	0	2645	**2108**										weir flow depth at elev >		1096.80		
															(Just east of Culvert 71)				
See Culverts 78 through 71 Analysis below)																			
		Wsel = 1099.5																	
		(See Analysis for Culverts 67 through 78 together below)																	
						1092					**								
						1094	2	0.80		16.00	32								
				Culvert @ 1092		1098	6	2.40		51.00	102								
						1099	7	2.80		57.00	114								
						1099.5	7.5	3.00		60.00	**120**	120							
						1100	8	3.20		62.00	124								
							**These flows are doubled because												

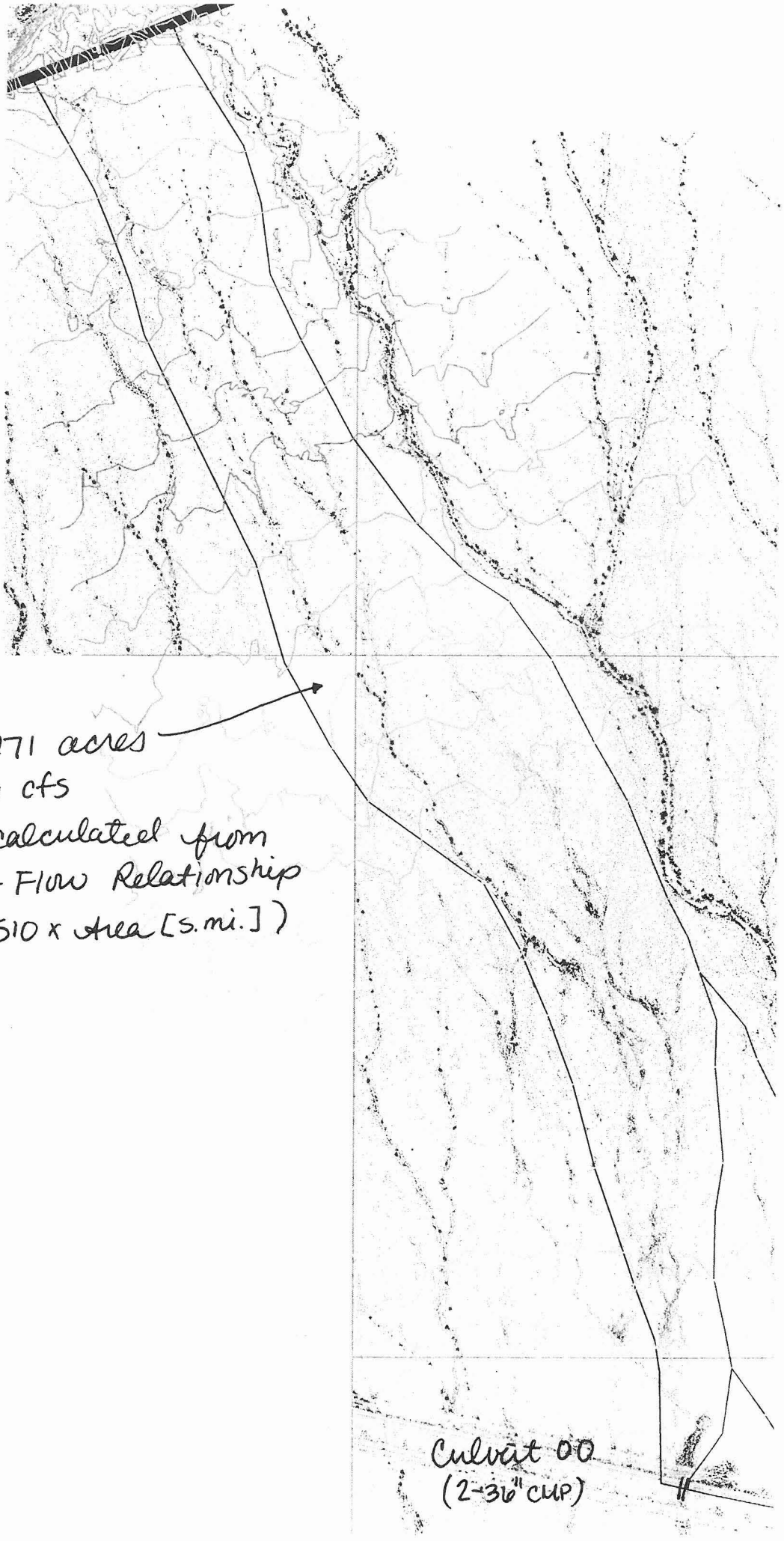
Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
							there are two culverts											
72	2-30" CMP	56	0	56	45									weir flow depth at elev >		1096.80		
														(Just east of Culvert 71)				
See Culverts 78 through 71 Analysis below)																		
		Wsel = 1099.5																
		(See Analysis for Culverts 67 through 78 together below)																
						1092				**								
						1094	2	0.80	16.00	32								
						1096	4	1.60	38.00	76								
				Culvert @ 1092		1098	6	2.40	51.00	102								
						1099	7	2.80	57.00	114								
						1099.5	7.5	3.00	60.00	**120**	120							
						1100	8	3.20	62.00	124								
							**These flows are doubled because											
							there are two culverts											
71	2-30" CMP	210	0	210	168									Length (L) of berm (ft)		292.00		
														weir flow depth at elev >		1096.80		
See Culverts 78 through 71 Analysis below)														side slope (right) [Z:1]		255.00		
		Wsel = 1099.5																
		(See Analysis for Culverts 67 through 78 together below)				1092				**								
						1094	2	0.80	16.00	32								
						1095	3	1.20	28.00	56								
						1098	6	2.40	51.00	102								
					Culvert @ 1092	1099	7	2.80	57.00	114								
						1099.5	7.5	3.00	60.00	**120**	120							
						1100	8	3.20	62.00	124								
							**These flows are doubled because				6012.00							
							there are two culverts											
Hydraulic Analysis for Culverts 78 through 71														Length (L) of berm (ft)		292.00		
78	1-30" CMP	111	0	3570	**2845**									weir flow depth at elev >		1096.80		
77 (20)	3-5' x 10' RCB									**				side slope (right) [Z:1]		255.00		
76	2-36" CMP	529				1091												
75	1-30" CMP	19				1092												
74	1-30" CMP					1094.1												
73	2-30" CMP	2645				1096	4	1.60		657.8								
72	2-30" CMP	56				1096.8	4.8	1.92		907.3								
71	2-30" CMP	210					**These flows are added for Culverts 78 to 71,											
							see spreadsheet in Analysis Sheets											
The Hydraulic Calculations at EL > 1096.8 (Which is now a submerged Dyke) is shown below																		
67 and	1-36" CMP		0	3802	**3029**													
68	1-42" CMP									**								
69 and	42" CMP and		1370			1097	5	2.00		3167				0.13	51.00	0.19 76.75		**3244**
70	2-8' x 10' RCB					1098	6	2.40		3672				0.80	306.00	1.00 1603.27		**5275**
78 to 71			2431			1099	7	2.80		4172				1.47	561.00	1.72 5184.83		**9357**
		Wsel=1098					**These flows were added together for the											
		(This Wsel is for Culverts 67 through 78)					culverts, individual flows are shown on a											
							separate spreadsheet											
The following two culverts 79 to 81) are on a (-) Slope, flowing towards Culvert 81											normal depth at elev >	1105						
79	3-30" CMP	27	0	27	22													
						1101				**								
						1103	2	0.80		48								**48**
		Wsel = 1103.5				1103.5	2.5	1.00		66								**66**
		(See Analysis for Culverts 79, 80, and 81 together below)				1104	3	1.20		84								**84**
							**These flows are tripled because											

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
							there are three culverts											
81 (21)	4-7' x 10' RCB	6343	0	6343	5054		Bottom Width (ft)		10.00					weir flow depth at elev >		1110.00		
and 80	2-30" CMP																	
						1089.2				**								
						1093	3.8	0.54	22.00	952								**952**
						1095	5.8	0.83	41.00	1740								**1740**
						1100	10.8	1.54	88.00	3670								**3670**
						1101	11.8	1.69	95.00	3960								**3960**
						1103	13.8	1.97	106.00	4420								**4420**
							**These flows are added together for two											**0**
							culverts, look at spreadsheet for individual											**0**
							culvert flows											**0**
The Hydraulic Calculations at EL > 1103 (Which is now a mixed flow with Culvert 79) is shown below																		
79	3-30" CMP		0	796	634													
81 and	4-7' x 10' RCB					1089.2				**								
80	2-30" CMP		796			1103.5	14.3	2.04	110.00	4648								**4648**
						1103.6	14.4	2.06	113.00	4776								**4776**
		Wsel=1103.5					**These were added for nine culverts											
		(This Wsel is for Culverts 79, 80, and 81)																
The following culverts (85 to 83 and an existing box culvert) are on a (+) Slope, flowing towards Culvert 8											normal depth at elev >	1108						
85	3-36" CMP	118	0	150	120													
						1099				**								
						1103	4	1.33	46.00	138								**138**
		Wsel = 1107.8				1105	6	2.00	70.00	210								**210**
		(If Wsel > 1107.8, then culvert analsis will be analyzed as a mix flow				1106	7	2.33	76.00	228								**228**
		with Culvert 83)					**These flows are tripled because											
							there are three culverts											
83	2-6' x 10' RCB	1636	0	1636	1304		Bottom Width (ft)		10.00					weir flow depth at elev >		1110.00		
						1091.1				**								
						1094	2.9	0.48	14.00	280								**280**
						1095	3.9	0.65	23.00	460								**460**
		Wsel = 1100				1100	8.9	1.48	66.00	1320								**1320**
		(If Wsel > 1107.8, then culvert analsis will be analyzed as a mix flow				1101	9.9	1.65	73.00	1460								**1460**
		with Culvert 85)				1105	13.9	2.32	95.00	1900								**1900**
						1107.8	16.7	2.78	109.00	2180								**2180**
							**These flows are doubled because											
							there are two box culverts											
Box Culvert (2-8' x 10')		2811	0	2811	2240		Bottom Width (ft)		10.00					weir flow depth at elev >		1110.00		
(No Survey for this culvert)																		
(Flow is coming directly from Culvert #83)						1086				**								
						1090	4	0.50	24.00	480								**480**
						1093	7	0.88	55.00	1100								**1100**
						1095	9	1.13	75.00	1500								**1500**
		Wsel = 1100				1098	12	1.50	103.00	2060								**2060**
						1100	14	1.75	125.00	2500								**2500**
							**These flows are doubled because											
							there are two box culverts											
The following culverts (86 to 89) are on a (-) Slope, flowing towards Culvert 89											normal depth at elev >	1106						
86	1-30" CMP	24	0	45	36	1102												
						1103.5	1.5	0.60		10								**10**
		Wsel = 1104.3				1104	2	0.80		16								**16**
				86 & 87 are a combined system		1104.3	2.3	0.92		20								**20**
						1105	3	1.20		28								**28**
87	1-24" CMP	11	0	16	13						normal depth at elev >	1103						
						1100												
		Wsel = 1102				1102	2	1.00		13								**13**

Culvert ID	Culvert Type	Contributing Area from the north (acres)	Contributing Area from the west (acres)	Total Area Contributing to Culvert (acres)	Target Flow (cfs)	Elevation (ft)	Culvert Flow: HW (ft)	Chart 2 or 8 HW/D	Chart 8 Q/B (cfs/ft)	Q-culvert (cfs)	Manning's Equation for flow along highway: Cross Section Area (s.ft)	Wetted Perimeter (ft)	Normal Depth Q (cfs)	Weir Flow over obstruction: Avg. height HW (ft)	Length (L2) (ft)	Weighted Avg Head (H) (ft)	Q-east (cfs)	Q-total (cfs)
						1103	3	1.50		20								**20**
88 (23A)	5-5' x 10' RCB	2570	0	2560	**2040**		Bottom Width (ft)		10.00					Length (L) of berm (ft)		125.00		
														weir flow depth at elev >		1100.30		
						1096.5				**				side slope (right) [Z:1]		202.00		
						1098	1.5	0.30	5.50	275								**275**
						1099	2.5	0.50	12.00	600								**600**
		Wsel = 1104.5				1100	3.5	0.70	19.50	975								**975**
						1100.3	3.8	0.76	22.00	1100								**1100**
						1100.4	3.9	0.78	22.50	1125								**1137**
						1100.5	4	0.80	23.70	1185				0.07	20.20	0.10	11.55	**1220**
						1101	4.5	0.90	28.00	1400				0.13	40.40	0.18	35.17	**1715**
			The Road elevation is 1105			1102	5.5	1.10	36.50	1825				0.47	141.40	0.58	314.56	**3666**
						1103.5	7	1.40	48.00	2400				1.13	343.40	1.28	1841.24	
						1105	8.5	1.70	58.00	2900								
							**These flows are multiplied by 5 because											
							there are five box culverts											
89	3-36" CMP	167	270	436	**348**						normal depth at elev >	1095.5						
						1095												
						1097	2	0.67										**0**
		Wsel=1098				1098	3	1.00										**0**
		(See Analysis for Culverts 89 and 90 together below)				1099	4	1.33										
						1100	5	1.67										
The following culverts 90 to 91) are on a (+) Slope, flowing towards Culvert 90														weir flow depth at elev >		1103.90		
91 (24)	1-6' x 10' RCB	245	0	245	**195**		Bottom Width (ft)		10.00									
		Wsel = 1101				1097.3												
						1100	2.7	0.45	13.00	130								**130**
						1101	3.7	0.62	21.00	210								**210**
						1102	4.7	0.78	30.00	300								**300**
						1103.3	6	1.00	43.00	430								**430**
90	1-36" CMP	41	0	213	**170**						bottom slope	0.001						
											side slope (right) [Z:1]	205.000						
89	3-36" CMP	167	270								side slope (left) [Z:1]	6.000						
											bottom width (ft)	0.00						
(Same invert from as-builts)											normal depth at elev >	1095.5						
						1094				**								
		Wsel = 1098				1096	2	0.67		74	26.38	105.54	7.58					**82**
		(This Wsel is for Culverts 89 and 90)				1096.5	2.5	0.83		104	105.50	211.09	48.15					**152**
						1097	3	1.00		140	237.38	316.63	141.99					**282**
						1098	4	1.33		200	659.38	527.71	554.53					**755**
							**These flows are multiplied by 4 because											
							there are four identical culverts											



Total Associated Area to
C01-03=1.997 s.mi.=1278 acres
(This value is also shown on the Flow Calculation Spreadsheet)


Area = 271 acres
Q = 216 cfs
(Flow calculated from
Area - Flow Relationship
Q = 510 x Area [s.mi.])
Culvert 00
(2-36" CMP)

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BY ____ DATE ____

CHECK ____ DATE ____

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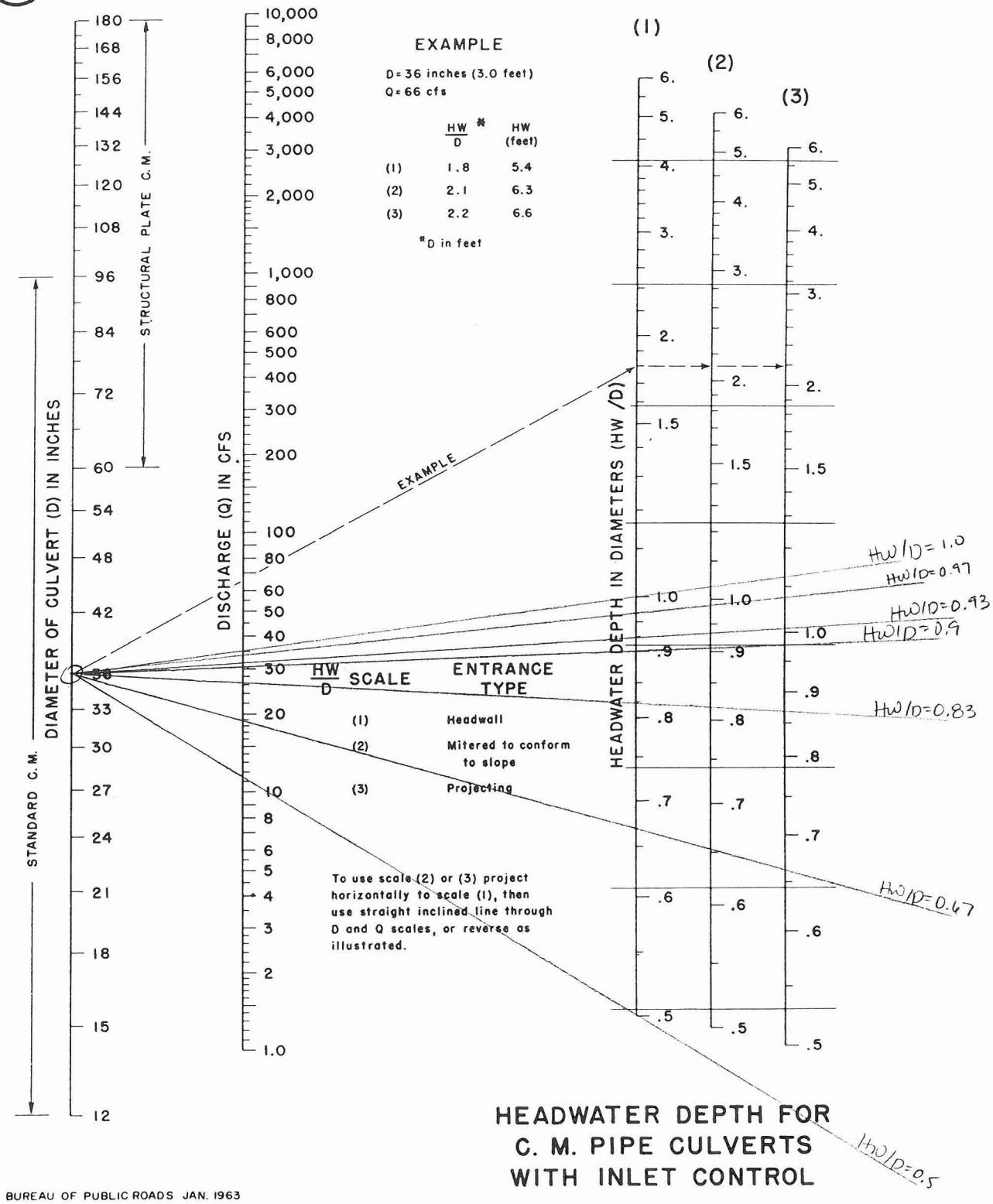
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Culvert # (2-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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BY _____ DATE _____

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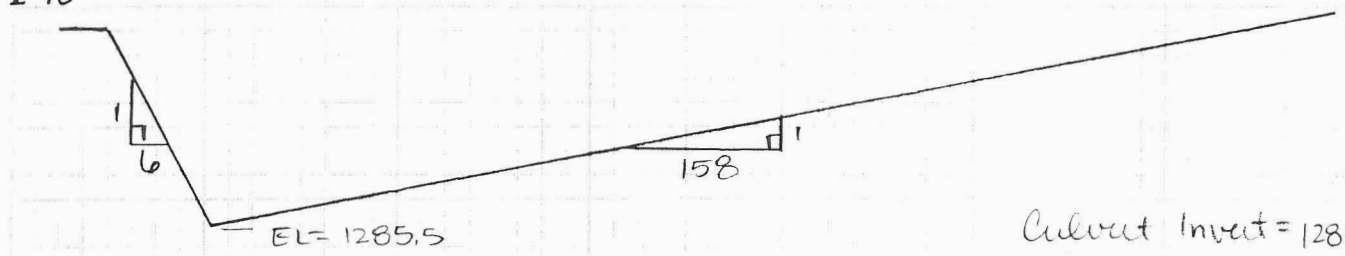
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1285.5) Culvert (2-36" CMP)

I-10

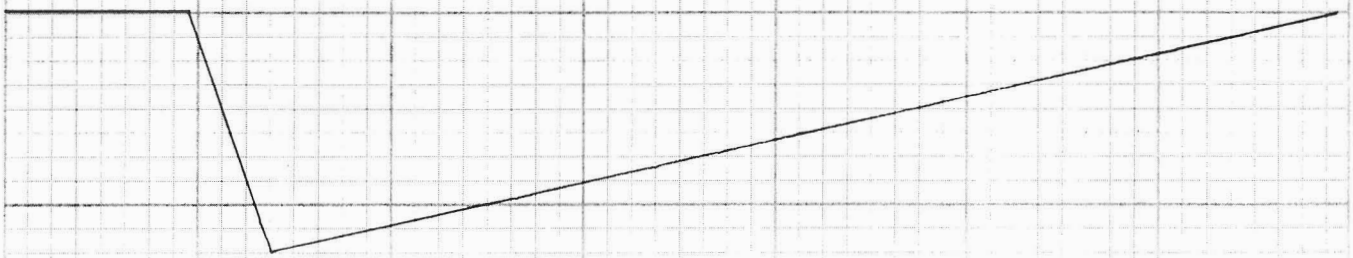


Culvert Invert = 1284

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0036
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

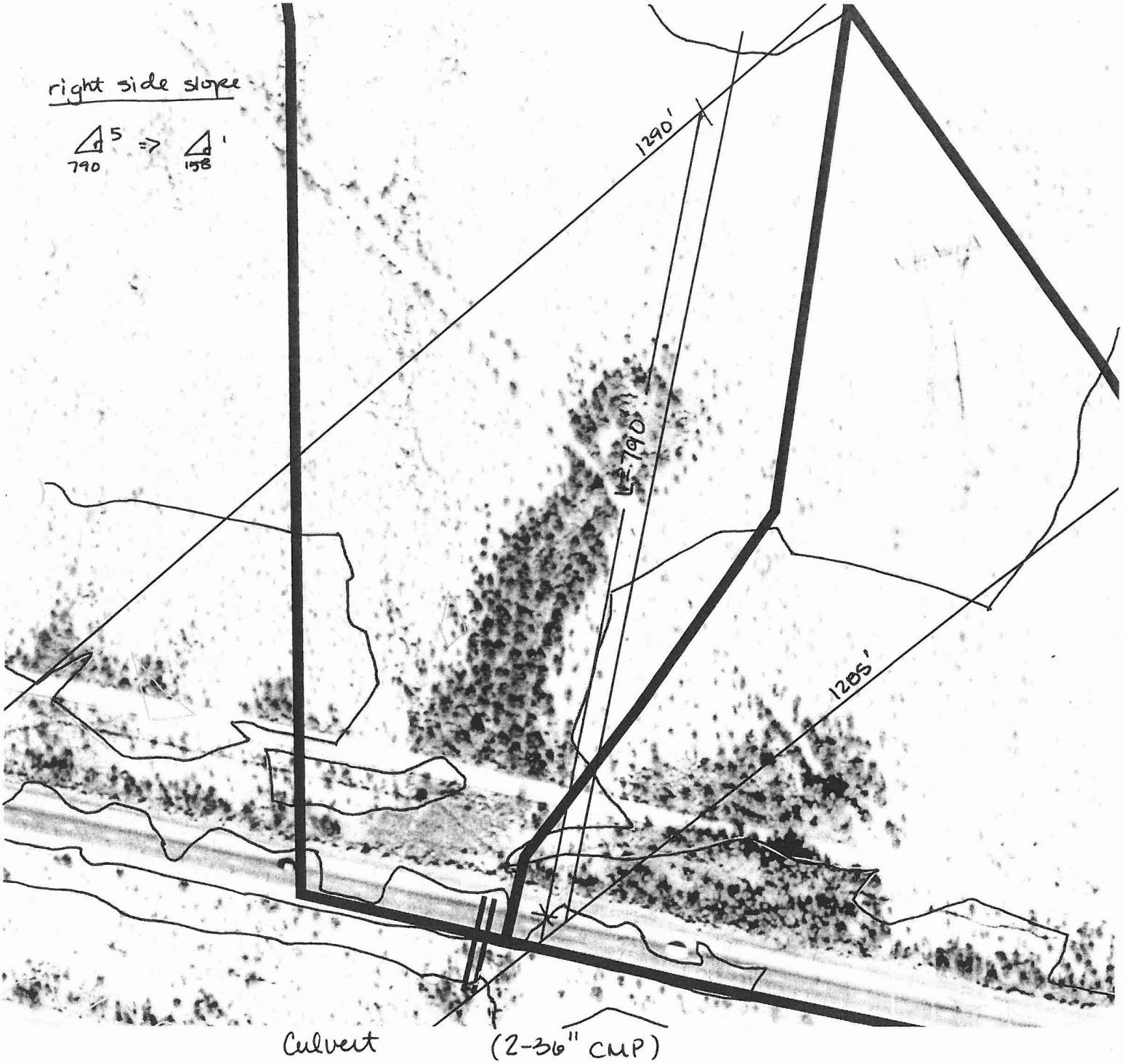
Weir Analysis (at EL >)

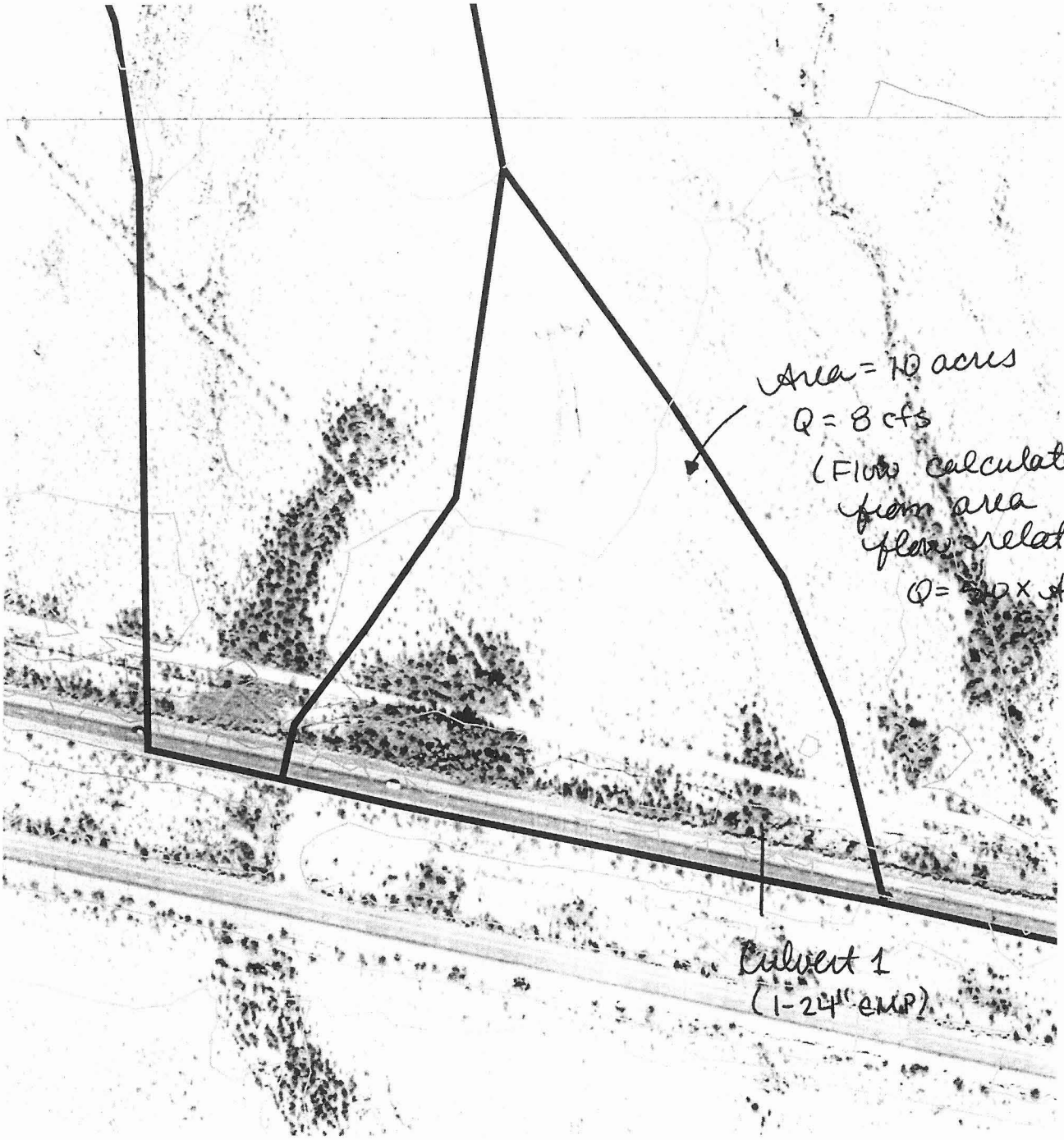


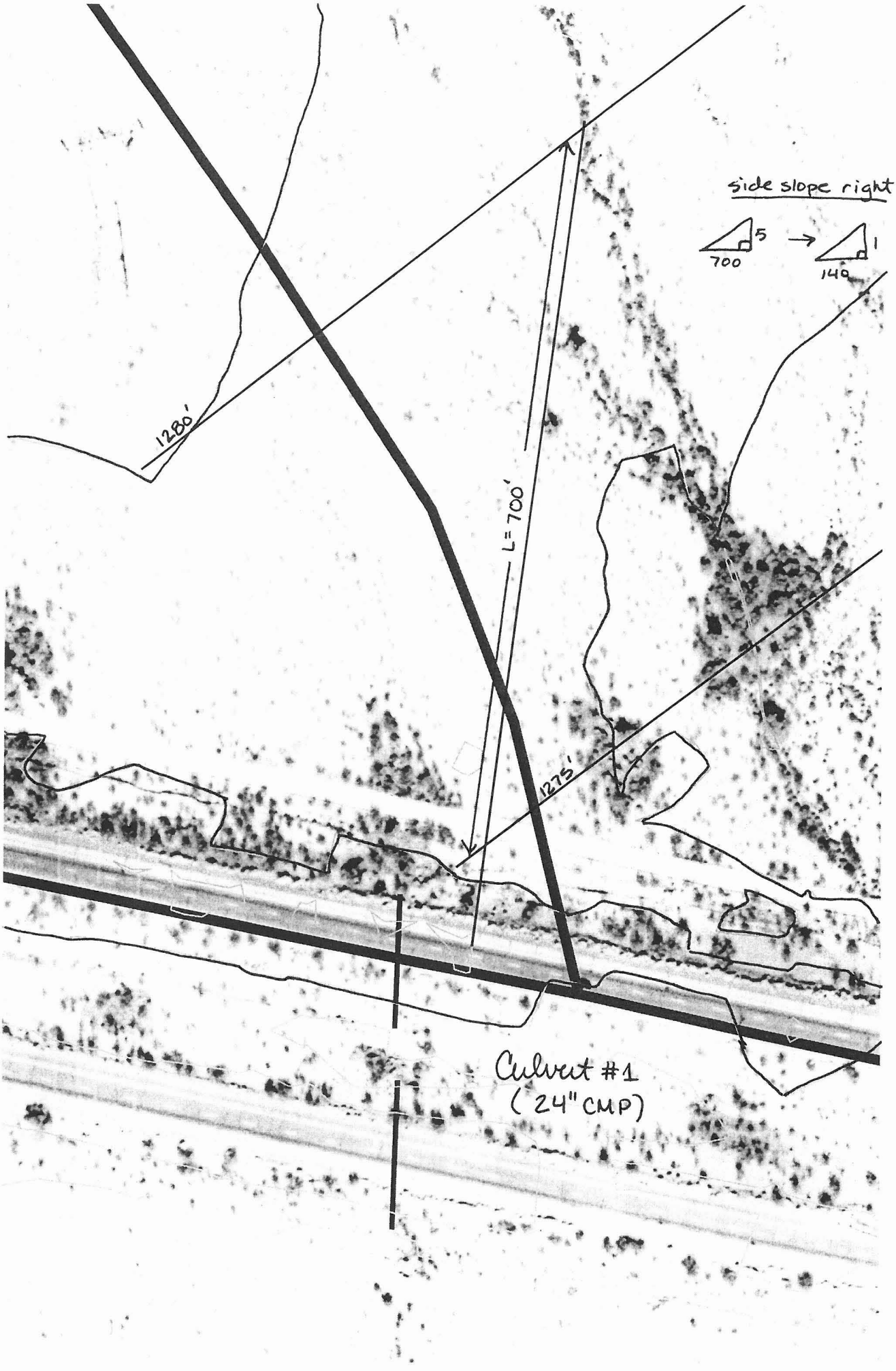
$$Q = C L H^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$


right side slope
5
790
=>
1
158
1290'
790'
1205'
Culvert
(2-36" CMP)


Area = 10 acres
Q = 8 cfs
(Flow calculated
from area
flow relationship
Q = 800 x Area [s.m
Culvert 1
(1-24" CMP)


side slope right
5
700
1
140
1280'
L= 700'
1275'
Culvert #1
(24" CMP)

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SHEET____ OF ____

BY ____ DATE ____

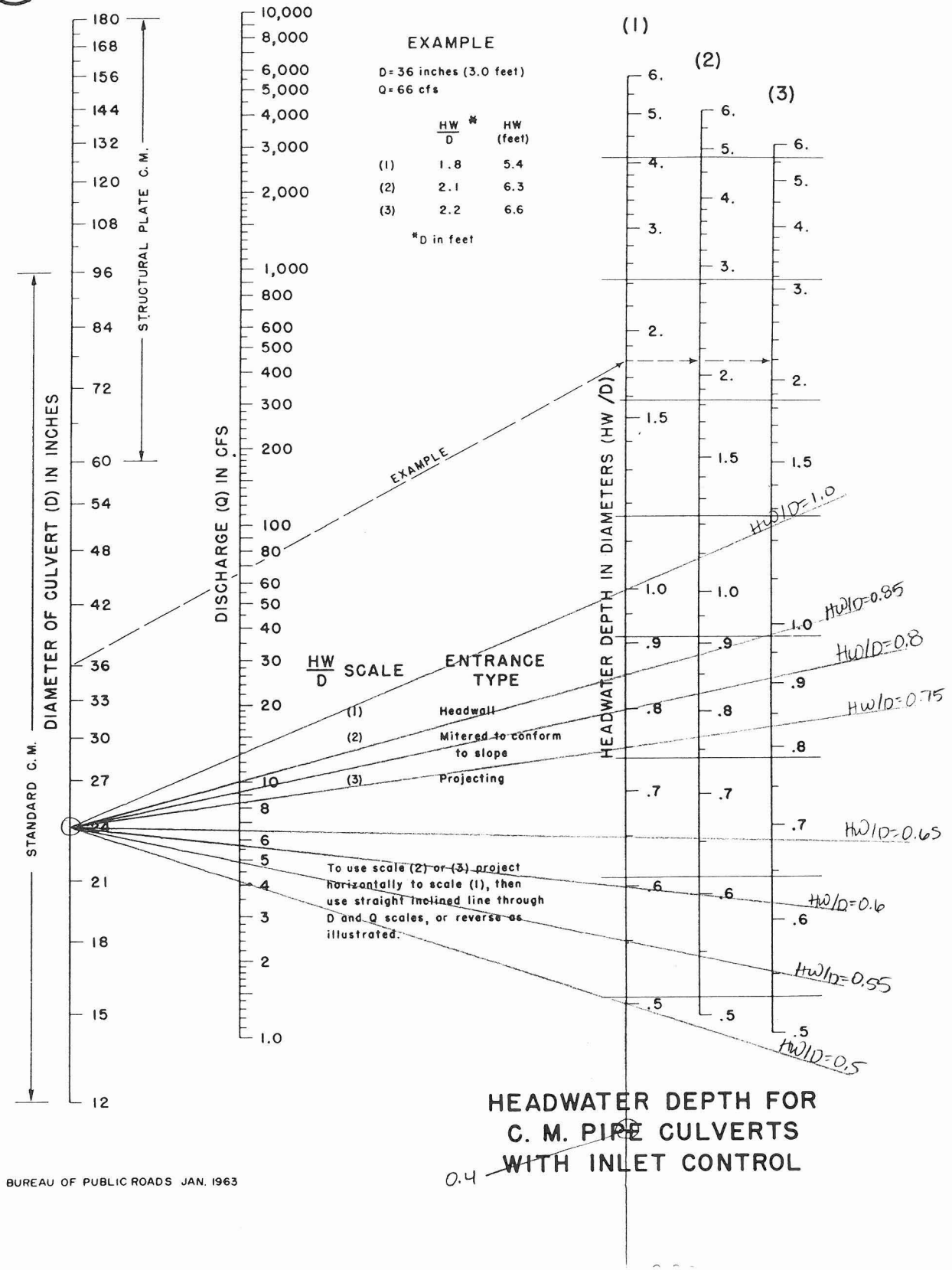
CHECK ____ DATE ____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #1 (24" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

0.4

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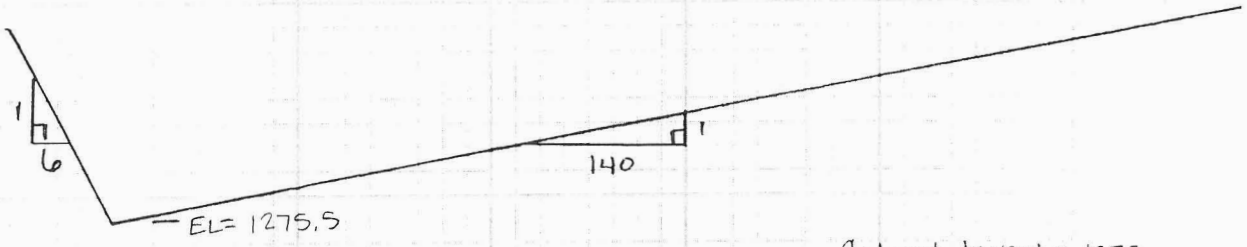
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1275.5)

Culvert #1 (24" CMP)



Culvert Invert = 1275

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

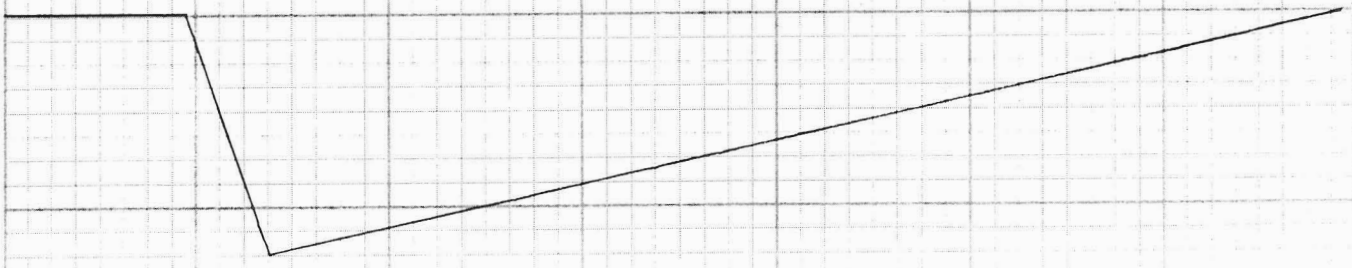
where $n = 0.065$

S = downstream slope = 0.091

A = Area of channel cross section

$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

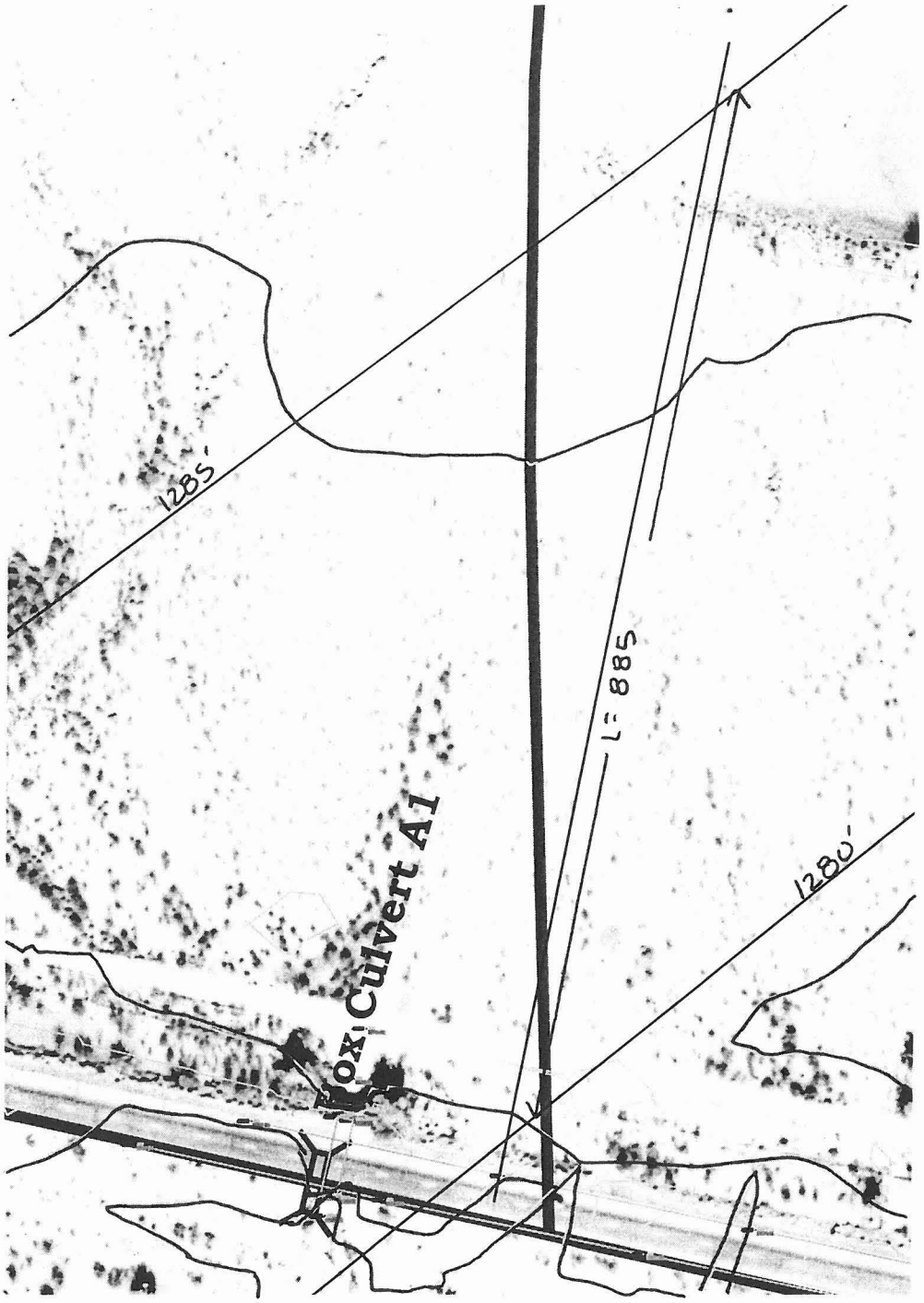
where $C = 2.7$

L = length of berm/dyke

H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L+l}\right)$$

Area = 66.29 acres
Flow = 50cfs



CULVERT #2
(BOX CULVERT A1)
(12' x 12' RCB)

right side slope

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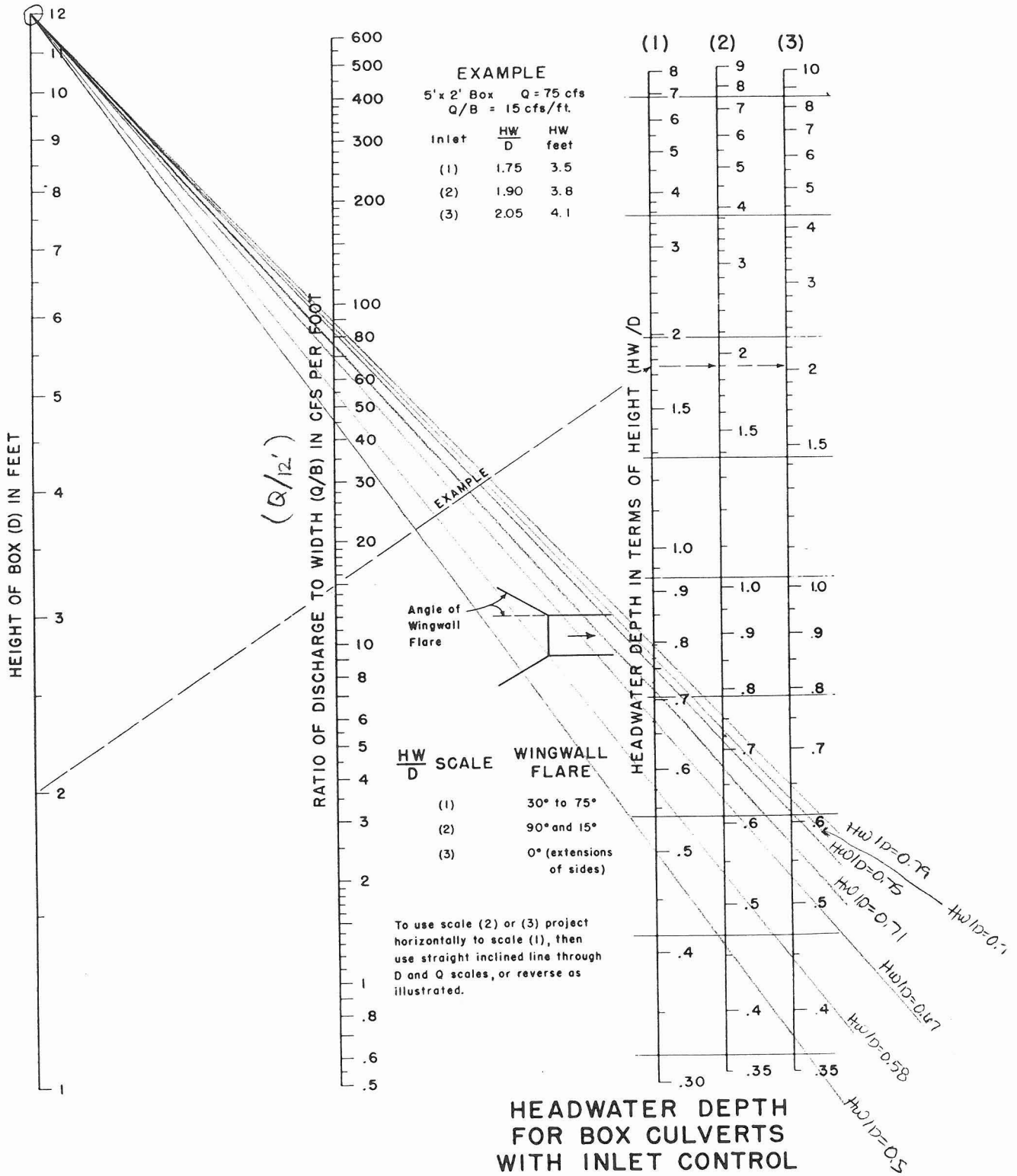
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #2 (Box Culvert A1)
(12' x 12' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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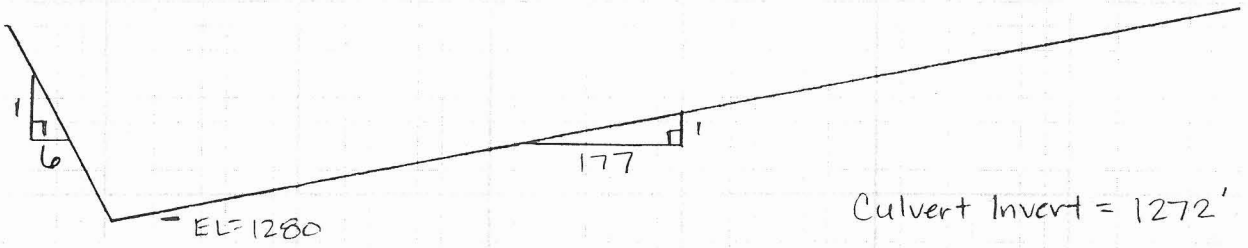
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1280')

Culvert #2 (Box culvert A1)
(12'x12' RCB)

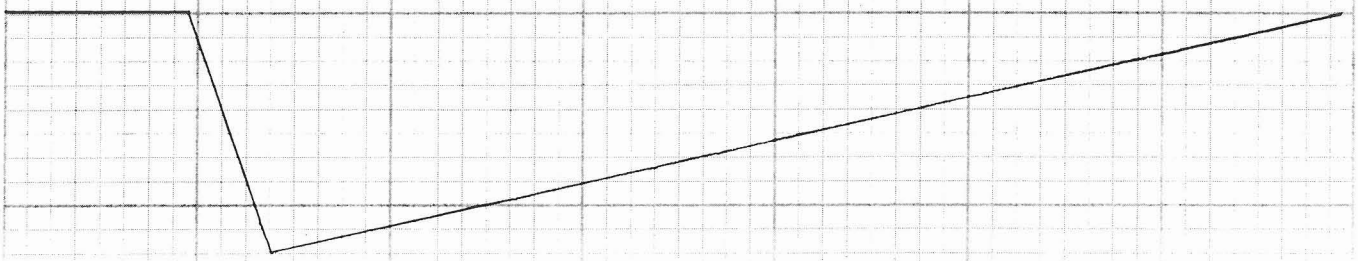


Culvert Invert = 1272'

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0051
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

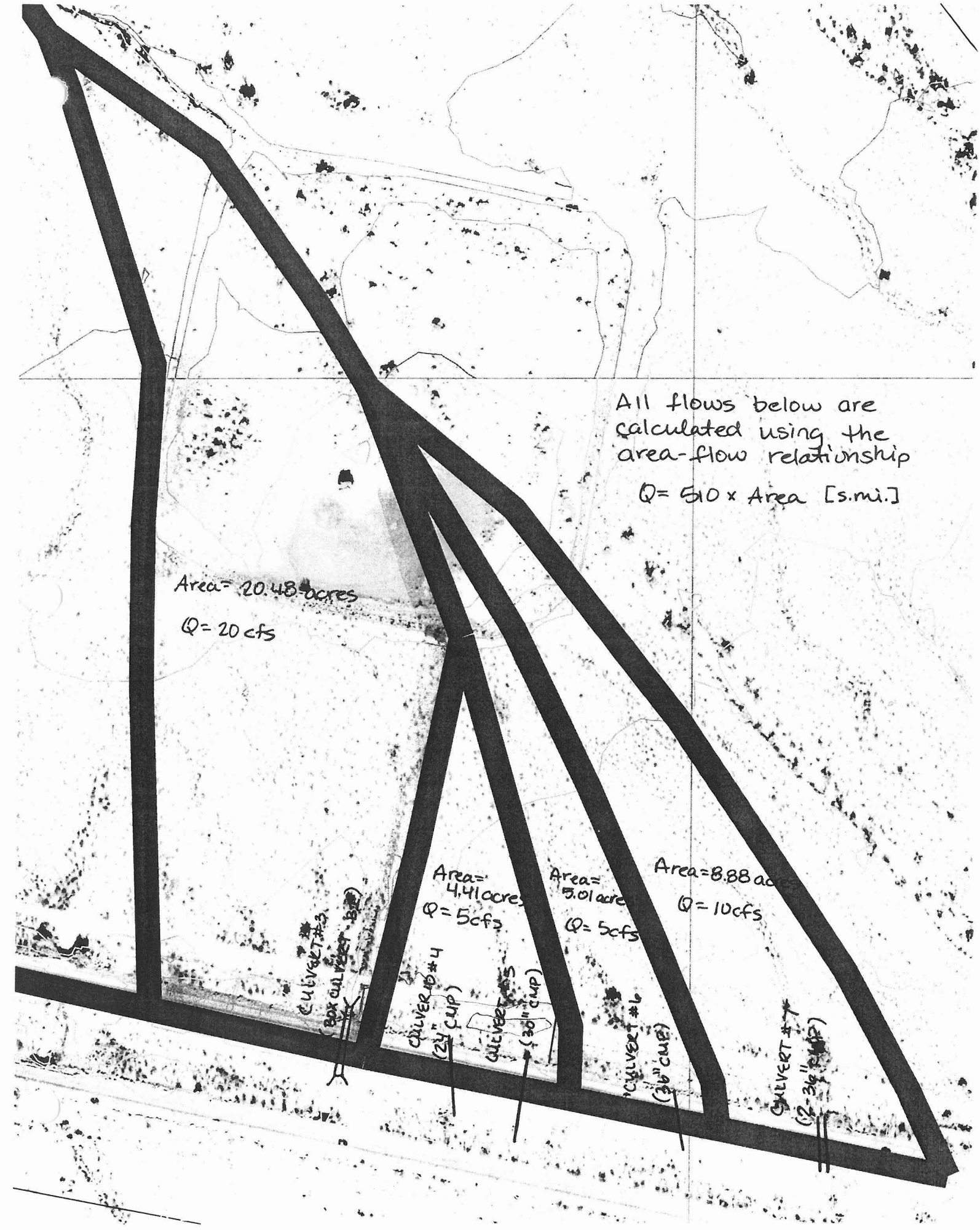
Weir Analysis (at EL >)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L+l}\right)$$


All flows below are calculated using the area-flow relationship
Q= 510 x Area [s.mi.]
Area= 20.48 acres
Q= 20 cfs
Area= 4.41 acres
Q= 5cfs
Area= 5.01 acres
Q= 5cfs
Area= 8.88 acres
Q= 10cfs
CULVERT #3 (BOX CULVERT - 8'x3')
CULVERT #4 (24" CMP)
CULVERT #5 (30" CMP)
CULVERT #6 (36" CMP)
CULVERT #7 (2-36" CMP)

Culvert #3
(10'x5' RCB)
Box Culvert Rt. 51
(7L=337 ≈ 340 ft

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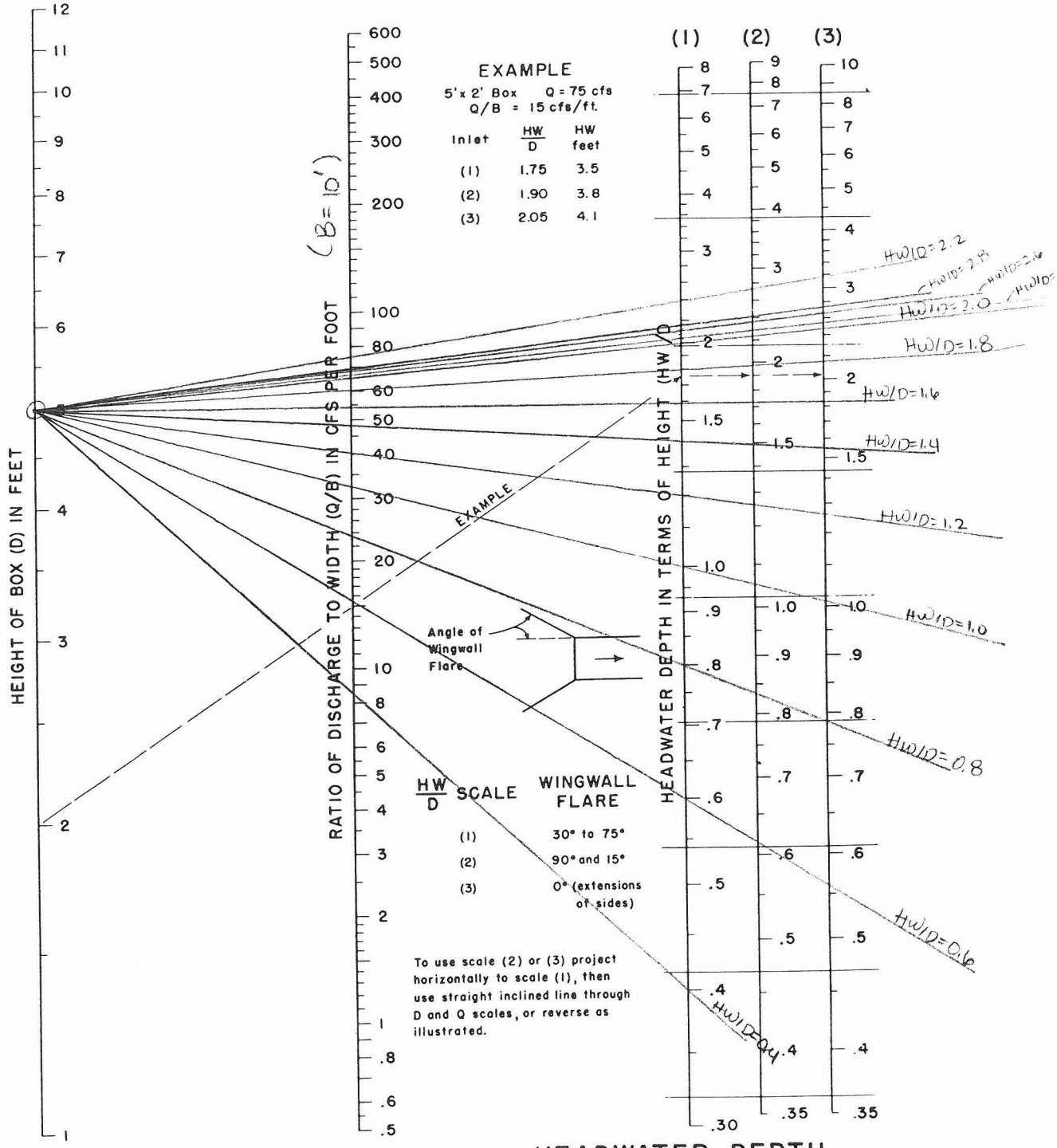
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #3 (Box Culvert B1)
(10'x5' RCB)

☐ **CHART 8**



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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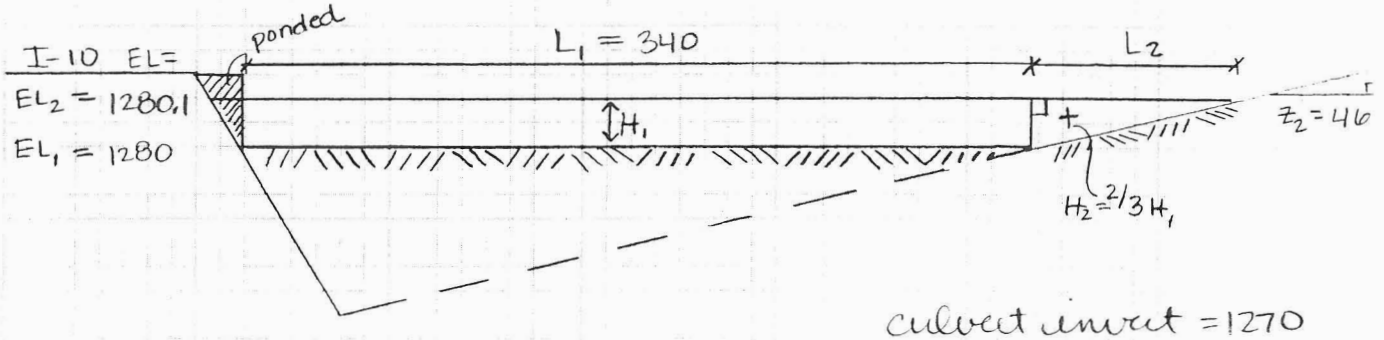
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1280)

Culvert #3
(Box Culvert B1)
(10'x5')



culvert invert = 1270

$H_1 = E_2 - E_1 = 1280 - 1280.1 = 0.10$ ft

$L_2 = H_1 z_2 = (0.10)(465) = 46.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(340)(0.10) + (46.5)(0.0667)}{(340 + 46.5)} =$

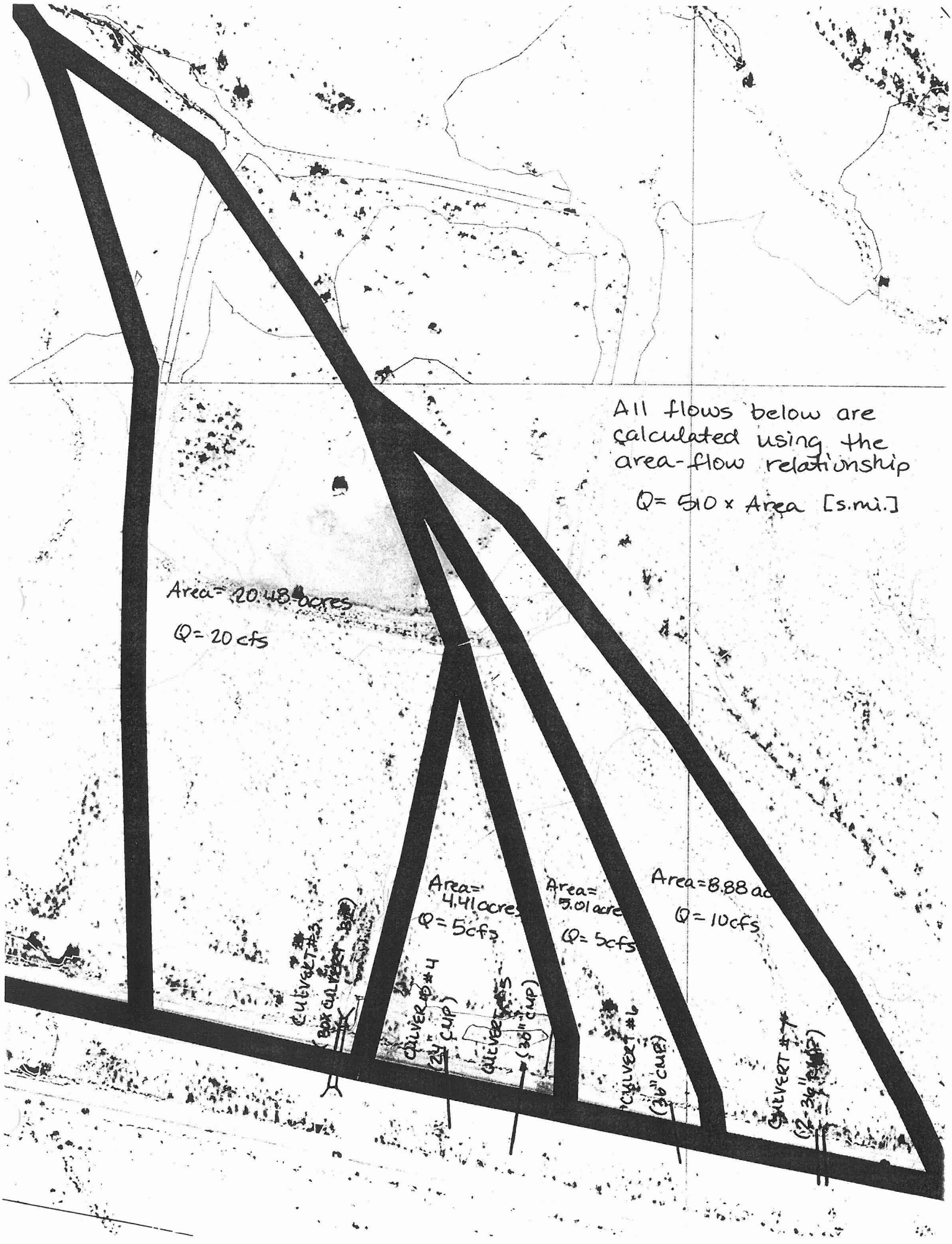
0.0

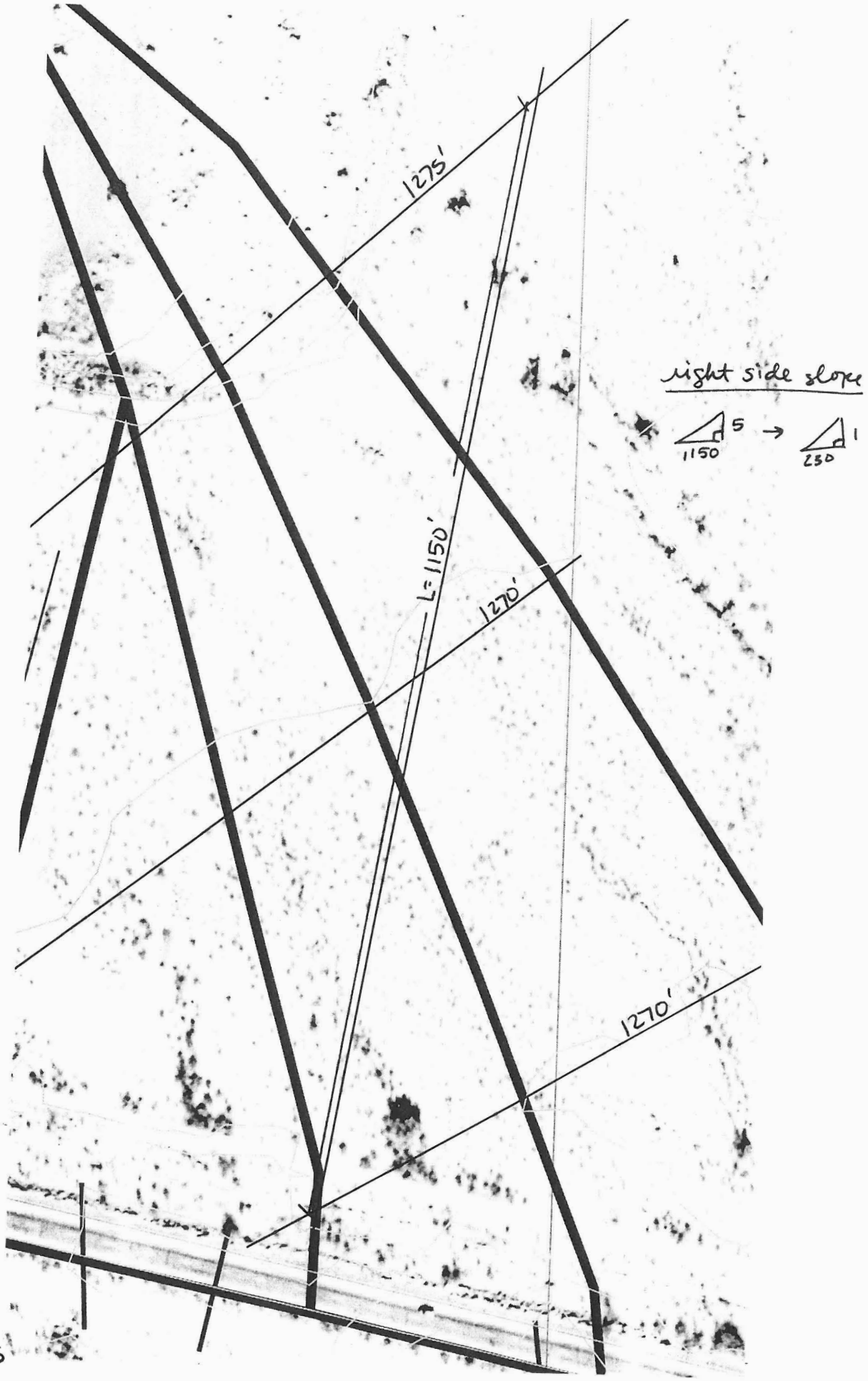
$L_T = L_1 + L_2 = 340 + 46.5 = 386.5$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (386.5)(0.096)^{1.5} = 31.04$


All flows below are calculated using the area-flow relationship
Q= 510 x Area [s.mi.]
Area= 20.48 acres
Q= 20 cfs
Area= 4.41 acres
Q= 5cfs
Area= 5.01 acre
Q= 5cfs
Area=8.88 ac
Q= 10cfs
CULVERT #3 (BOX CULVERT - 8'x8')
CULVERT #4 (24" CMP)
CULVERT #5 (36" CMP)
CULVERT #6 (36" CMP)
CULVERT #7 (2-36" CMP)


1275'
L=1150'
1270'
1270'
right side slope
5
1150
1
250
culvert 4+5

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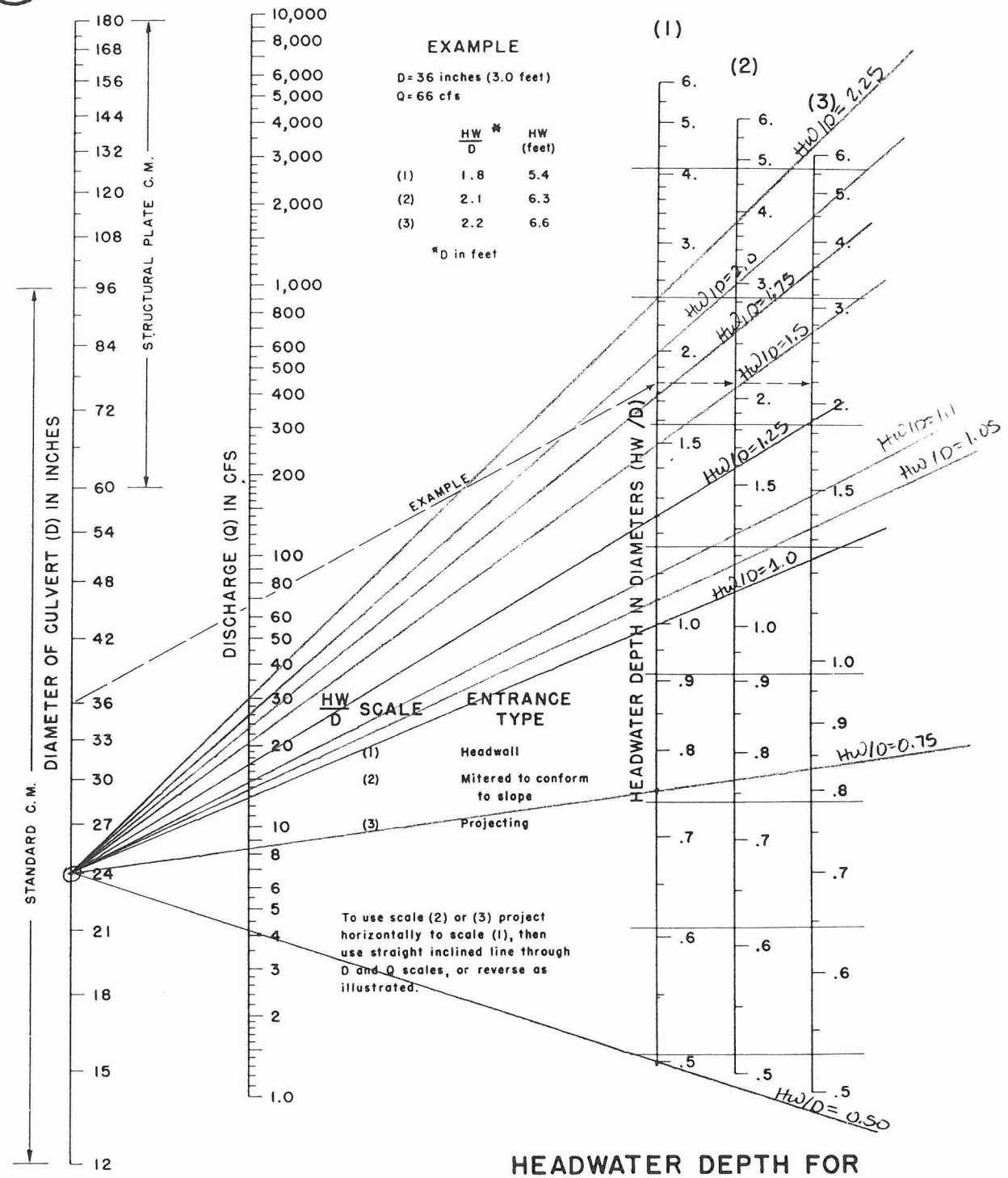
JOB NAME Polo Verde Zone A delination JOB NO. 310.019

Culvert 4 (24" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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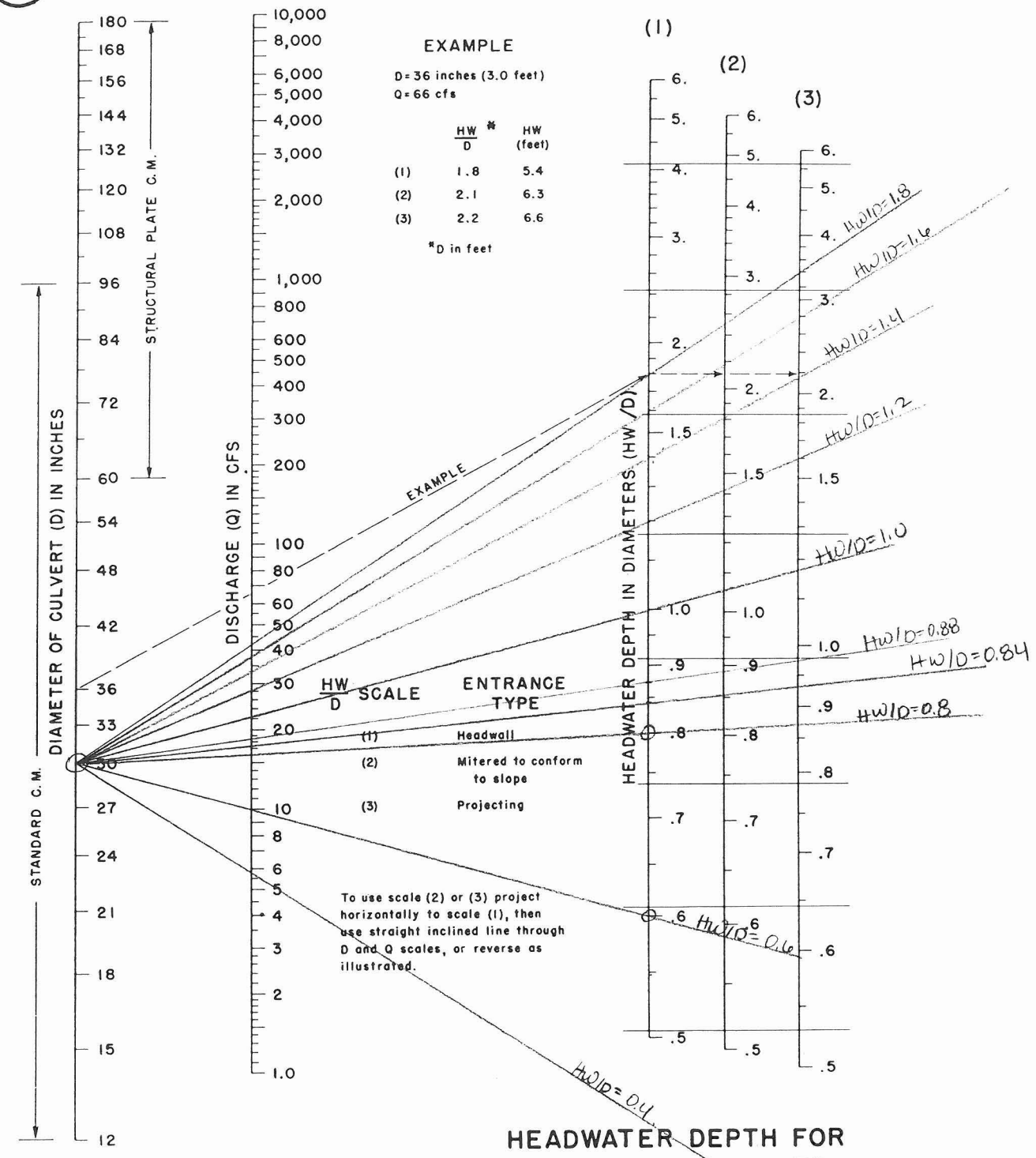
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Culvert 5 (30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	24" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
4 and 5	1-24" CMP	1274						**
	1-30" CMP	1275.5	1.5	0.60	10	0.75	8.2	18.2
		1276	2	0.80	16	1	13	29
		1276.5	2.5	1.00	22	1.25	17	39
		1277	3	1.20	28	1.5	20	48
		1277.5	3.5	1.40	34	1.75	23	57
		1278	4	1.60	38	2	26	64
		1278.5	4.5	1.80	43	2.25	30	73
		1279	5	2.00		2.5		0
		1279.5	5.5	2.20		2.75		
		1280	6	2.40		3		
		1280.5	6.5	2.60		3.25		
		1281	7	2.80		3.5		
		1276.1	2.1	0.84	17.2	1.05	14	31.2
		1276.2	2.2	0.88	18.5	1.10	15	33.5

These flows were added to the main spreadsheet

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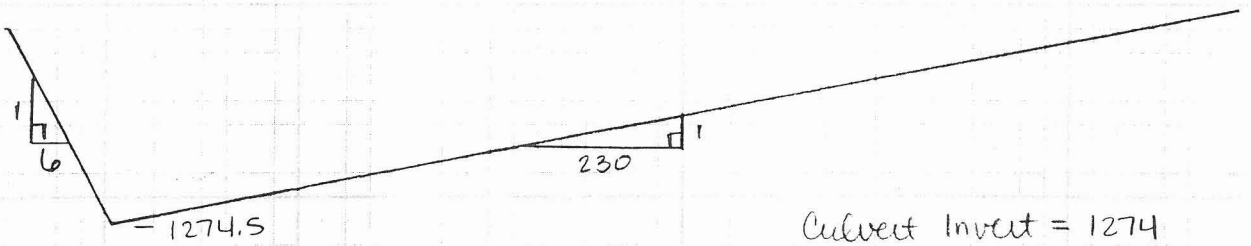
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1274.5) Culvert #4 #5 (CMP24") (CMP30")



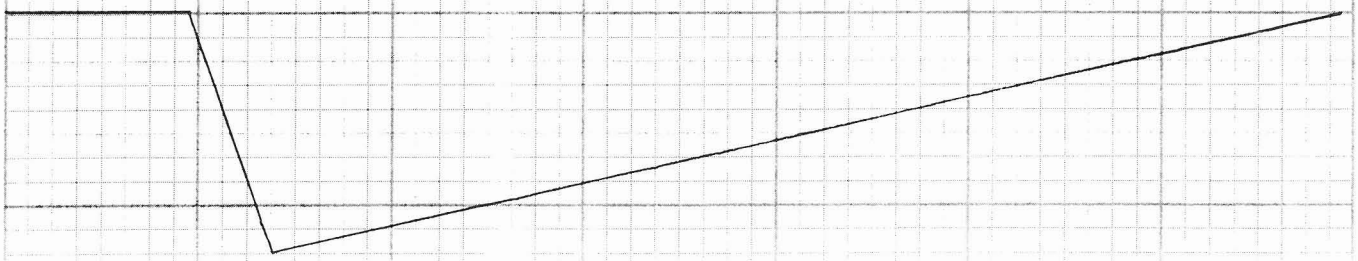
Culvert Invert = 1274

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00595
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

* Assumed culverts roll at same EL and analyzed side by side.

Weir Analysis (at EL >)

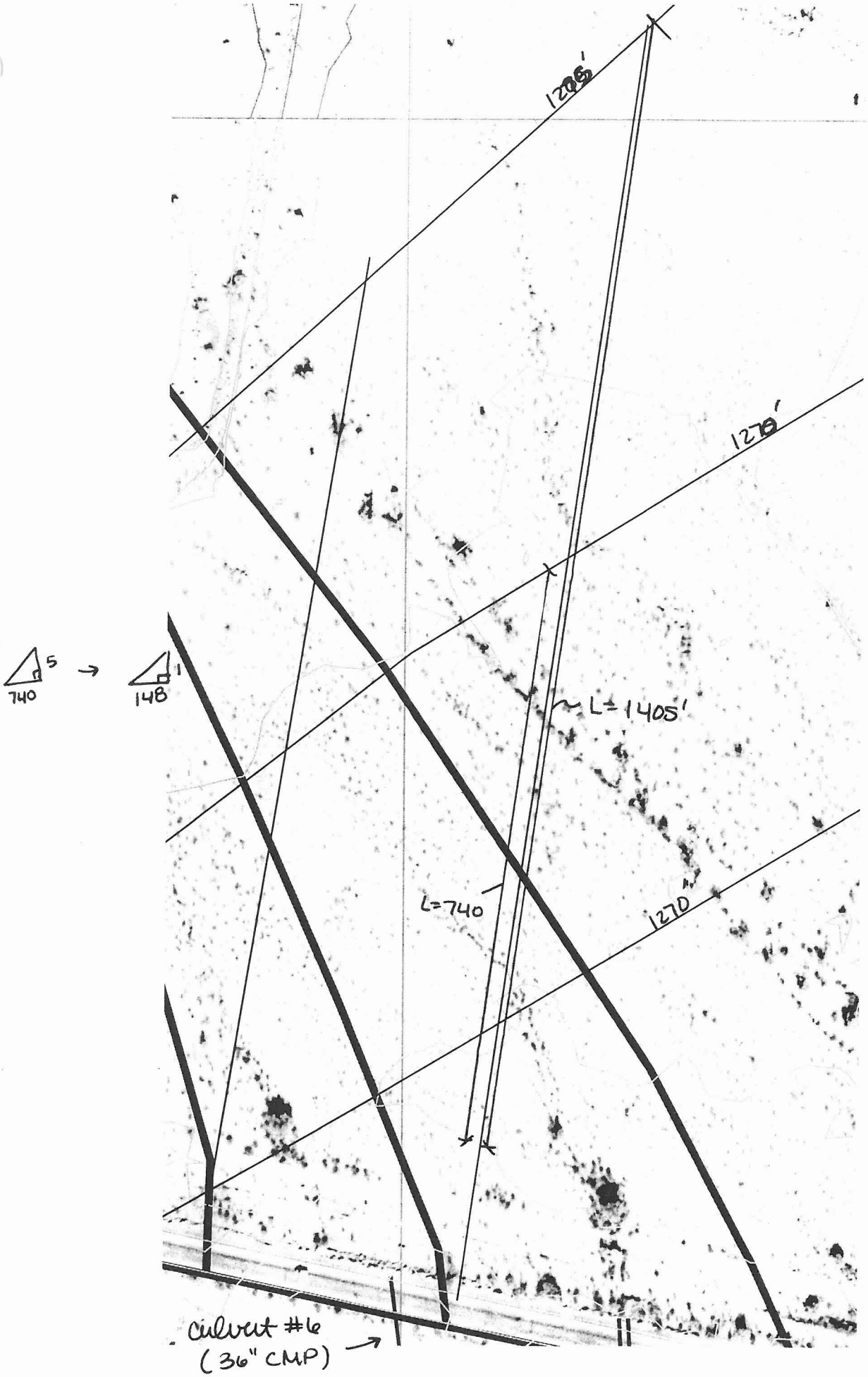


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L + l}\right)$$

All flows below are calculated using the area-flow relationship
Q= 510 x Area [s.mi.]
Area= 20.48 acres
Q= 20 cfs
Area= 4.41 acres
Q= 5cfs
Area= 5.01 acres
Q= 5cfs
Area= 8.88 ac
Q= 10cfs
CULVERT #3 (8' BOX CULVERT - BOX)
CULVERT #4 (24" CMP)
CULVERT #5 (30" CMP)
CULVERT #6 (36" CMP)
CULVERT #7 (2-36" CMP)


1295'
1270'
1270'
~L=1405'
L=740
5
740
1
148
culvert #6
(36" CMP)

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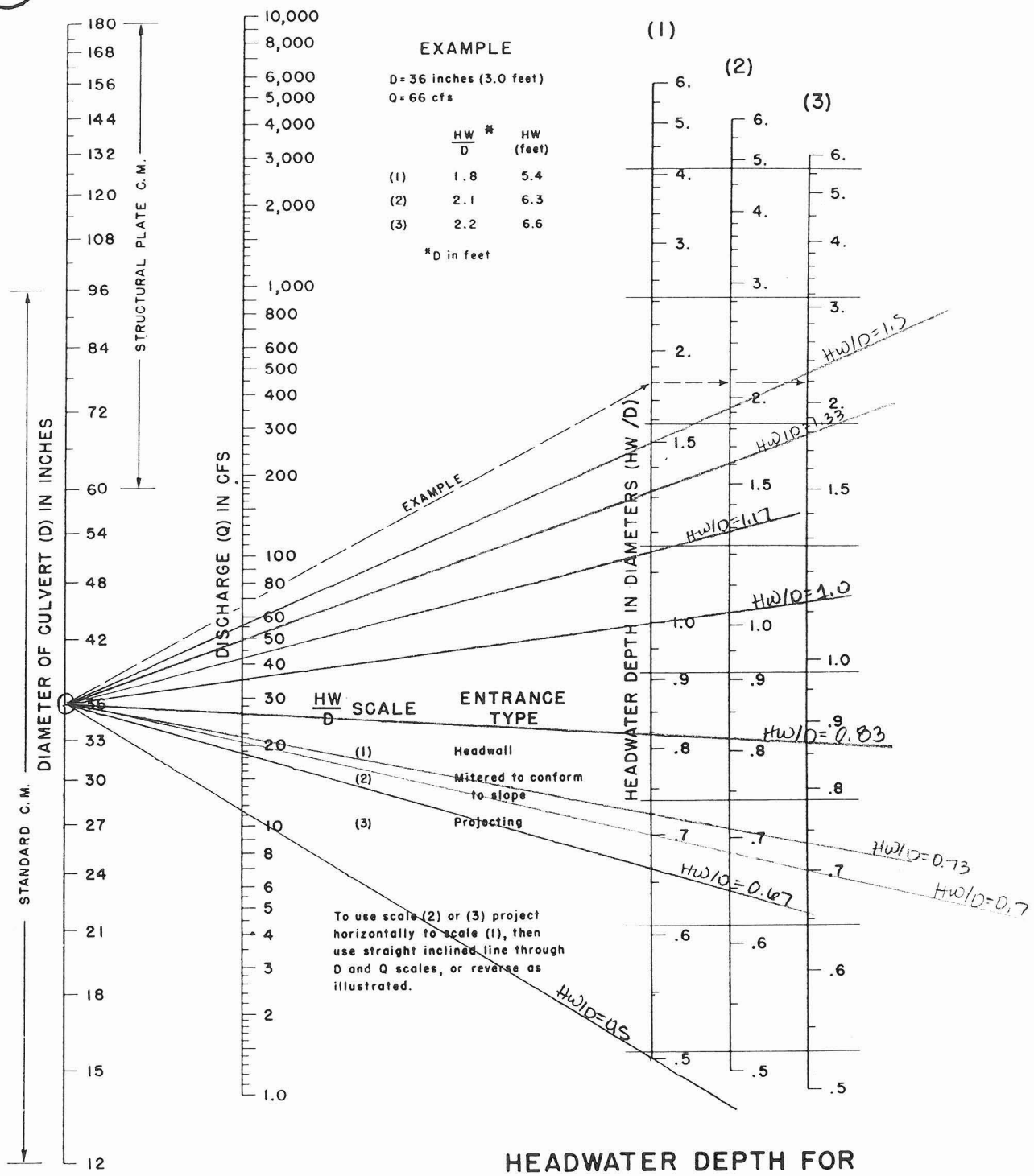
JOB NAME Palo Verde Zone A Delineation — Culvert #6 (36" CMP)

JOB NO. 310.019

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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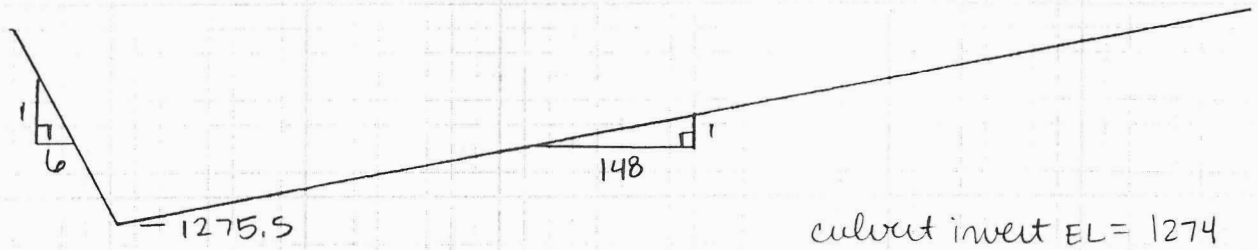
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #6 (36" CMP)

Manning's Equ. (at EL > 1275.5)

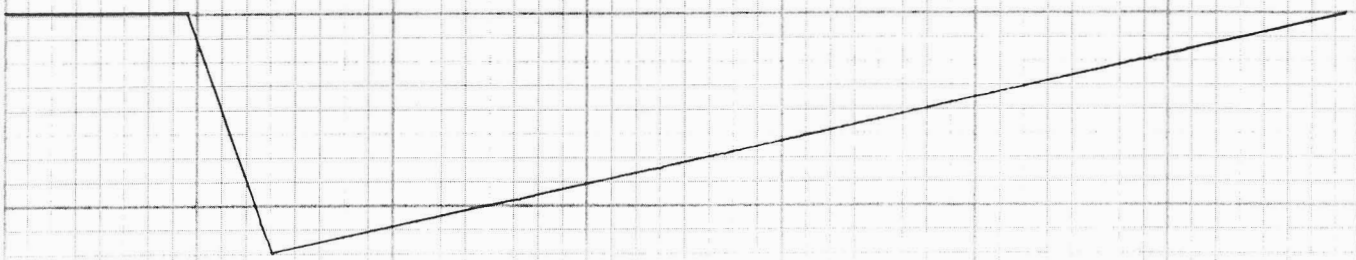


culvert invert EL = 1274

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00595
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

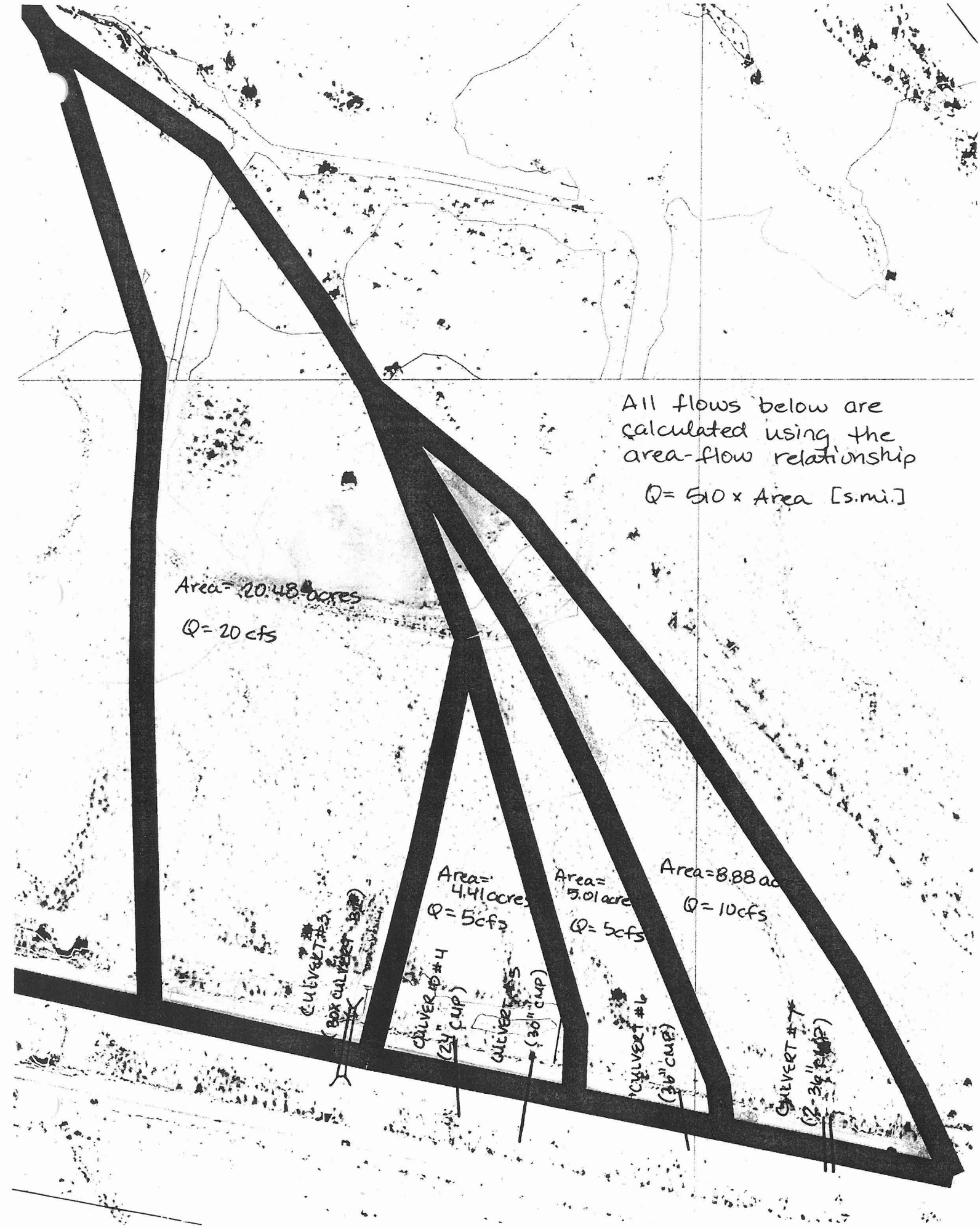
Weir Analysis (at EL >)

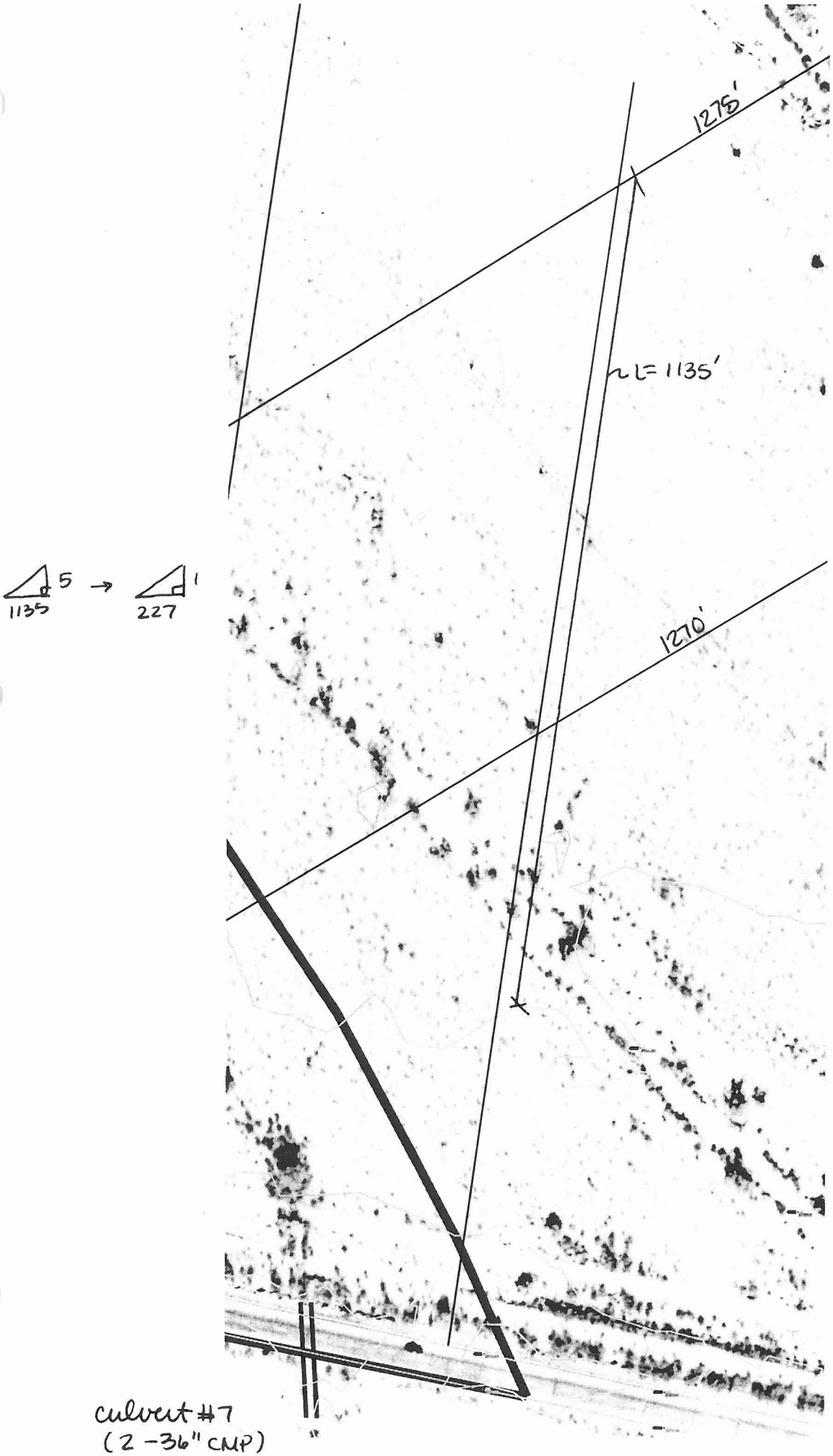


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L + l}\right)$$


All flows below are calculated using the area-flow relationship
Q= 510 x Area [s.mi.]
Area= 20.48 acres
Q= 20 cfs
Area= 4.41 acres
Q= 5cfs
Area= 5.01 acres
Q= 5cfs
Area=8.88 acres
Q= 10cfs
CULVERT #3 (BOX CULVERT - 8')
CULVERT #4 (24" CMP)
CULVERT #5 (30" CMP)
CULVERT #6 (36" CMP)
CULVERT #7 (2-36" CMP)



culvert #7
(2 -36" CMP)

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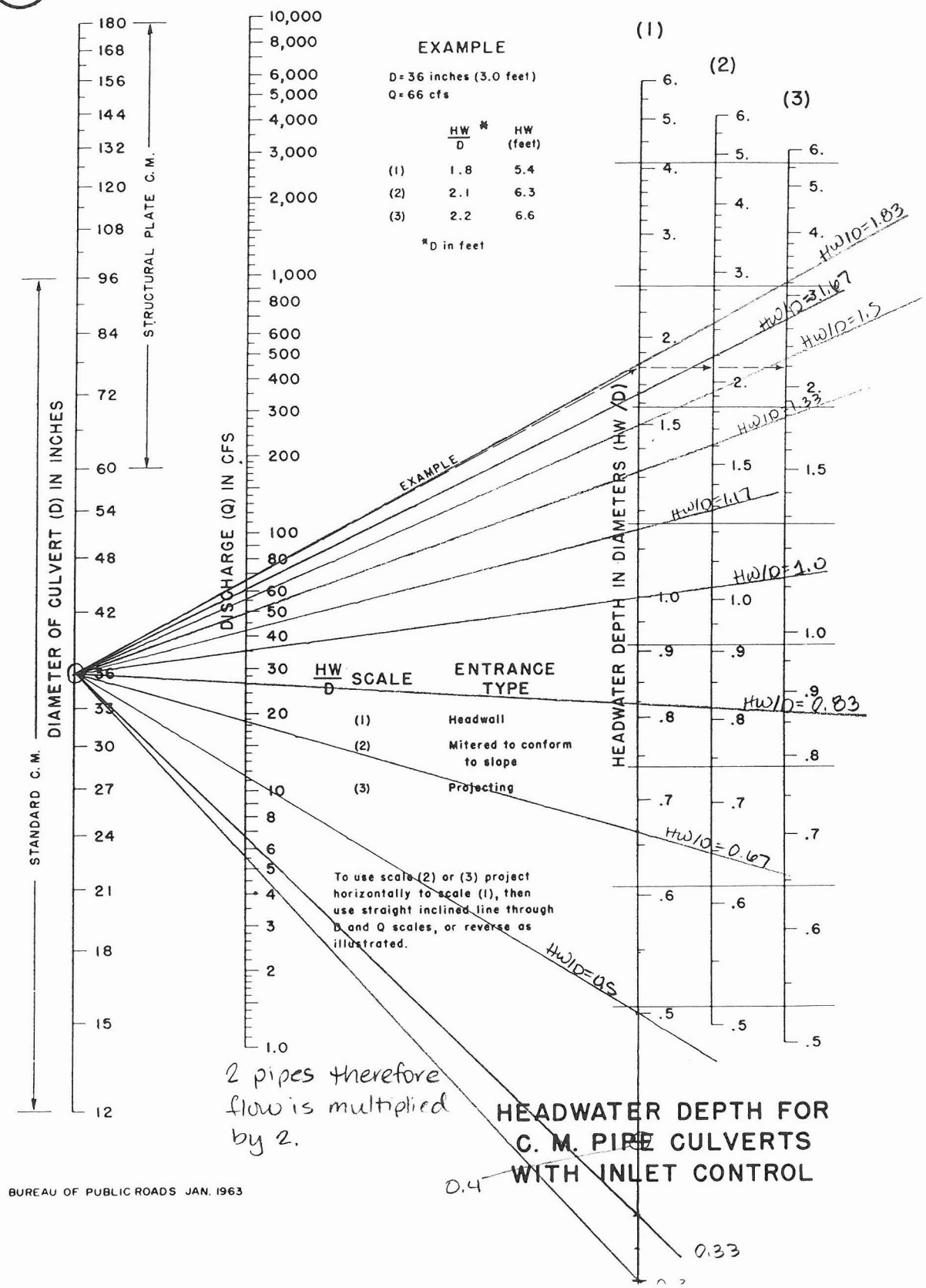
JOB NAME Palo Verde Zone A Delineation — Culvert #7 (2-36" CMP)

JOB NO. 310.019

CHART 2



2 pipes therefore flow is multiplied by 2.

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

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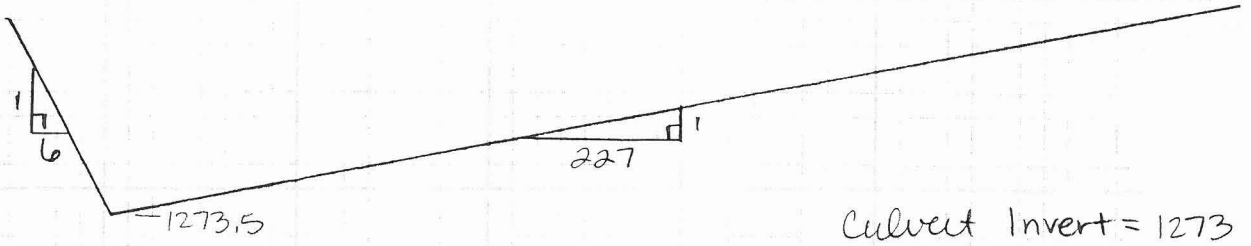
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #7 (2-36" CMP)

Manning's Equ. (at EL > 1273.5)

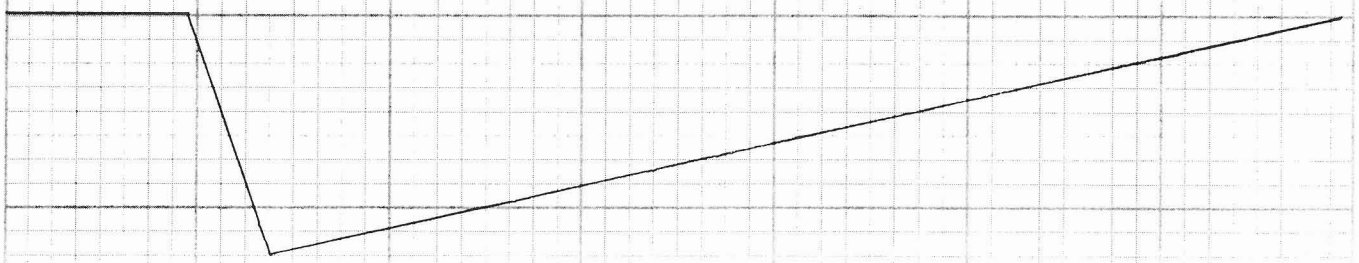


Culvert Invert = 1273

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00595
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

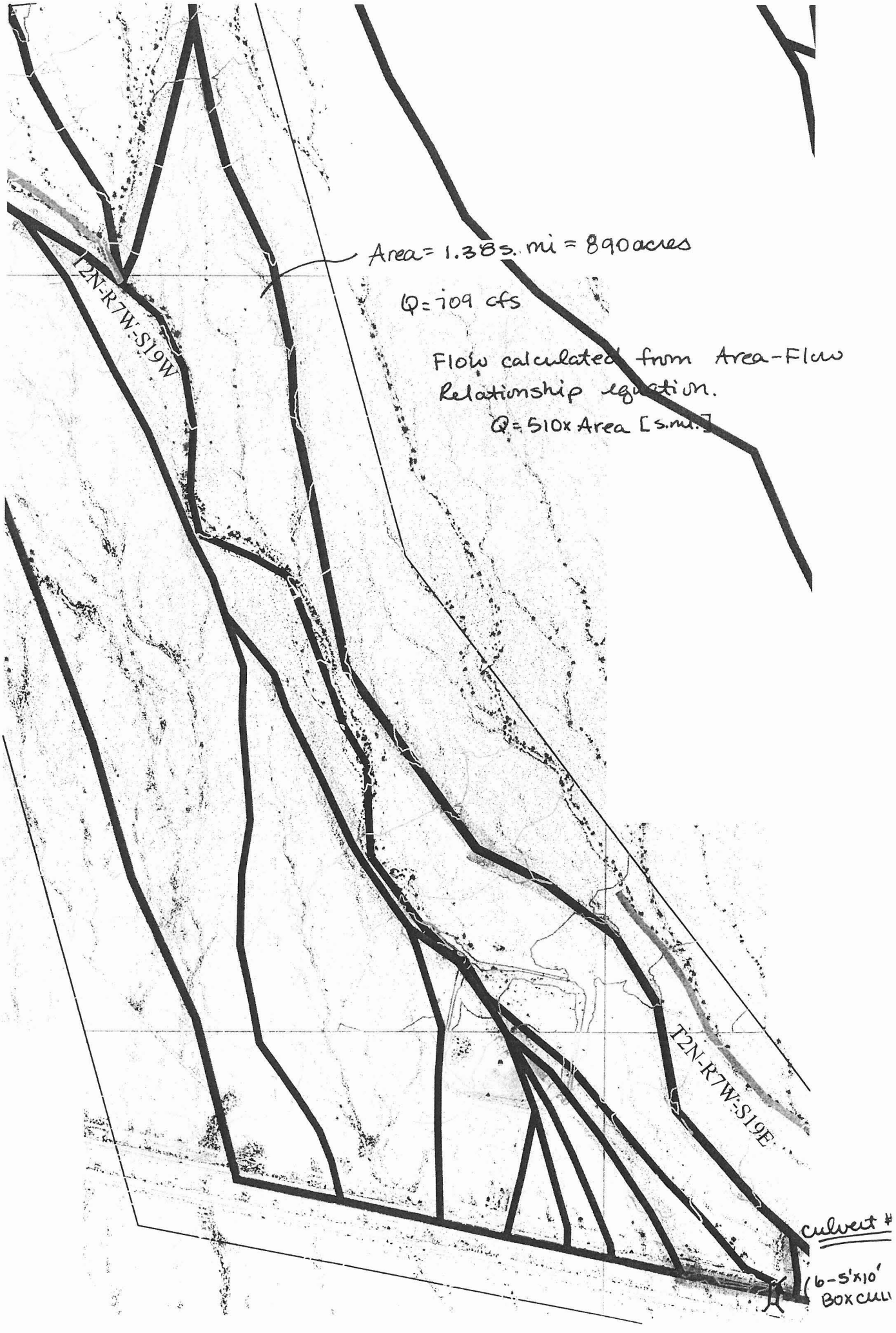
Weir Analysis (at EL >)

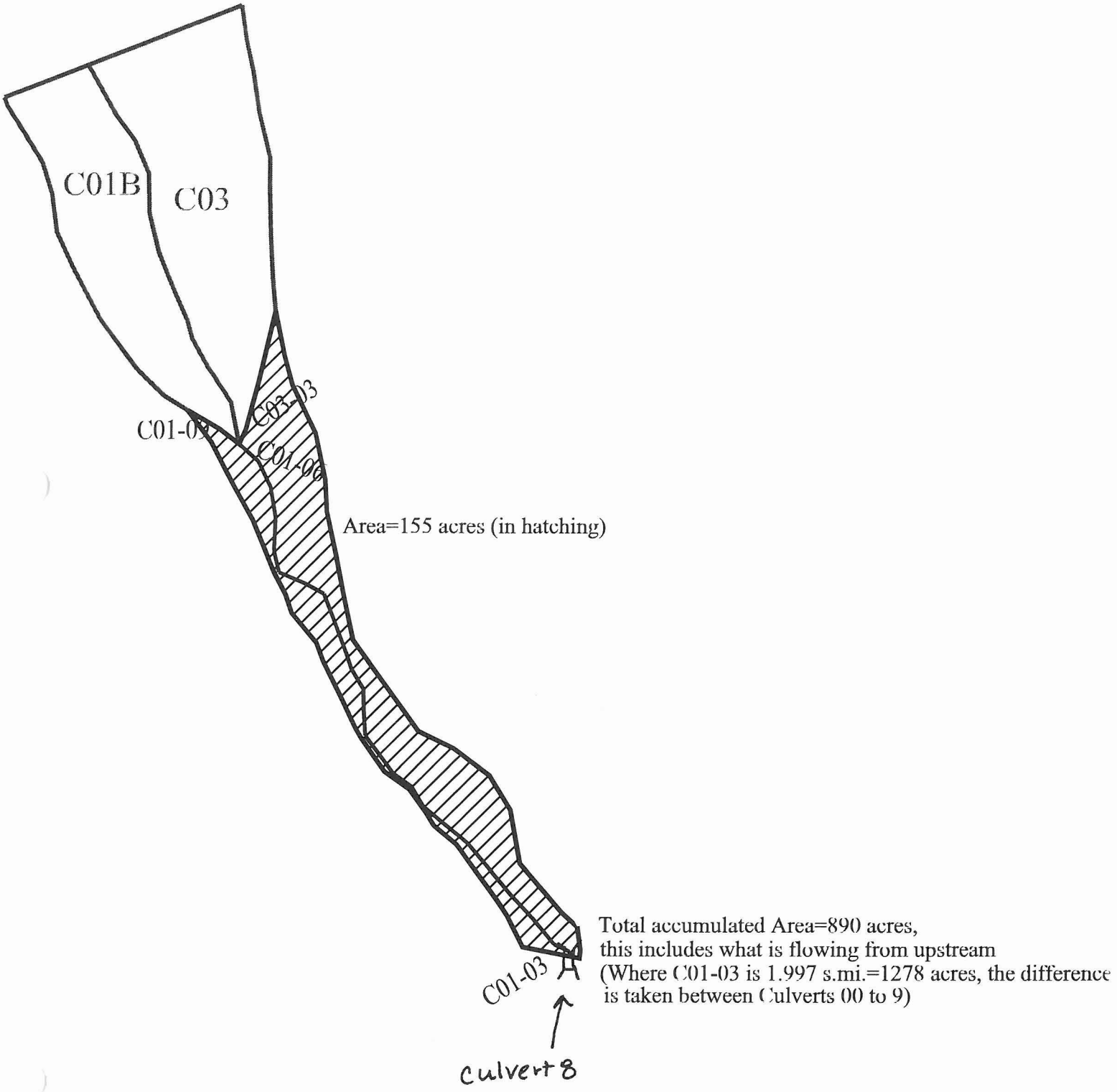


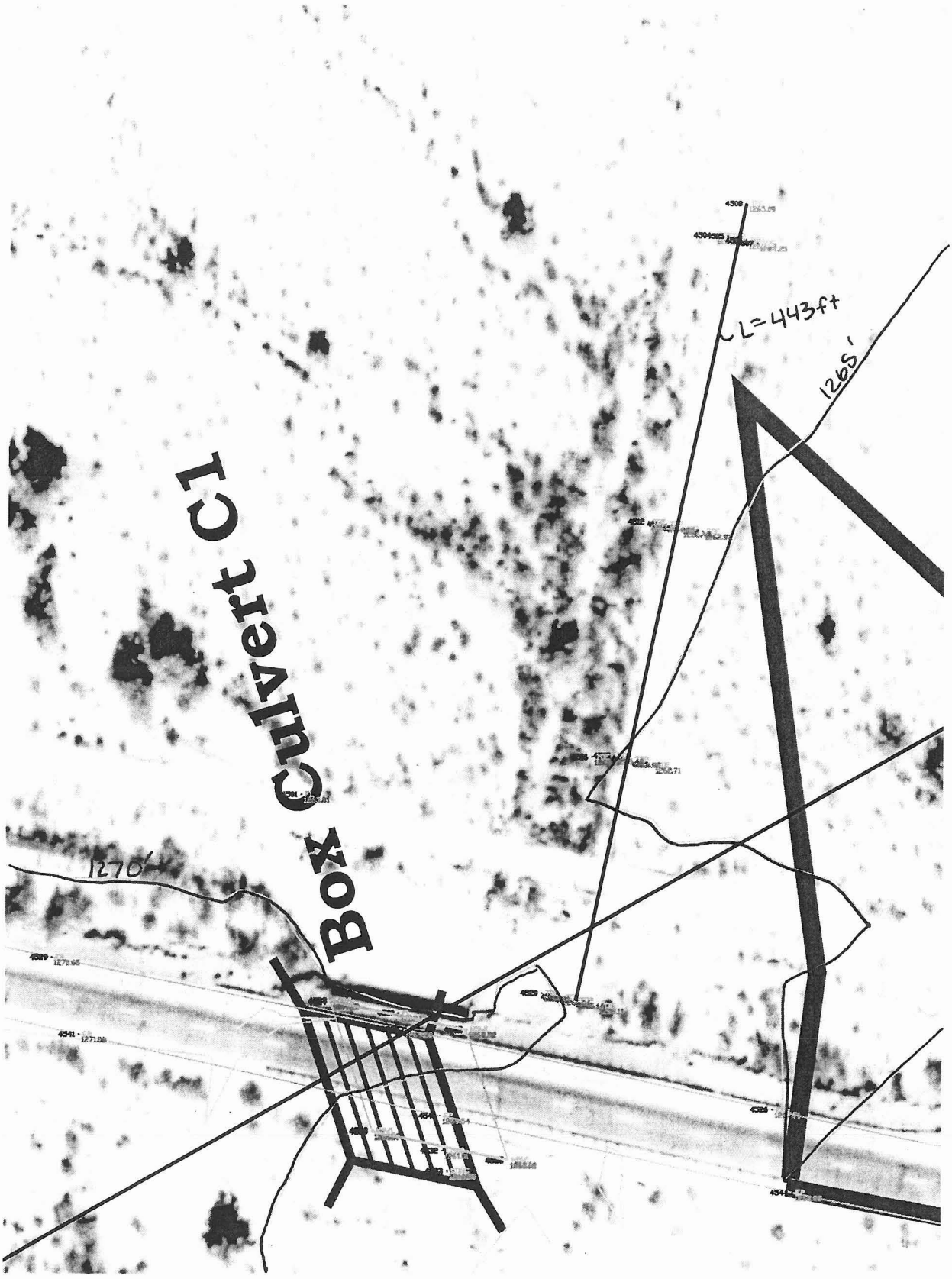
$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$


Area = 1.38 s. mi = 890 acres
Q = 709 cfs
Flow calculated from Area-Flow Relationship equation.
Q = 510 x Area [s.mi.]
T2N-R7W-S19W
T2N-R7W-S19E
culvert #
(6-5'x10' BOX CULV


C01B
C03
C03-03
C01-03
C01-06
Area=155 acres (in hatching)
Total accumulated Area=890 acres,
this includes what is flowing from upstream
(Where C01-03 is 1.997 s.mi.=1278 acres, the difference
is taken between Culverts 00 to 9)
C01-03
Culvert 8



Culvert #8
(6-5'x10' RCB)

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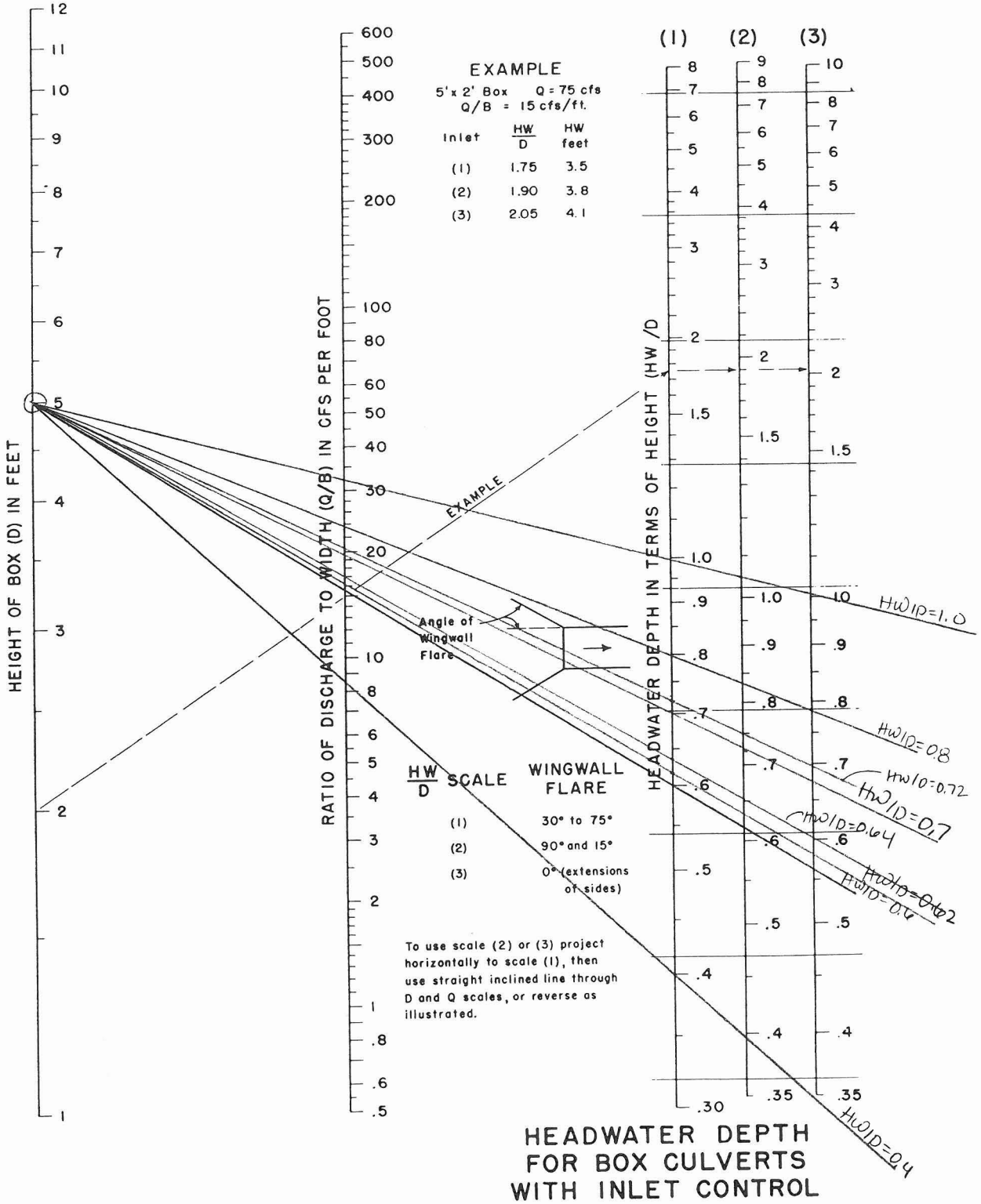
JOB NAME Palo Verde Zone A Delineation — JOB NO. 310.019

Culvert #8 (6-5'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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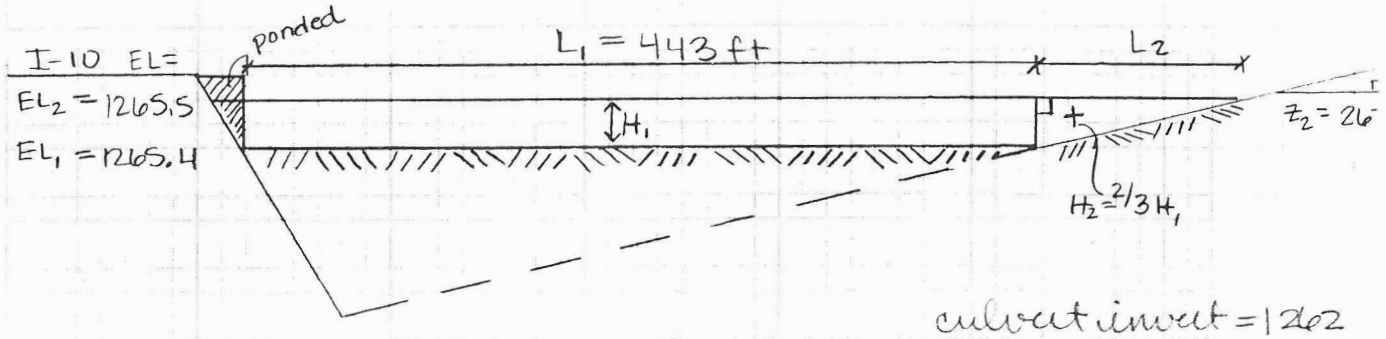
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1265.4) culvert #8 (6-5'x10



culvert invert = 1262

$H_1 = E_2 - E_1 = 1265.5 - 1265.4 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(26.7) = 26.7$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

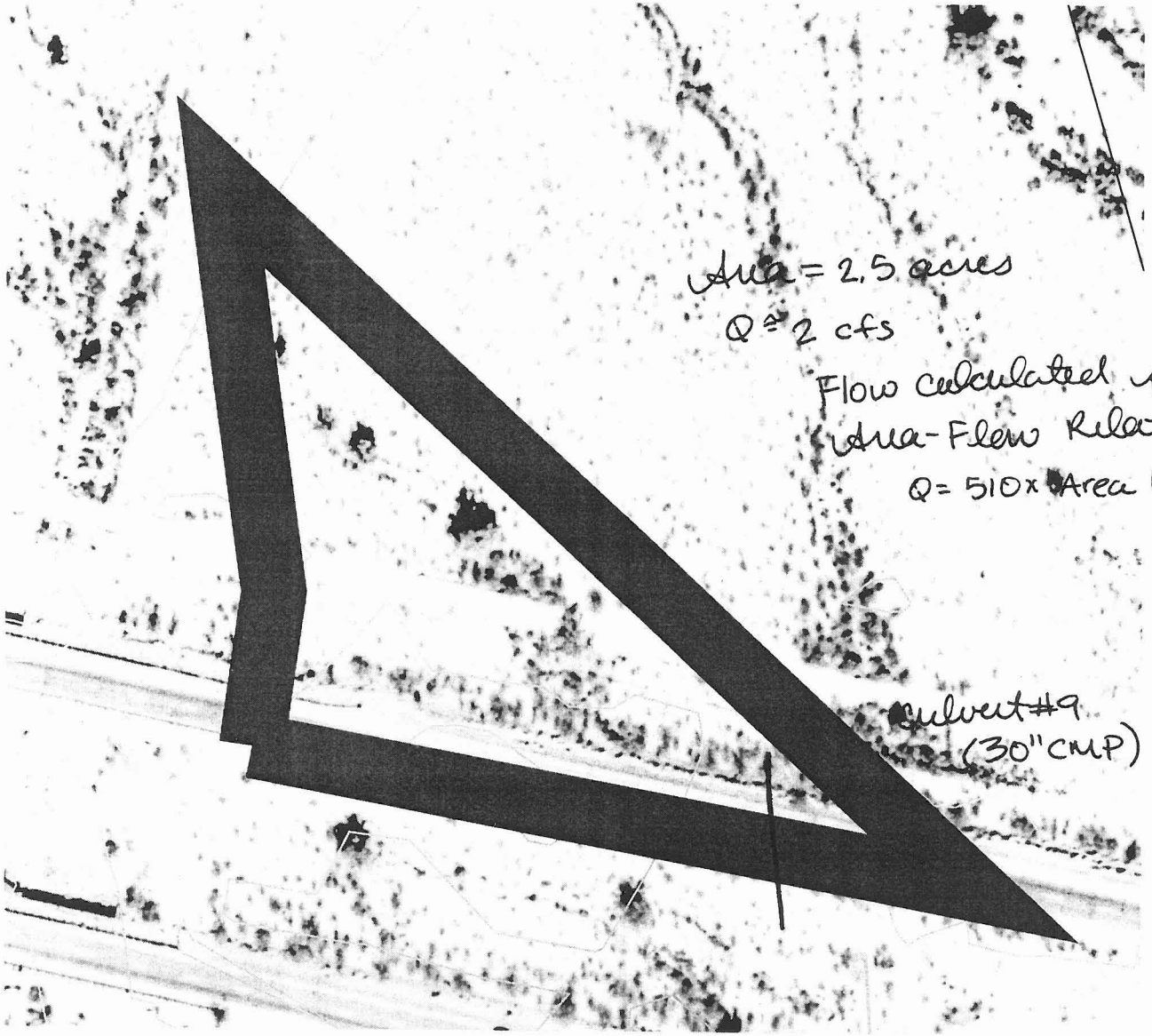
Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(443)(0.10) + (26.7)(0.0667)}{443 + 26.7} = 0.098$

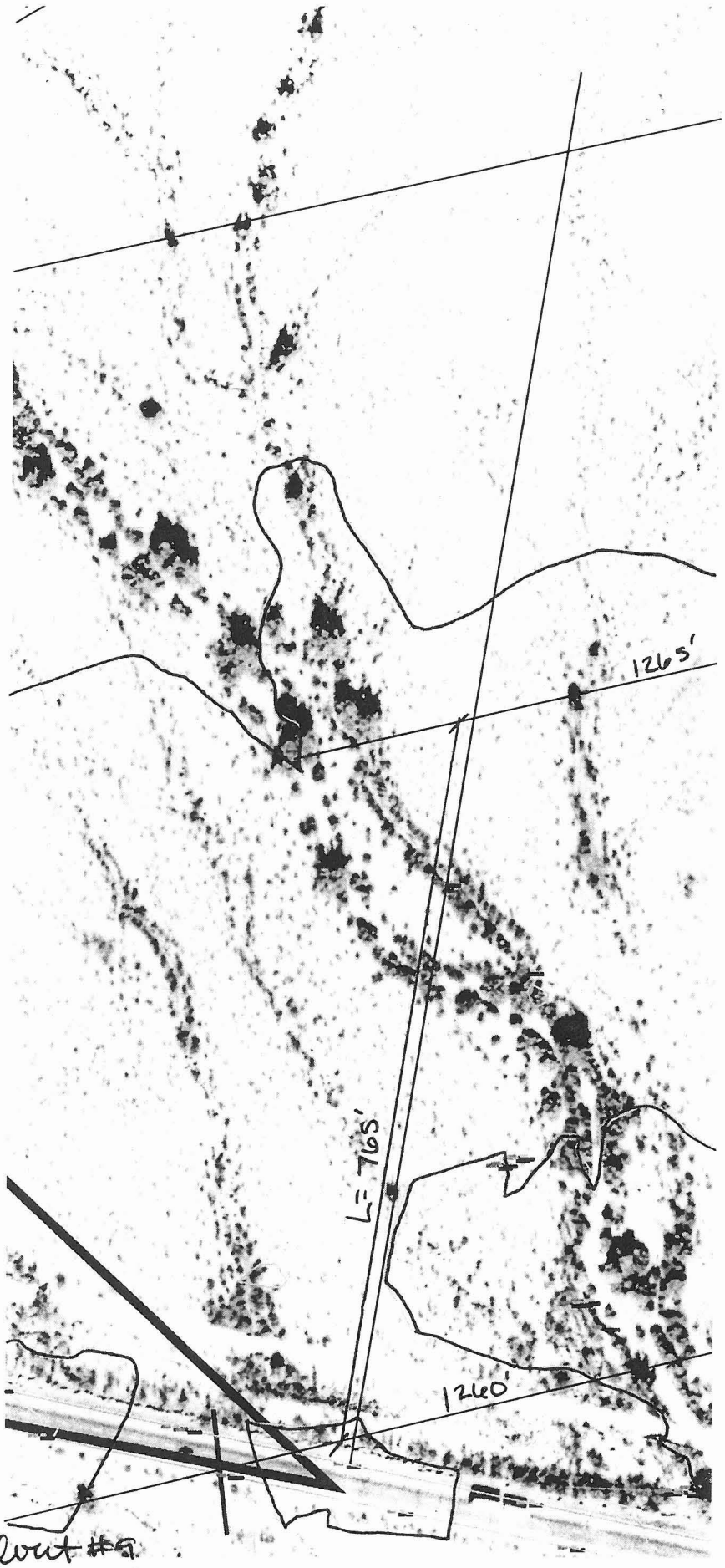
$L_T = L_1 + L_2 = 469.7$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (469.7)(0.0981)^{1.5} = 38.966$ cfs


Area = 2.5 acres
Q ≈ 2 cfs
Flow calculated from
Area-Flow Relationship
Q = 510 x Area [s.mi.]
Culvert #9
(30" CMP)



5 → 1
765 153

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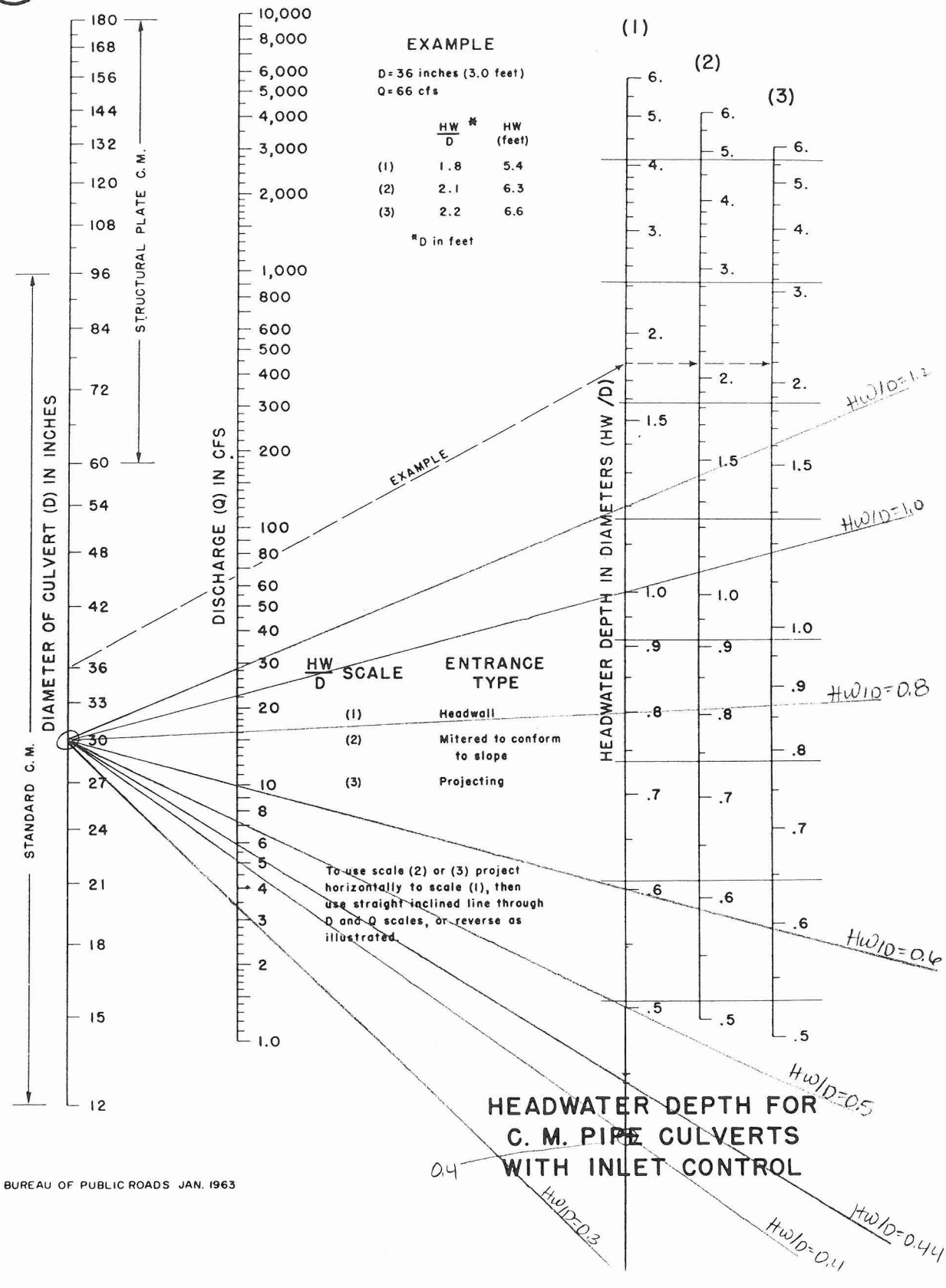
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #9 (30" CMP)

CHART 2



BUREAU OF PUBLIC ROADS JAN. 1963

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

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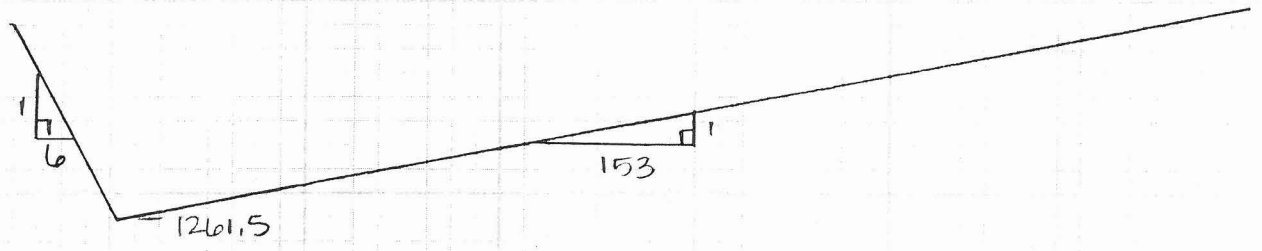
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1261.5)

Culvert #9 (30" CMP)



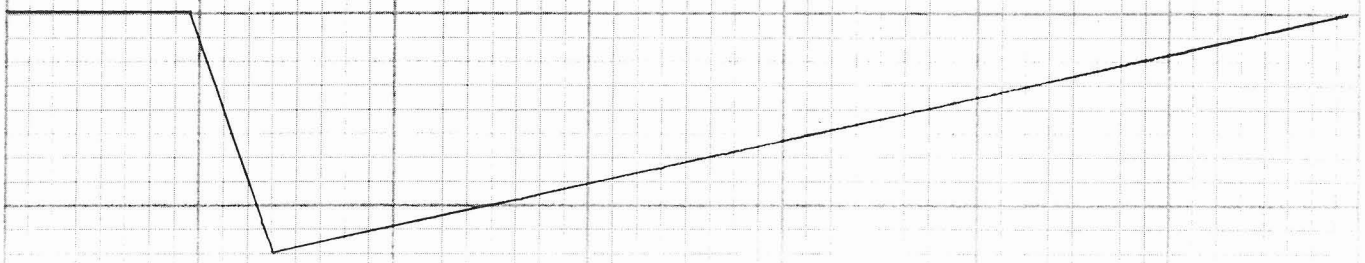
$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

Culvert Invert EL = 1261

where $n = 0.065$
S = downstream slope = 0.00350
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

* Assumed all flow went thru culvert since there is only 2cfs flood

Weir Analysis (at EL >)

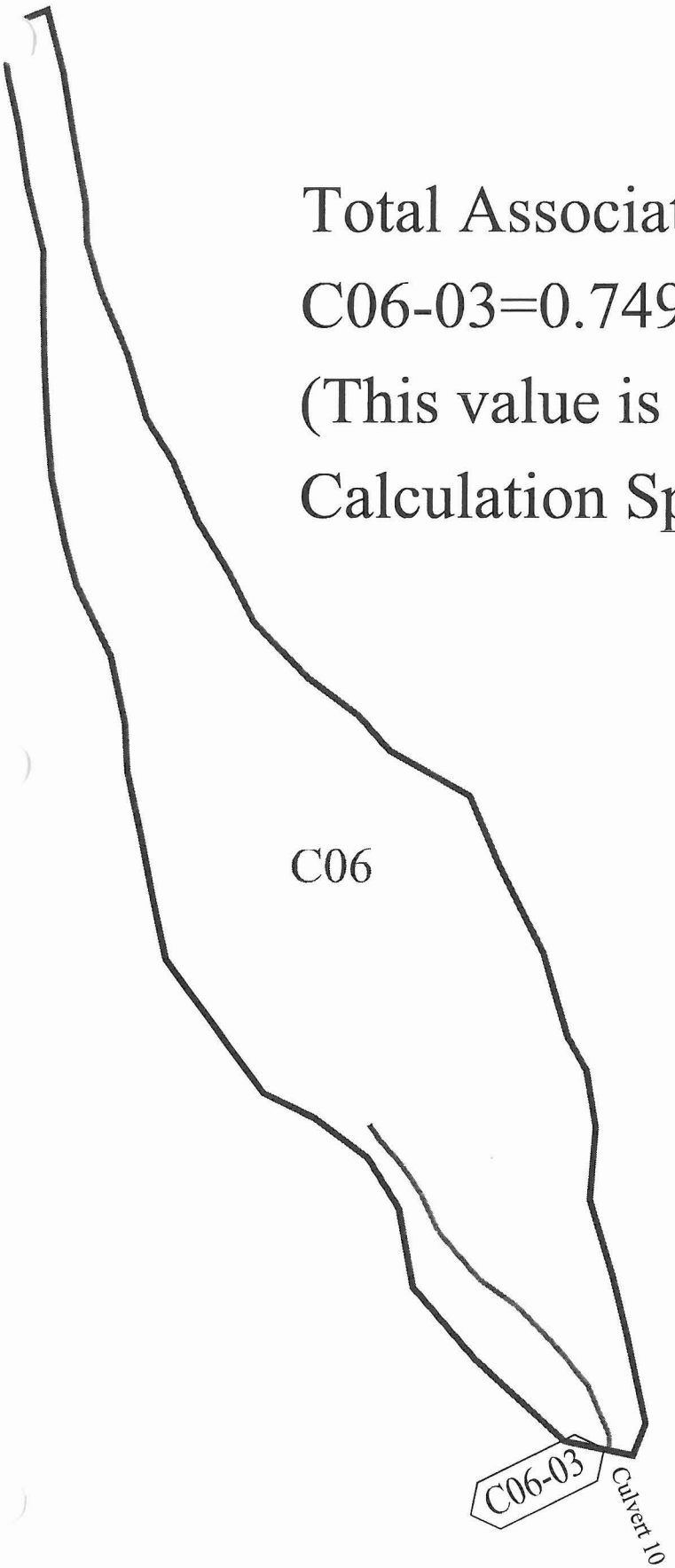


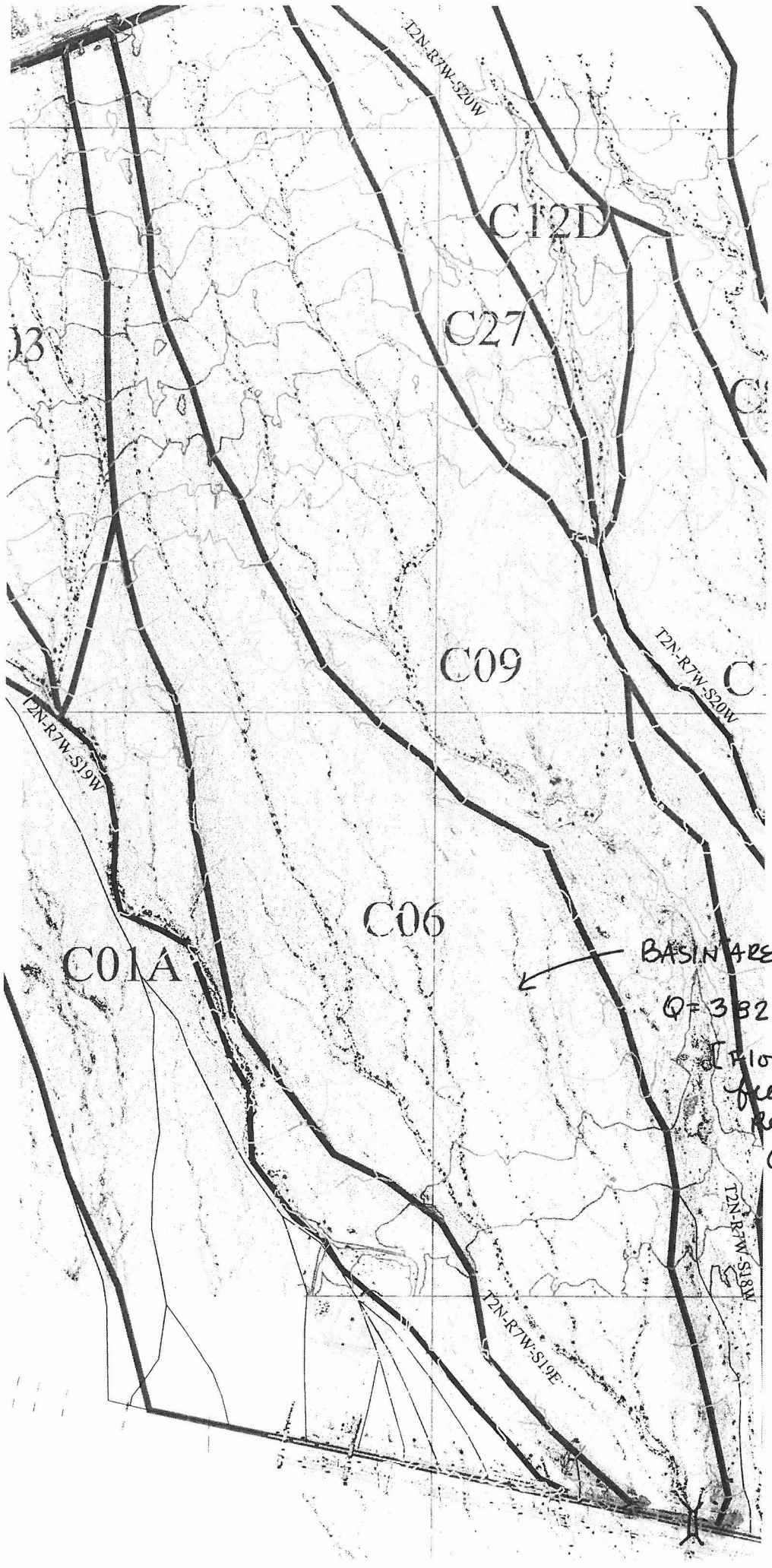
$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L + \ell}\right)$$

Total Associated Area to
C06-03=0.749 s.mi.=479 acres
(This value is also shown on the Flow Calculation Spreadsheet)




T2N-R7W-S20W
C12D
C27
C09
C06
C01A
T2N-R7W-S19W
T2N-R7W-S18W
T2N-R7W-S19E
BASIN AREA$_{C06}$ = 479 acre
Q = 3132 cfs
Flow calculated from Area-Flow Relationship
Q = 510 x Area
Culvert #10
(Box culvert 1
(2-6'x10' RCB)

Culvert #10 (1A)
(2-6'x10' RCB)

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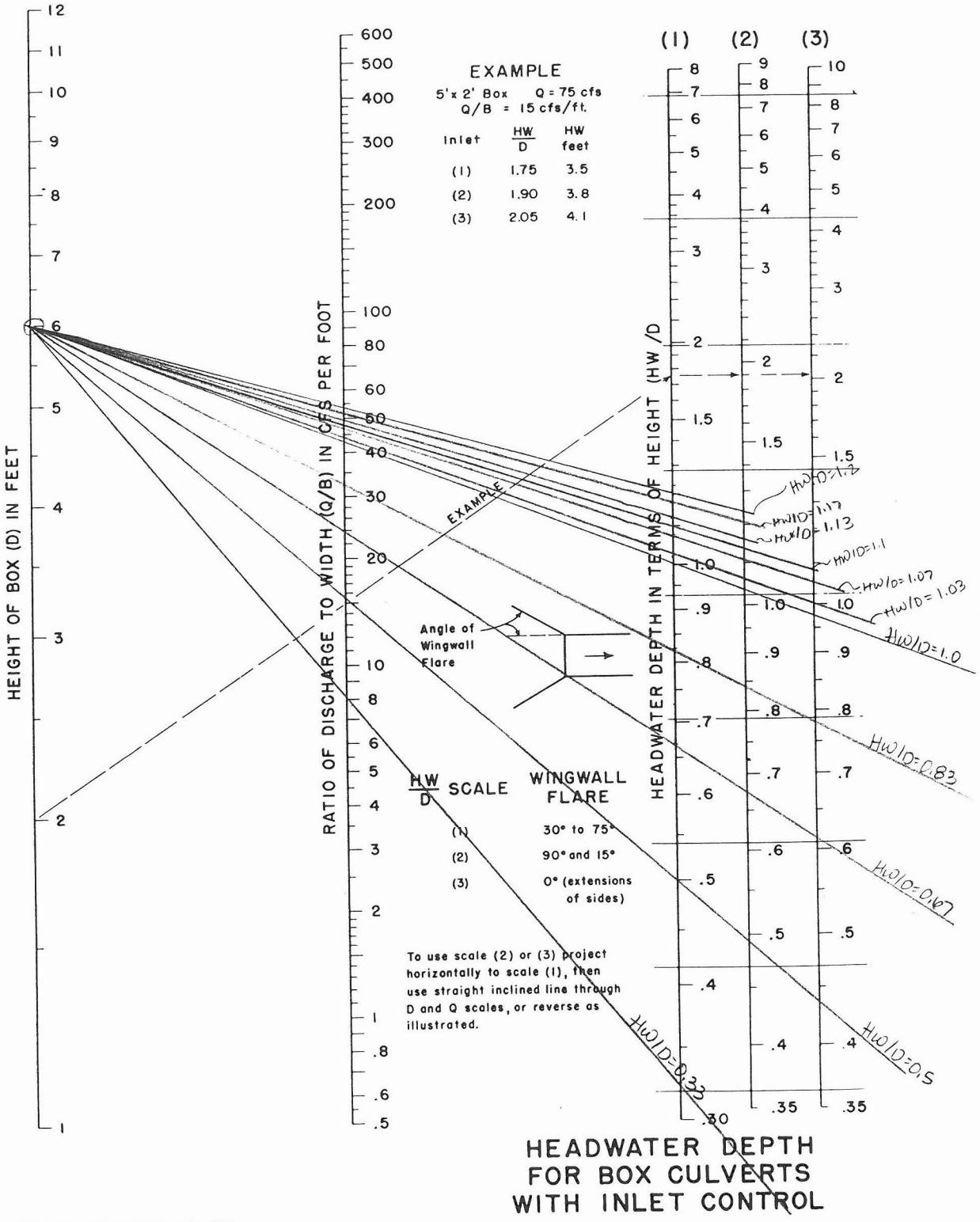
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #10 (2-6x10' RCB)
(Box Culvert 1A)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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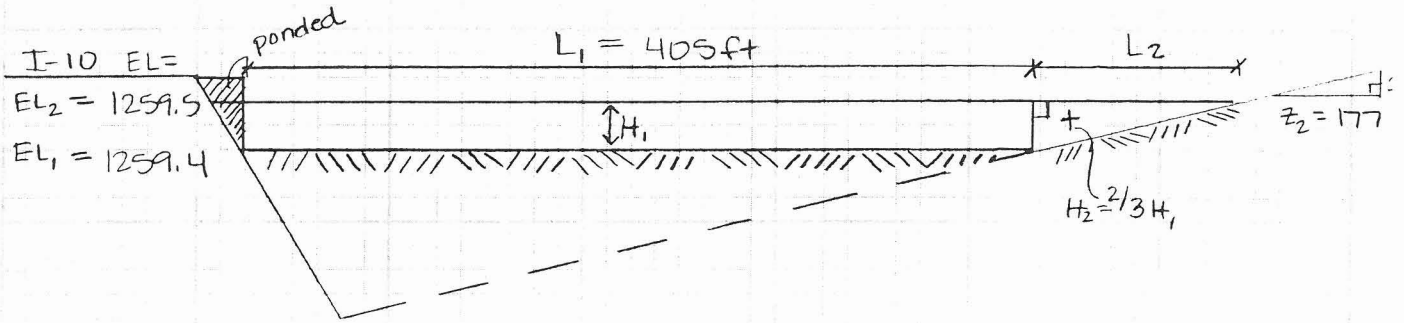
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1259.4)

Box Culvert #10 (1A)
(2-6'x10' RCB)



culvert invert = 1252.5

$H_1 = E_2 - E_1 = 1259.5 - 1259.4 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(177) = 17.7$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

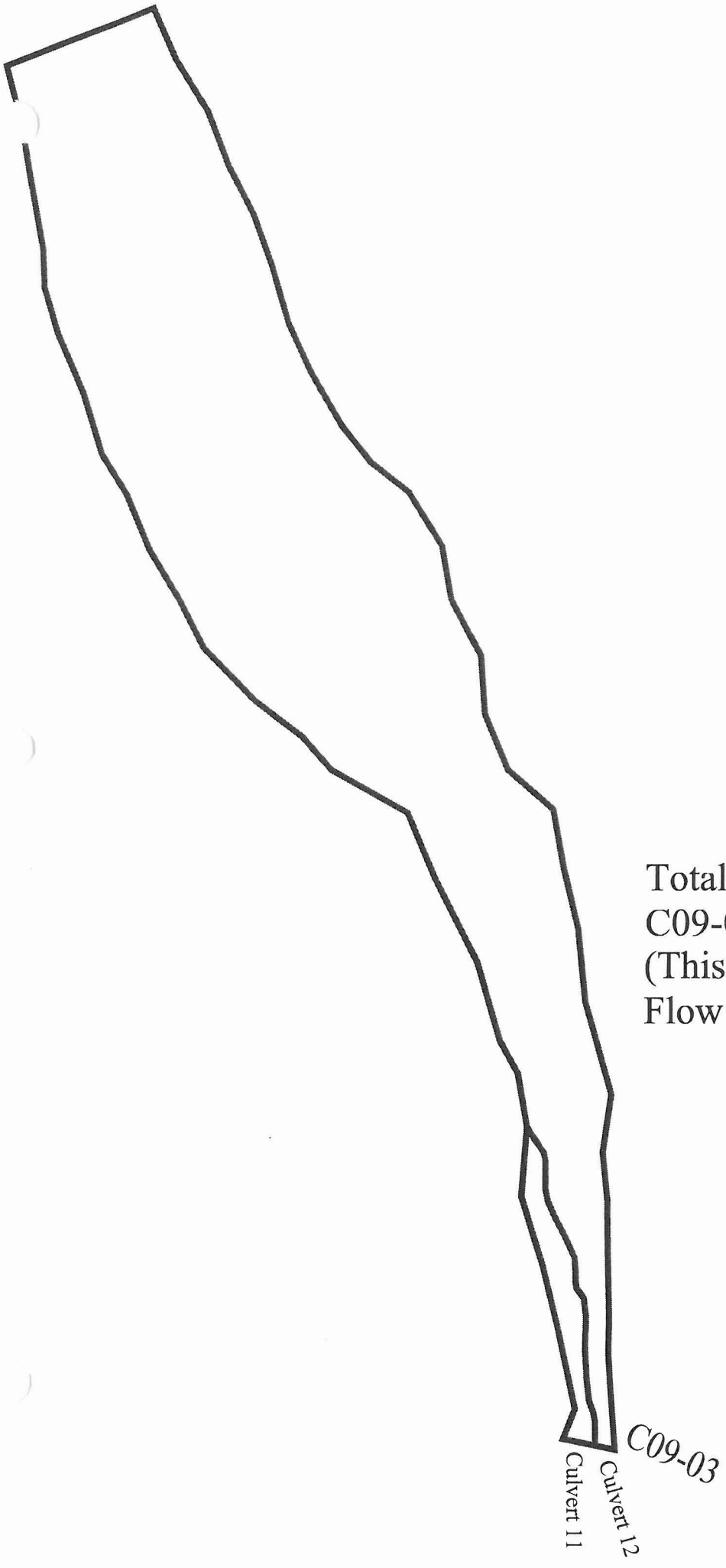
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(405)(0.10) + (17.7)(0.0667)}{405 + 17.7} = 0.098$

$L_T = L_1 + L_2 = 405 + 17.7 = 422.7$ ft

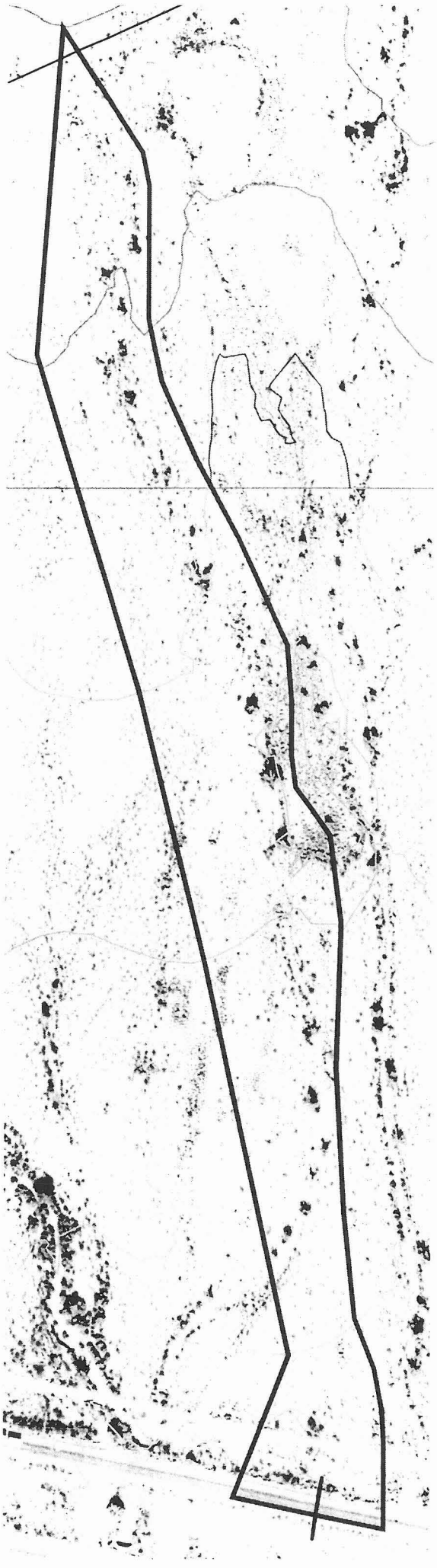
Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(422.7)(0.0986)^{1.5} = 35.336$ cfs

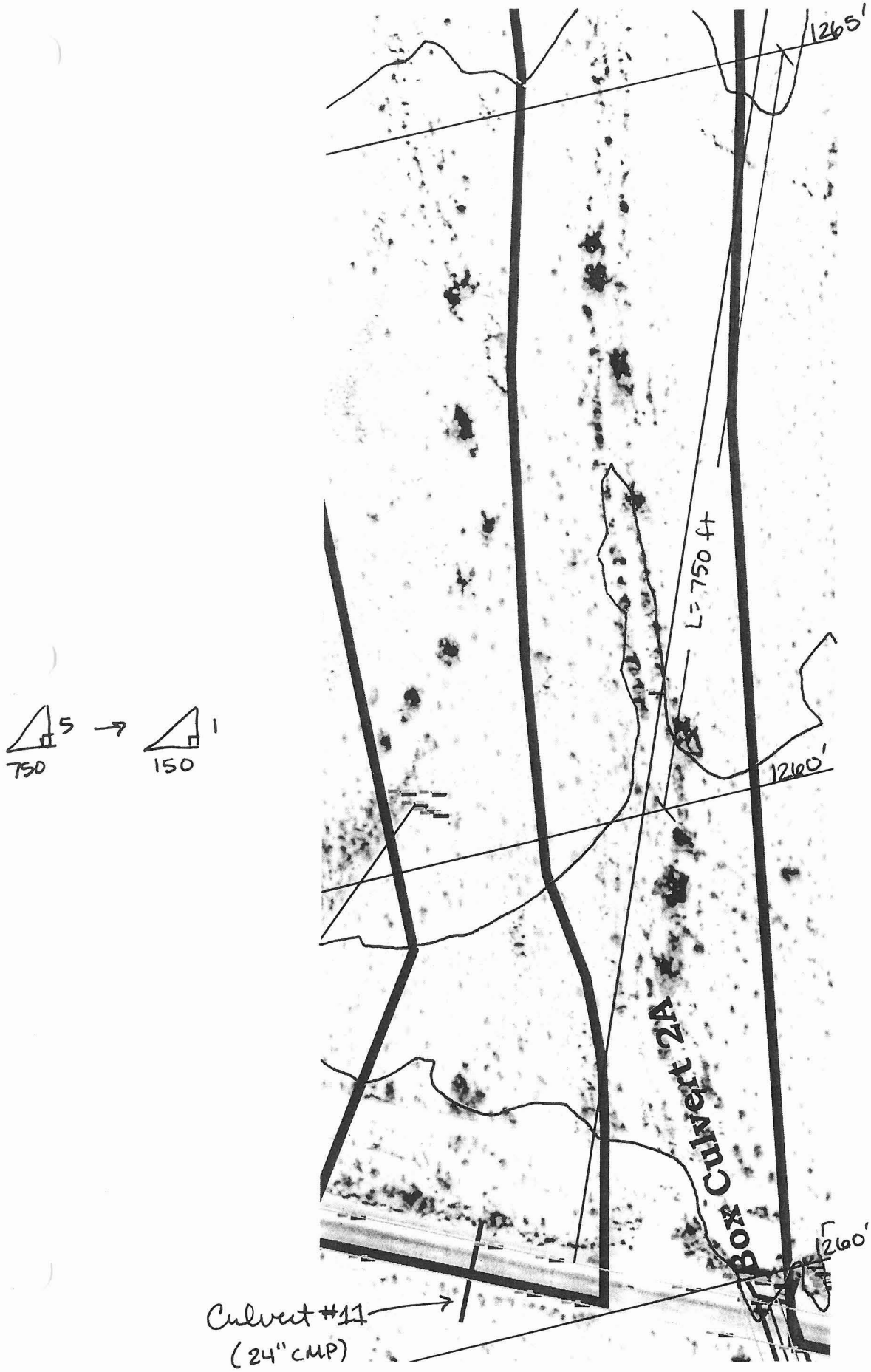


Total Associated Area to
C09-03=0.729 s.mi.=467 acres
(This value is also shown on the
Flow Calculation Spreadsheet)



Area = 15 acres
Q = 12 cfs
(Flow calculated from Area-Flow Relationship
$Q = 510 \times Area\ [s\ mi.]$

culvert #11
(24" CMP)


1265'
L=750 ft
1260'
Box Culvert 2A
1260'
Culvert #11
(24" CMP)
5
750
1
150

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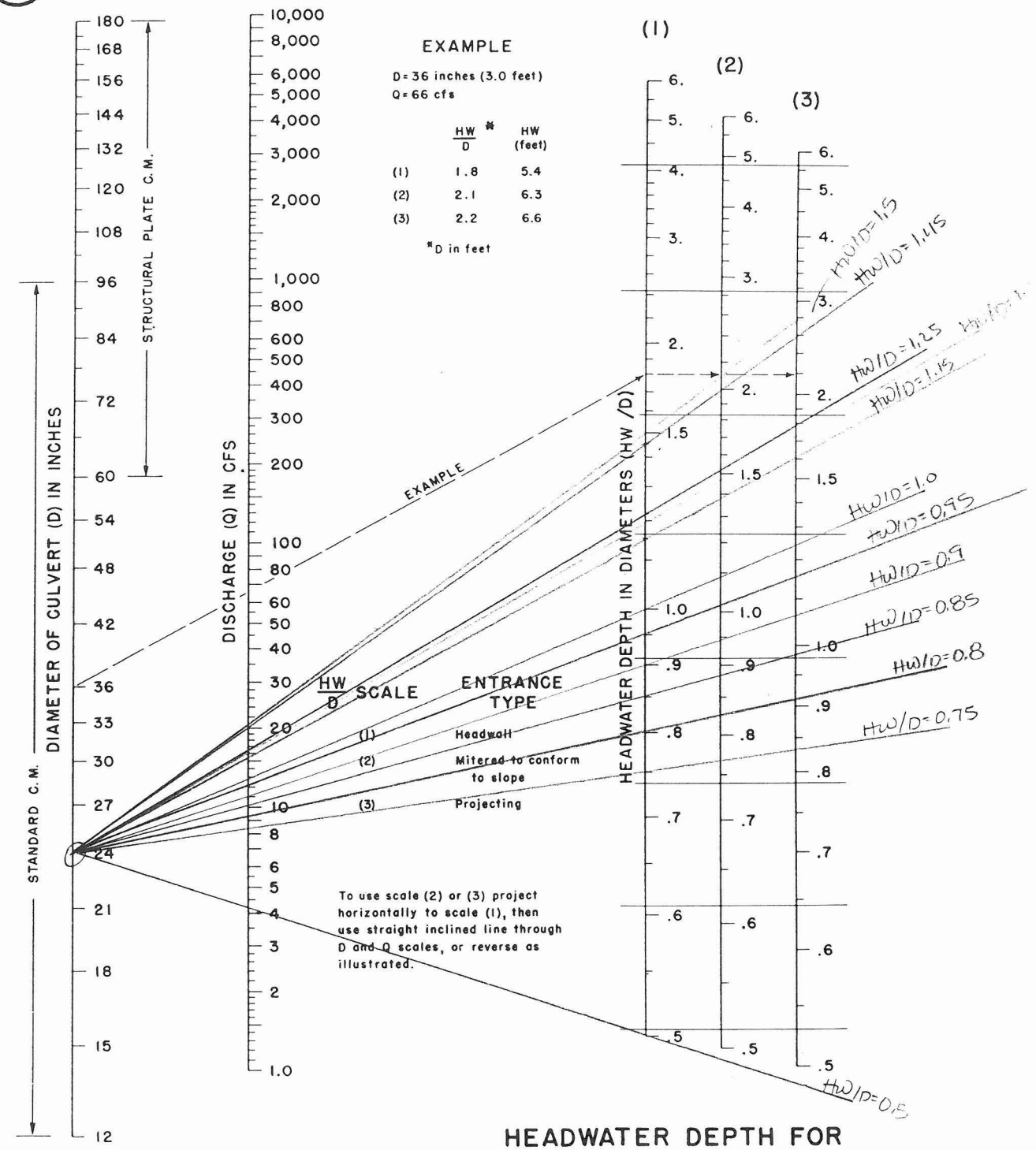
JOB NAME Palo Verde Zone A Delineation JOB NO. 310,019

CHART 2

Culvert #11 (24" CMP)



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

BUREAU OF PUBLIC ROADS JAN. 1963

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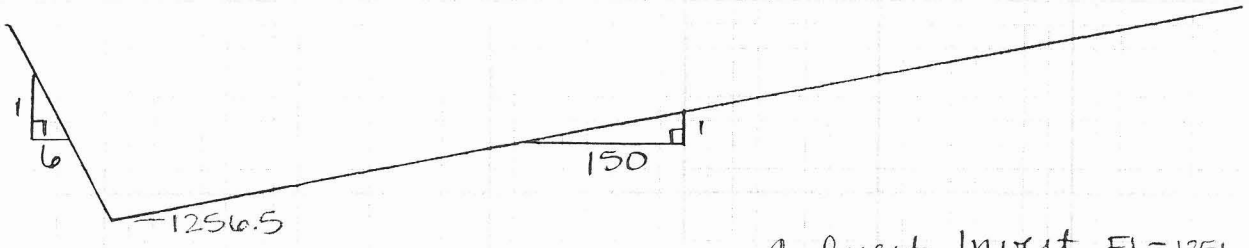
Manning's Equ. (at EL > 1256.5)

Culvert #11 (24" CMP)



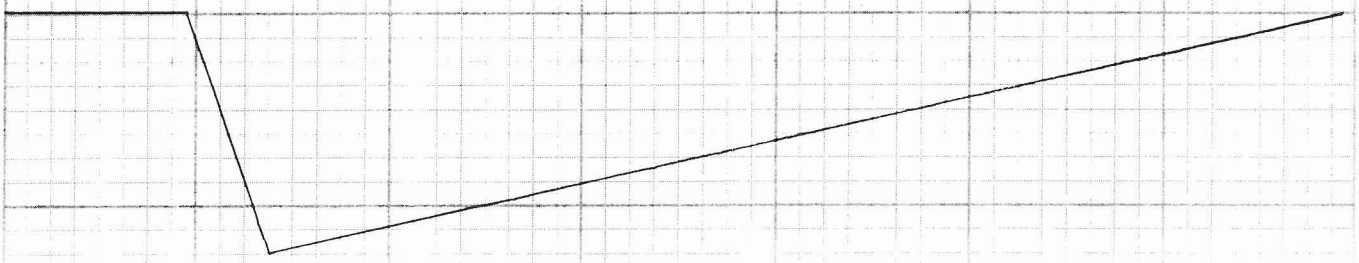
Culvert Invert EL=1256

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00273
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

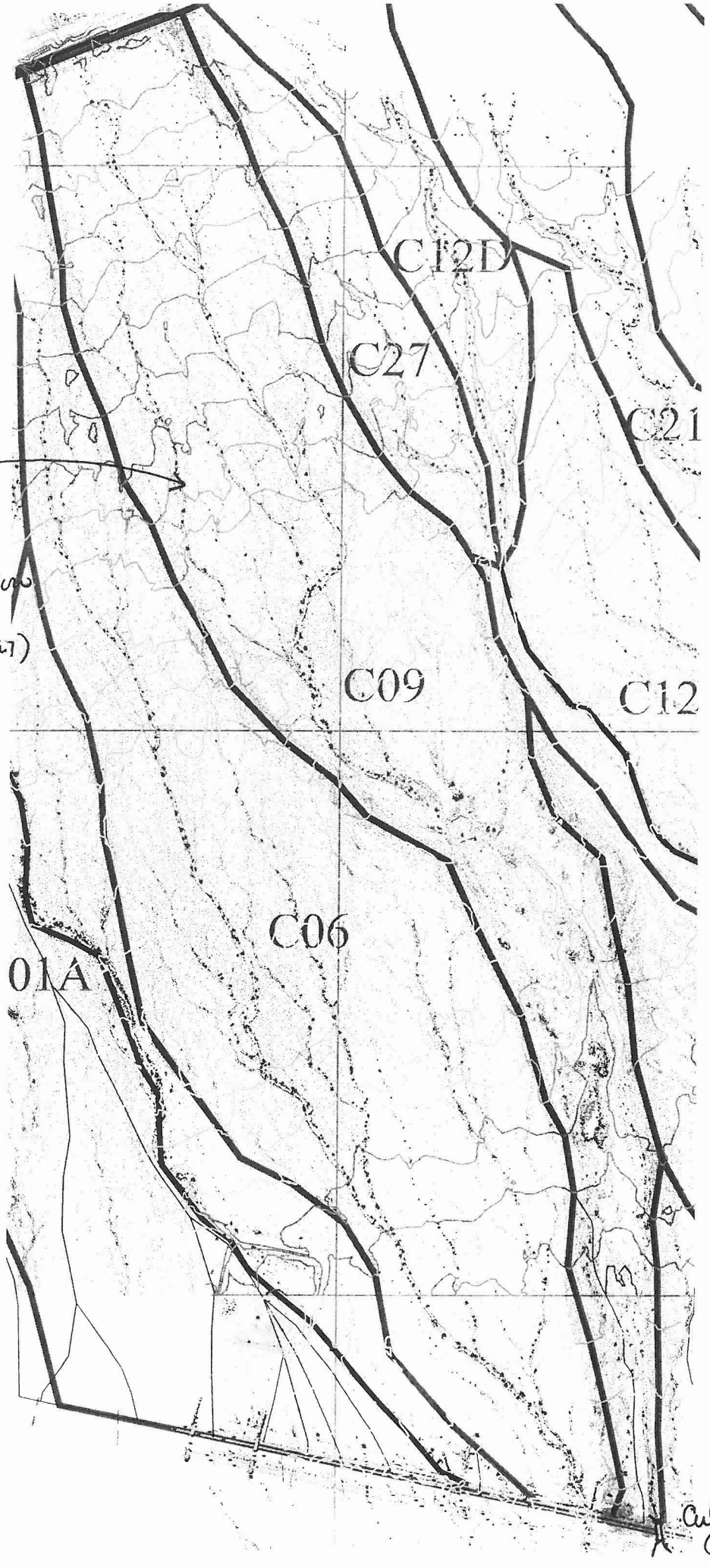
Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L+l}\right)$$



Area = 451 acres
Q = 359 cfs
[Flow from Area-Flow Relationship
$Q = 510 \times Area\ (s.mi.)$]

Culvert #12 (2A)
(3-5'×11' RCB)

Box Culvert 2A
1260'
Length = 265 ft
B

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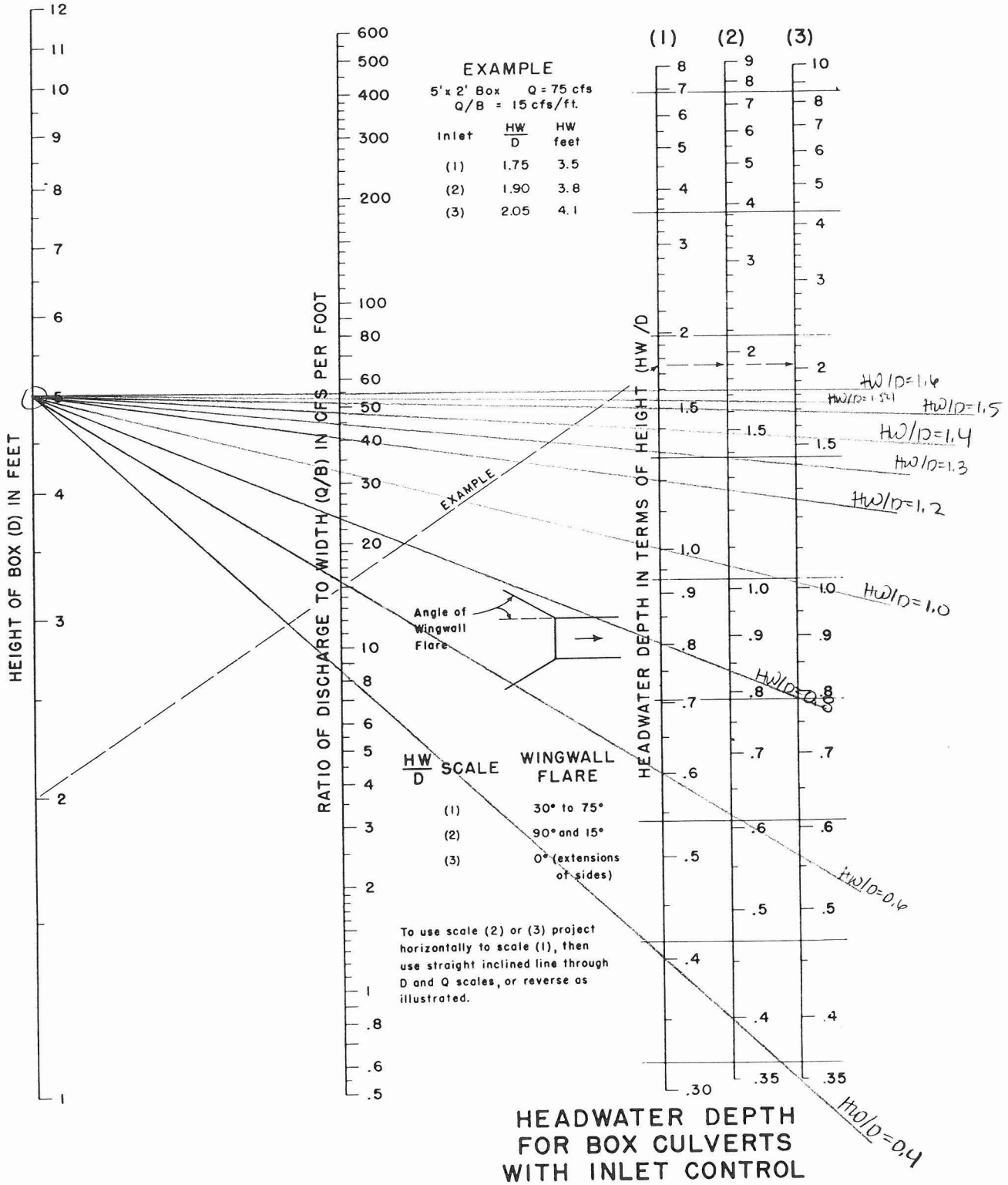
JOB NAME Palo Verde Zone A Delineation — Culvert #12 (3-5'x10' RCB)

JOB NO. 310.019

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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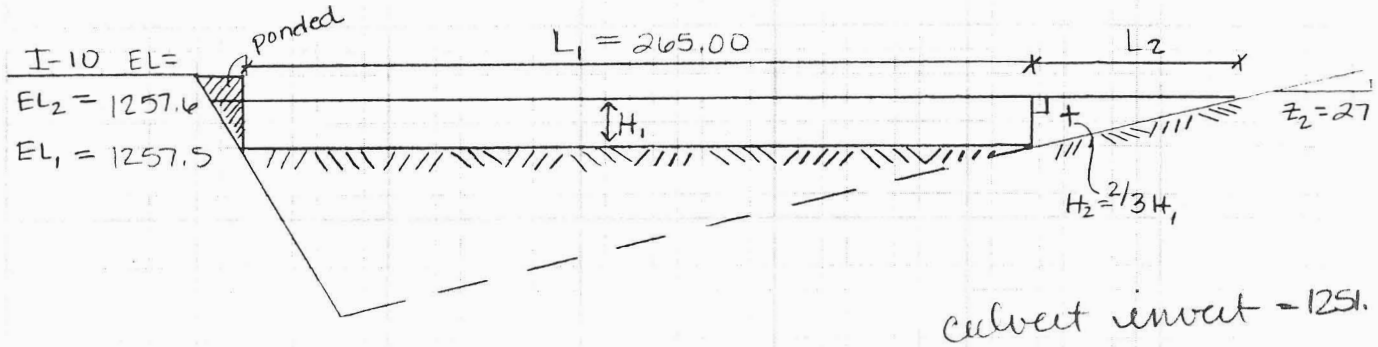
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 12 (2A)
(3-5'x10' RCB)

Weir Analysis (at EL > 1257.5)



culvert invert = 1251.

$H_1 = E_2 - E_1 = 1257.6 - 1257.5 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(276) = 27.6$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

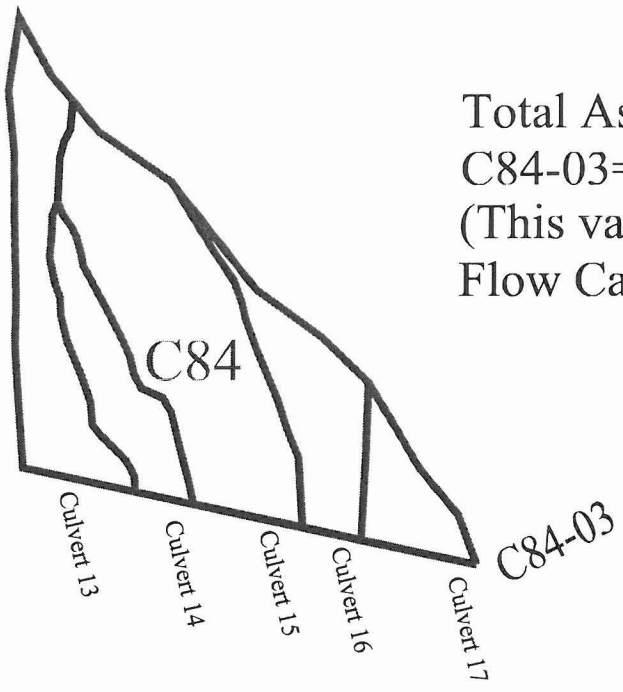
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(265)(0.10) + (27.6)(0.0667)}{265 + 27.6} = 0.0969$

$L_T = L_1 + L_2 = 265 + 27.6 = 292.6$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(292.6)(0.0969)^{1.5} = \underline{23.83 \text{ cfs}}$



Total Associated Area to
C84-03=0.220 s.mi.=141 acres
(This value is also shown on the
Flow Calculation Spreadsheet)

Area = 30 acres

Q = 24 cfs

(Flow calculated from Area-Flow Relationship

Q = 510 x Area [s.mi.]

culvert #13
(2-36" CMP)

Culvert #13
(2-36" CMP)

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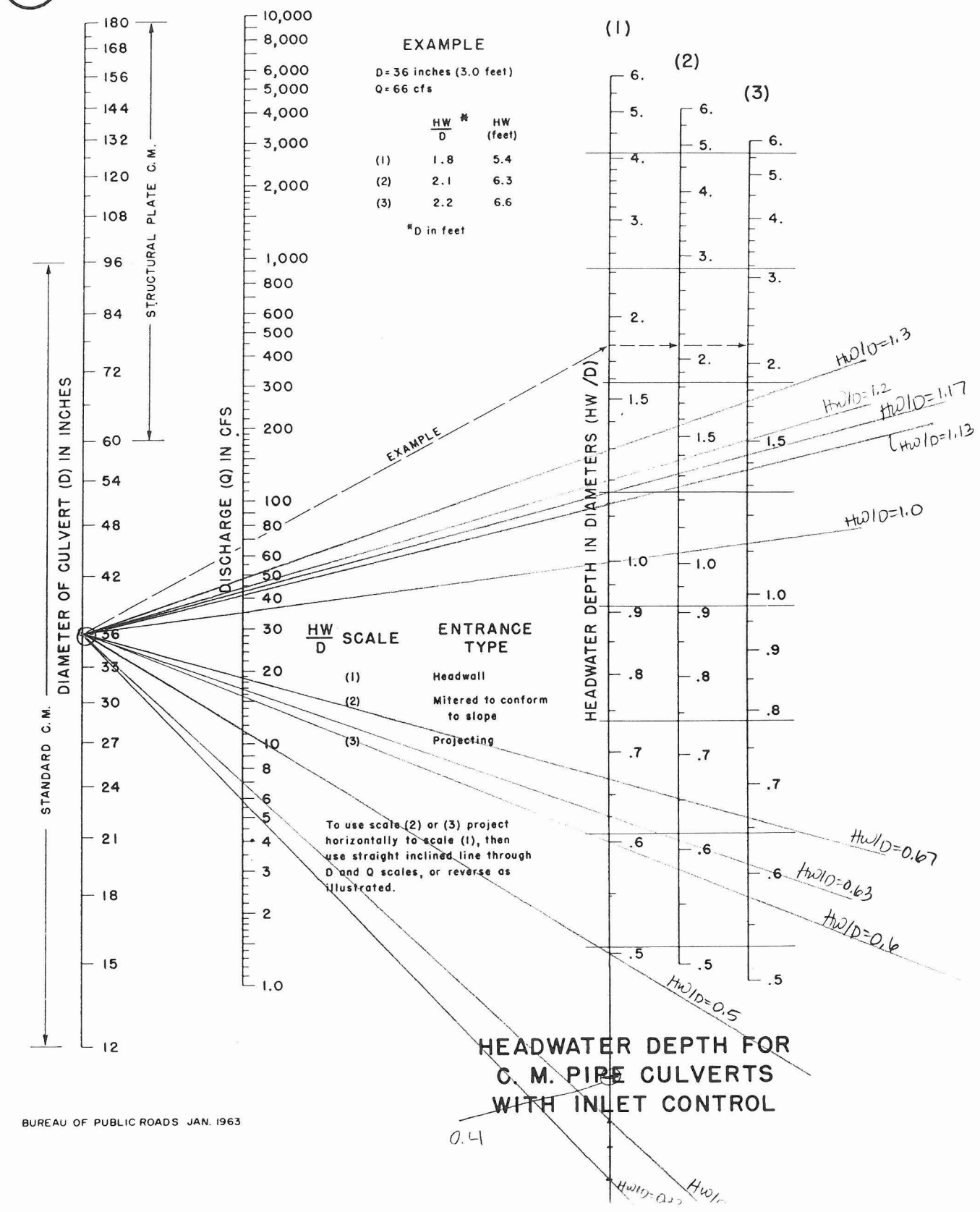
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #13 (2-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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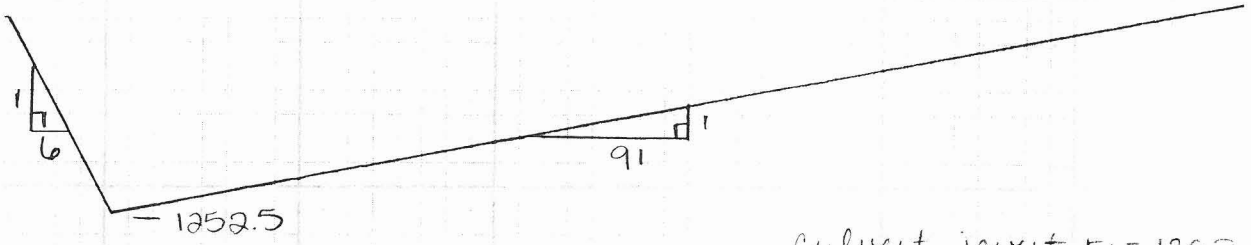
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1252.5)

Culvert #13 (2-36" CMP)

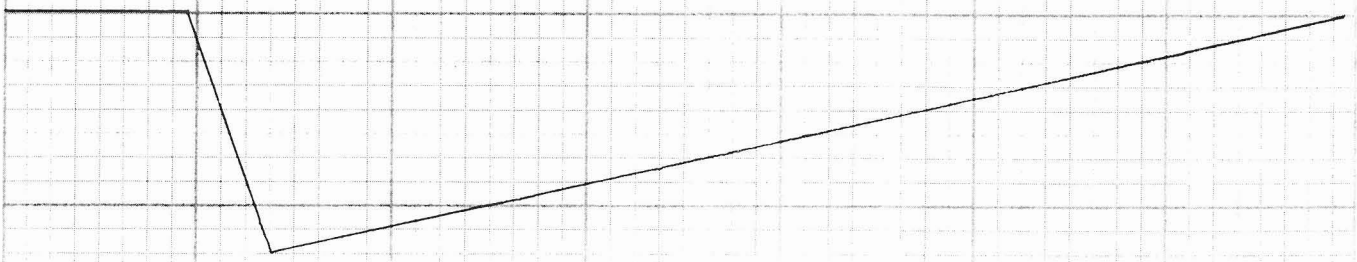


Culvert invert EL = 1252

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00413
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL >)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$

Area = 18 acres
Flow = 15 cfs
(Area-Flow Relationship used to calculate Flow
Q = 510 x Area [sq. mi.])
culvert #14
(2-36" CMP)

culvert #14
(2-36" CMP)

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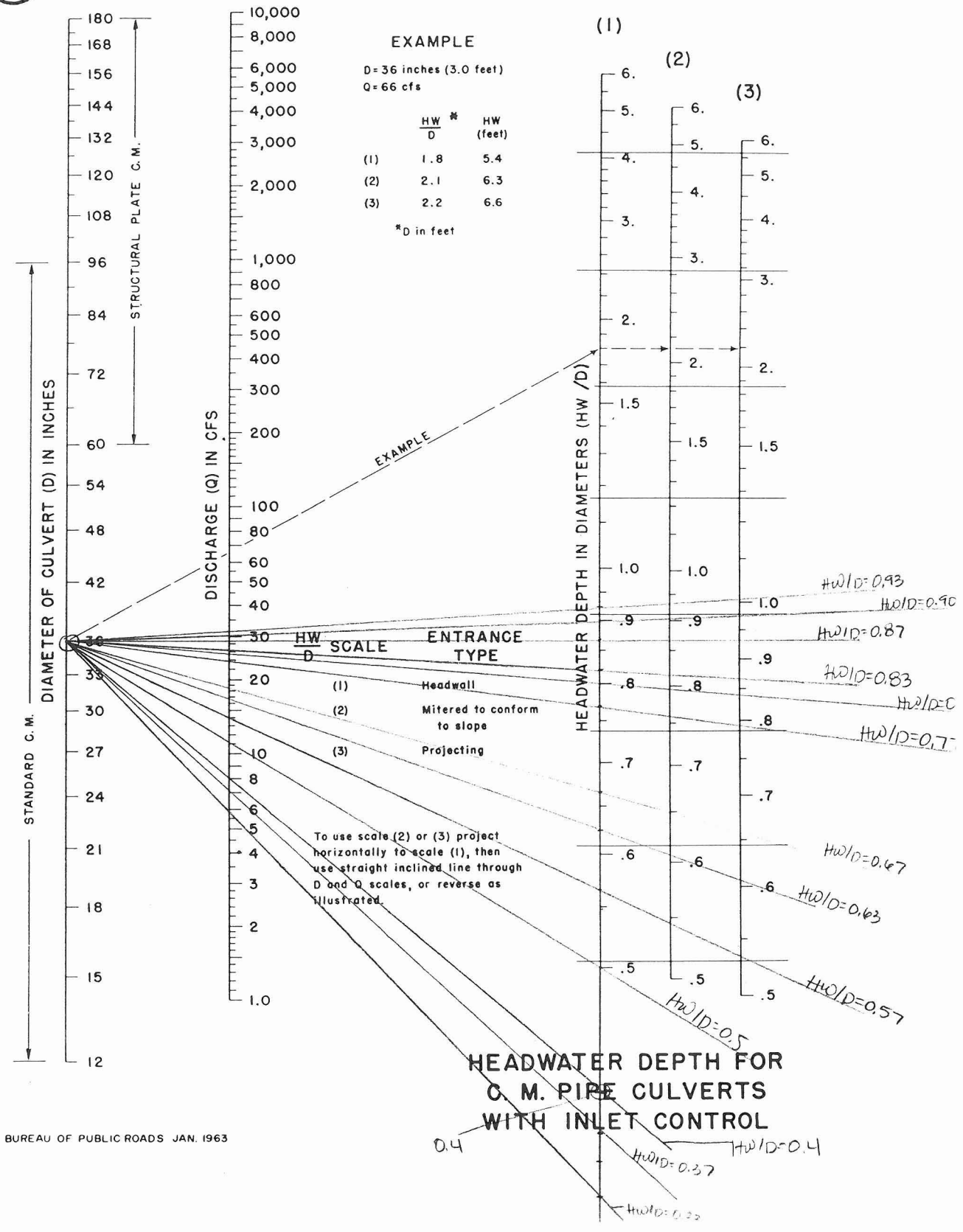
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #14 (2-36" CMP)

CHART 2



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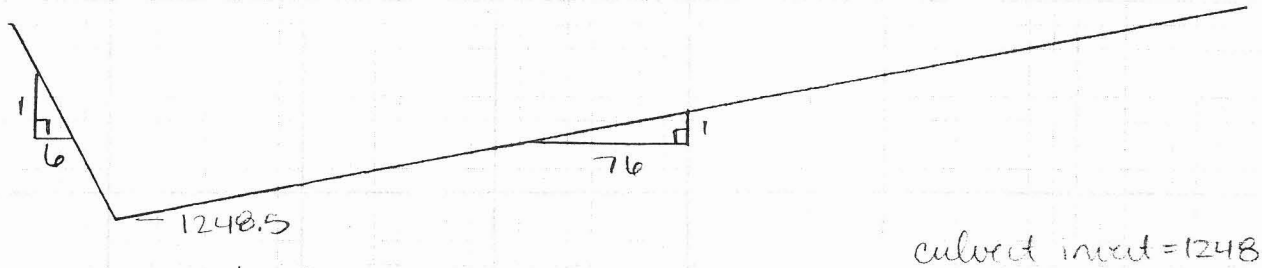
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1248.5) culvert #14 (2-36" CMP)



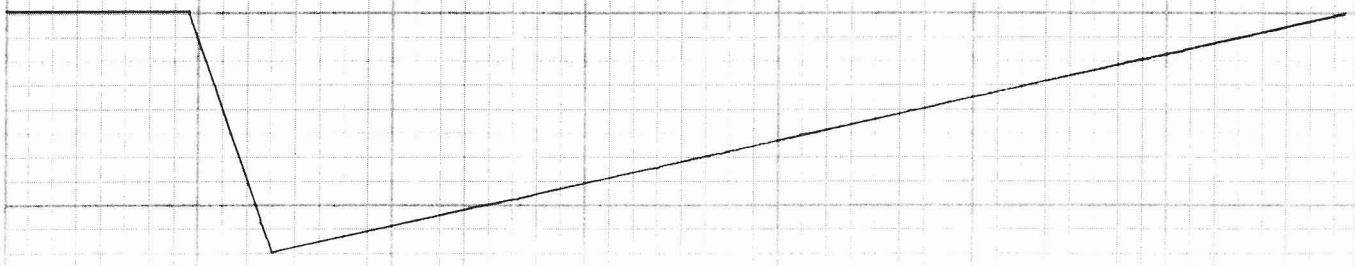
culvert invert = 1248

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00413
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

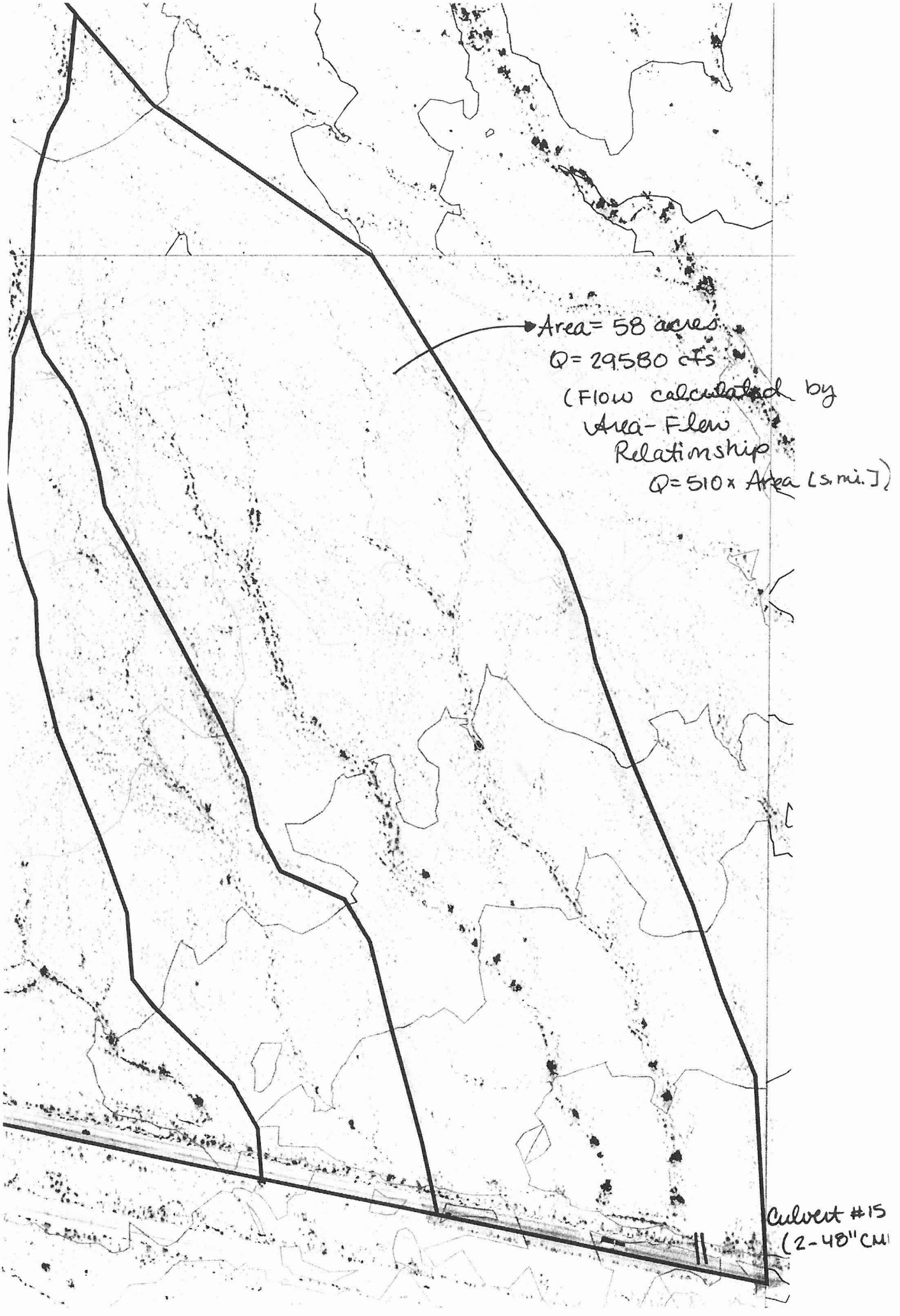
Weir Analysis (at EL >)

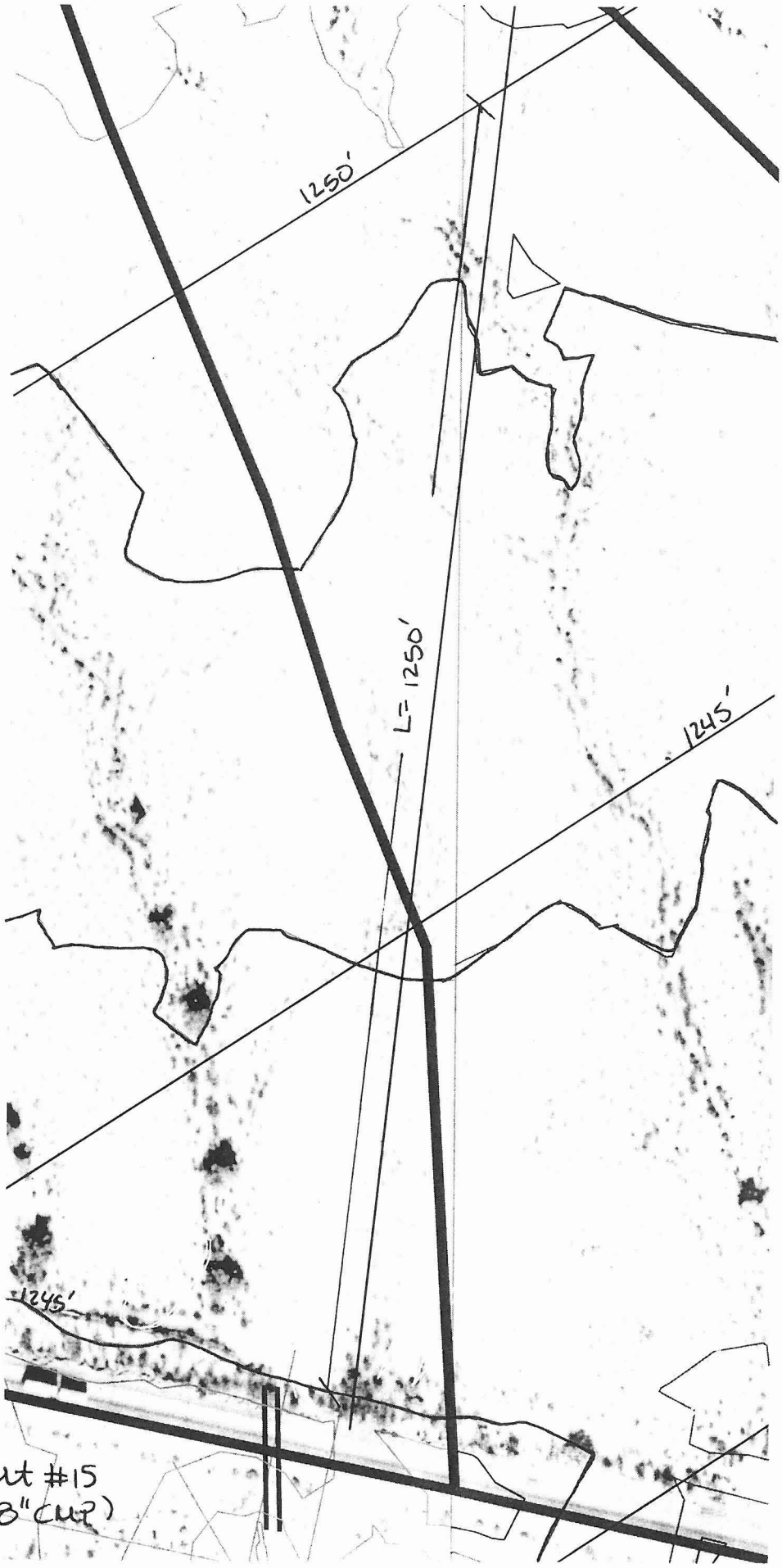


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$


Area = 58 acres
Q = 29580 cfs
(Flow calculated by
Area-Flow
Relationship
Q = 510 x Area (s.mi.)
Culvert #15
(2-48" CM



5 / 1250 → 1 / 250

culvert #15
(2-48" CMP)

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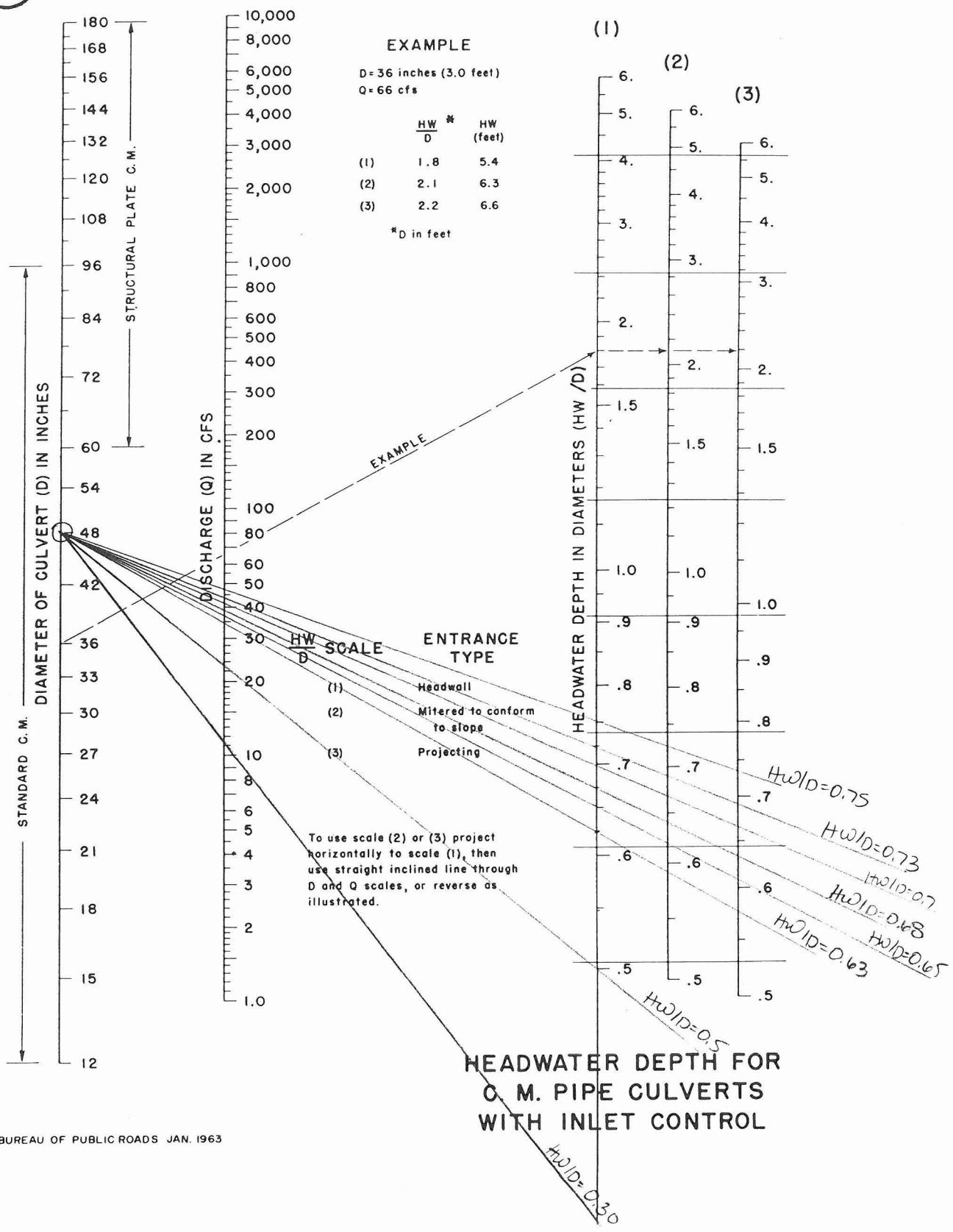
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #15 (2-48" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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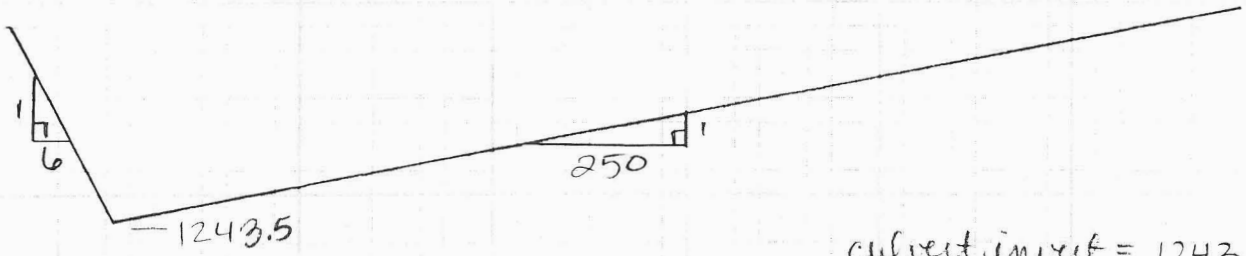
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1243.5)

culvert #15 (2-48" CMP)

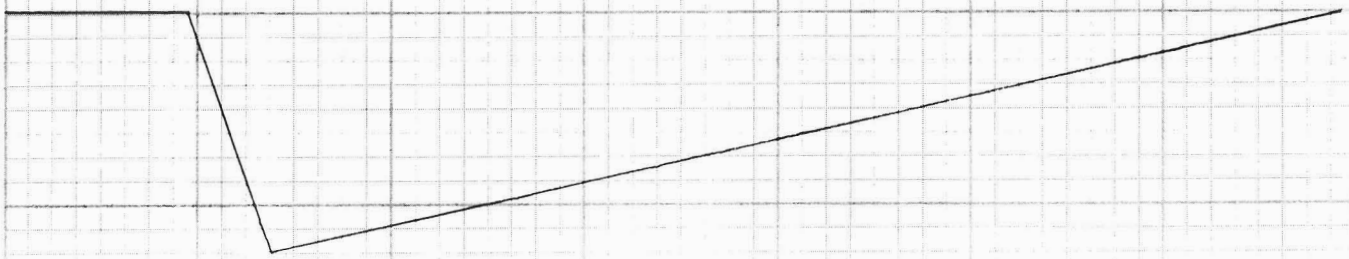


culvert invert = 1243

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0040
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

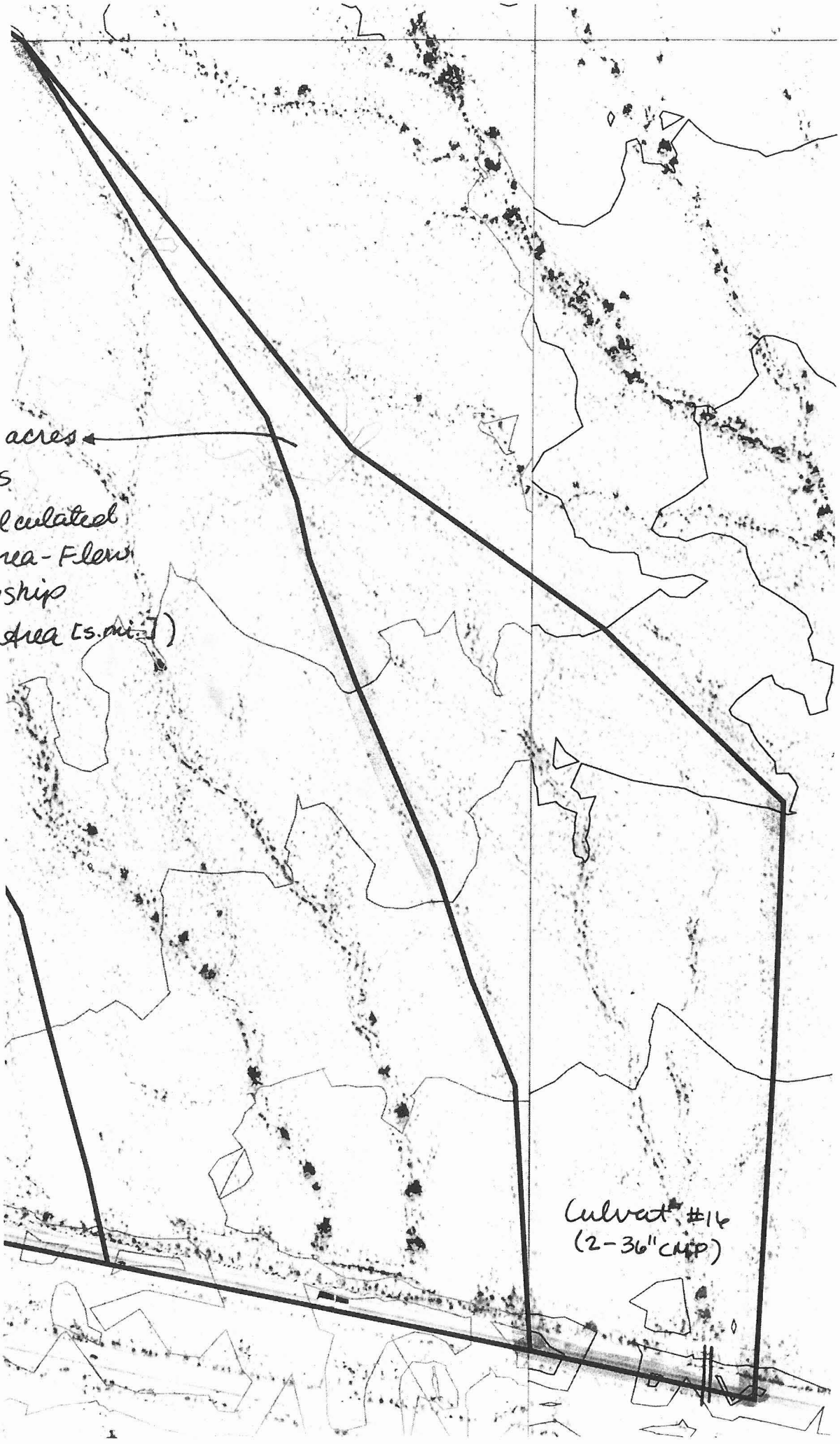
Weir Analysis (at EL >)

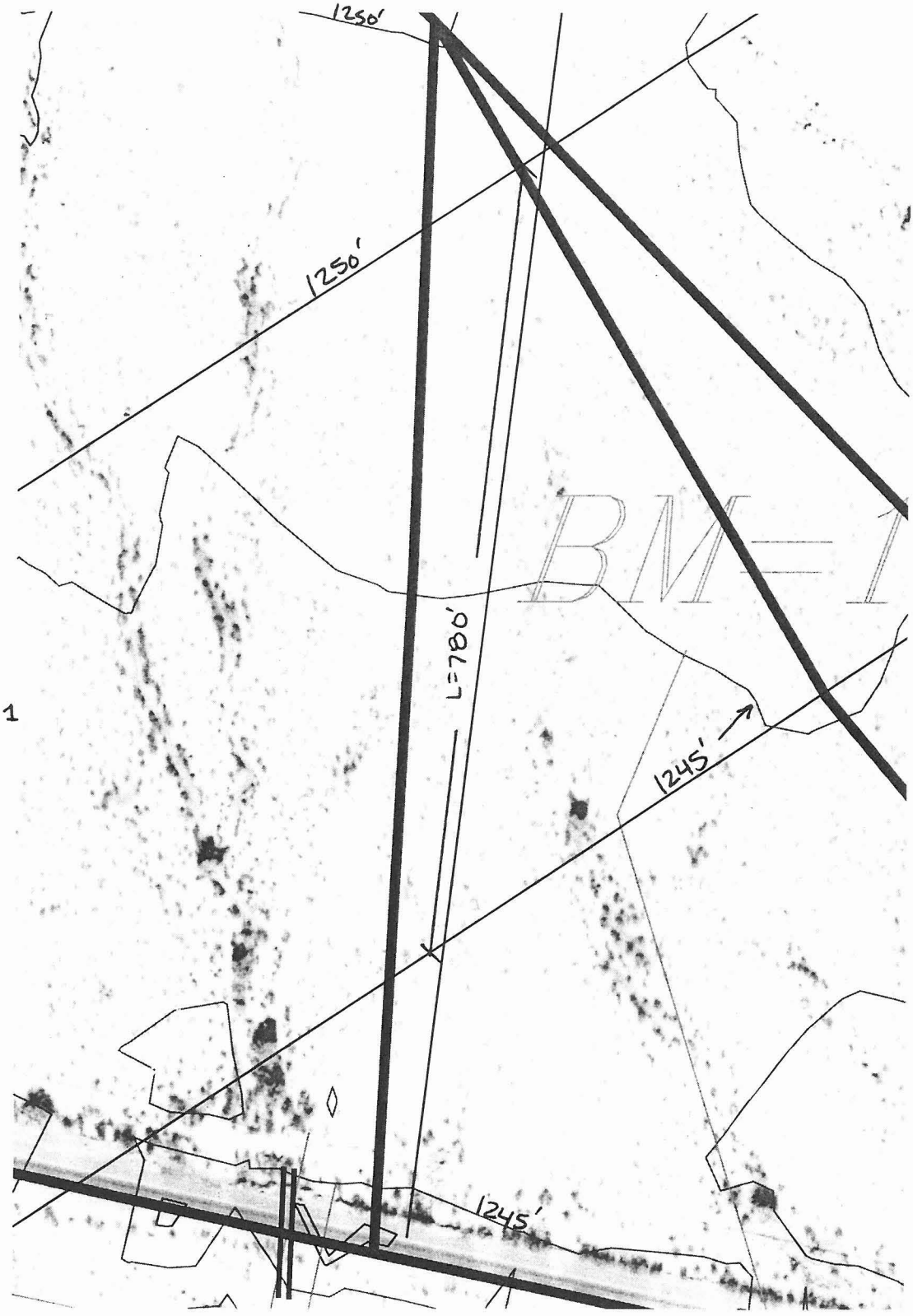


$$Q = C L H^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


Area = 23 acres
Q = 18 cfs
(Flow calculated from Area-Flow Relationship
Q = 510 x Area [s.mi.])
Culvert #16
(2-36" CMP)



5 → 1
780 156

Culvert #16
(2-36" CMP)

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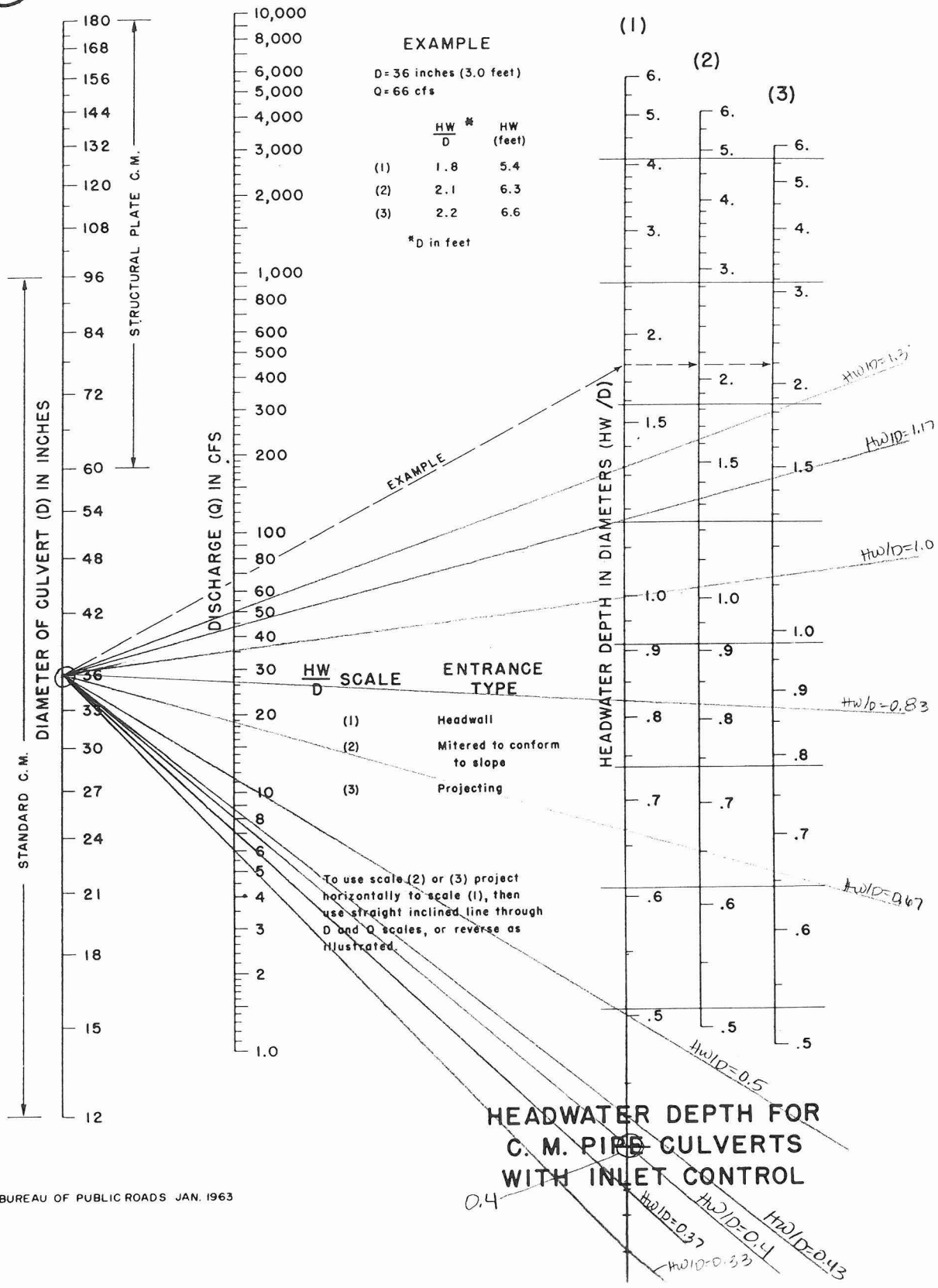
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation — Culvert #16 (2-36" CMP)

JOB NO. 310.019

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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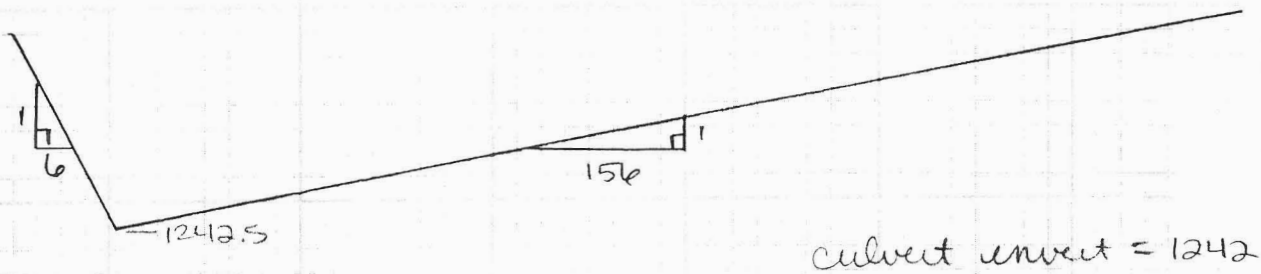
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1242.5) culvert #16 (2-36" CMP)

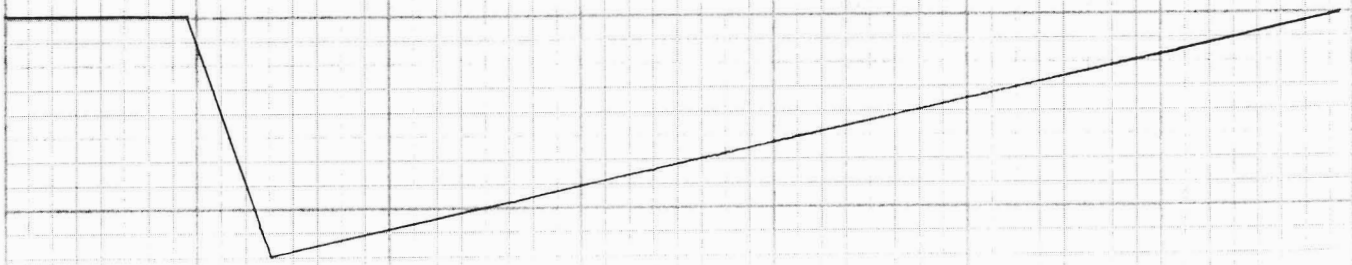


culvert invert = 1242

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0040
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

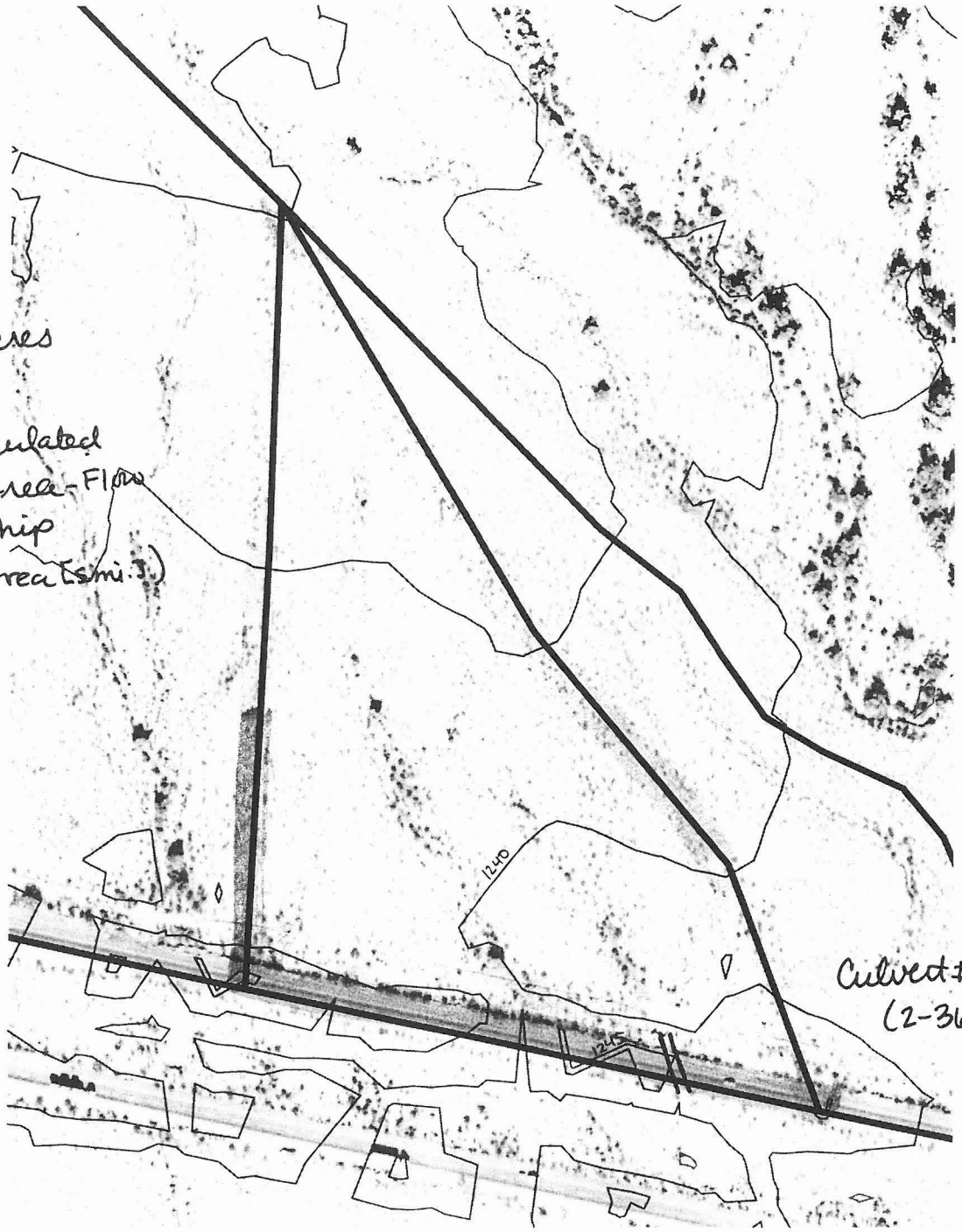
Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(\frac{2}{3}\bar{H})}{L+l}\right)$$



Area = 12 acres
Q = 10 cfs
(Flow calculated from Area-Flow Relationship
Q = 510 x Area (sq. mi.))

Culvert # 17
(2-36" CMP)

culvert #17
(2-36" CMP)

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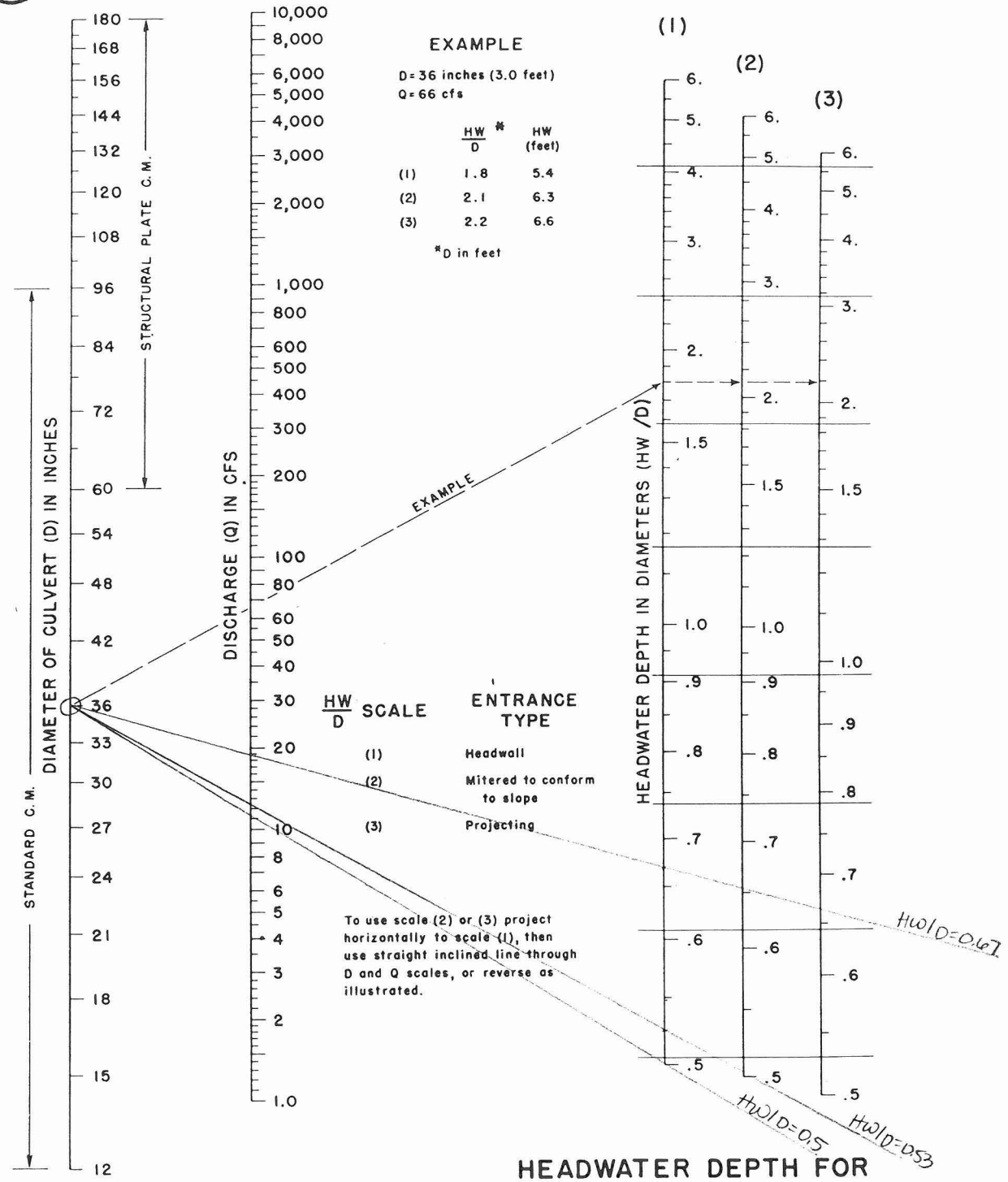
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #17 (2-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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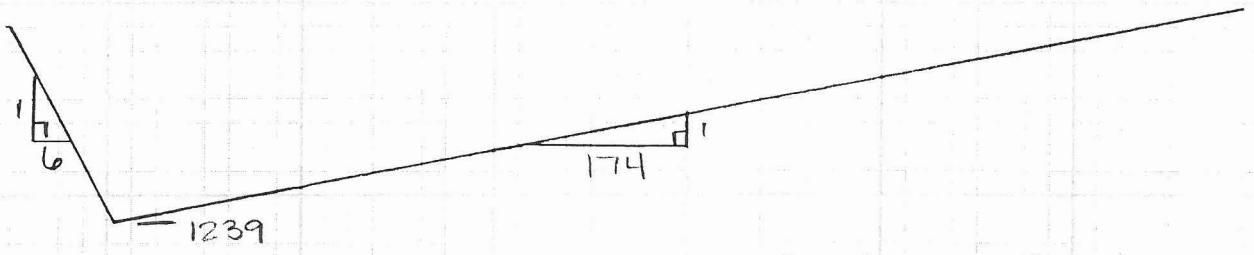
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1239) culvert #17 (2-36" CMP)



culvert invert = 1238

$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

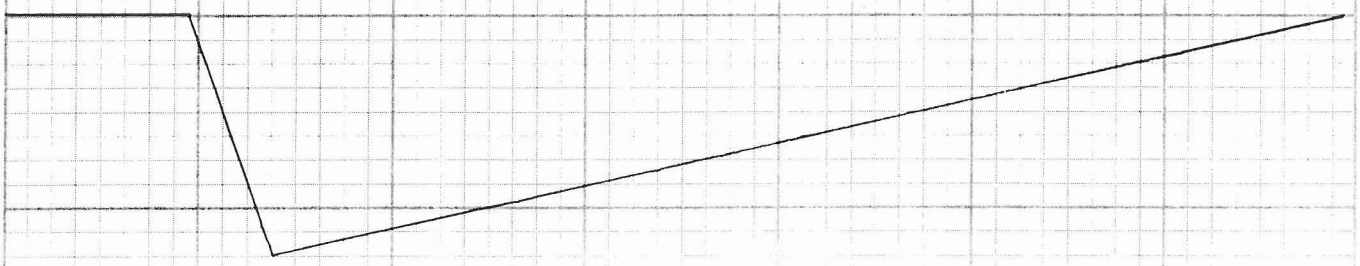
where $n = 0.065$

S = downstream slope = 0.0070

A = Area of channel cross section

$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL>)



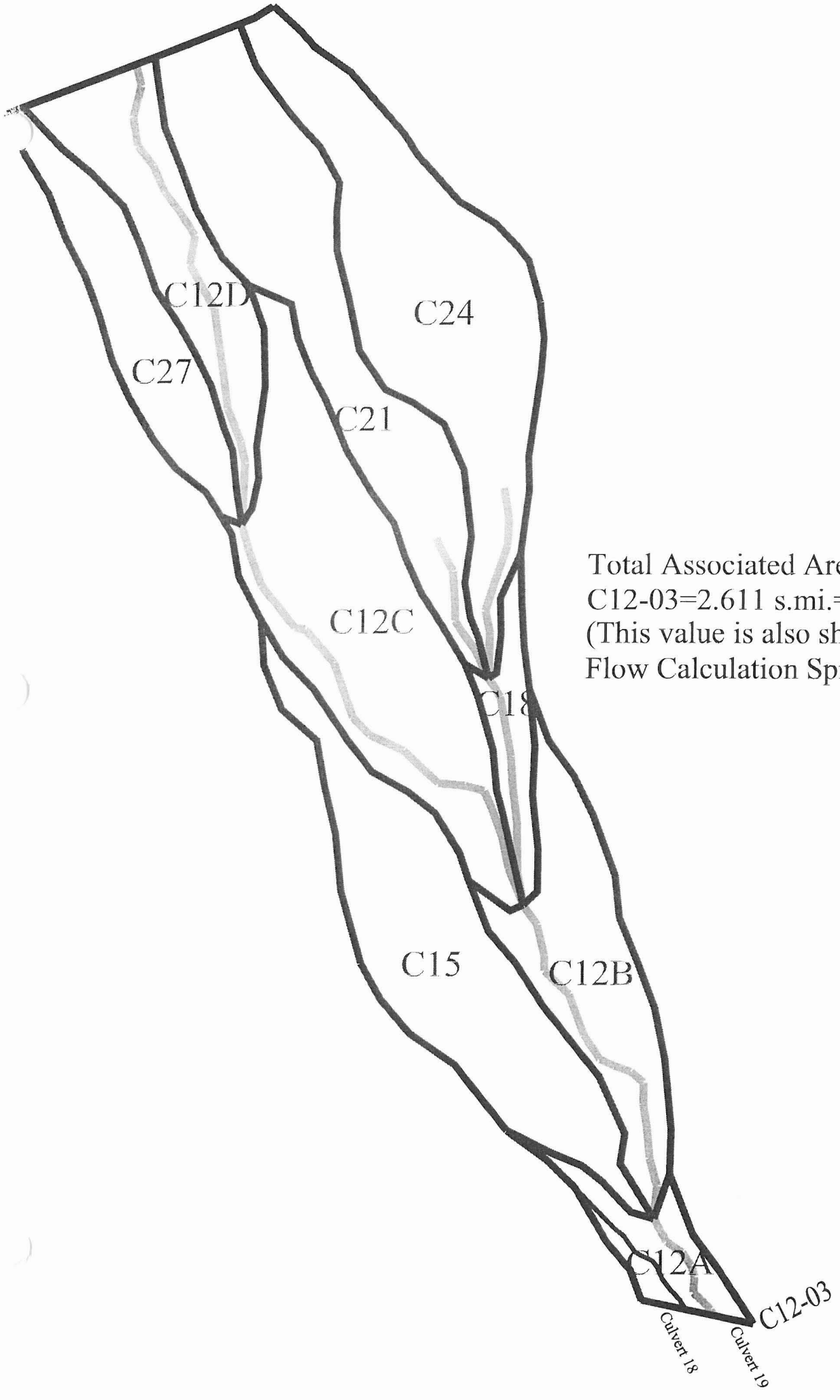
$Q = CLH^{1.5}$

where $C = 2.7$

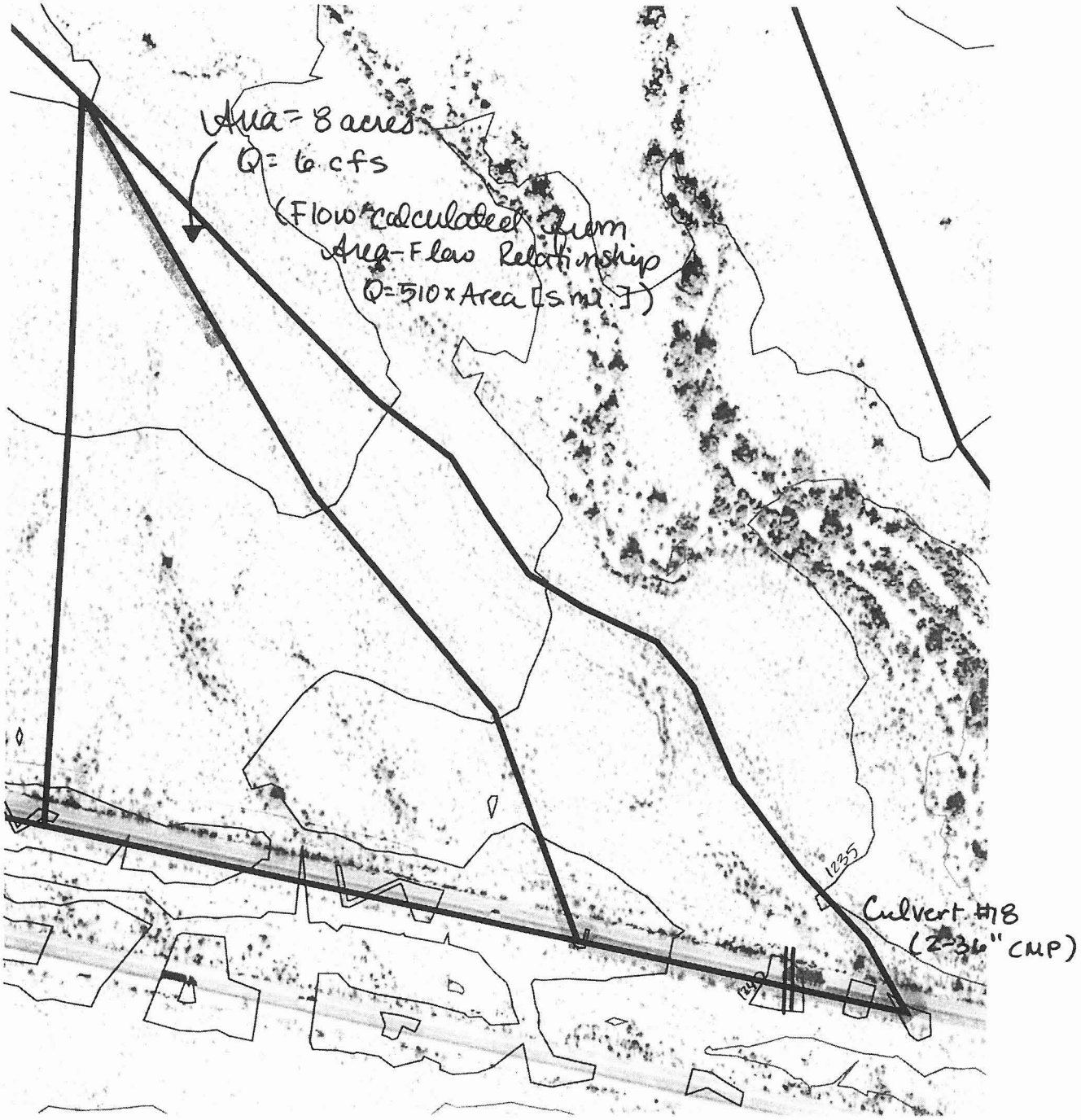
L = length of berm/dyke

H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L+l}\right)$$



Total Associated Area to
C12-03=2.611 s.mi.=1671 acres
(This value is also shown on the
Flow Calculation Spreadsheet)


Area = 8 acres
Q = 6 cfs
(Flow calculated from
Area-Flow Relationship
Q=510 x Area [sq. mi.])
1235
Culvert #18
(2-36" CMP)

Culvert #18
(2-36" CMP)

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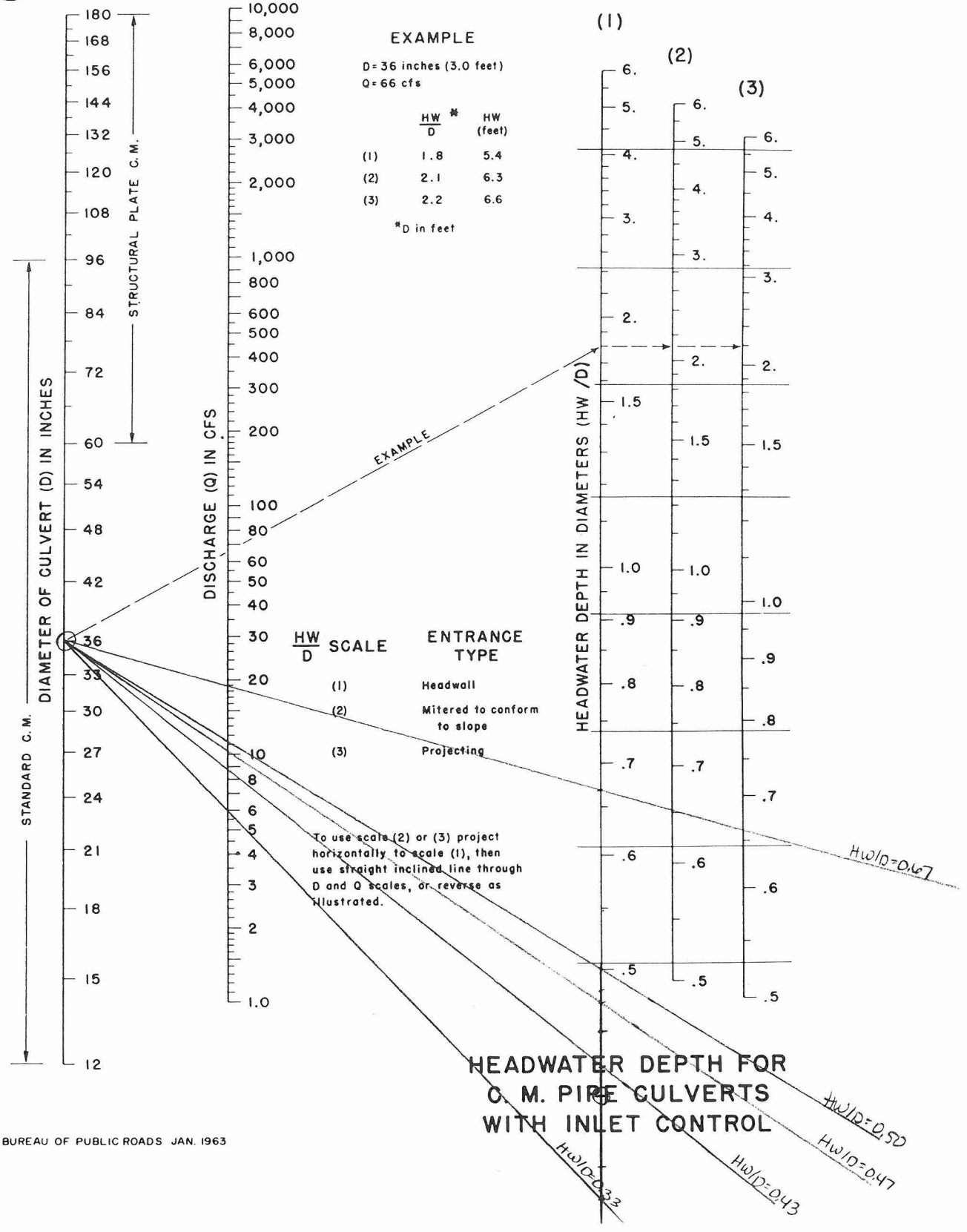
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #18 (2-36" CMP)

CHART 2



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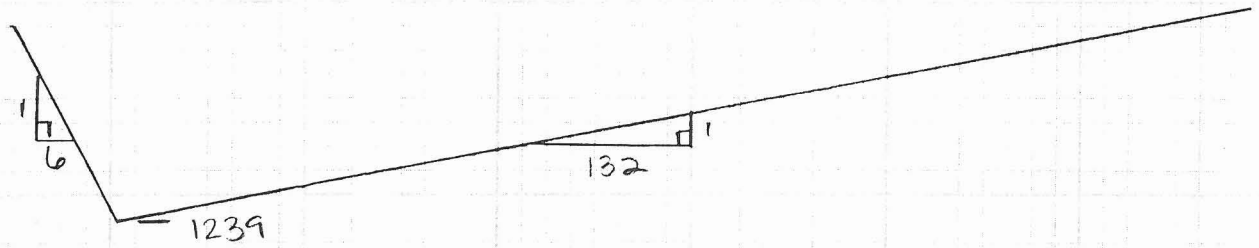
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1239) Culvert #18 (2-36" CMP)

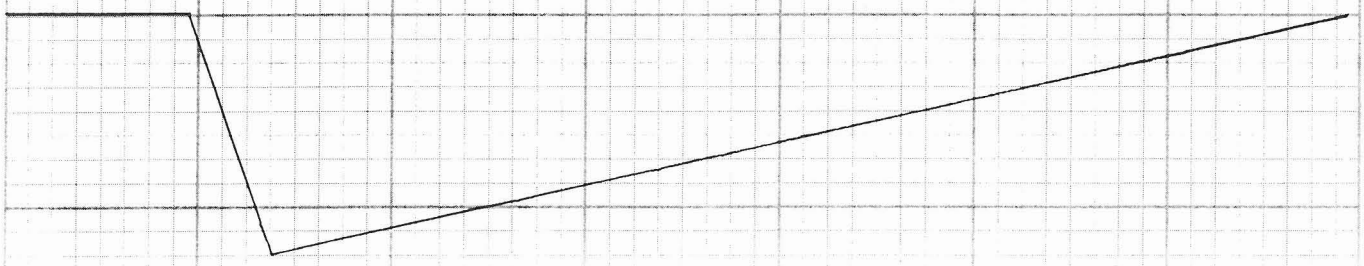


$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$ culvert invert = 1238

where $n = 0.065$
S = downstream slope = 0.0070
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL >)



$Q = C L H^{1.5}$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell\left(\frac{2}{3}\overline{H}\right)}{L + \ell}\right)$$

C12A
Area = 1163 acres
Q = 927 cfs
[Flow from Area-Flow Relationship
Q = 510 x Area [s.mi.
Culvert #19(3A)
(4-7'x10' RCB)

10
1519
1
152
1240'
1235'
1230'
L=1519
Box Culvert 3A
3B

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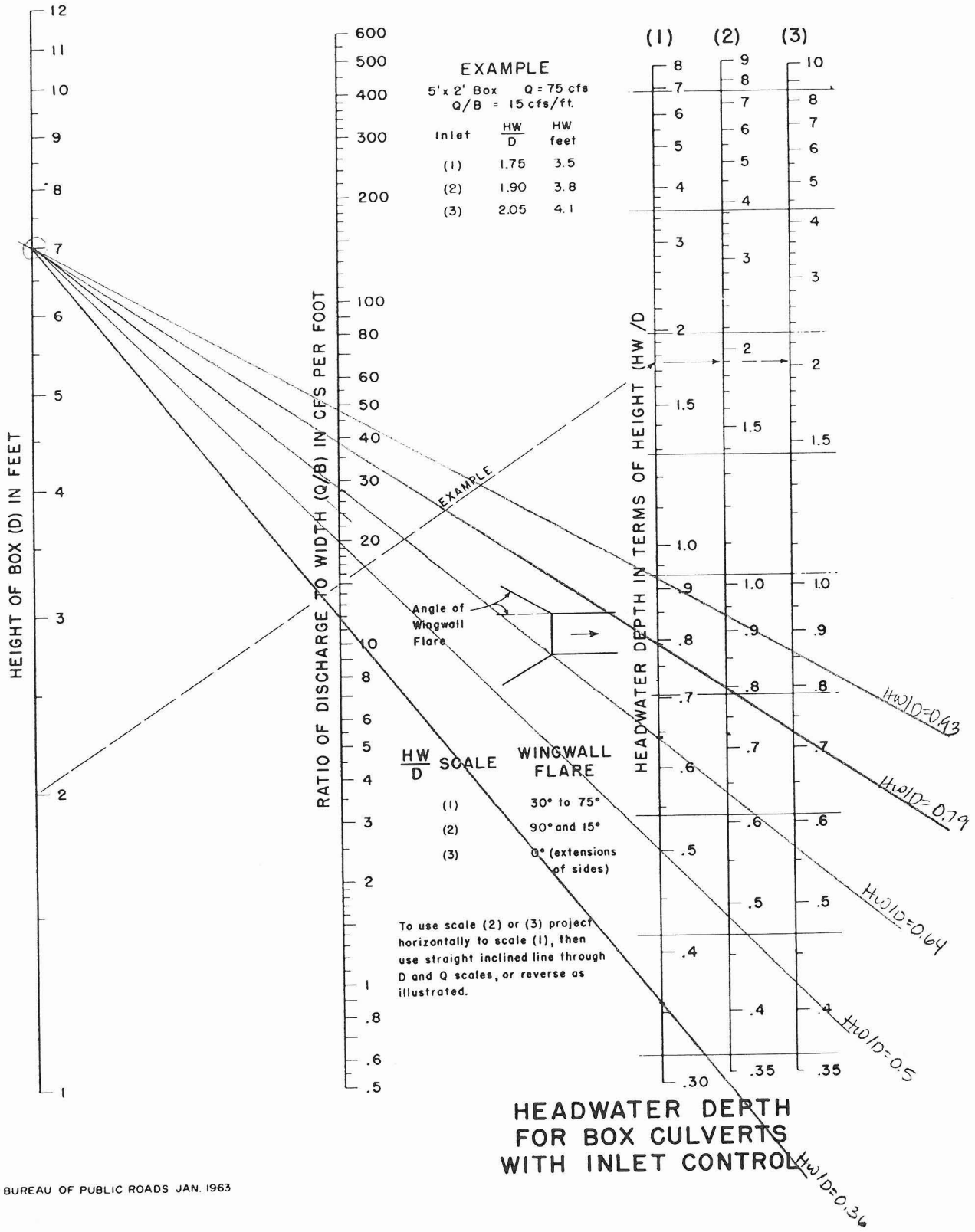
Culvert #19(2A) (4-7'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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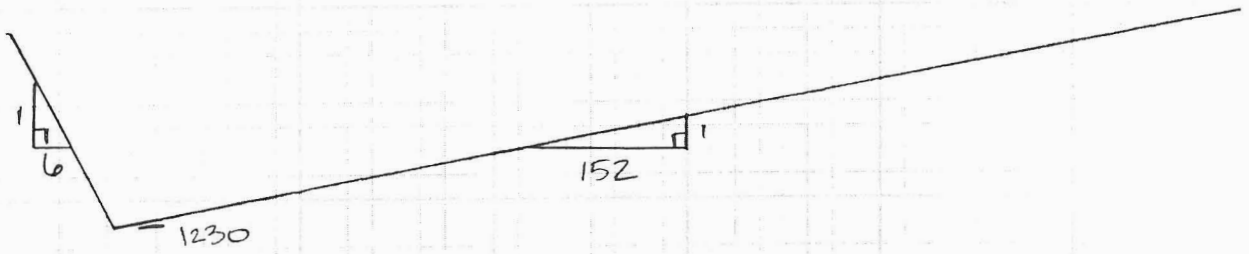
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1230)

Culvert # 19 (3A)
(4 – 7'x10' RCB)

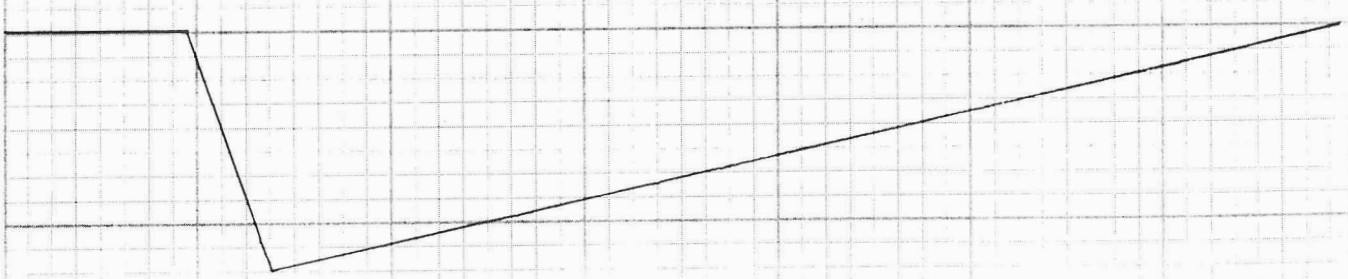


$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

Culvert Invert = 1223.56

where n = 0.065
S = downstream slope
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

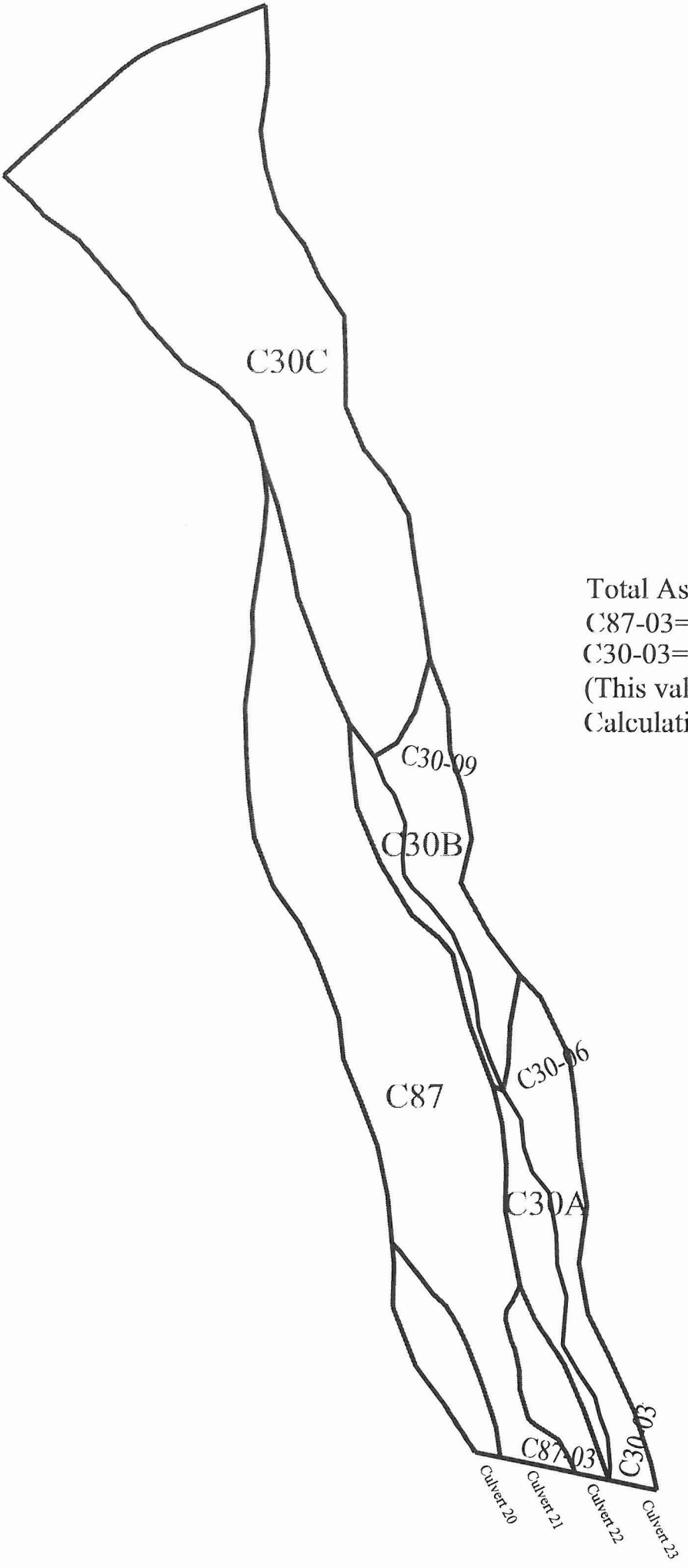
Weir Analysis (at EL >)



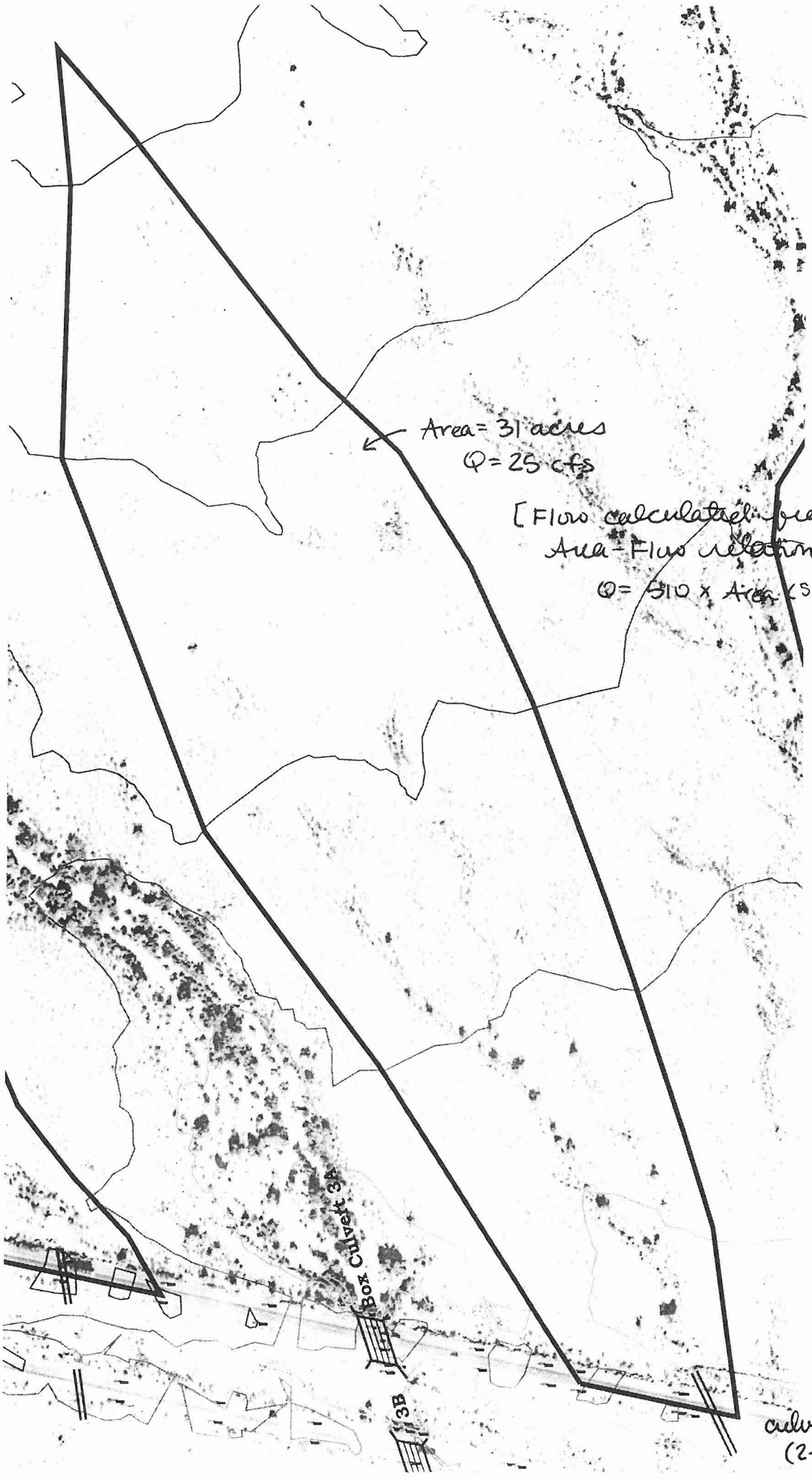
$Q = CLH^{1.5}$

where C = 2.7
L = length of berm/dyke
H = weighted avg $\bar{H}$

$\left(H = \frac{L(\bar{H}) + l(\frac{2}{3}\bar{H})}{L+l}\right)$



Total Associated Area to
C87-03=0.578 s.mi.=370 acres and
C30-03=1.662 s.mi.=1064 acres
(This value is also shown on the Flow Calculation Spreadsheet)


Area = 31 acres
Q = 25 cfs
[Flow calculated from
Area-Flow relationship
Q = 510 x Area (S.mi)]
Box Culvert 3A
3B
culvert #20
(2-36" CMP)

culvert #20
(2-36" CMP)

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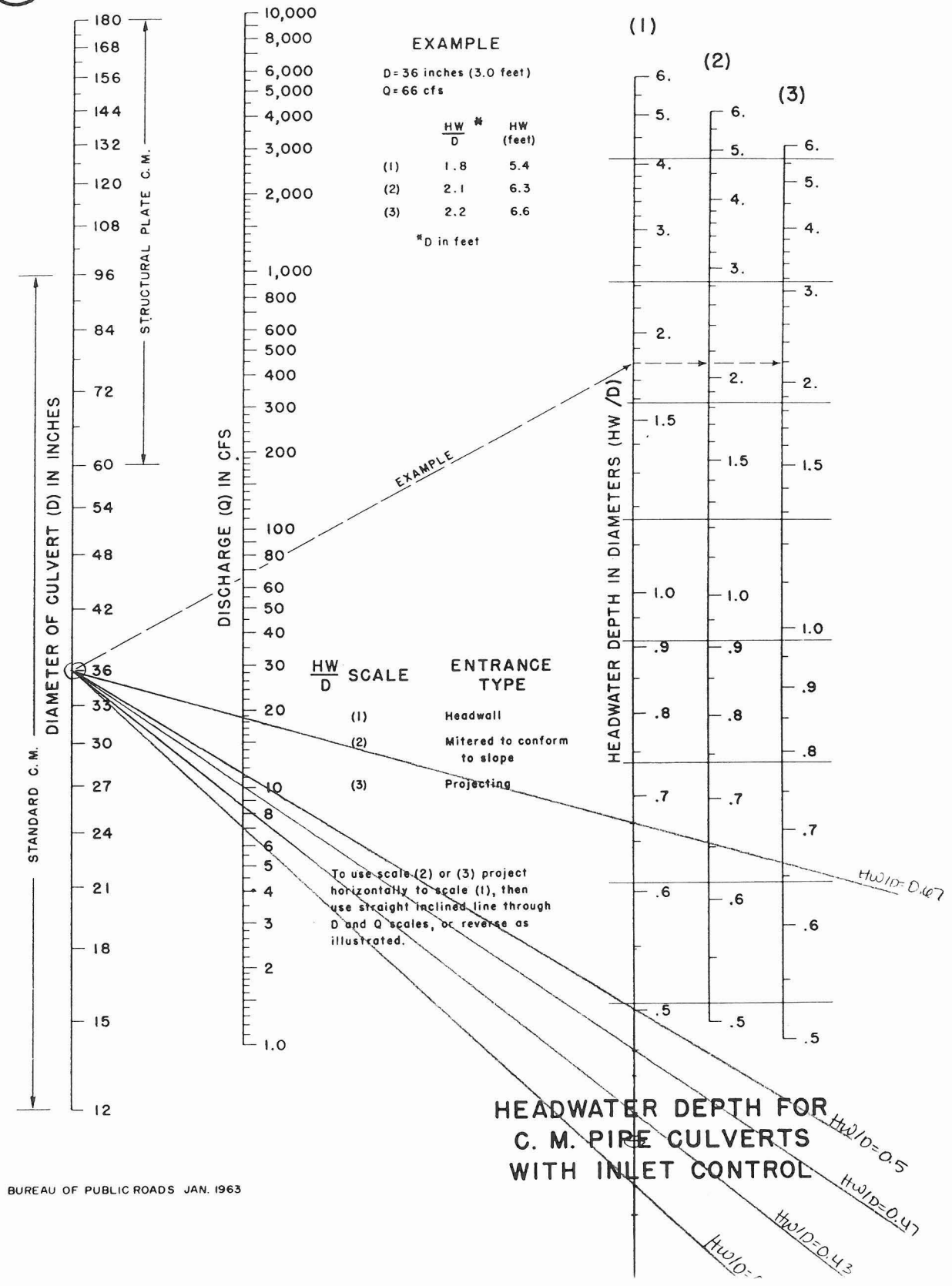
JOB NAME Palo Verde Zone A Delineation JOB NO. 310,019

Culvert #20 (2-36" CMP)

CHART 2



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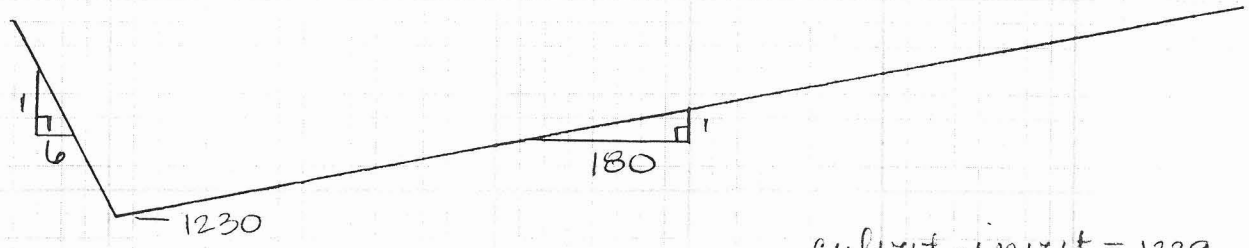
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1230)

Culvert #20 (2-36" CMP)

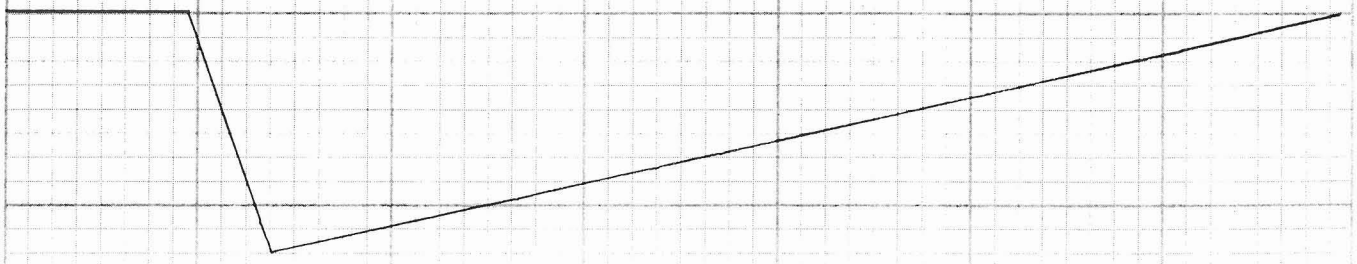


culvert invert = 1229

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0025
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

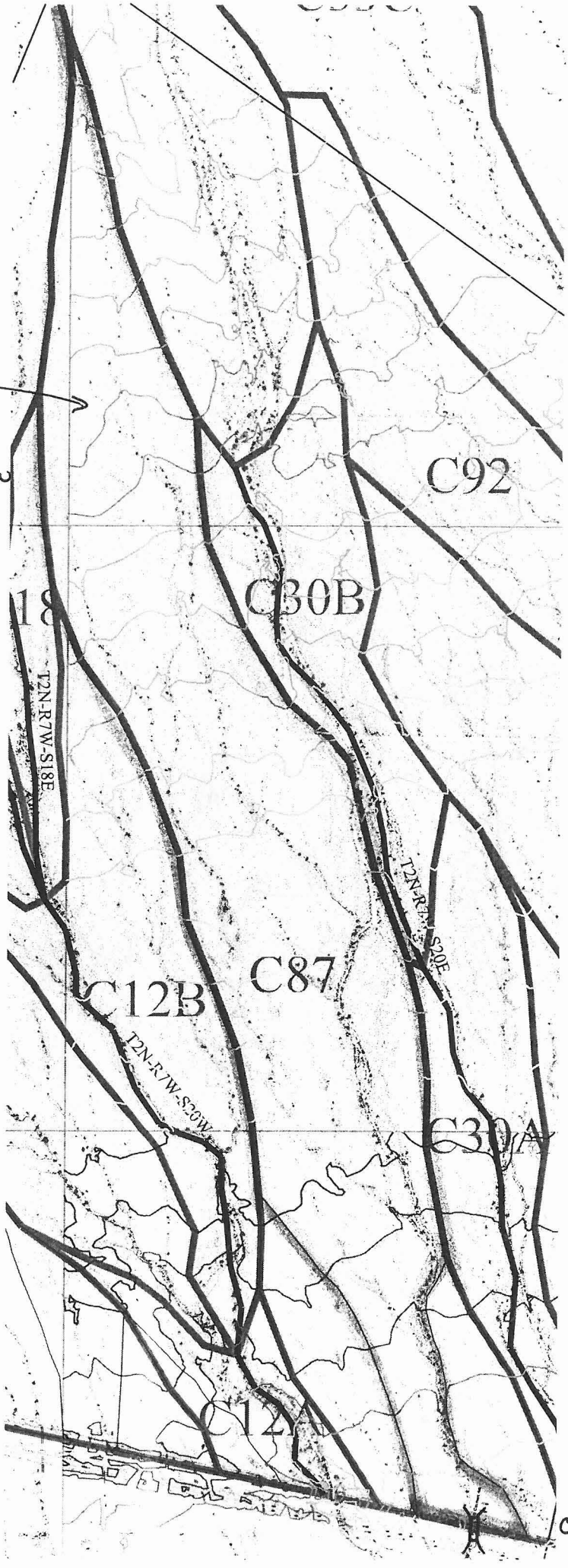
Weir Analysis (at EL >)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L + l}\right)$$



Area = 313 acres

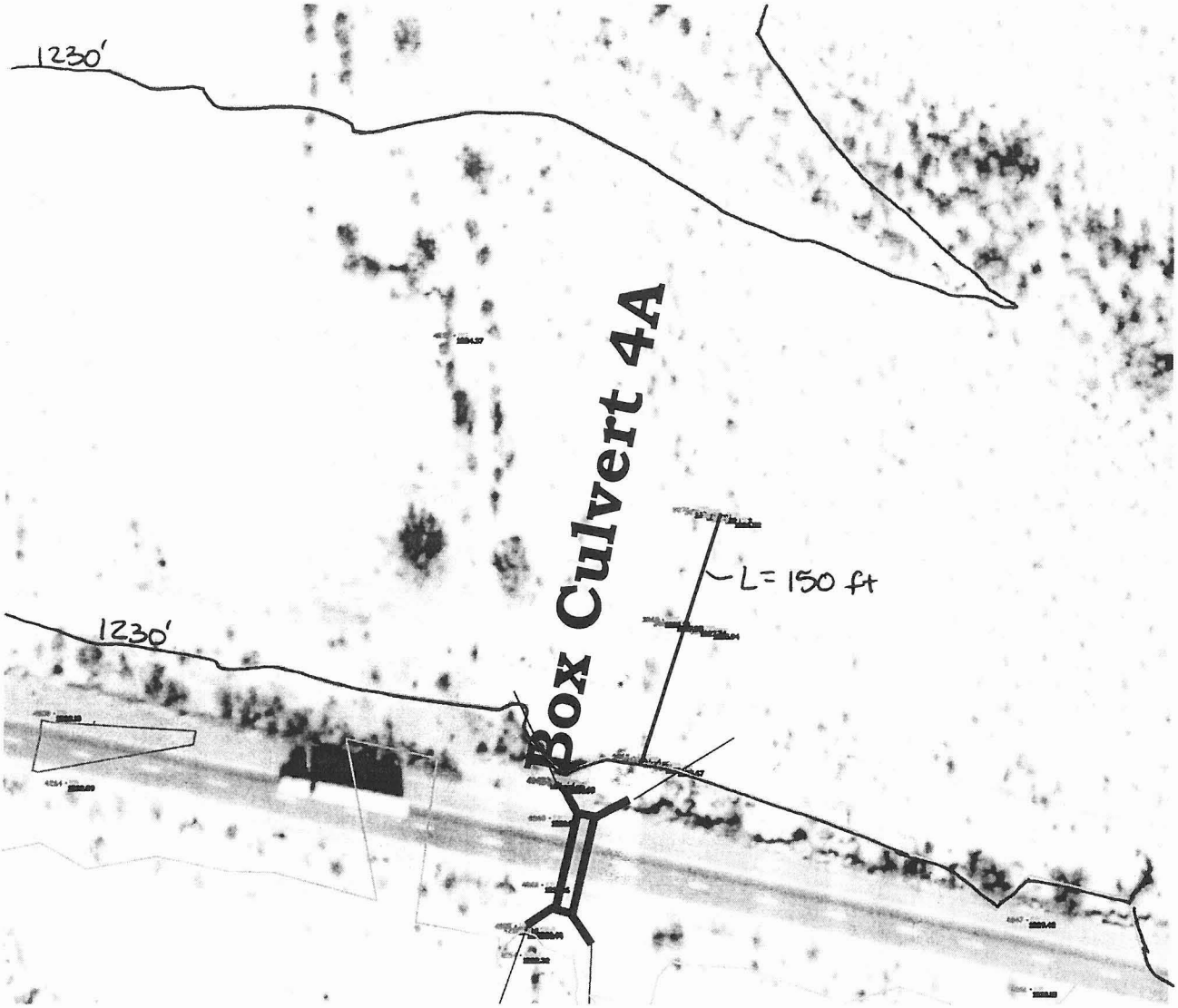
Q = 249 cfs

(Flow from Area-Flow Relationship

Q = 510 x Area (S. mi.))

culvert #21 (4A)

16' x 10' RCB



Culvert #21(4A)
(6'x10' RCB)

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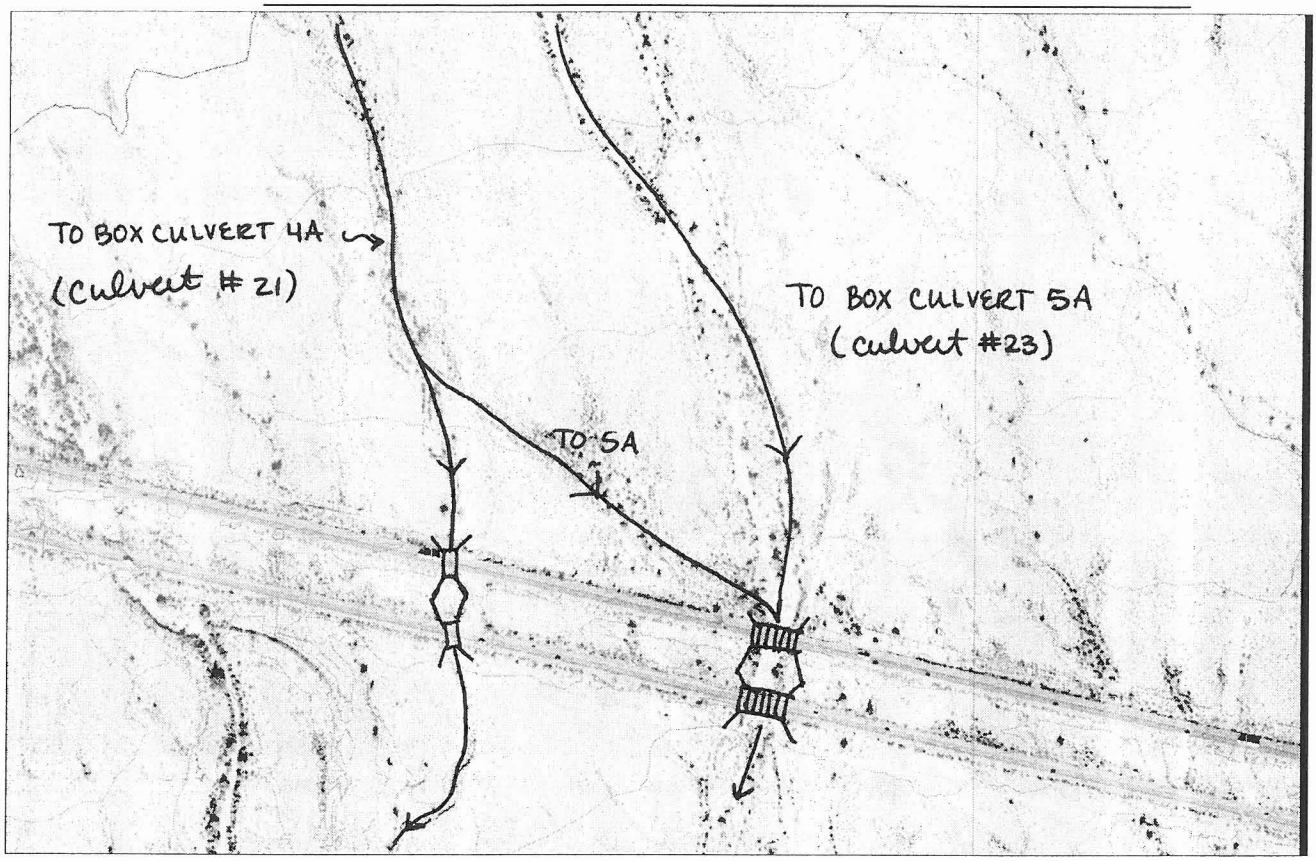
Client Flood Control District of Maricopa County (FCDMC)
Job Palo Verde Zone A floodplain delineation

JOB NO. 310.019

Split Flow Calculations

Split Point Location: Towards Culvert #21 (Box Culvert 4A)
Split Point ID: near C83-03
Split Description

Main flow-	Flow east towards Culvert #23 (Box Culvert 5A)
split flow	Flow south to Culvert #21 (Box Culvert 4A)



Diversion path 1

Description Flow east towards Culvert #23 (Box Culvert 5A)
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0025 ft/ft

Diversion Path 2

Description Flow south to Culvert #21 (Box Culvert 4A)
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0025 ft/ft

Diversion Path 3

Description 0
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = ft/ft

Split Flow Table

Split Point Location:	Towards Culvert #21 (Box Culvert 4A)	
Split Point ID:	near C83-03	
Split Description	Main flow-	Flow east towards Culvert #23 (Box Culvert 5A)
	split flow	Flow south to Culvert #21 (Box Culvert 4A)

		S =	0.0025			S=	0.0025		
Inflow	Approx. Depth	**Main flowpath**				**Diverted flowpath 1**			
		width	n value	Flow	Fow %	width	n value	Flow	Fow %
0	0.0	600	0.065	0.0		500	0.065	0.0	
23	0.2	600	0.065	12.6	55%	500	0.065	10.5	45%
46	0.3	600	0.065	25.2	55%	500	0.065	21.0	45%
69	0.4	600	0.065	37.8	55%	500	0.065	31.5	45%
92	0.4	600	0.065	50.4	55%	500	0.065	42.0	45%
115	0.5	600	0.065	63.0	55%	500	0.065	52.5	45%
139	0.5	600	0.065	75.6	55%	500	0.065	63.0	45%
162	0.6	600	0.065	88.2	55%	500	0.065	73.5	45%
185	0.6	600	0.065	100.8	55%	500	0.065	84.0	45%
208	0.7	600	0.065	113.4	55%	500	0.065	94.5	45%
231	0.7	600	0.065	126.0	55%	500	0.065	105.0	45%
254	0.8	600	0.065	138.5	55%	500	0.065	115.5	45%

Flow from upstream	254	
Flow remaining after div.	**139**	55%
Flow diverted at south div.	115	
Total Div. flow	**115**	45%

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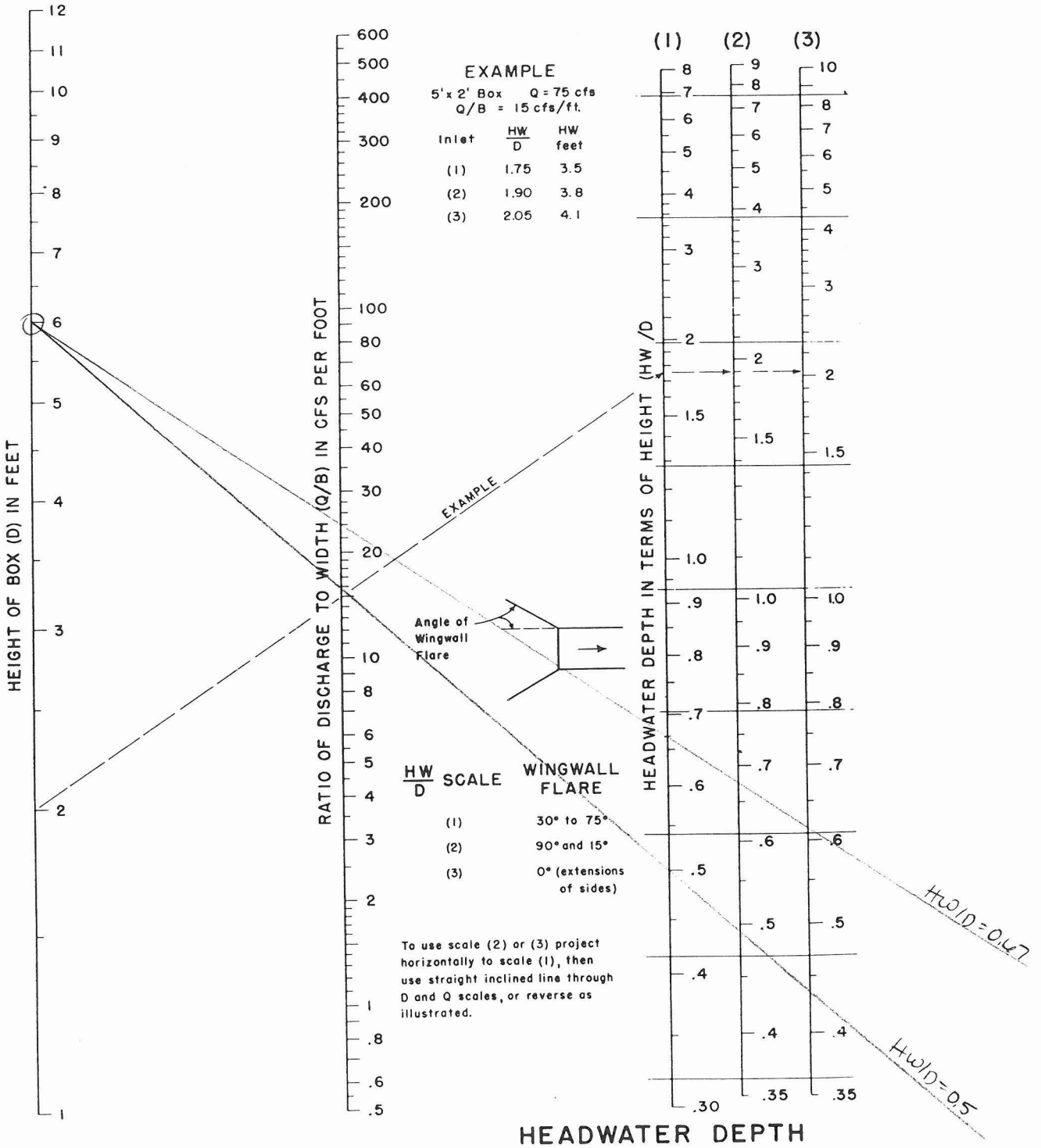
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #21 (4A)
(6'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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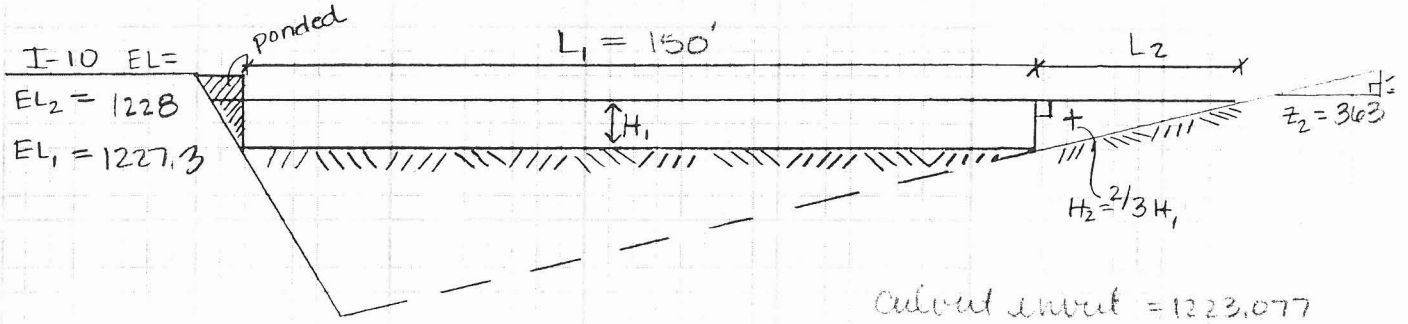
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1227.3)

Culvert #21 (3-4)
(6'x10' RCB)



Culvert invert = 1223.077

$H_1 = E_2 - E_1 = 1228 - 1227.25 = 0.75$ ft

$L_2 = H_1 Z_2 = (0.75)(3) = 2.25$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.75) = 0.5$ ft

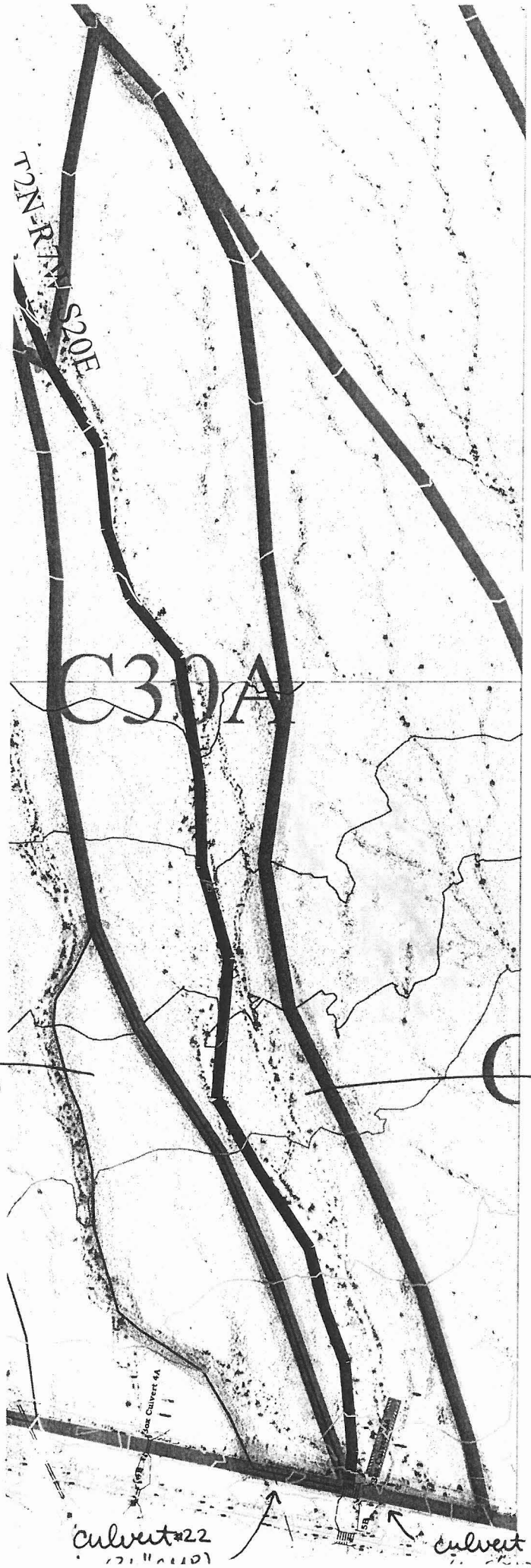
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(150)(0.75) + (2.25)(0.5)}{150 + 2.25} = 0.589$ ft

$L_T = L_1 + L_2 = 150 + 2.25 = 152.25$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (152.25)(0.589)^{1.5} = 185$ cfs

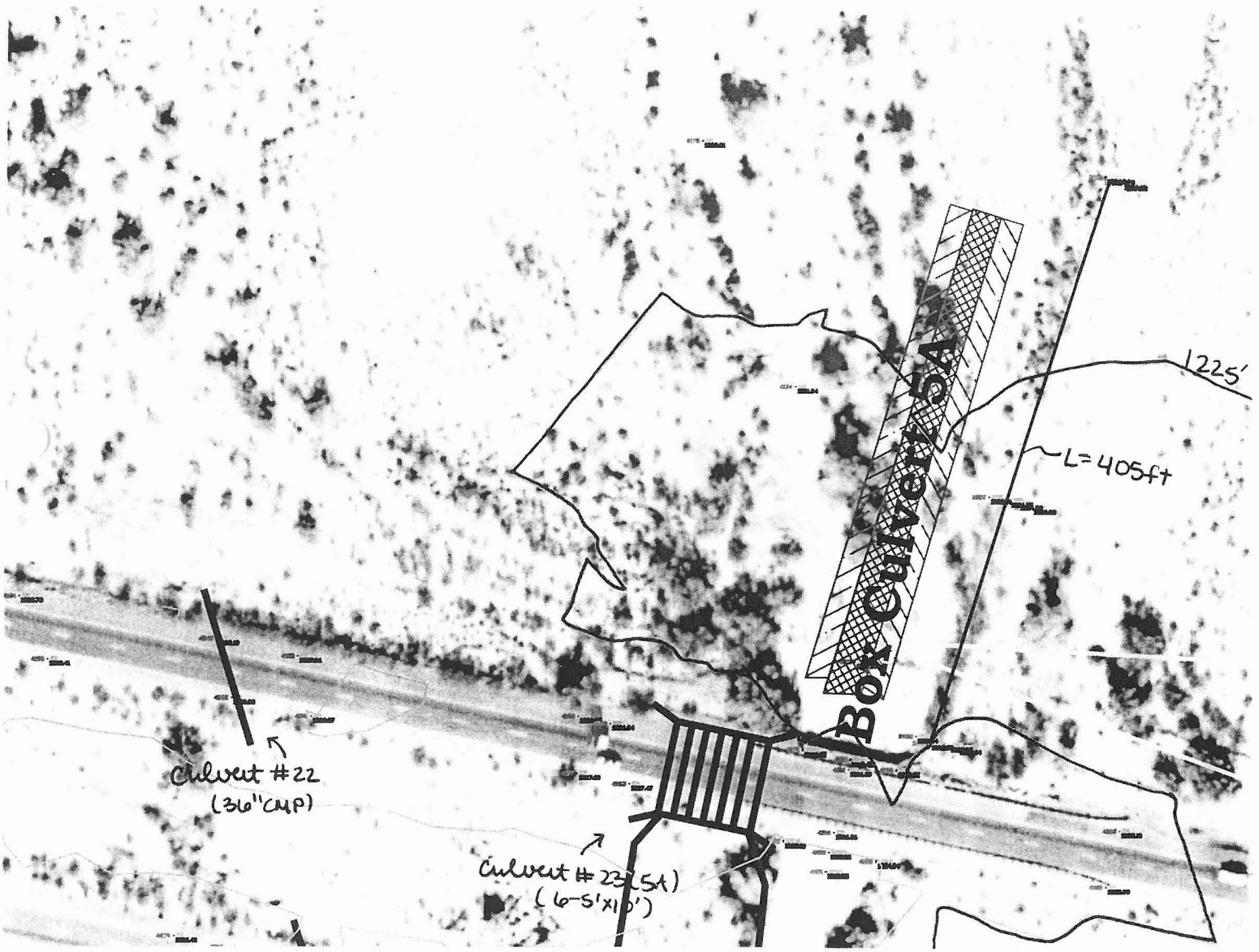


Area$_1$ = 25.8 acres

Area$_2$ = 1063.7 acres

Total Area = 25.8 + 1063.7
= 1089.47 acres

Total Flow = 868 cfs
(Flow calculated from
Area-Flow Relationship
Q = 510 × Area (s.mi.)]


Box Culvert 5A
1225'
L=405ft
Culvert #22
(36"CMP)
Culvert #23 (5A)
(6-5'x10')

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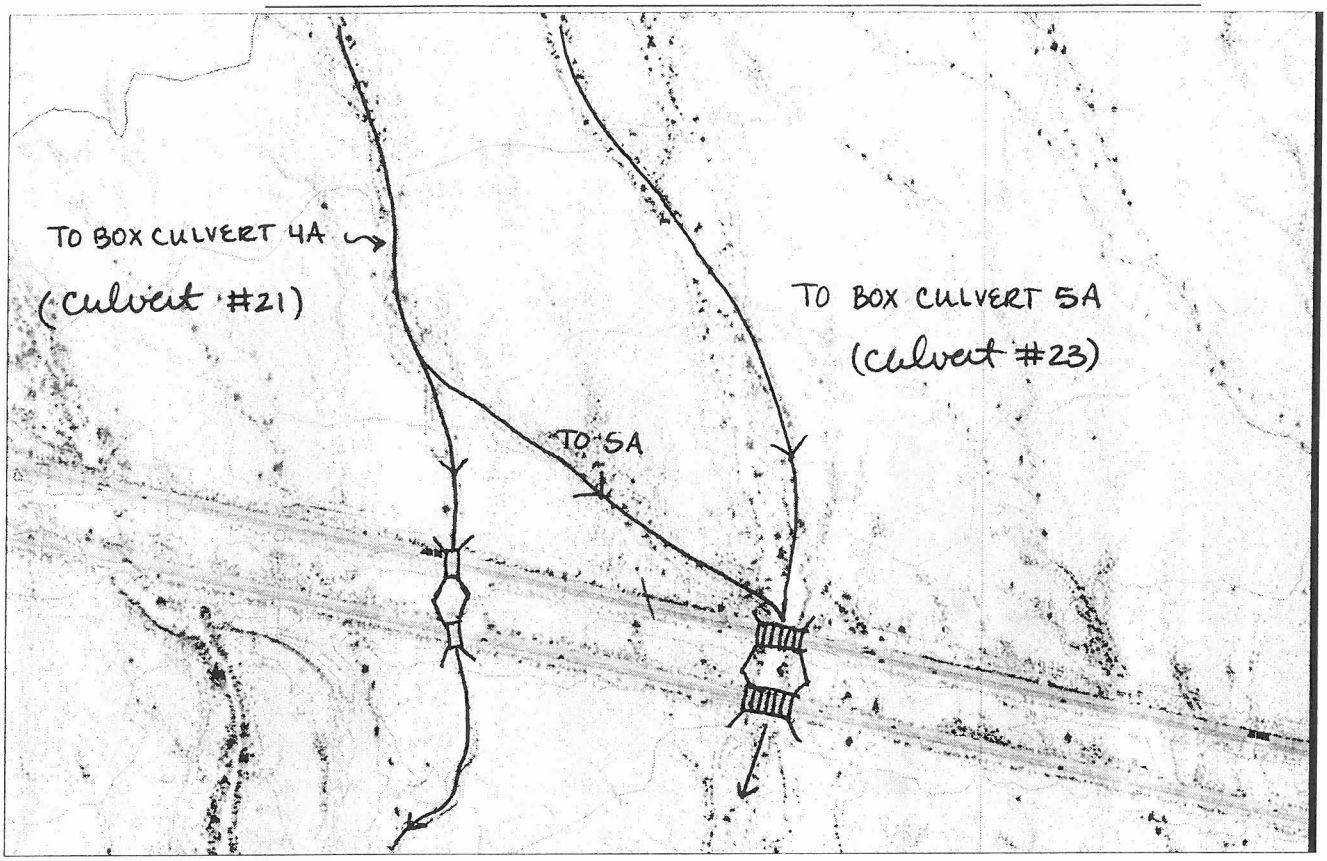
Client Flood Control District of Maricopa County (FCDMC)
Job Palo Verde Zone A floodplain delineation

JOB NO. 310.019

Split Flow Calculations

Split Point Location: Towards Culvert #21 (Box Culvert 4A)
Split Point ID: near C83-03
Split Description

Main flow-	Flow east towards Culvert #23 (Box Culvert 5A)
split flow	Flow south to Culvert #21 (Box Culvert 4A)



Diversion path 1

Description Flow east towards Culvert #23 (Box Culvert 5A)
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0025 ft/ft

Diversion Path 2

Description Flow south to Culvert #21 (Box Culvert 4A)
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0025 ft/ft

Diversion Path 3

Description 0
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = ft/ft

Split Flow Table

Split Point Location:	Towards Culvert #21 (Box Culvert 4A)	
Split Point ID:	near C83-03	
Split Description	Main flow-	Flow east towards Culvert #23 (Box Culvert 5A)
	split flow	Flow south to Culvert #21 (Box Culvert 4A)

		S =	0.0025			S=	0.0025		
Inflow	Approx. Depth	**Main flowpath**				**Diverted flowpath 1**			
		width	n value	Flow	Fow %	width	n value	Flow	Fow %
0	0.0	600	0.065	0.0		500	0.065	0.0	
23	0.2	600	0.065	12.6	55%	500	0.065	10.5	45%
46	0.3	600	0.065	25.2	55%	500	0.065	21.0	45%
69	0.4	600	0.065	37.8	55%	500	0.065	31.5	45%
92	0.4	600	0.065	50.4	55%	500	0.065	42.0	45%
115	0.5	600	0.065	63.0	55%	500	0.065	52.5	45%
139	0.5	600	0.065	75.6	55%	500	0.065	63.0	45%
162	0.6	600	0.065	88.2	55%	500	0.065	73.5	45%
185	0.6	600	0.065	100.8	55%	500	0.065	84.0	45%
208	0.7	600	0.065	113.4	55%	500	0.065	94.5	45%
231	0.7	600	0.065	126.0	55%	500	0.065	105.0	45%
254	0.8	600	0.065	138.5	55%	500	0.065	115.5	45%

Flow from upstream	254	
Flow remaining after div.	**139**	55%
Flow diverted at south div.	115	
Total Div. flow	**115**	45%

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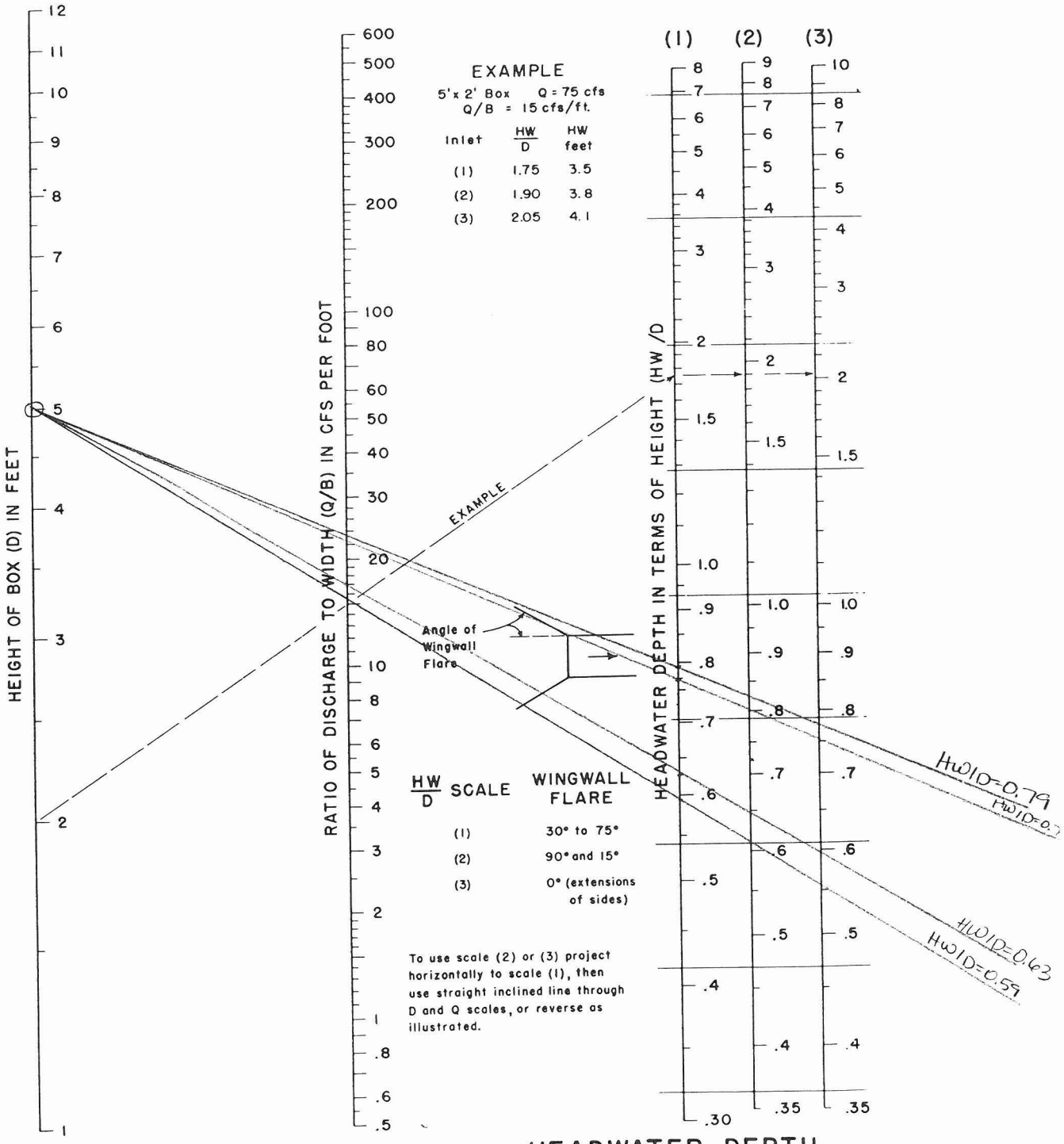
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #23(SA)
6-5'x10' RCB

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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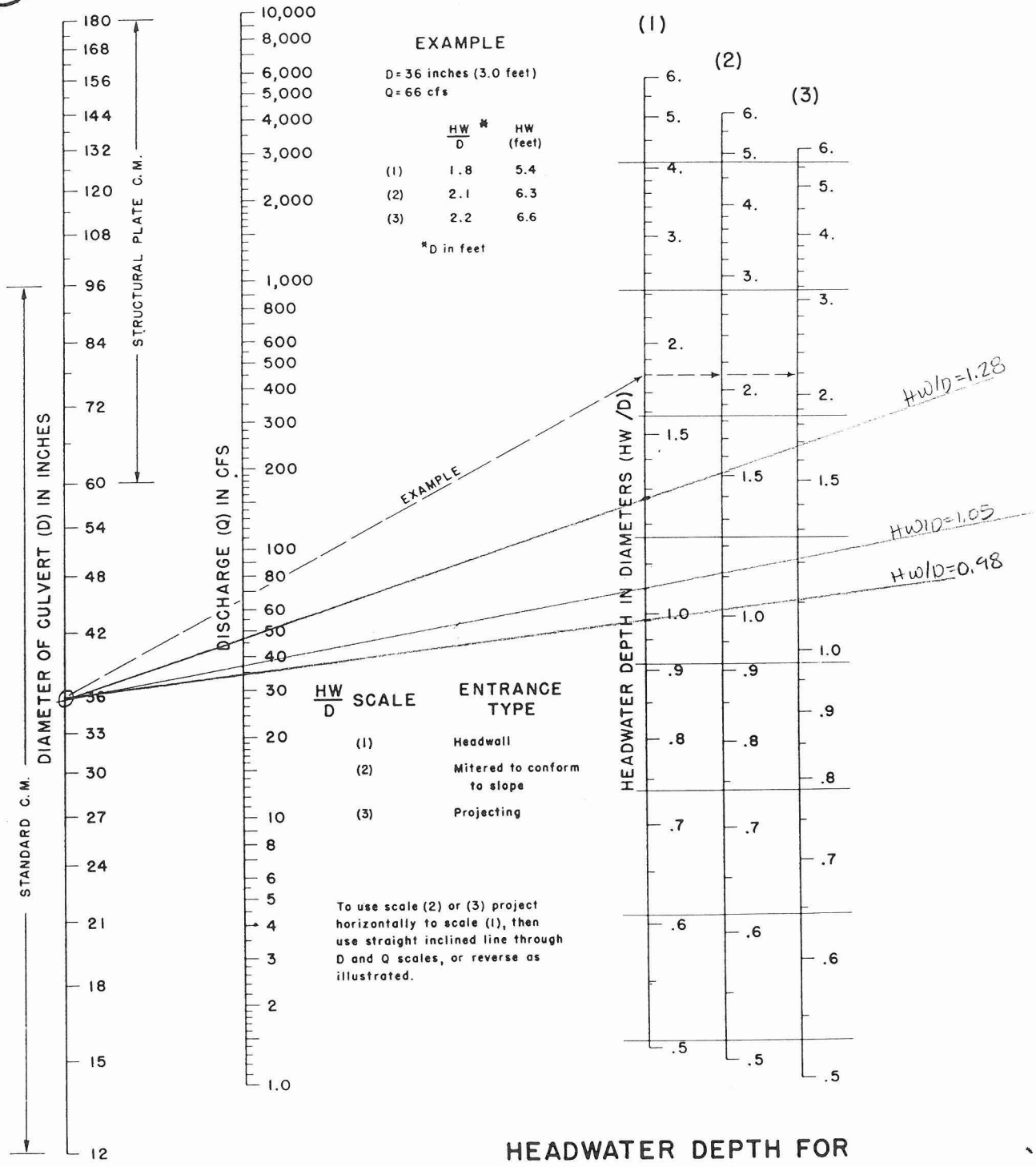
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.C19

culvert #22 (36" CMP)

CHART 2



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

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Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	5' x 10' RCB Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
22 and	1-36" CMP	1219.06							**
23 (5A)	6-5' x 10' RCB	1222	2.94	0.98	35	0.588	15.30	918	953
		1222.2	3.14	1.05	37	0.628	16.90	1014	1051
		1222.9	3.84	1.28	47	0.768	22.30	1338	1385

These flows were added to the main spreadsheet.

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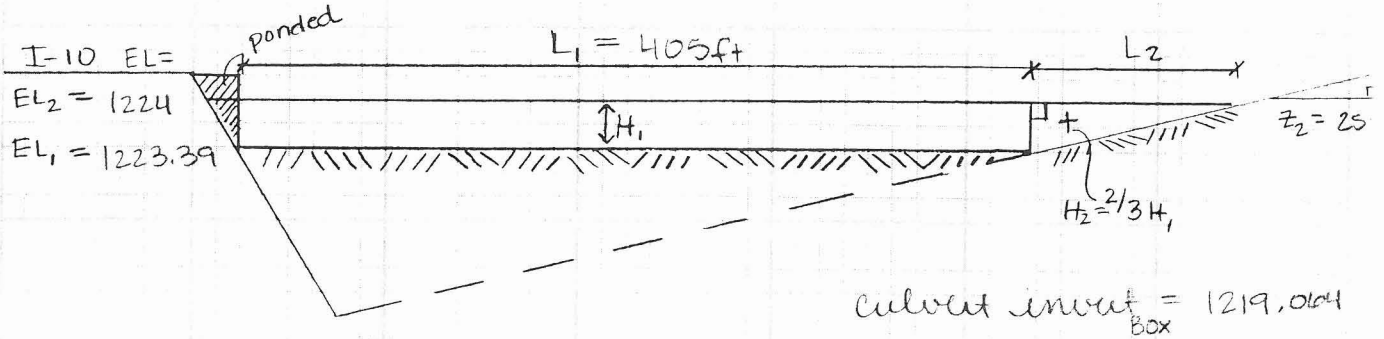
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert # 22 and culvert # 22 (SA)

Weir Analysis (at EL > 1223.39)



culvert invert$_{Box}$ = 1219.064

(culvert invert$_{CMP}$ = 1223 assume same invert as box culvert = 1219.064

$H_1 = E_2 - E_1 = 1224 - 1223.39 = 0.61$

$L_2 = H_1 Z_2 = (0.61)(250) = 152.50$

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.61) = 0.41067$

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(405)(0.61) + (152.50)(0.4067)}{405 + 152.50}$

$= 0.55$

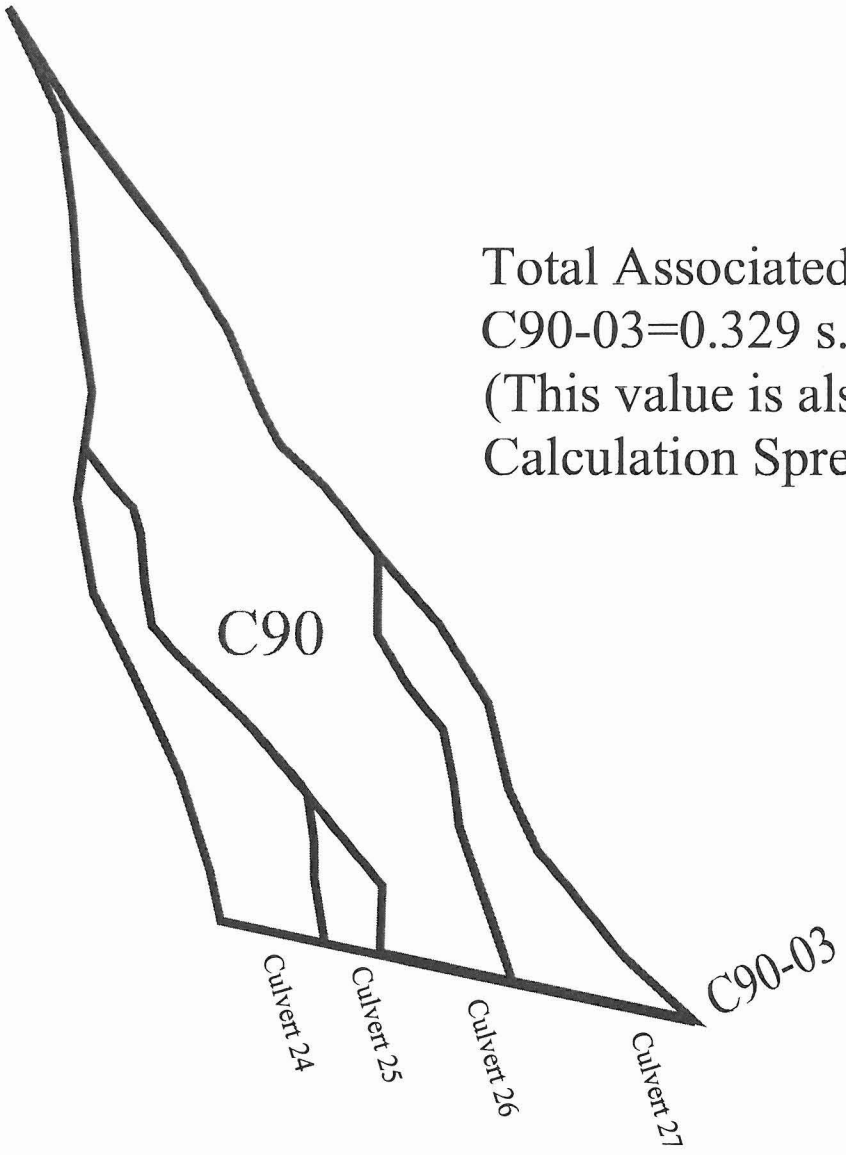
$L_T = L_1 + L_2 = 405 + 152.50 = 557.5$

Weir Flow $Q = C L_T \overline{H}^{1.5}$

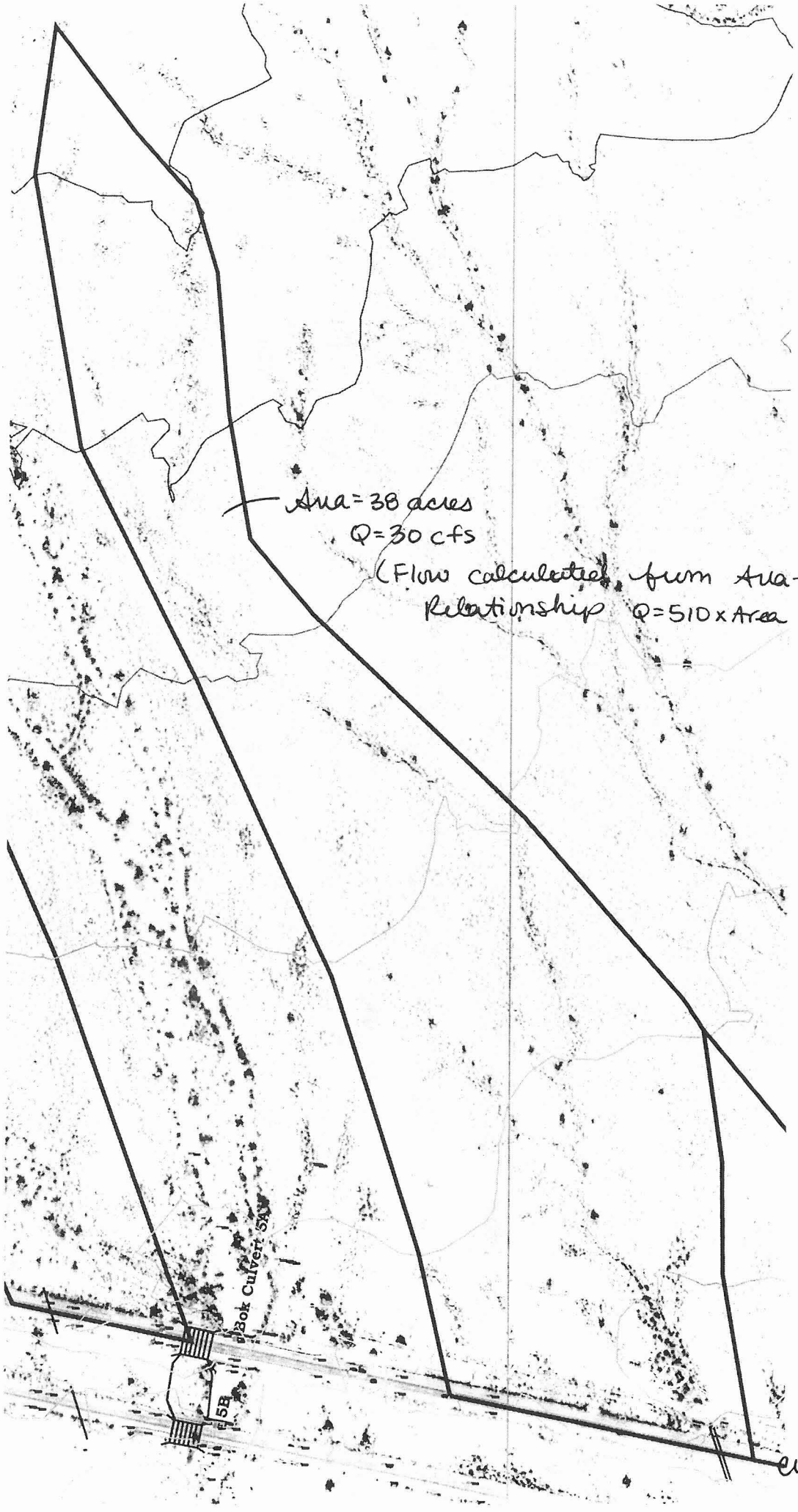
$C = 2.7$

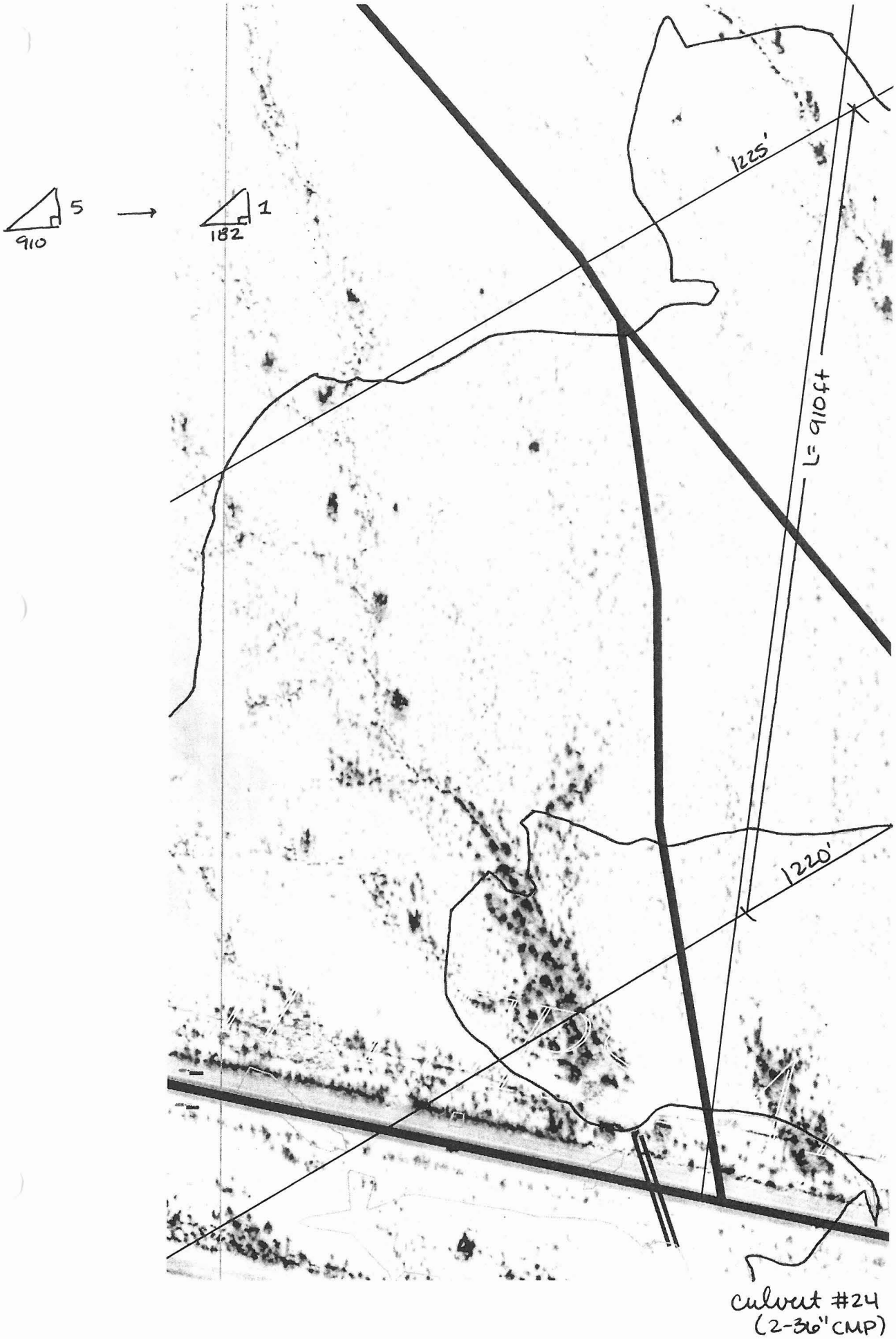
$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (557.5)(0.554)^{1.5} = 621$ cfs

*These two culverts will be analyzed together at the same invert.



Total Associated Area to
C90-03=0.329 s.mi.=211 acres
(This value is also shown on the Flow Calculation Spreadsheet)


Area = 38 acres
Q = 30 cfs
(Flow calculated from Area-Flow Relationship Q = 510 x Area [s.mi.])
Bok Culvert SR
5B
culvert #24
(2-36" CMP)


5
910
1
182
1225'
L= 910ft
1220'
culvert #24
(2-36" CMP)

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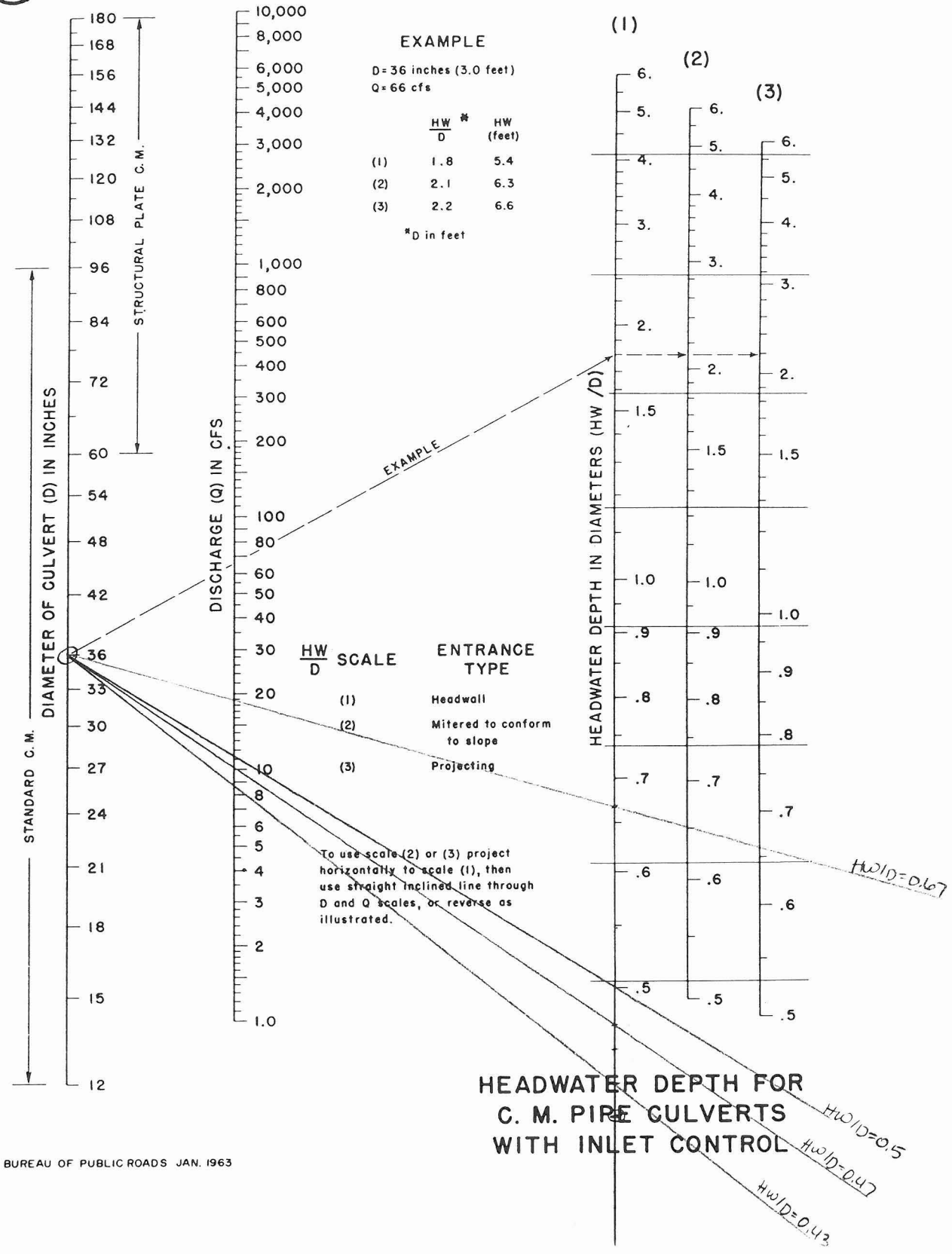
JOB NAME Palo Verde Area Delineation JOB NO. 810.019

culvert #24 (2-36" CMP)

CHART 2



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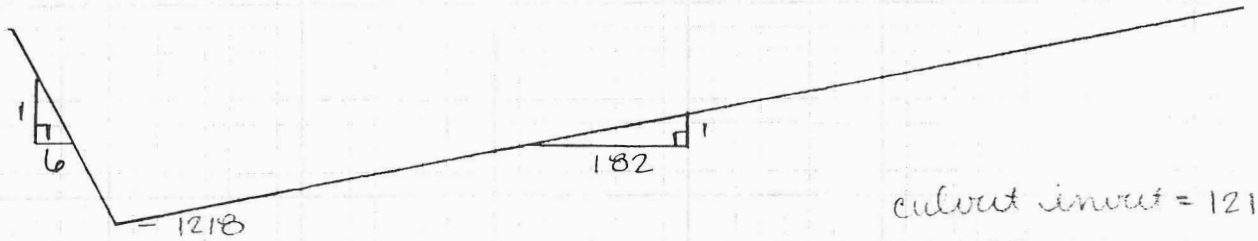
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1218) culvert # 24 (2-36" CMP)

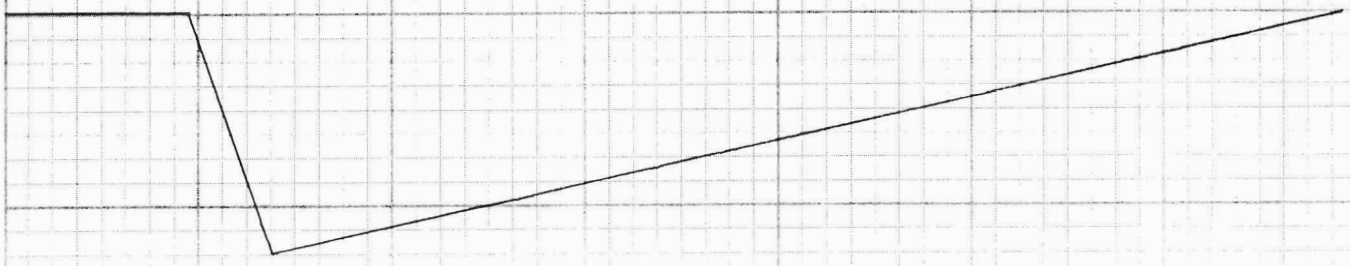


culvert invert = 1217

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0055
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

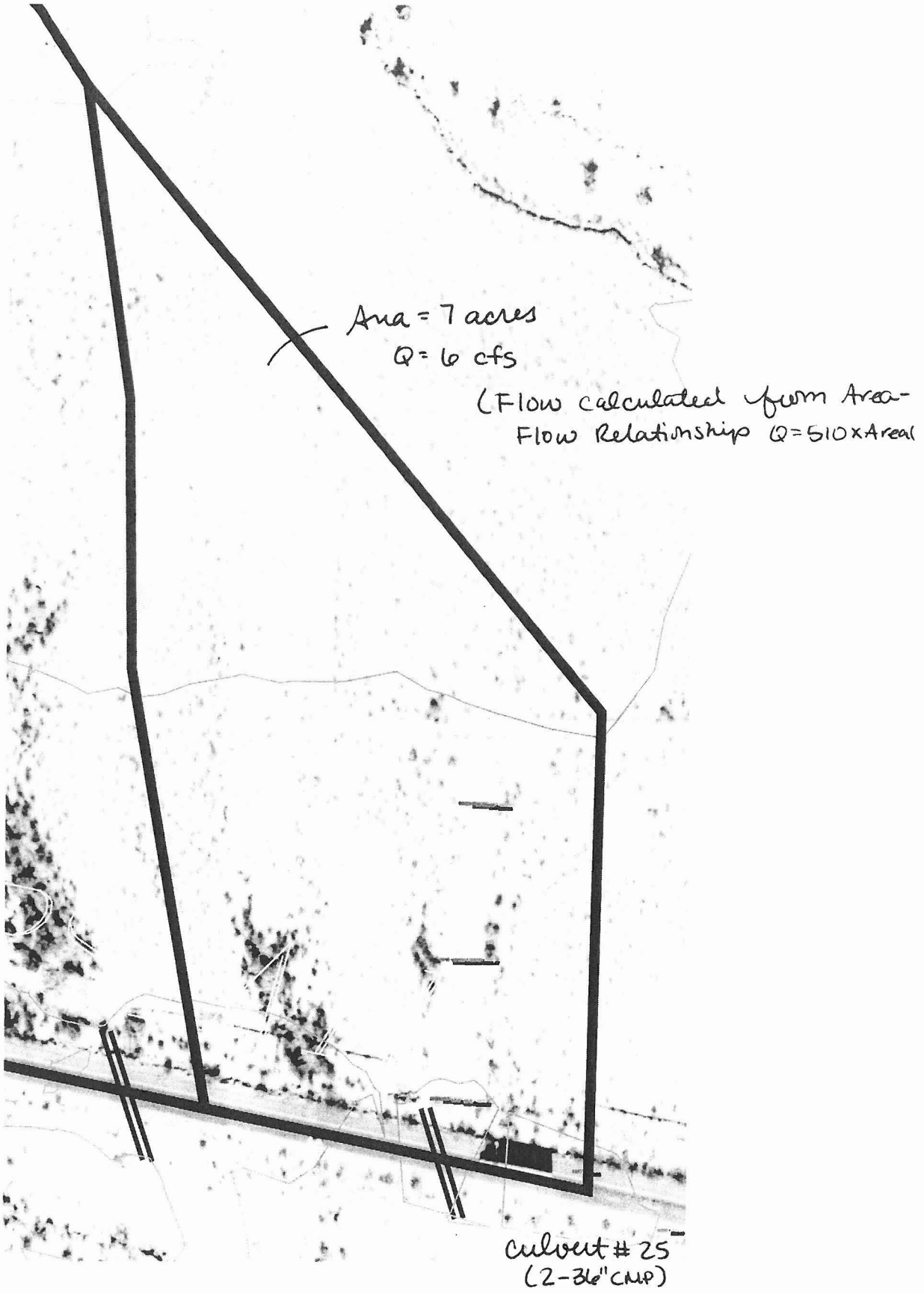
Weir Analysis (at EL>)

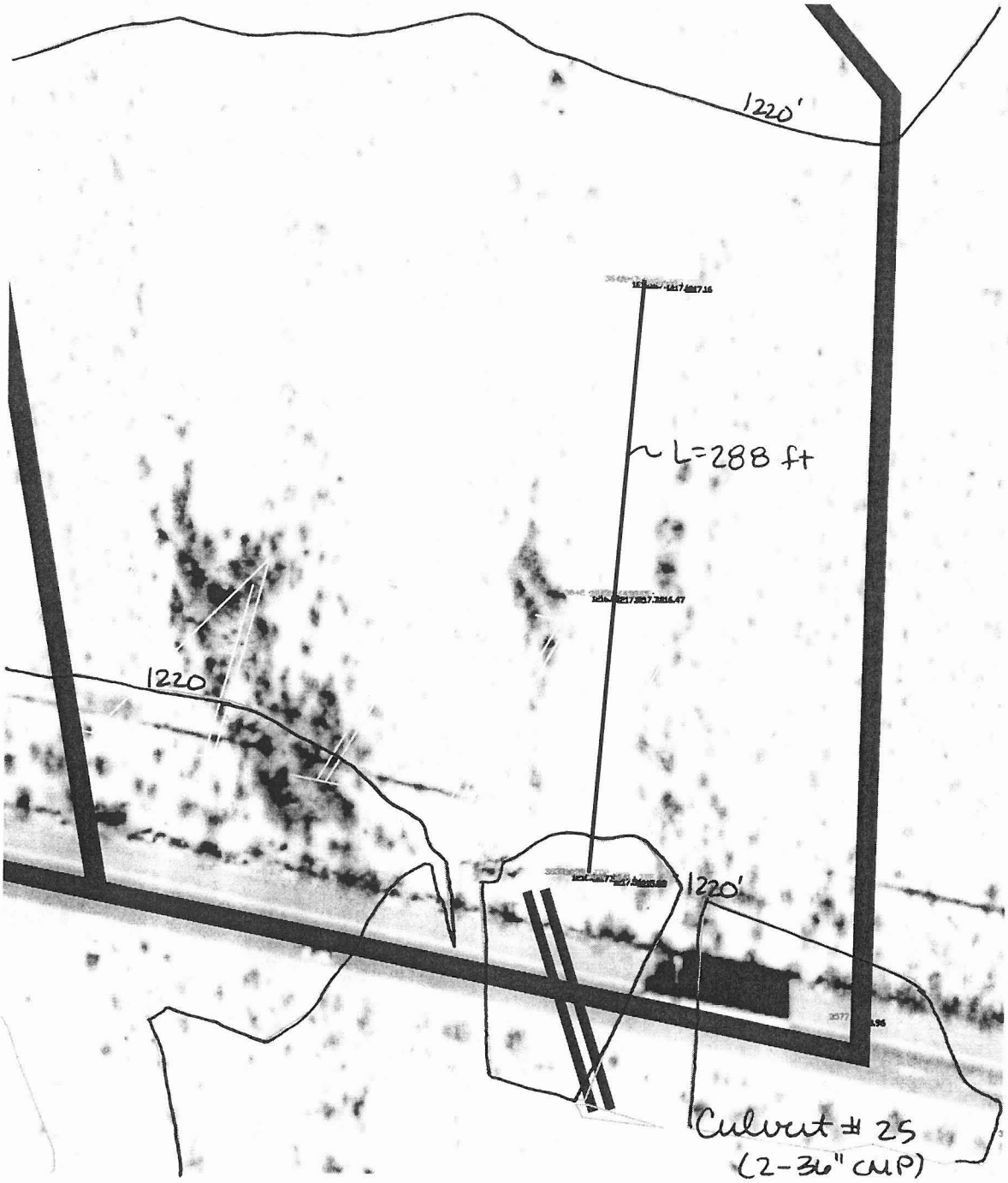


$$Q = C L H^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


Area = 7 acres
Q = 6 cfs
(Flow calculated from Area-Flow Relationship Q = 510 x Area)
Culvert # 25
(2-36" CMP)


1220'
~L=288 ft
1220
1220'
Culvert #25
(2-36" CMP)

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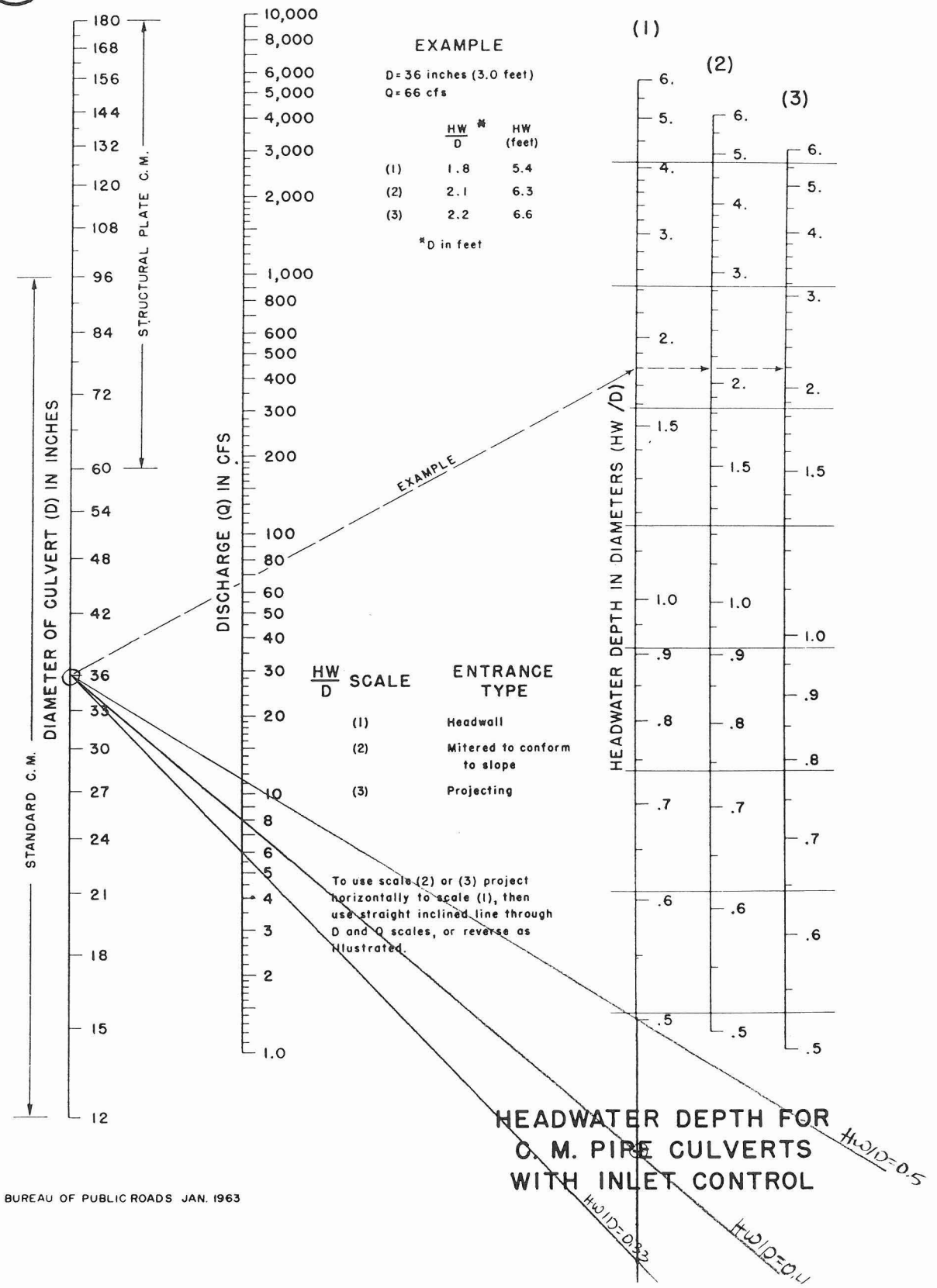
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert = 35 (2-26' CMP)

CHART 2



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

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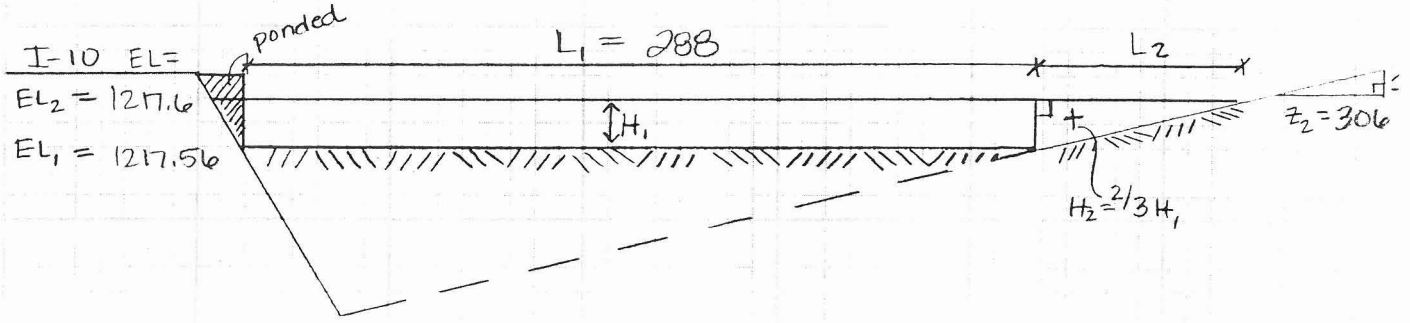
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1217.56)

culvert #25
(2-36" CMP)



culvert invert = 1216

$H_1 = E_2 - E_1 = 1217.6 - 1217.56 = 0.04$

$L_2 = H_1 Z_2 = (0.04)(306) = 12.24$

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.04) = 0.026667$

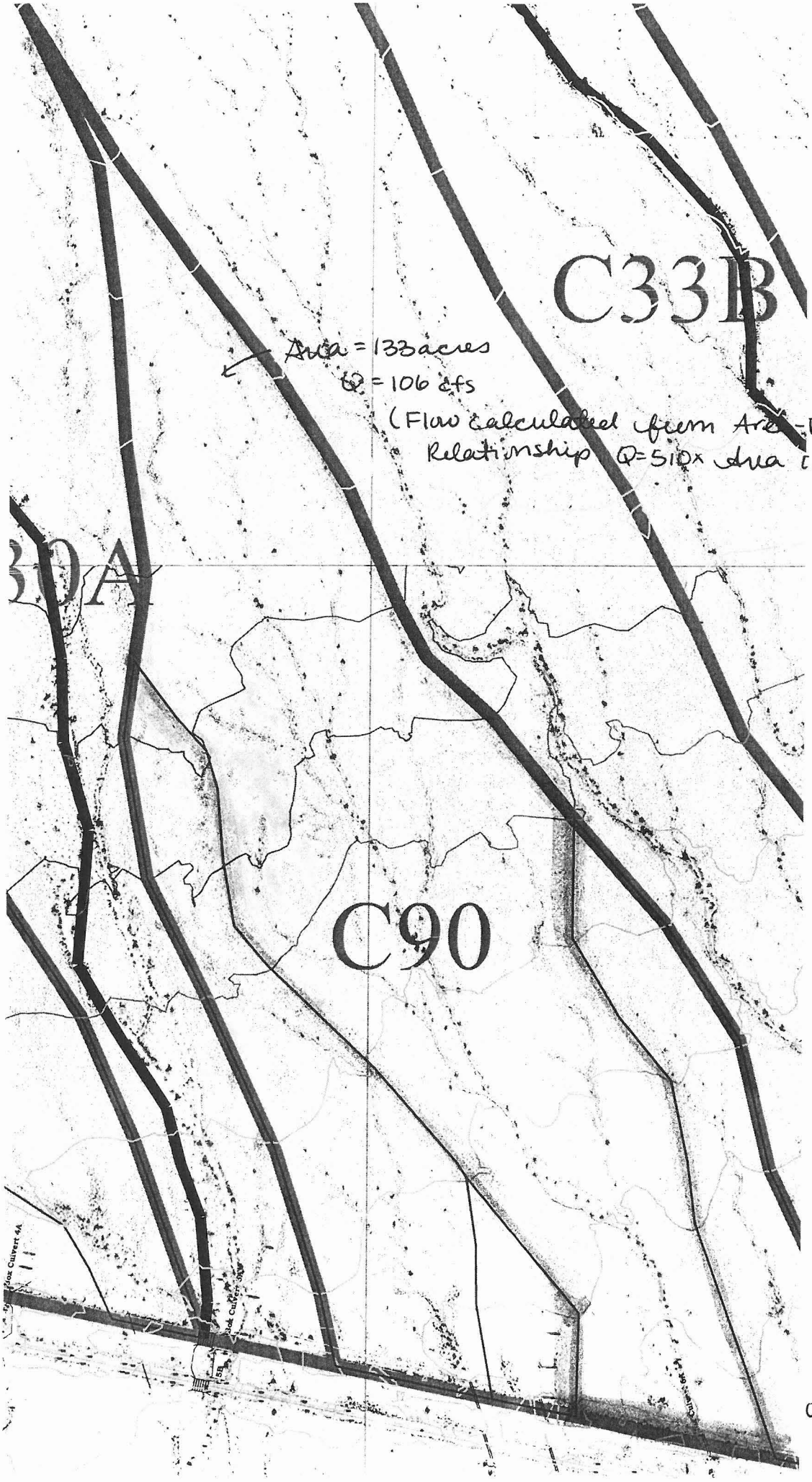
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(288)(0.04) + (12.24)(0.026667)}{288 + 12.24} = 0.03$

$L_T = L_1 + L_2 = 288 + 12.24 = 300.24$

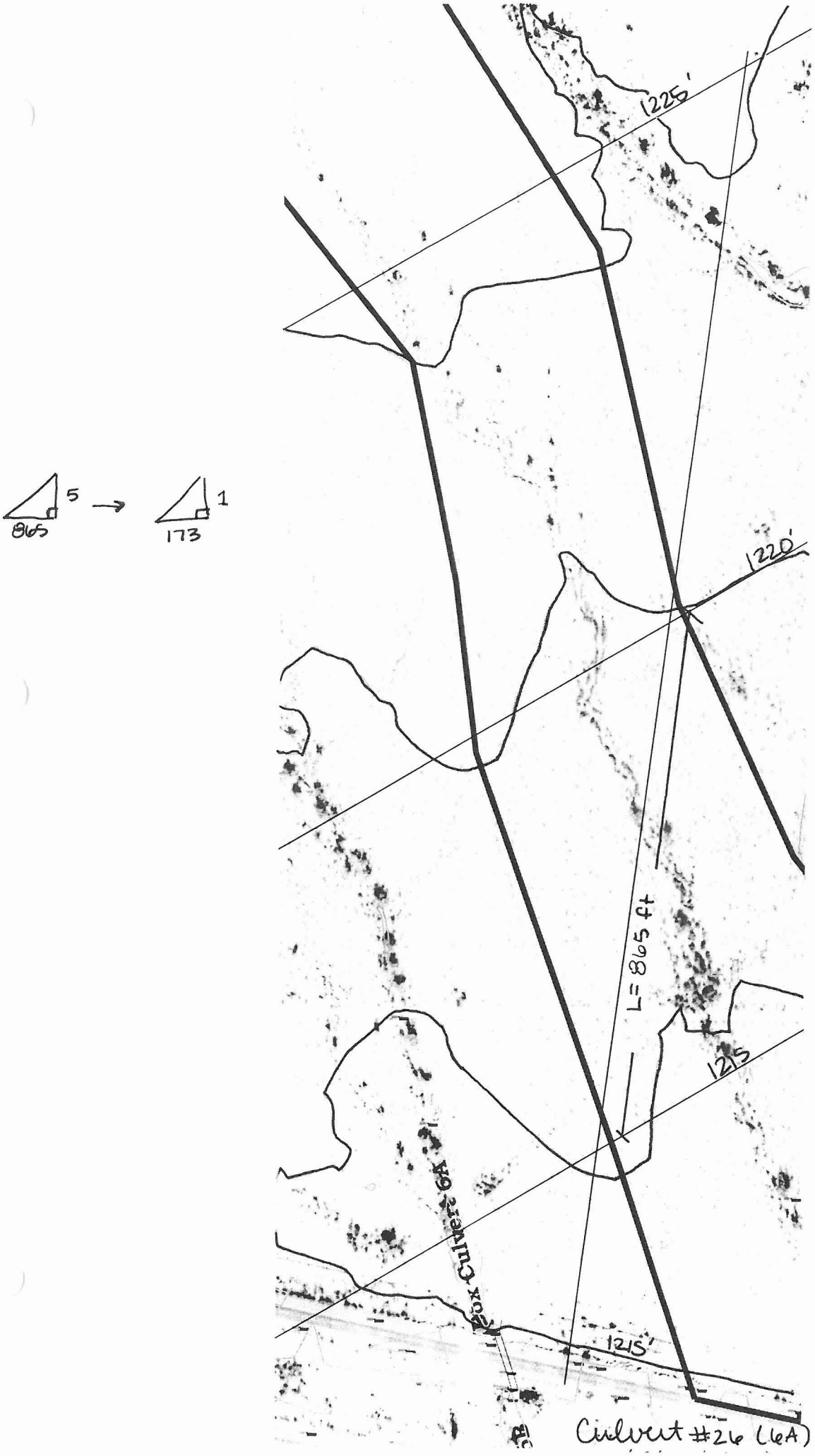
Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (300.24)(0.0395)^{1.5} = 6.36 \text{ cfs}$



culvert #2616
(8'x10' RCB)


5
865
1
173
1225'
220'
L=865 ft
125
Box Culvert 6x4
125'
Culvert #26 (16A)

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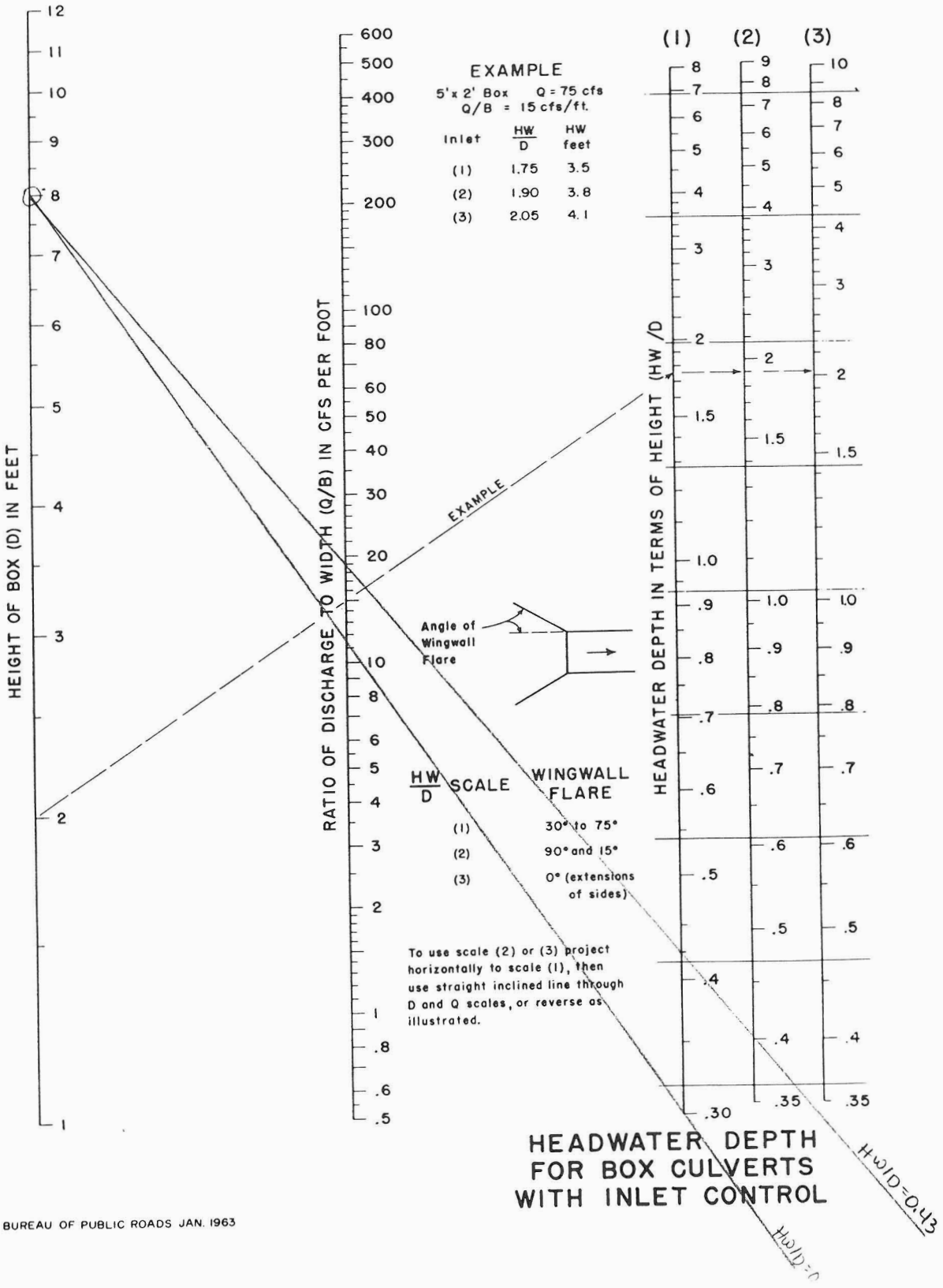
Culvert #26 (6A)
(8'x10' RCB)

CHART 8



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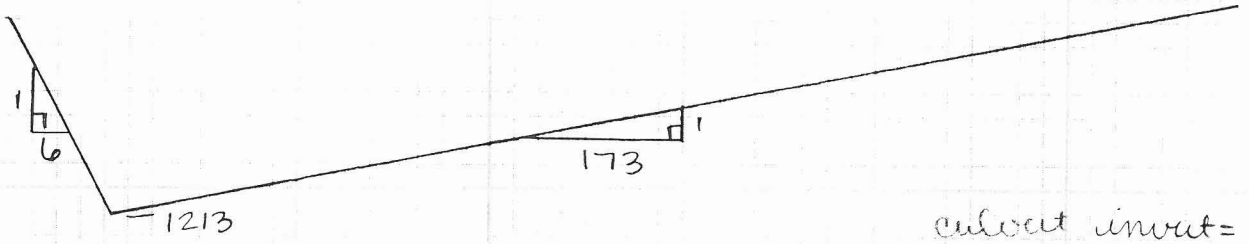
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1213)

Culvert #26 (16A)
(8'x10' RCB)

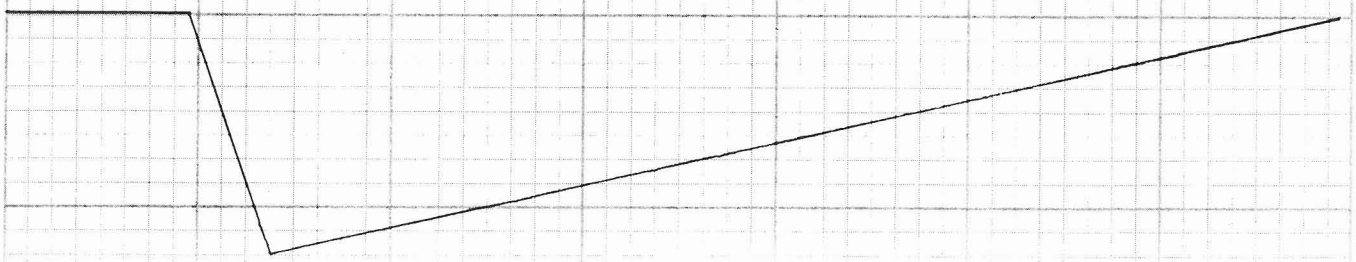


culvert invert = 121

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0055
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL >)

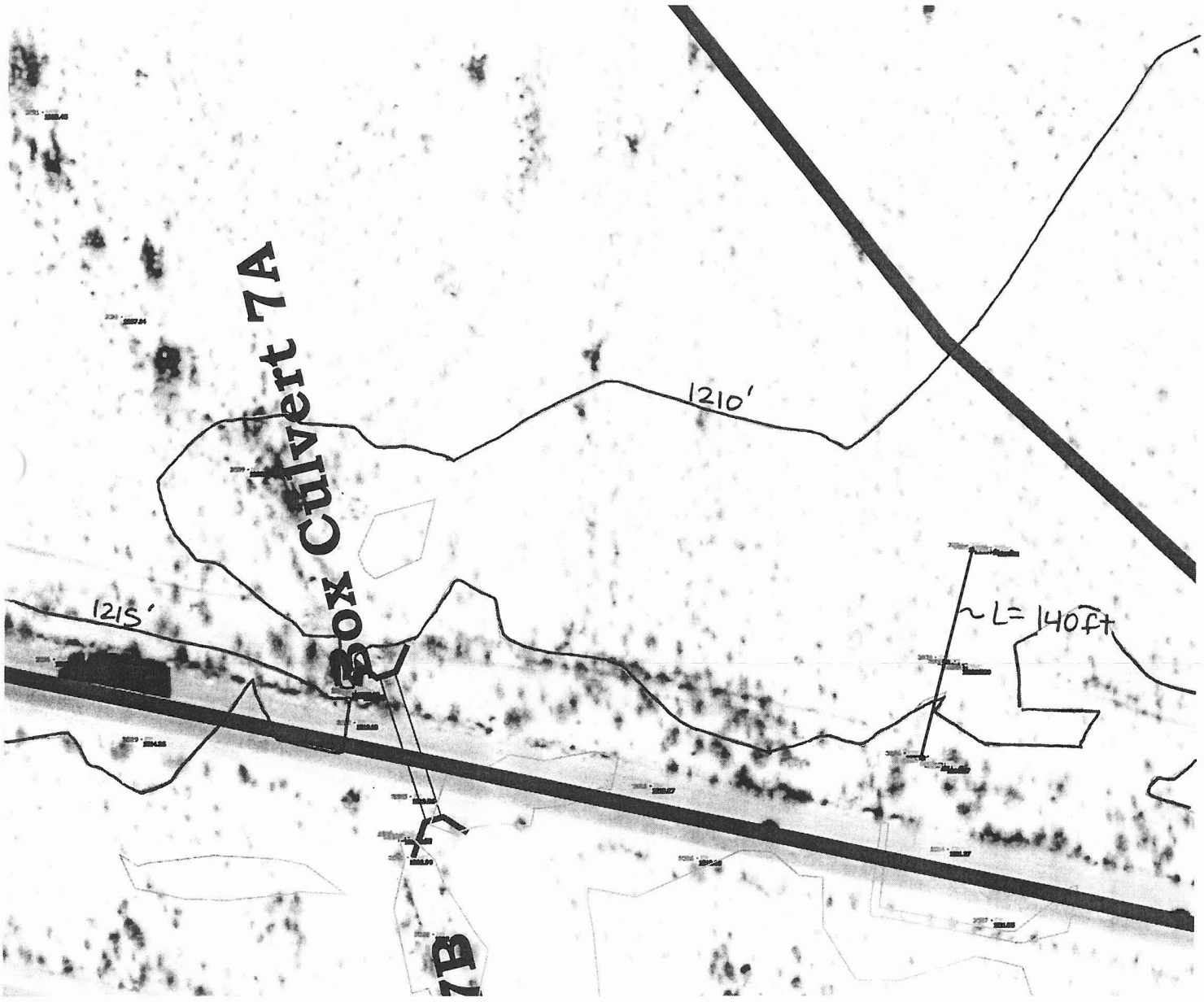


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(2/3\,\bar{H})}{L+\ell}\right)$$

~ Area = 33 acres
Q = 26 cfs
(Flow calculated from Area-Flow Relationship Q = 510 x Area [s.mi²])
Box Culvert 6A
Box Culvert 7A
Culvert #27 (74)
(6'x6' RCB)



Culvert # 27(7A)
(6'x6' RCB)

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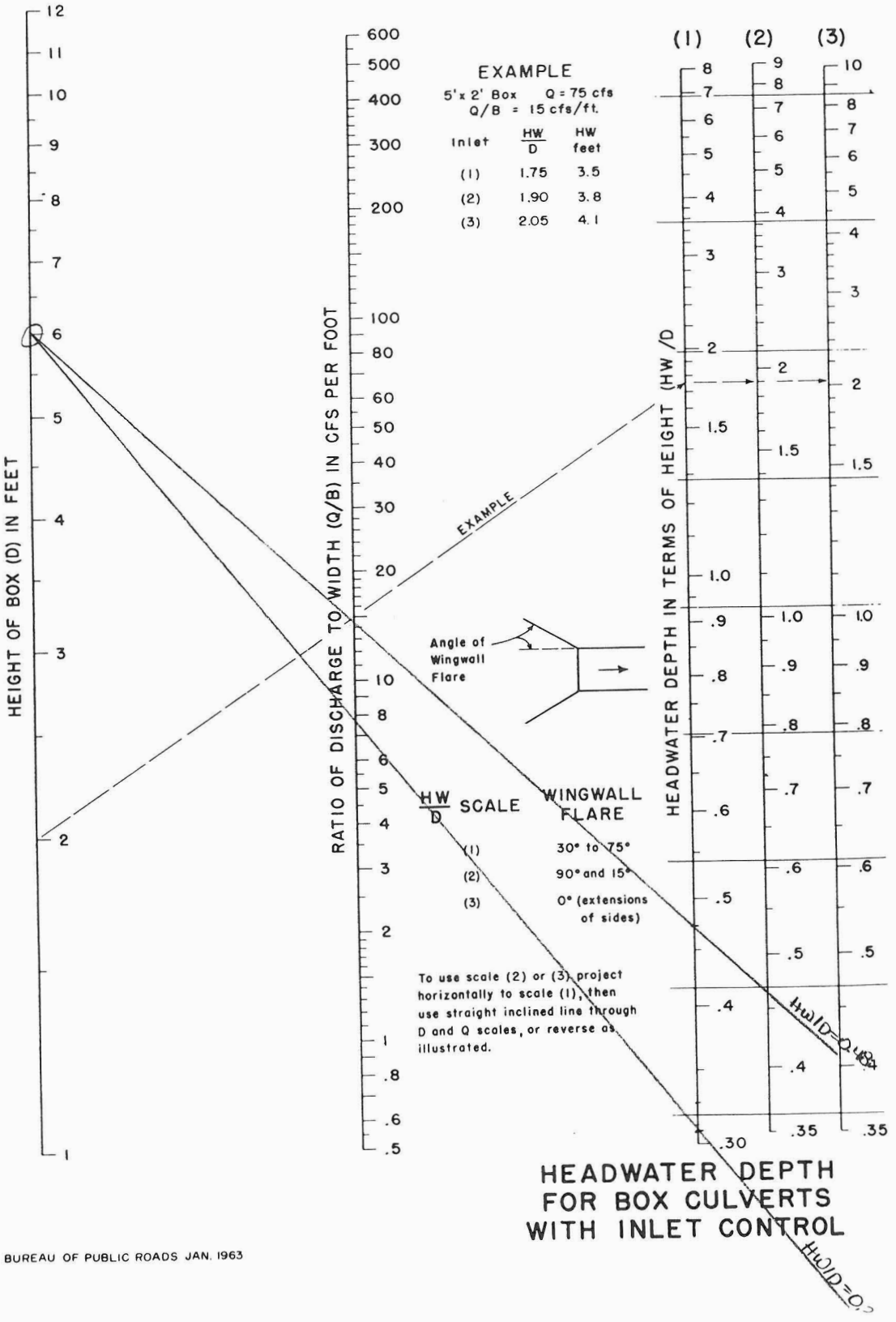
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #27 (7A)
(6'x6' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

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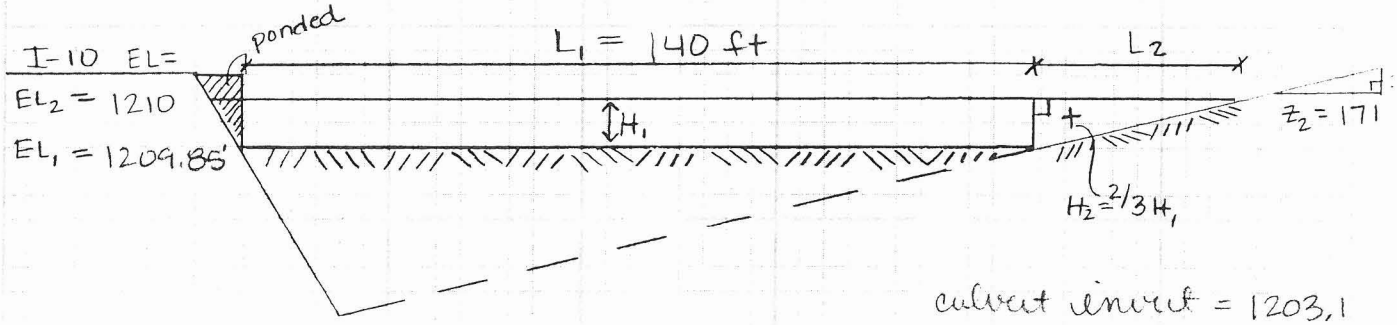
culvert #27(7A)
(6'x6' RCB)

Weir Analysis (at EL > 1209.85)



culvert invert = 1203.1

$H_1 = E_2 - E_1 = 1210 - 1209.85 = 0.15$ ft

$L_2 = H_1 Z_2 = (0.15)(171) = 25.65$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.15) = 0.10$ ft

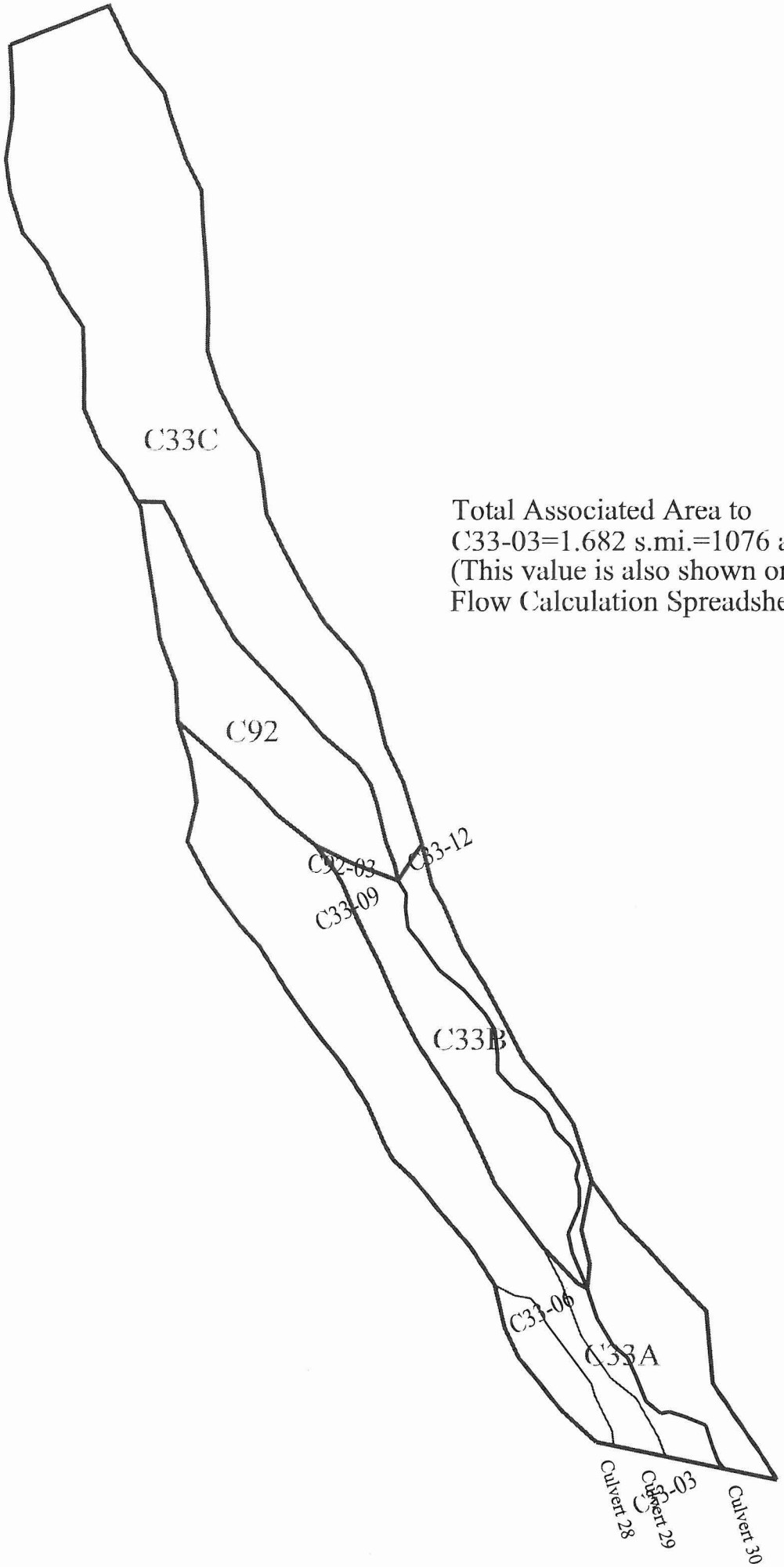
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(140)(0.15) + (25.65)(0.10)}{140 + 25.65} = 0.142$ ft

$L_T = L_1 + L_2 = 140 + 25.65 = 165.65$ ft

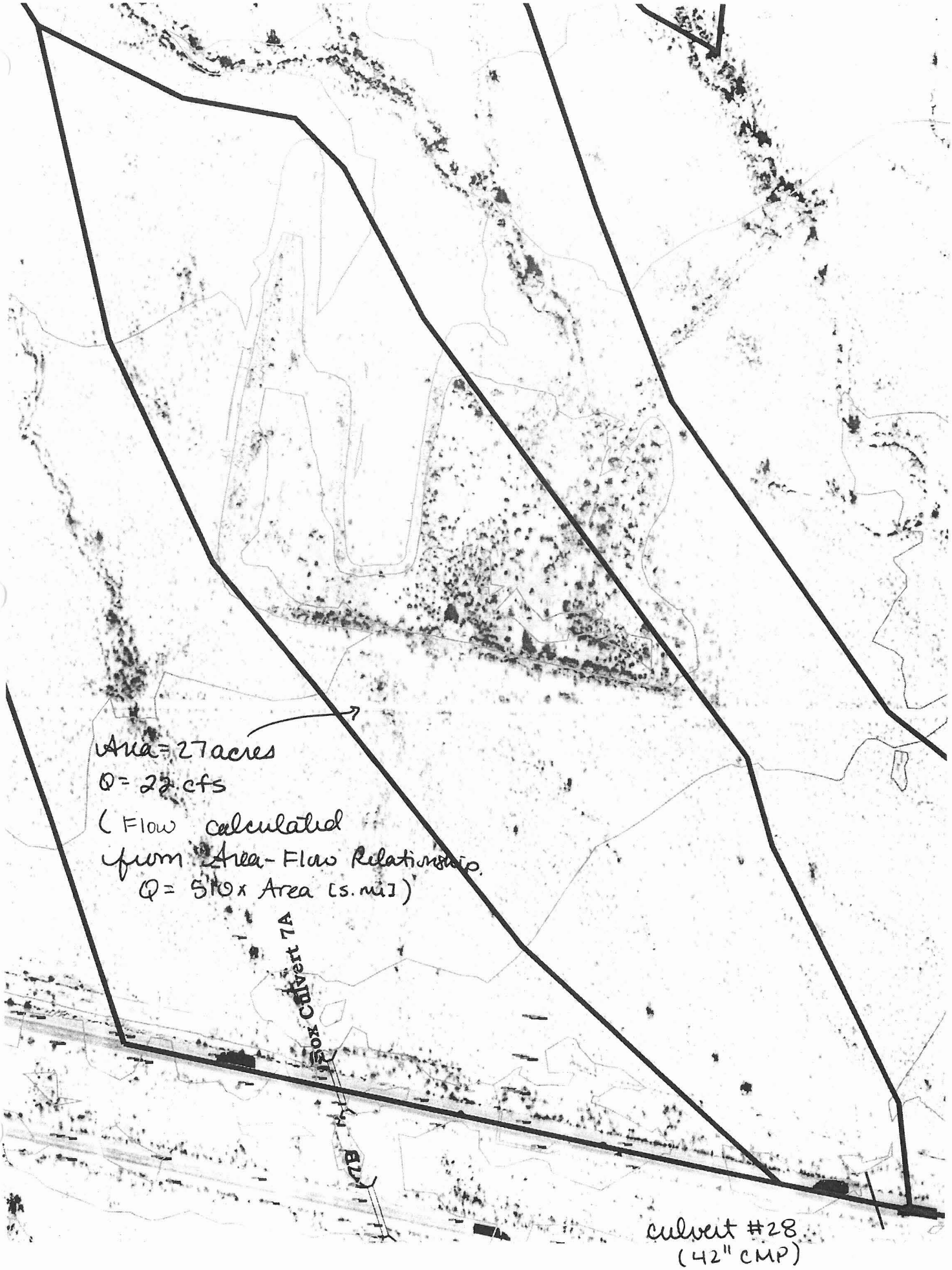
Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(165.65)(0.142) = 63.51$ cfs



Total Associated Area to C33-03=1.682 s.mi.=1076 acres (This value is also shown on the Flow Calculation Spreadsheet)


Area = 27 acres
Q = 22 cfs
(Flow calculated
from Area-Flow Relationship
Q = 510 x Area [s. mi])
12' x 5' Box Culvert 7A
culvert #28
(42" CMP)

5 → 1
345 169

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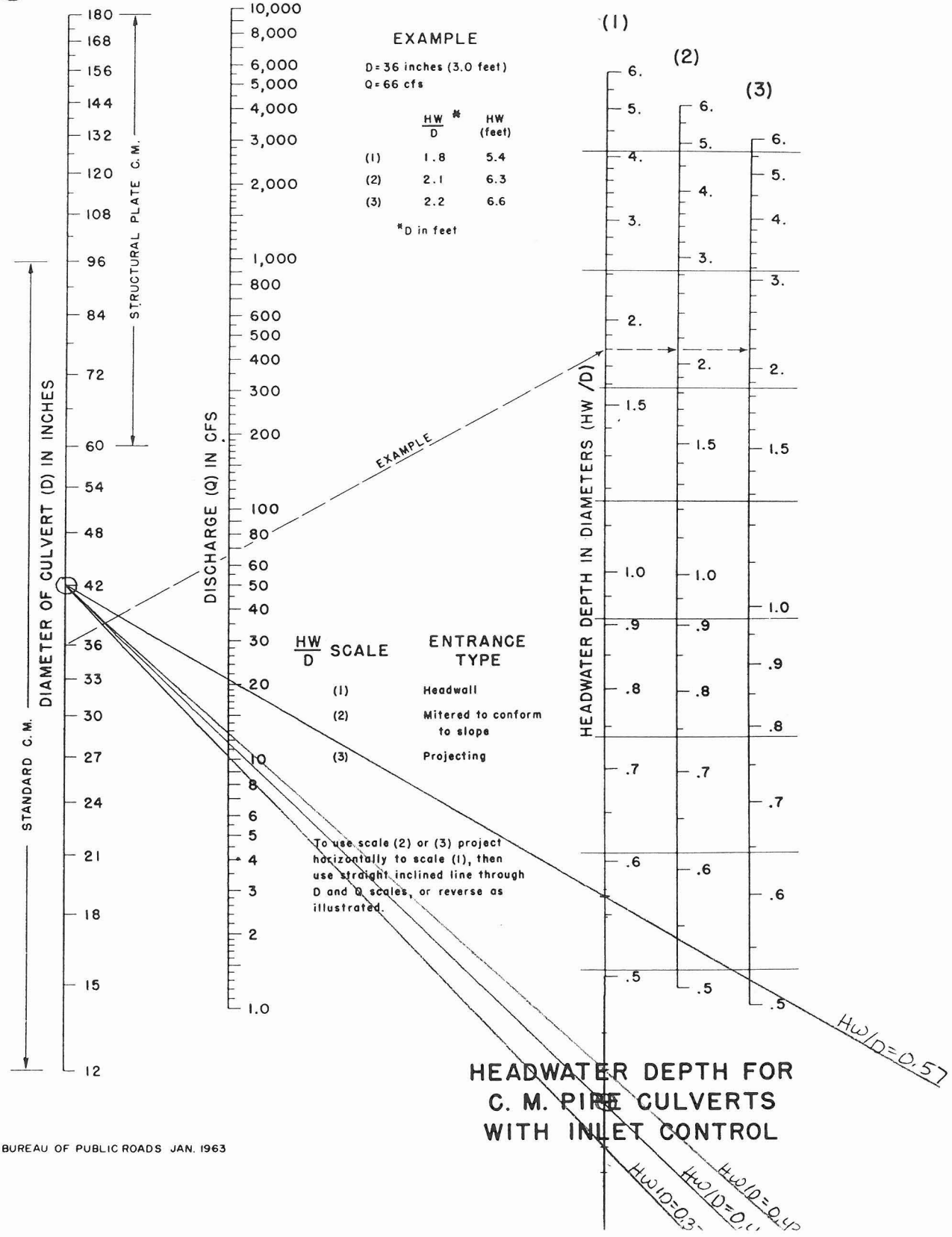
JOB NAME Palo Verde Zone A Delineation JOB NO. 310,019

culvert #28 (42" CMP)

CHART 2



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

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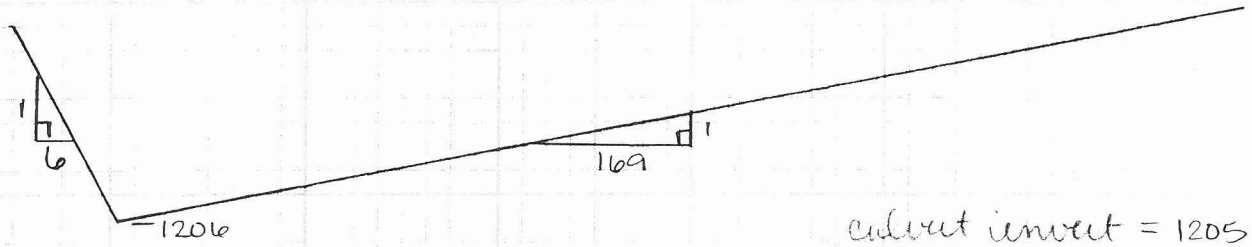
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1206)

culvert #28 (42" CMP)

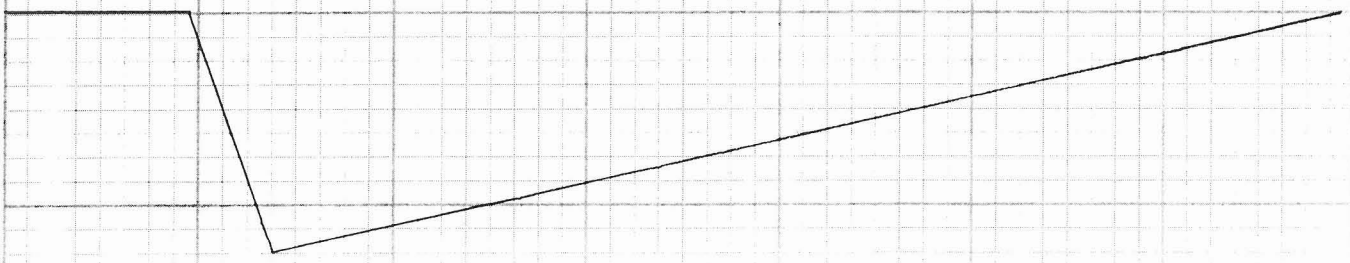


culvert invert = 1205

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0052
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

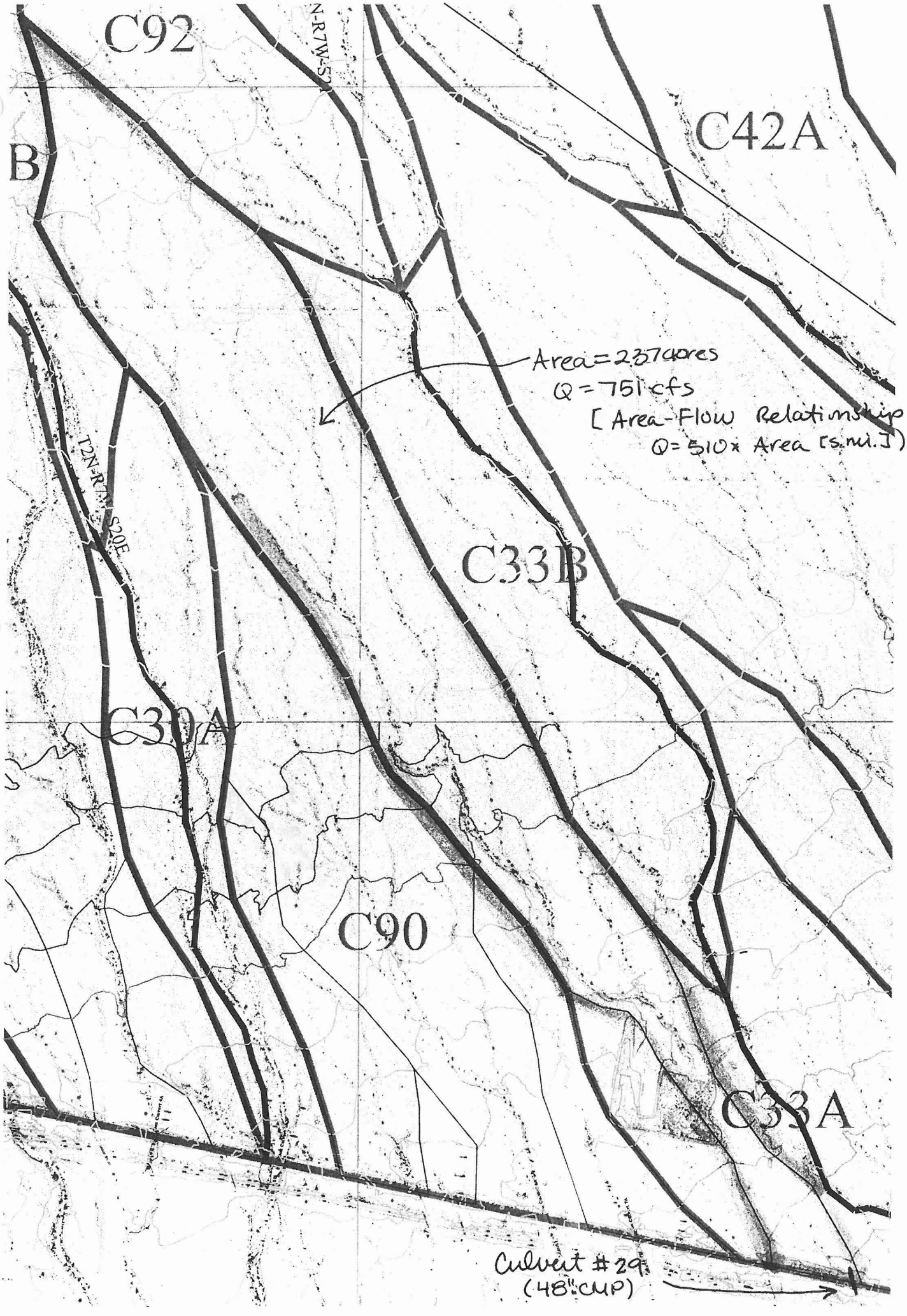
Weir Analysis (at EL >)

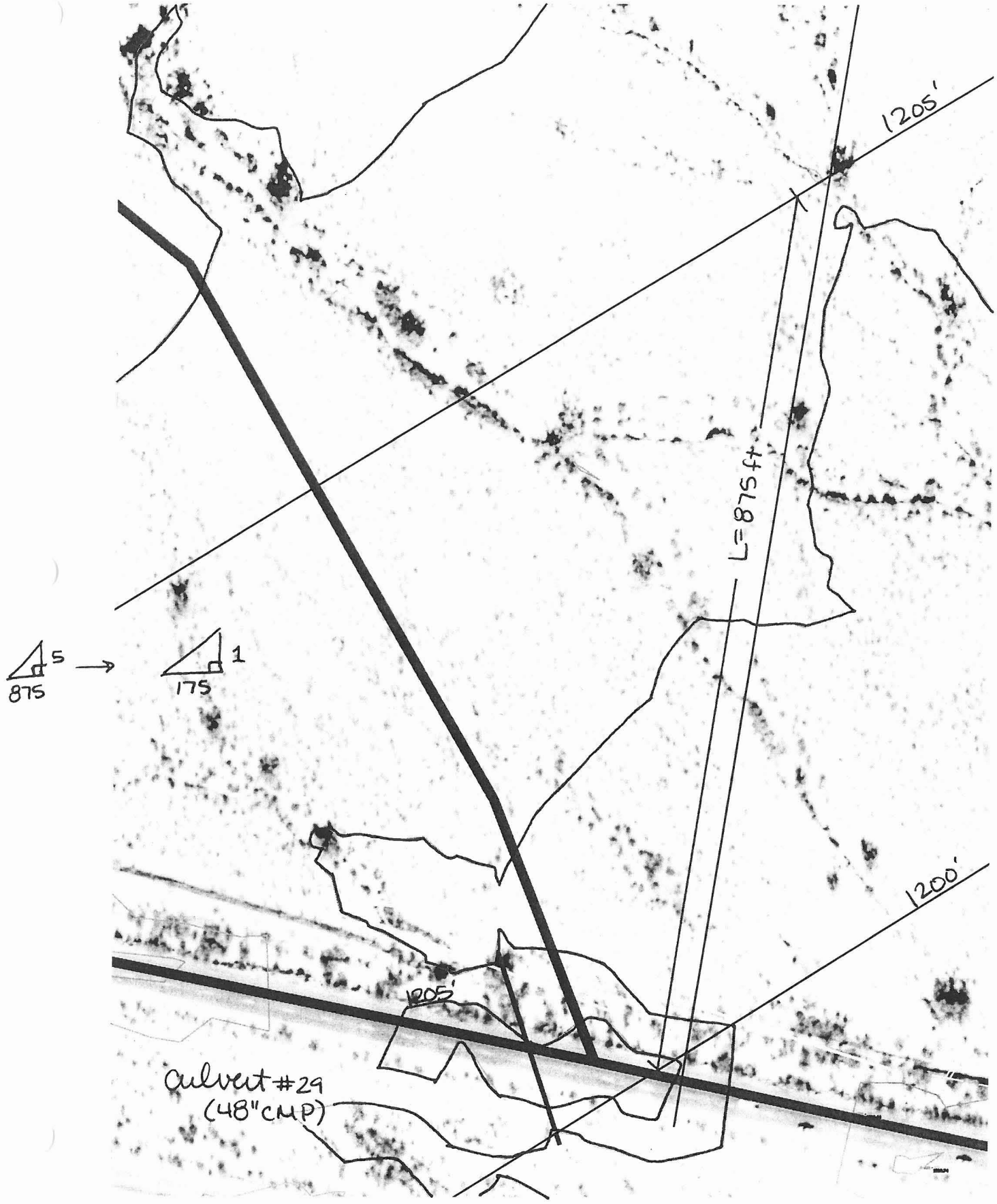


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


C92
C42A
B
Area = 237 acres
Q = 751 cfs
[Area-Flow Relationship
Q = 510 x Area (s.mi.)]
T2N-R7W-S20E
C33B
C30A
C90
C33A
Culvert #29
(48" CMP)


1205'
L=875 ft
5
875
1
175
1200'
1205'
Culvert #29
(48" CMP)

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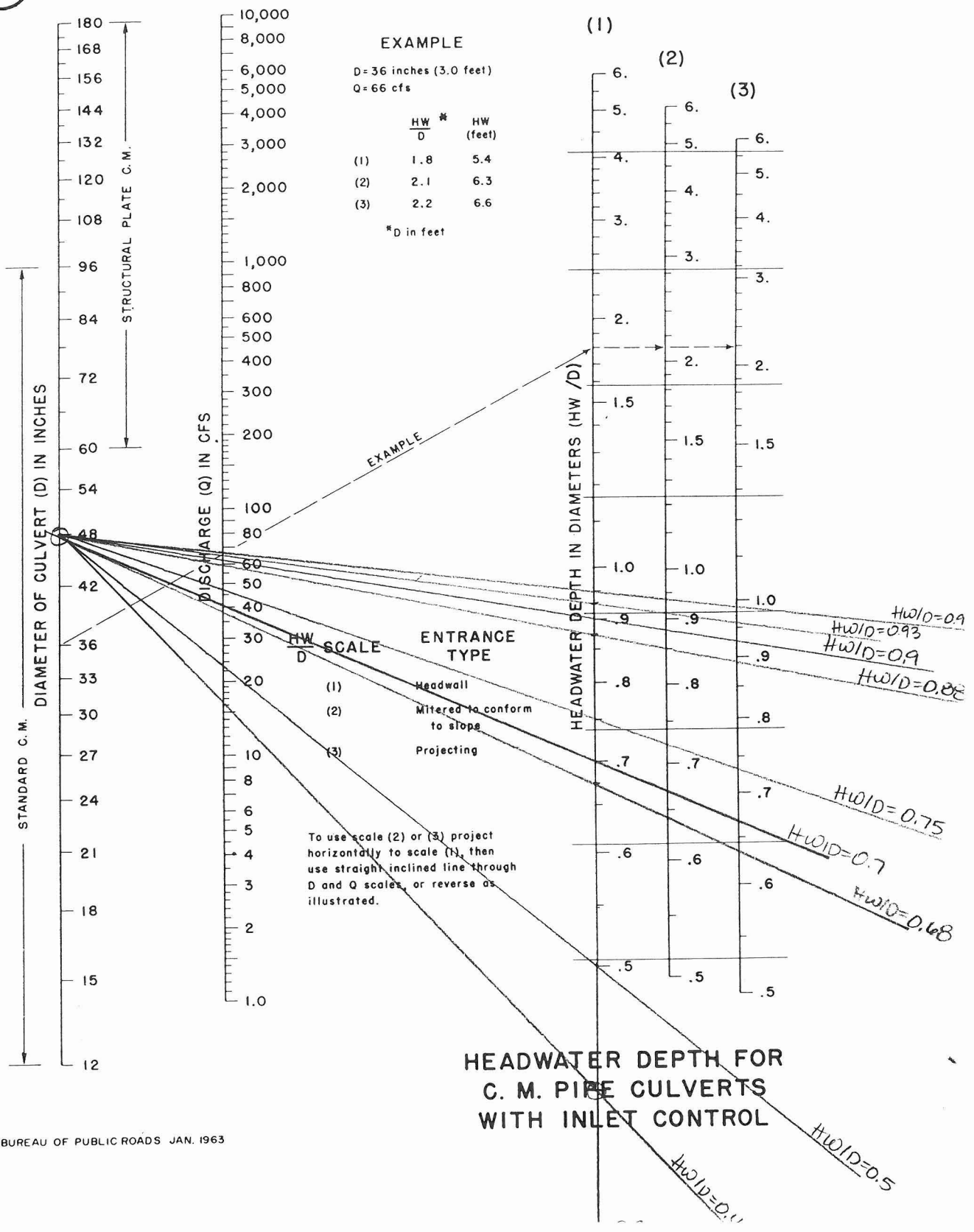
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #29 (48" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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BY ____ DATE ____

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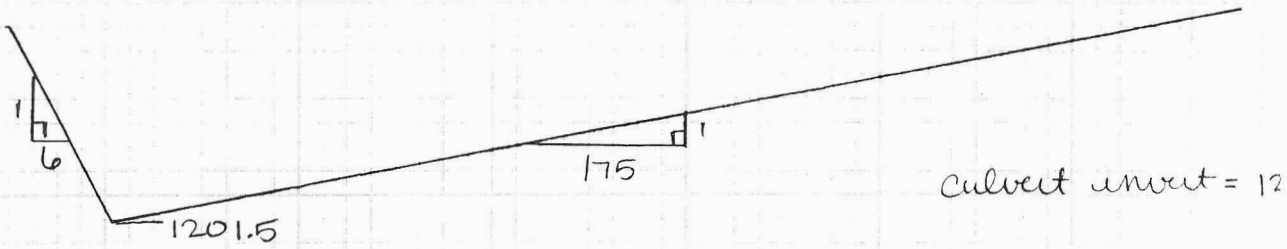
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1201.5) culvert #29 (48" CMP)



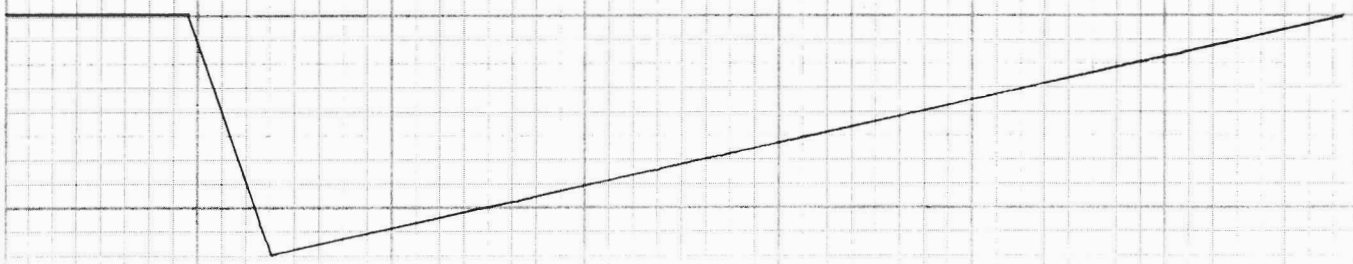
Culvert invert = 12

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0052
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

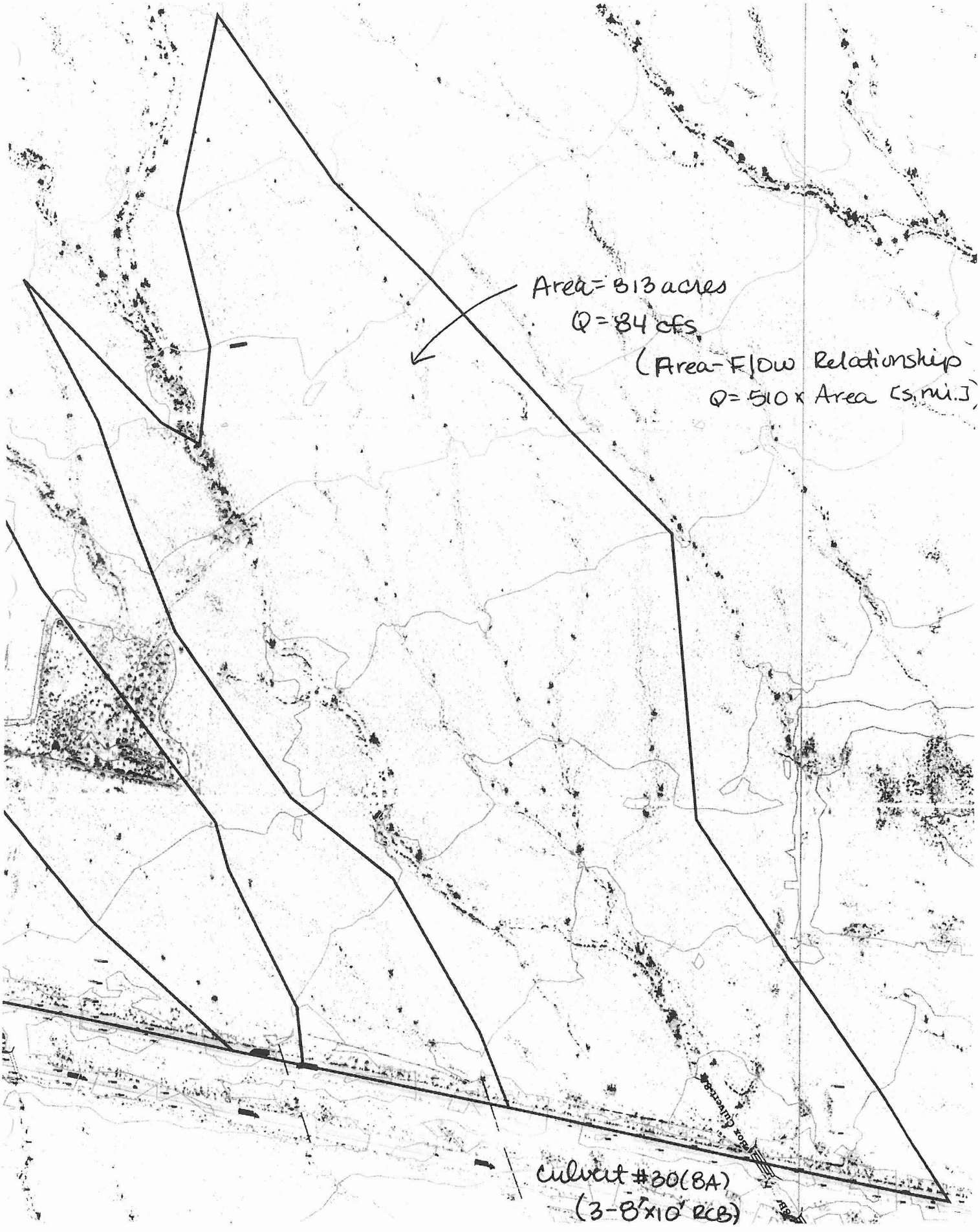
Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L+l}\right)$$


Area = 813 acres
Q = 84 cfs
(Area-Flow Relationship
Q = 510 x Area [s. mi.])
culvert #30(8A)
(3-8'x10' RCB)

Culvert # 80 (8A)
(3-8'x10' RCB)

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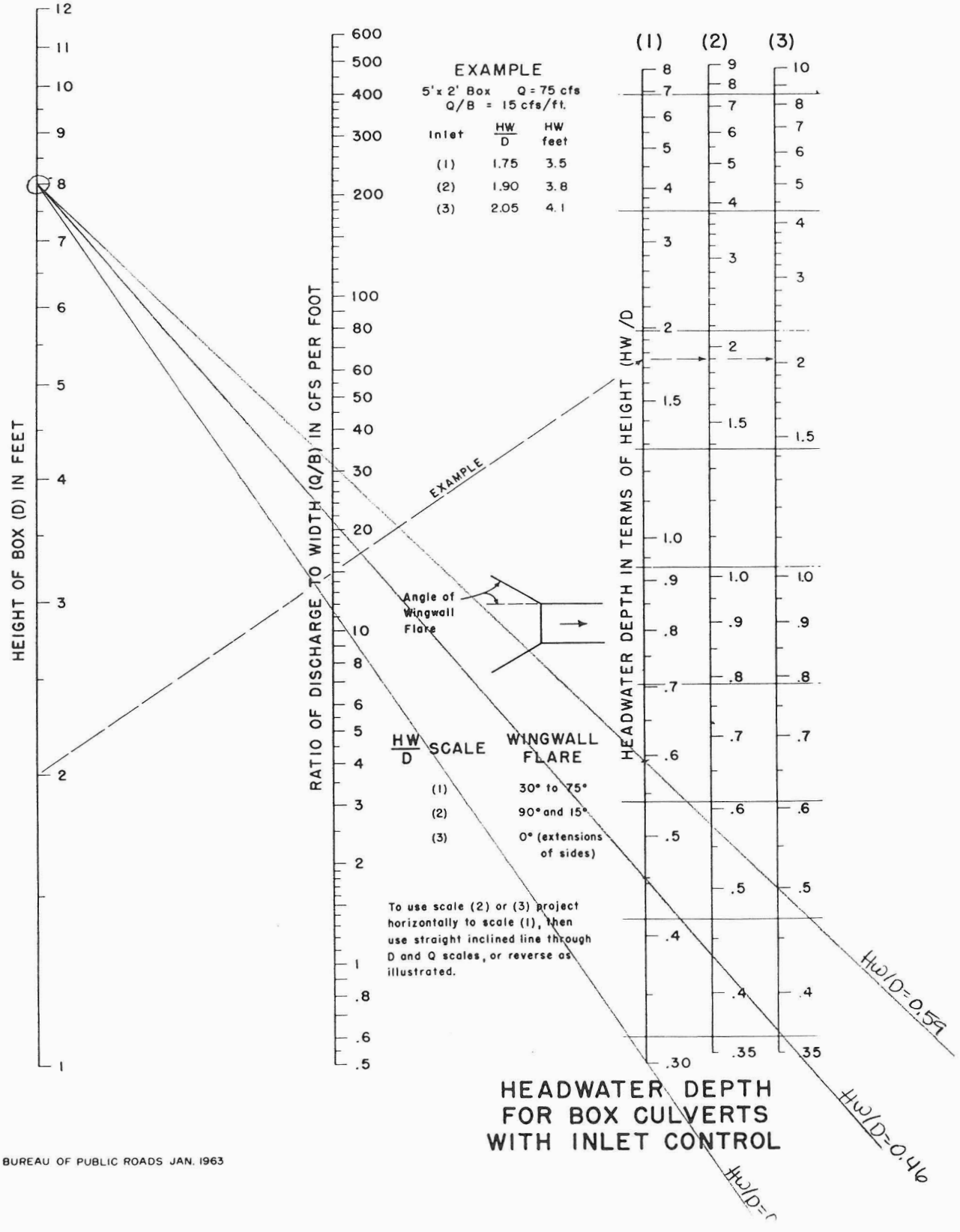
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 30 (BA)
(3-8'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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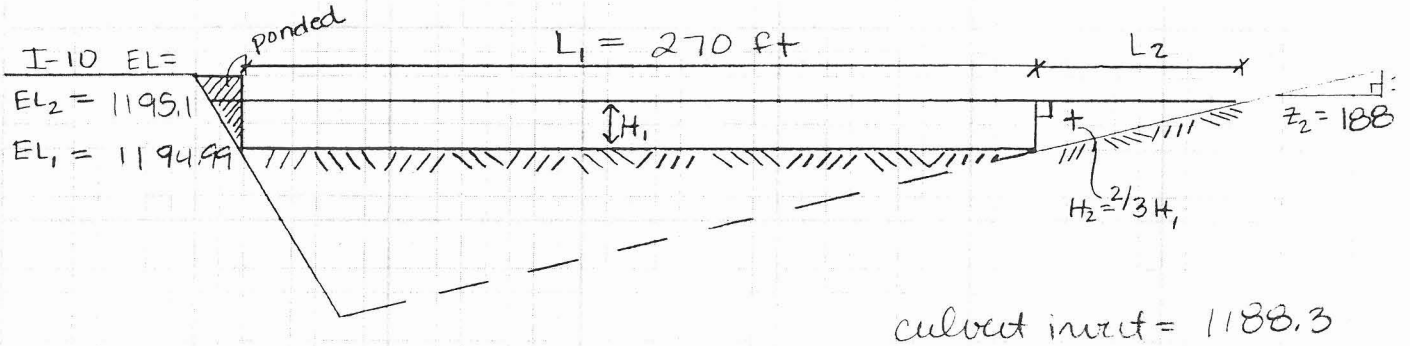
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1195)

culvert #30(8A)
(3-8'x10' RCB)



culvert invert = 1188.3

$H_1 = E_2 - E_1 = 1195.1 - 1194.99 = 0.11$ ft

$L_2 = H_1 Z_2 = (0.11)(188) = 20.68$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.11) = 0.0734$ ft

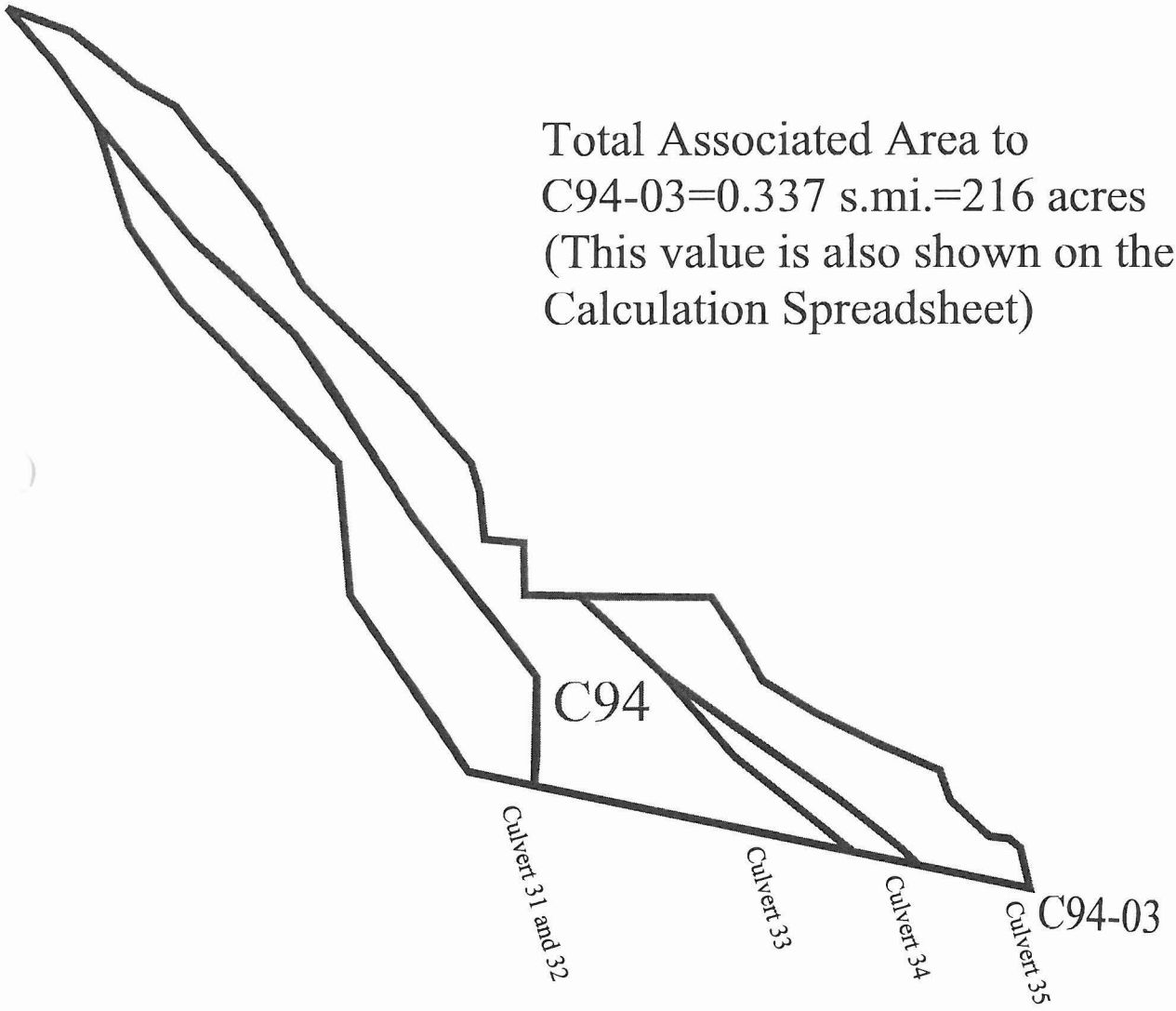
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(270)(0.11) + (20.68)(0.0734)}{(270 + 20.68)} = 0.1$

$L_T = L_1 + L_2 = 270 + 20.68 = 290.68$ ft

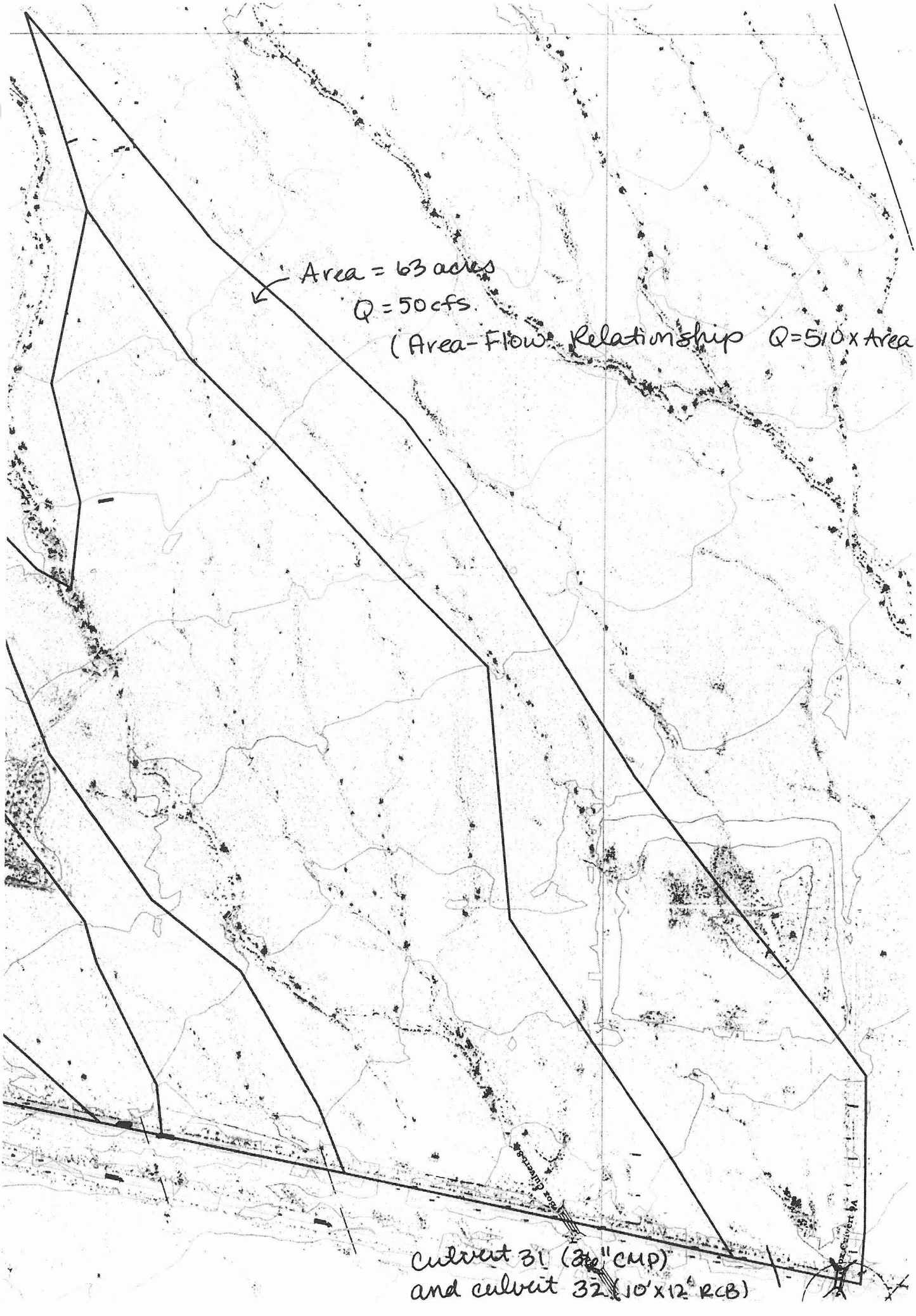
Weir Flow $Q = C L_T \bar{H}^{1.5}$

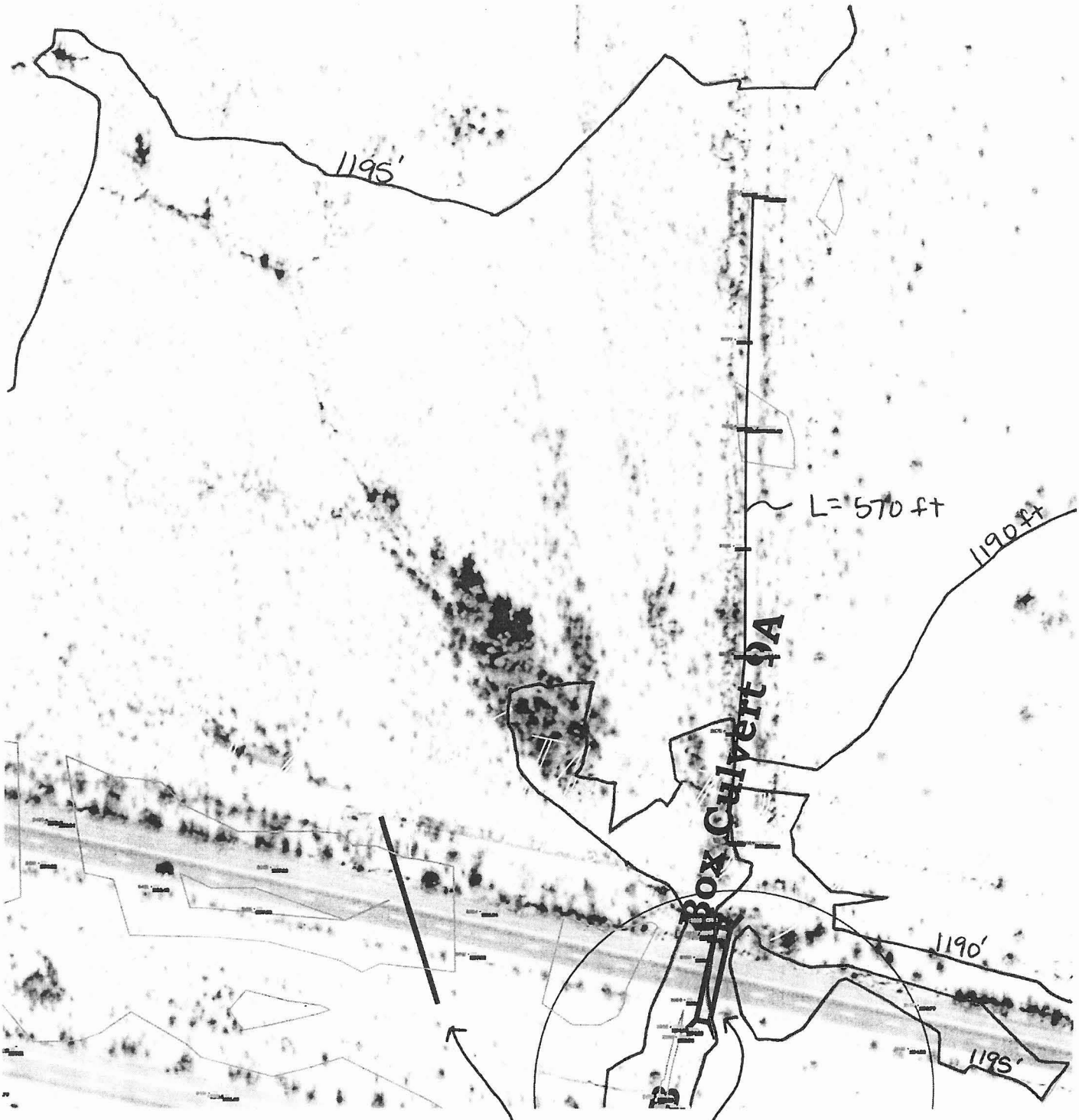
$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(290.68)(0.1074)^{1.5} = \underline{27.62 \text{ cfs}}$



Total Associated Area to
C94-03=0.337 s.mi.=216 acres
(This value is also shown on the Flow Calculation Spreadsheet)


Area = 63 acres
Q = 50 cfs.
(Area-Flow Relationship Q=510 x Area)
Culvert 31 (36" CMP)
and culvert 32 (10'x12' RCB)



culvert #31 and #32 (9A)

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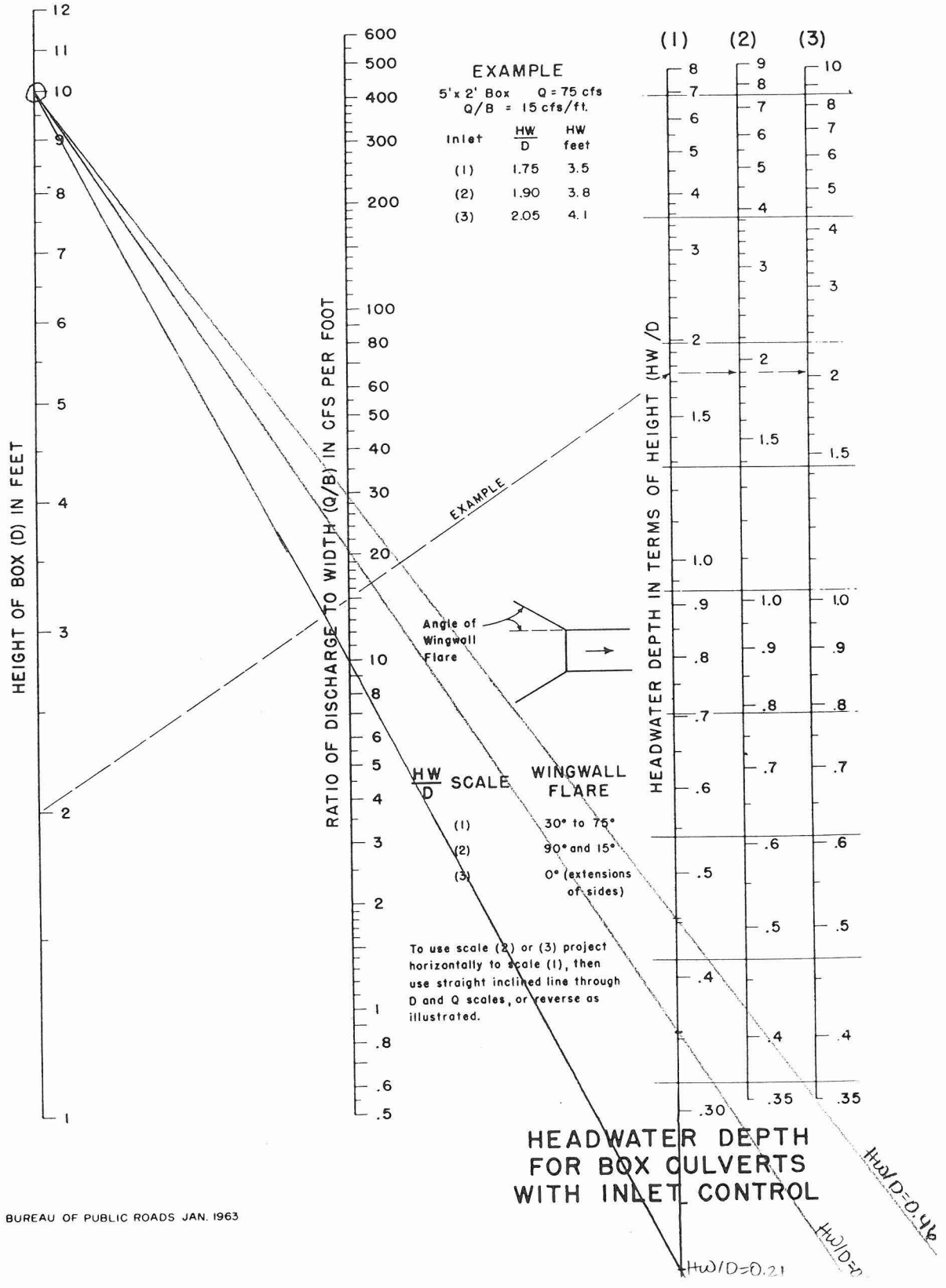
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #32 (9A)

CHART 8



BUREAU OF PUBLIC ROADS JAN. 1963

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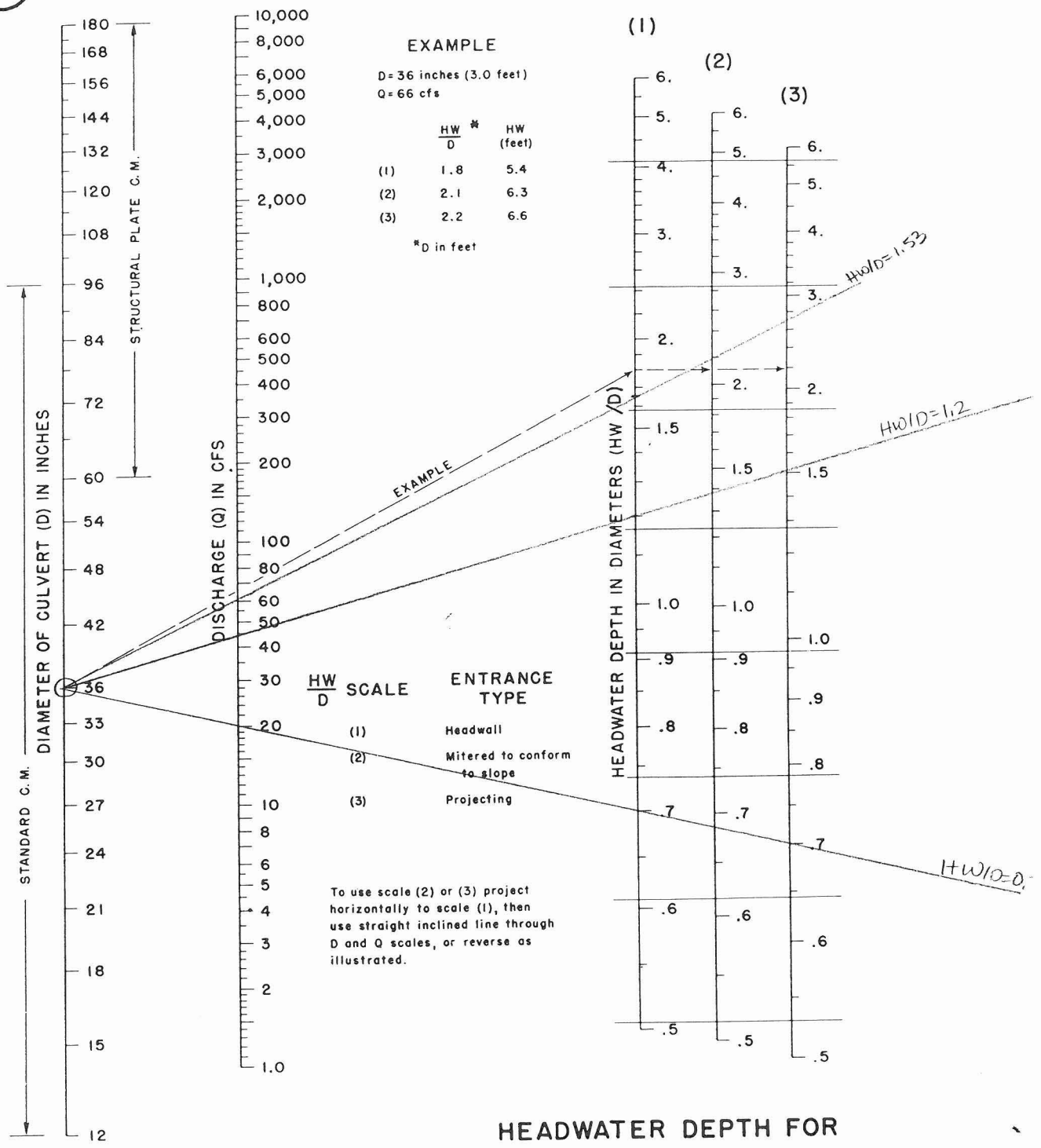
JOB NAME Palo Verde Zone A Delineation JOB NO. 3110.019

Culvert #31 (36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	10' x 12' RCB Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
31 and	1-36" CMP	1183.4							**
32 (9A)	1-10' x 12' RCB	1185.5	2.1	0.70	20	0.21	9.9	118.8	138.8
		1187	3.6	1.20	45	0.36	20.00	240	285
		1188	4.6	1.53	60	0.46	29.00	348	408

These flows are shown on the main spreadsheet

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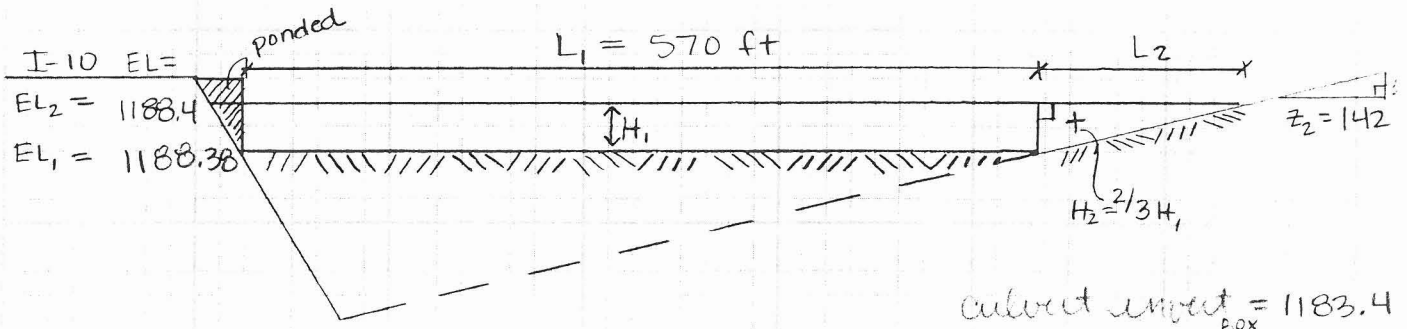
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1188.4)

Culvert #31 and #32/9A



culvert invert $_{BOX}$ = 1183.4
(culvert invert $_{CMP}$ = 1191
assume same EL as box culvert = 1183.4)

$H_1 = E_2 - E_1 = 1188.4 - 1188.38 = 0.02$ ft

$L_2 = H_1 Z_2 = (0.02)(142) = 2.84$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.02) = 0.0133$ ft

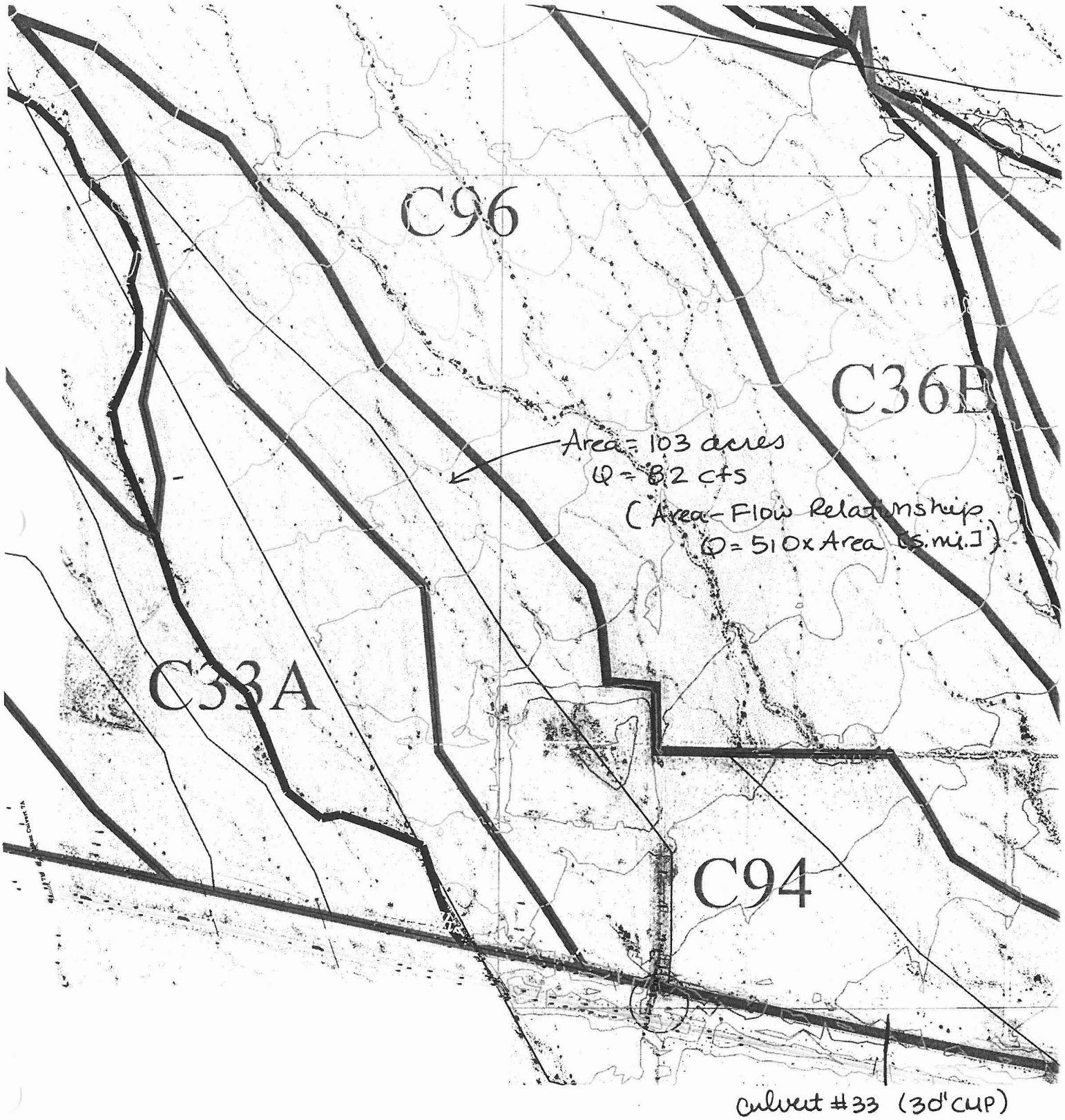
Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(570)(0.02) + (2.84)(0.0133)}{570 + 2.84} = 0.019$

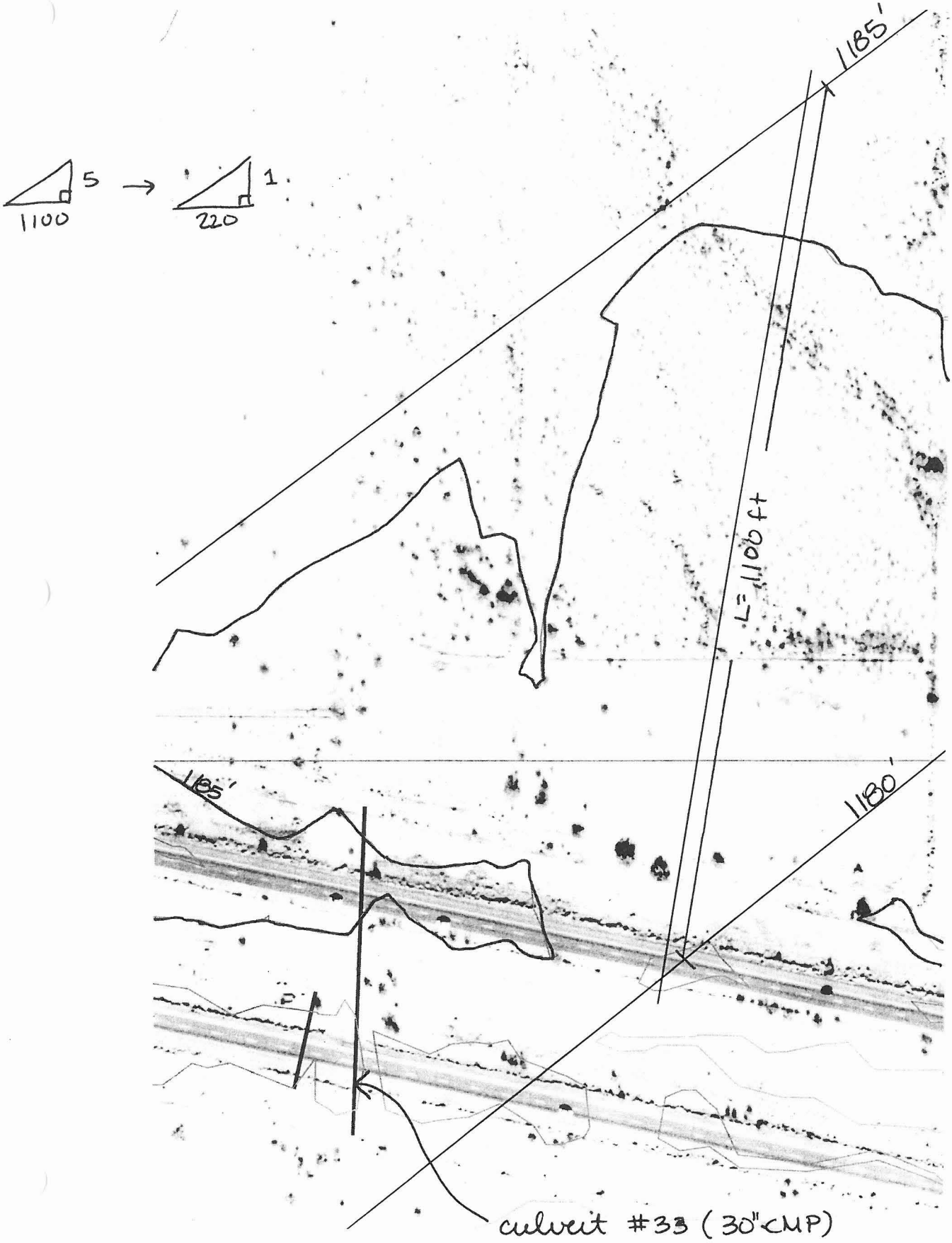
$L_T = L_1 + L_2 = 570 + 2.84 = 572.84$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (572.84)(0.0199)^{1.5} = 4.36$ cfs


C96
C36B
Area = 103 acres
Q = 82 cfs
(Area-Flow Relationship
Q = 510 x Area (s.mi.))
C33A
C94
Culvert #33 (30" CMP)


5
1100
1
220
1185'
L=1106 ft
1185'
1180'
culvert #33 (30" CMP)

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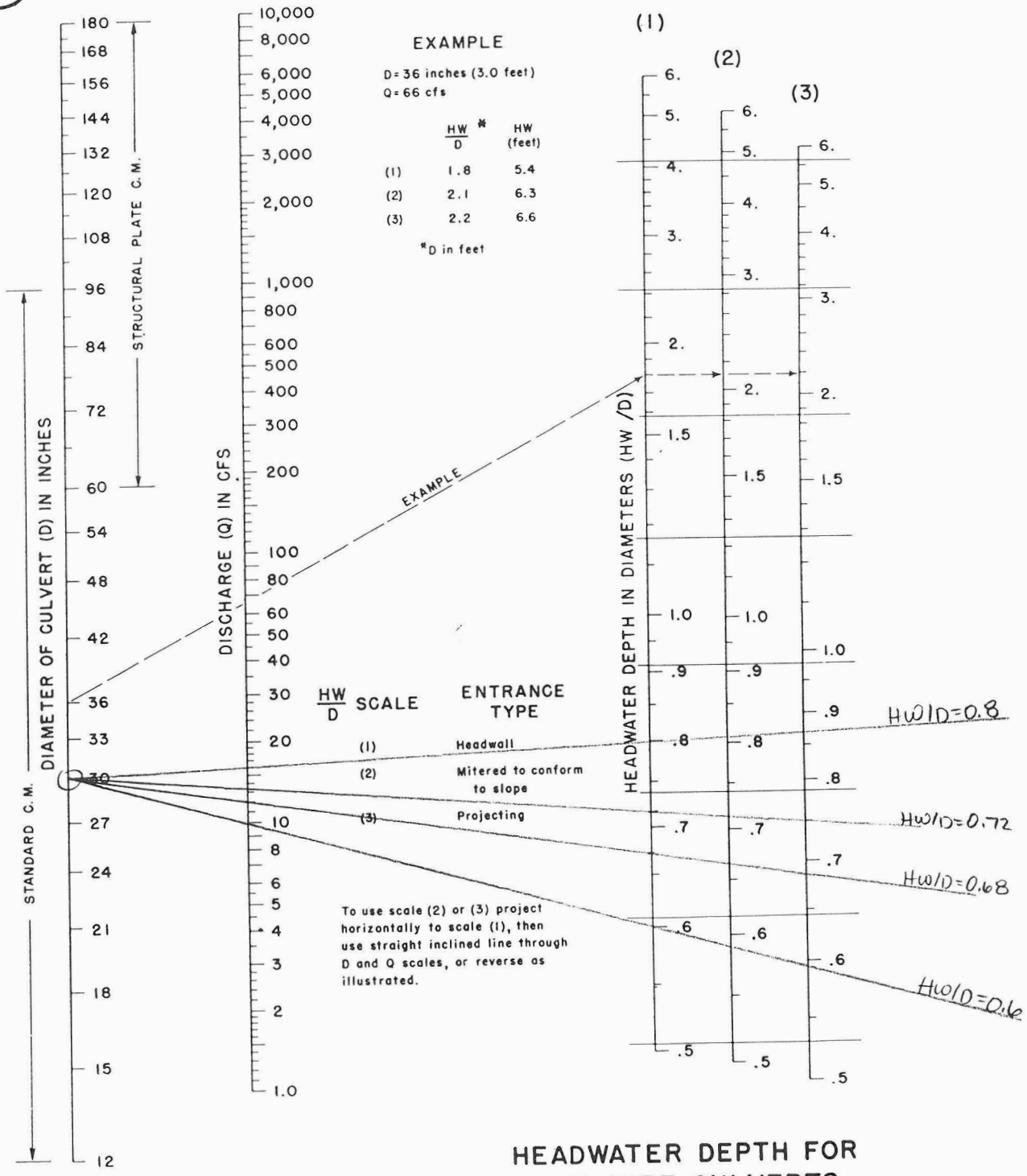
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert # 33 (30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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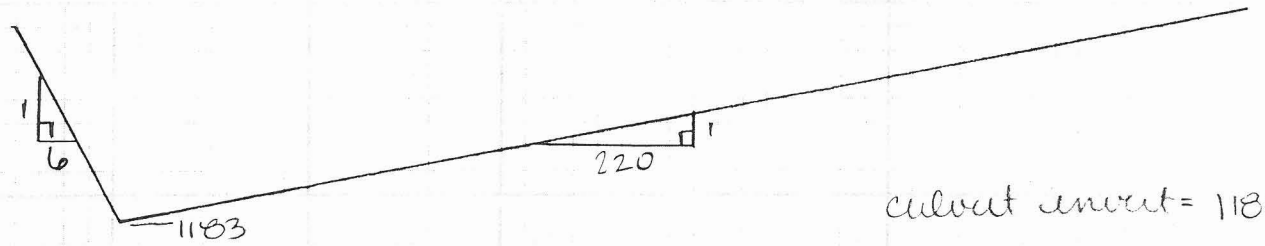
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1183) Culvert #33 (30" CMP)



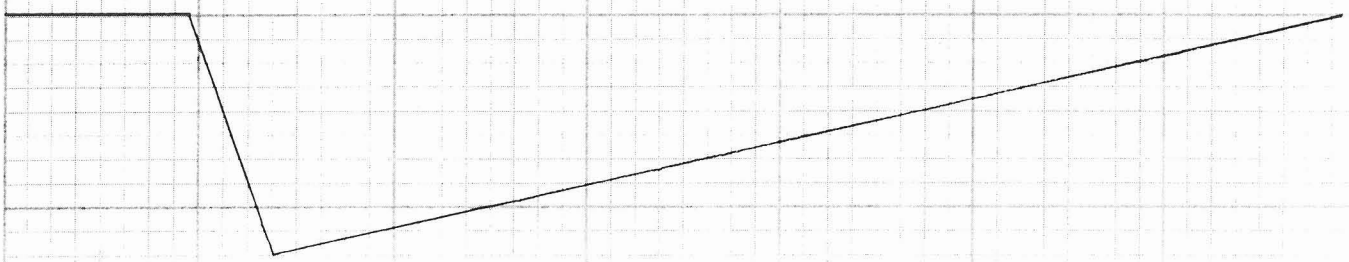
culvert invert = 1182

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.0070
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

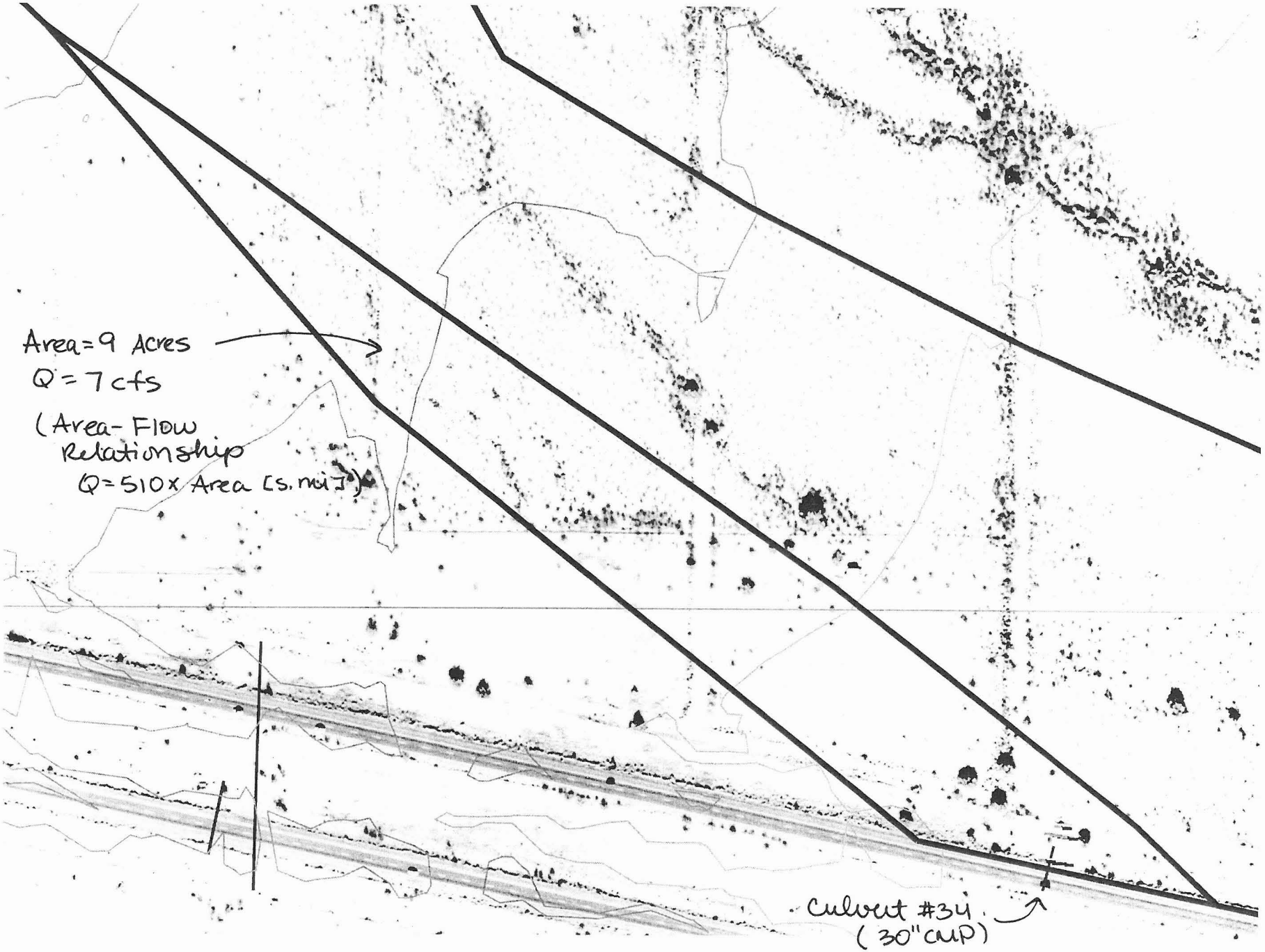
Weir Analysis (at EL>)

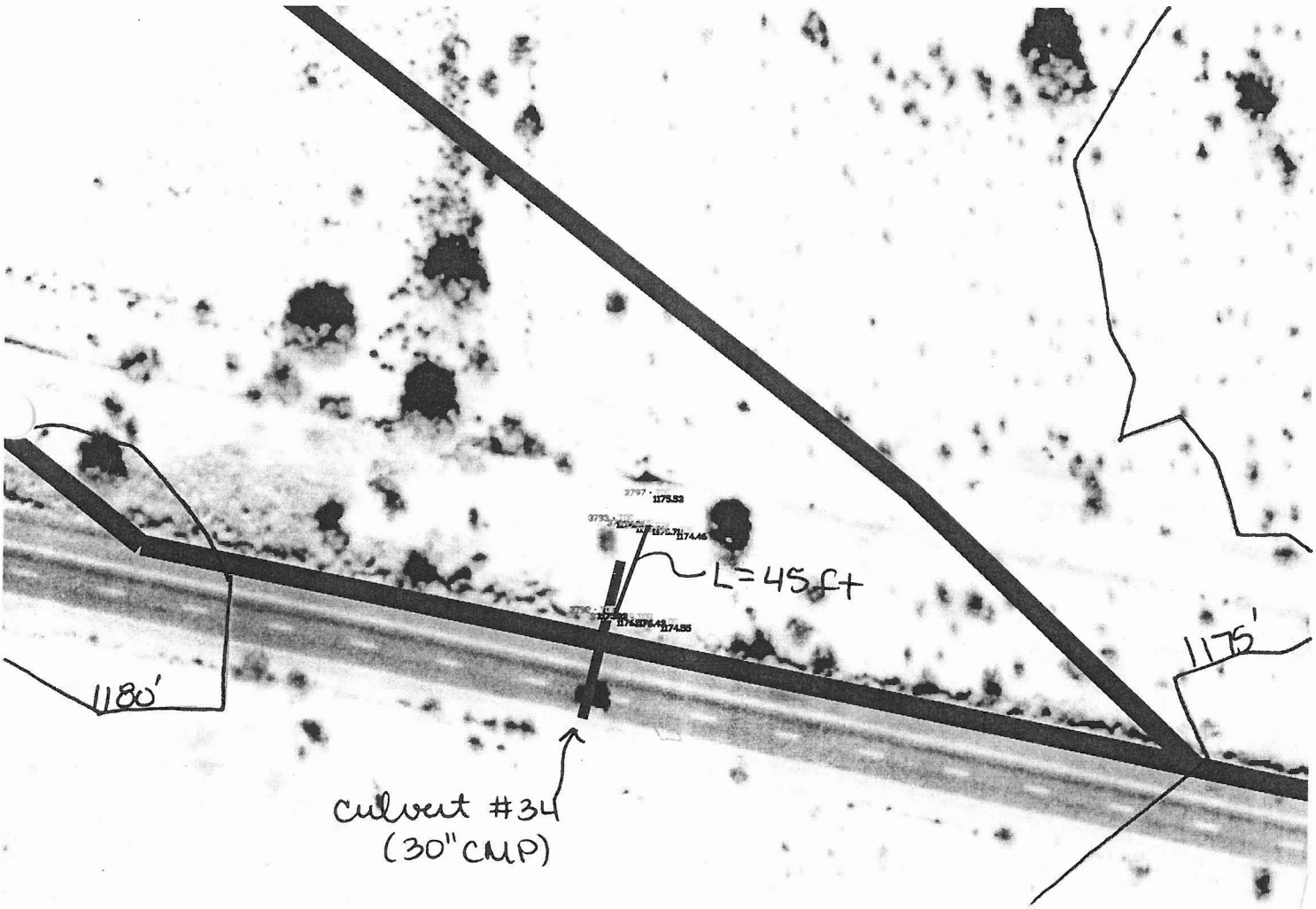


$$Q = C L H^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


Area = 9 Acres
Q = 7 cfs
(Area-Flow Relationship
Q = 510 x Area [s. mi]^0.6)
Culvert #34
(30" CMP)


L=45ft
1180'
1175'
culvert #34
(30" CMP)

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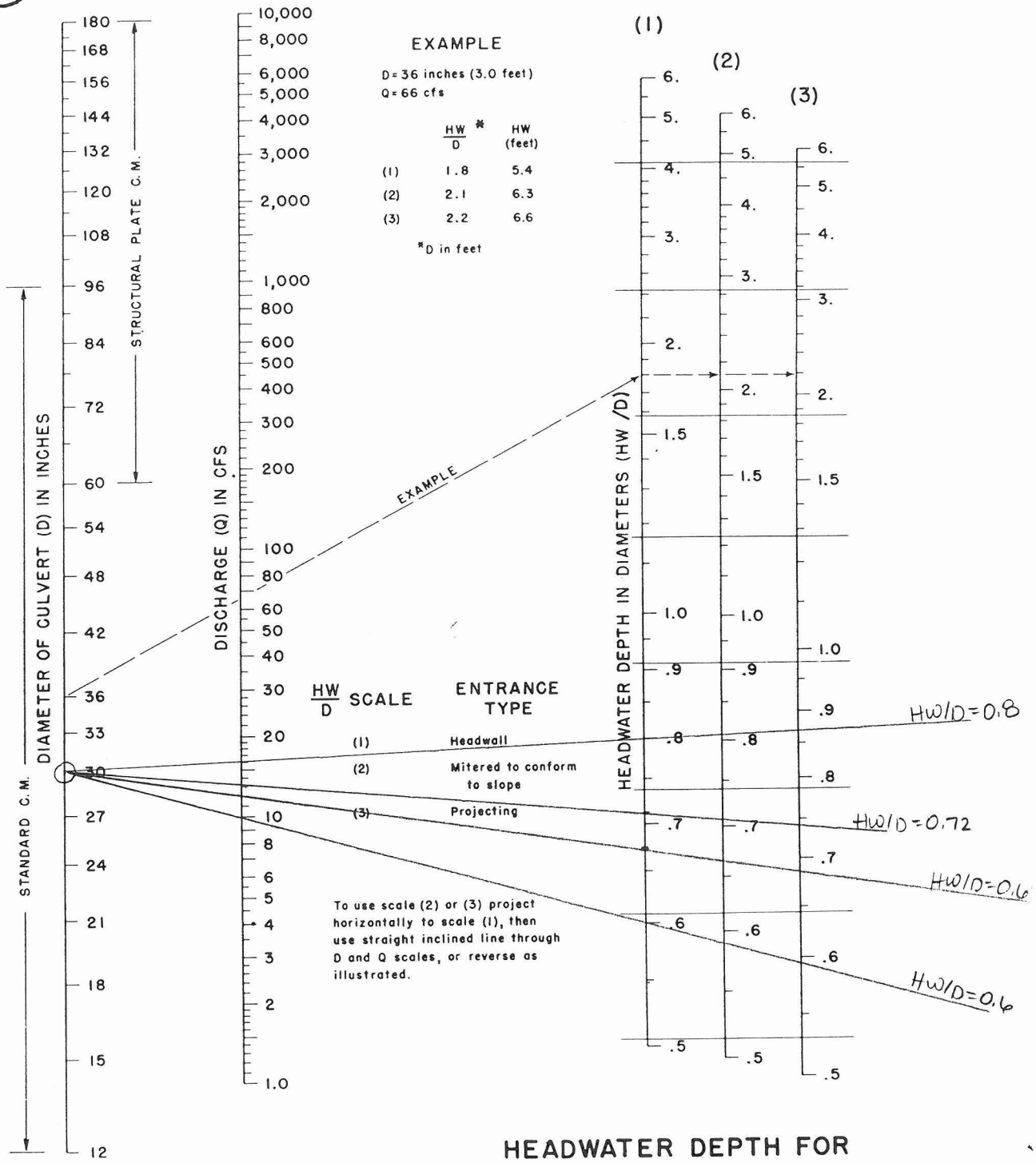
JOB NAME Palo Verde Zone A Delineation JOB NO. 310,019

culvert #34 (30"CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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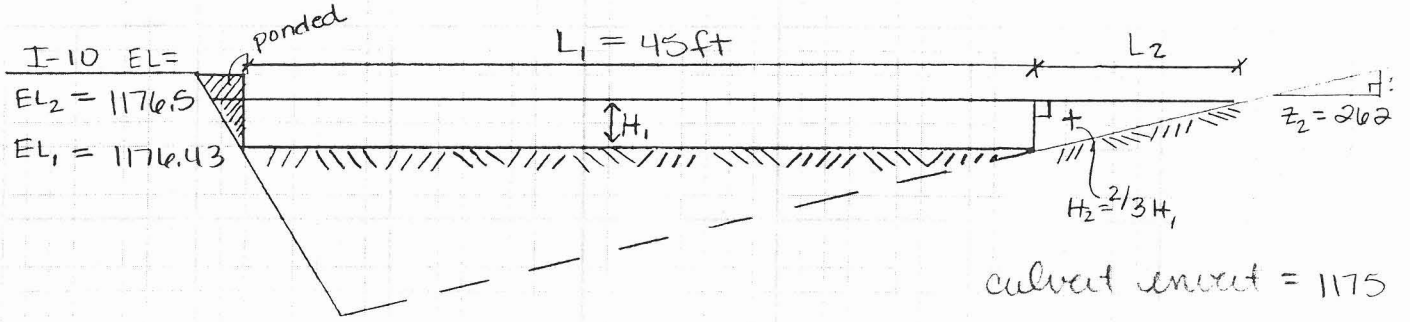
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1176.4)

culvert #34 (30" CMP



culvert invert = 1175

$H_1 = E_2 - E_1 = 1176.5 - 1176.43 = 0.07$ ft

$L_2 = H_1 z_2 = (0.07)(262) = 18.34$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.07) = 0.047$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(45)(0.07) + (18.34)(0.047)}{45 + 18.34} = 0.06$

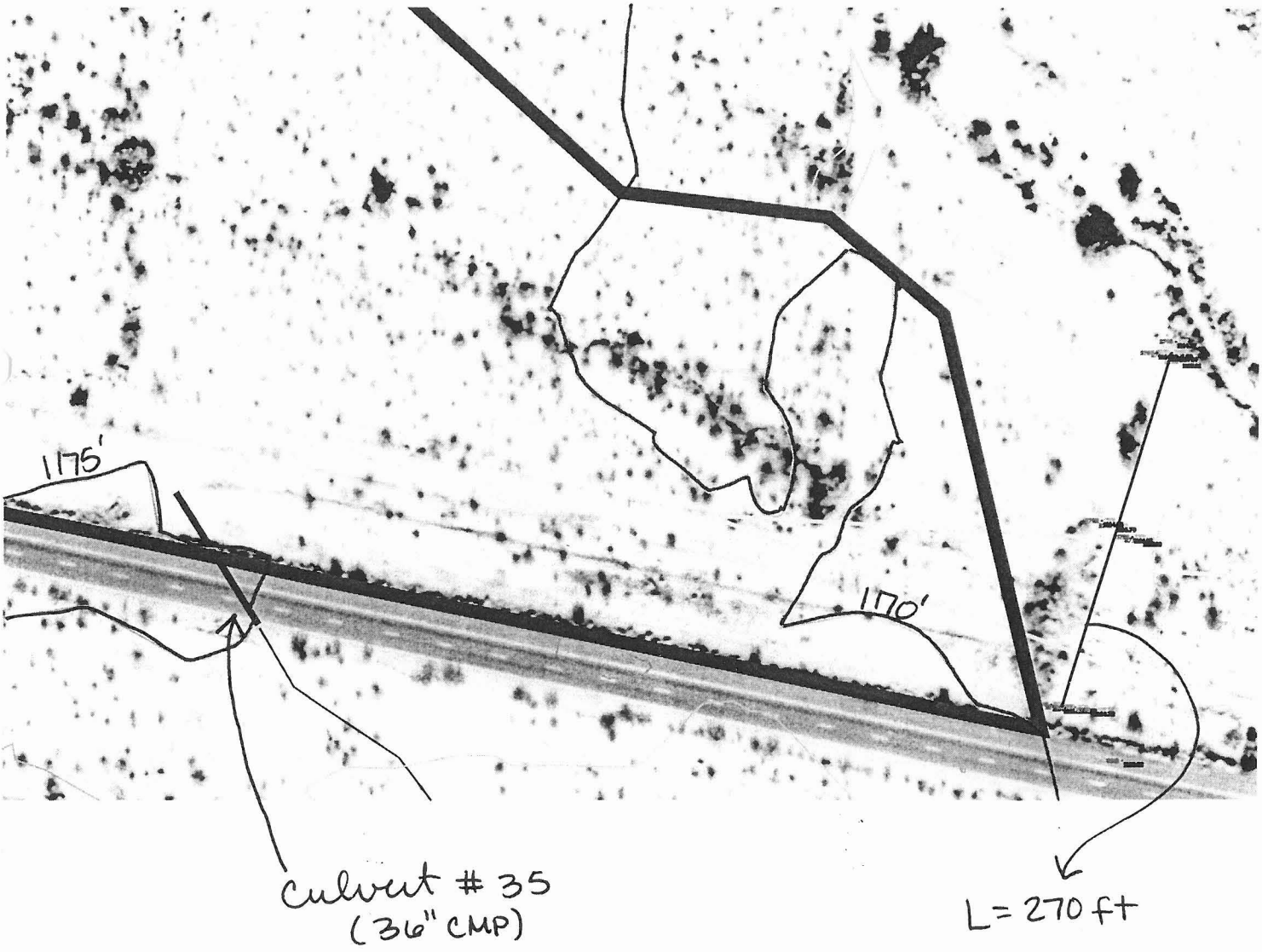
$L_T = L_1 + L_2 = 45 + 18.34 = 63.34$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(63.34)(0.0633)^{1.5} = \underline{2.72 \text{ cfs}}$

Area= 41 acres
Q= 33 cfs
(Area-Flow
Relationship
Q=510x Area [s.mi])
Culvert #35 (36" CMP)


1175'
170'
culvert #35
(36" CMP)
L=270 ft

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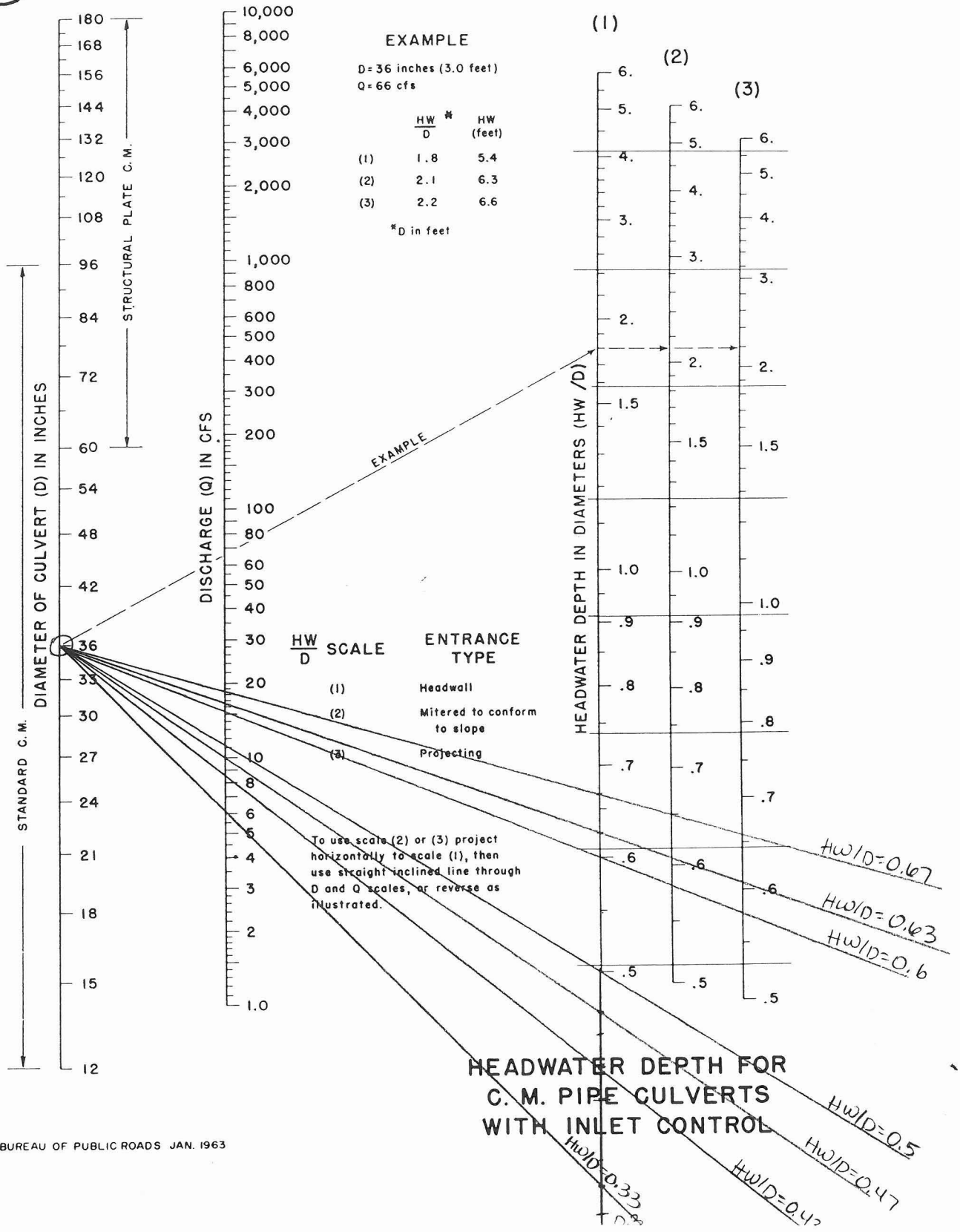
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 35 (36" CMP)

CHART 2



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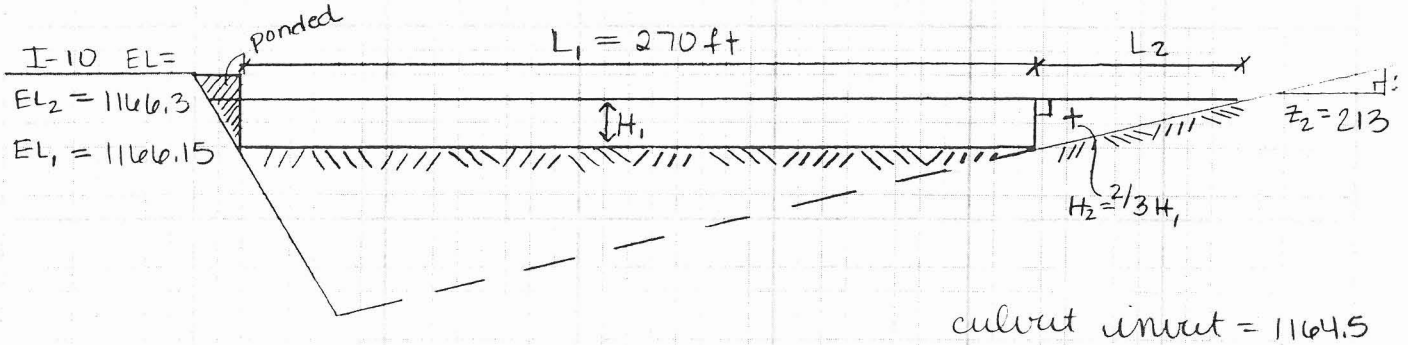
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1166.2)



culvert invert = 1164.5

$H_1 = E_2 - E_1 = 1166.3 - 1166.2 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(2:1) = 21.3$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

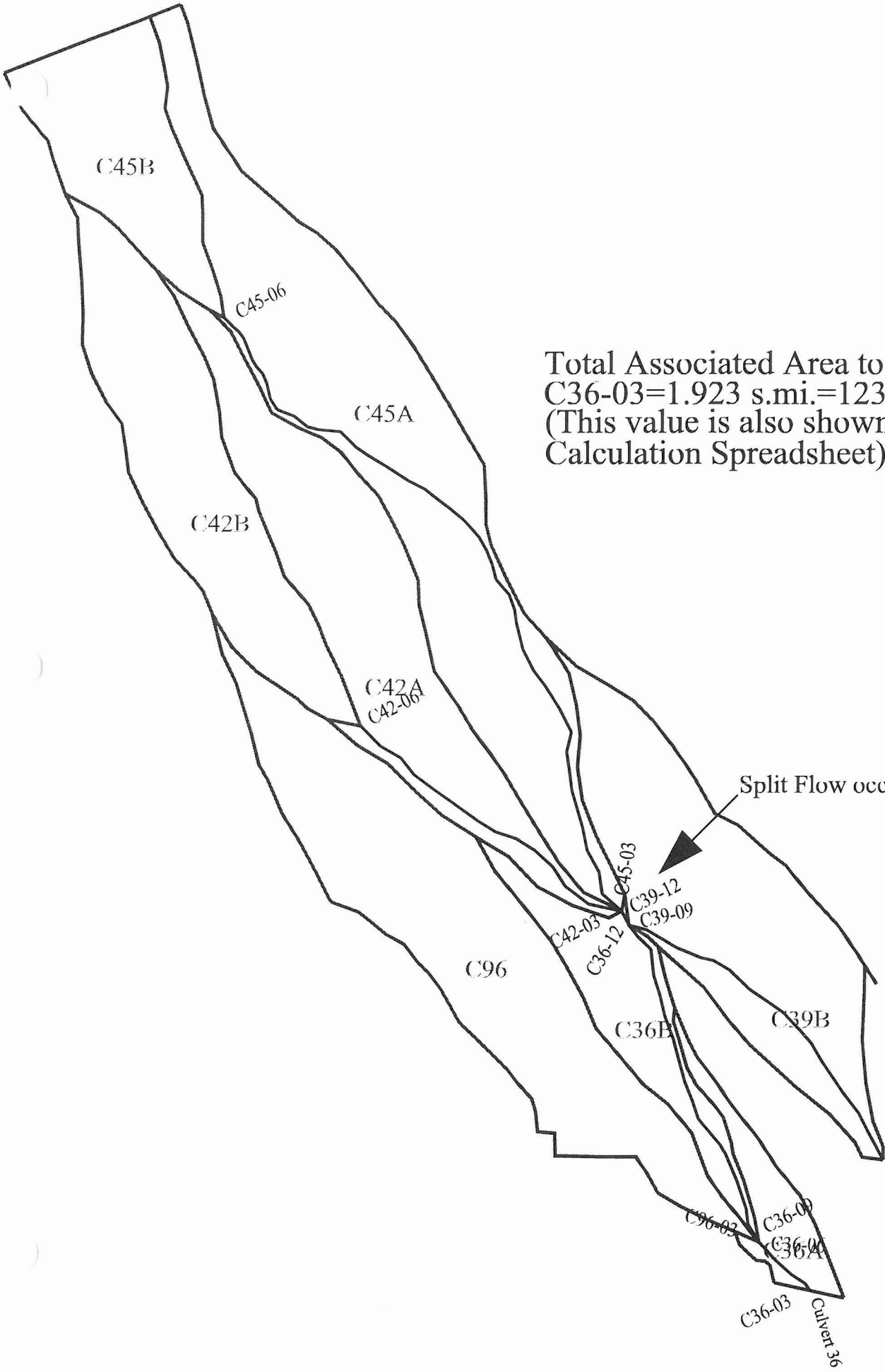
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(270)(0.10) + (21.3)(0.067)}{270 + 21.3} = 0.098$

$L_T = L_1 + L_2 = 270 + 21.3 = 291.3$ ft

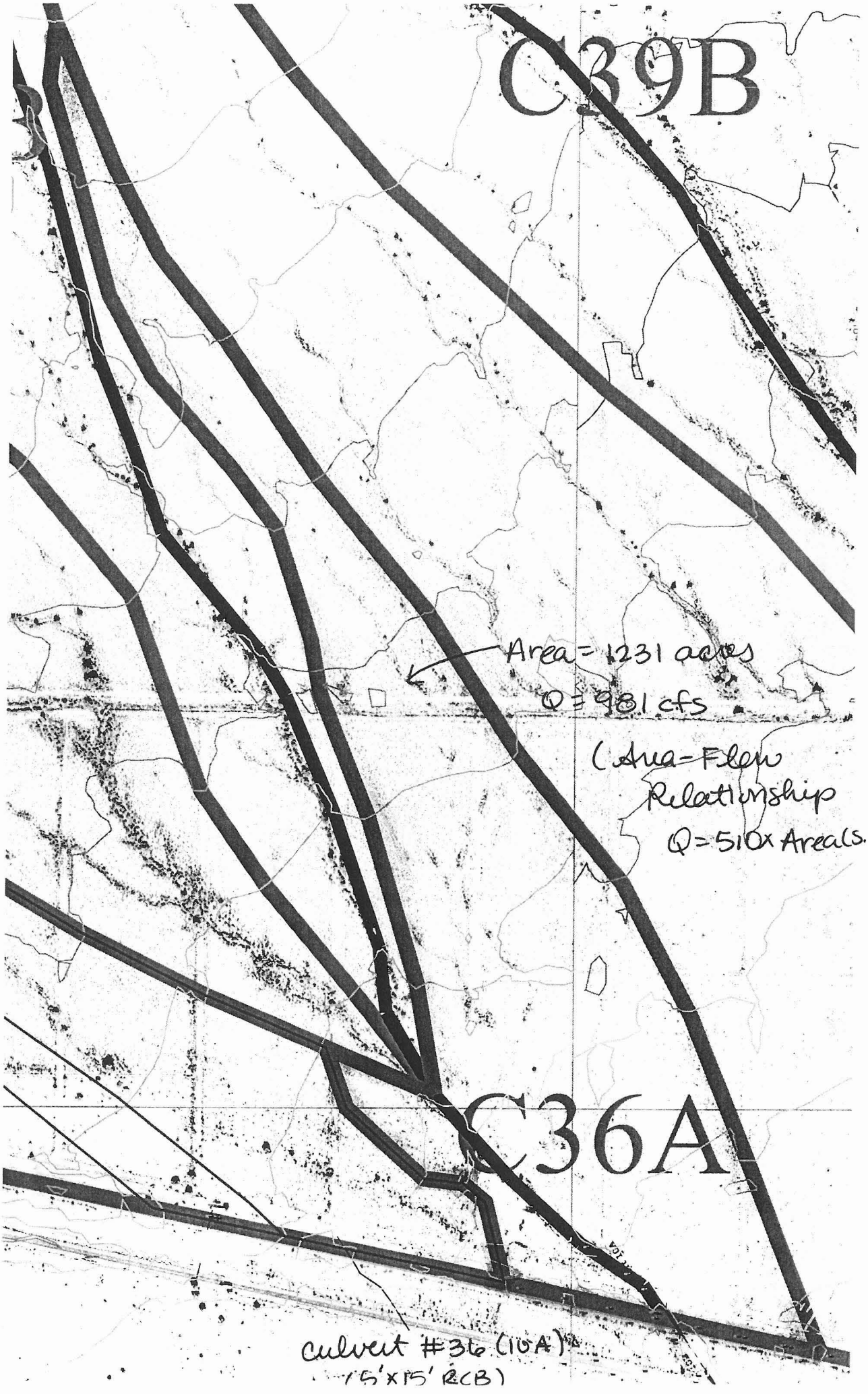
Weir Flow $Q = C L_T \bar{H}^{1.5}$

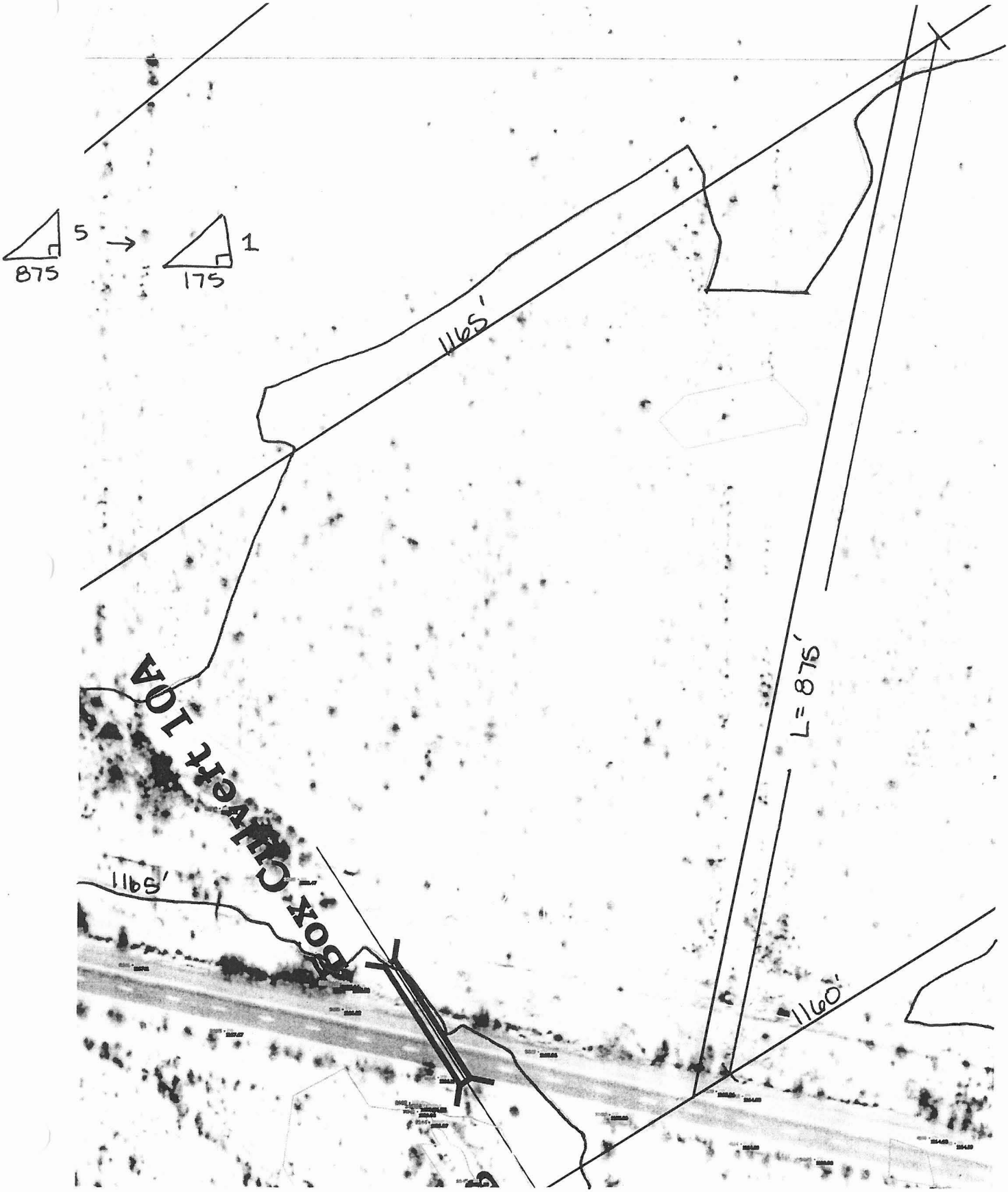
$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(291.3)(0.098)^{1.5} = \underline{23.9 \text{ cfs}}$



Total Associated Area to
C36-03=1.923 s.mi.=1231 acres
(This value is also shown on the Flow Calculation Spreadsheet)


C39B
Area = 1231 acres
Q = 981 cfs
(Area-Flow
Relationship
Q = 510 x Area(s.mi))
C36A
culvert #36 (10A)
15'x15' RCB)



culvert #36(10A)
(5'x15' RCB)

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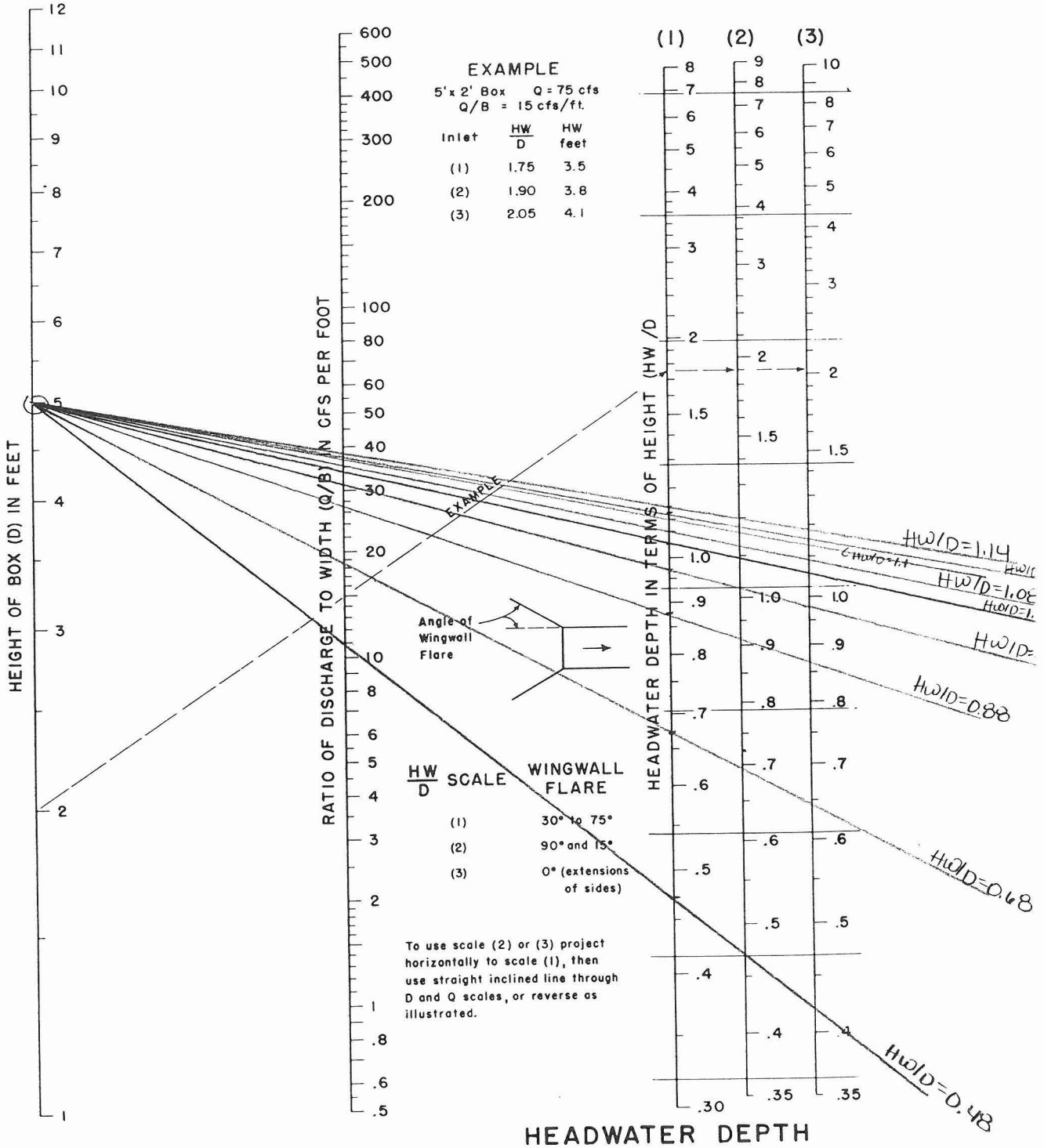
JOB NAME Palo Verde Zone A Delineation JOB NO. 3101019

culvert # 36 (10A) (5x15' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

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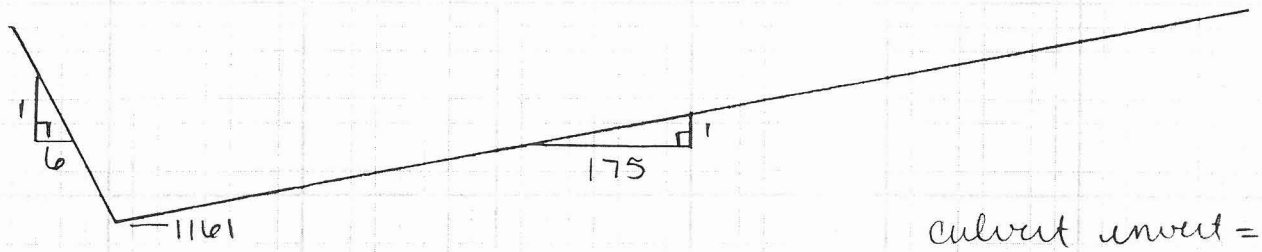
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1161)

culvert #361 (10A)
(5'x15' RCB)

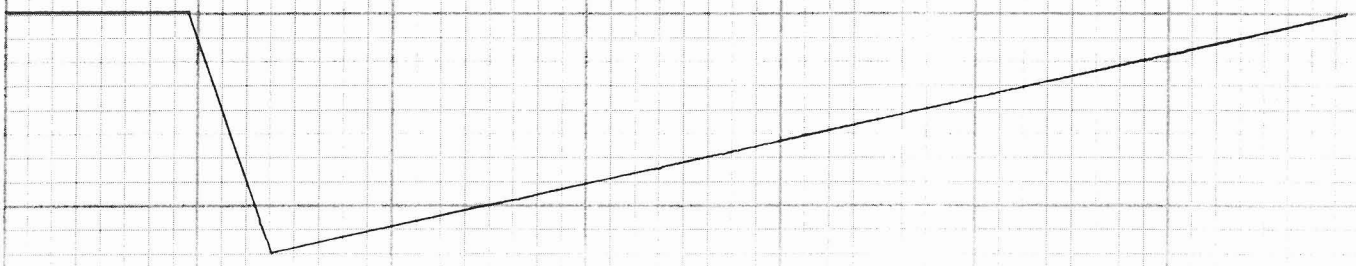


culvert invert = 115

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.00556
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

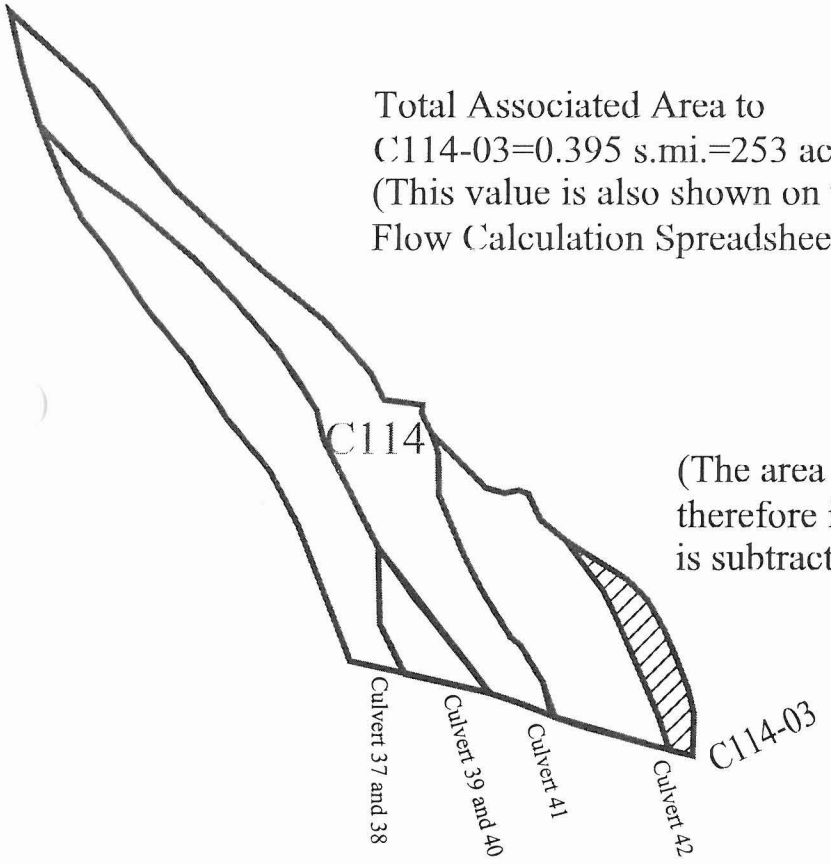
Weir Analysis (at EL >)



$$Q = CLH^{1.5}$$

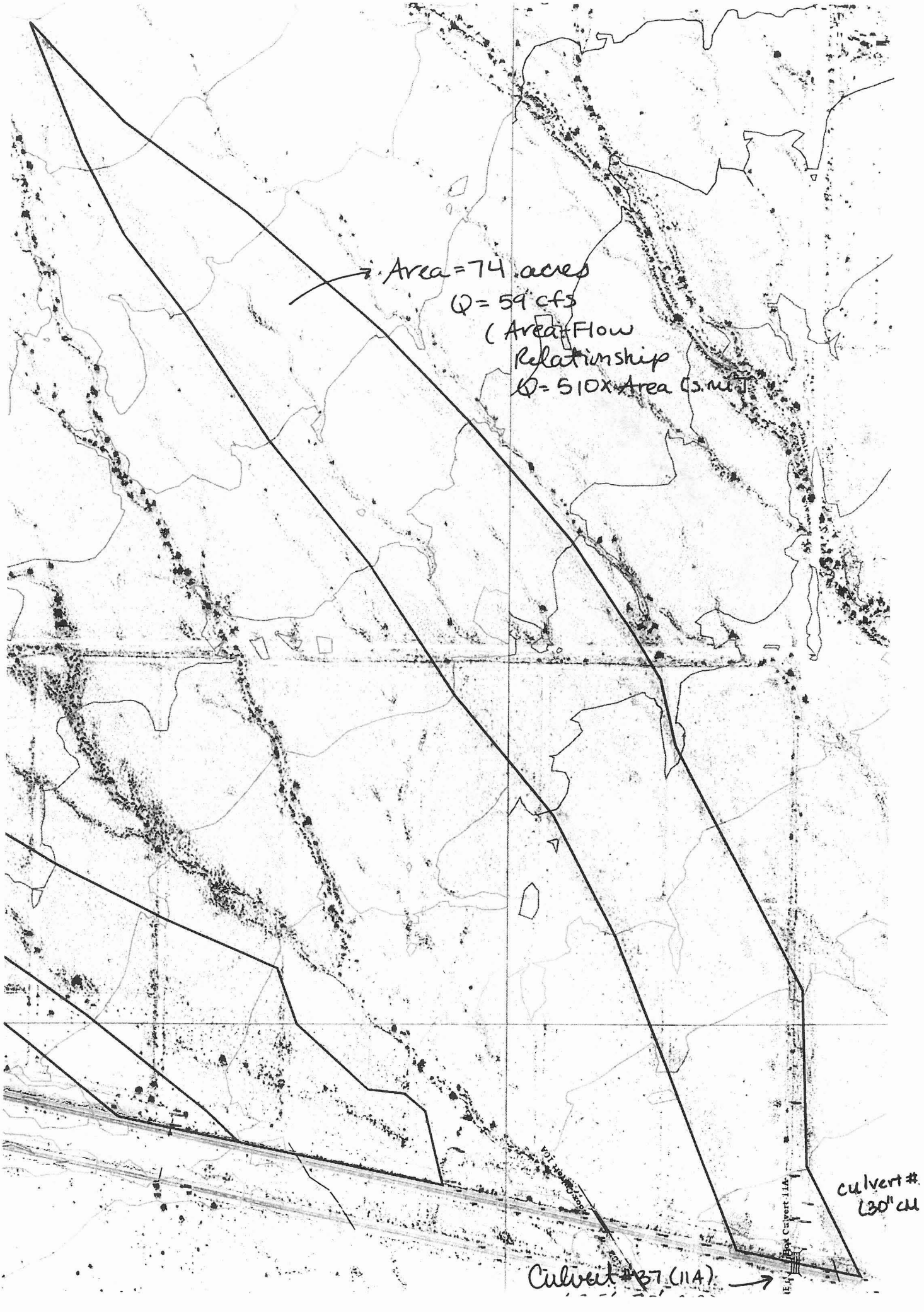
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

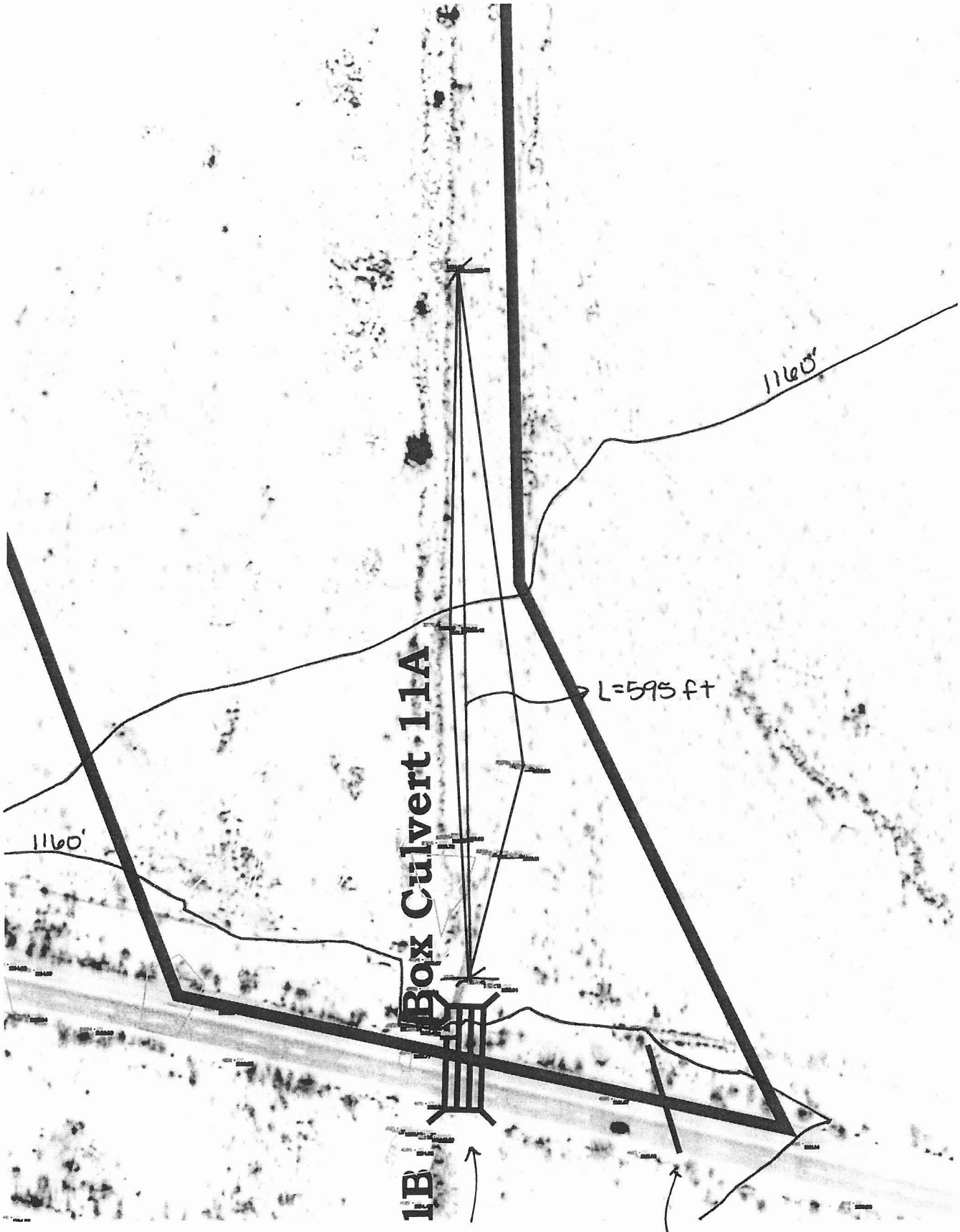
$$\left(H = \frac{L(\bar{H}) + \ell(2/3\,\bar{H})}{L+\ell}\right)$$



Total Associated Area to
C114-03=0.395 s.mi.=253 acres
(This value is also shown on the
Flow Calculation Spreadsheet)

(The area shaded flows towards Culverts 43 and 44
therefore it is not included in Basin C114, and
is subtracted and added into basin C39)


Area = 74 acres
Q = 59 cfs
(Area-Flow
Relationship
Q = 510 x Area (s.mi.)
culvert #
130" dia
Culvert #37 (114)


1160'
L=595 ft
Box Culvert 11A
1160'
1B
culvert # 37 (11A)
(3-5'x10' RCB)
culvert #38
(30" CMP)

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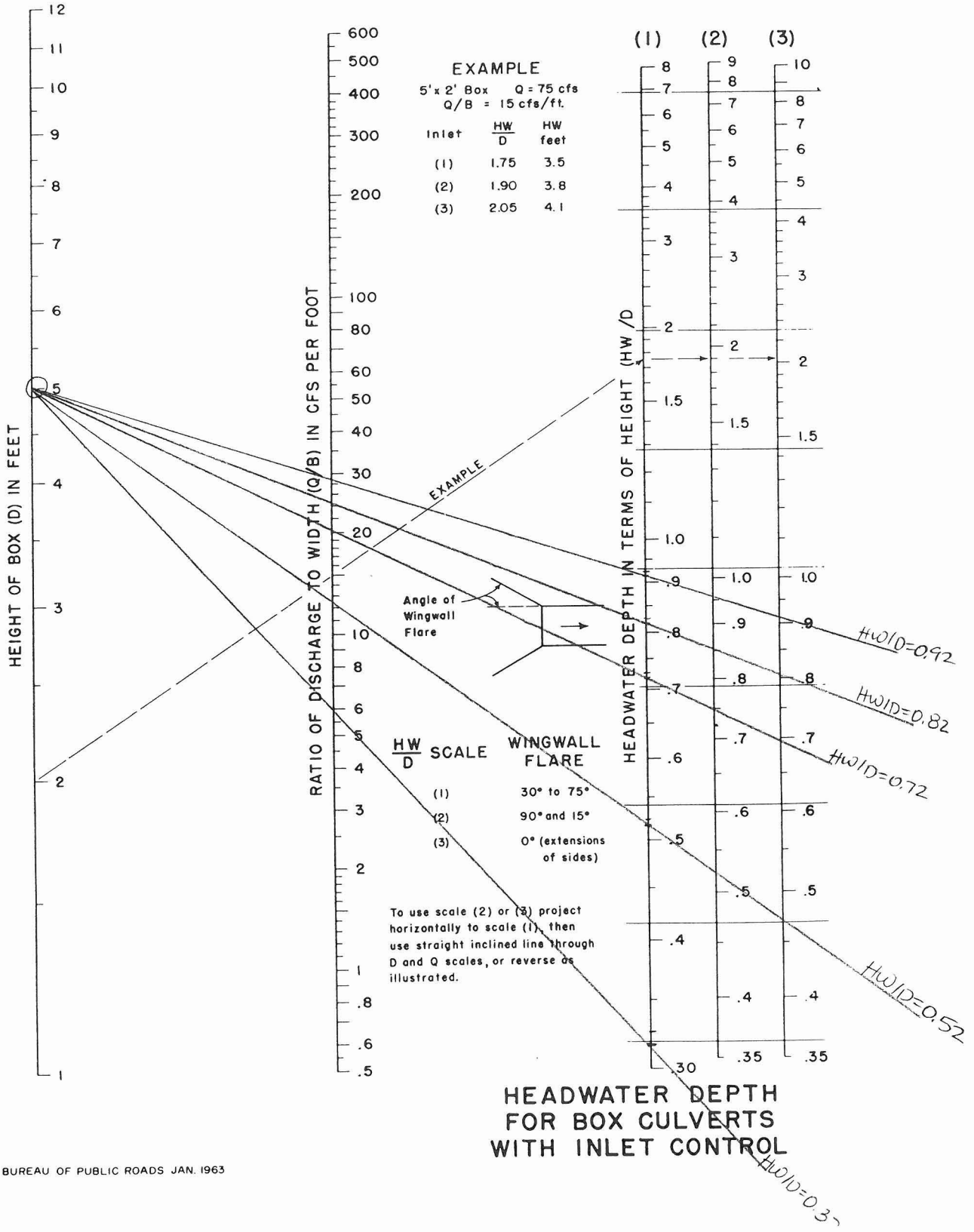
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Culvert #37 (11A)
(5'x10'12CB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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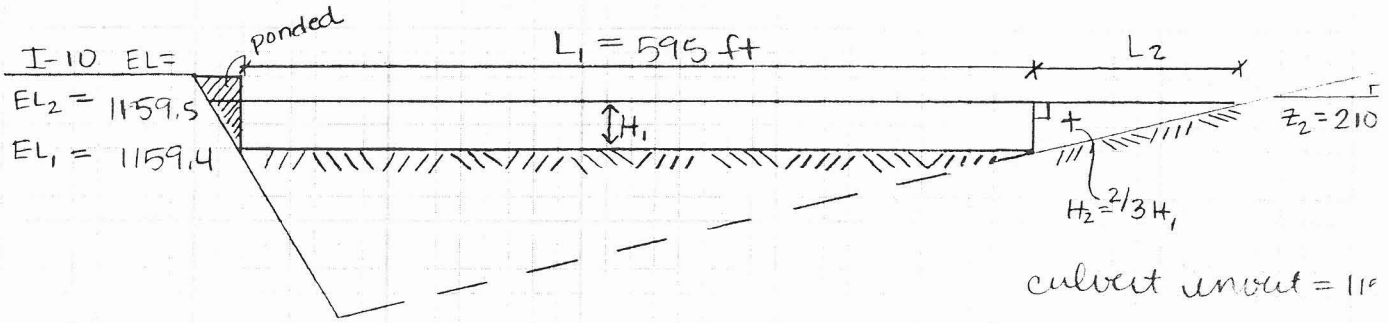
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1159.35)

culvert #37 (11A)
(3-5'x10' RCB)



$H_1 = E_2 - E_1 = 1159.5 - 1159.4 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(210) = 21$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(595)(0.10) + (21)(0.0667)}{595 + 21} = 0.09$

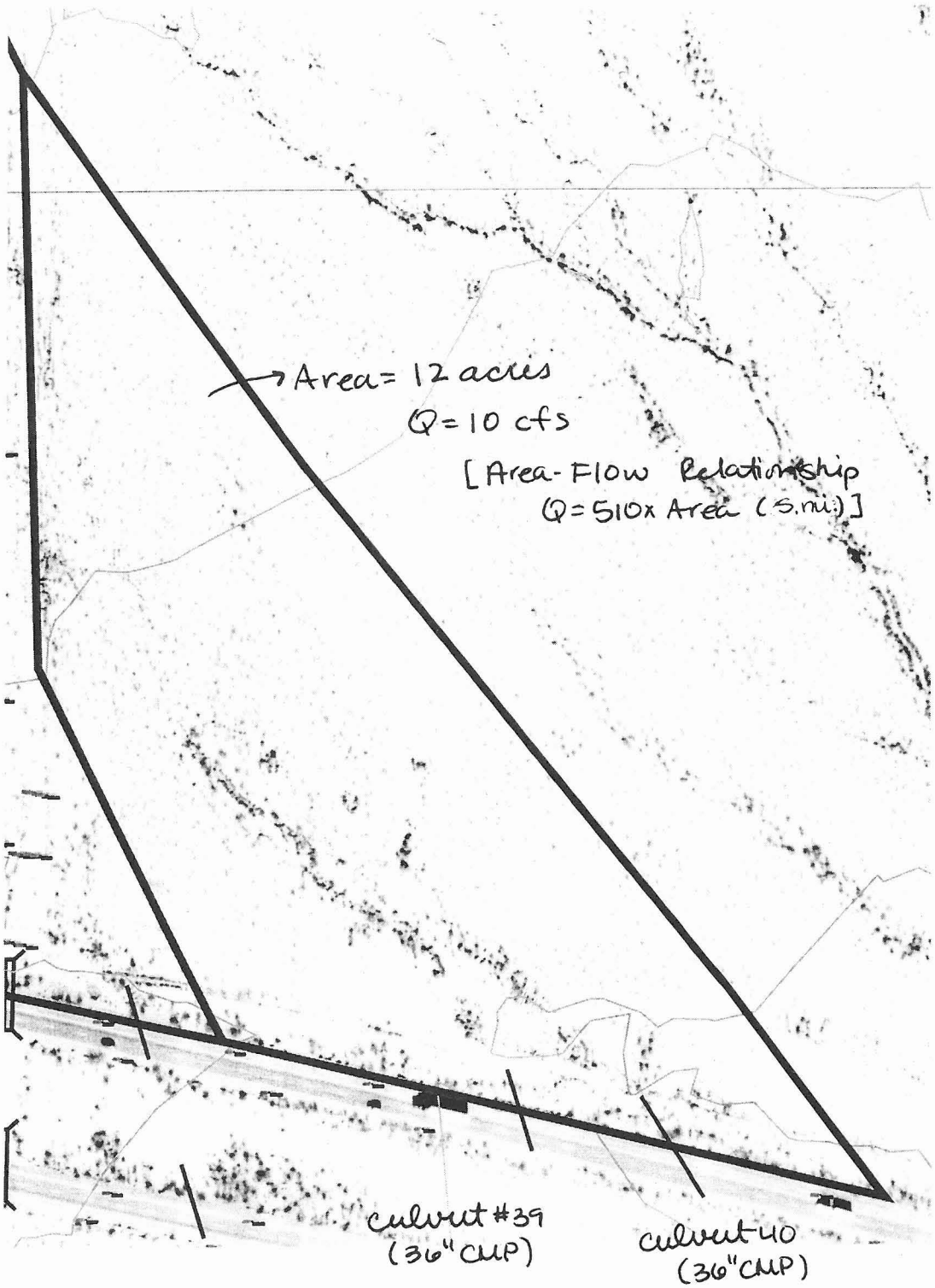
$L_T = L_1 + L_2 = 595 + 21 = 616$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \overline{H}^{1.5} = 2.7(616)(0.0989)^{1.5} = 51.7$ cfs

* Just doing the hydraulic analysis using the 3-5'x10' Box culverts, there is no flow flowing East along highway. Therefore, the 30" CMP was ignored.


Area = 12 acres
Q = 10 cfs
[Area-Flow Relationship
Q = 510 x Area (S.mi.)]
culvert #39
(36" CMP)
culvert 40
(36" CMP)

1160'
1155'
5
1030
1
206
Culvert 12A

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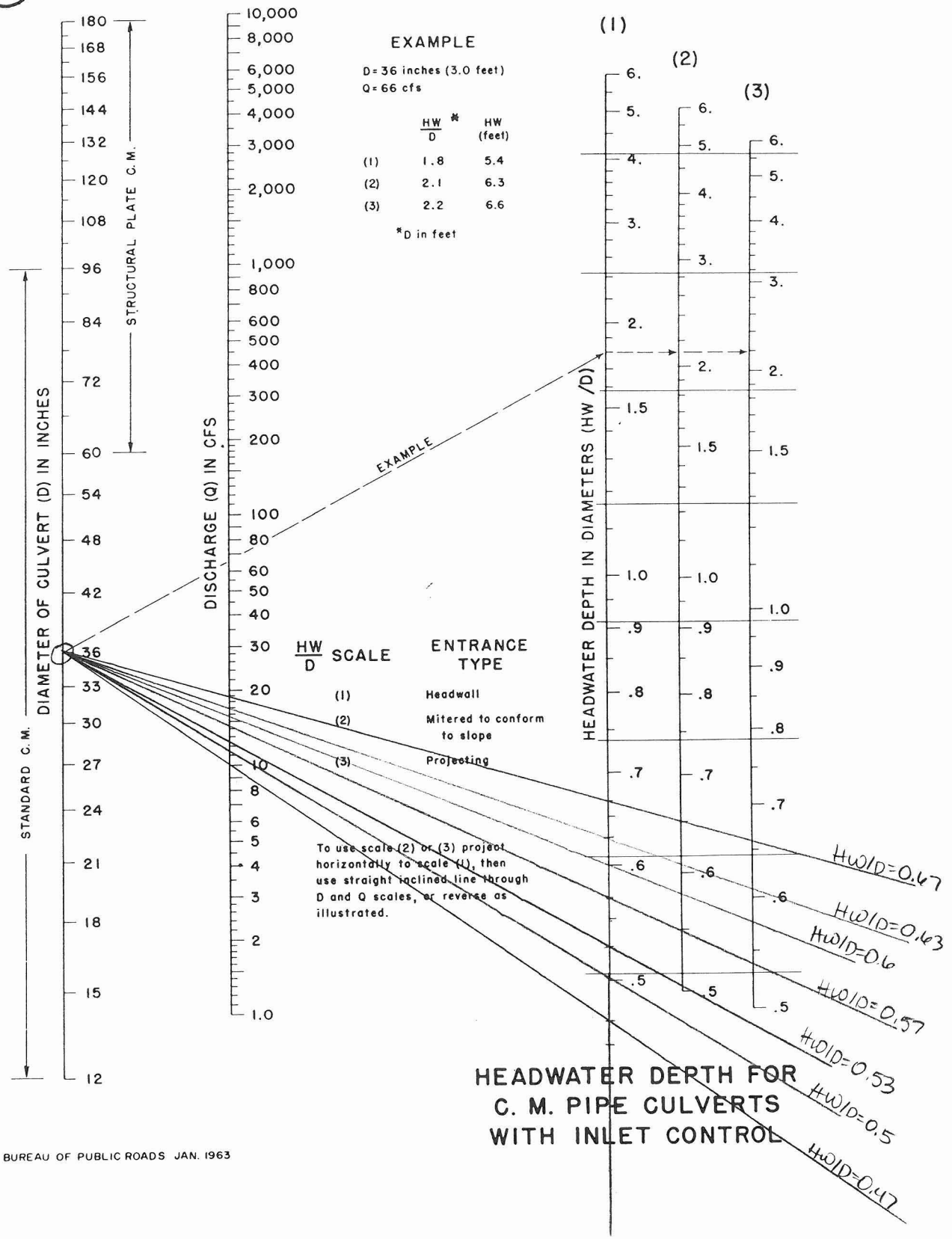
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #39 (36" CMP)
culvert #110 (36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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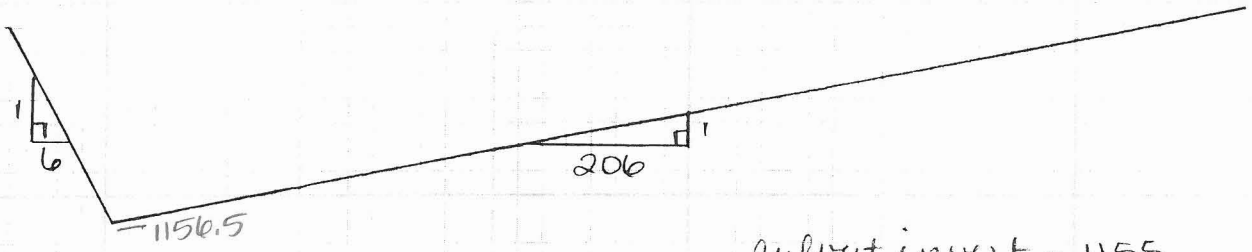
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1156.5)

culvert #39 and culvert #40 (both 36" CMP)

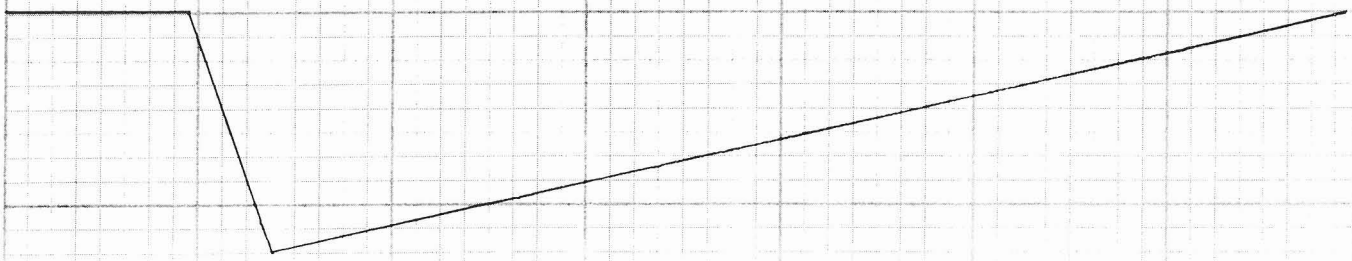


culvert invert = 1155
(assumed both culverts have same invert)

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.006
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

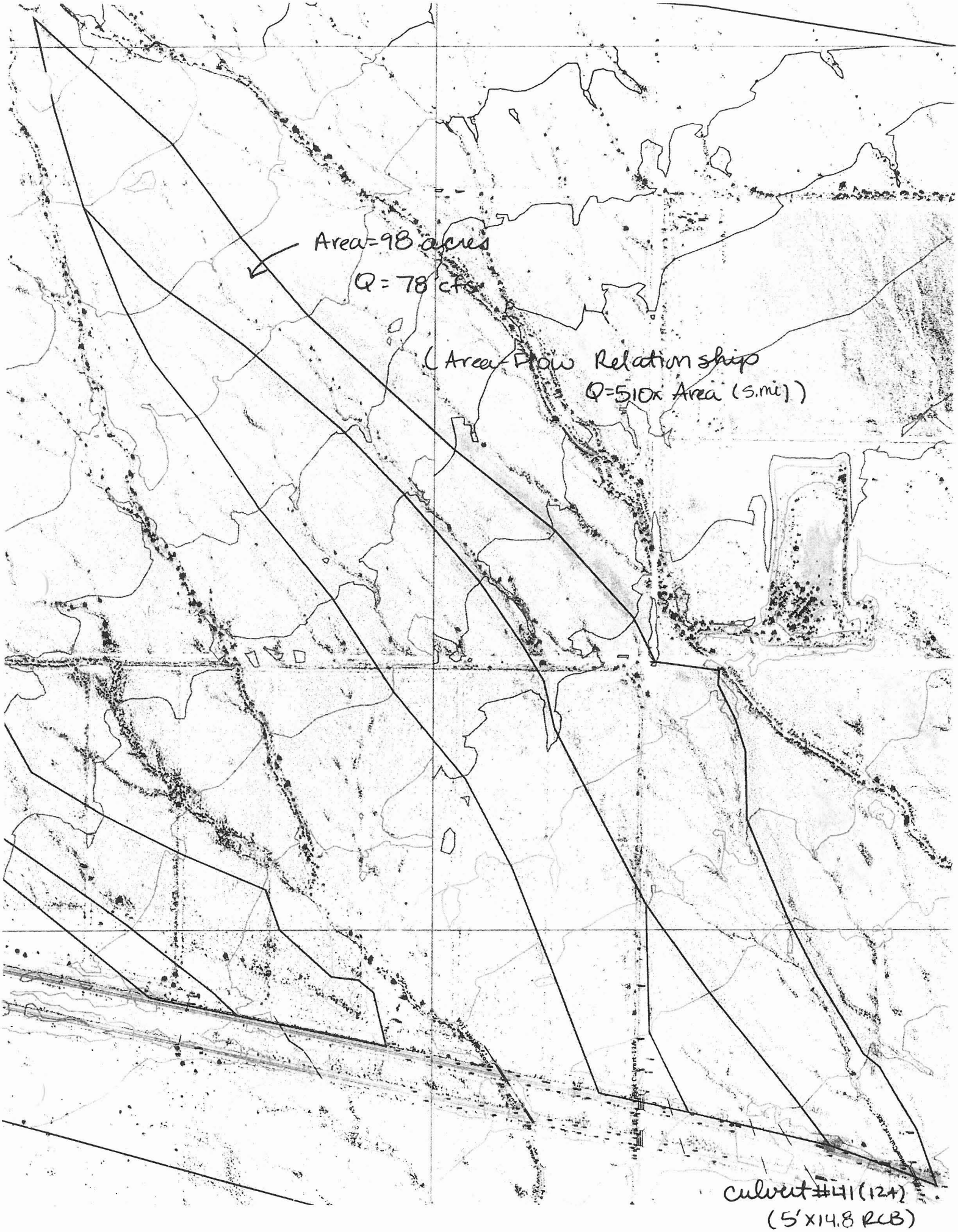
Weir Analysis (at EL >)

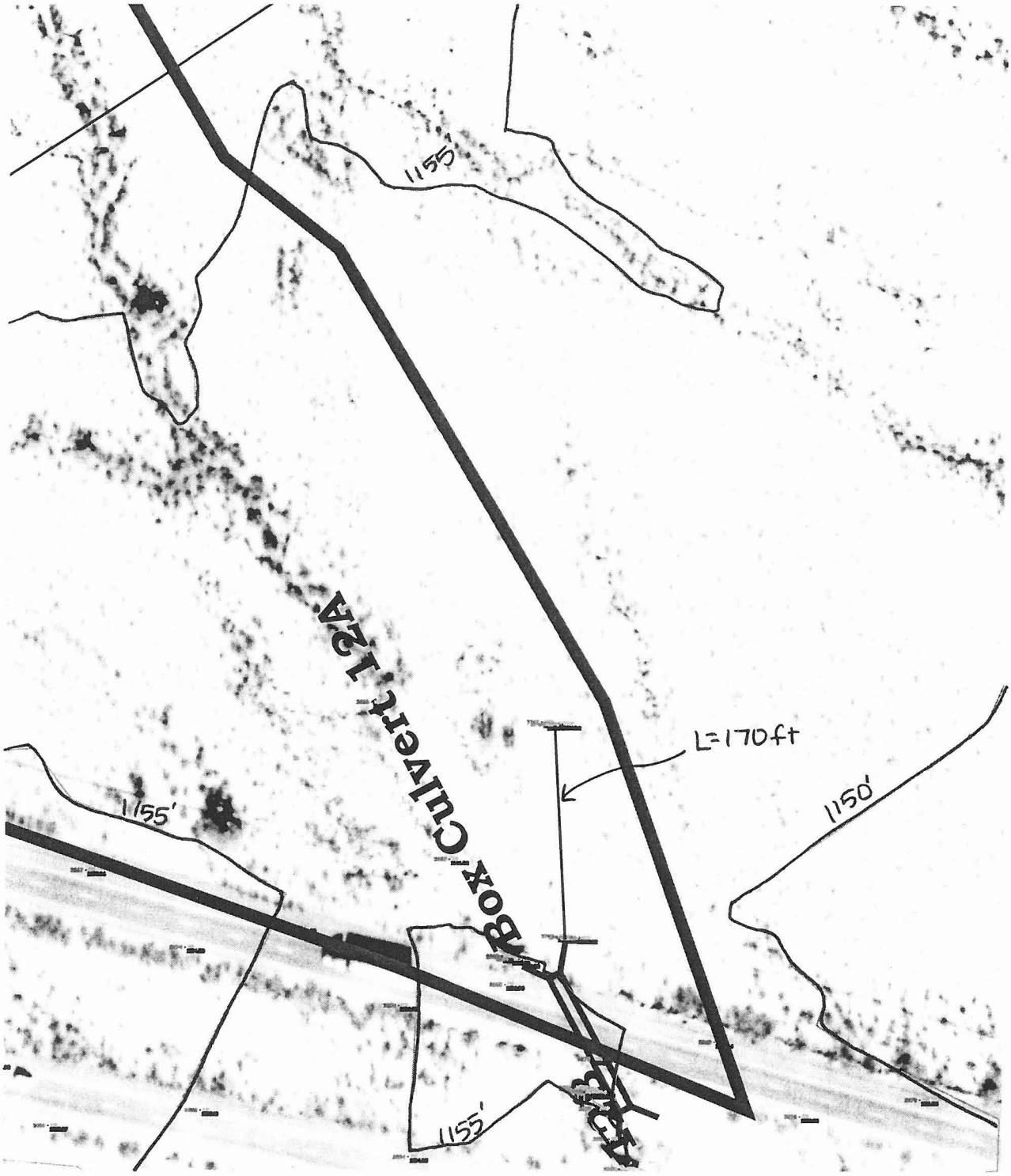


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


Area=98 acres
Q = 78 cfs
(Area-Flow Relationship
Q=510x Area (s.mi))
Culvert #41 (124)
(5'x14.8 RCB)



Culvert #41 (12A)
(5'x14.8' RCB)

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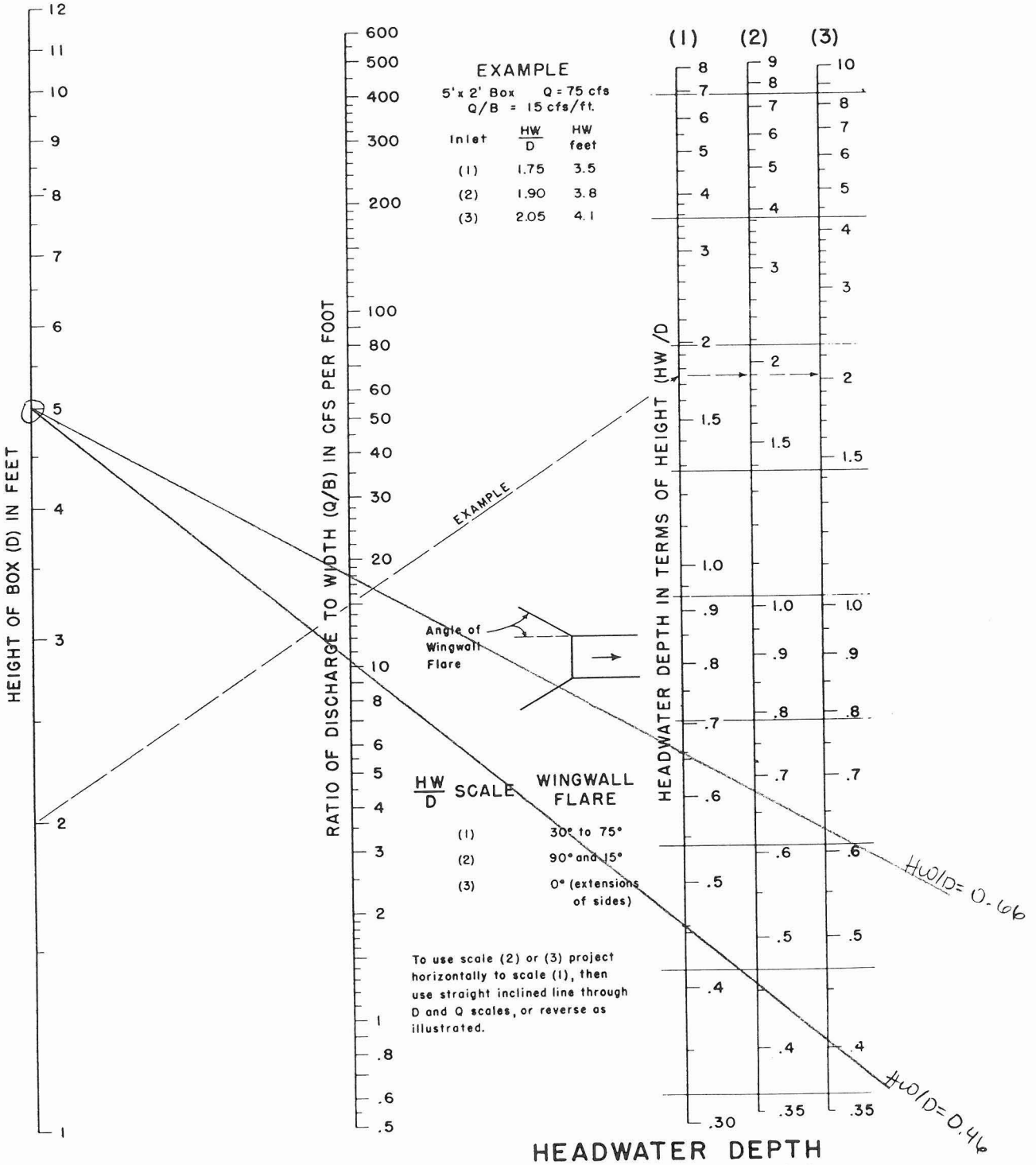
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #41 (12A) (5'x14.8' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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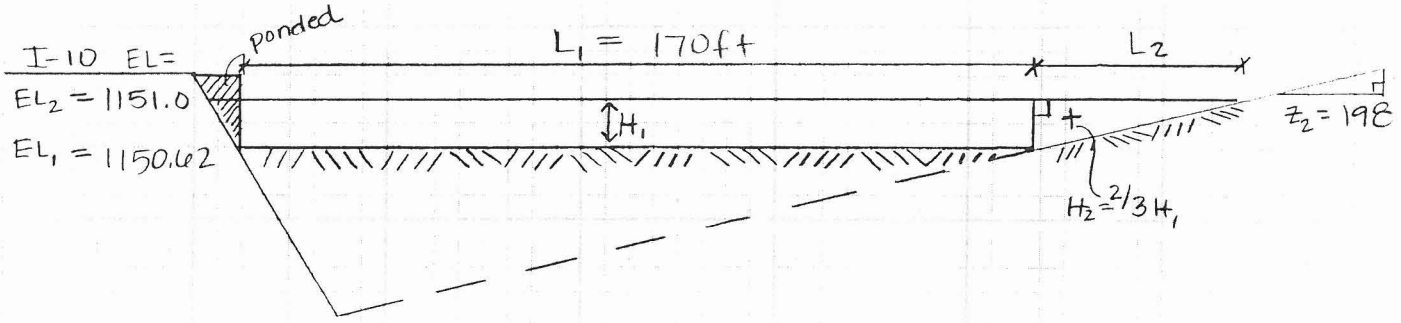
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1150.6)

Culvert #41 (12A)
(5'x14.8' RCB)



$H_1 = E_2 - E_1 = 1151.0 - 1150.62 = 0.38$ ft

Culvert crest = 1145.7

$L_2 = H_1 Z_2 = (0.38)(198) = 75.24$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.38) = 0.44$ ft

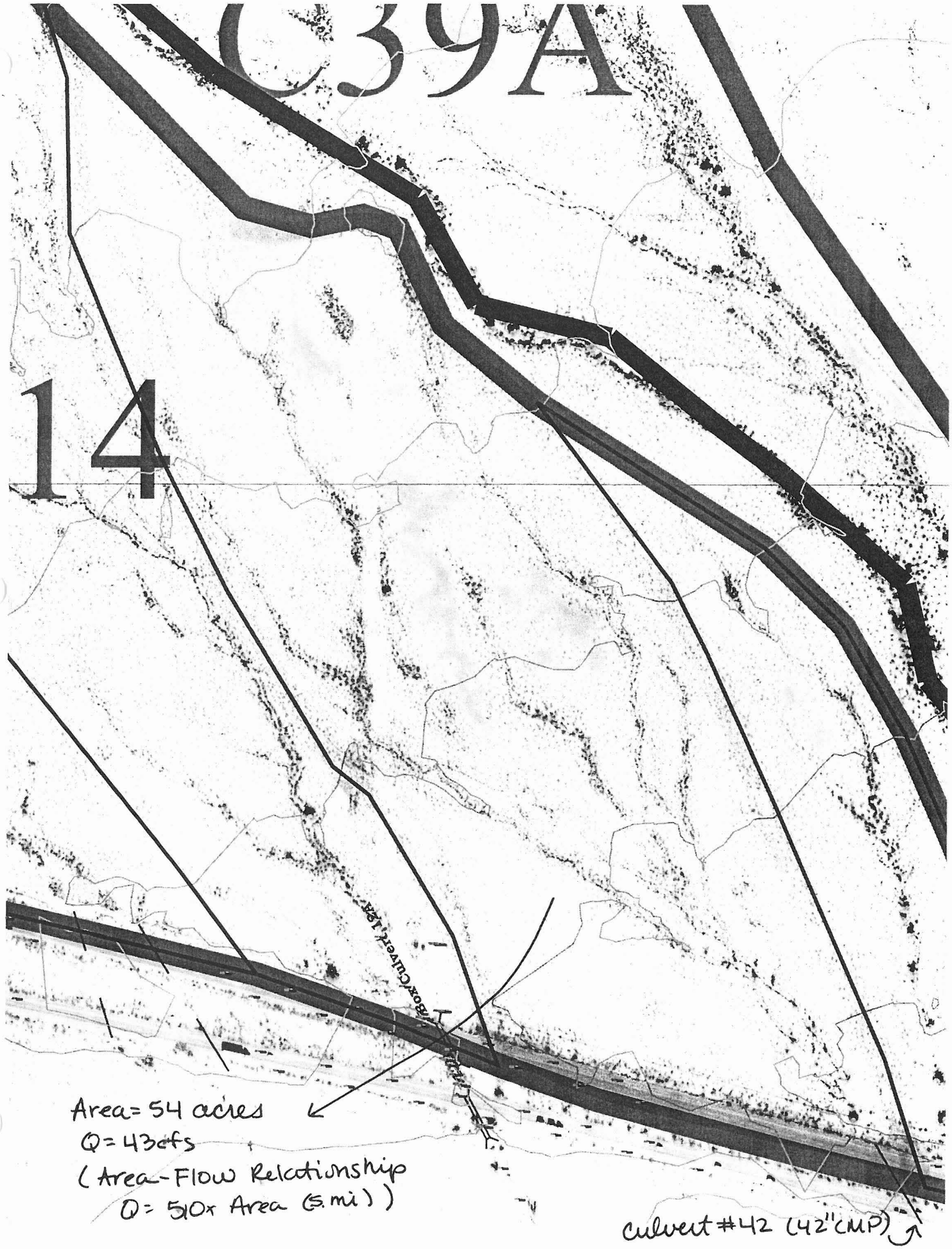
Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(170)(0.38) + (75.24)(0.44)}{170 + 75.24} = 0.398$ ft

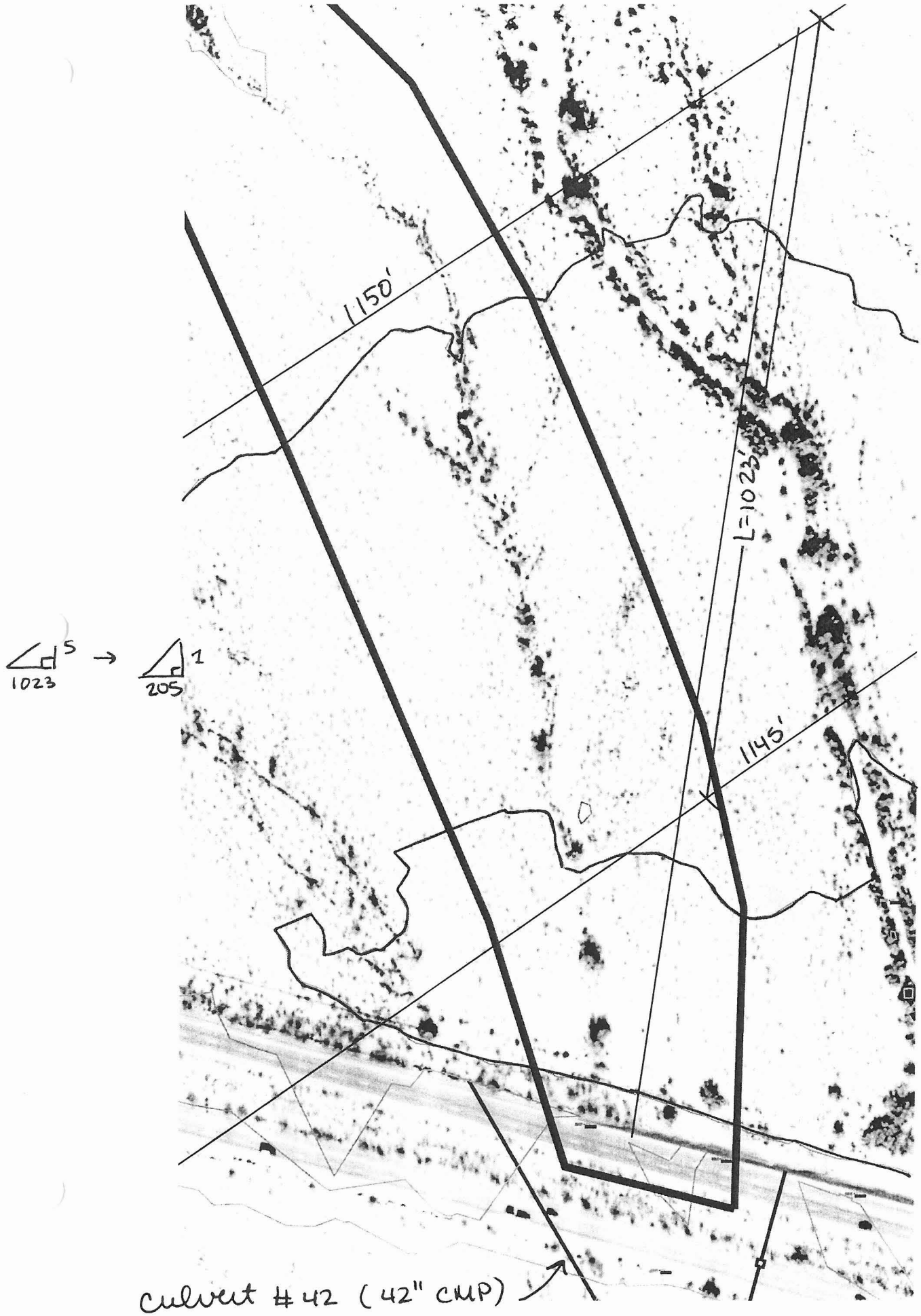
$L_T = L_1 + L_2 = 170 + 75.24 = 245.24$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (245.24)(0.398)^{1.5} = 166.5$ cfs


C39A
14
Box Culvert 1EA
Area= 54 acres
Q= 43cfs
(Area-Flow Relationship
Q= 510x Area (sq mi))
culvert #42 (42"CMP)


1150'
L=1023'
1145'
5
1023
1
205
culvert #42 (42" CMP)

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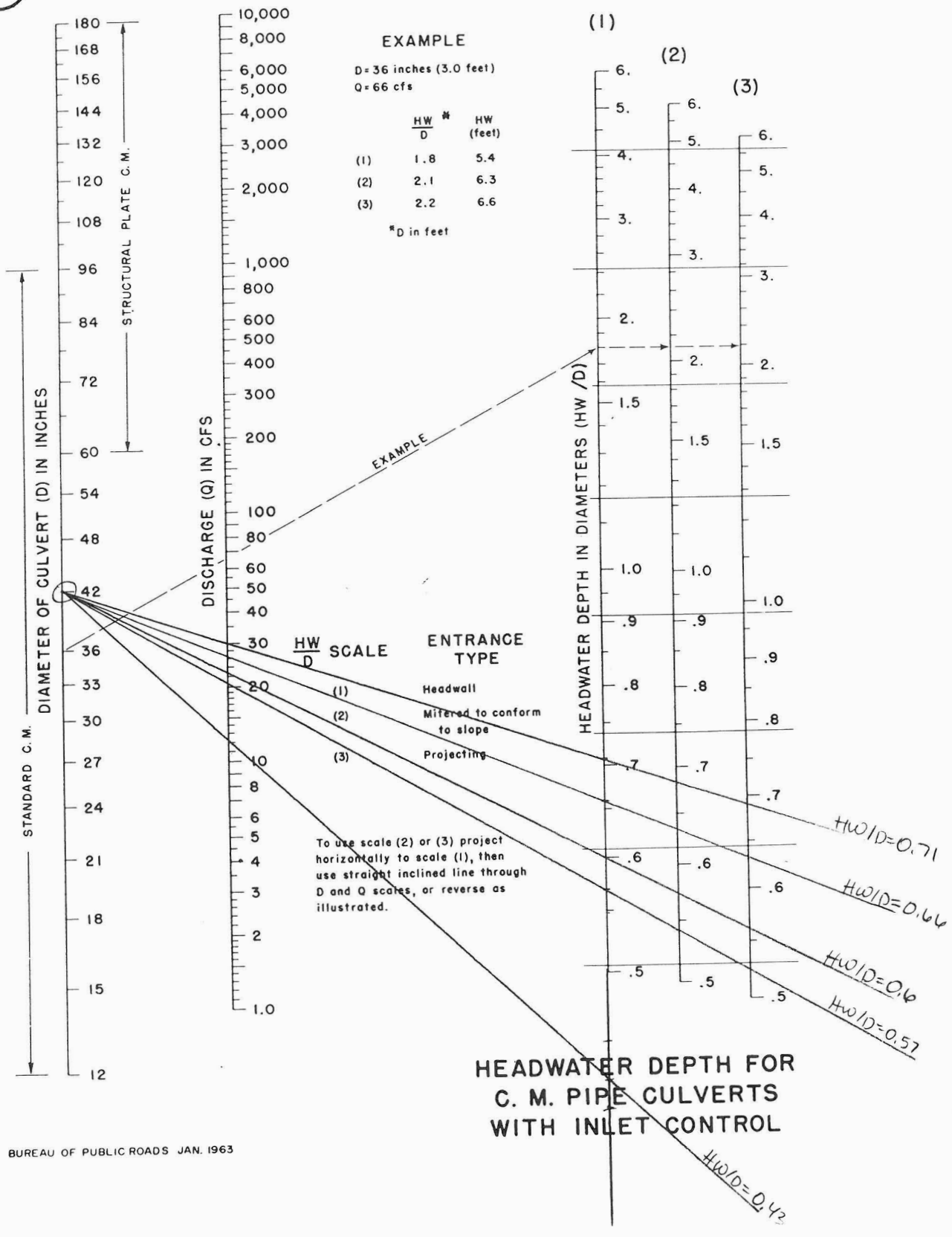
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #42 (42" CMP)

CHART 2



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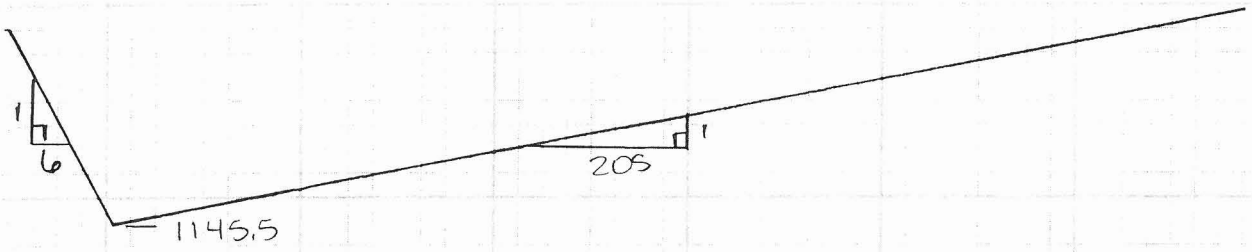
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1145.5) culvert #42 (42" CMP)

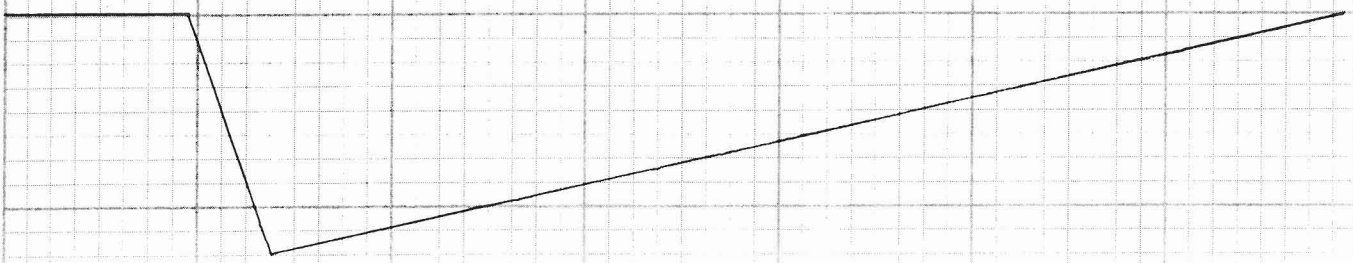


culvert invert = 1144

$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

where $n = 0.065$
S = downstream slope = 0.0033
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL>)

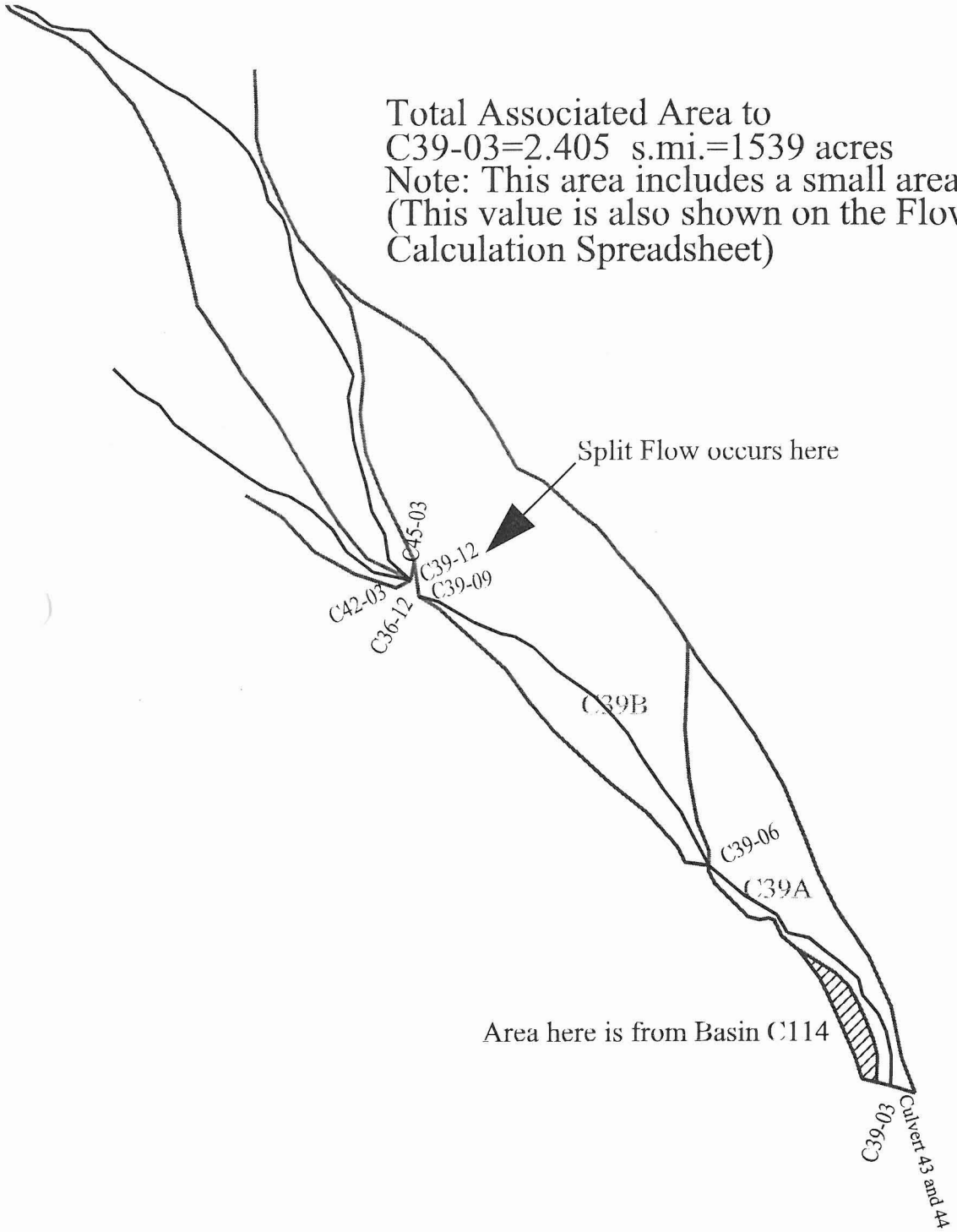


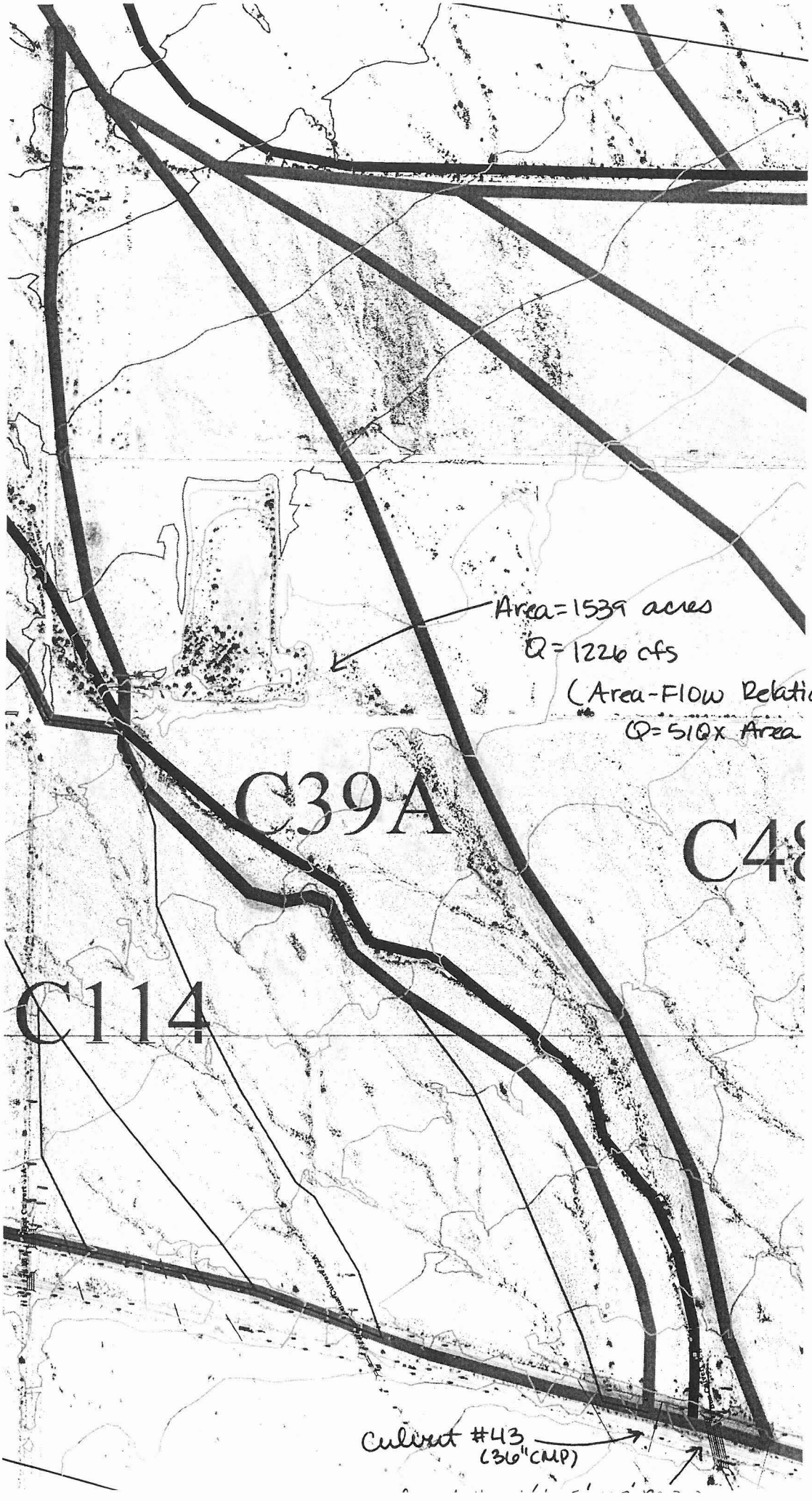
$Q = CLH^{1.5}$

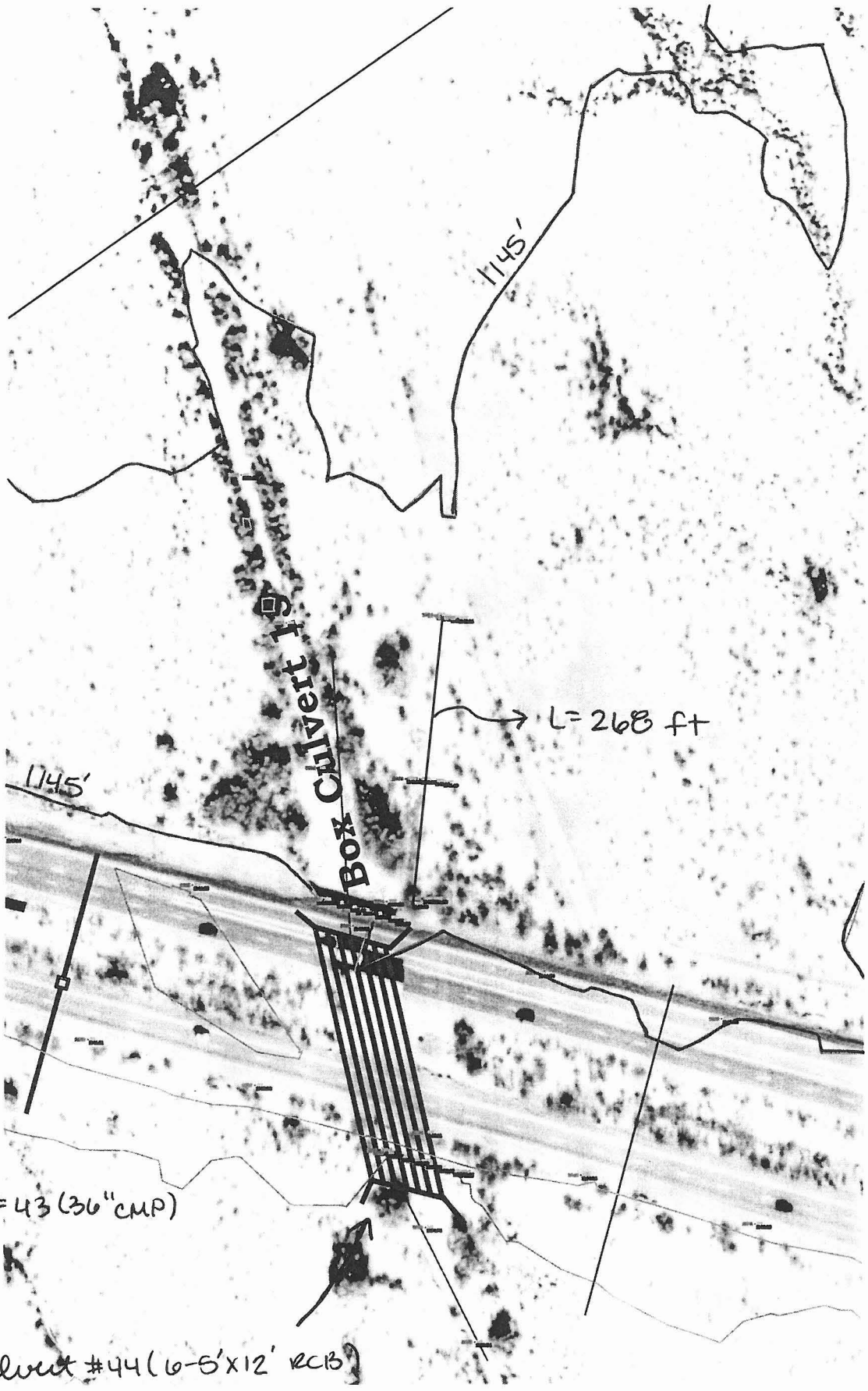
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$

Total Associated Area to
C39-03=2.405 s.mi.=1539 acres
Note: This area includes a small area from Basin C114
(This value is also shown on the Flow
Calculation Spreadsheet)




Area=1539 acres
Q=1226 cfs
(Area-Flow Relationship
Q=51Qx Area (s.mi))
C39A
C48
C114
Culvert #43
(36"CMP)


1145'
Box Culvert 1
L=268 ft
1145'
Culvert #43 (36" CMP)
Culvert #44 (6-5'x12' RCB)

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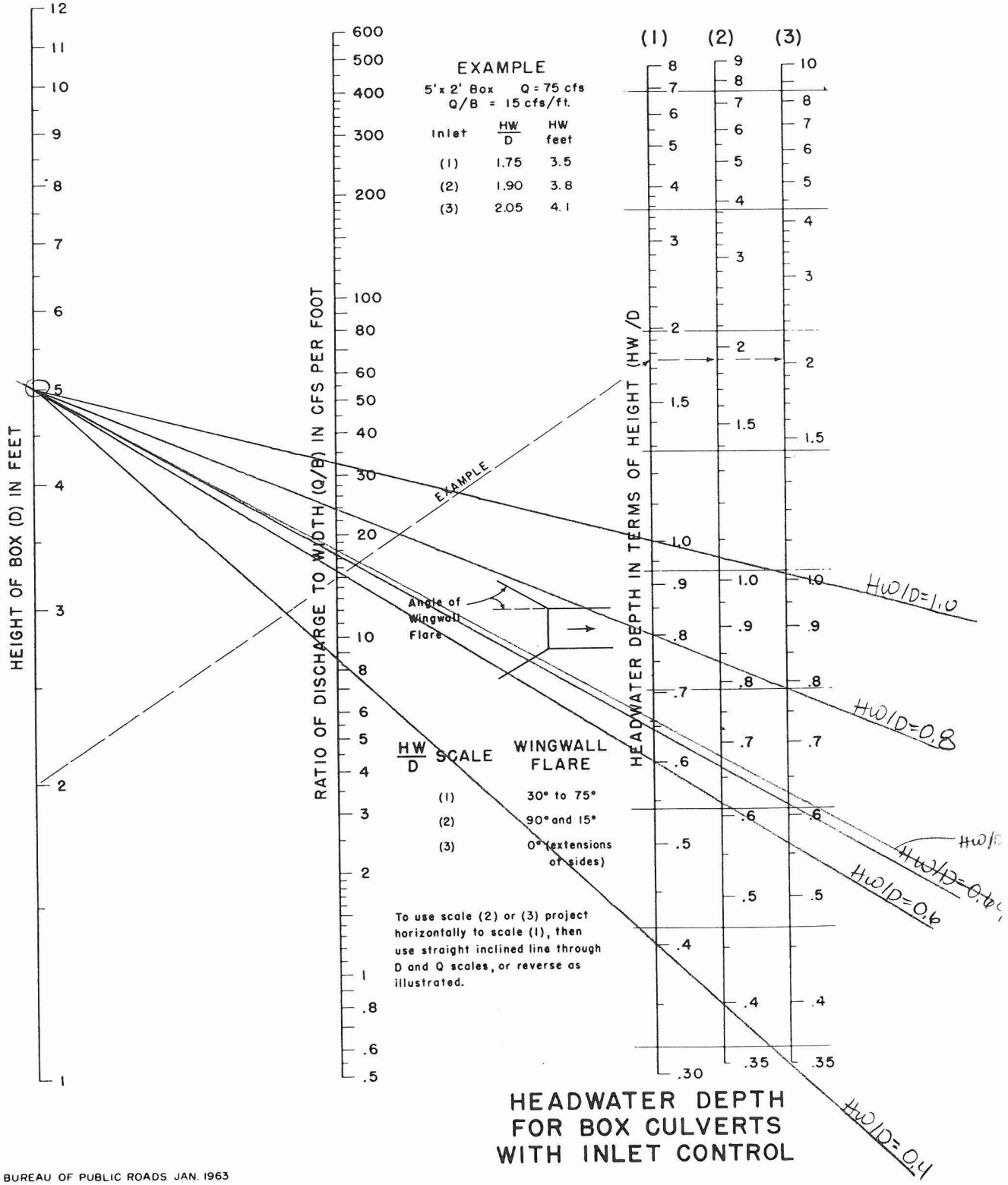
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #44 (6-5'x12' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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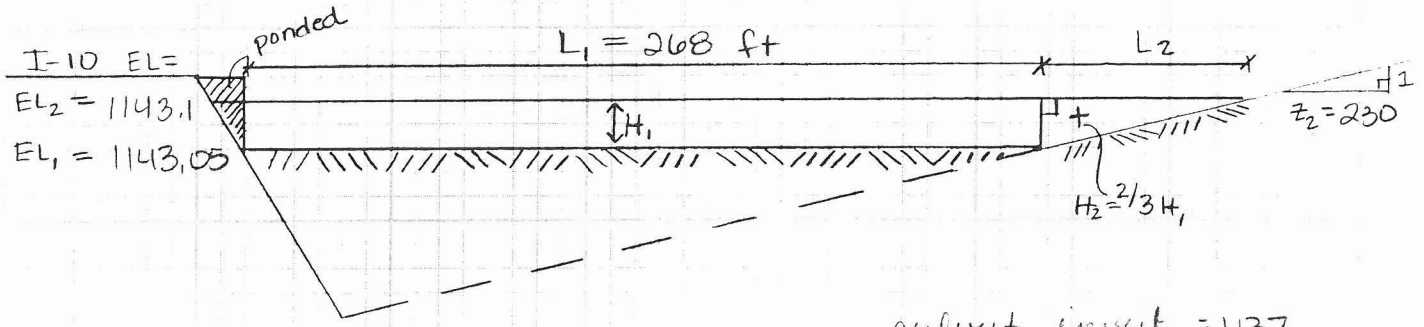
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1143.1)

Culvert # 44 (13)
(6-5'x12' RCB)



culvert invert = 1137

$H_1 = E_2 - E_1 = 1143.1 - 1143.05 = 0.05$ ft

$L_2 = H_1 z_2 = (0.05)(230) = 11.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.05) = 0.033$ ft

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(268)(0.05) + (11.5)(0.033)}{268 + 11.5} = 0.049$ ft

$L_T = L_1 + L_2 = 268 + 11.5 = 279.5$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

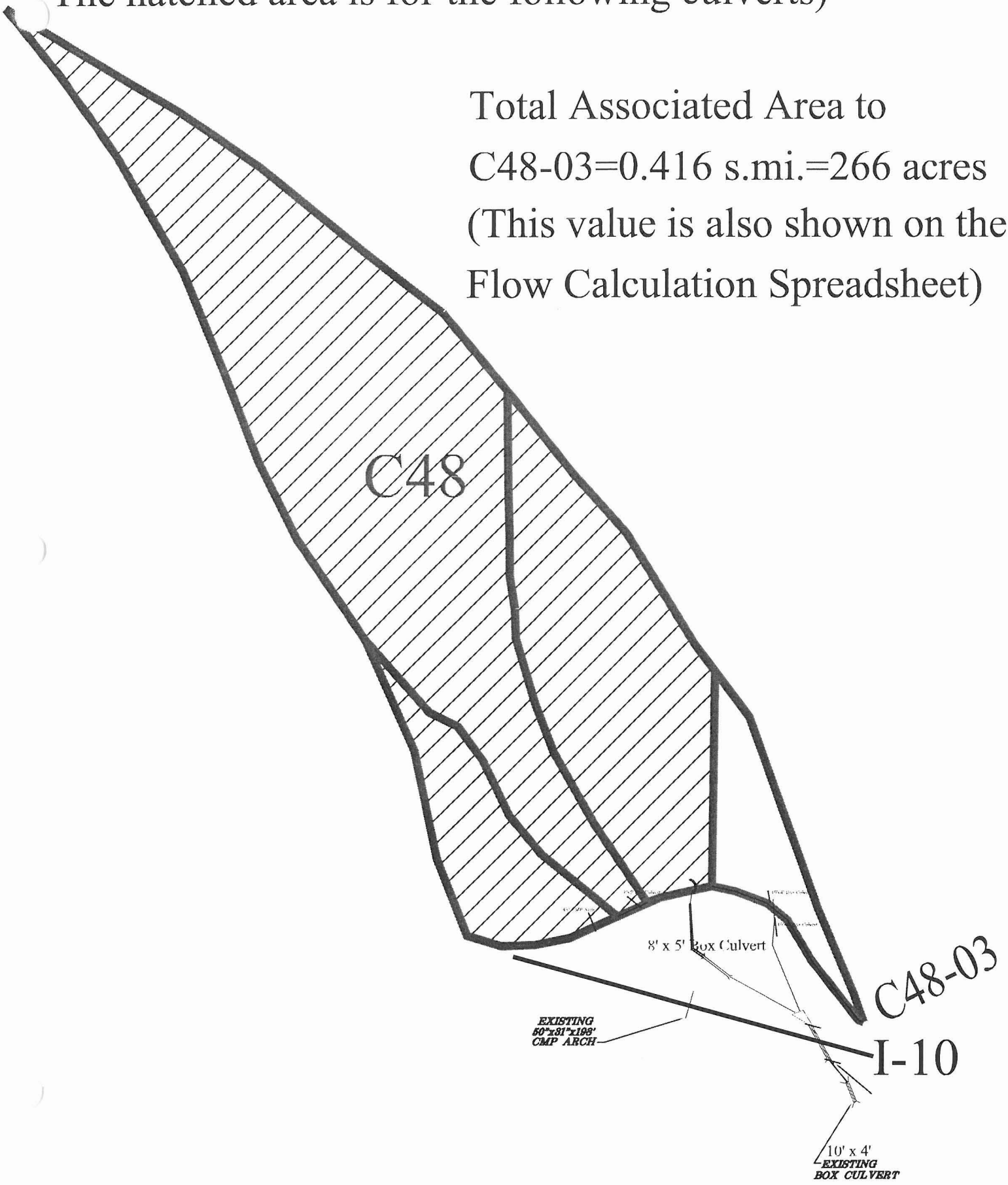
$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (279.5)(0.049)^{1.5} = \underline{8.26 \text{ cfs}}$

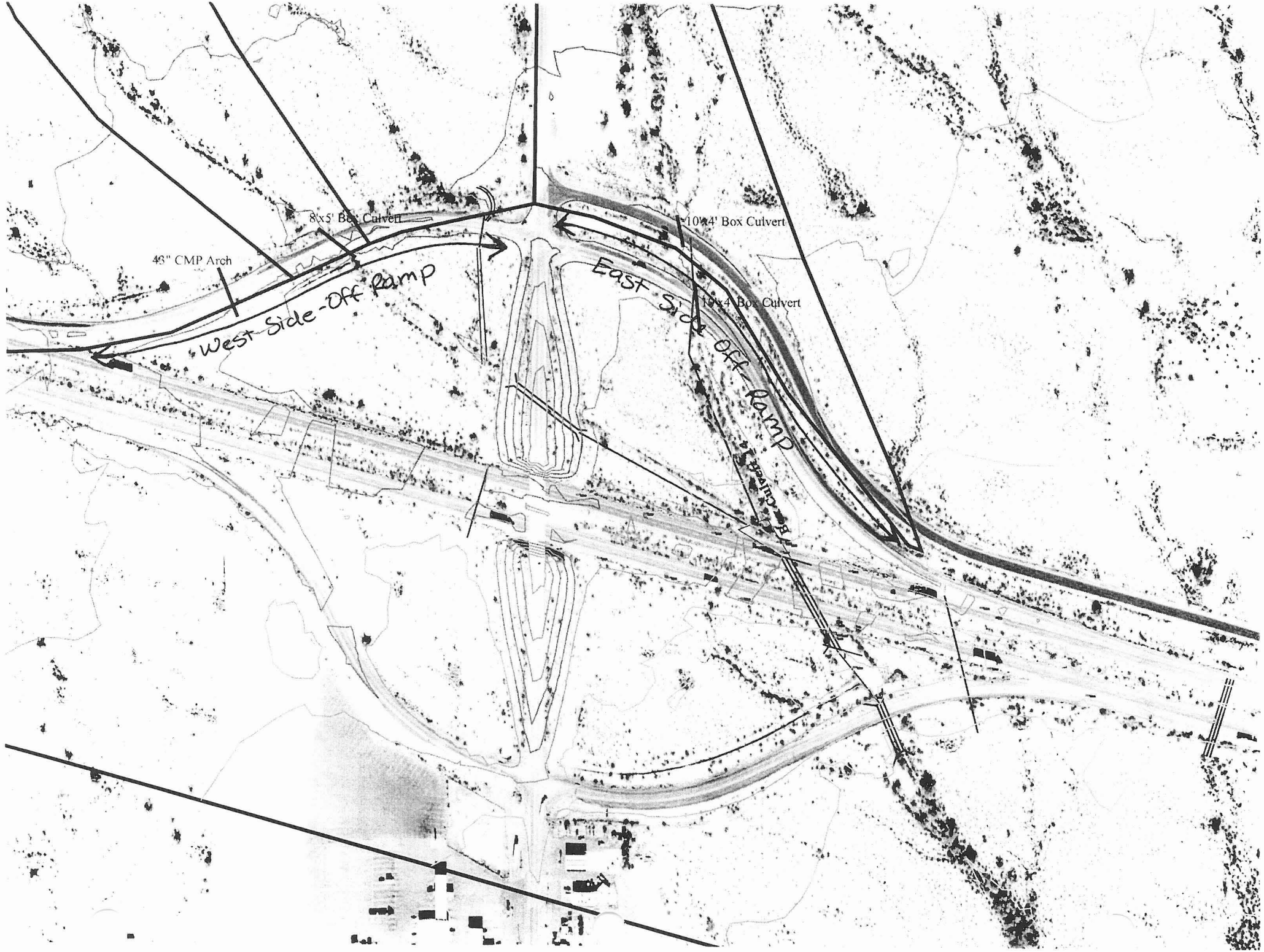
*** Culvert #43 (30" CMP) wasn't included in this analysis, since culvert #44 (6-5'x12' RCB) can take the target flow on the spreadsheet w/o any flow bypassing to the east.

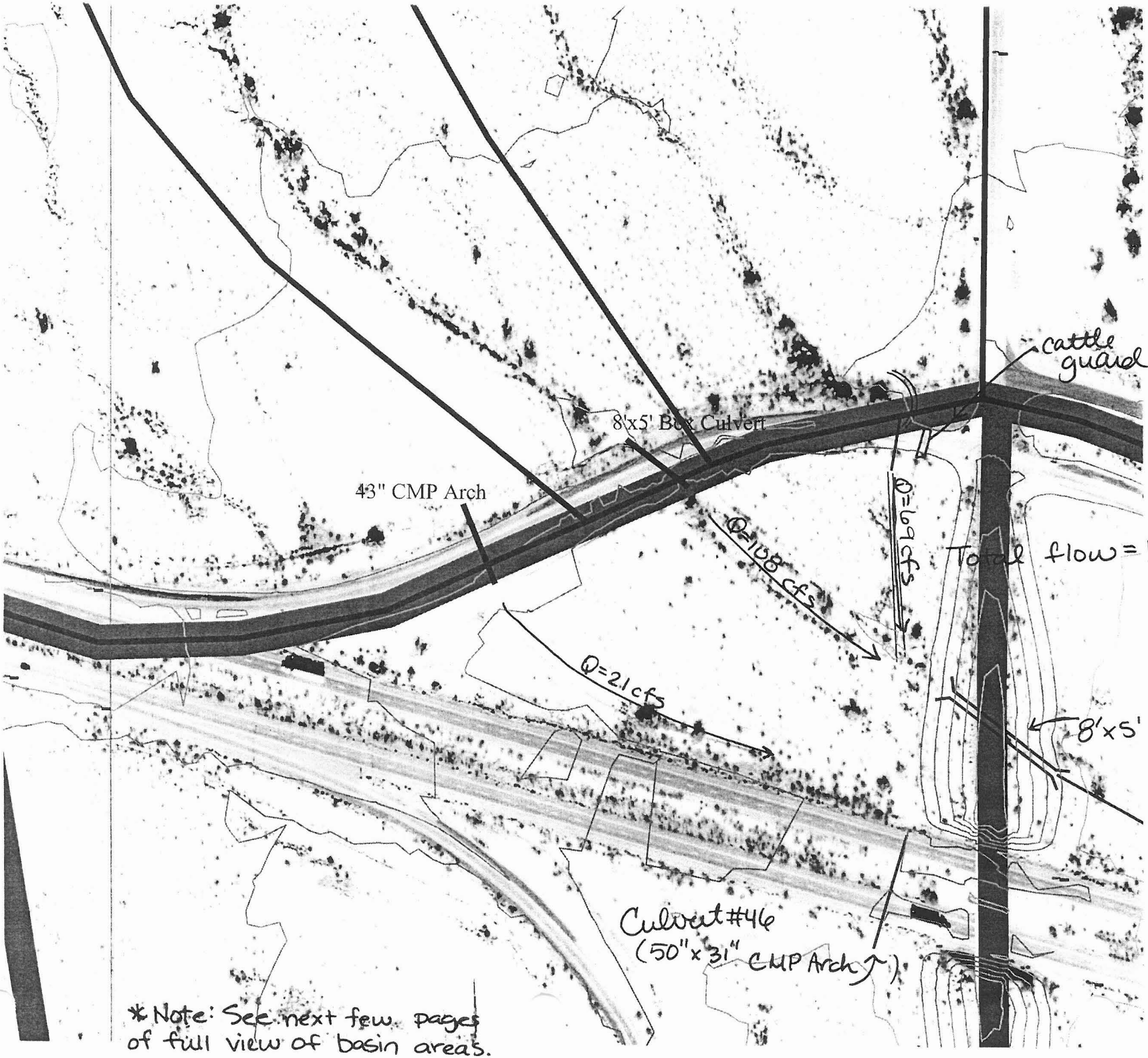
* This culvert is ignored b/c there is no flow flowing east from the previous box culverts, and it is in a 4" pipe

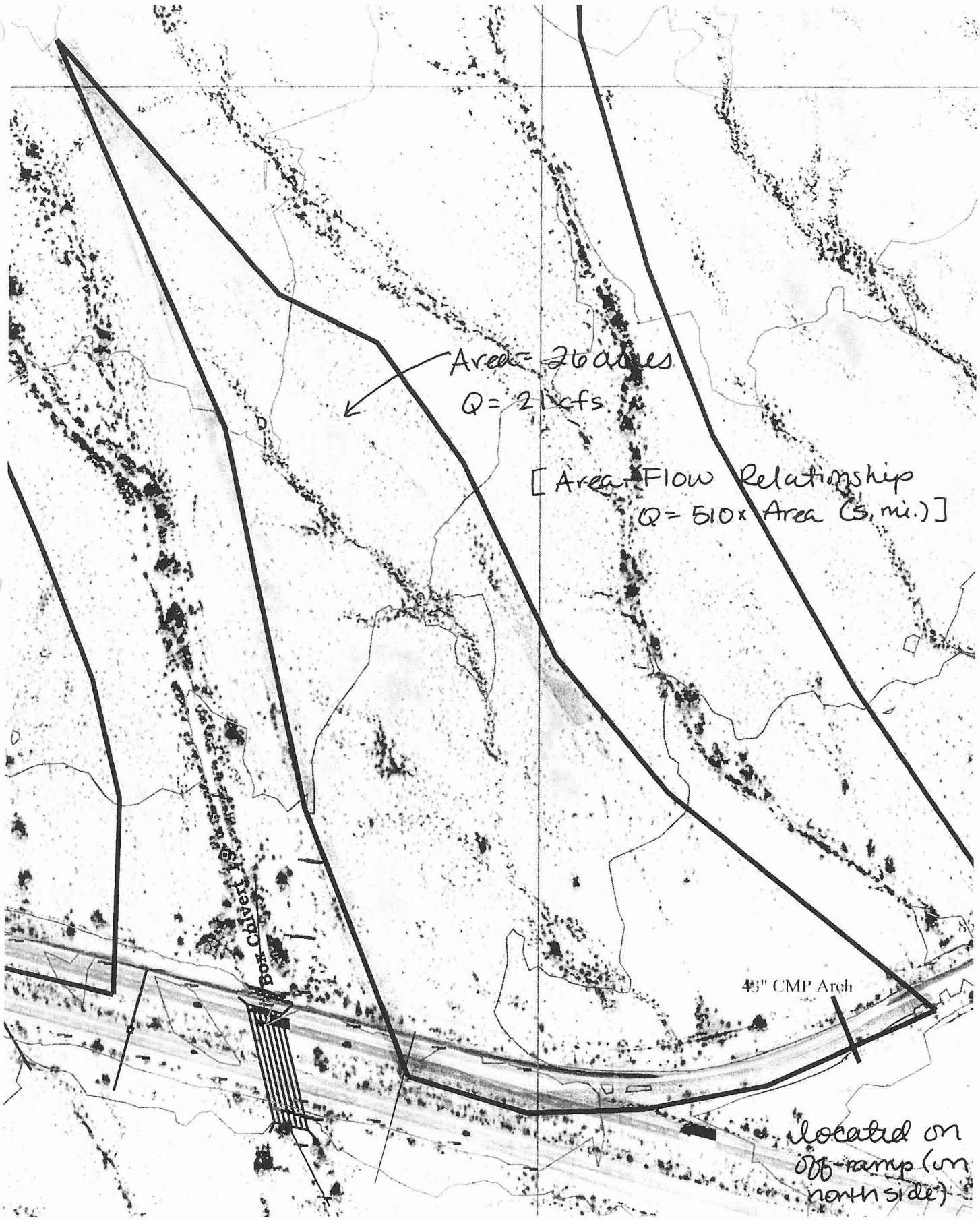
(The hatched area is for the following culverts)

Total Associated Area to C48-03=0.416 s.mi.=266 acres (This value is also shown on the Flow Calculation Spreadsheet)




8'x5' Box Culvert
10'x4' Box Culvert
48" CMP Arch
West Side Off Ramp
East Side Off Ramp
10'x4' Box Culvert


cattle guard
8'x5' Box Culvert
43" CMP Arch
Q=69 cfs
Q=108 cfs
Total flow = 198cfs
Q=21 cfs
8'x5' Box Culvert
Culvert #46
(50"x31" CMP Arch)
* Note: See next few pages of full view of basin areas.


Area = 216 acres
Q = 2 cfs
[Area-Flow Relationship
Q = 510 x Area (S. mi.)]
Box Culvert @ [illegible]
48" CMP Arch
located on
off-ramp (on
northside)

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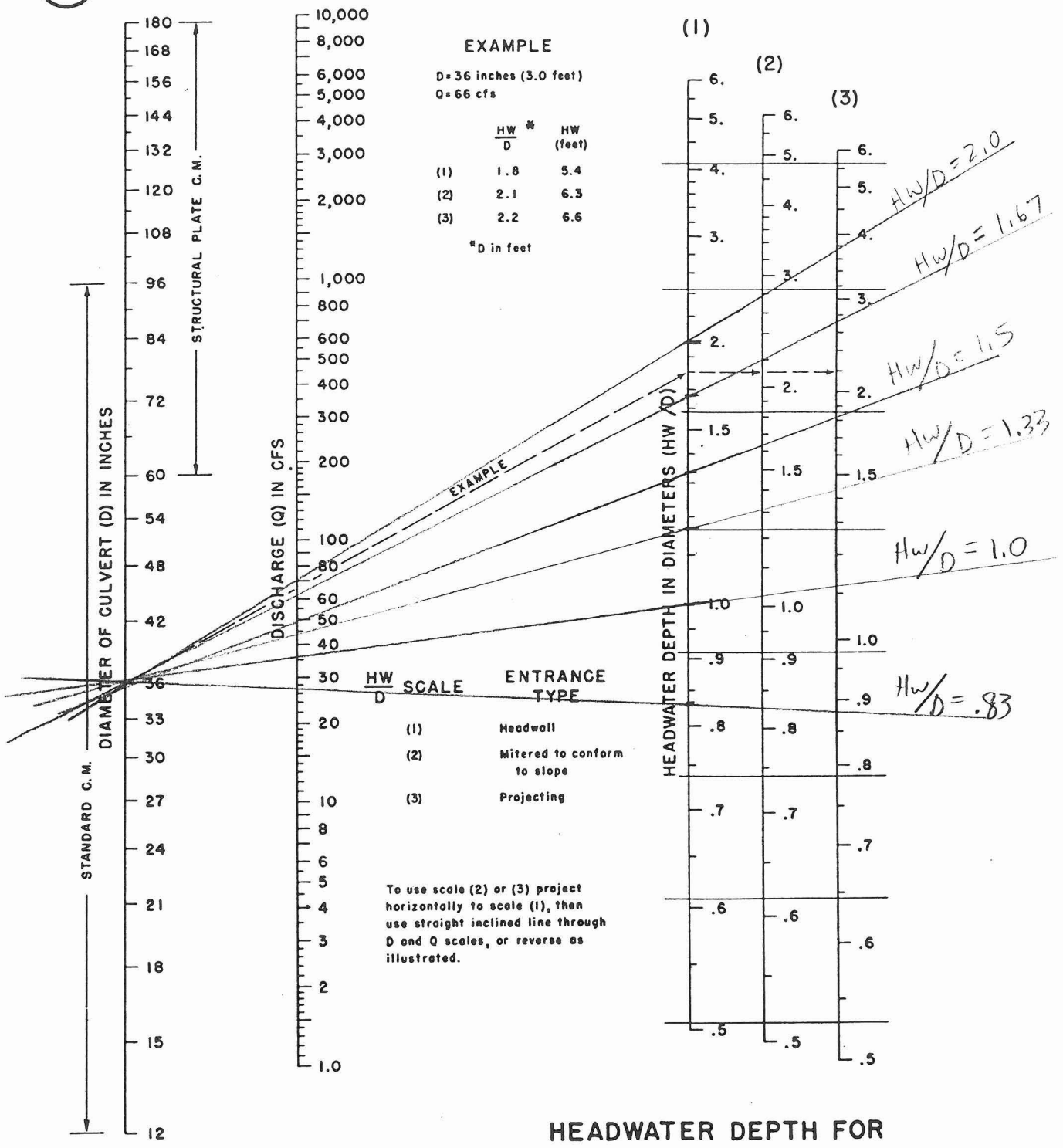
JOB NAME PALO VERDE JOB NO. _____

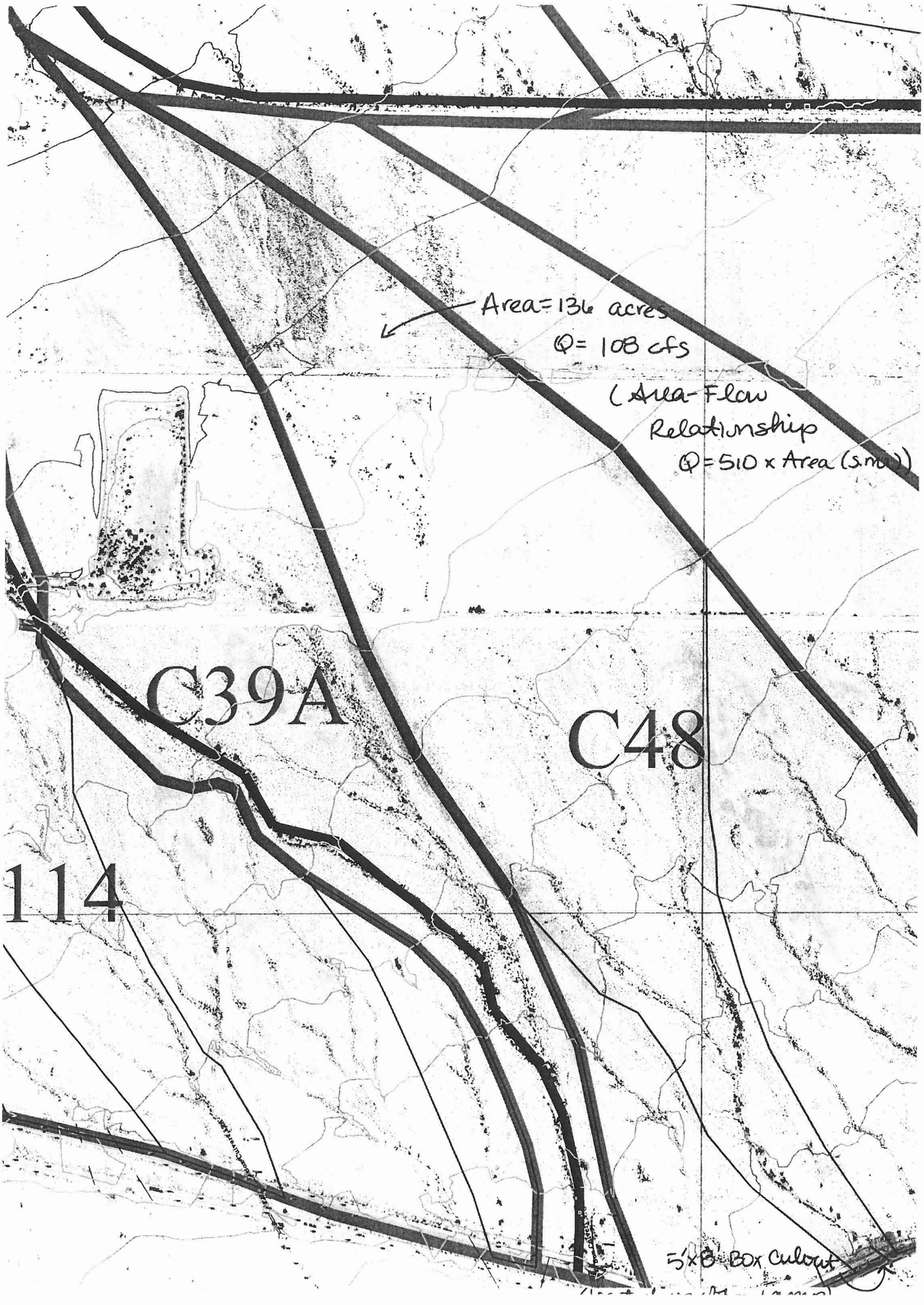
36" CMP (46A)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963


Area=136 acres
Q= 108 cfs
(Area-Flow
Relationship
Q=510 x Area (sq mi))
C39A
C48
114
5'x8' Box Culvert

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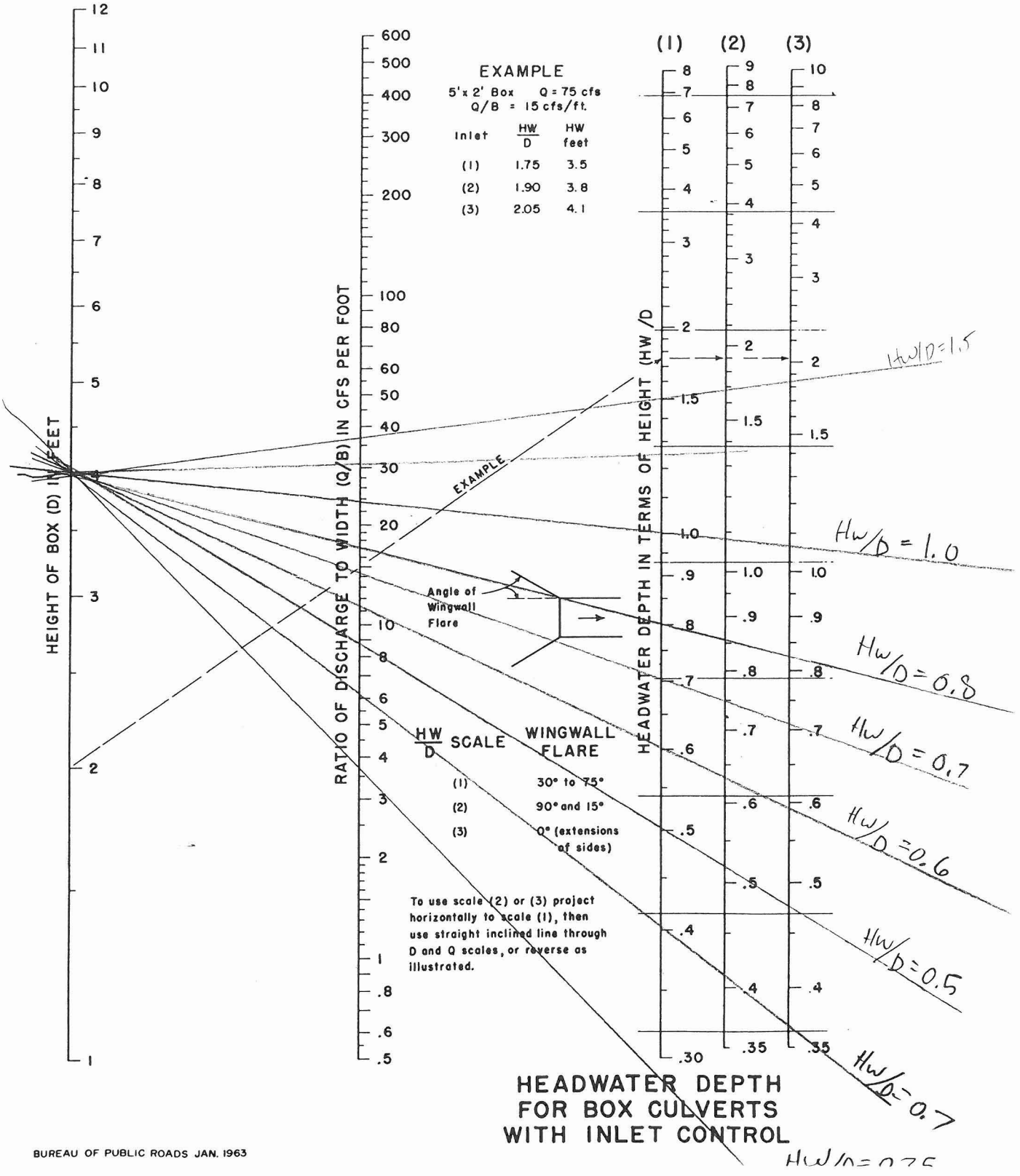
JOB NAME PALO VERDE JOB NO. _____

Culvert #46B & 46D

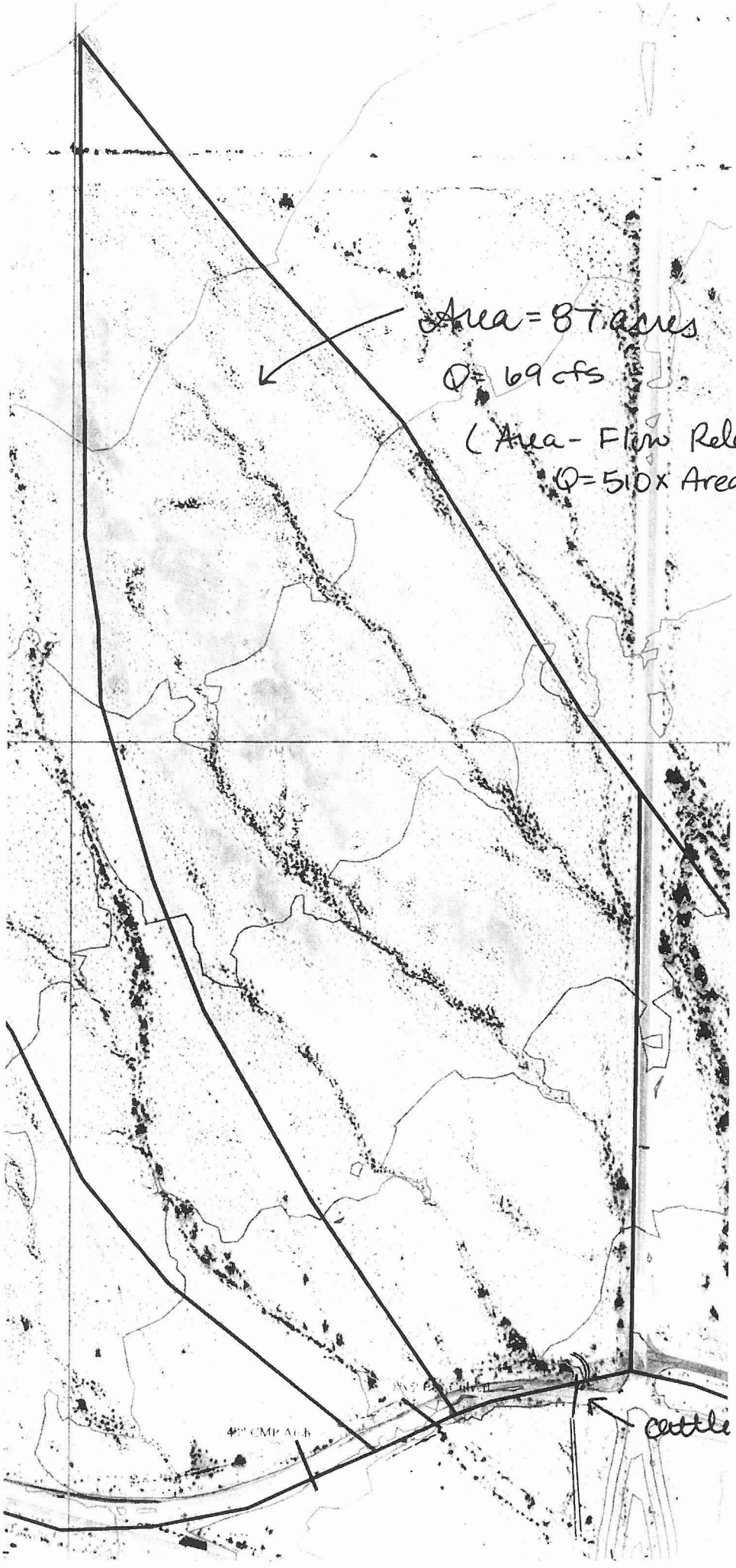
CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Hw/D=0.75


Area = 87 acres
Q = 69 cfs
(Area - Flow Relationship
Q = 510 x Area (s. mi))
cattle guard

Entellus

SHEET		OF	
BY	AMG	DATE	05/14/02
CHECK		DATE	

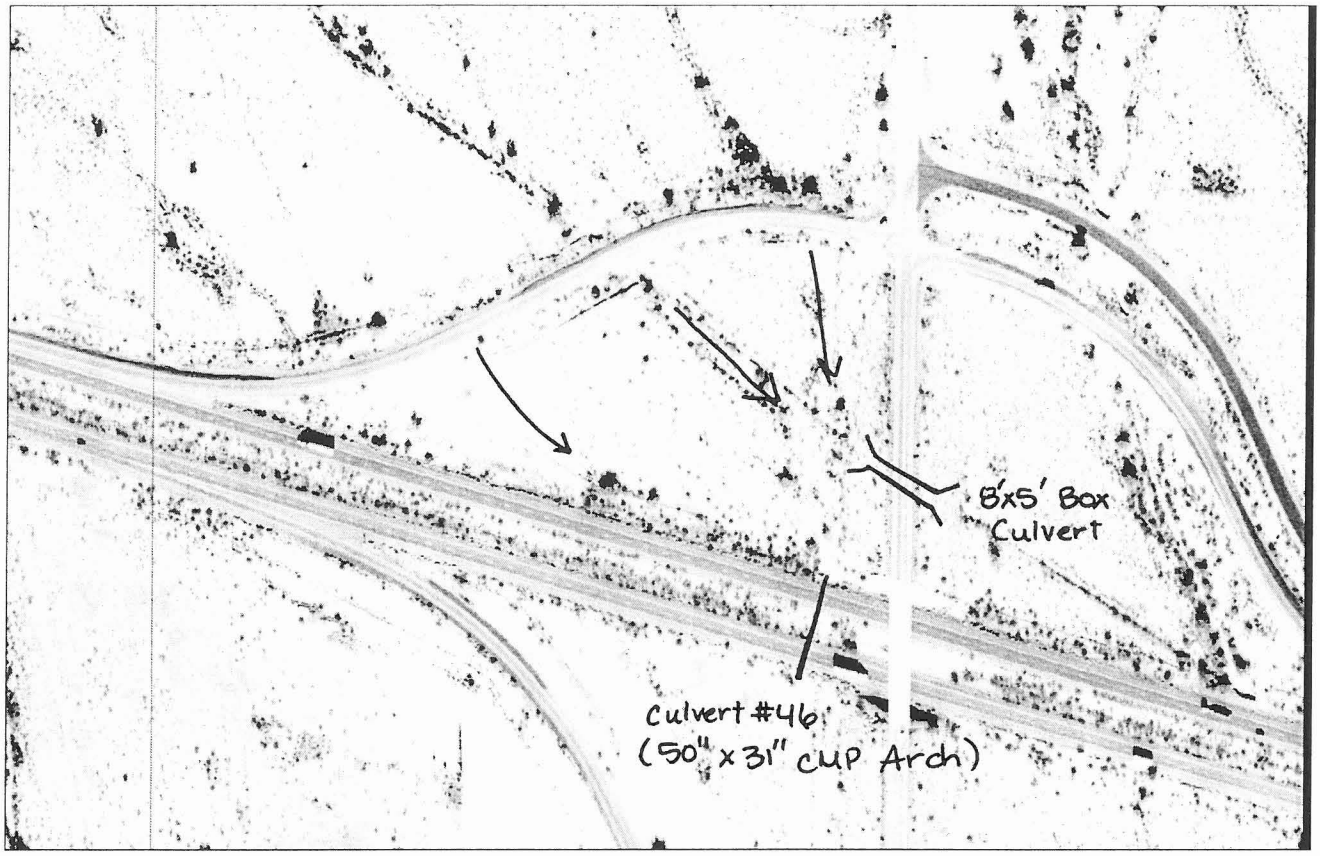
Client Flood Control District of Maricopa County (FCDMC)
Job Palo Verde Zone A floodplain delineation

JOB NO. 310.019

Split Flow Calculations

Split Point Location: Towards Box Culvert 8' x 5' RCB
Split Point ID: near C48-03
Split Description

Main flow-	Flow east towards Box Culvert 8' x 5' RCB
split flow	Flow south to Culvert #46 (50" x 31" CMP Arch)



Diversion path 1

Description Flow east towards Box Culvert 8' x 5' RCB
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0060 ft/ft

Diversion Path 2

Description Flow south to Culvert #46 (50" x 31" CMP Arch)
General Contour Slope ft
Angle between cont/split Degrees

Estimated Slope = 0.0060 ft/ft

Split Flow Table

Split Point Location: Towards Box Culvert 8' x 5' RCB

Split Point ID: near C48-03

Split Description

Main flow-	Flow east towards Box Culvert 8' x 5' RCB
split flow	Flow south to Culvert #46 (50" x 31" CMP Arch)

		S =	0.006			S=	0.006		
Inflow	Approx. Depth	**Main flowpath**				**Diverted flowpath 1**			
		width	n value	Flow	Fow %	width	n value	Flow	Fow %
0	0.0	52	0.065	0.0		17	0.065	0.0	
18	0.6	52	0.065	13.6	75%	17	0.065	4.4	25%
36	1.0	52	0.065	27.1	75%	17	0.065	8.9	25%
54	1.2	52	0.065	40.7	75%	17	0.065	13.3	25%
72	1.5	52	0.065	54.3	75%	17	0.065	17.7	25%
90	1.7	52	0.065	67.8	75%	17	0.065	22.2	25%
108	1.9	52	0.065	81.4	75%	17	0.065	26.6	25%
126	2.0	52	0.065	95.0	75%	17	0.065	31.0	25%
144	2.2	52	0.065	108.5	75%	17	0.065	35.5	25%
162	2.4	52	0.065	122.1	75%	17	0.065	39.9	25%
180	2.5	52	0.065	135.7	75%	17	0.065	44.3	25%
198	2.7	52	0.065	149.2	75%	17	0.065	48.8	25%

Flow from upstream	198	
Flow remaining after div.	**149**	75%
Flow diverted at south div.	49	
Total Div. flow	**49**	25%

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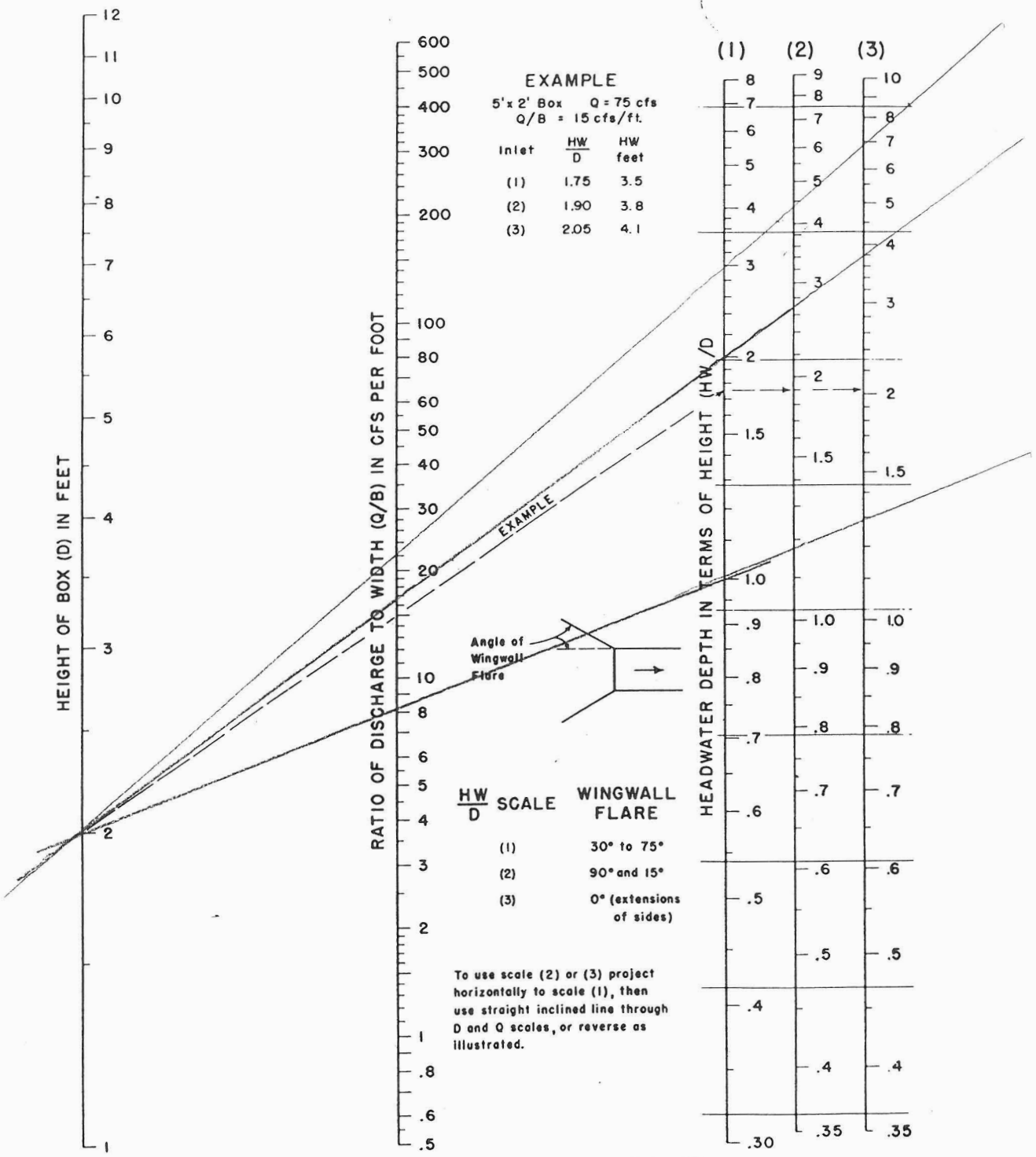
JOB NAME PALO VERDE

JOB NO. _____

CATTLE GUARD (46C)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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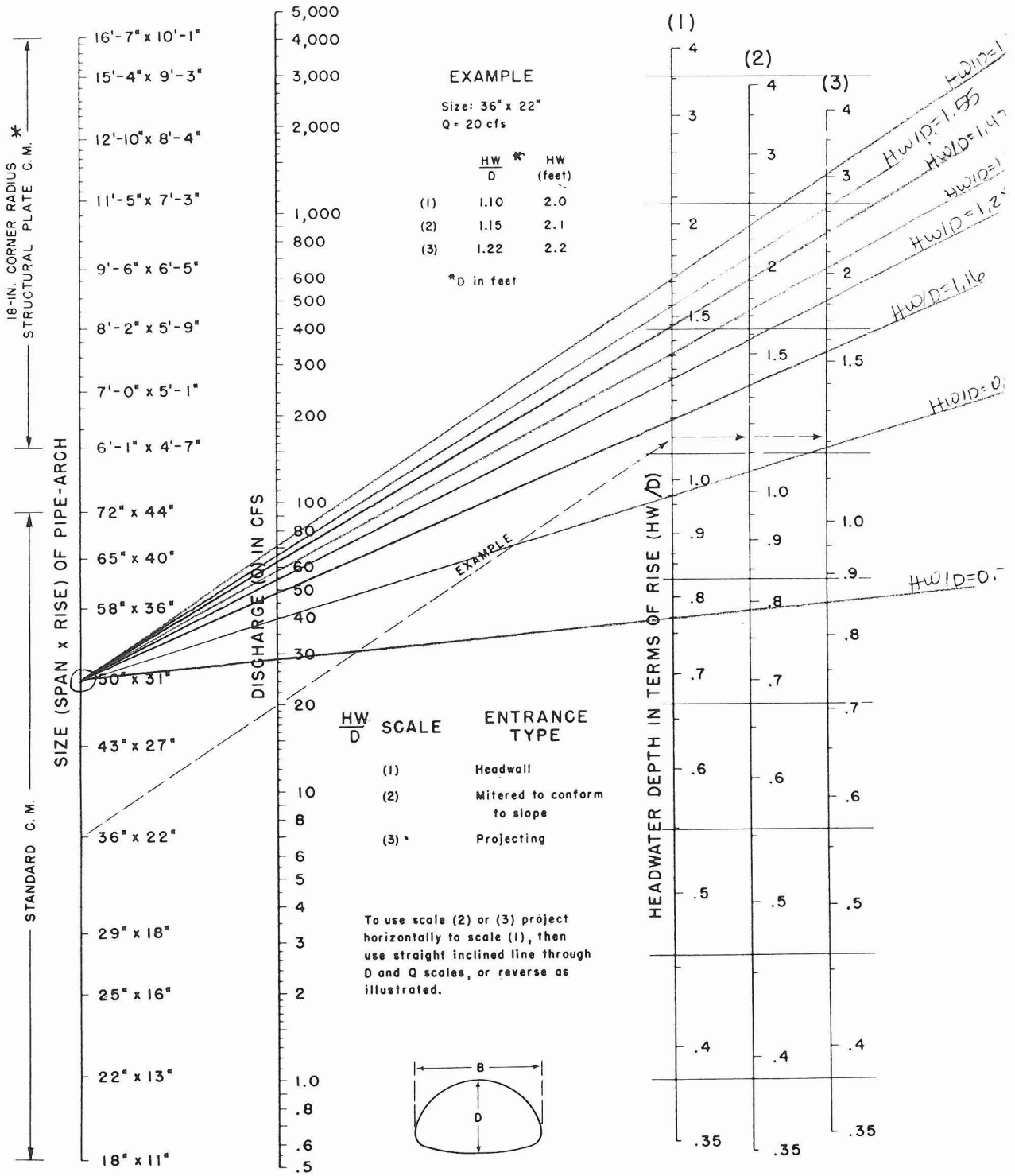
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #416 (50"x31" CMP-Arch)

CHART 34



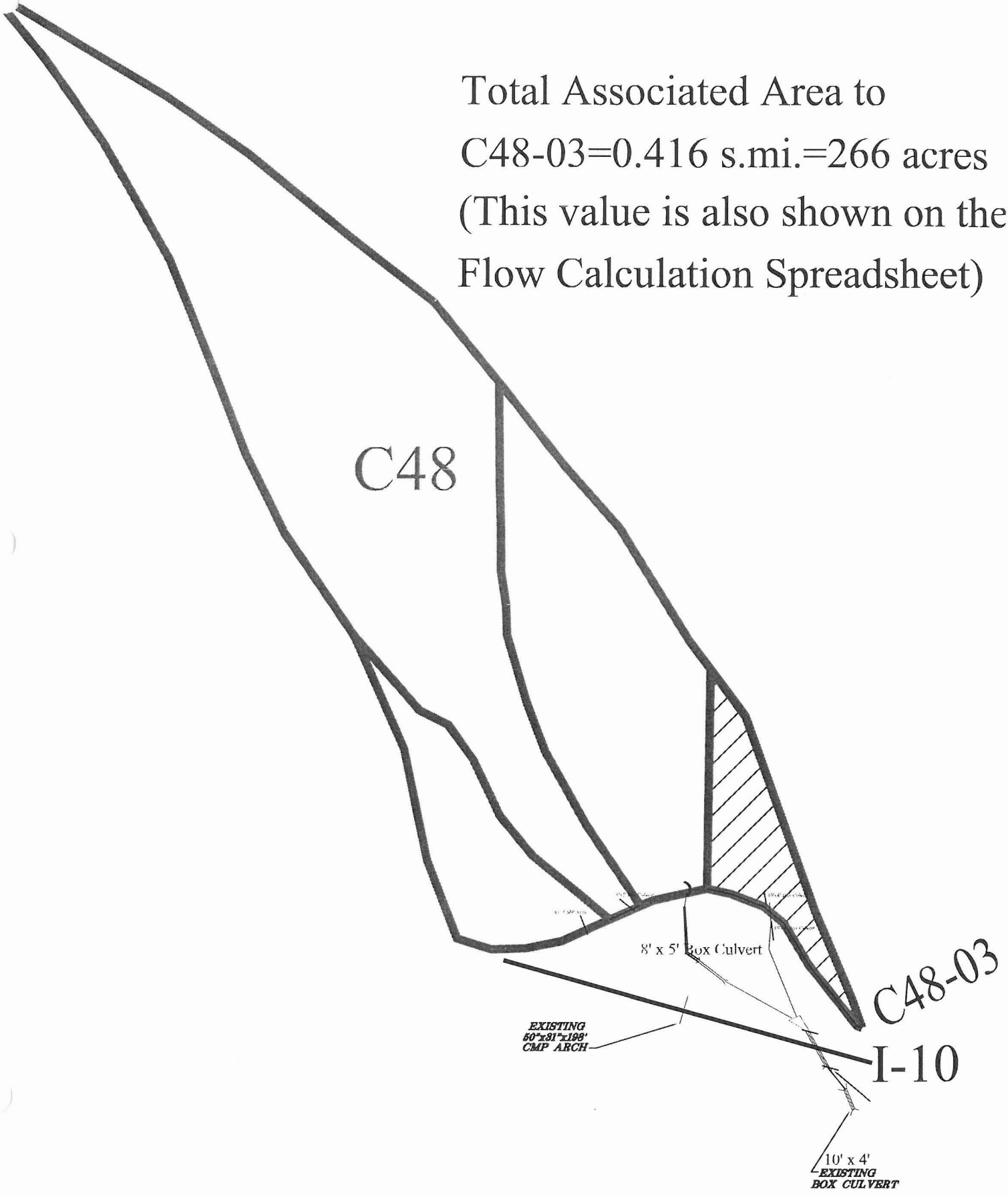
*ADDITIONAL SIZES NOT DIMENSIONED ARE LISTED IN FABRICATOR'S CATALOG

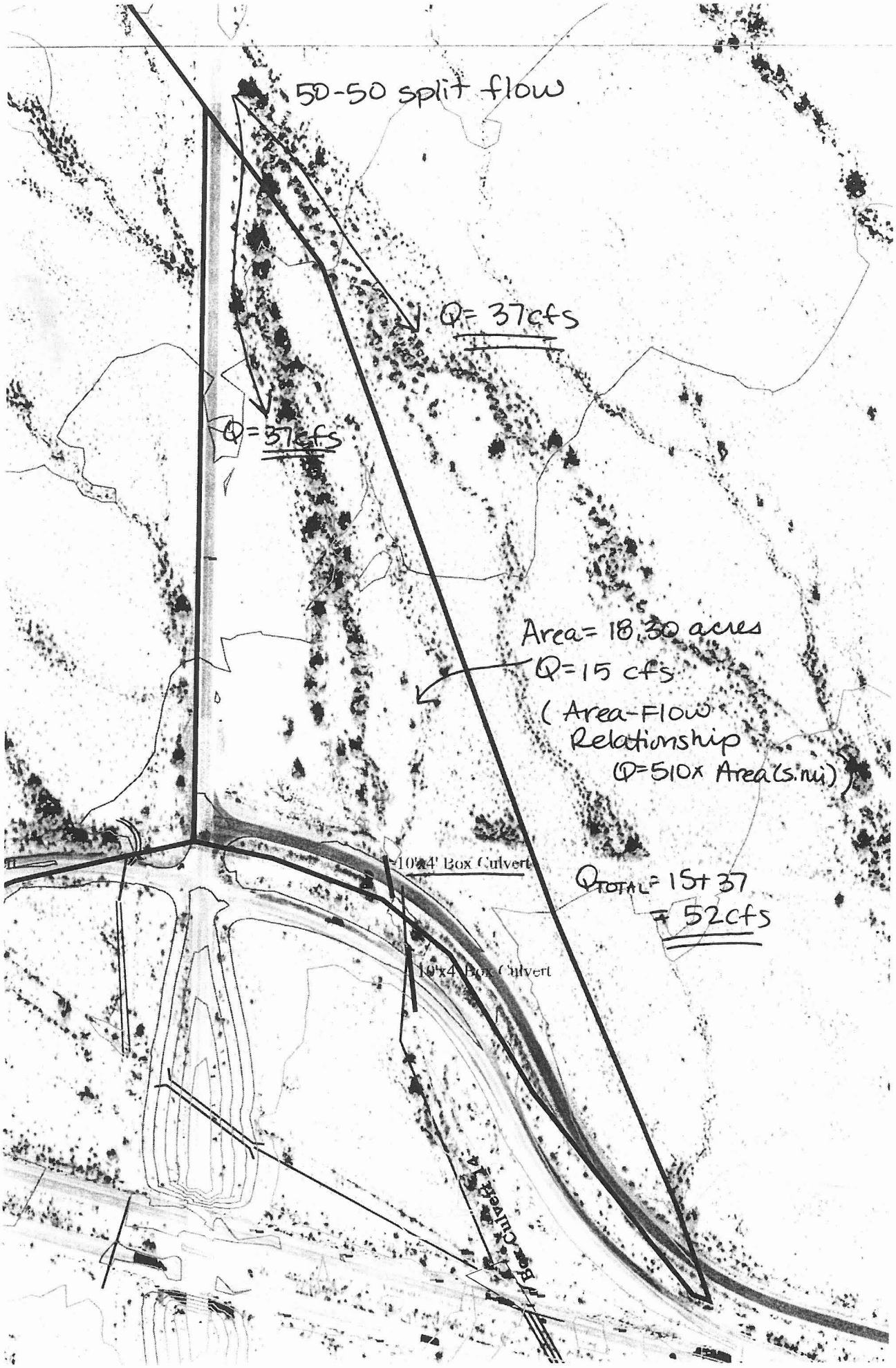
BUREAU OF PUBLIC ROADS JAN. 1963

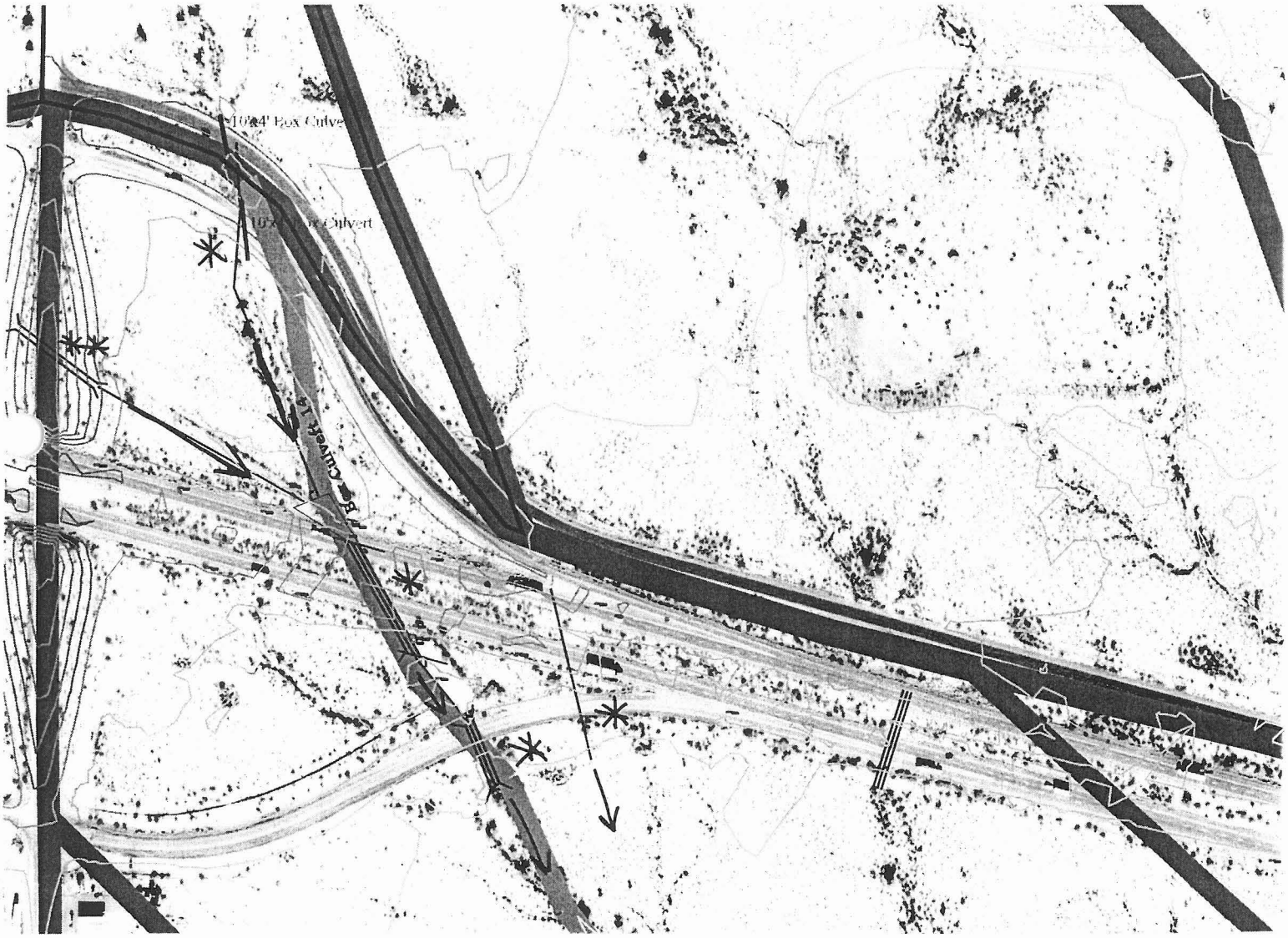
HEADWATER DEPTH FOR C. M. PIPE-ARCH CULVERTS WITH INLET CONTROL

(The hatched area is for the following culverts)

Total Associated Area to C48-03=0.416 s.mi.=266 acres (This value is also shown on the Flow Calculation Spreadsheet)




50-50 split flow
Q= 37cfs
Q=37cfs
Area= 18.30 acres
Q=15 cfs
(Area-Flow Relationship
Q=510x Area(s.mi))
10'x4' Box Culvert
10'x4' Box Culvert
QTOTAL = 15+37
= 52cfs
Box Culvert A



Basin

Culvert analysis will not be done where there is a * denoted because they all flow into the same basin.

(** This flow is known look at spreadsheet)

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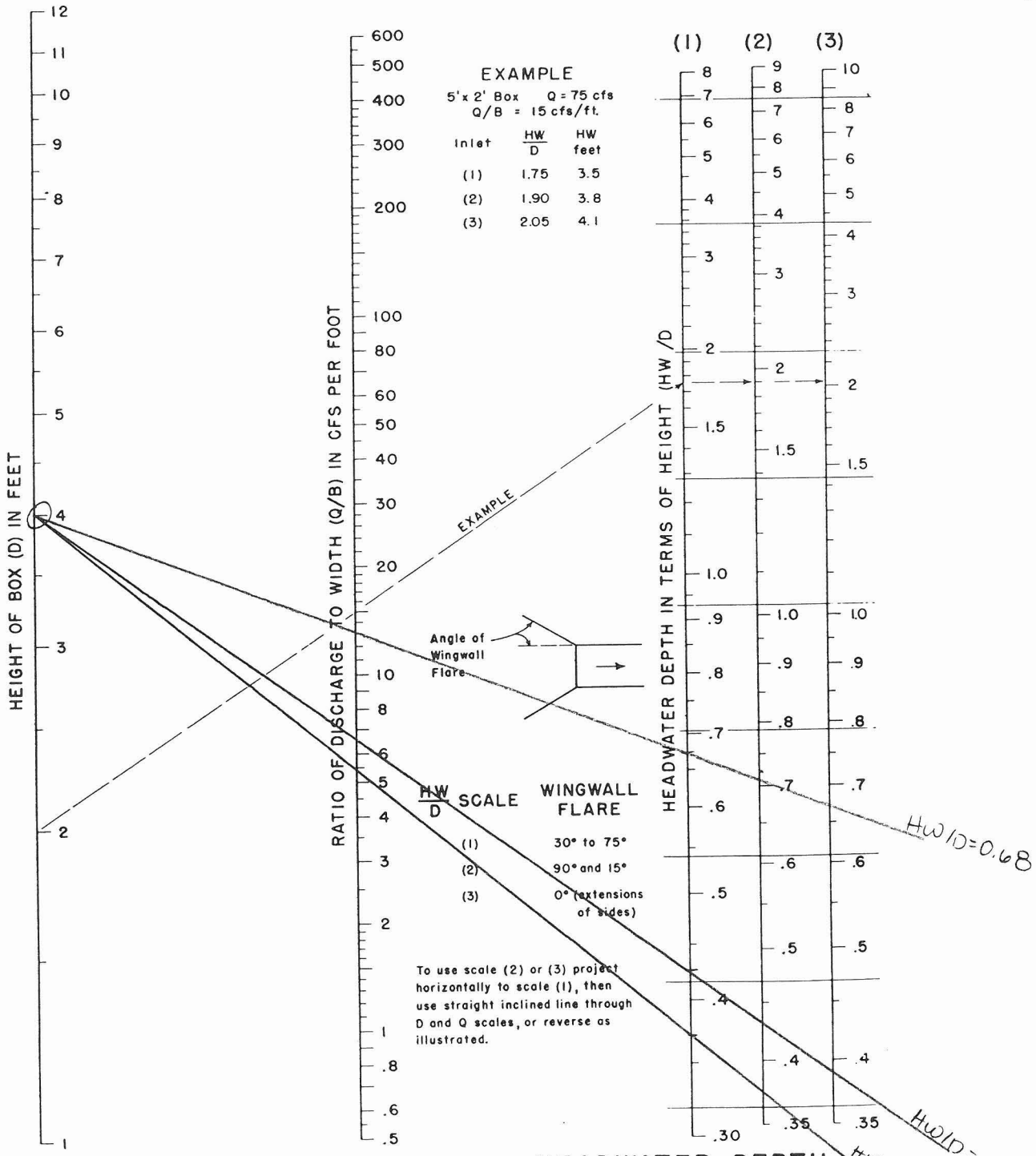
JOB NAME Palo Verde Zone A Delination JOB NO. 310.019

10'x4' Culvert

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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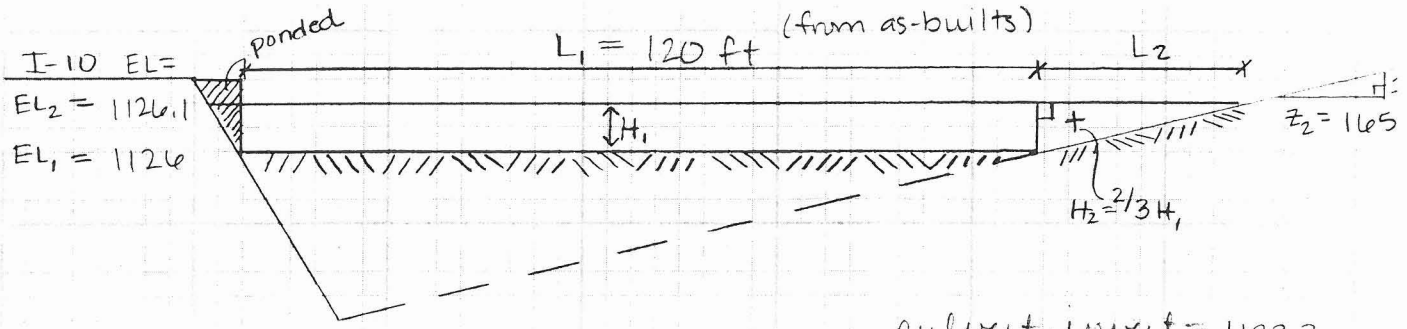
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1126)

(10'x4' Box Culvert) located on east-side of ramp.



culvert invert = 1122.3 (from as-builts)

$H_1 = E_2 - E_1 = 1126.1 - 1126 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(165) = 16.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(120)(0.10) + (16.5)(0.0667)}{120 + 16.5} = 0.096$

$L_T = L_1 + L_2 = 120 + 16.5 = 136.5$ ft

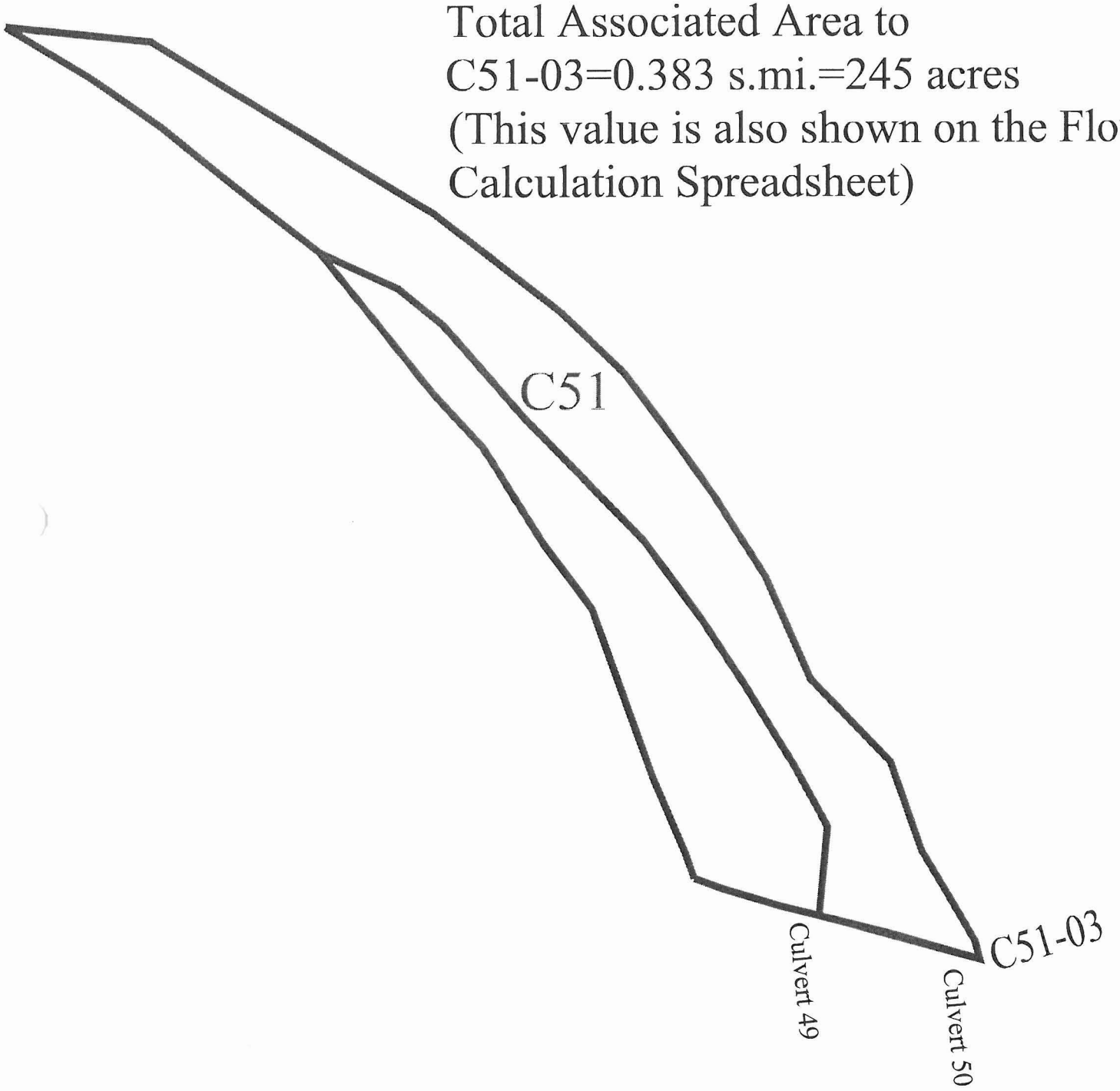
Weir Flow $Q = C L_T \bar{H}^{1.5}$

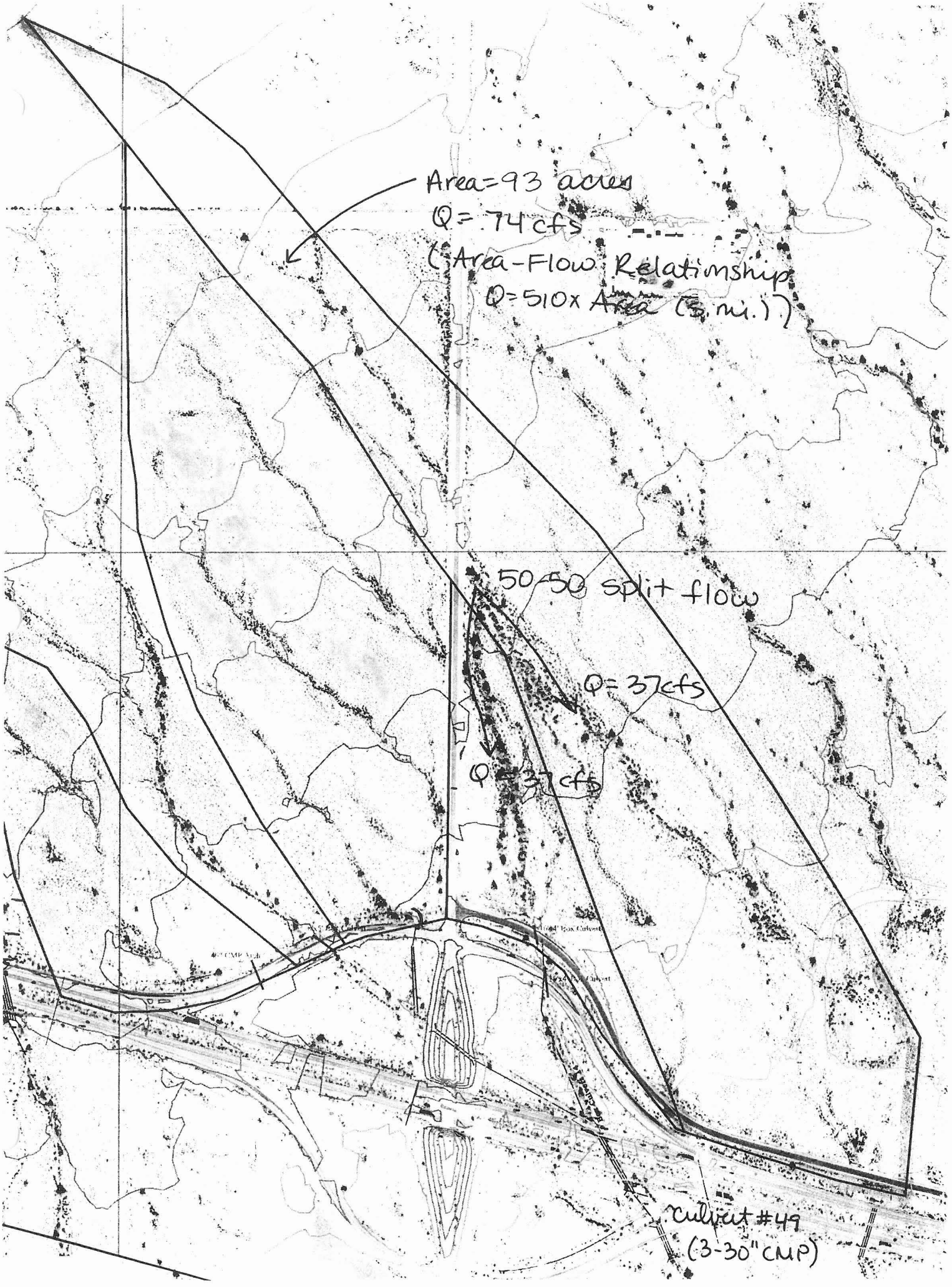
$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = (2.7)(136.5)(0.096)^{1.5} = 10.95$ cfs

$\simeq 11$ cfs

Total Associated Area to
C51-03=0.383 s.mi.=245 acres
(This value is also shown on the Flow
Calculation Spreadsheet)




Area=93 acres
Q=.74 cfs
(Area-Flow Relationship
Q=510x Area (S. mi.))
50-50 split flow
Q=37cfs
Q=37cfs
culvert #49
(3-30" CMP)

5
1
1107
22'
1125'
1107 ft
Culvert #49
(3-30" CMP)
1120'

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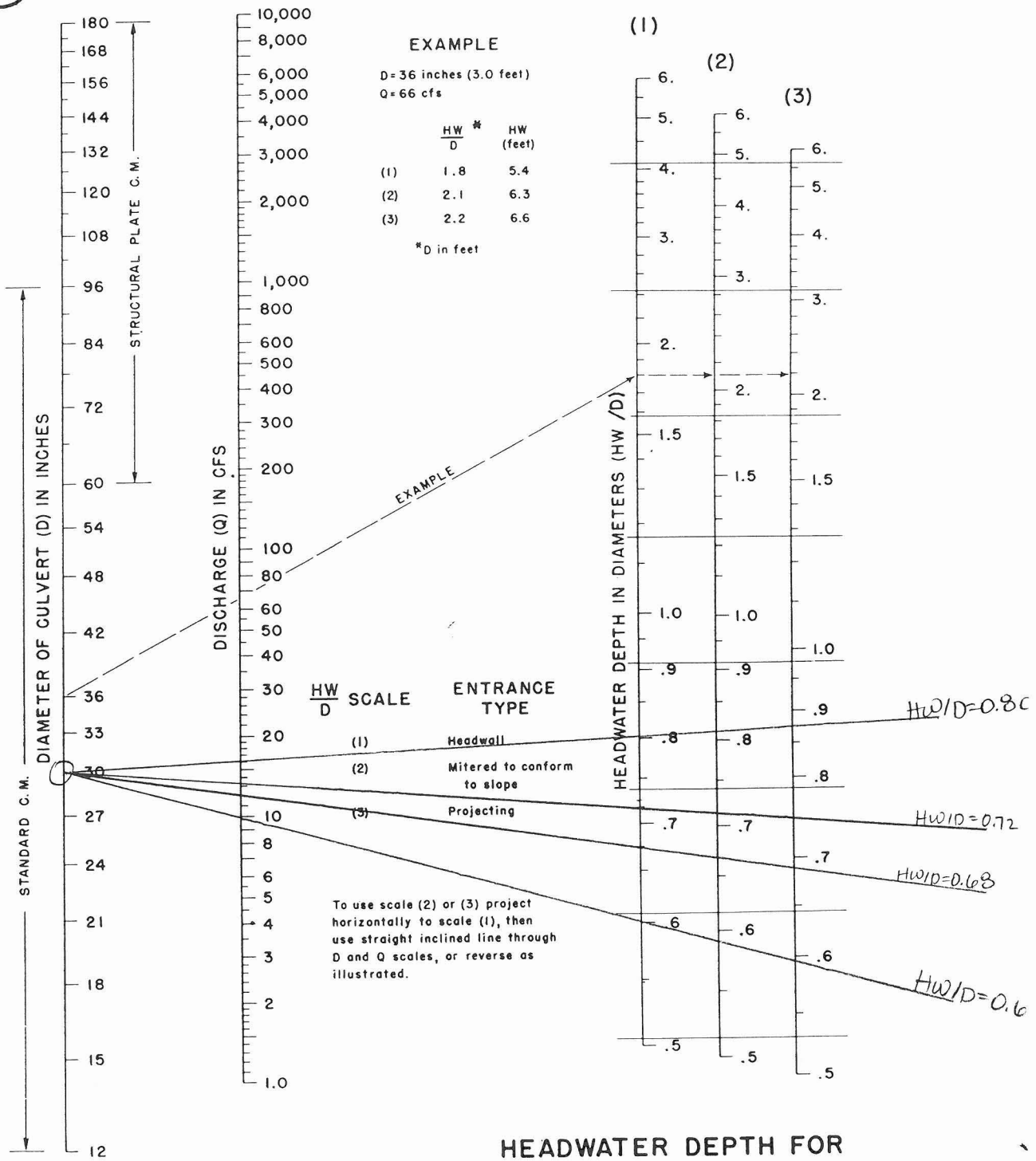
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #49 (3-30" CMP)

CHART 2



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

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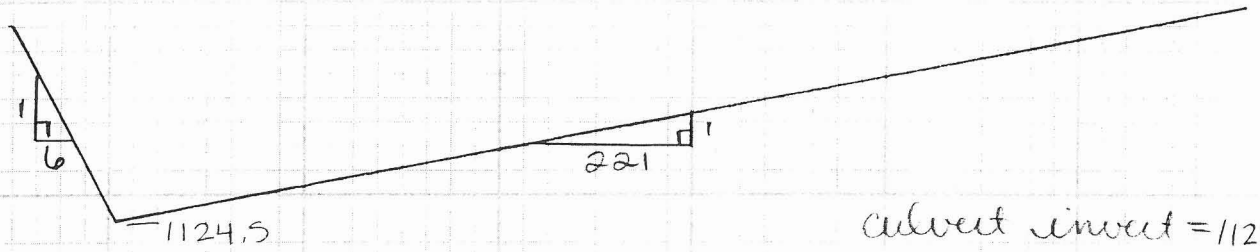
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1124.5)

Culvert #49
(3-30" CMP)



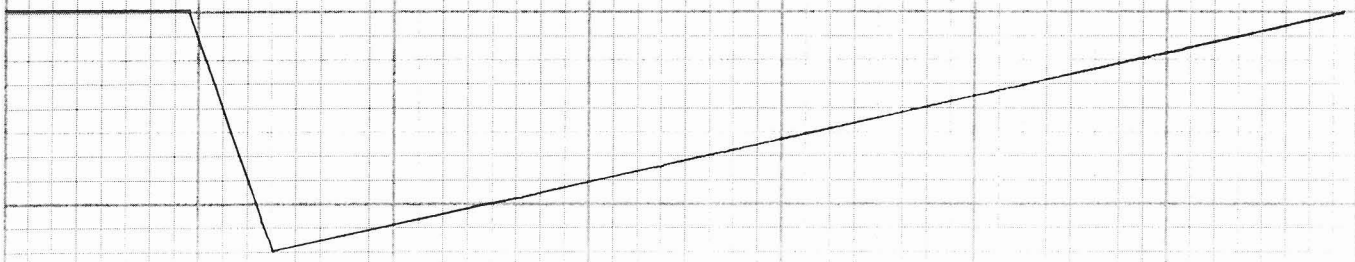
culvert invert = 1122

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.006
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

* There was a 50-50 split flow from this basin, Since the culverts at which the split flow leads to, flows into the same basin downstream the % of split was an approximate guess.

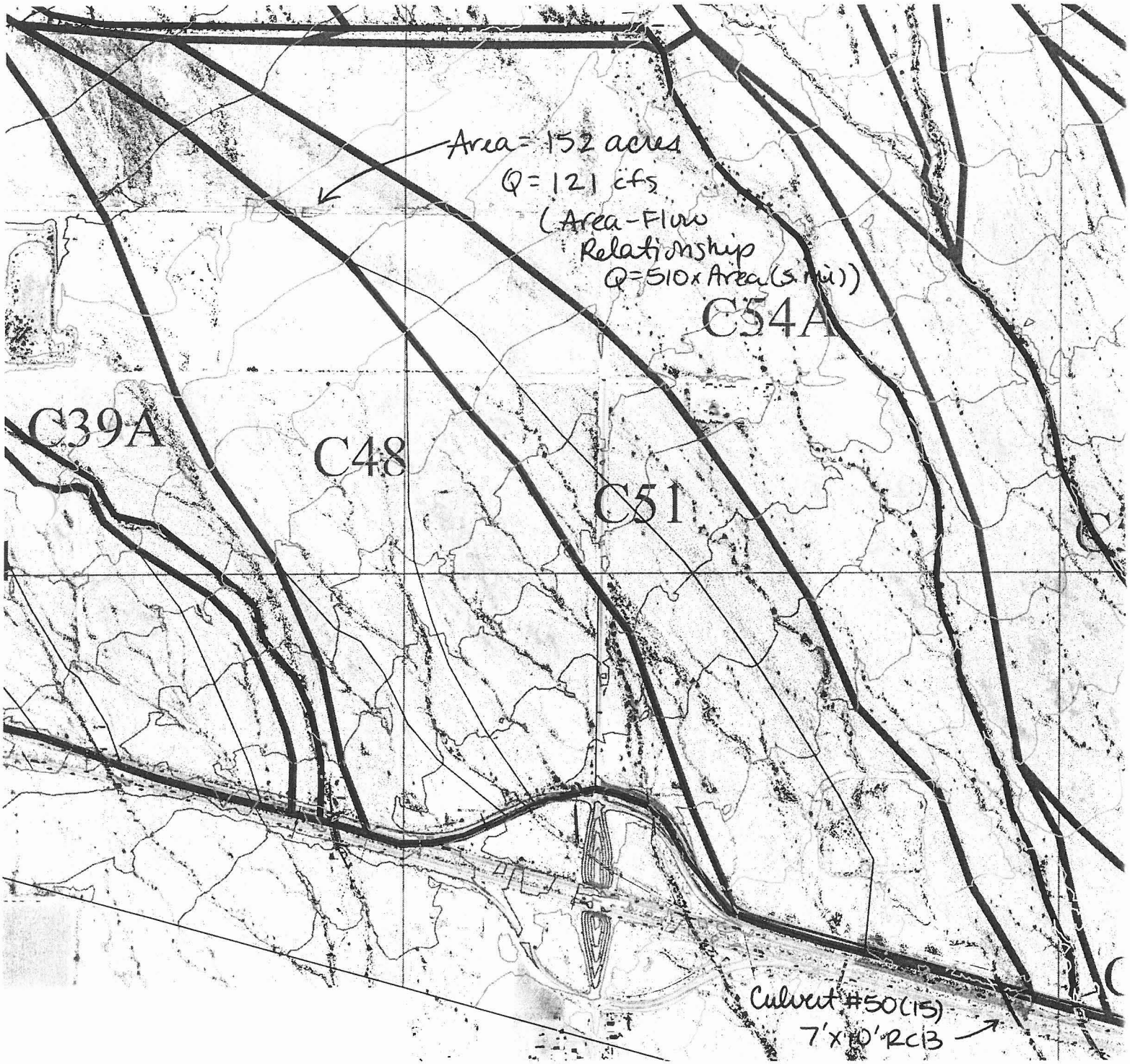
Weir Analysis (at EL>)

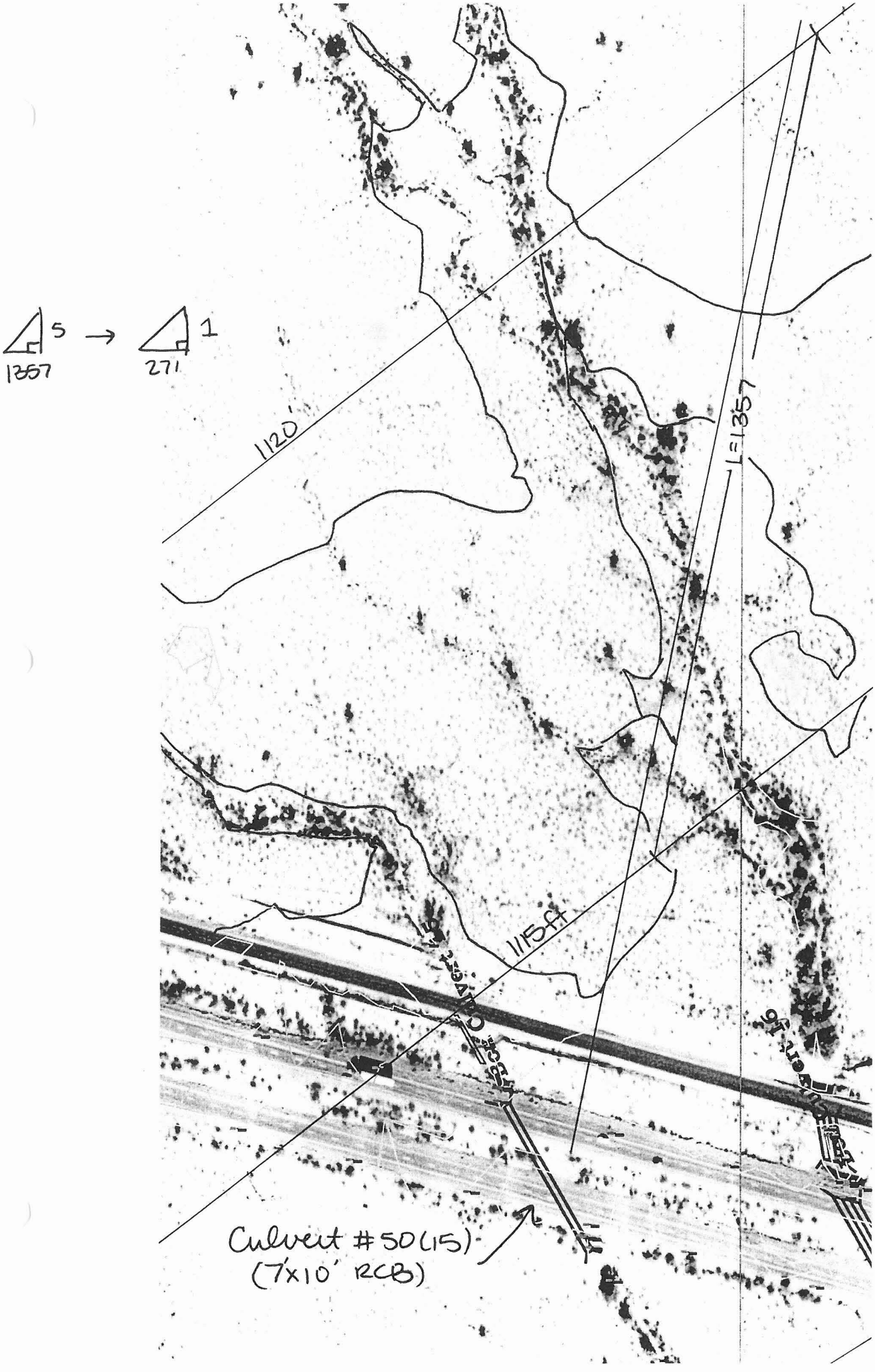


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(\frac{2}{3}\overline{H})}{L + l}\right)$$


Area = 152 acres
Q = 121 cfs
(Area-Flow
Relationship
Q=510 x Area(sq mi))
C54A
C39A
C48
C51
Culvert #50(15)
7'x10' RCB


5
1357
1
271
1120'
L=1357
1115ft
Culvert #50(15)
(7'x10' RCB)

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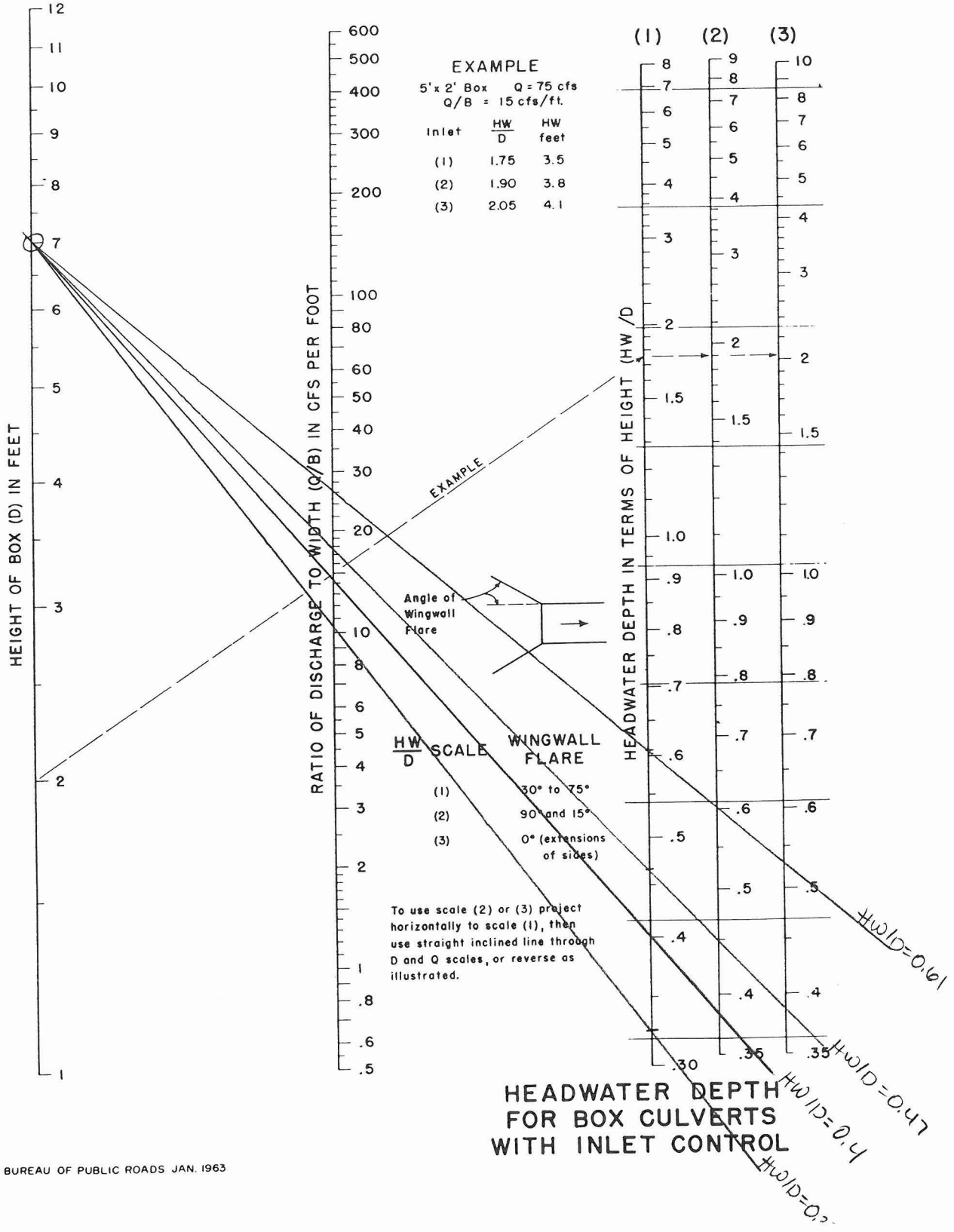
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 50(15)
(7'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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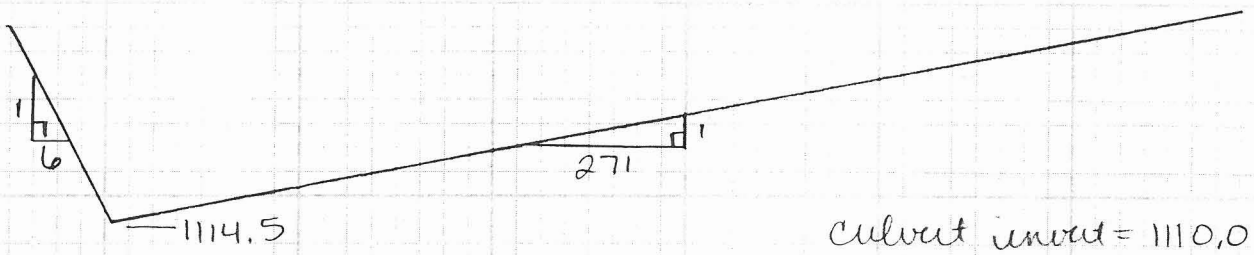
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1114.5)

Culvert #50 (15)
(7'x10' RCB)

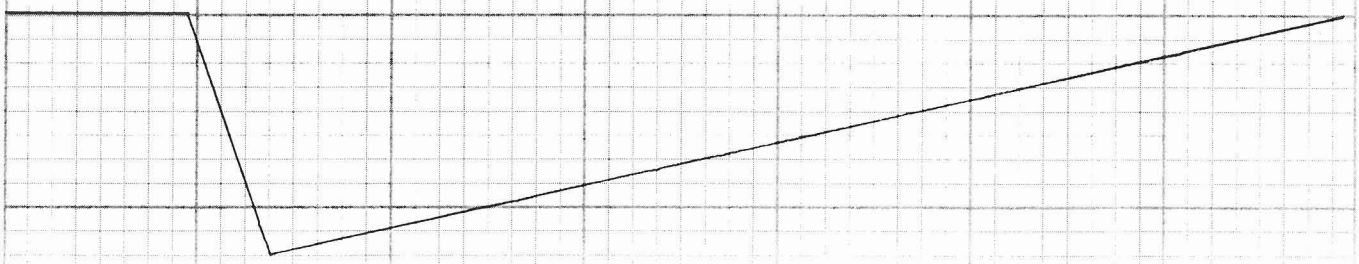


Culvert invert = 1110.0

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.006
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

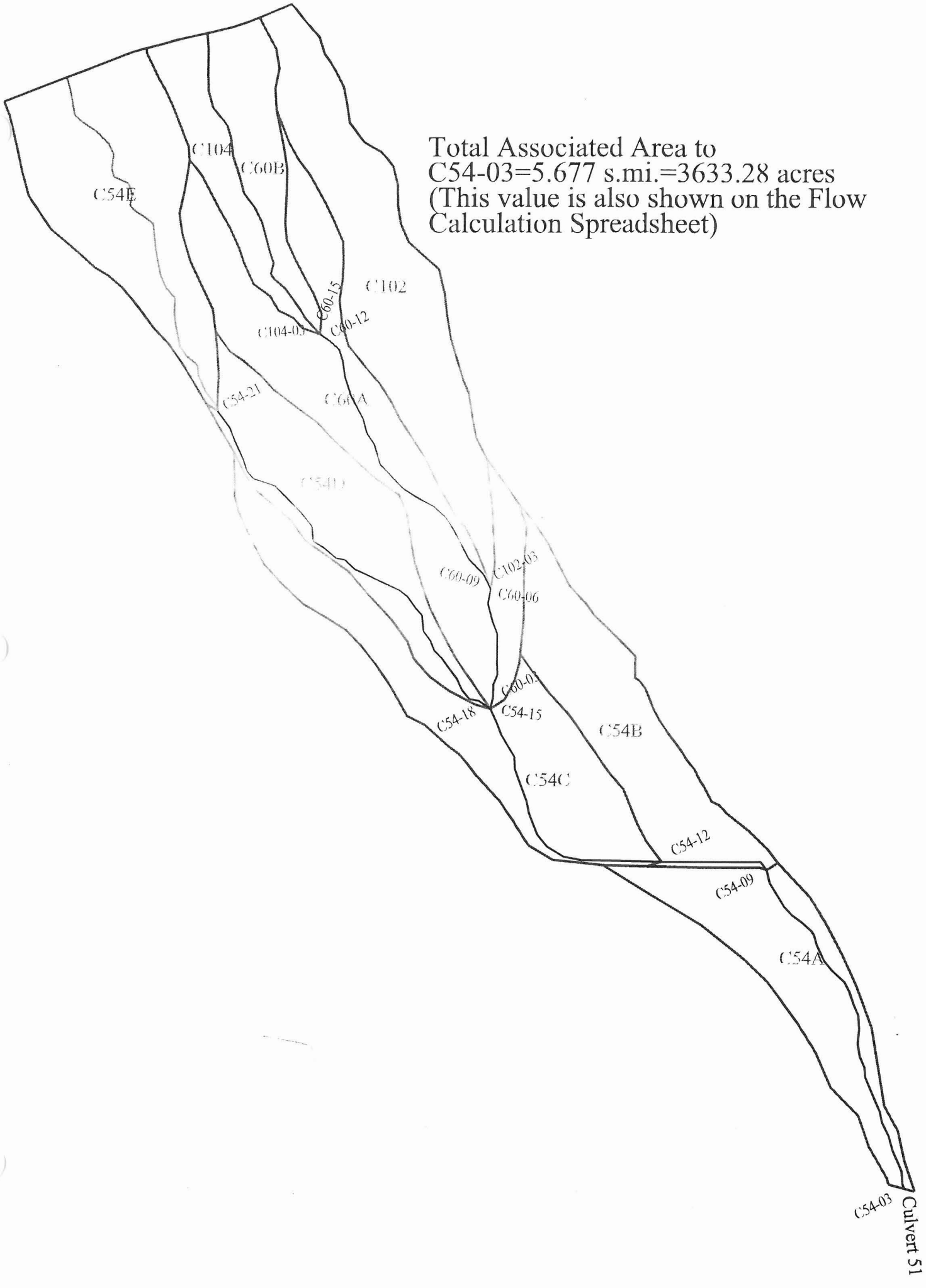
Weir Analysis (at EL >)

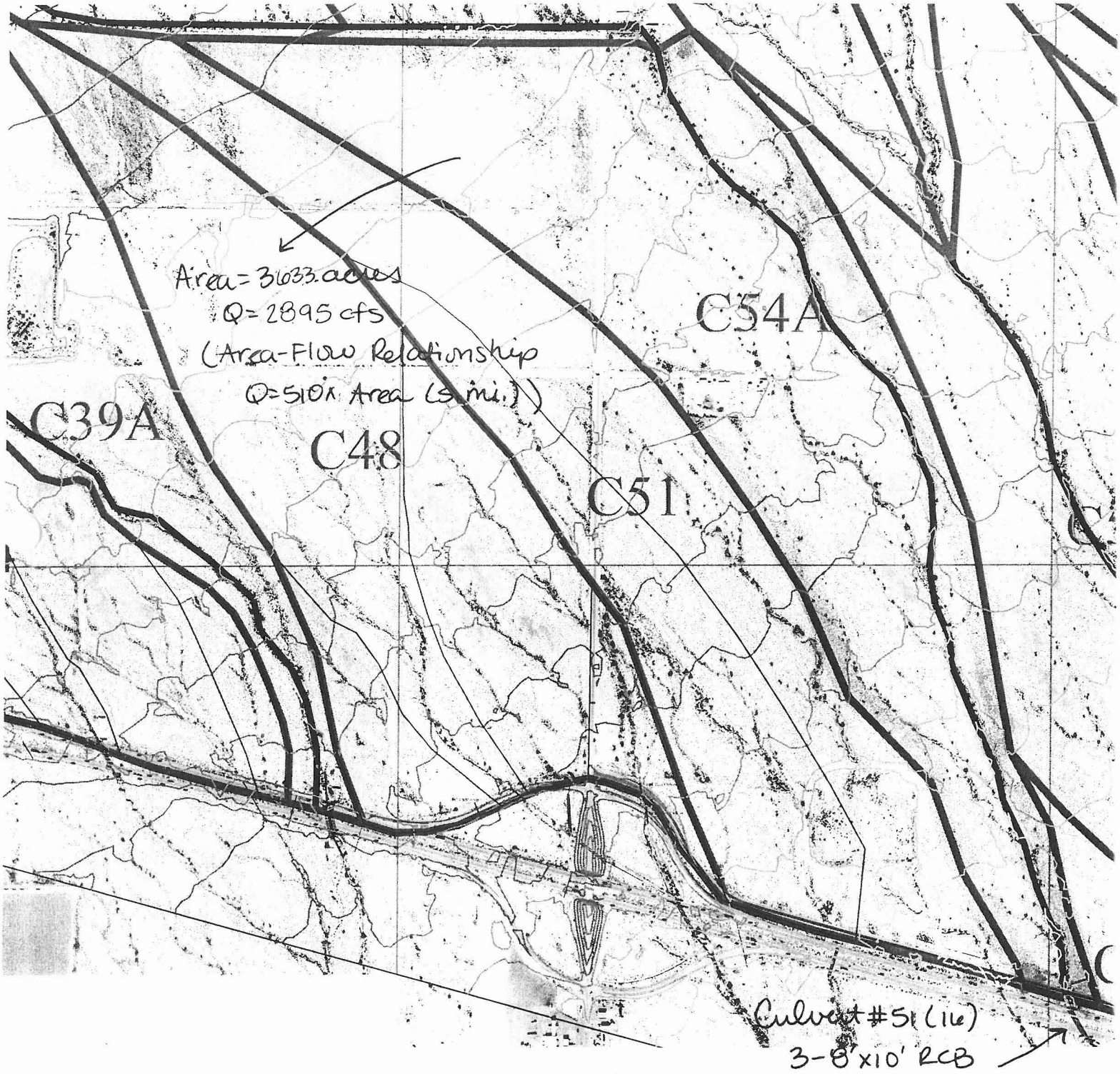


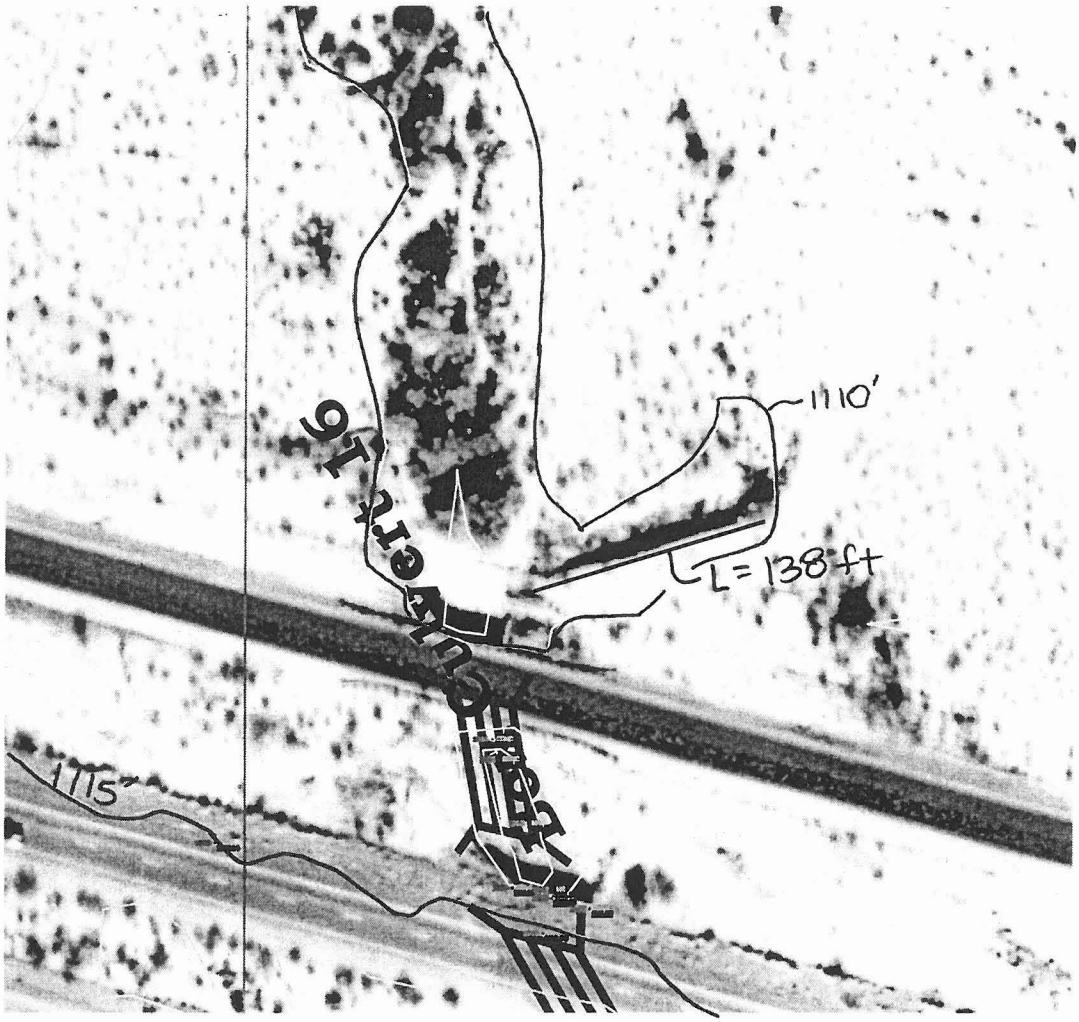
$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell\left(\frac{2}{3}\bar{H}\right)}{L+\ell}\right)$$


Total Associated Area to
C54-03=5.677 s.mi.=3633.28 acres
(This value is also shown on the Flow
Calculation Spreadsheet)
C54E
C104
C60B
C102
C60-15
C104-03
C60-12
C54-21
C60A
C54D
C60-09
C102-03
C60-06
C60-03
C54-18
C54-15
C54B
C54C
C54-12
C54-09
C54A
C54-03
Culvert 51


Area = 3633 acres
Q = 2895 cfs
(Area-Flow Relationship
Q = 510 x Area (sq mi.))
C39A
C48
C51
C54A
Culvert #51 (16)
3-8'x10' RCB



Culvert #51(16)
3-8'x10' RCB

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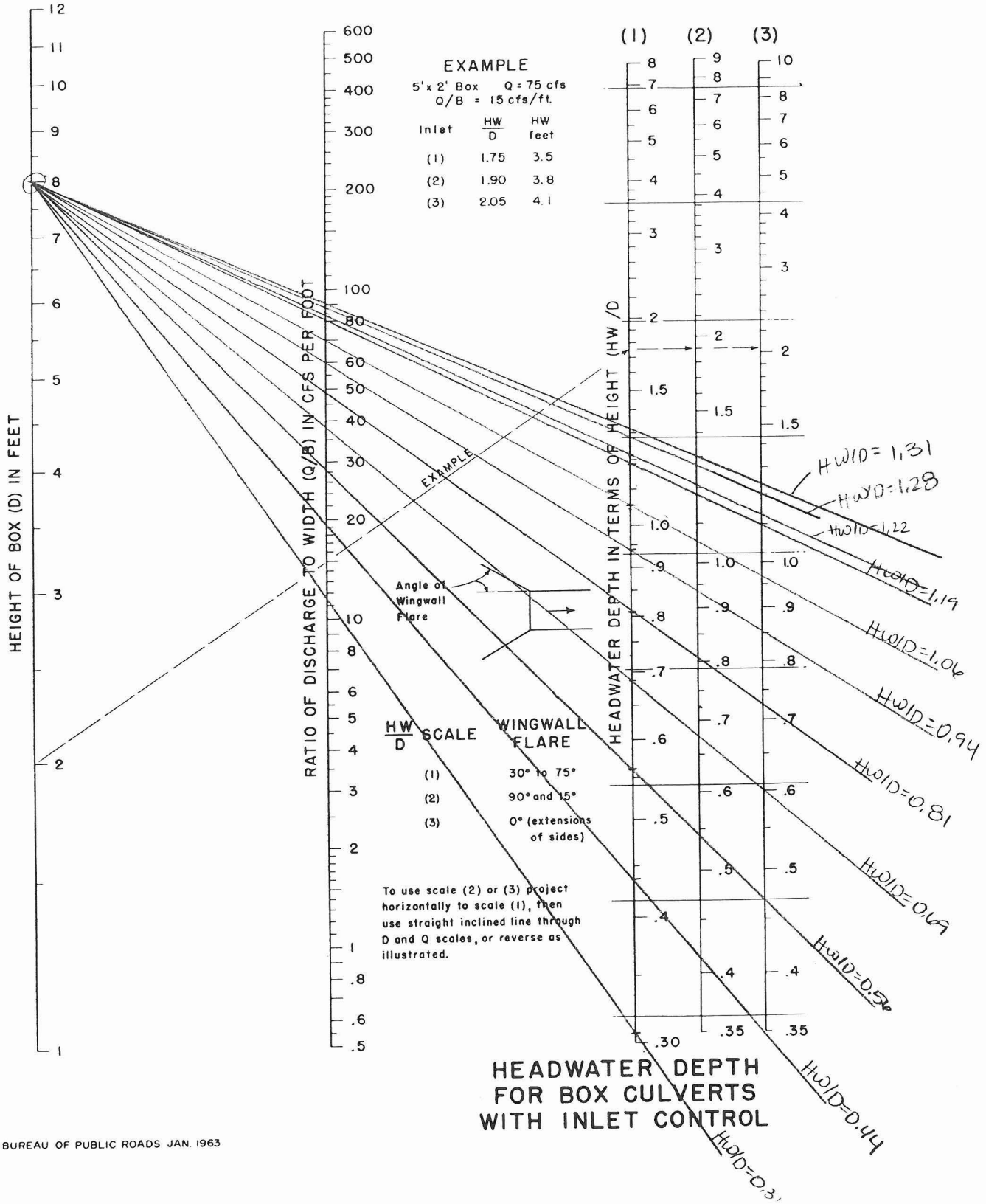
JOB NAME Palo Verde Zone A Relinquishment JOB NO. 310.019

Culvert #51(16)
3-8'x10' RCB

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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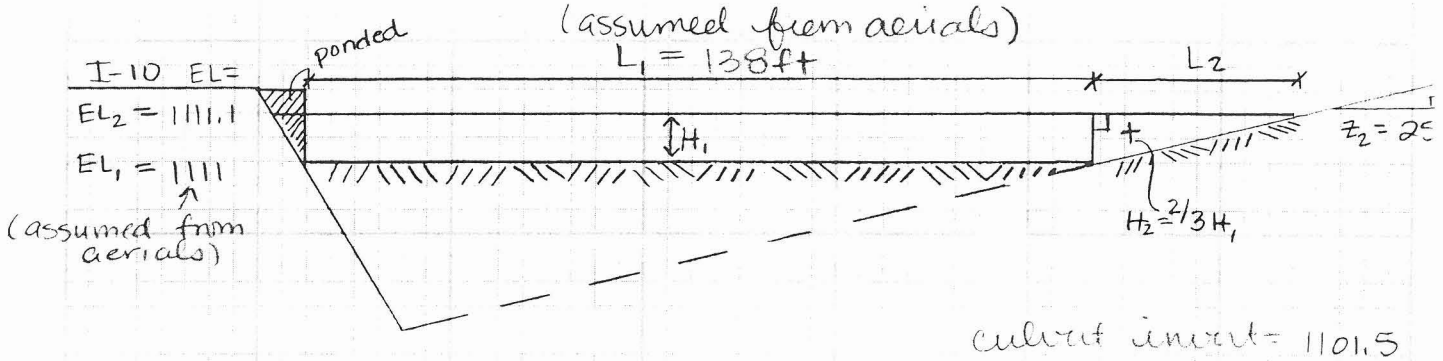
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 51(16)
3-8'x10' RCB

Weir Analysis (at EL > 1111)



culvert invert = 1101.5

$H_1 = E_2 - E_1 = 1111.1 - 1111.0 = 0.10$ ft

$L_2 = H_1 z_2 = (0.10)(258) = 25.8$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(138)(0.10) + (25.8)(0.0667)}{138 + 25.8} = 0.09$

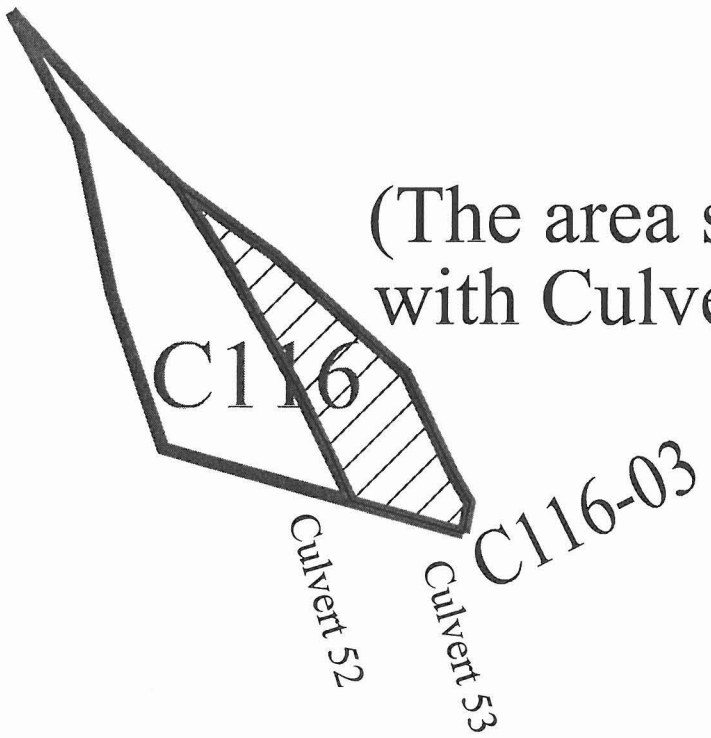
$L_T = L_1 + L_2 = 138 + 25.8 = 163.8$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

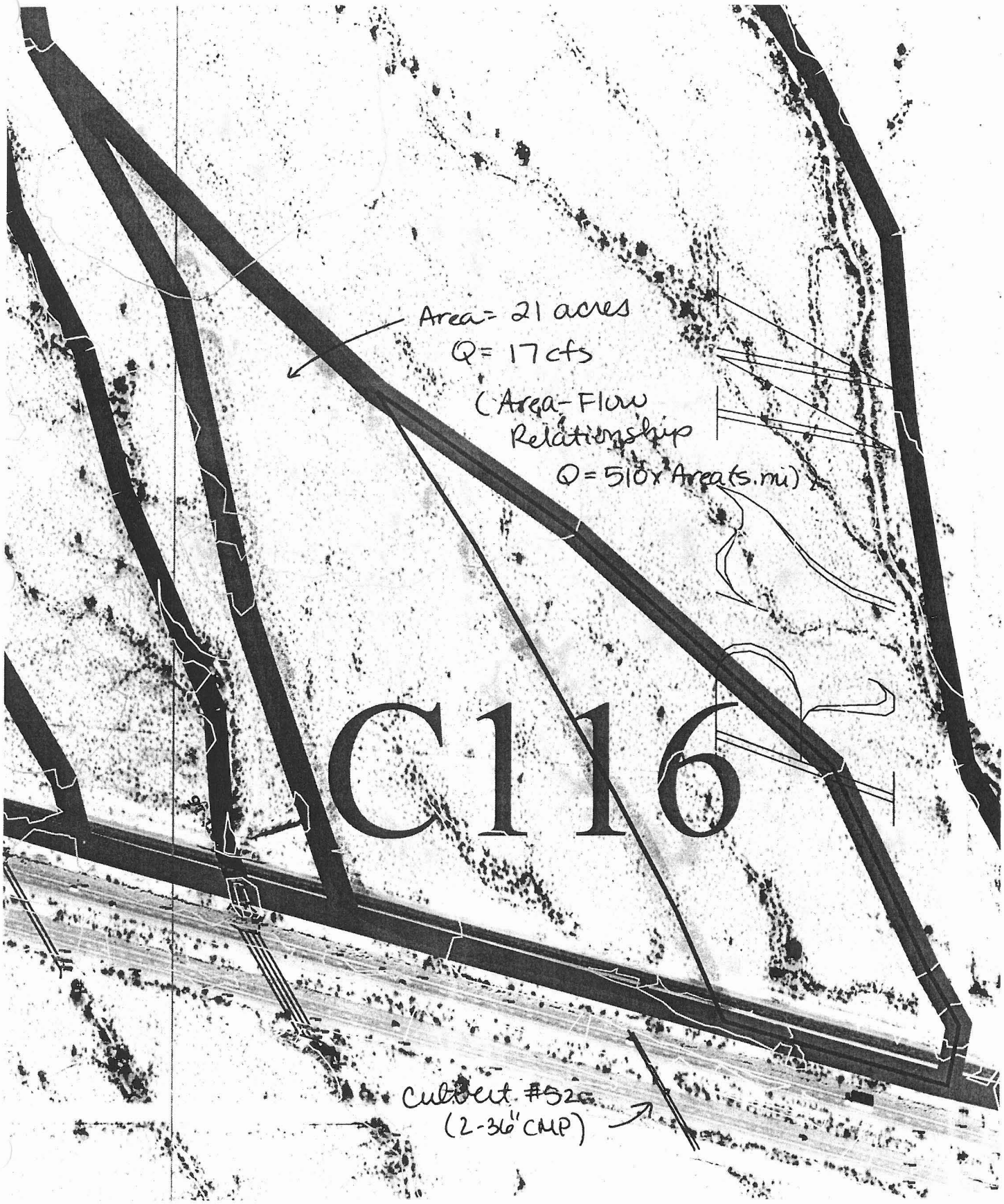
$C = 2.7$

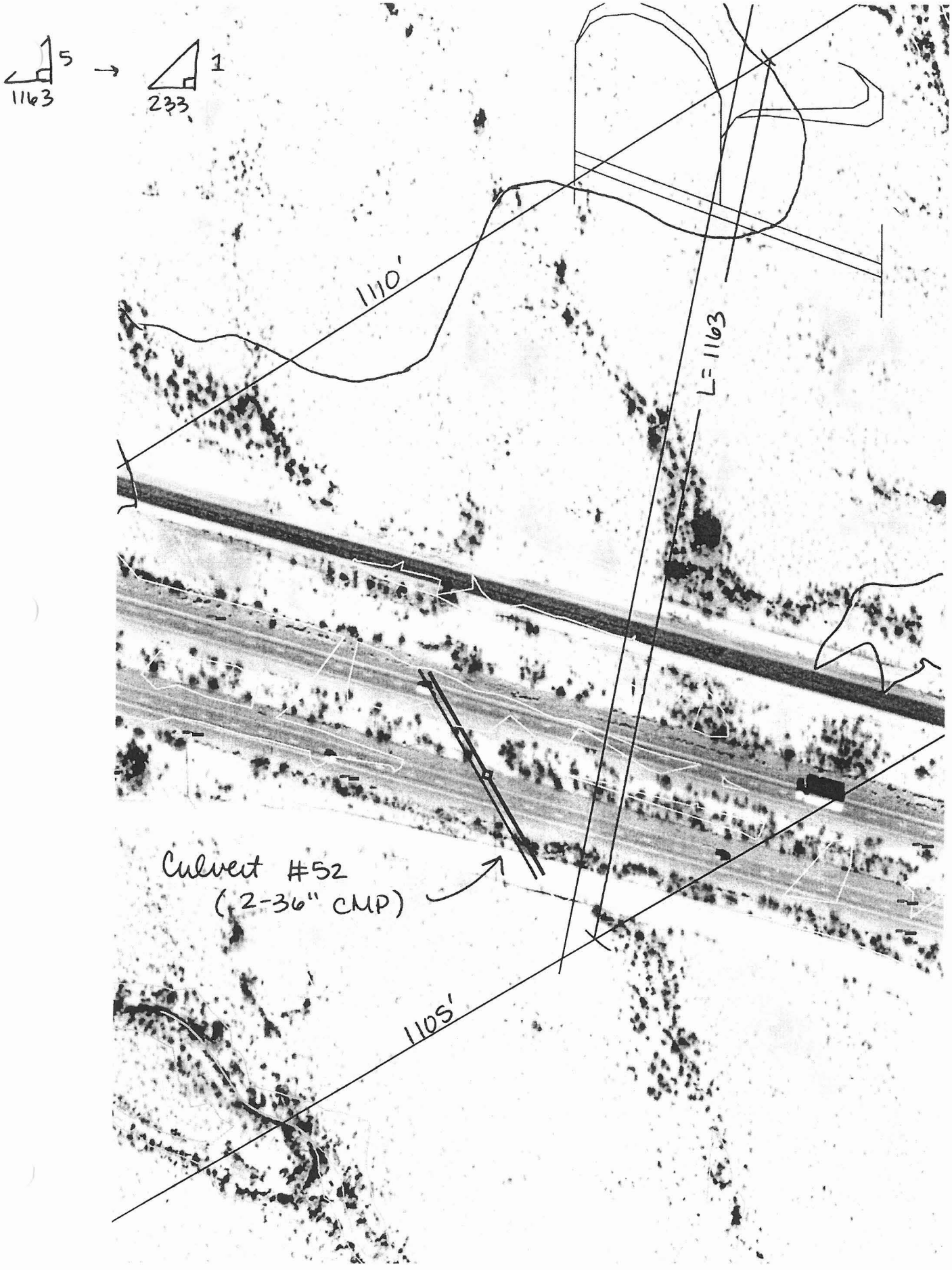
$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (163.8)(0.0948)^{1.5} = 12.9$ cfs $\simeq$ 13cfs

Total Associated Area to
C116-03=0.054 s.mi.=35 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The area shaded is included with Culvert #54 Analysis)


Area= 21 acres
Q= 17 cfs
(Area-Flow Relationship
Q= 510 x Area(s.mi)
C116
Culvert #52c
(2-36" CMP)


5
1163
1
233
1110'
L= 1163
Culvert #52
(2-36" CMP)
1105'

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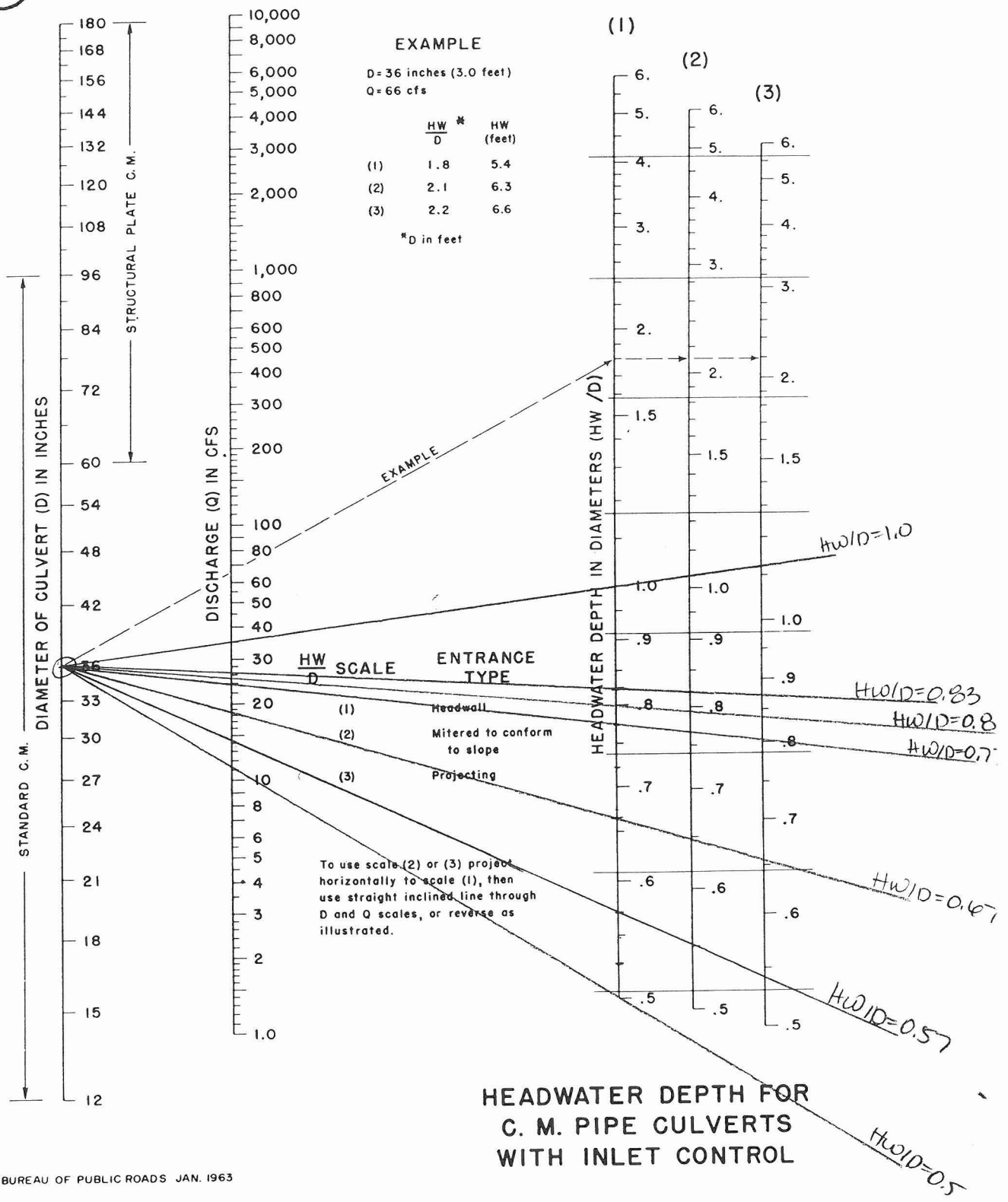
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #52 (2-36" CMP)

CHART 2



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

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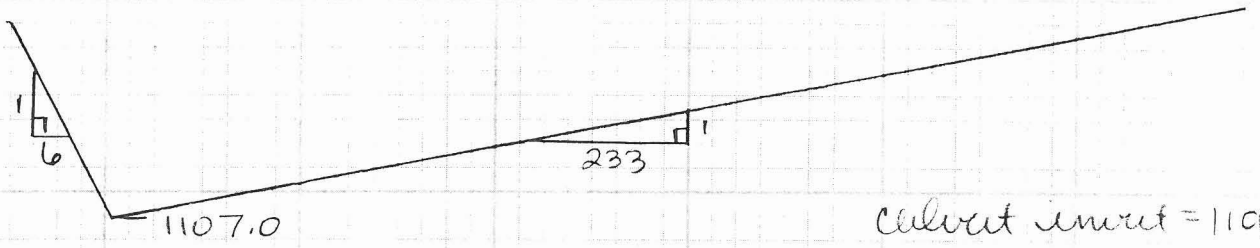
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1107.0)

Culvert # 52
(2-36" CMP)

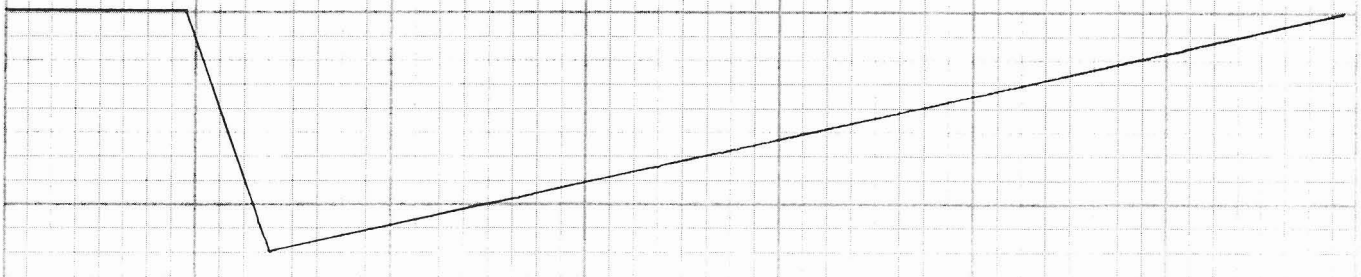


Culvert invert = 1106

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

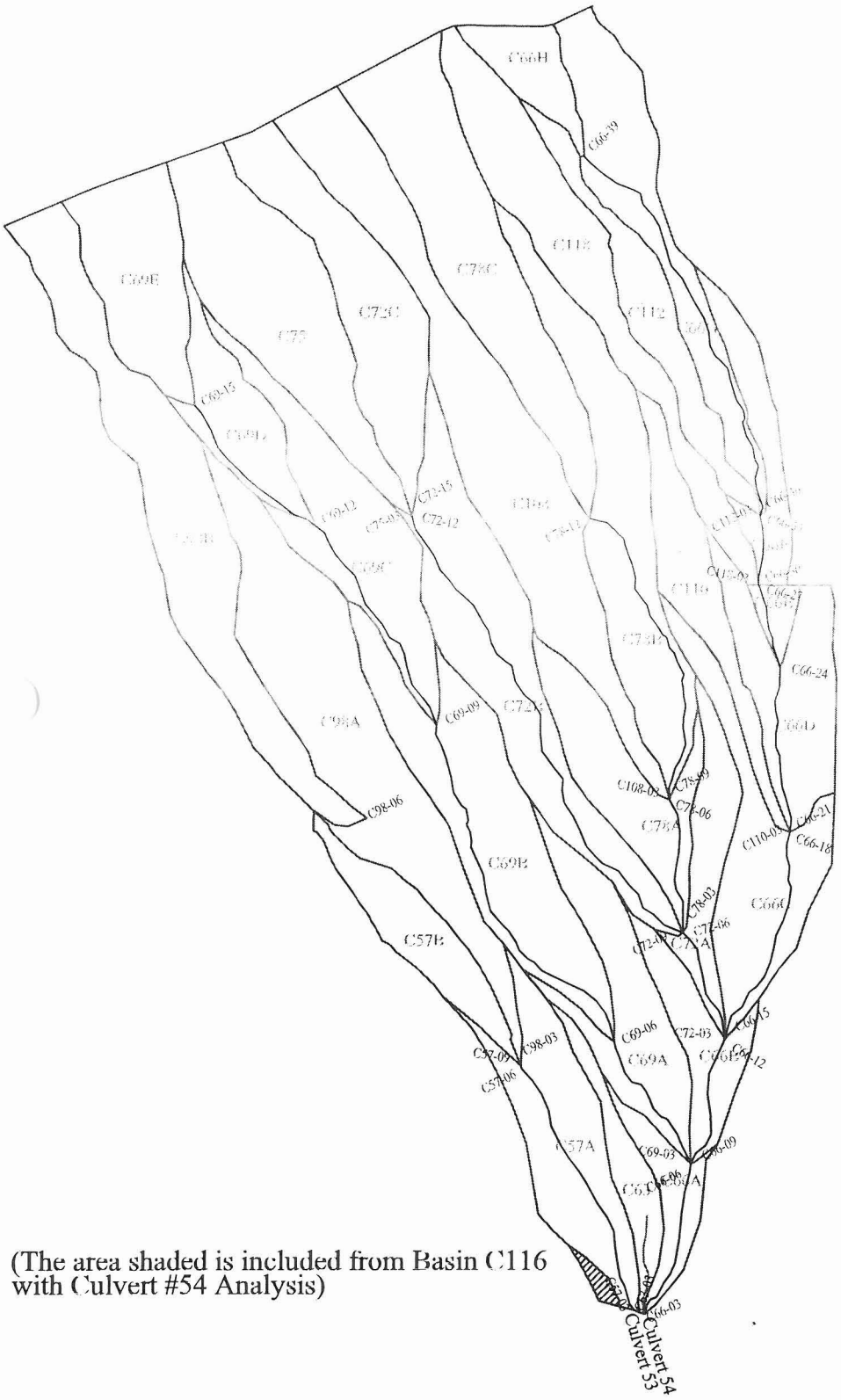
Weir Analysis (at EL>)



$$Q = C L H^{1.5}$$

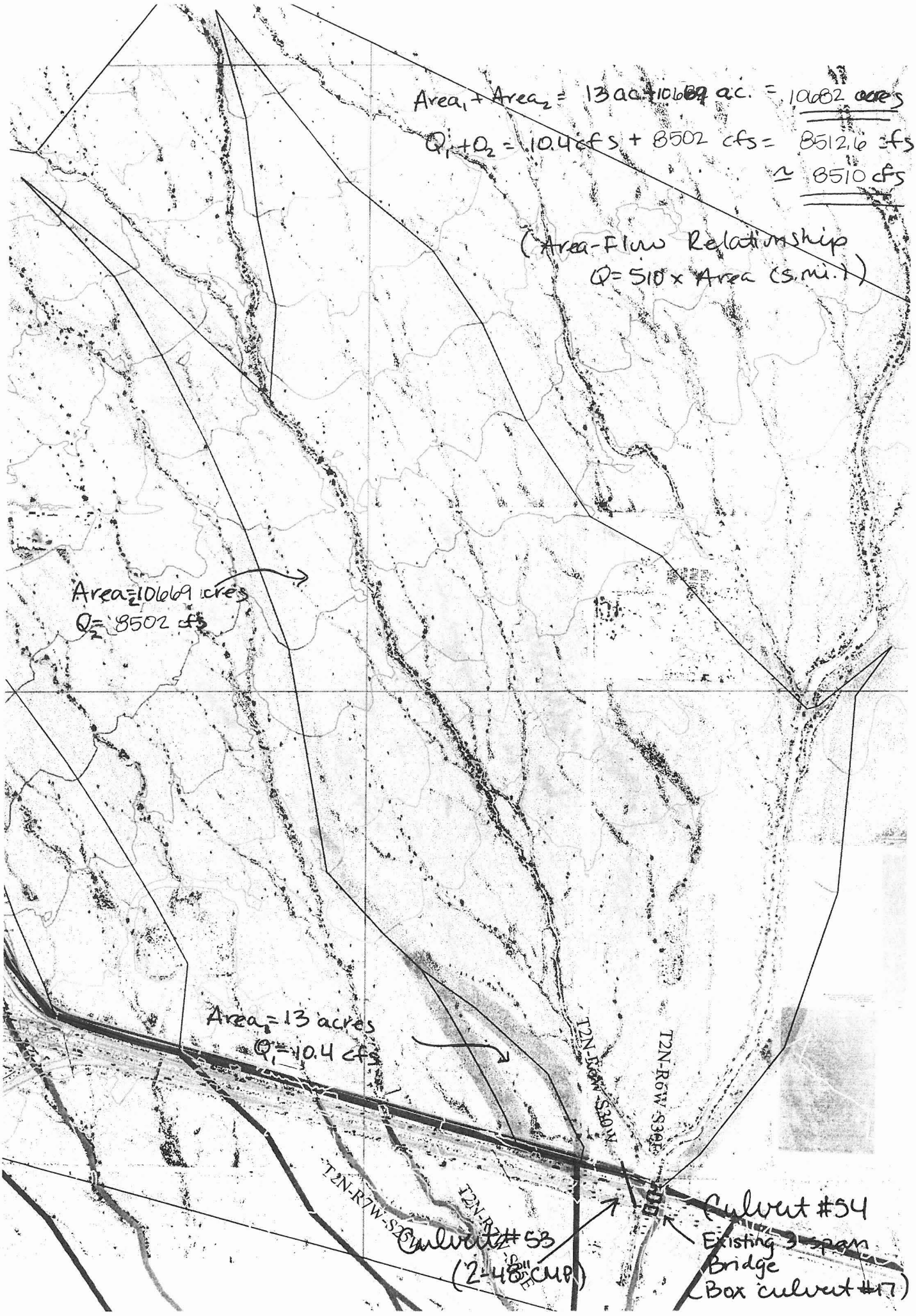
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

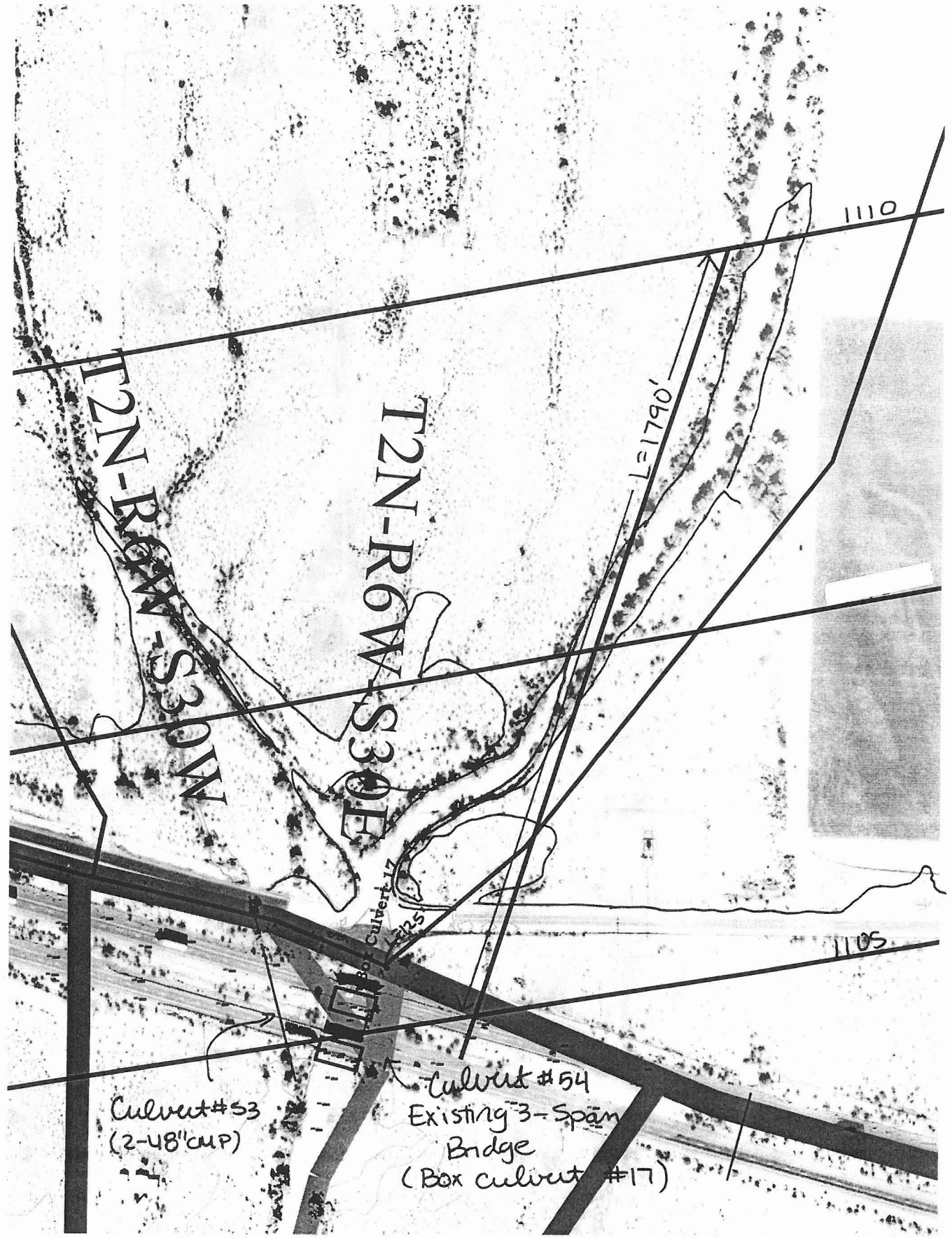
$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$



Total Associated Area to
C66-03=13.942 s.mi.=8923 acres and
C57-03=2.567 s.mi.=1643 acres and
C63-03=0.162 s.mi.=104 acres
For a Total of 10669 acres (which includes a
small area from Basin C116)
(This value is also shown on the Flow
Calculation Spreadsheet)

(The area shaded is included from Basin C116
with Culvert #54 Analysis)


Area$_1$ + Area$_2$ = 13 ac + 10669 ac. = 10682 acres
$Q_1 + Q_2$ = 10.4 cfs + 8502 cfs = 8512.6 cfs
≃ 8510 cfs
(Area-Flow Relationship
Q = 510 × Area (s.mi.))
Area$_2$ = 10669 acres
Q_2 = 8502 cfs
Area$_1$ = 13 acres
Q_1 = 10.4 cfs
T2N-R6W-S30W
T2N-R6W-S30E
T2N-R7W-S25
T2N-R7W-S25
Culvert #53
(2-48" CMP)
Culvert #54
Existing 3-span
Bridge
(Box culvert #17)



* The hydraulic calculations shown in the speadsheet don't include Culvert#53, since the BC#17 contains all flow from upstream into the Box culvert.

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SHEET____ OF ____

BY ____ DATE ____

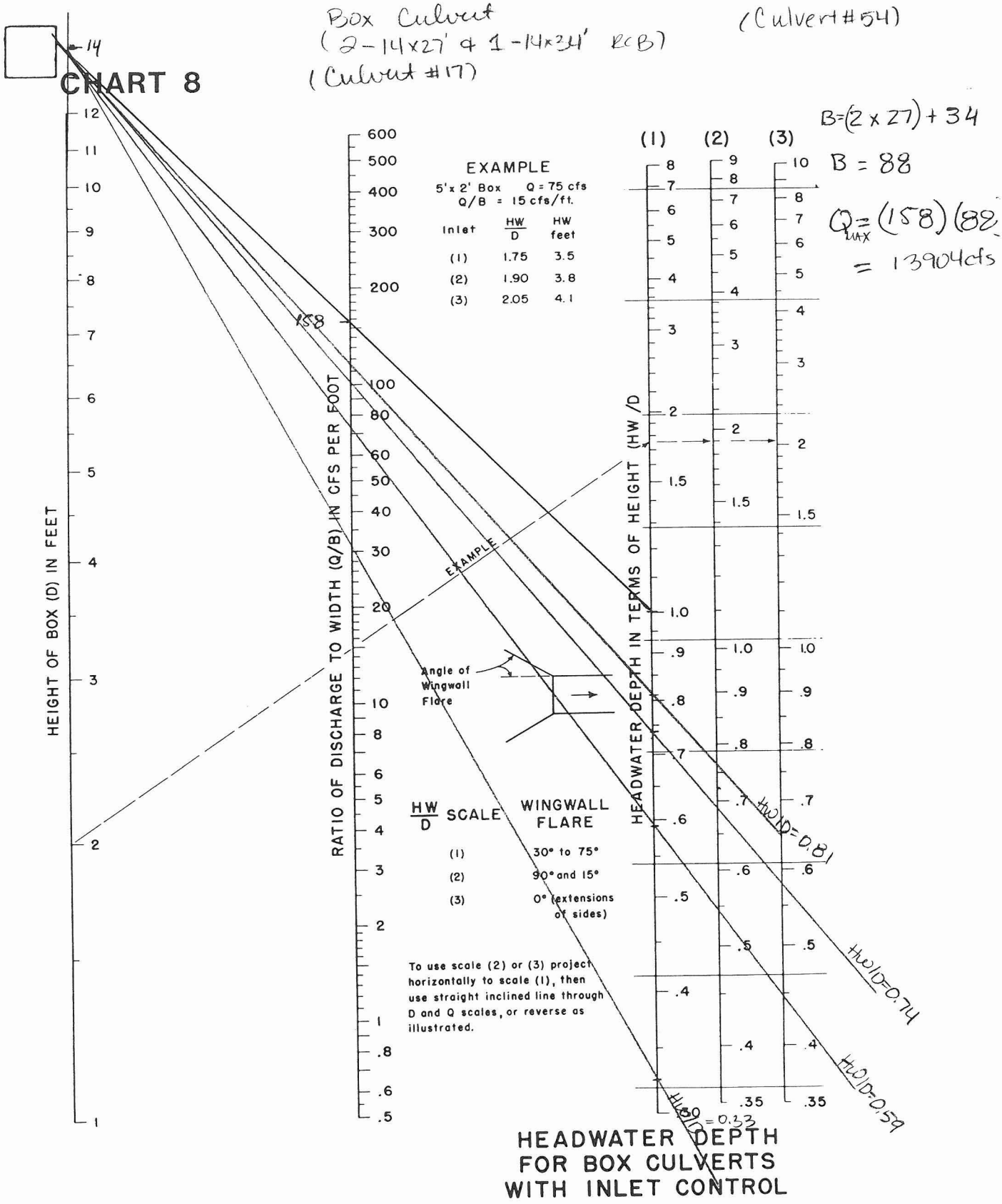
CHECK ____ DATE ____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Relocation JOB NO. 310.019

Box Culvert
(2-14x27' & 1-14x34' RCB)
(Culvert #17)

(Culvert #54)



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

B=(2 x 27) + 34

B = 88

Q_{MAX} = (158)(88)

= 13904cfs

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SHEET _____ OF _____

BY _____ DATE _____

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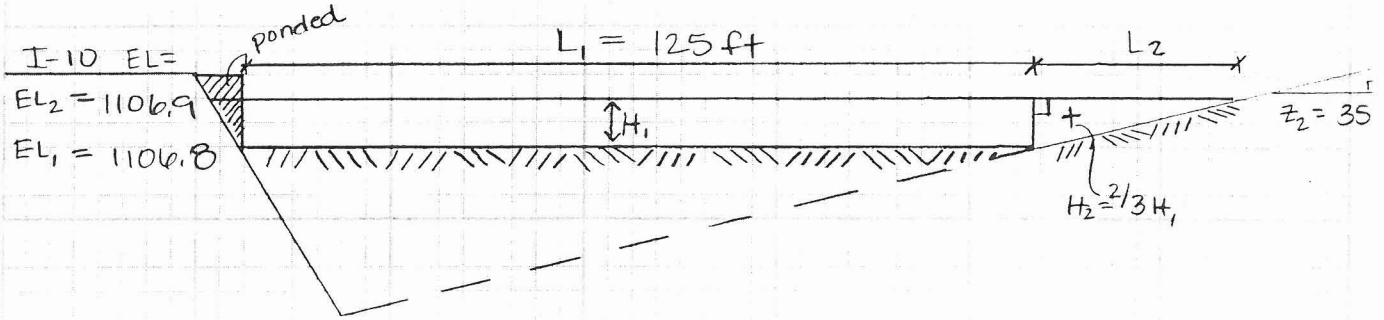
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 54
3 Span Bridge

Weir Analysis (at EL > 1106.8)



$H_1 = E_2 - E_1 = 1106.9 - 1106.8\ ft = 0.10\ ft$

$L_2 = H_1 Z_2 = (0.10)(358) = 35.8\ ft$

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667\ ft$

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{125(0.10) + (0.1667)(35.8)}{125 + 35.8} = 0.221$

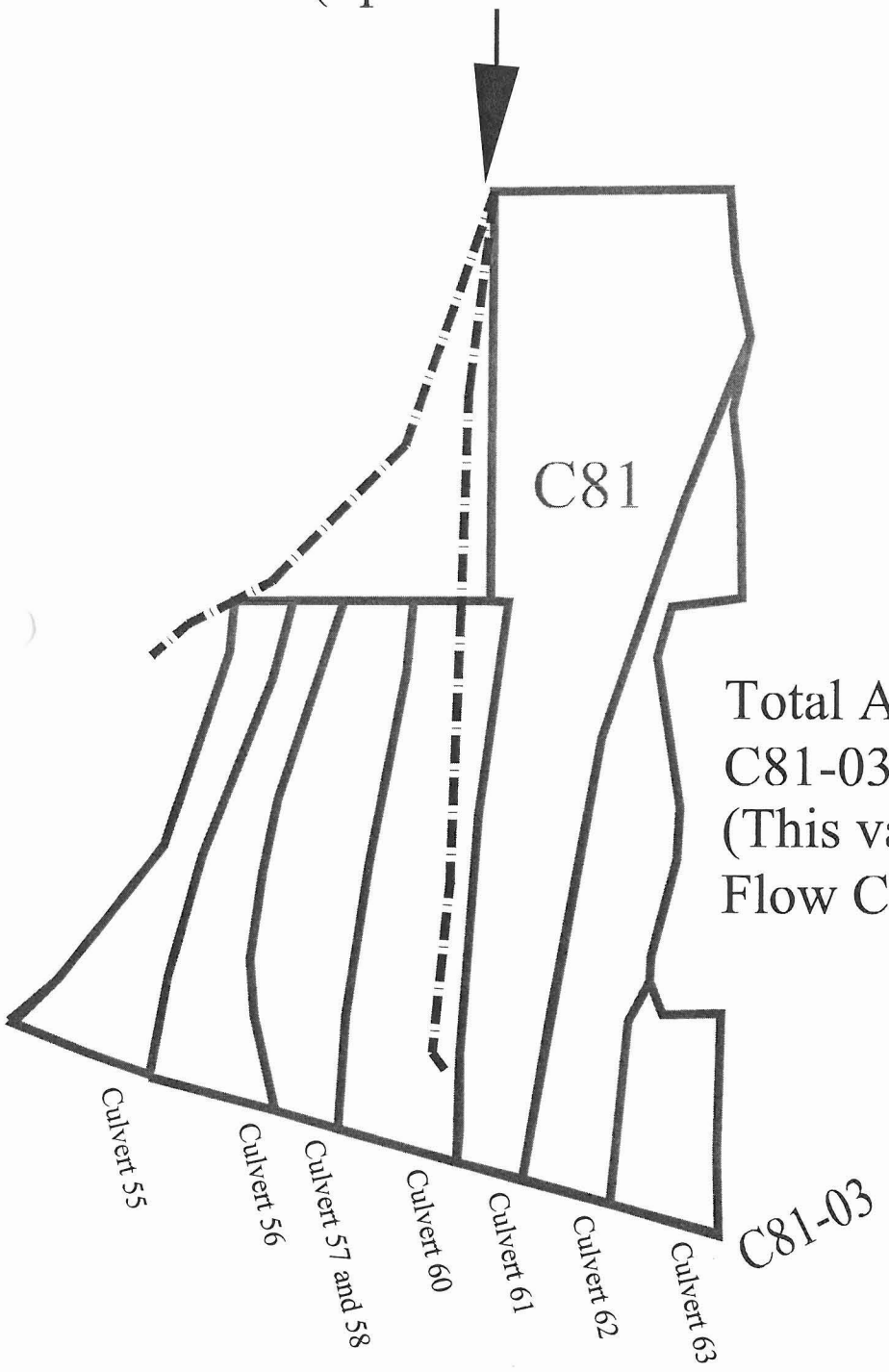
$L_T = L_1 + L_2 = 125 + 35.8 = 160.8\ ft$

Weir Flow $Q = C L_T \bar{H}^{1.5}$

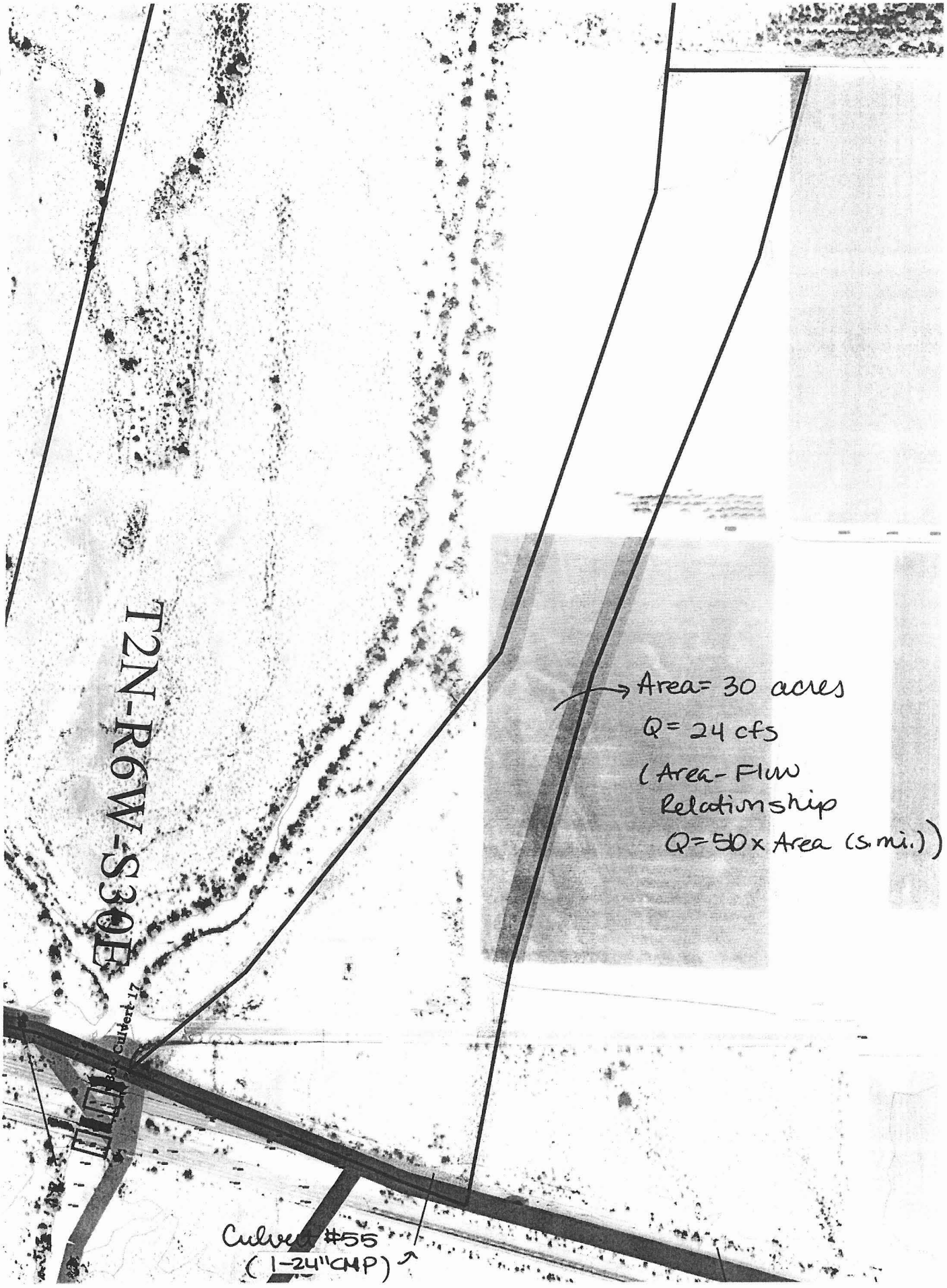
$C = 2.7$

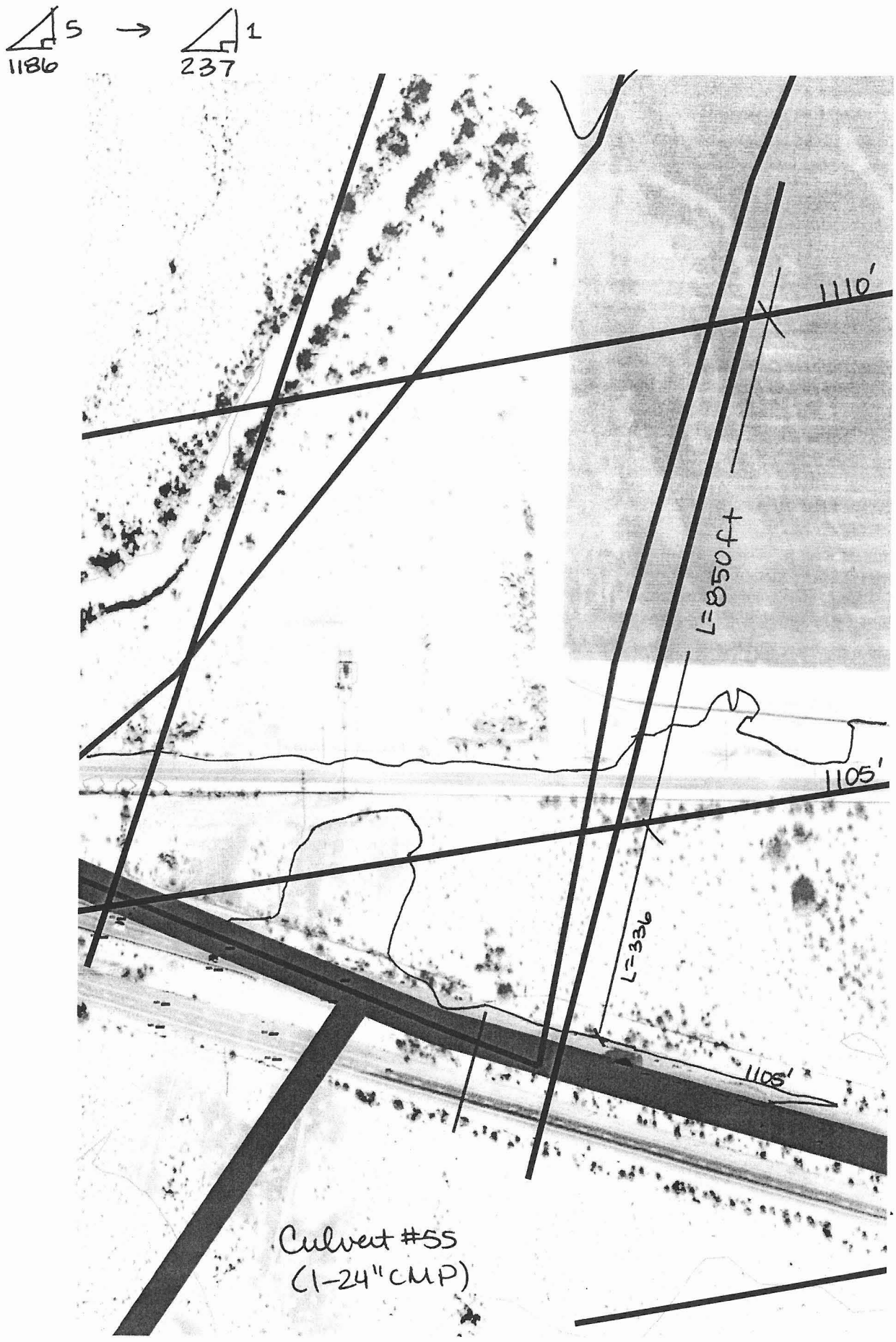
$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (160.8)(0.216)^{1.5} = 46.7\ cfs$

(Split Flow occurs here at C106-03)



Total Associated Area to C81-03=0.898 s.mi.=575 acres (This value is also shown on the Flow Calculation Spreadsheet)


T2N-R6W-S30E
Area= 30 acres
Q= 24 cfs
(Area-Flow Relationship
Q=50 x Area (s.mi.))
Culvert #55
(1-24"CMP)


5
1186
1
237
1110'
L=850ft
1105'
L=336
1105'
Culvert #55
(1-24" CMP)

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SHEET _____ OF _____

BY _____ DATE _____

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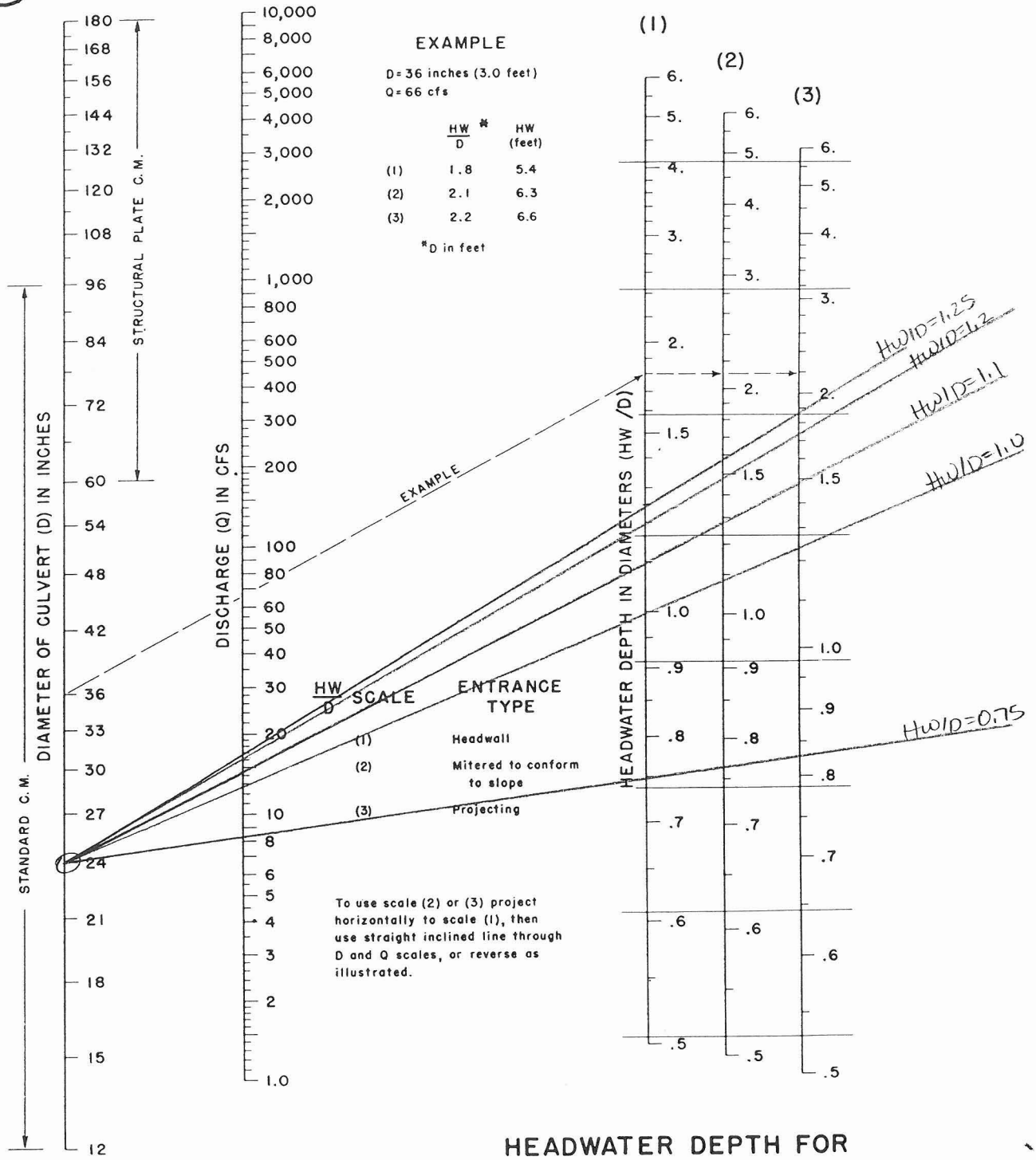
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #55 (1-24" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

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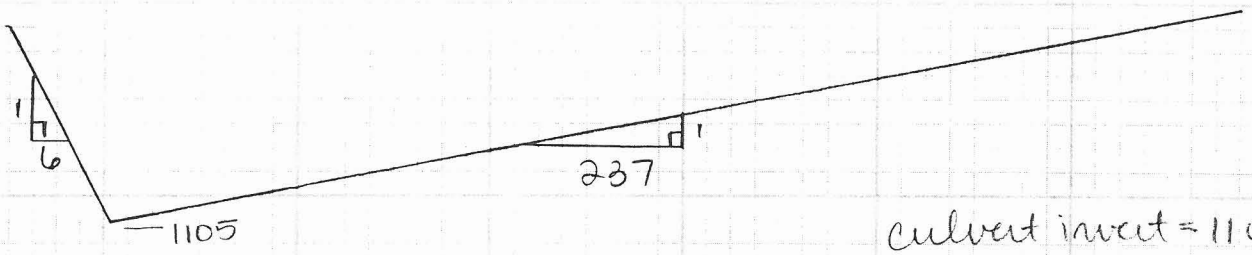
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1105)

Culvert # 55 (1-24" CMP)

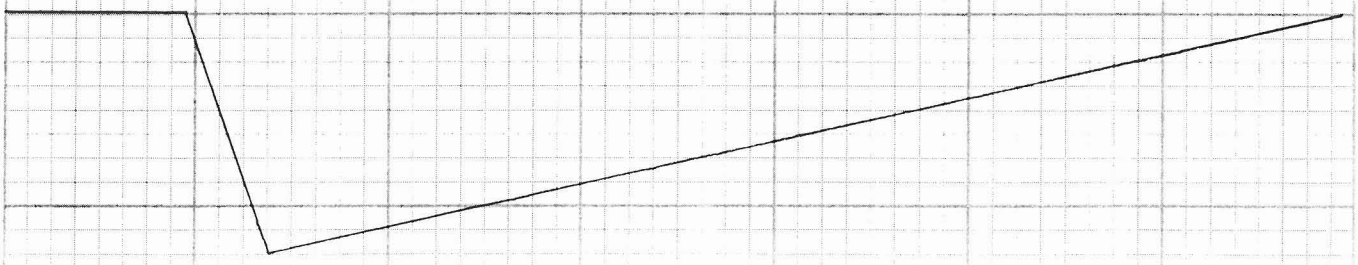


Culvert invert = 1103

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL >)

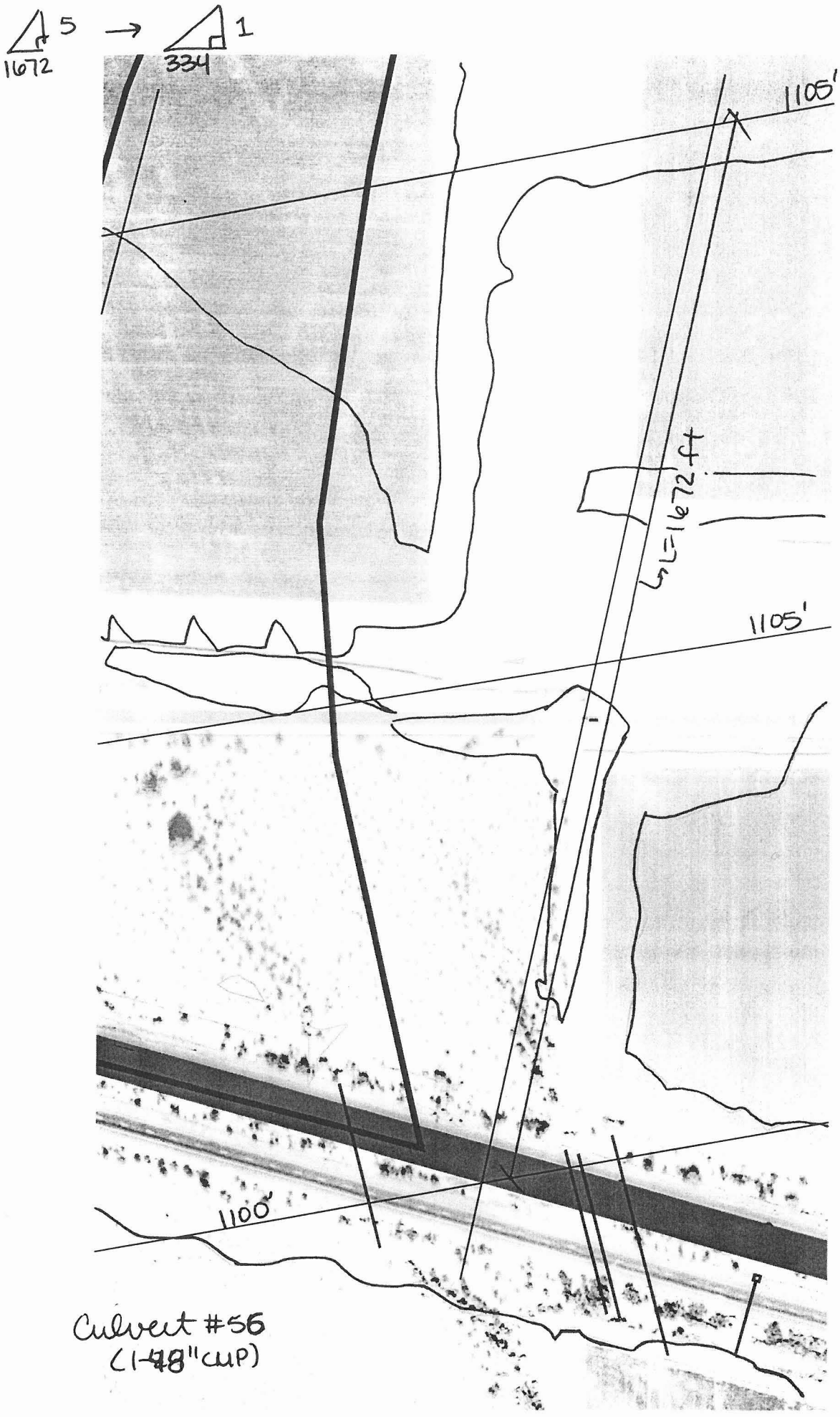


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L+l}\right)$$

Area = 32 acres
Q = 26 cfs
(Area-Flow Relationship
Q = 510 x Area (S mi))
Culvert #56
(1-48" CMP)



Culvert #56
(1-48" CMP)

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SHEET____ OF ____

BY ____ DATE ____

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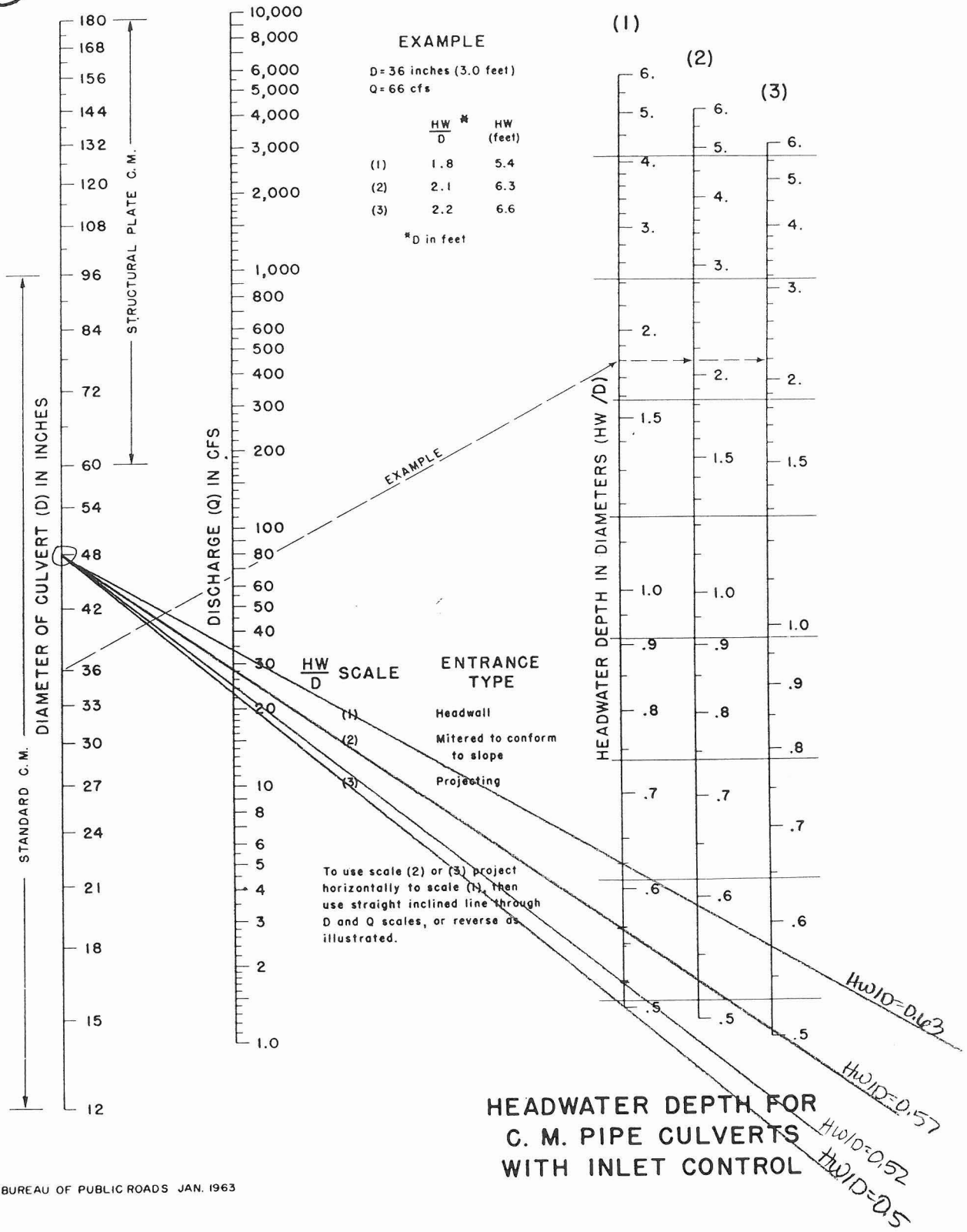
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation Culvert #56 (1-48" CMP)

JOB NO. 310.019

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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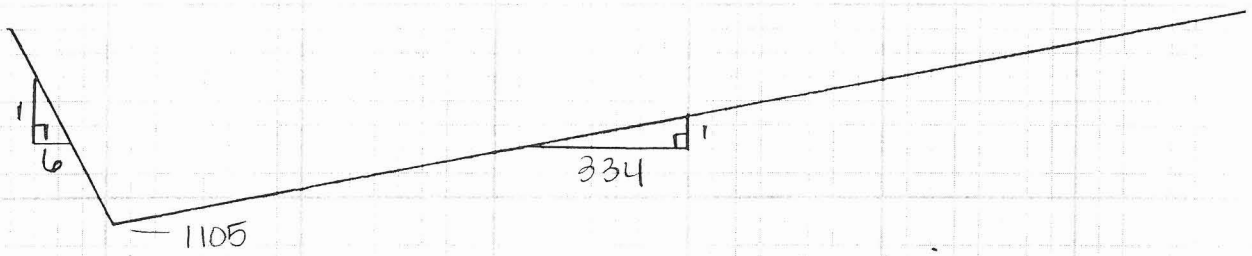
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1105)

Culvert # 56 (I-40 CRIP)



culvert invert = 1103

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$

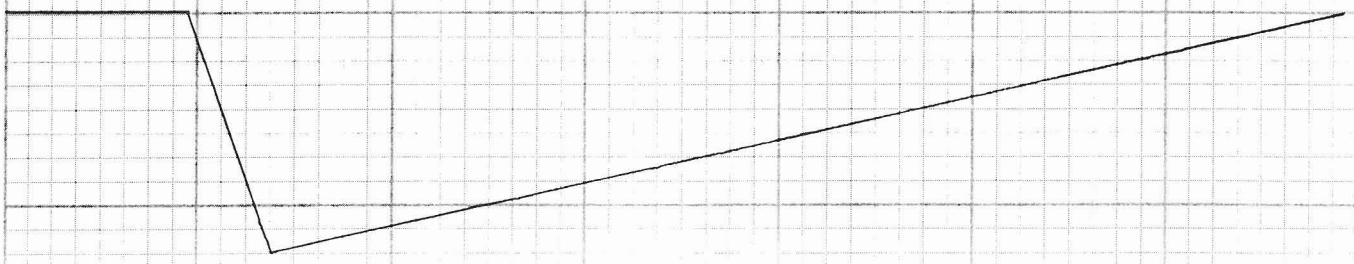
S = downstream slope = 0.002

A = Area of channel cross section

$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL>)



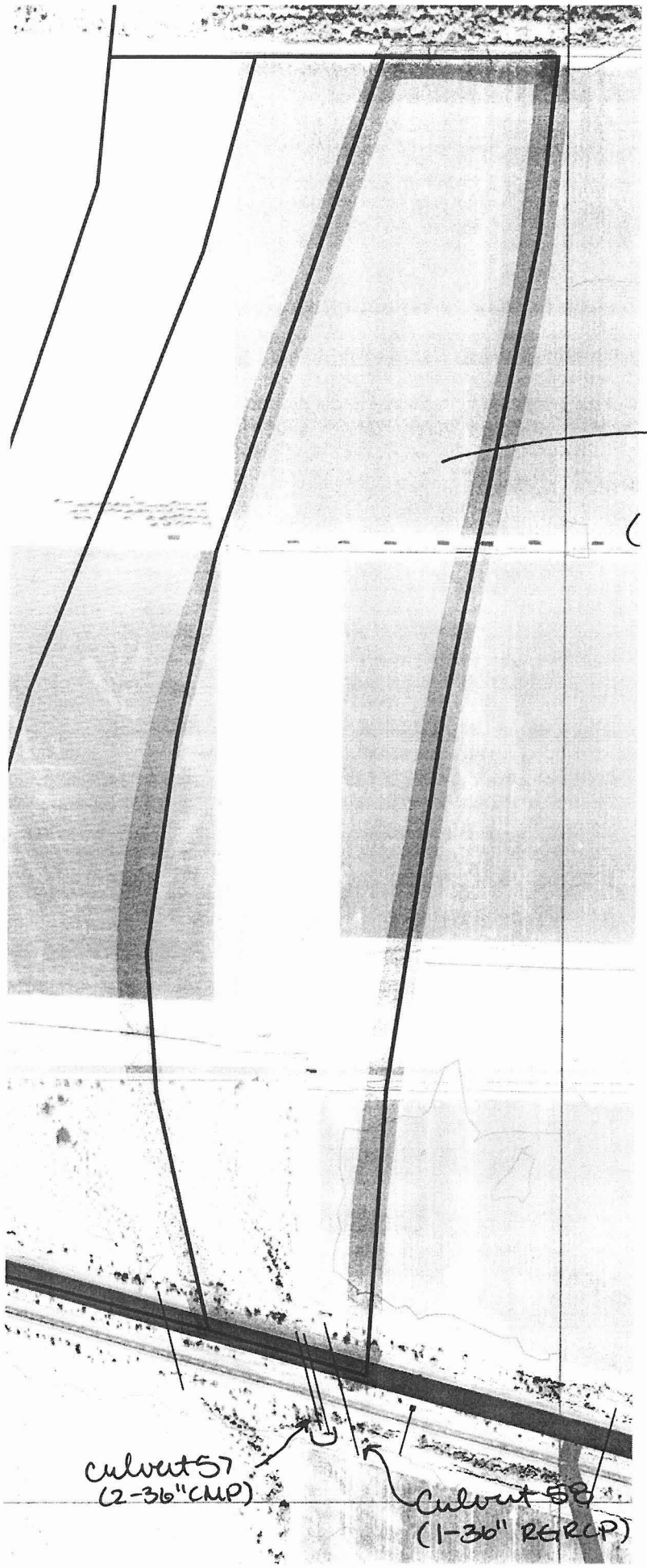
$$Q = CLH^{1.5}$$

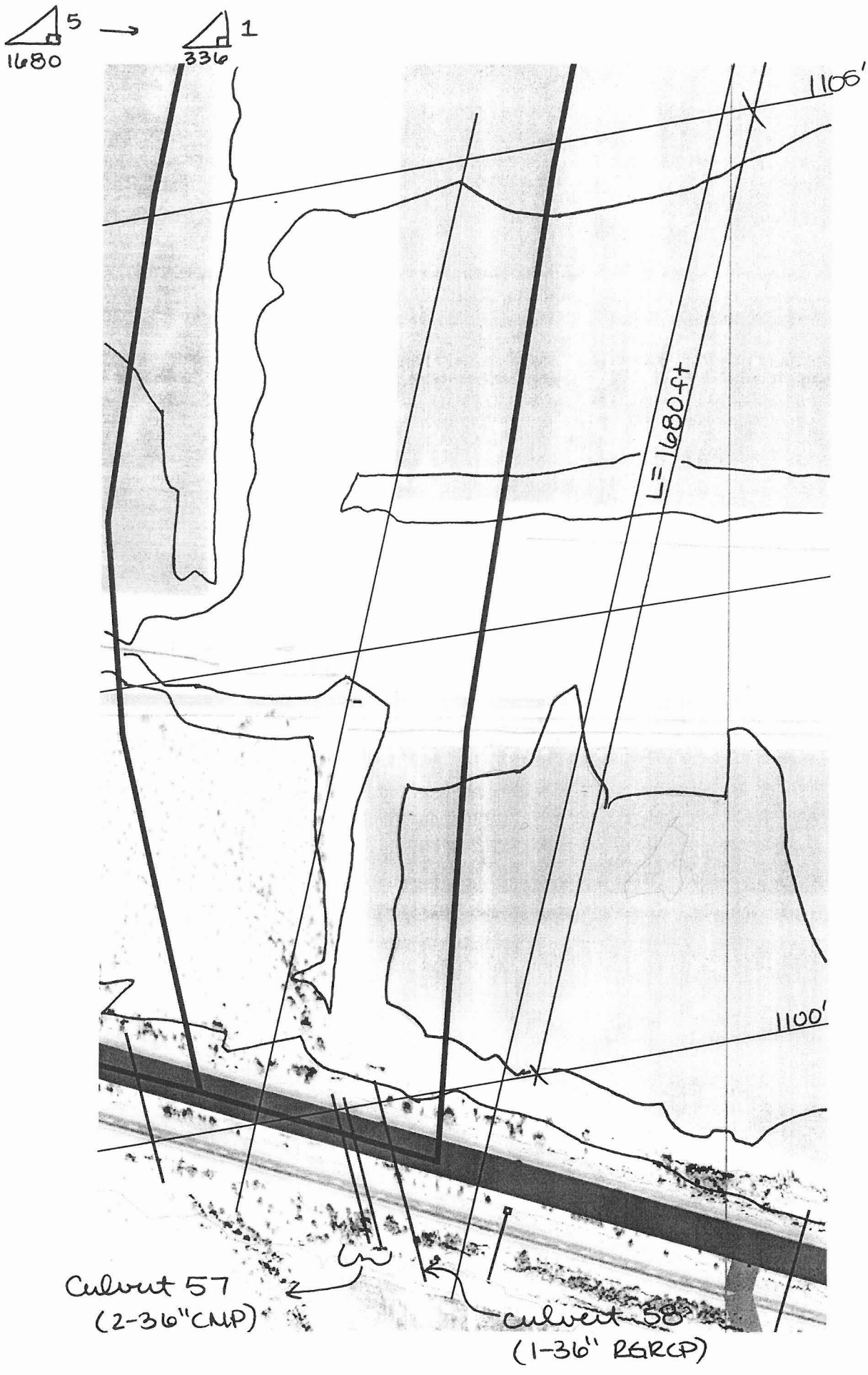
where $C = 2.7$

L = length of berm/dyke

H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$


Area= 45 acres
Q= 36 cfs
(Area-Flow Relationship
Q= 510x Area(s.mi)
culvert 57
(2-36" CMP)
Culvert 58
(1-36" RCP)


5
1680
1
336
1106'
L=1680ft
1100'
Culvert 57
(2-36"CMP)
culvert 58
(1-36" RGRCP)

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SHEET____ OF ____

BY ____ DATE ____

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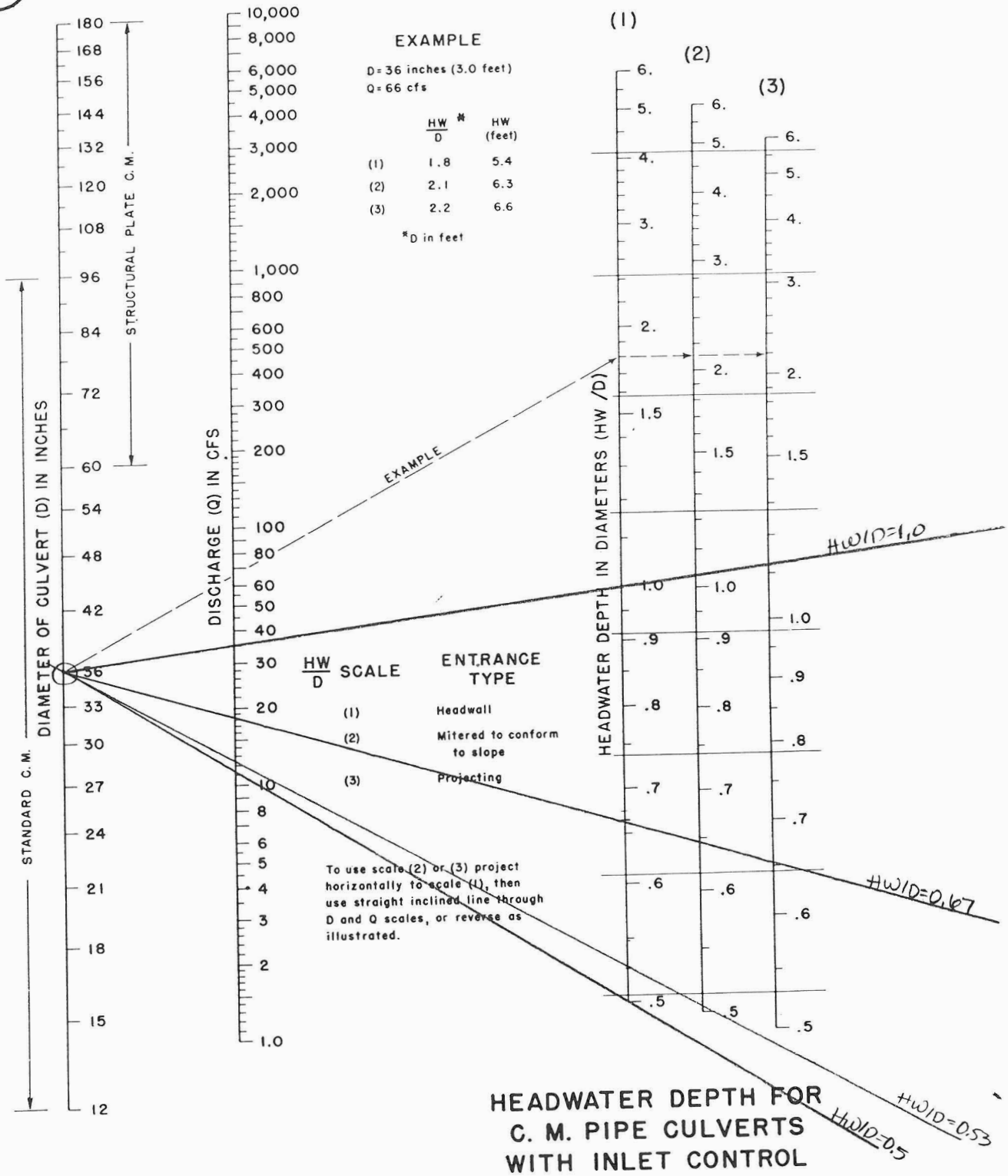
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation — JOB NO. 310.019

Culvert #57 (2-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET____ OF ____

BY ____ DATE ____

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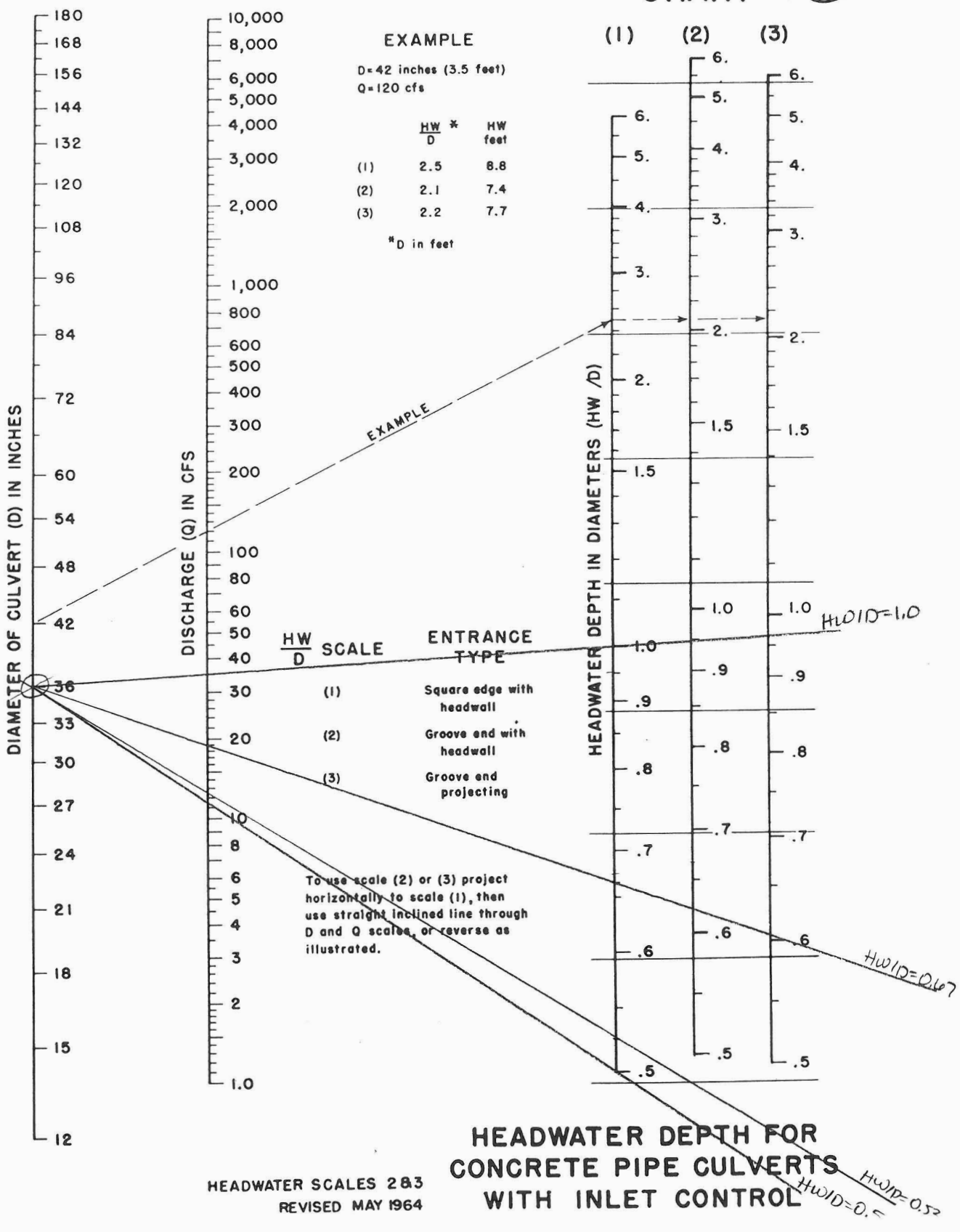
CLIENT FCDMC

JOB NAME Palo Verde Inv A Delineation
Culvert #58 (1-36" RGRCP)

JOB NO. 310 019

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

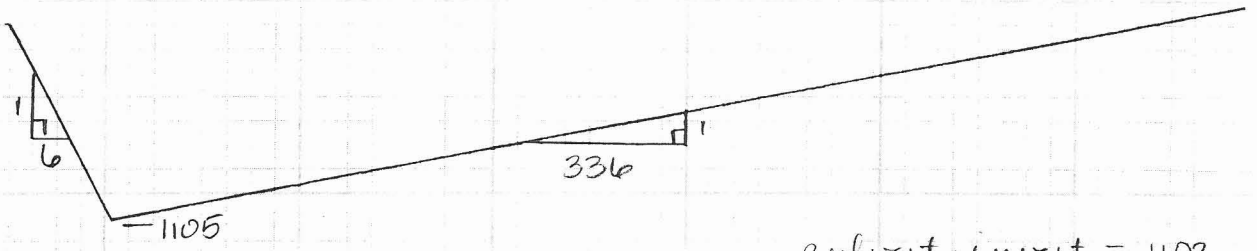
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1105)

Culvert 57 (2-36" CMP)
Culvert 58 (1-36" RGRCP)

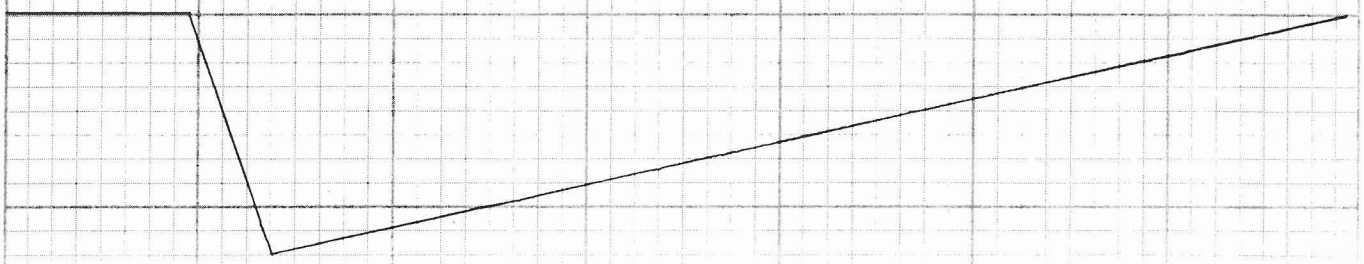


culvert invert = 1102

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

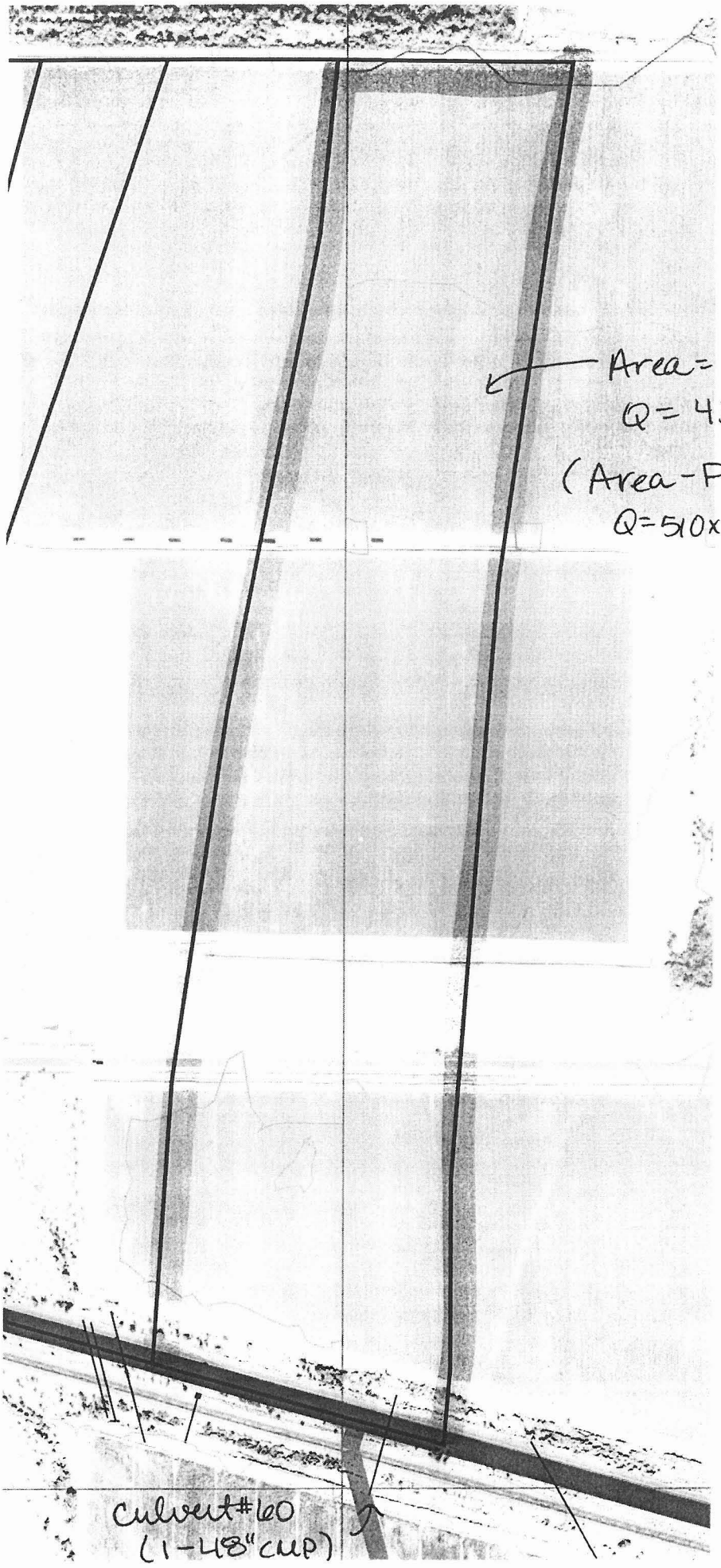
Weir Analysis (at EL >)

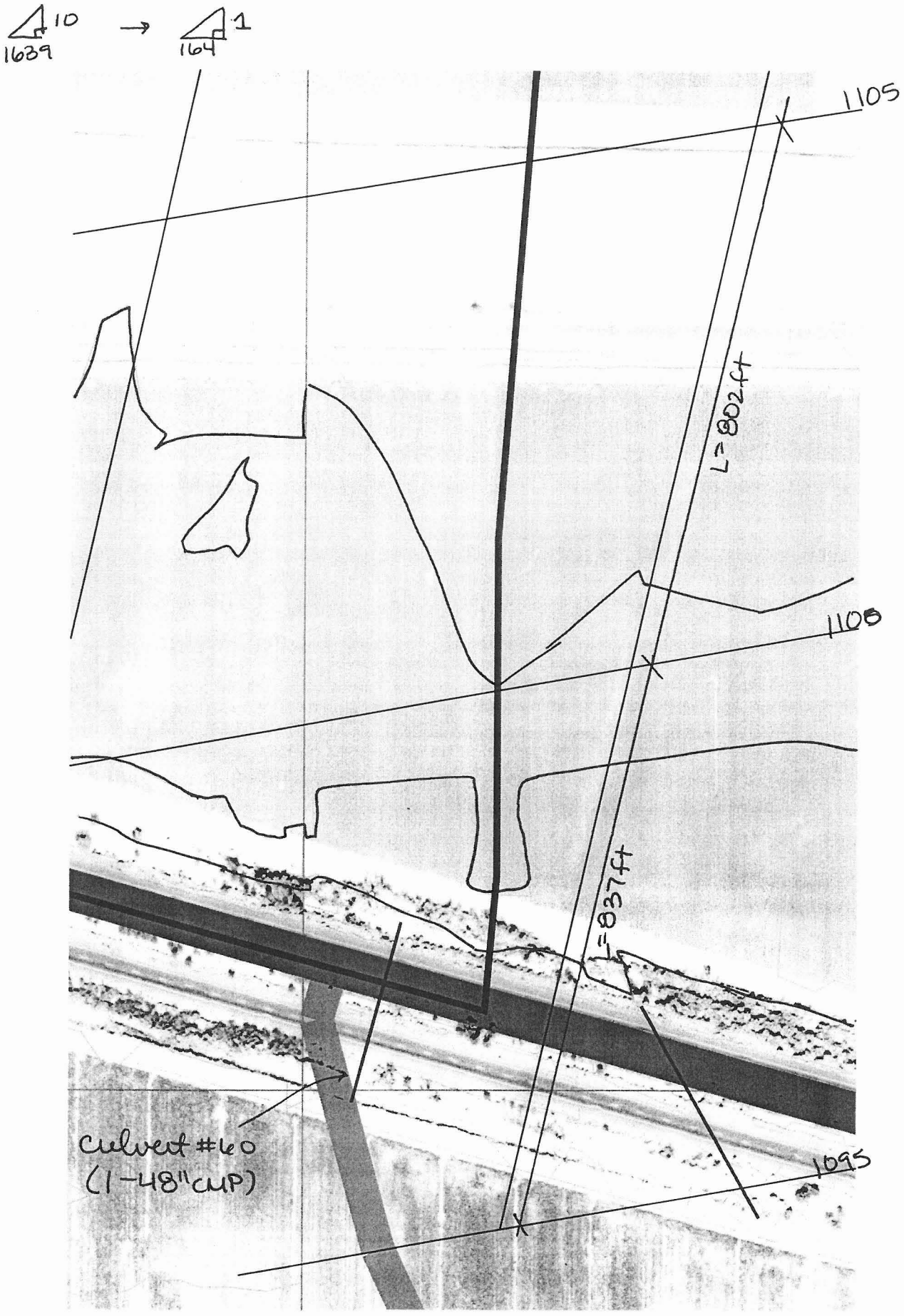


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(2/3\,\bar{H})}{L+\ell}\right)$$


Area = 55 acres
Q = 43 cfs
(Area-Flow Relationship
Q = 510 x Area (s.mi.))
Culvert #60
(1-48" CMP)


10
1639
1
164
1105
L=802ft
1100
L=837ft
Culvert #160
(1-48" CMP)
1095

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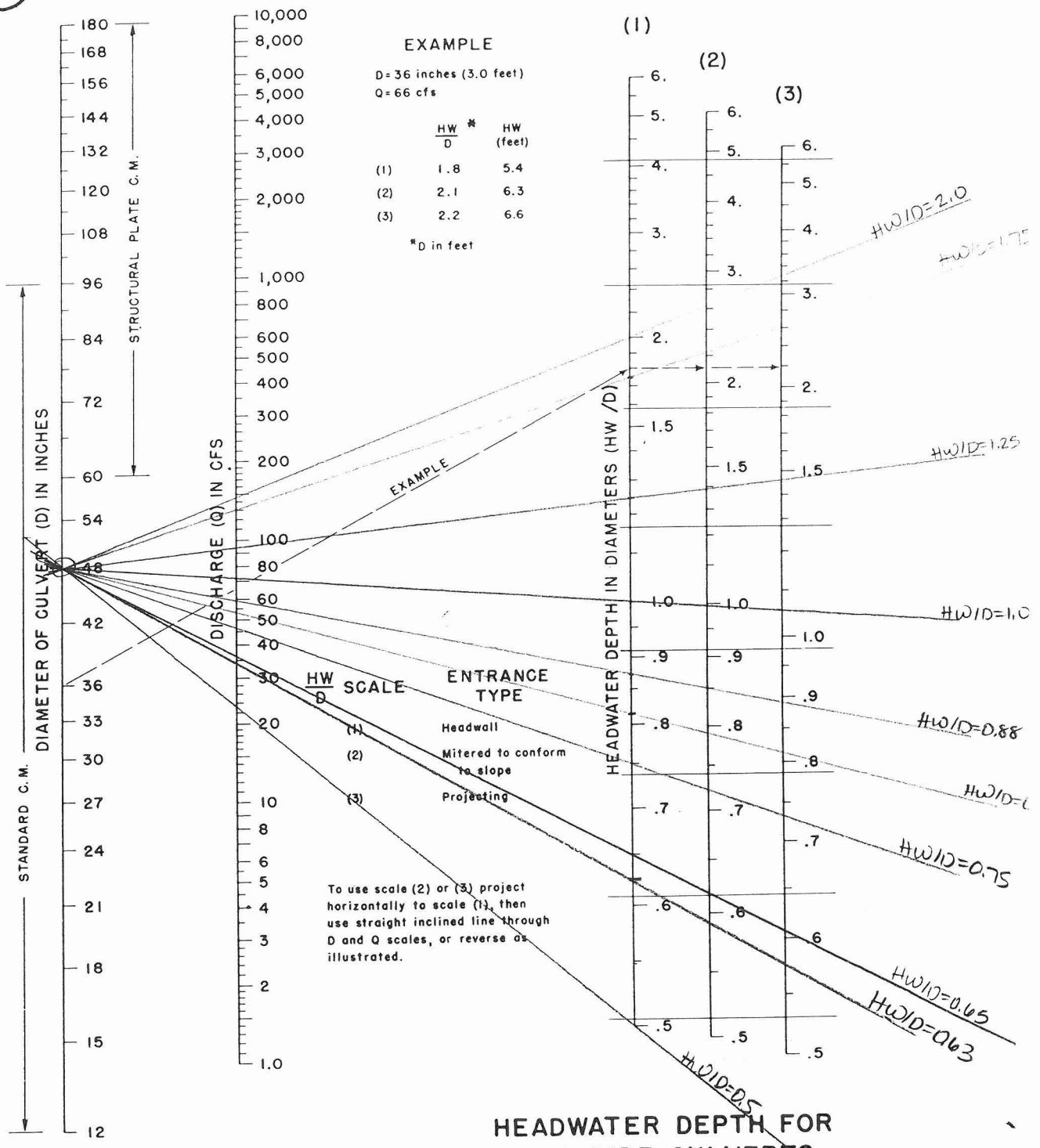
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #60
(1-48" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET _____ OF _____

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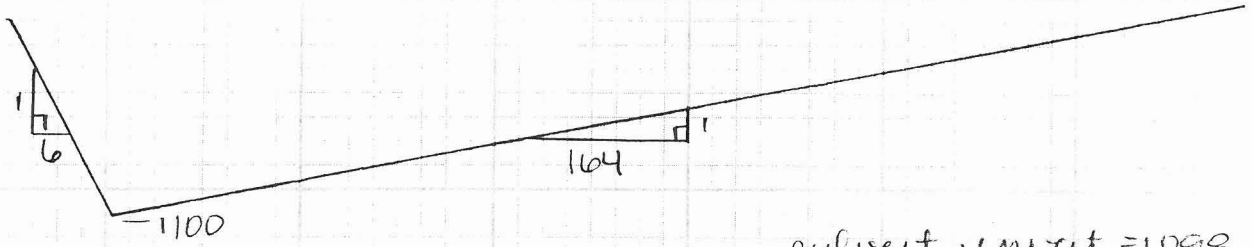
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1100)

Culvert #60
(1-48" CMP)

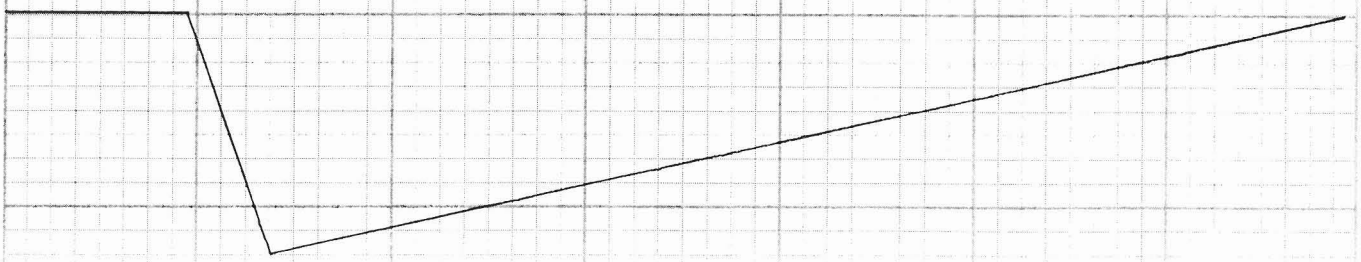


culvert invert = 1098

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

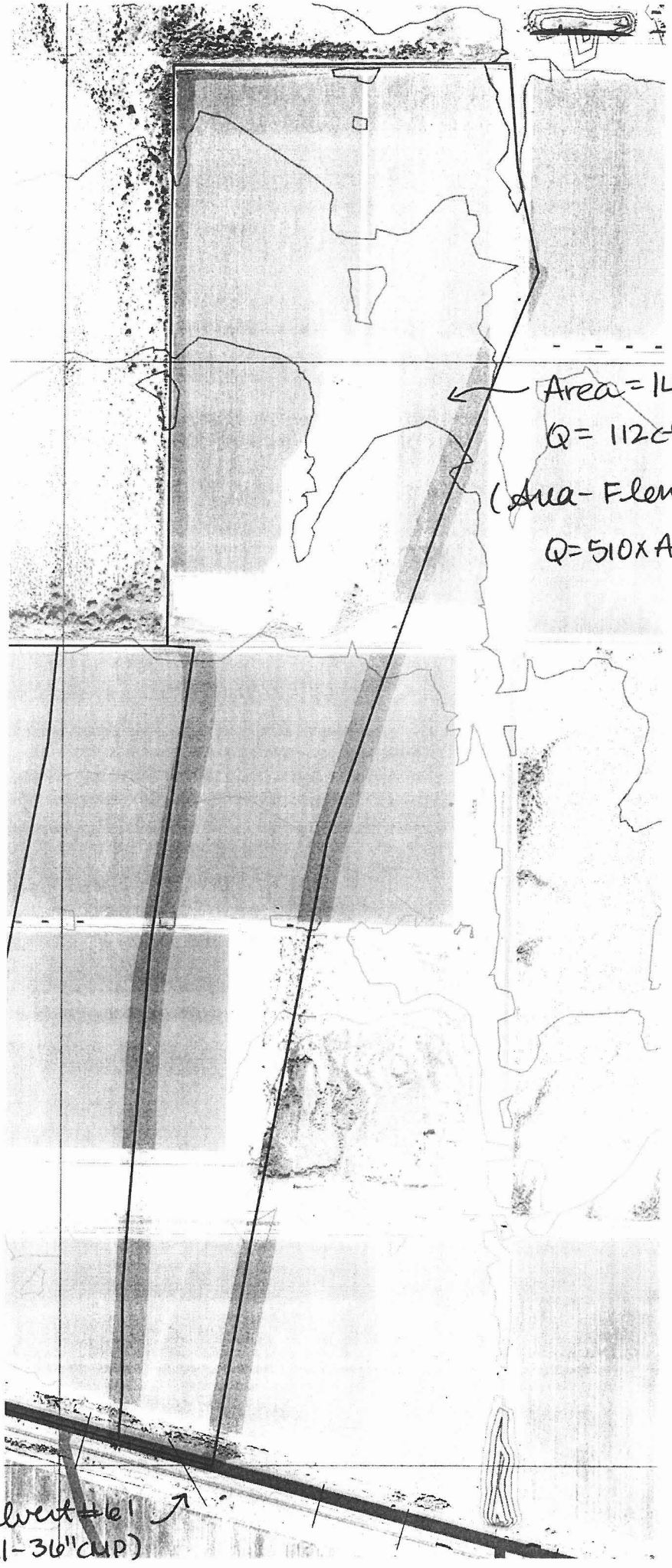
Weir Analysis (at EL>)

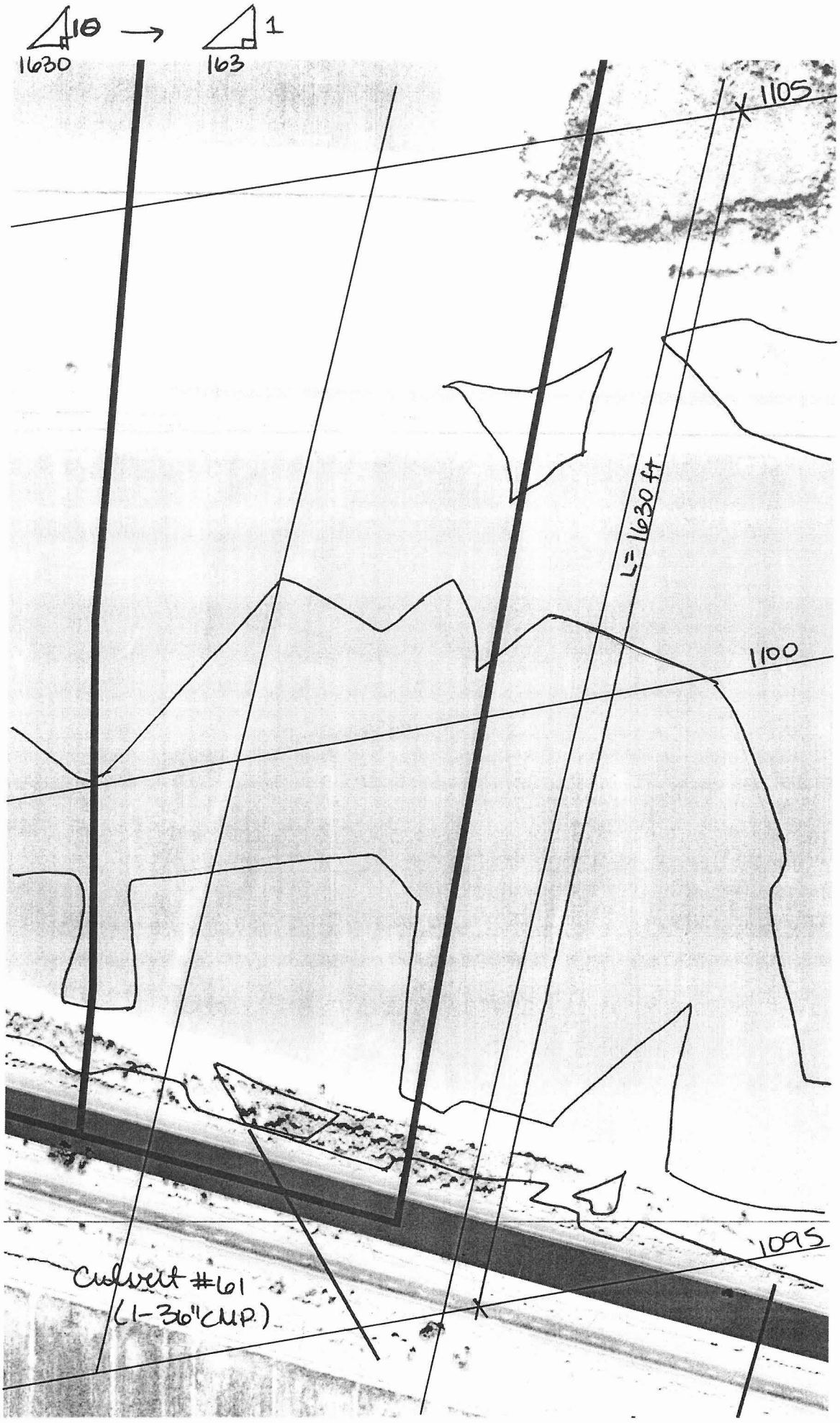


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(2/3\,\bar{H})}{L+\ell}\right)$$


Area = 140 acres
Q = 112 cfs
(Area-Flow Relationship
Q = 510 x Area (s. mi))
Culvert #61
(1-36" CMP)


10
1630
1
163
1105
L= 1630 ft
1100
1095
Culvert #61
(1-36" CMP)

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SHEET _____ OF _____

BY _____ DATE _____

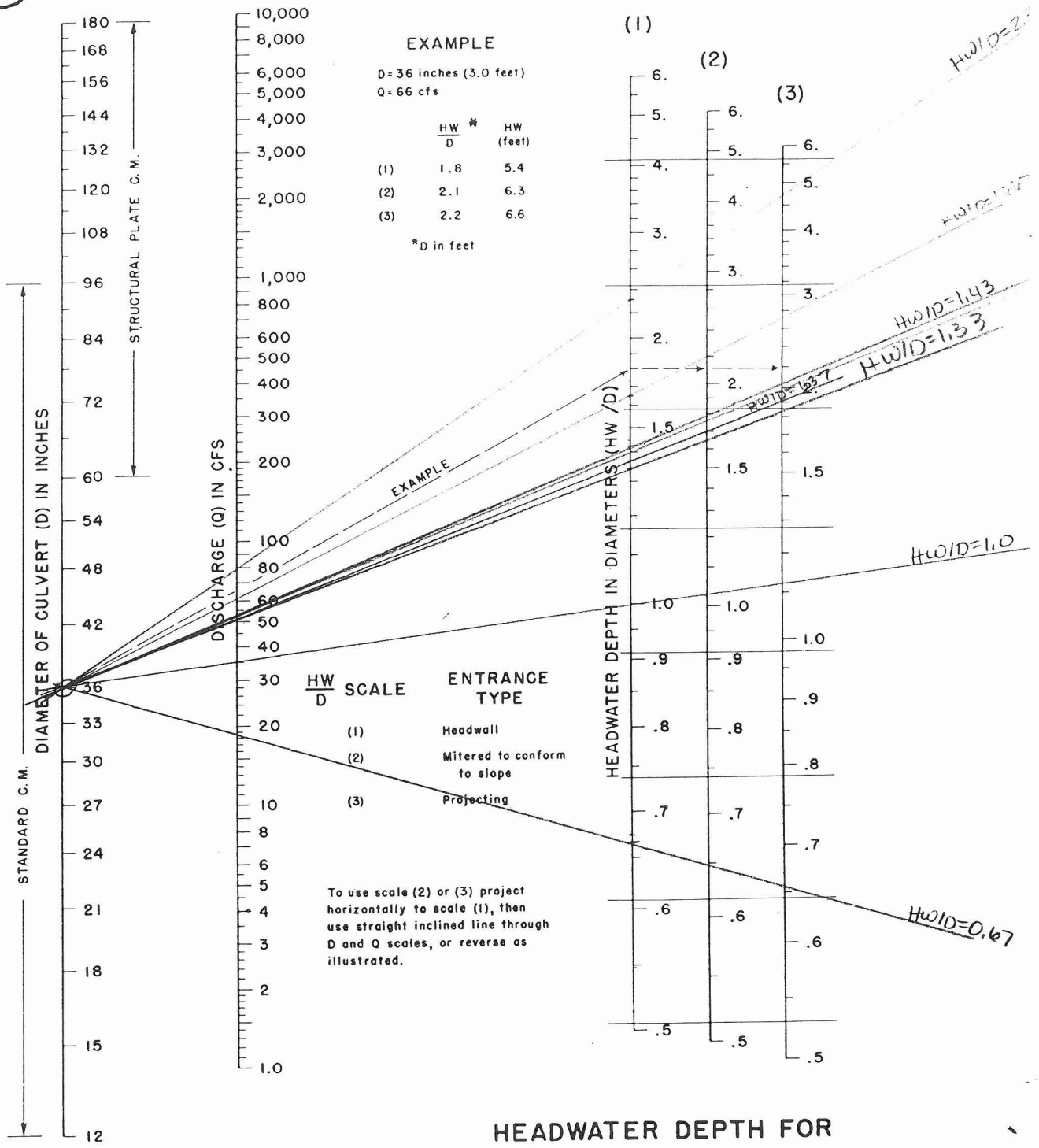
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #161 (36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

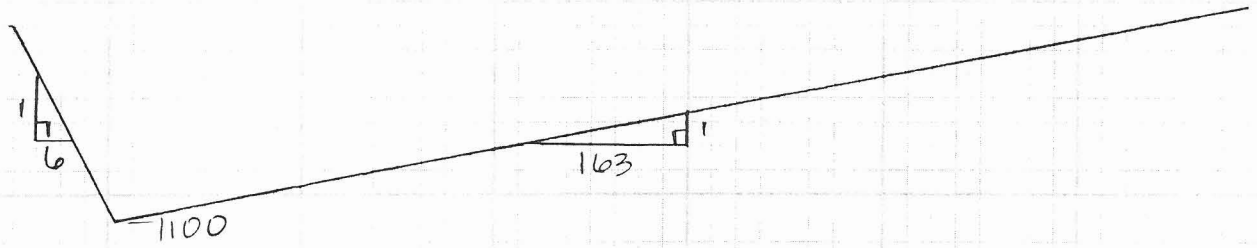
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1100)

culvert #61 (36" CMP)



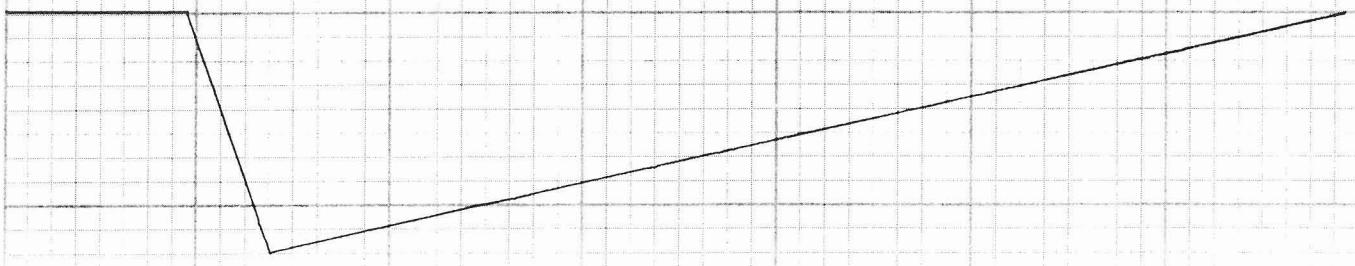
culvert invert = 1097

$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL >)



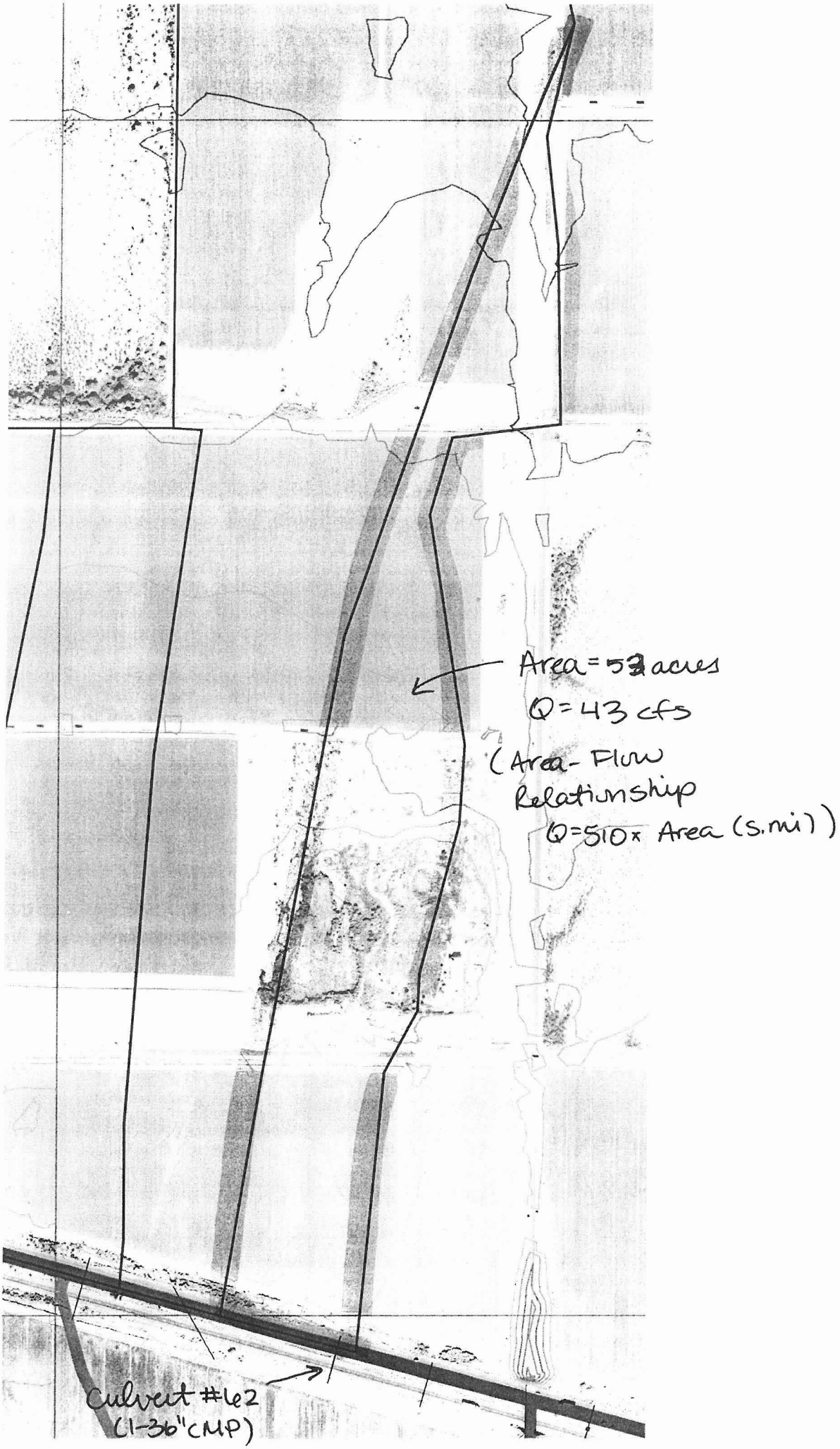
$Q = CLH^{1.5}$

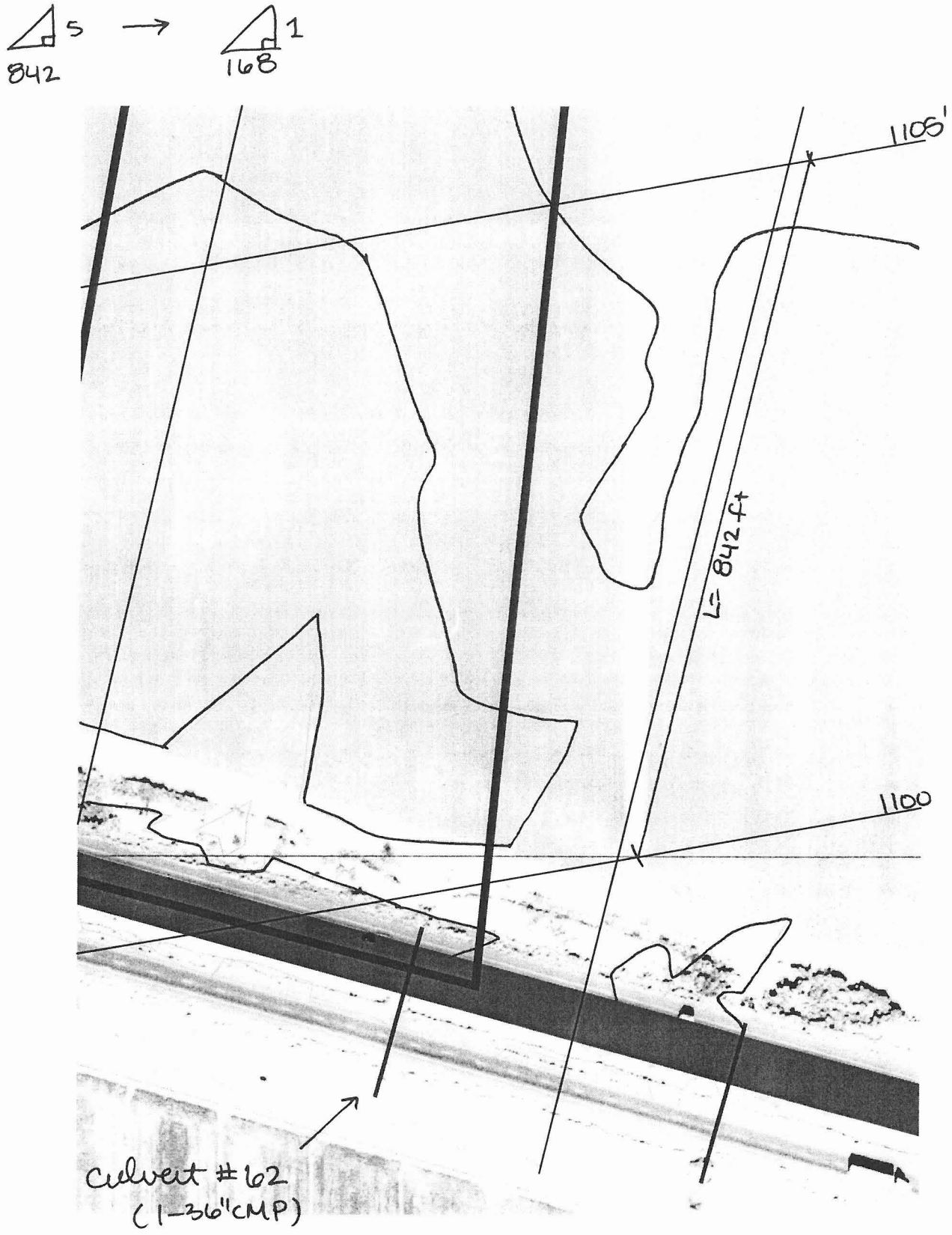
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L + l}\right)$$

vert ID	Culvert Type			48" CMP		36" CMP		Total
			HW	Chart 2 or 8	Q-culvert	Chart 2 or 8	Q-culvert	Q-culvert
		Elevation (ft)	(ft)	HW/D	(cfs)	HW/D	(cfs)	(cfs)
60 and 61	1-48" CMP	1098						
	1-36" CMP	1103	5	1.25	95	1.666666667	61	156
		1105	7	1.75	130	2.333333333	80	210

Culvert ID	Culvert Type			36" CMP		30" CMP		Total
			HW	Chart 2 or 8	Q-culvert	Chart 2 or 8	Q-culvert	Q-culvert
		Elevation (ft)	(ft)	HW/D	(cfs)	HW/D	(cfs)	(cfs)
62 and 63	1-36" CMP	1096						
	1-30" CMP	1103	7	2.33	80	2.8	58	138
		1105	9	3.00	95	3.6	66	161


Area = 53 acres
Q = 43 cfs
(Area-Flow Relationship
Q = 510 x Area (s.mi))
Culvert #62
(1-36" CMP)


5
842
1
168
1105'
L= 842 ft
1100
Culvert #62
(1-36"CMP)

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

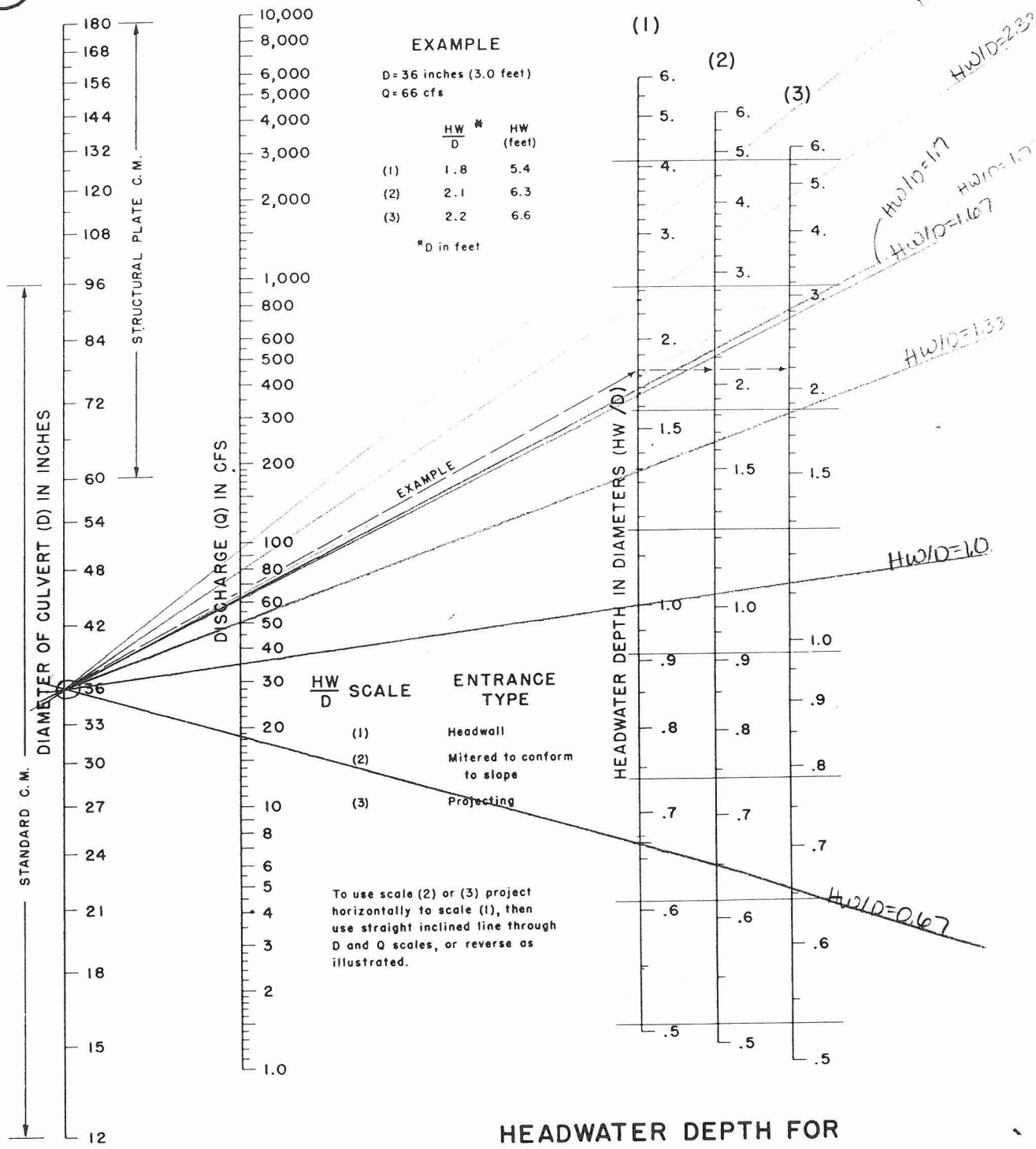
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #62 (1-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET _____ OF _____

BY _____ DATE _____

CHECK _____ DATE _____

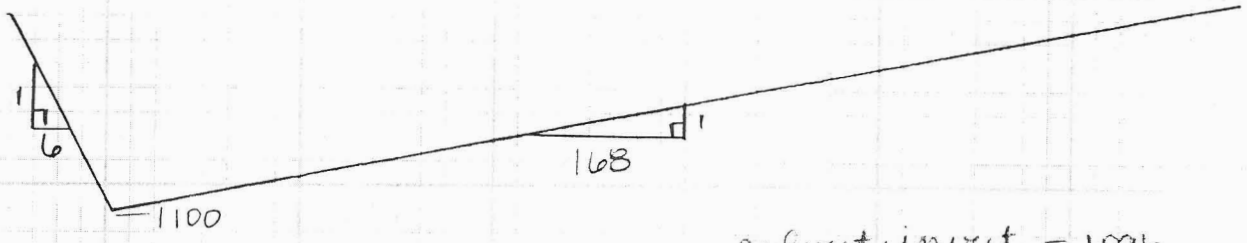
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1100)

culvert #62 (1-36" CMP)

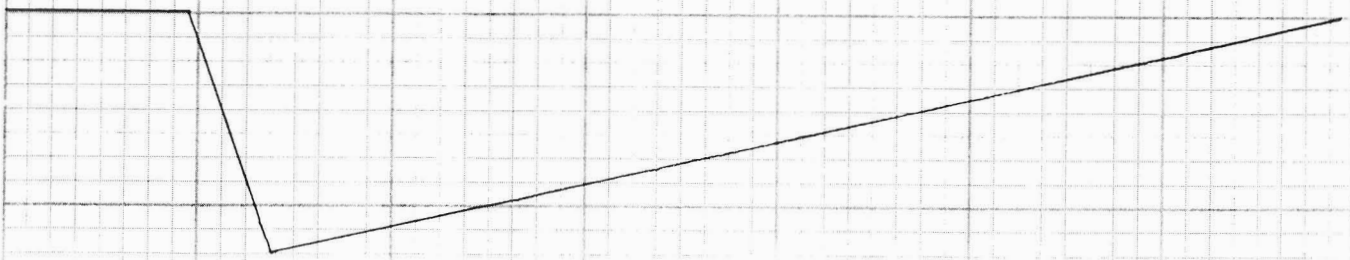


culvert invert = 1096

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

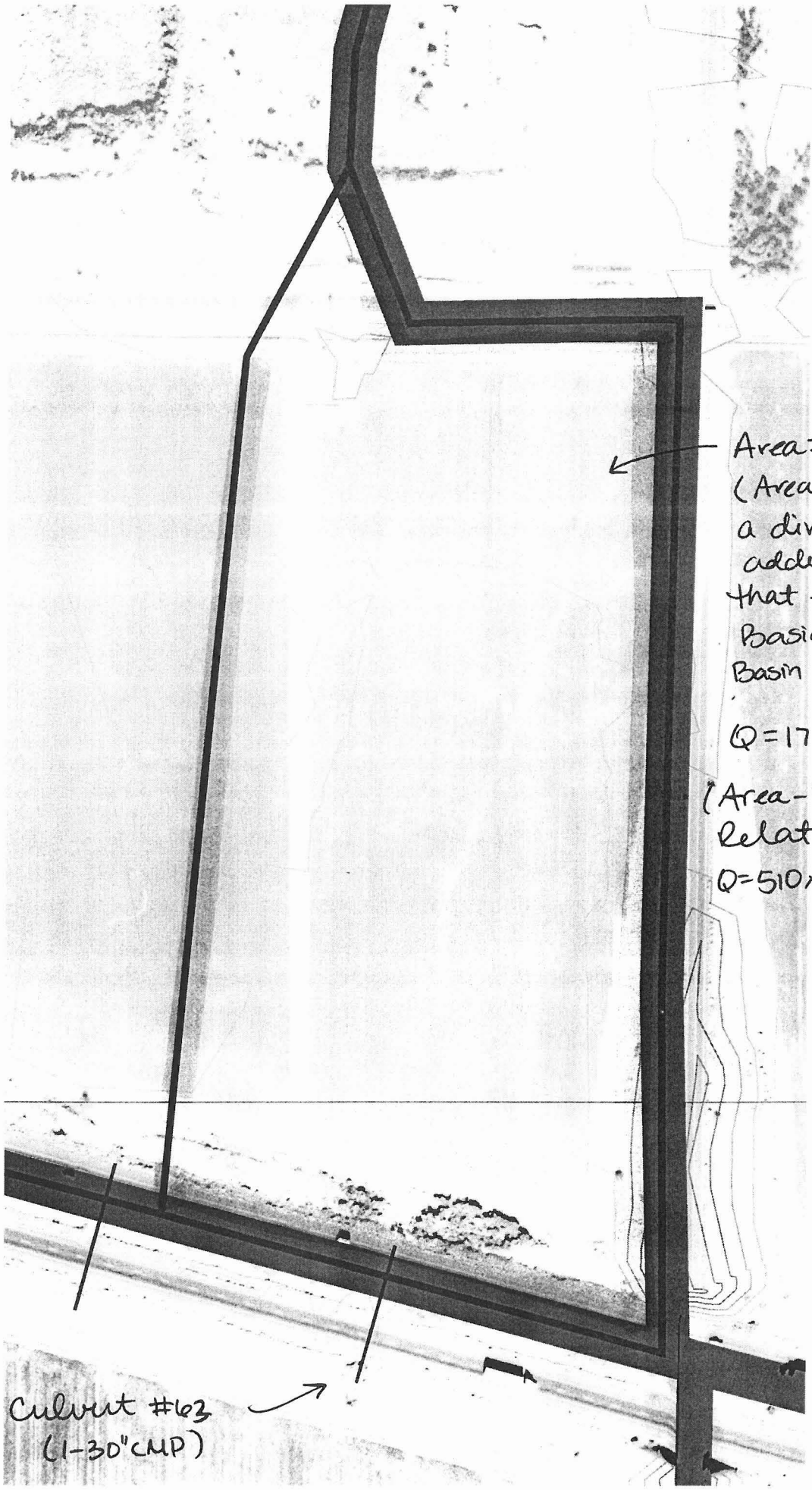
Weir Analysis (at EL >)

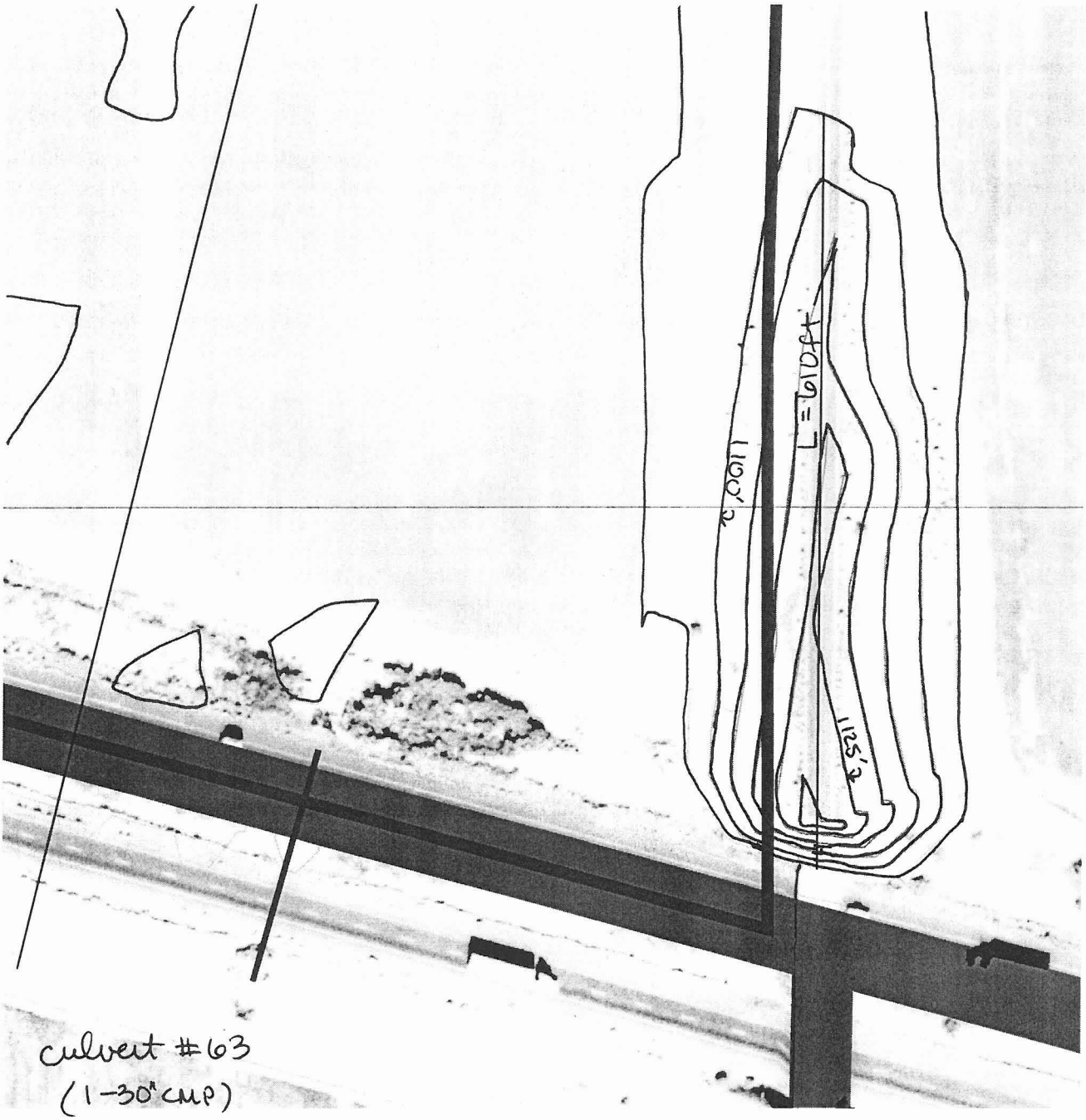


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(2/3\,\bar{H})}{L+\ell}\right)$$


Area=219 acres
(Area is large bec
a diversion is
added to this
that flows into
Basin C81 from
Basin C106)
Q=174 cfs
(Area-Flow
Relationship
Q=510x Area(S. mi
Culvert #163
(1-30" CMP)


L = 610 ft
1100'±
1125'±
culvert #63
(1-30" CMP)

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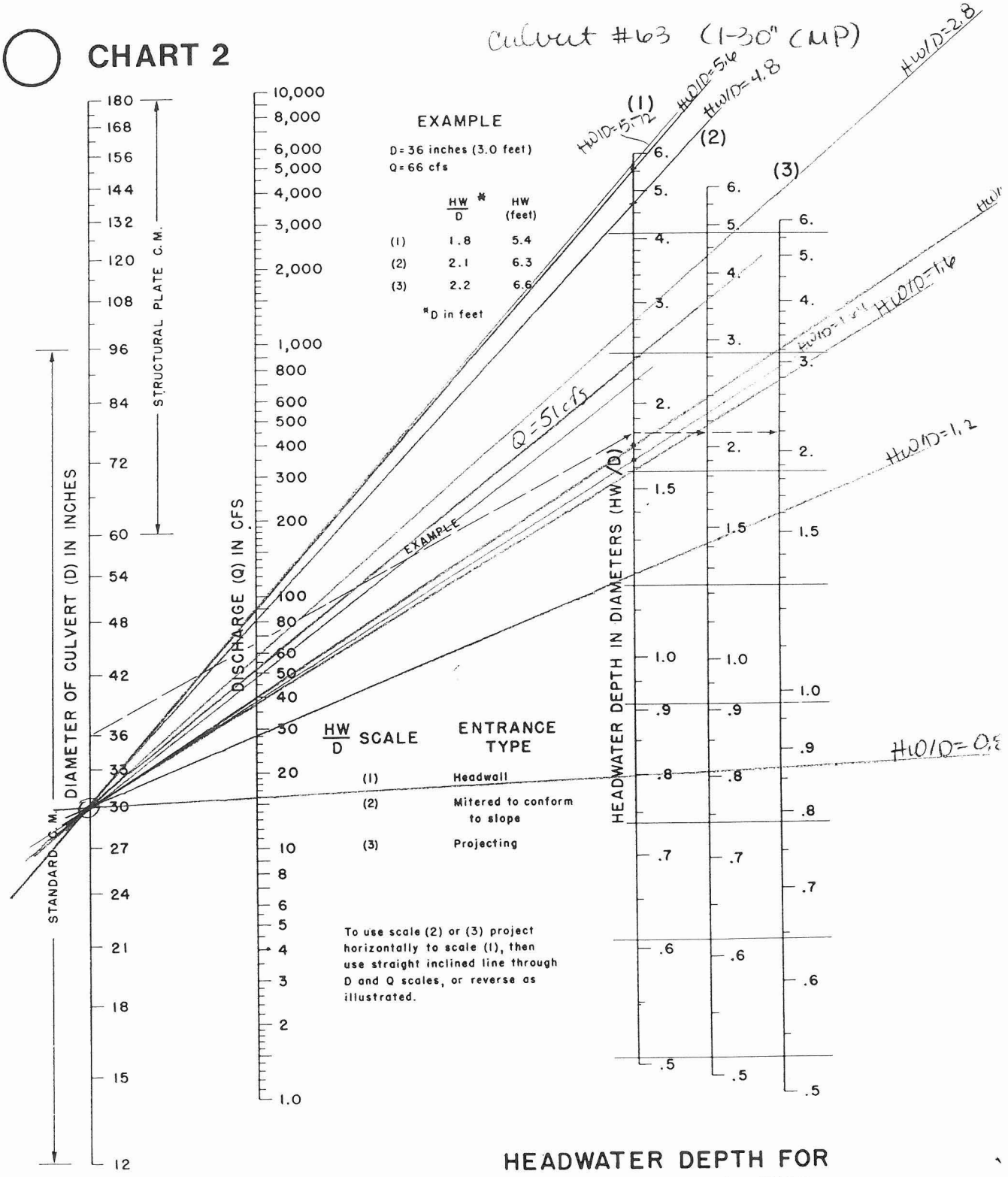
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #63 (1-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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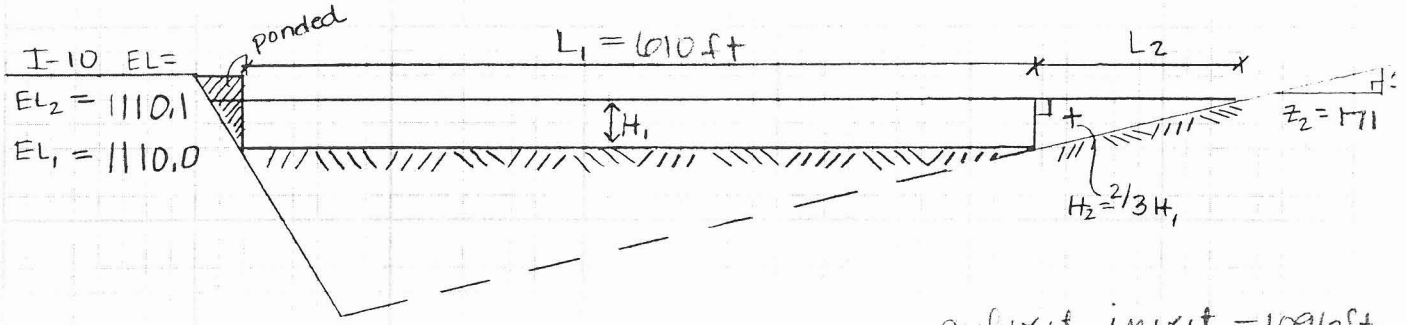
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1110)

Culvert #63 (1-30" CMP



culvert invert = 1096 ft

$H_1 = E_2 - E_1 = 1110.1 - 1110 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(171) = 17.1$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(610)(0.10) + (17.1)(0.0667)}{610 + 17.1} = 0.09$ ft

$L_T = L_1 + L_2 = 610 + 17.1 = 627.1$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

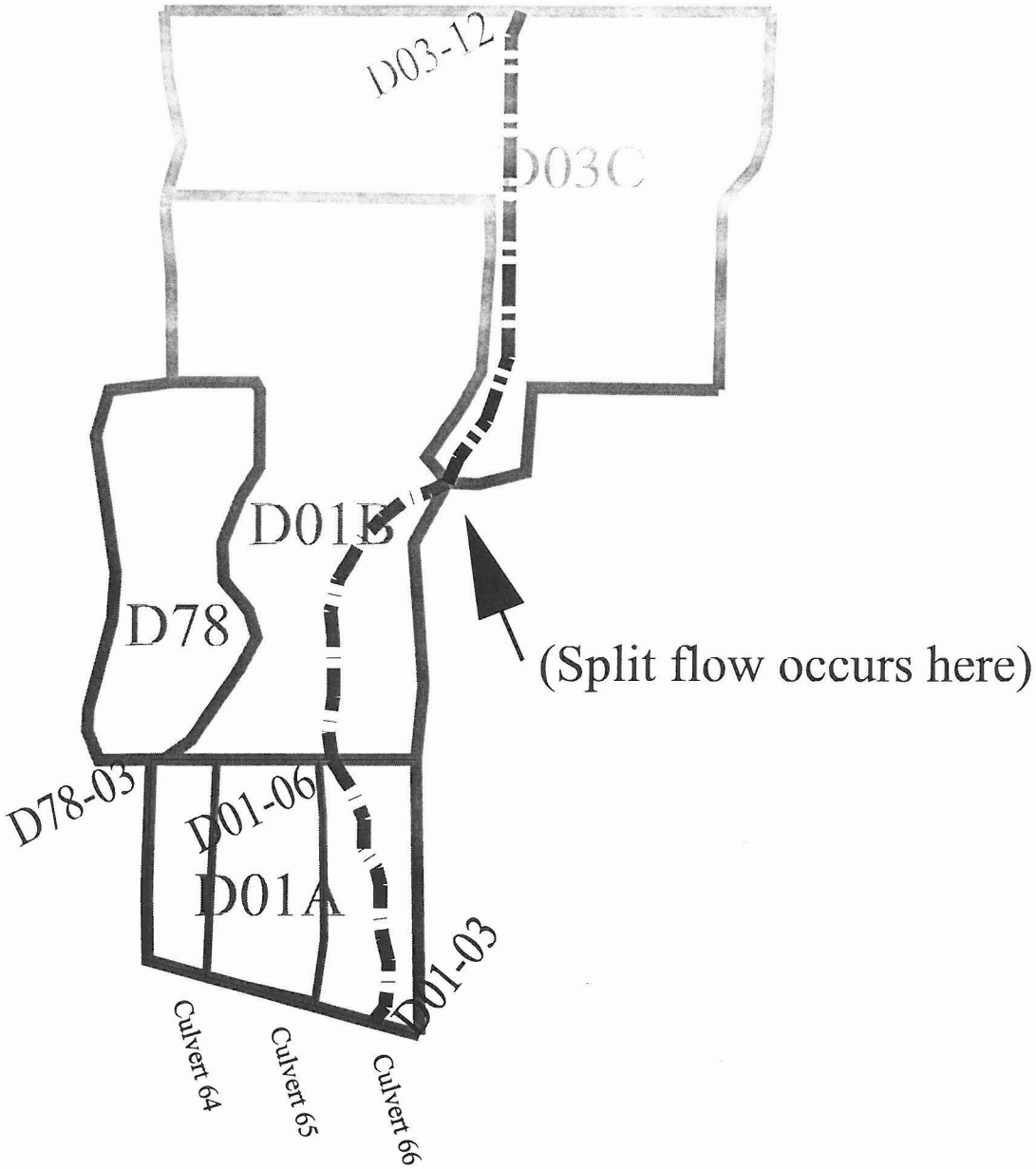
$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (627.1)(0.099)^{1.5} = 52.82$ cfs

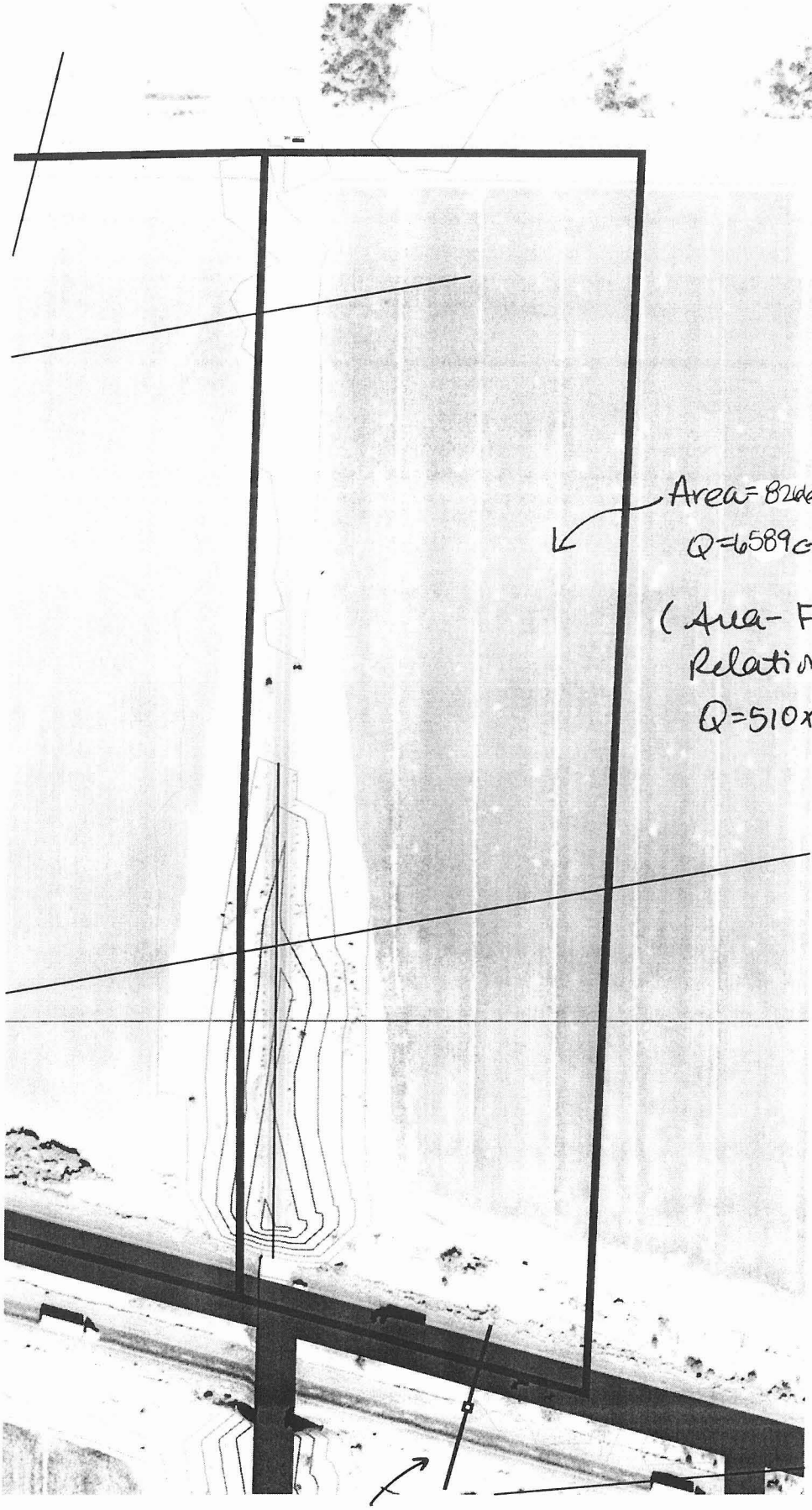
$\simeq 53$ cfs

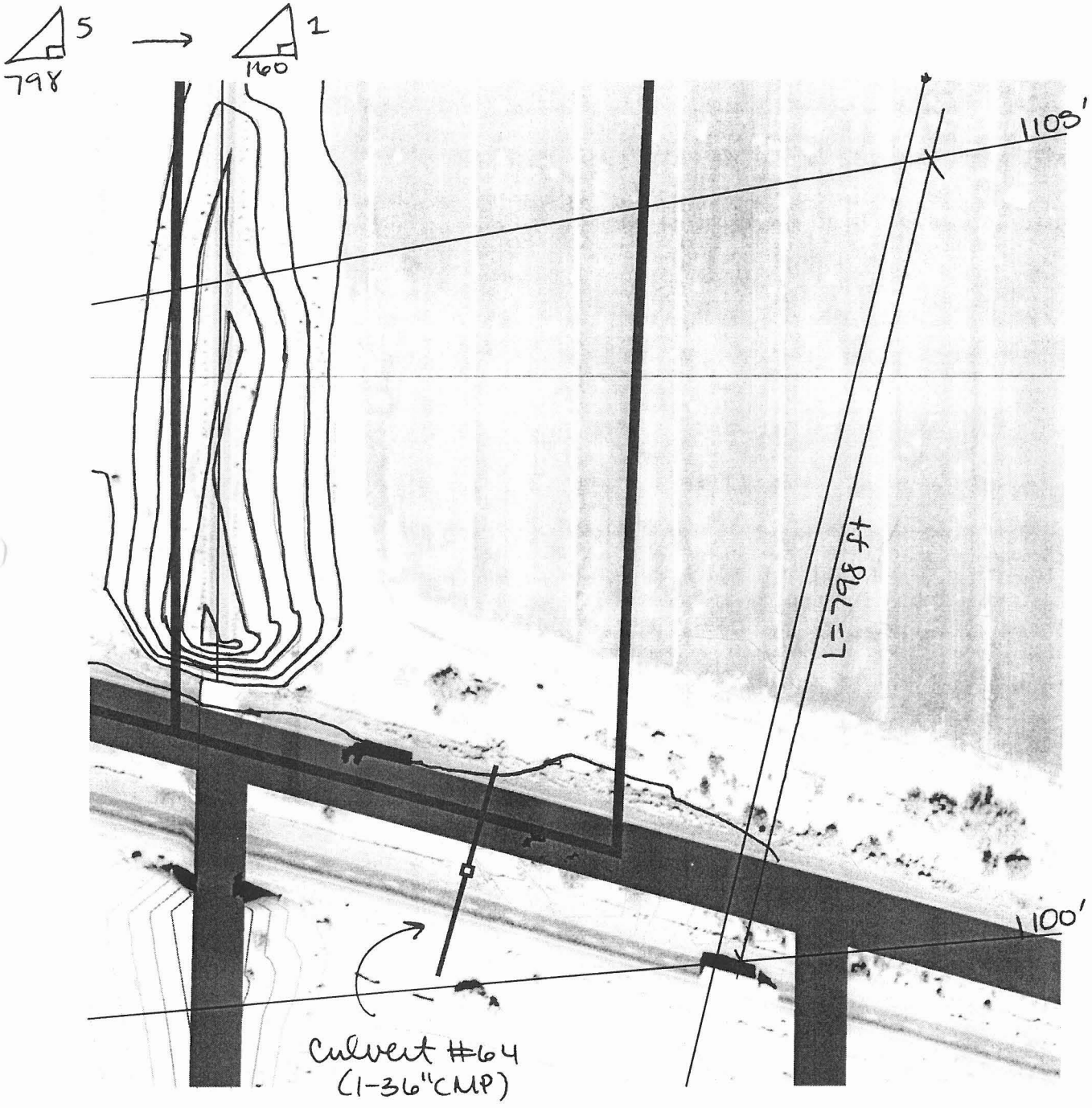
vert ID	Culvert Type	Elevation (ft)	HW (ft)	48" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
60 and 61	1-48" CMP	1098						
	1-36" CMP	1103	5	1.25	95	1.666666667	61	156
		1105	7	1.75	130	2.333333333	80	210

Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
62 and 63	1-36" CMP	1096						
	1-30" CMP	1103	7	2.33	80	2.8	58	138
		1105	9	3.00	95	3.6	66	161

Total Associated Area to
D01-03=12.92 s.mi.=8266 acres
(This value is also shown on the Flow Calculation Spreadsheet)




Area=820 acres
Q=6589 cfs
(Area-Flow Relationship
Q=510 x Area (s.mi))
Culvert #64
(1-36" CMP)


5
798
1
160
1105'
L=798 ft
1100'
Culvert #64
(1-36"CMP)

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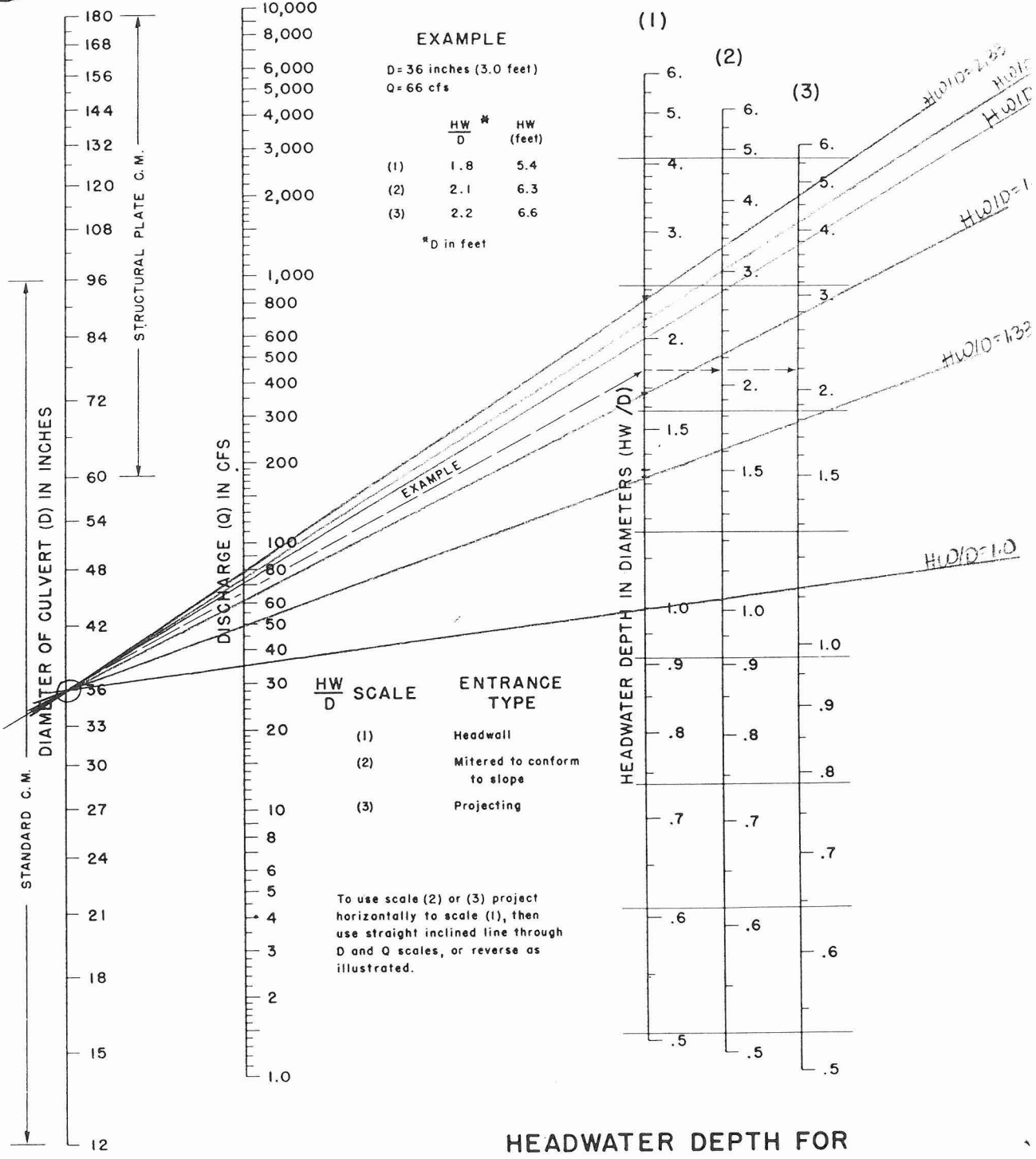
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert # 64 (1-36"CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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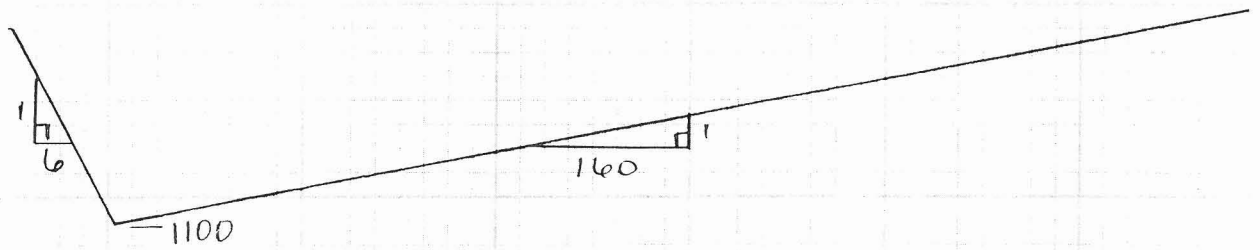
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #64
(1-36"CMP)

Manning's Equ. (at EL >1100)

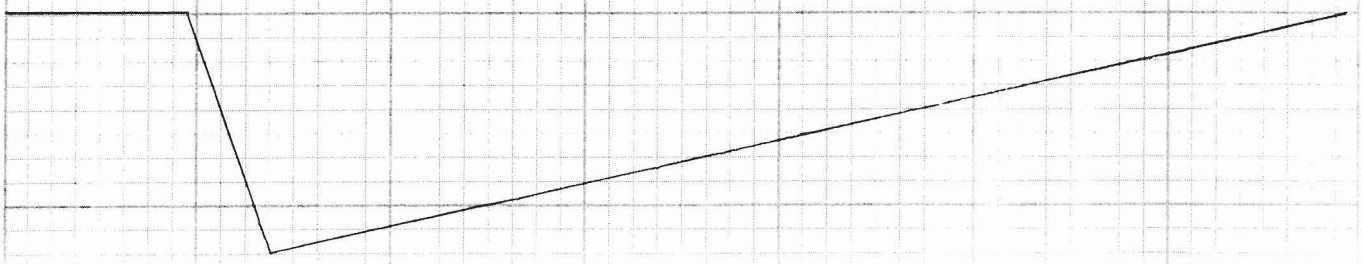


$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

culvert invert = 1095

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

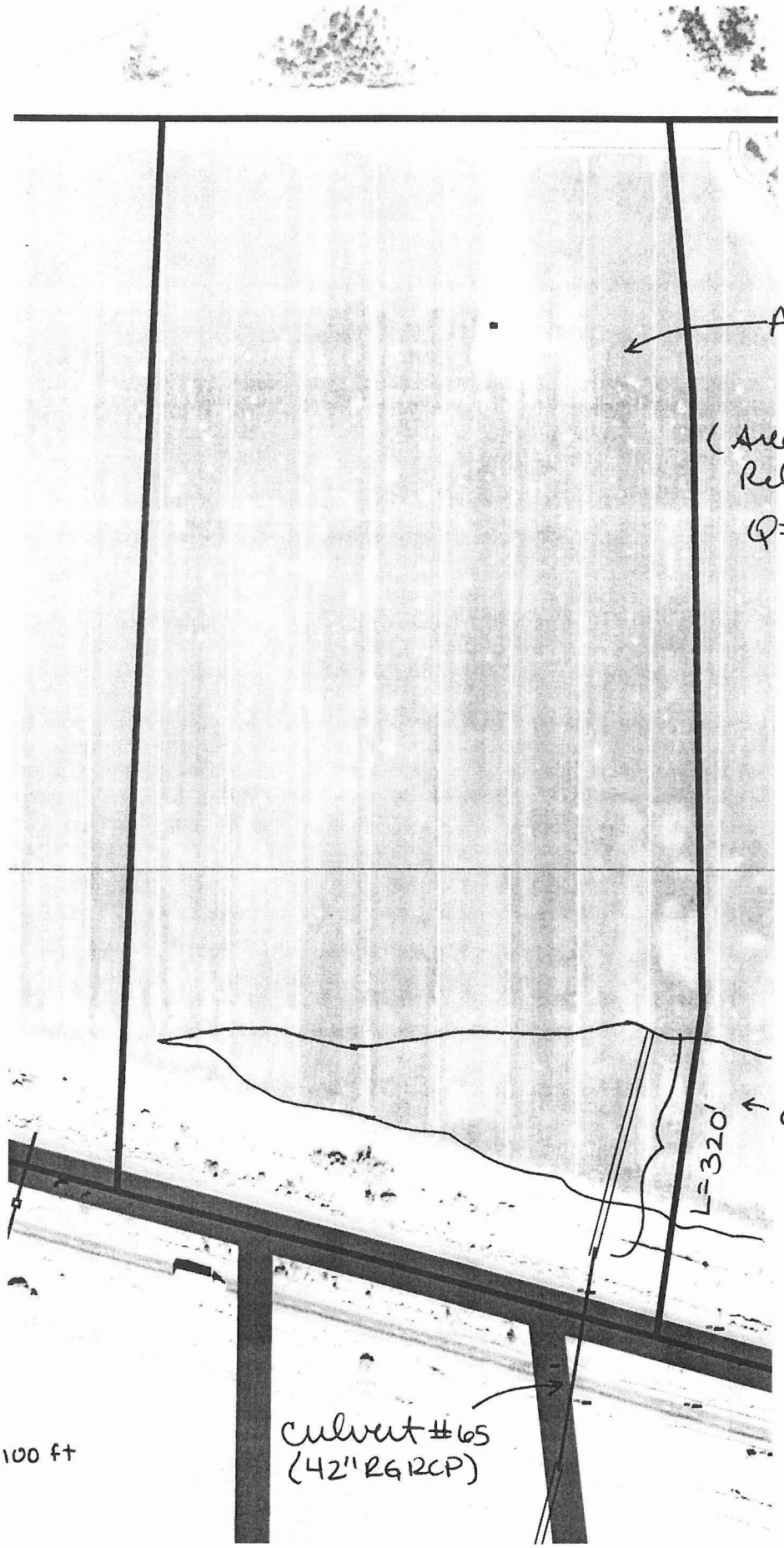
Weir Analysis (at EL>)



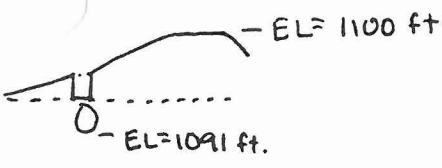
$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$



Side view



* weir flow analysis is used and irrigation ditch is ignored (assuming no flow in ditch)

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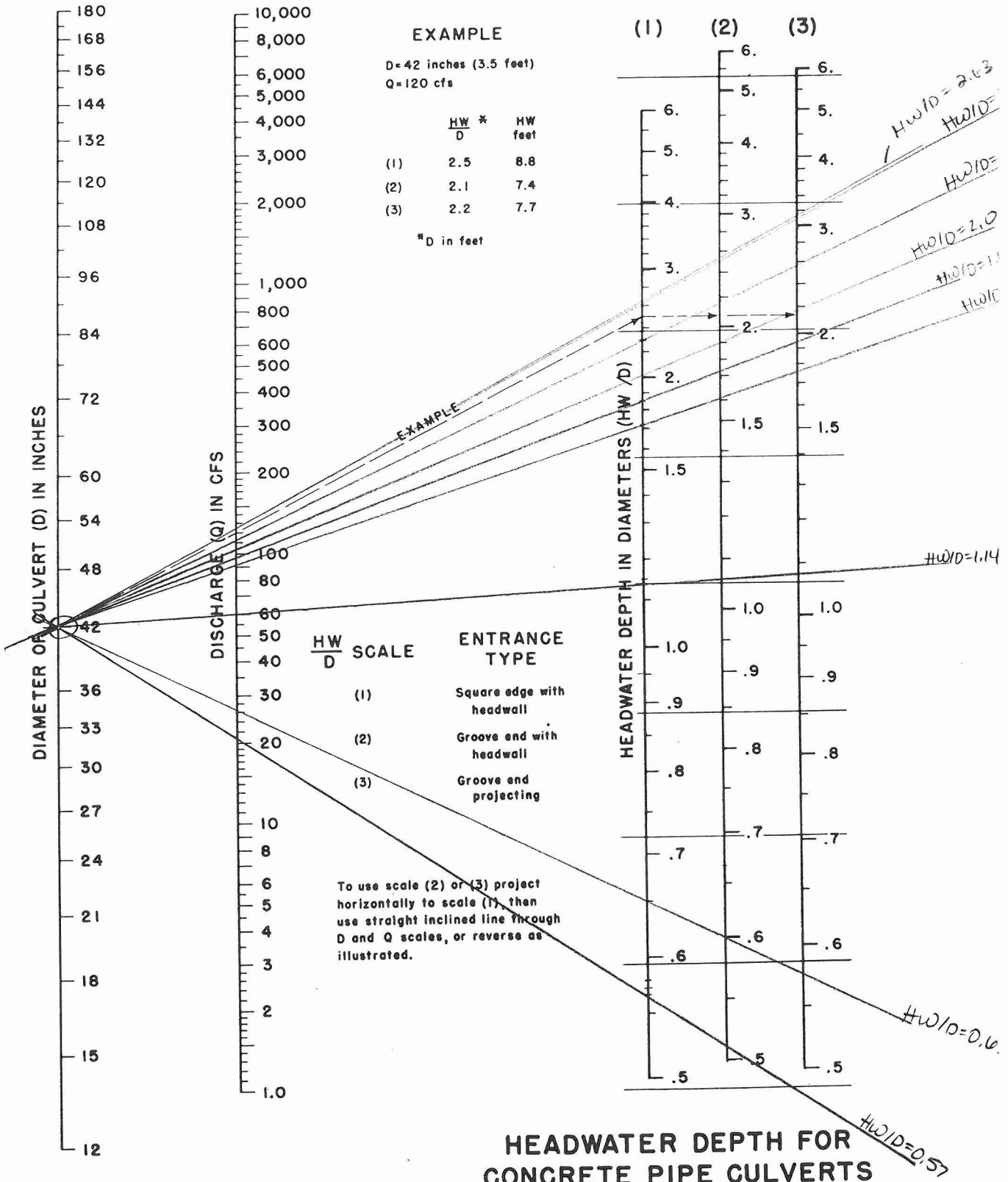
CLIENT FCDMC

JOB NAME Palo Verde Area A Delineation culvert #65 (42" RCP)

JOB NO. 310.019

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

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BY _____ DATE _____

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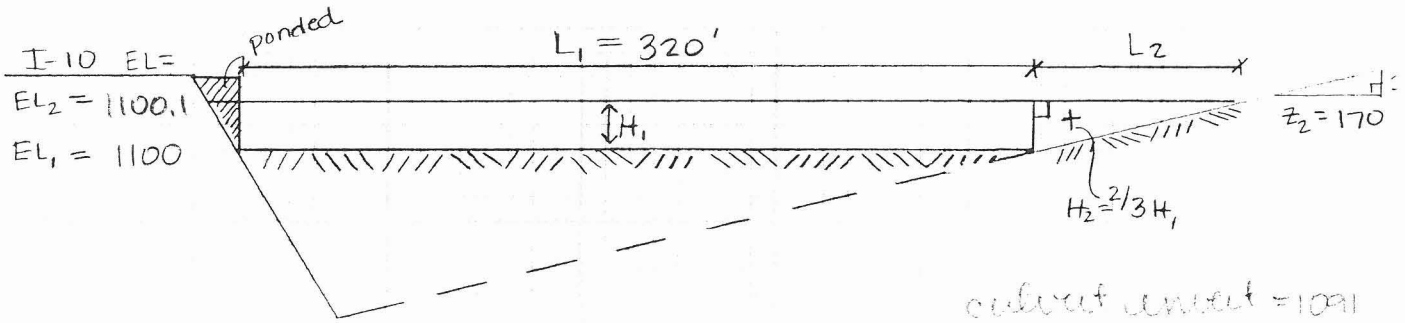
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1100)

culvert #65
(42" RCP)



$H_1 = E_2 - E_1 = 1100.1 - 1100 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(170) = 17.0$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(320)(0.10) + (17)(0.0667)}{320 + 17} = 0.098$

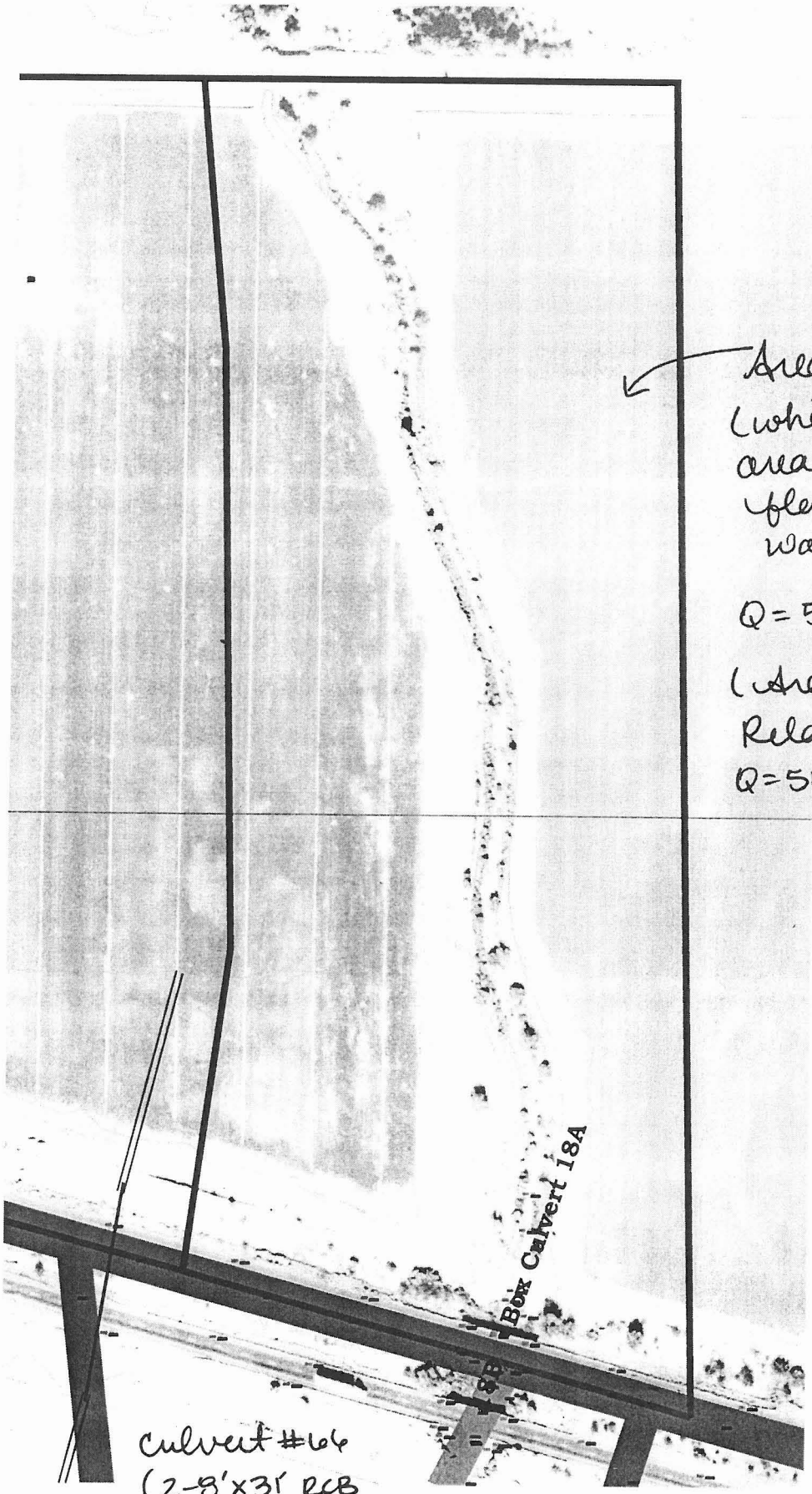
$L_T = L_1 + L_2 = 320 + 17 = 337$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(337)(0.098)^{1.5} = 28.05$ cfs

≈ 28 cfs

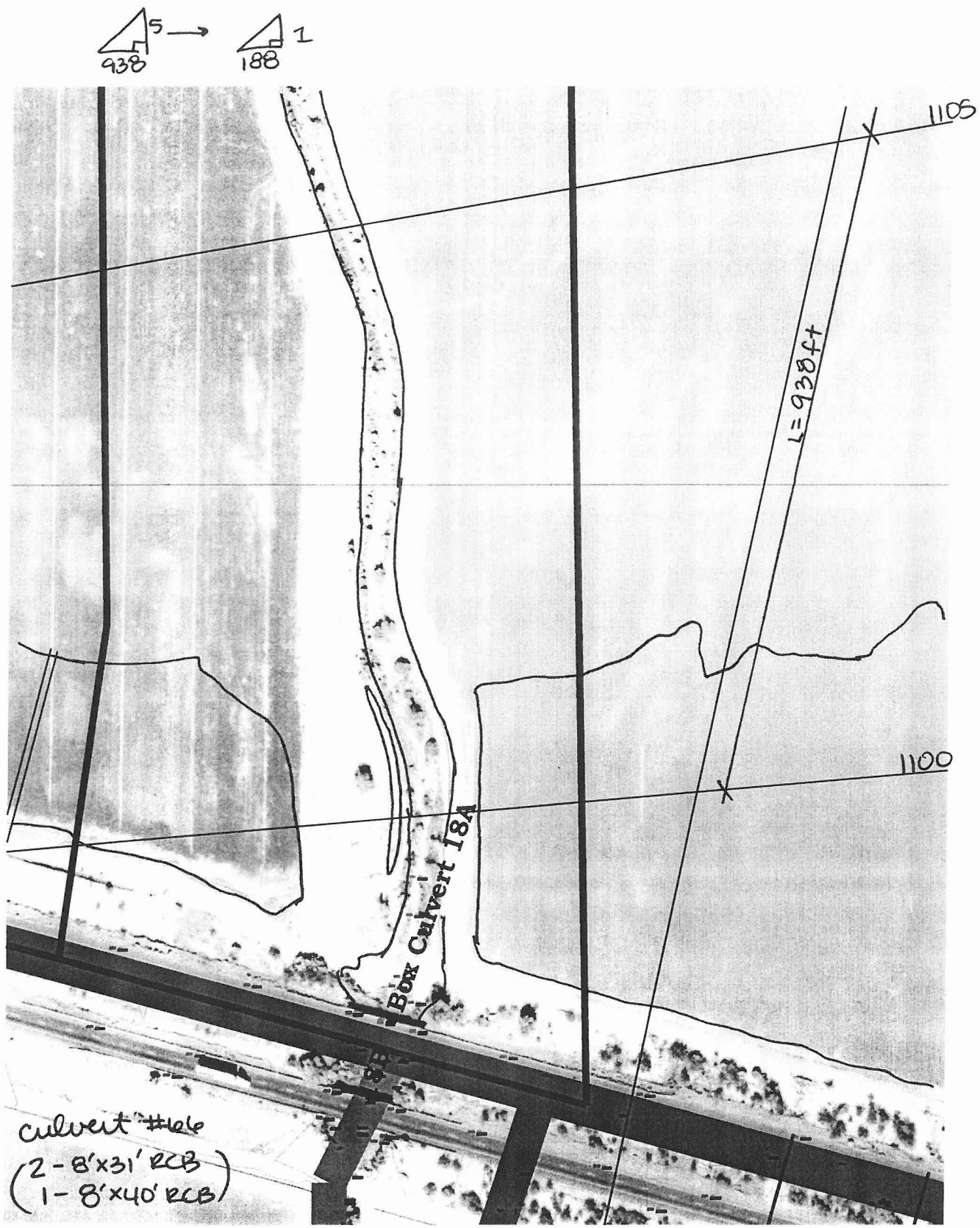


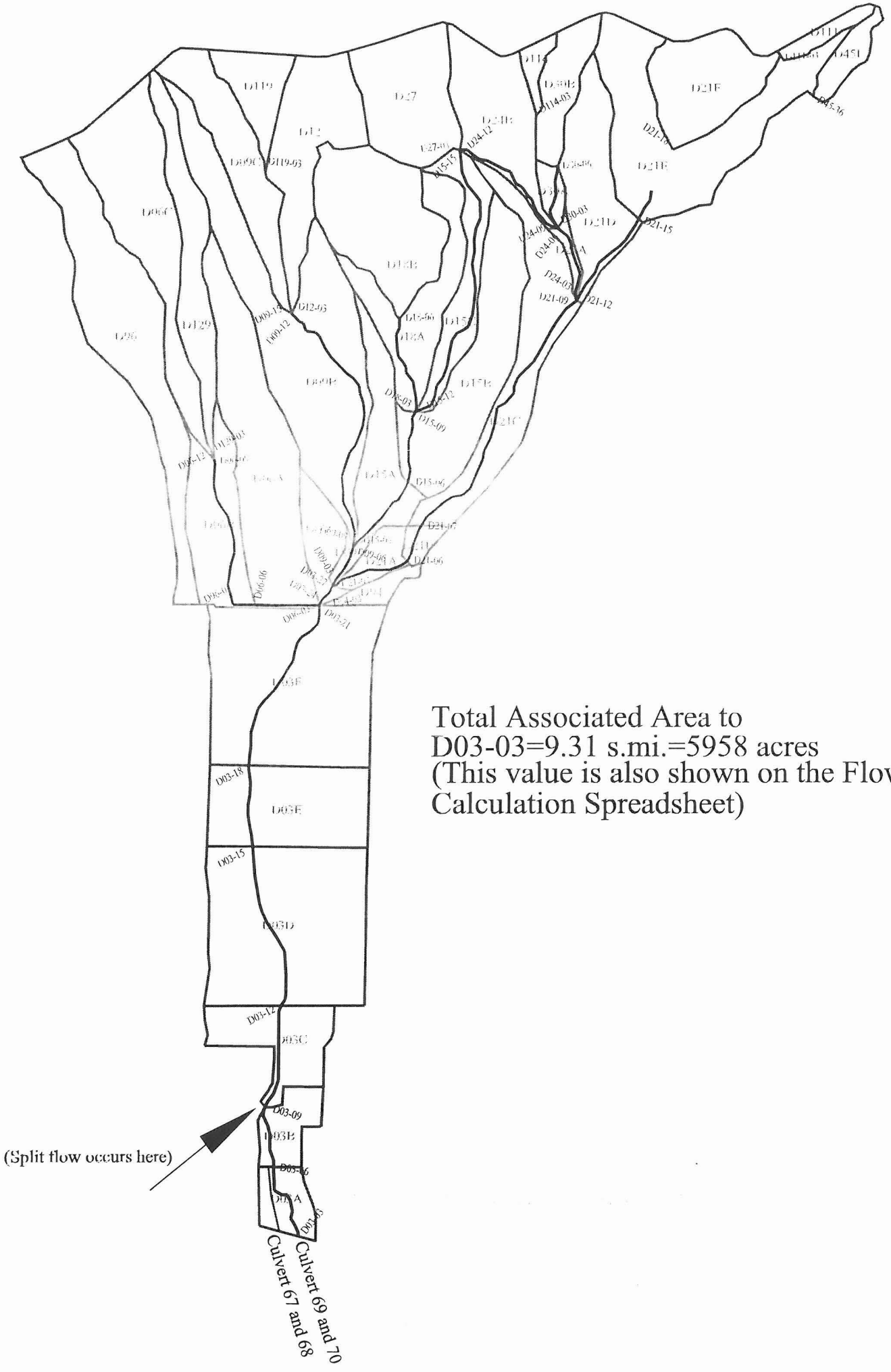
Area = 7130 acres
(which includes areas a diversions flowing into this wash/basin)

Q = 5682 cfs

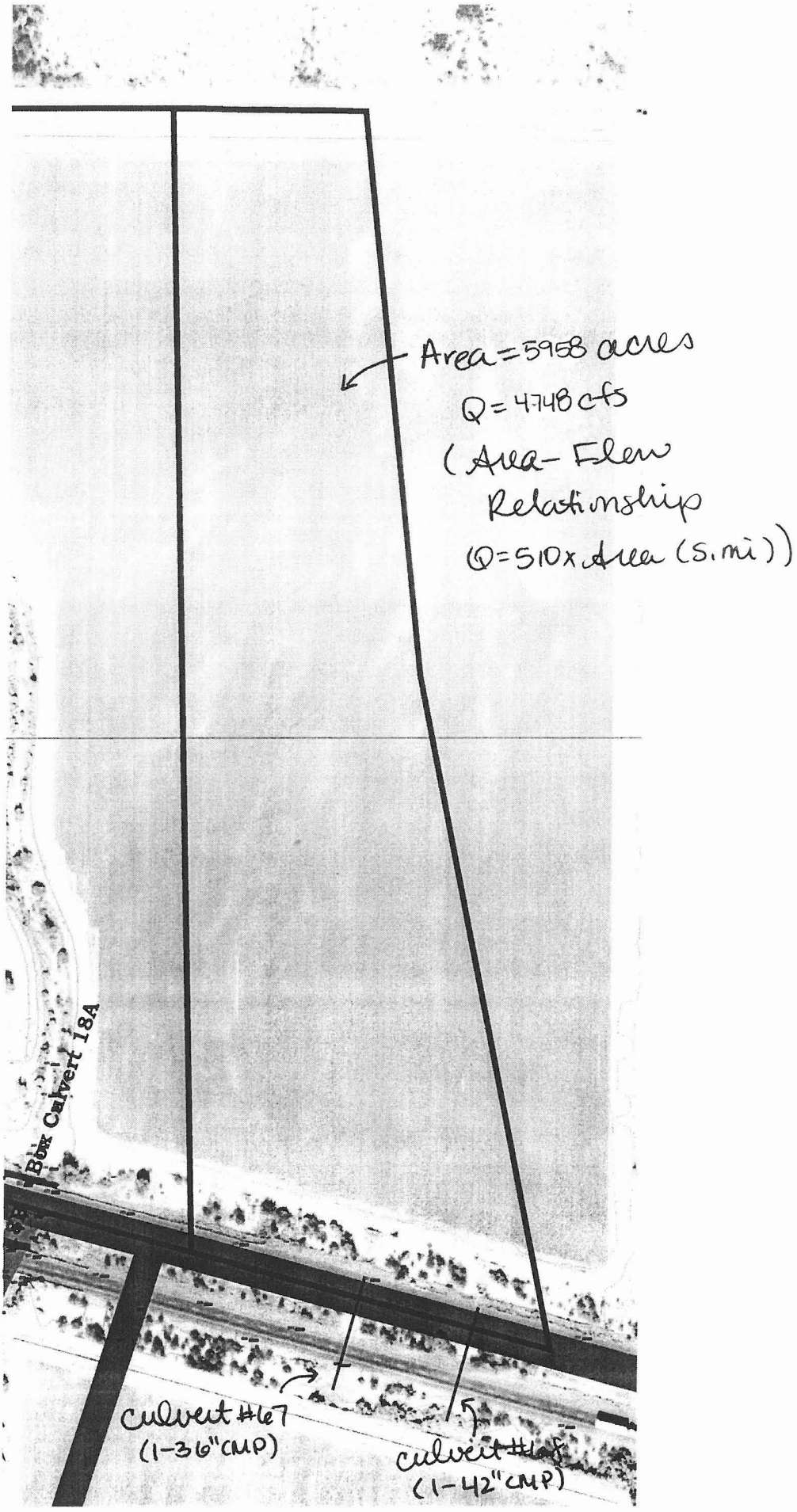
(Area-Flow Relationship
Q = 510 x Area (sq mi))

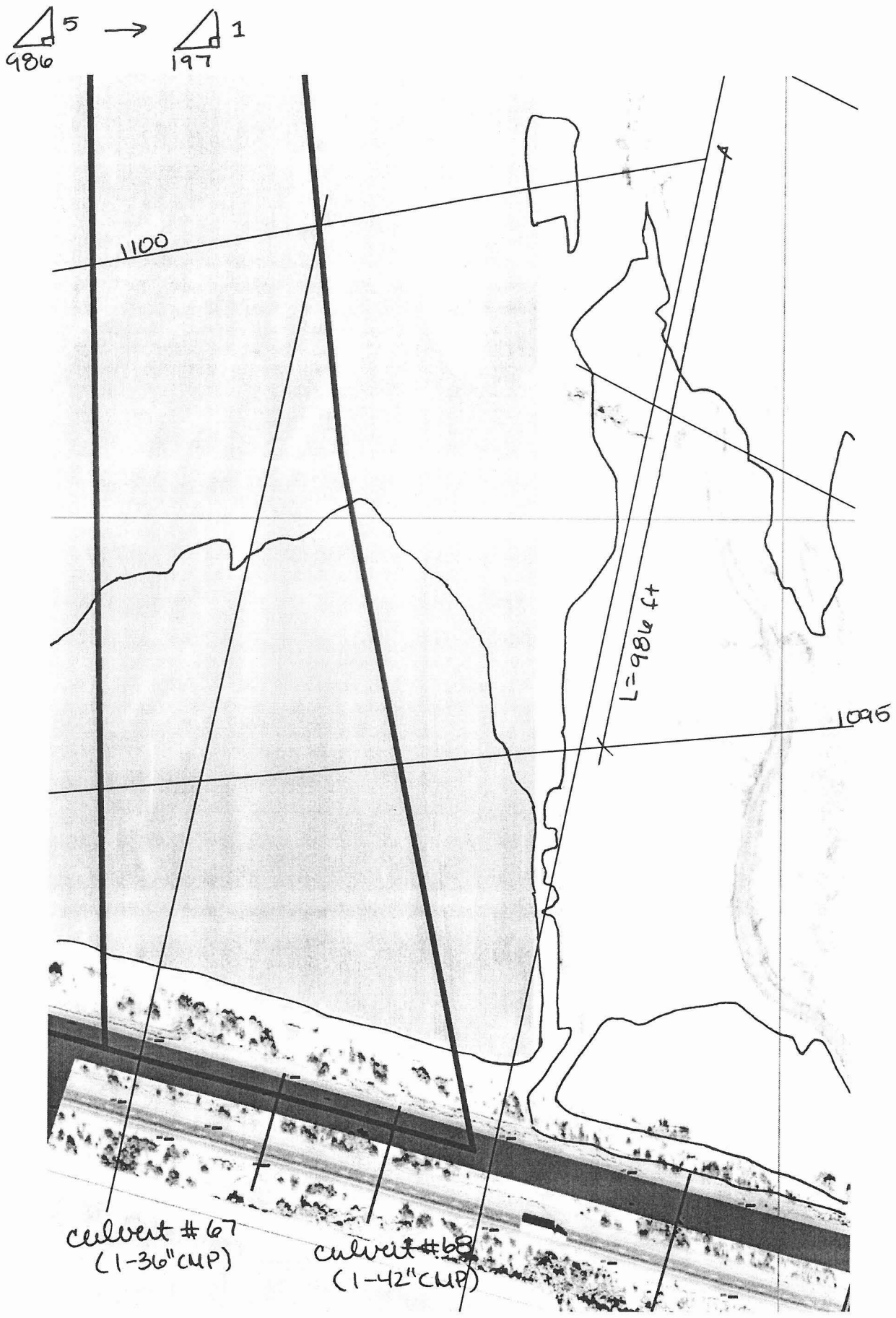
Culvert #64
(2-8'x3' RCB
and 1-8'x4' RCB)


5
938
1
188
1105
L=938ft
1100
Box Culvert 184
culvert #166
(2-8'x31' RCB
1-8'x40' RCB)



Total Associated Area to
D03-03=9.31 s.mi.=5958 acres
(This value is also shown on the Flow Calculation Spreadsheet)


Area = 5958 acres
Q = 4748 cfs
(Area-Flow
Relationship
Q = 510 x Area (S. mi))
Box Culvert 184
Culvert #167
(1-36" CMP)
Culvert #168
(1-42" CMP)


5
986
1
197
1100
1095
L=984 ft
culvert #67
(1-36" CMP)
culvert #68
(1-42" CMP)

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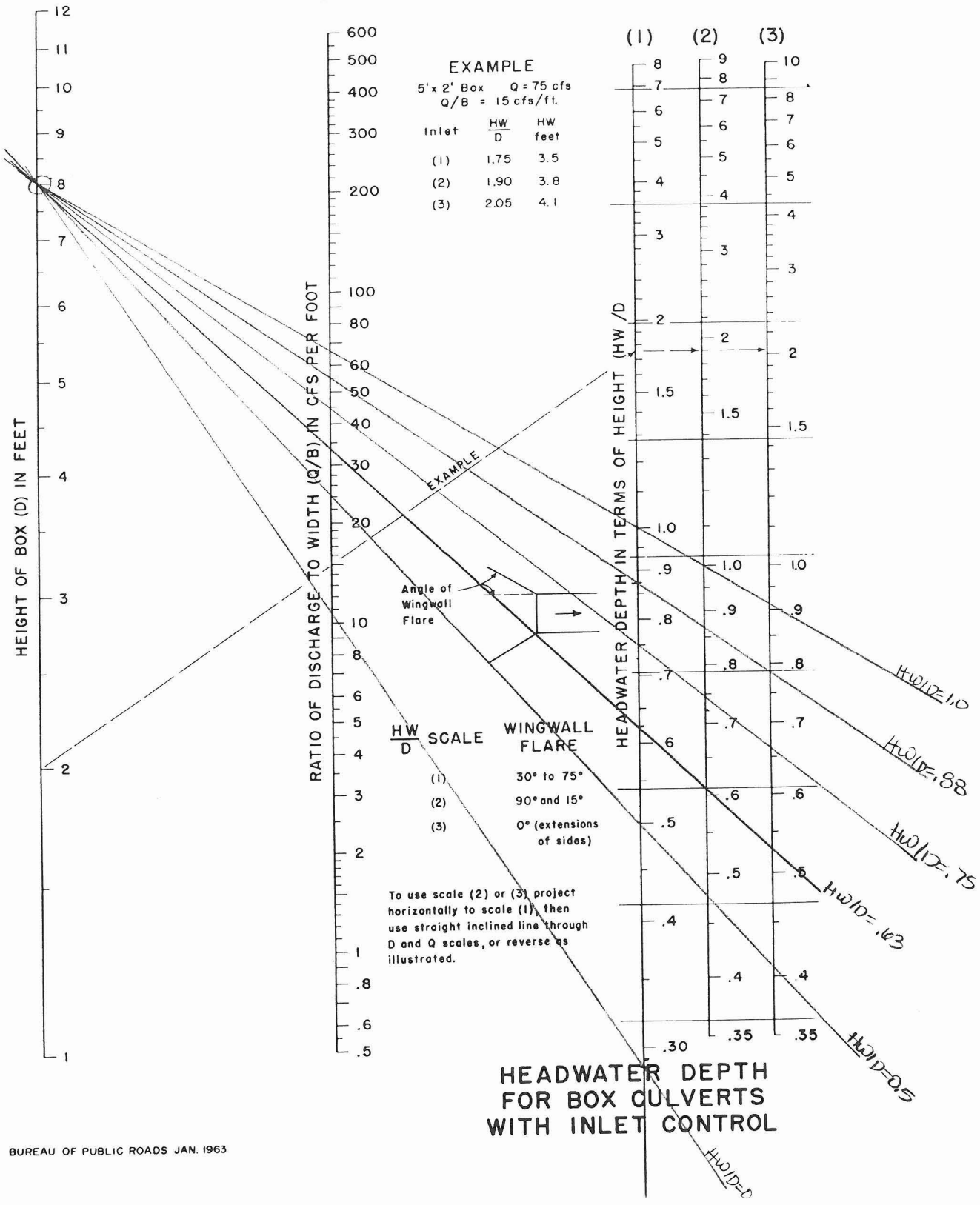
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #66
(2-8'x3' RCB
1-8'x4.0' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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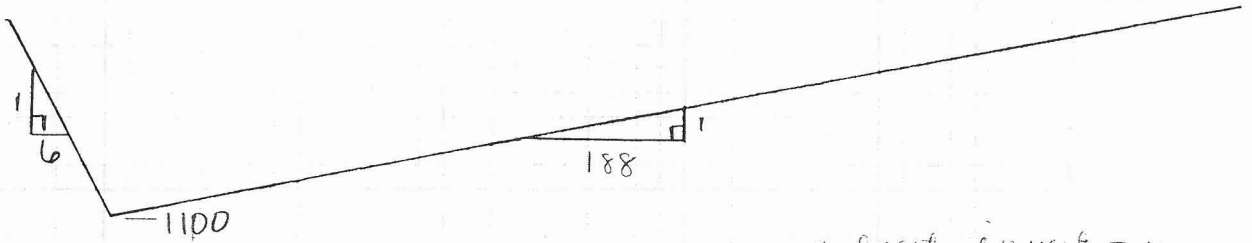
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1100)

culvert #166
(2-8'x3' RCB
1-8'x4' RCB)

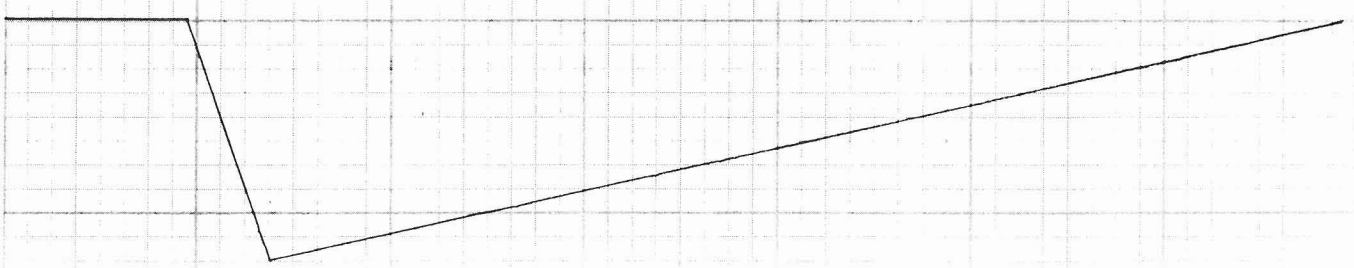


culvert invert = 1091

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(\frac{2}{3}\bar{H})}{L+\ell}\right)$$

ert ID	Culvert Type	Elevation (ft)	HW (ft)	36" CMP Chart 2 HW/D	Q-culvert (cfs)	42" CMP Chart 2 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
67 and 68	1-36" CMP	1092						
	1-42" CMP	1094	2	0.67	18.5	0.57	20.5	39
		1094.5	2.5	0.83	26	0.71	30	56
		1095	3	1.00	35	0.86	40	75
Top EL of Weir (East of Culvert 71)		1096.8	4.8	1.60	59	1.37	74	133
(Starting at this EL 1097		1097	5	1.67	60	1.43	79	139
look at Culverts 78 to 71)		1098	6	2.00	70	1.71	91	161
		1099	7	2.33	80	2.00	103	183

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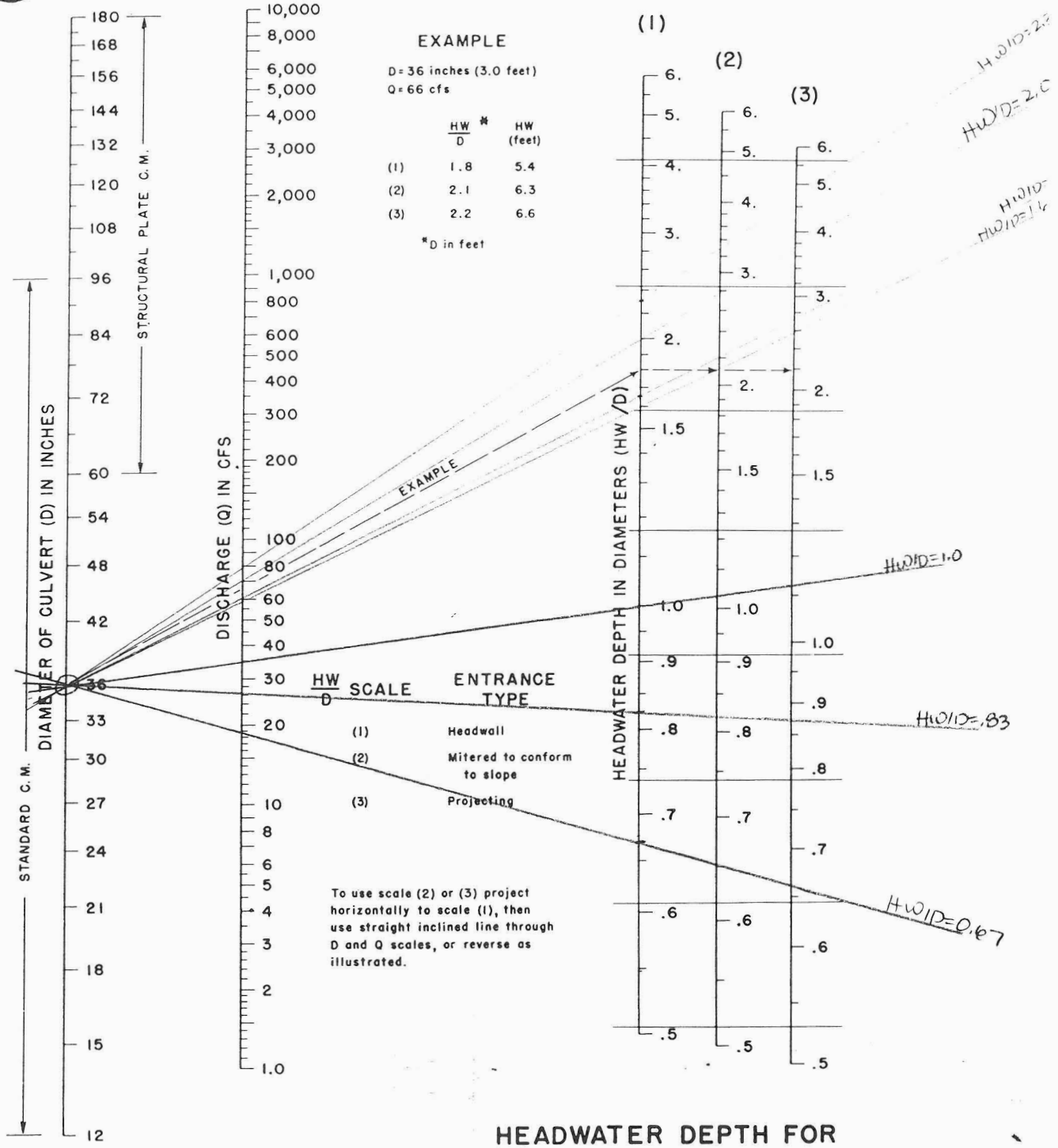
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #67 (1-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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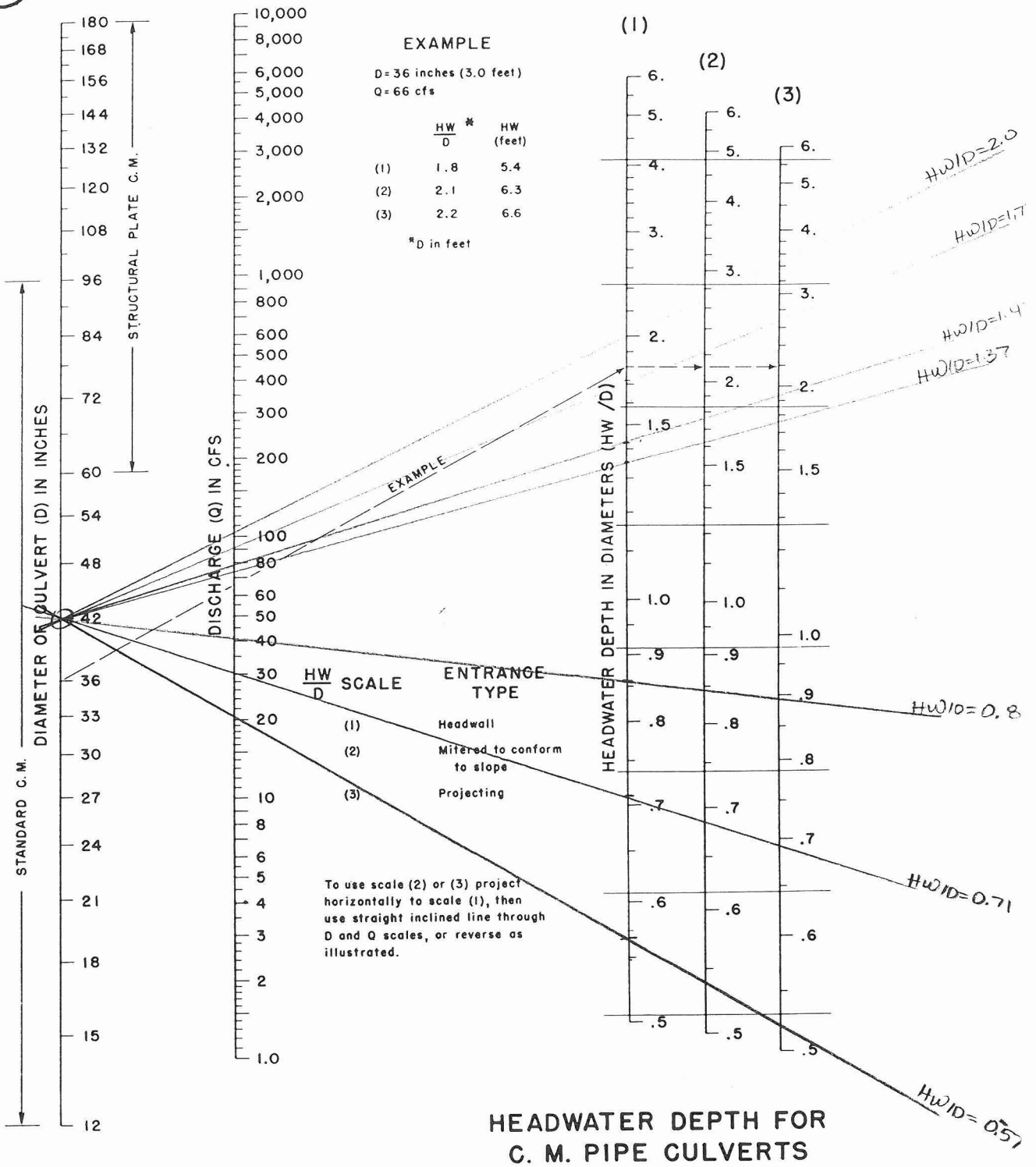
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #68 (1-42" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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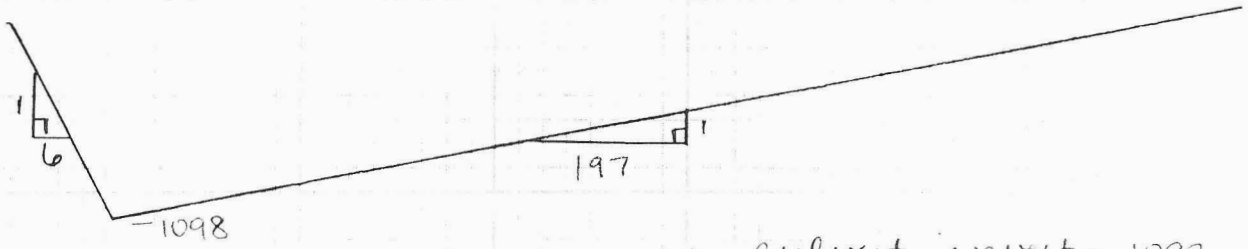
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1098)

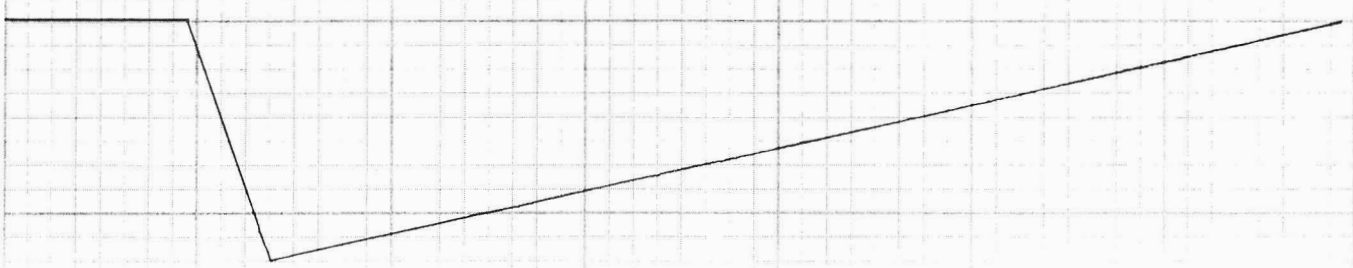


culvert invert = 1092

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

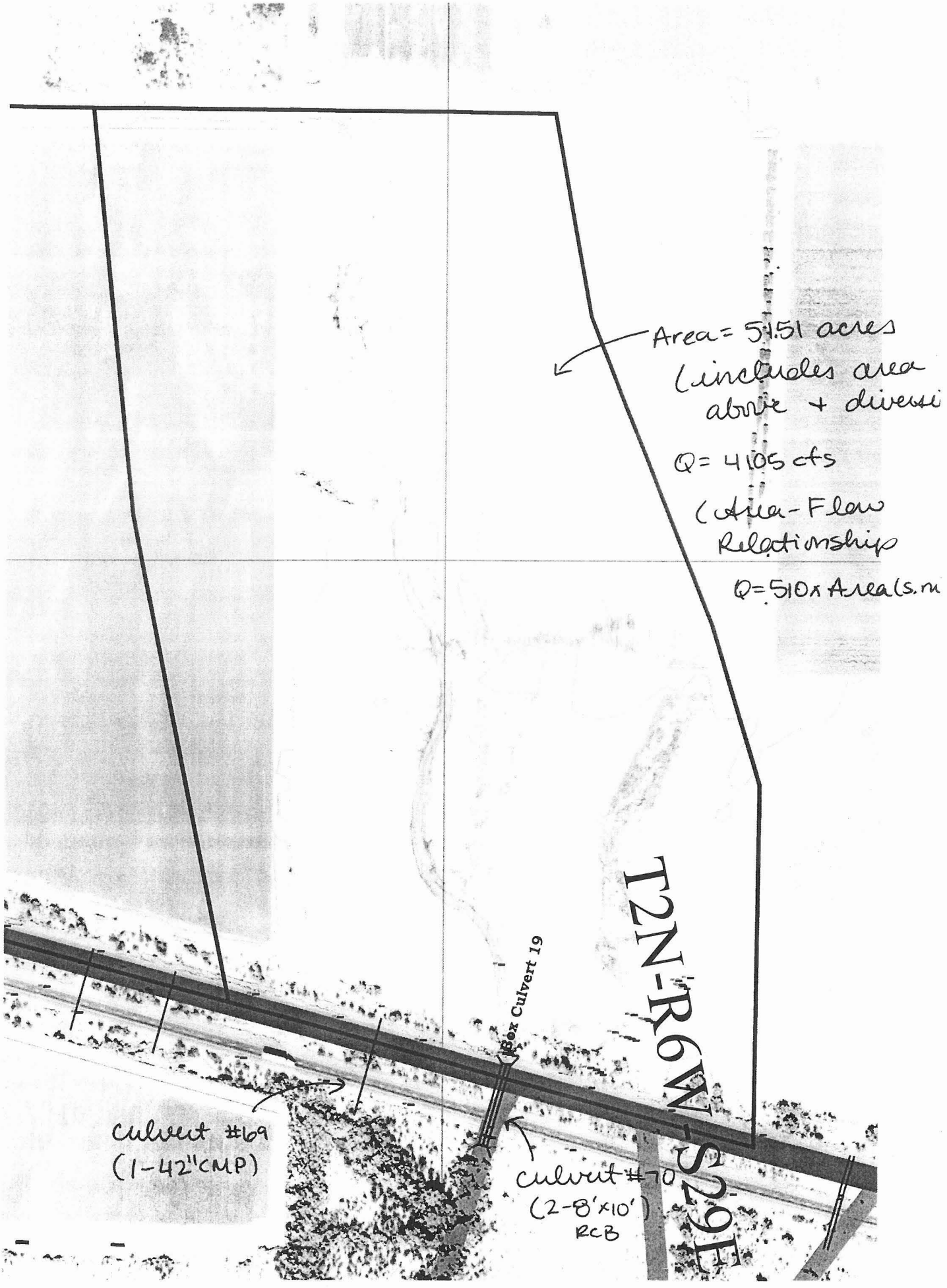
Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/ dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l(2/3\,\bar{H})}{L + l}\right)$$


Area = 511.51 acres
(includes area above + diversi
Q = 4105 cfs
(Area-Flow Relationship
Q = 510 x Area(s.m
T2N-R6W S29E
Box Culvert 19
Culvert #69
(1-42" CMP)
Culvert #70
(2-8'x10' RCB

culvert #69
(1-42" CMP)

culvert #70
(2-8'x10' RCB)

Culvert ID	Culvert Type			42" CMP		8' x 10' RCB	Q/B		Total
			HW	Chart 2 or 8	Q-culvert	Chart 2 or 8	Chart 8	Q-culvert	Q-culvert
		Elevation (ft)	(ft)	HW/D	(cfs)	HW/D	(cfs/ft)	(cfs)	(cfs)
69 and	1-42" CMP	1086							
70 (19)	2-8' x 10' RCB	1089	3	0.86	41	0.38	15.00	300	34
		1090	4	1.14	60	0.50	24.00	480	54(
		1091	5	1.43	79	0.63	34.00	680	75
		1092	6	1.71	90	0.75	44.00	880	97(
		1093	7	2.00	103	0.88	54.00	1080	118
		1094	8	2.29	112	1.00	65.00	1300	141
		1095	9	2.57	123	1.13	75.00	1500	162
		1096	10	2.86	132	1.25	85.00	1700	183
	Top EL of Weir	**1096.8**	**10.8**	**3.09**	**138**	**1.35**	**94.00**	**1880**	201
	(Starting at this EL 1097	1097	11	3.14	140	1.38	95.00	1900	204(
	look at Culvert ID 71)	1098	12	3.43	150	1.50	105.00	2100	225(
		1099	13	3.71	158	1.63	110.00	2200	235
		1100	14	4.00	163	1.75	120.00	2400	256
		1101	15	4.29	170	1.88	125.00	2500	267(

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BY _____ DATE _____

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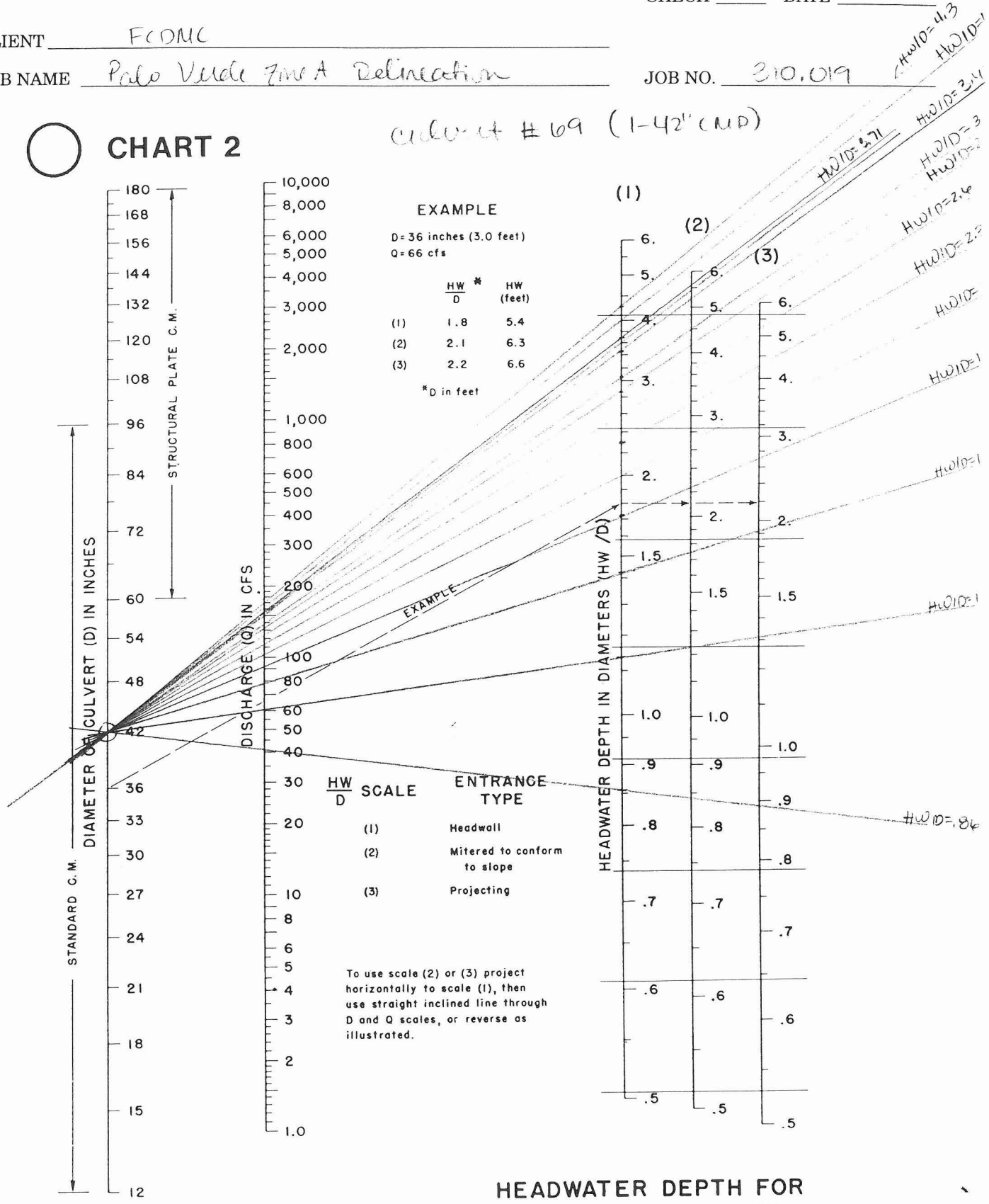
CLIENT FCDMC

JOB NAME Palo Verde 7m A Delineation JOB NO. 310.019

culvert #69 (1-42" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

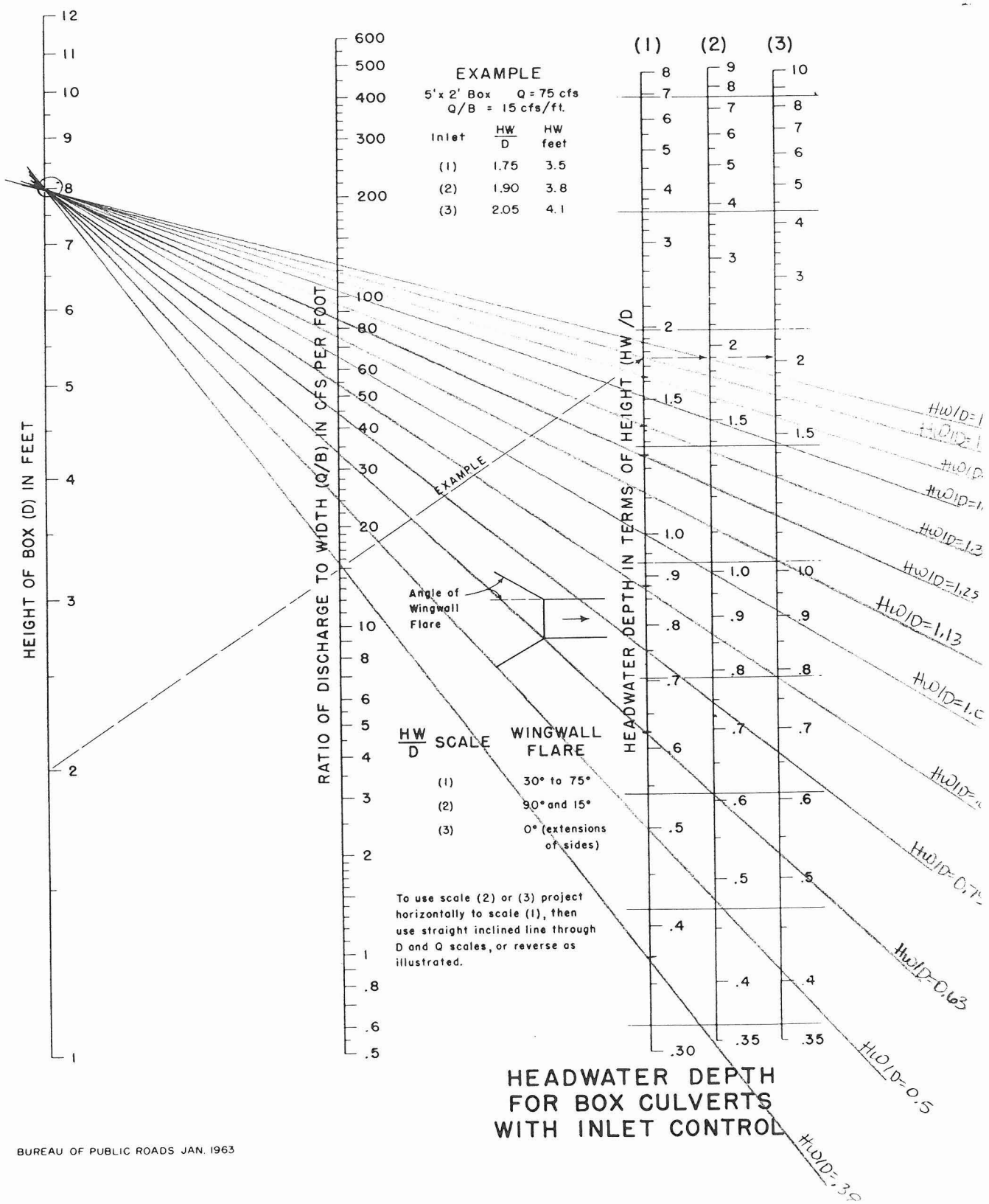
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 3.0.019

Culvert #70(19) (2-8'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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CHECK _____ DATE _____

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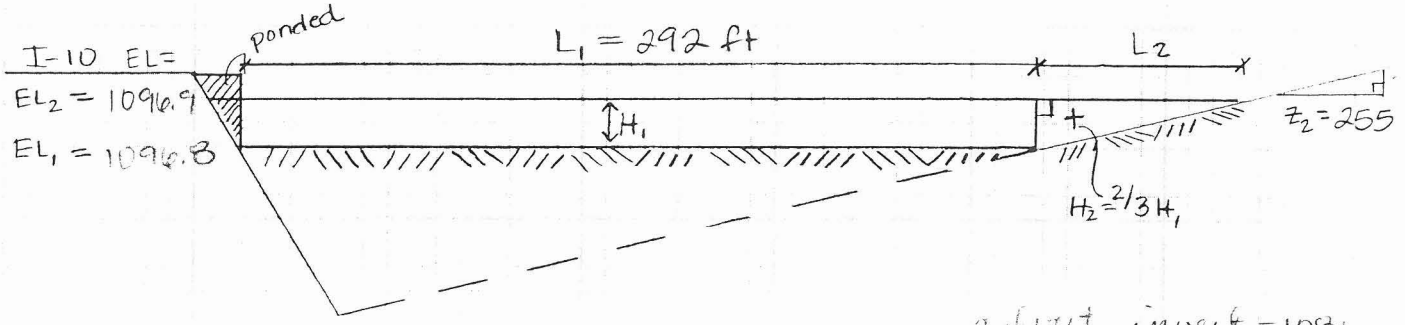
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1096.8)



culvert invert = 1086

$H_1 = E_2 - E_1 = 1096.9 - 1096.8 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(255) = 25.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.067$ ft

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(292)(0.10) + (25.5)(0.067)}{292 + 25.5}$

$= 0.0973$ ft

$L_T = L_1 + L_2 = 292 + 25.5 = 317.5$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \overline{H}^{1.5} = 2.7(317.5)(0.0973)^{1.5} = 26.03$ cfs

$\simeq 26$ cfs

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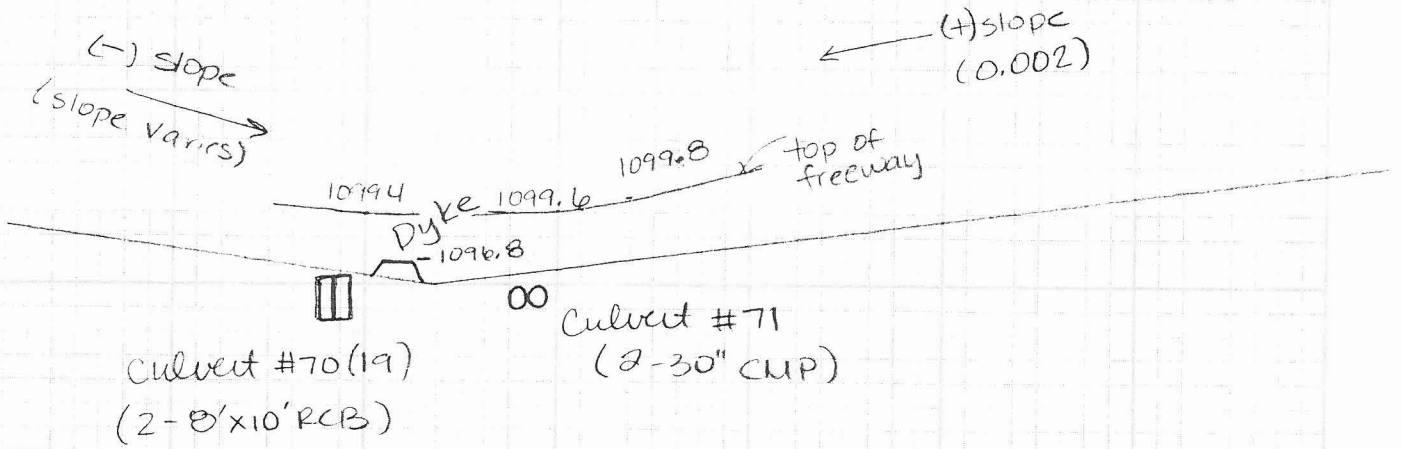
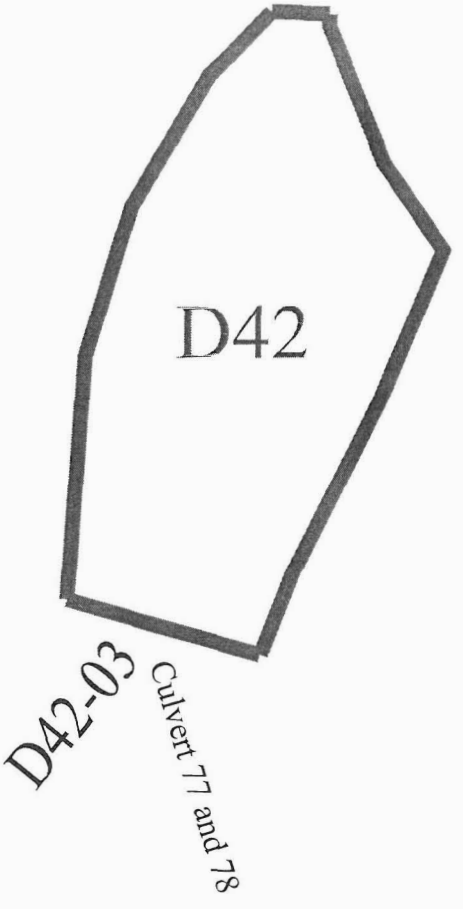
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

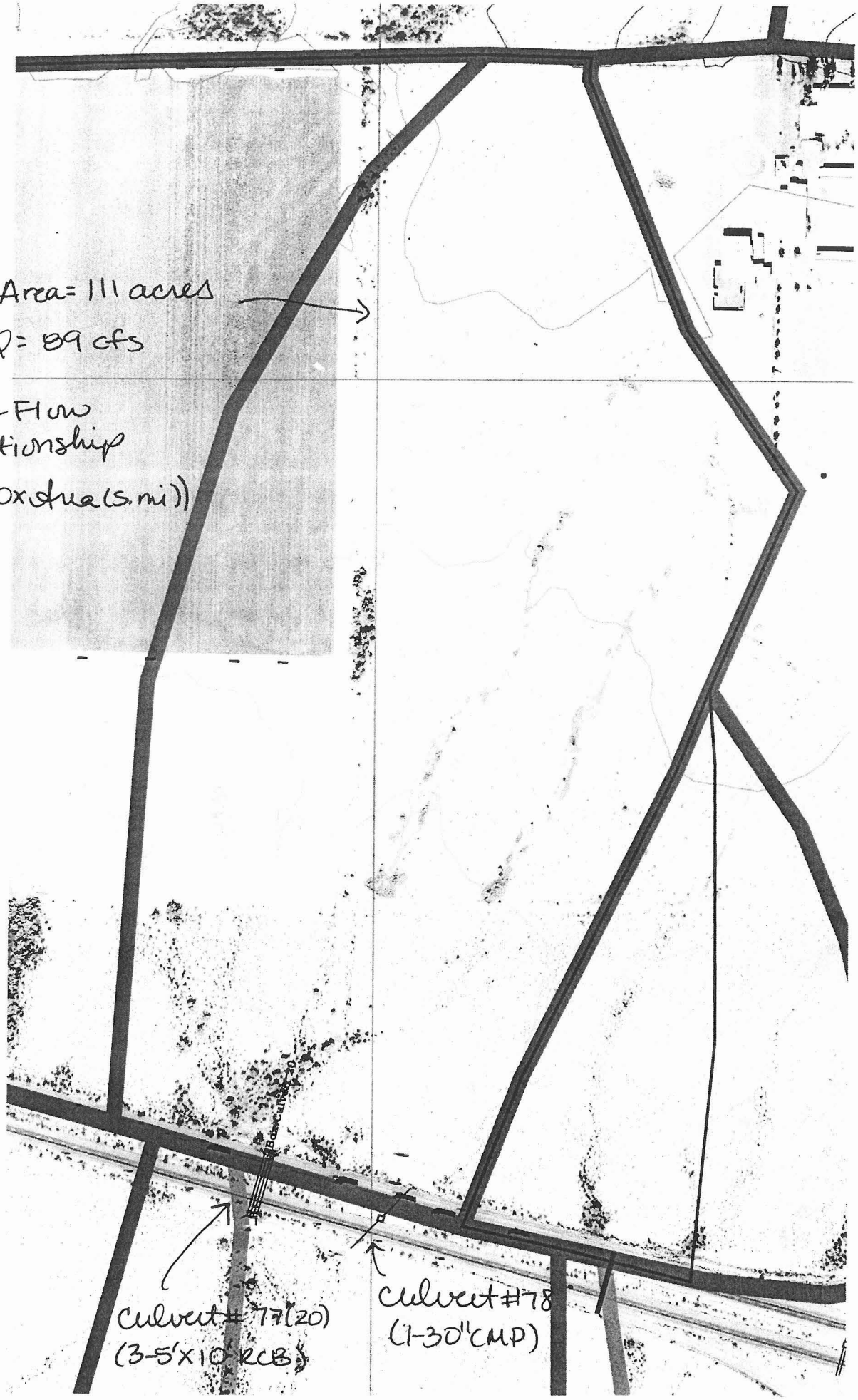


culverts 0 to 70 are on (-) slope

Culverts 71 to 78 are on (+) slope

Total Associated Area to
D042-03=0.174 s.mi.=111 acres
(This value is also shown on the Flow
Calculation Spreadsheet)




Area = 111 acres
Q = 89 cfs
(Area-Flow Relationship
Q = 510 x drea(s.mi))
Culvert #77(20)
(3-5'x10' RCB)
Culvert #78
(1-30" CMP)

10
1548
1
155
L=1548'
1110
1105
1100
Dyke
L=90ft
EL= 1099.4 ft
Culvert # 77
(3-5'x10' RCB)
Culvert #78
(1-30"CMP)

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SHEET____ OF ____

BY ____ DATE ____

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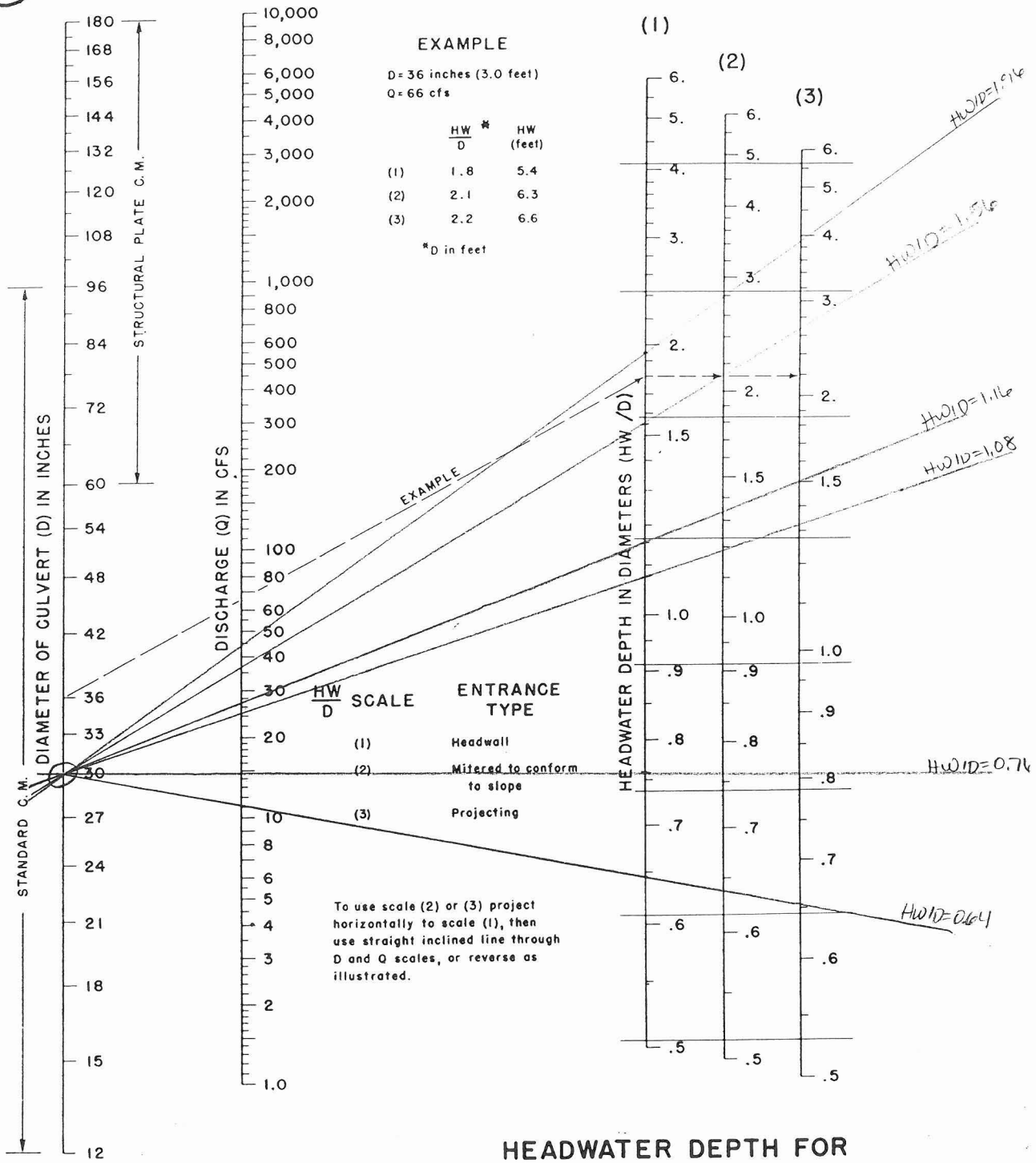
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #78 (1-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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BY ____ DATE ____

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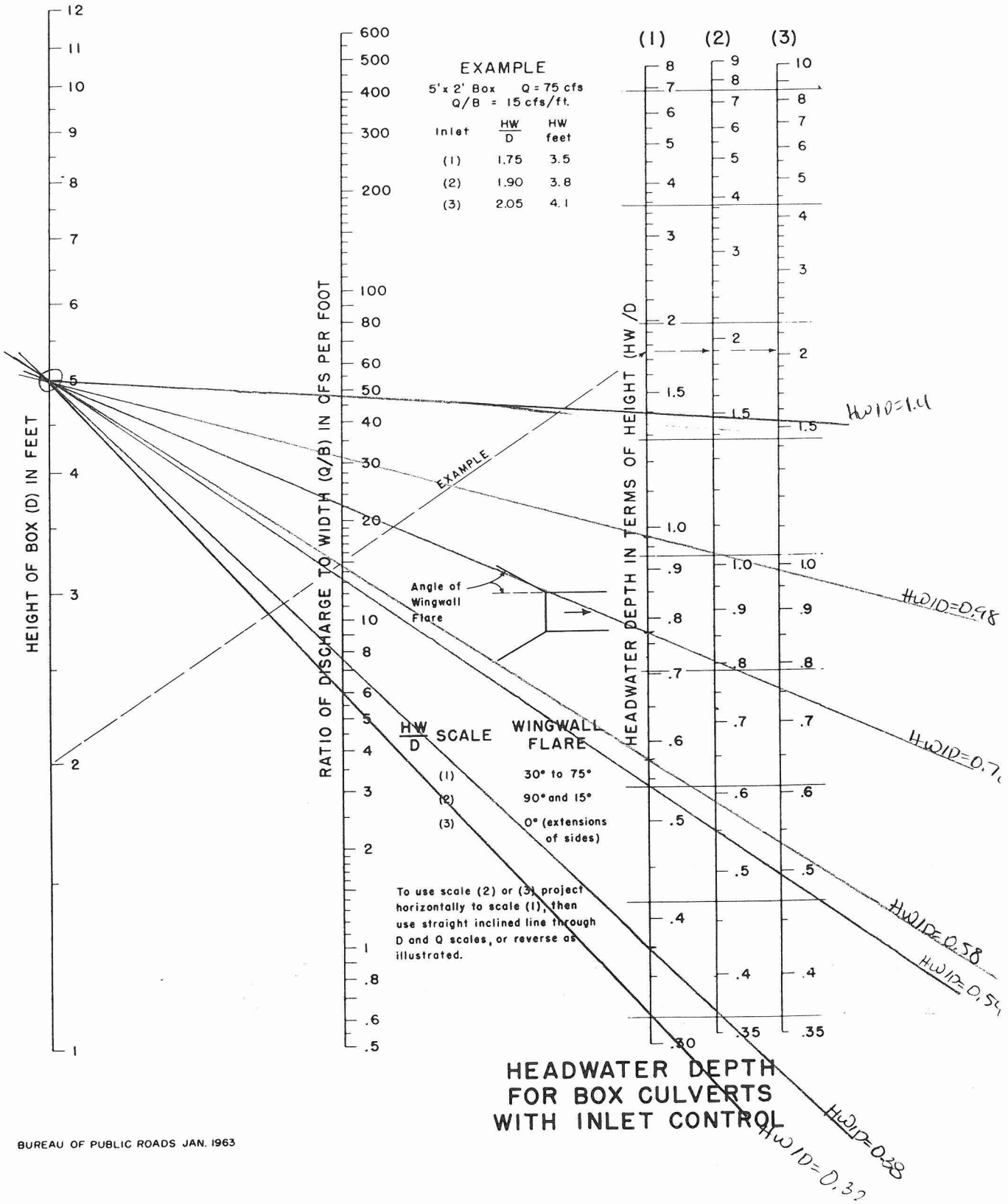
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #77(20) (3-5'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

ulvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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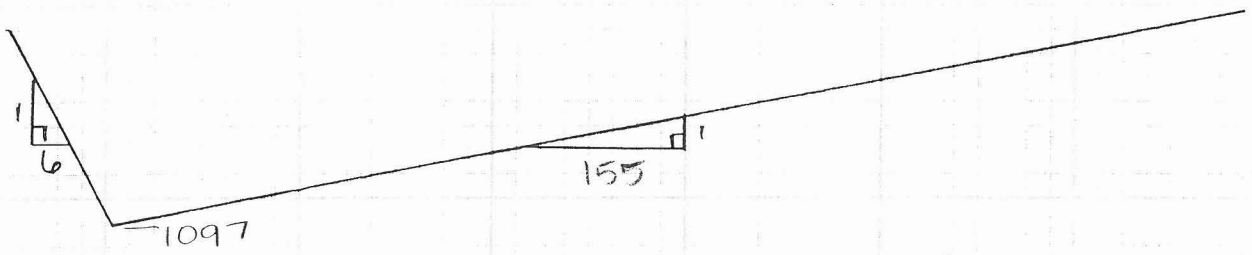
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1097.0)

culvert #78 (1-30" CMP)
culvert #77 (20)
(3-5'x10' RCB)

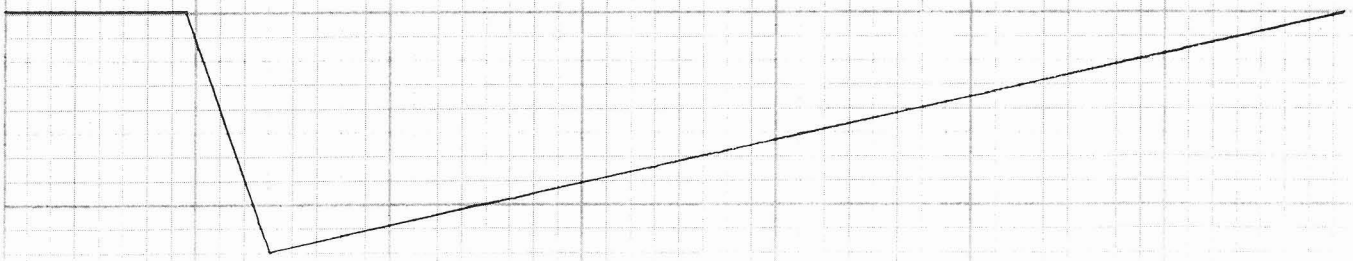


$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

culvert invert = 1094.1

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

Weir Analysis (at EL>)

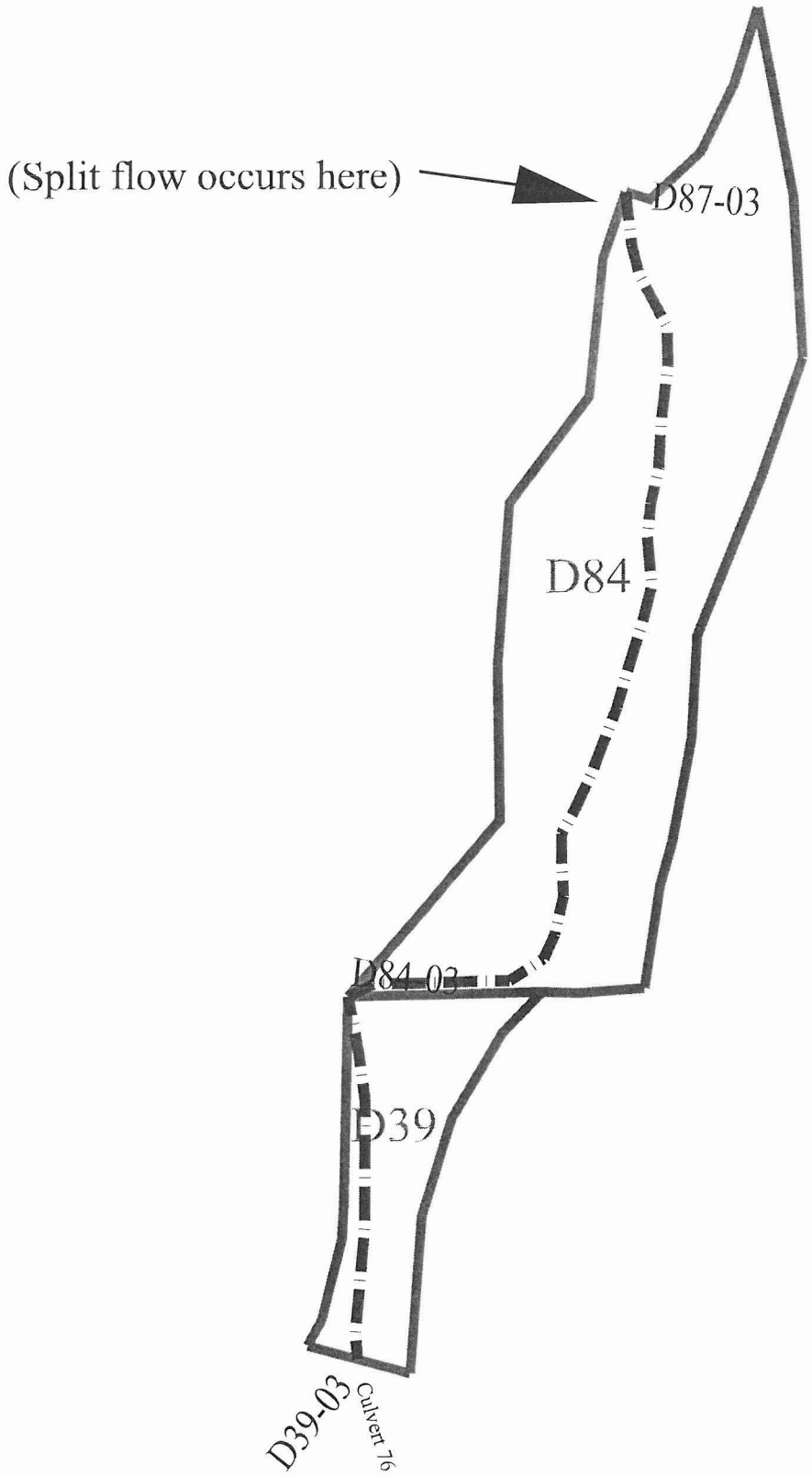


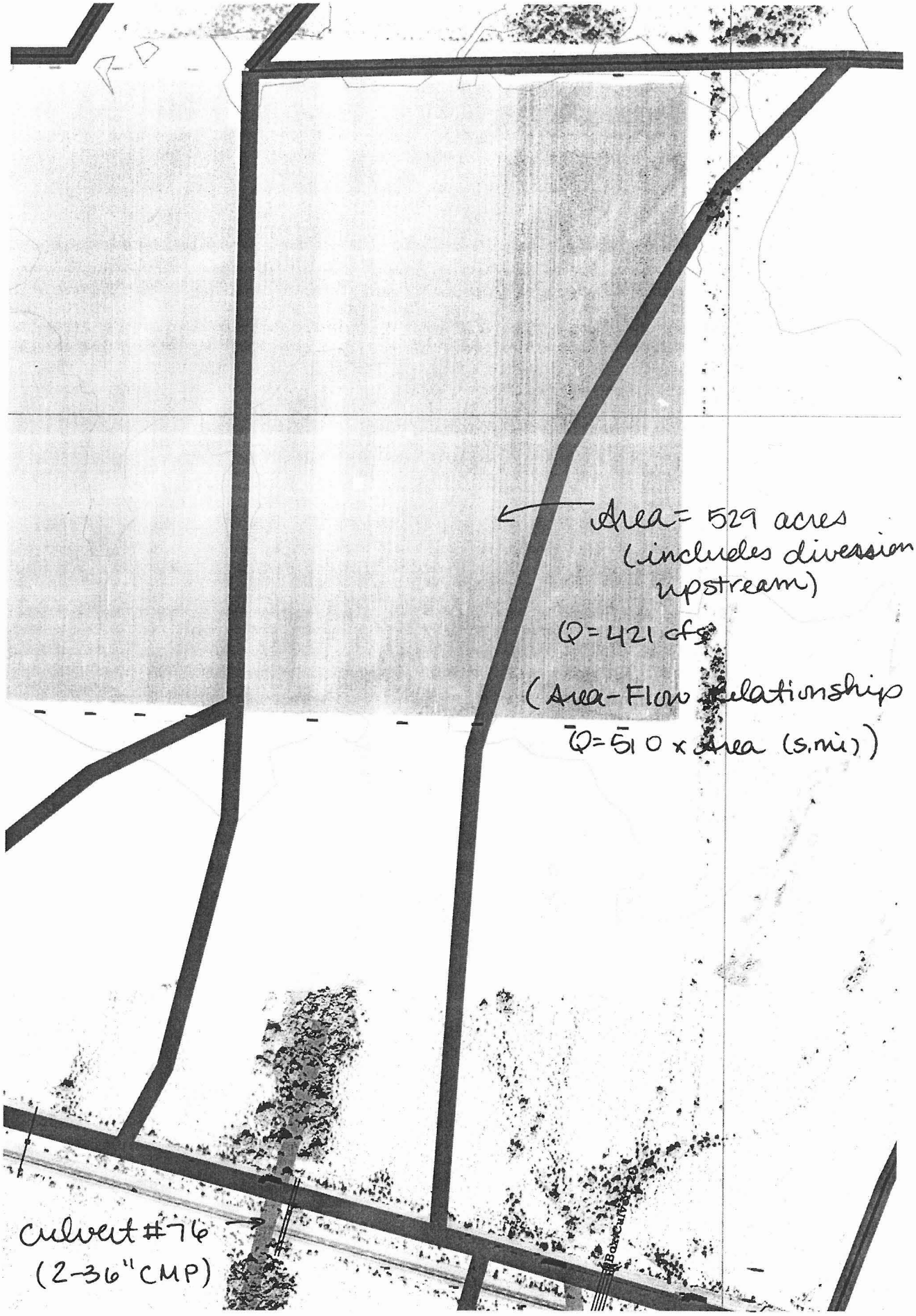
$Q = CLH^{1.5}$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + l\left(\frac{2}{3}\bar{H}\right)}{L + l}\right)$$

Total Associated Area to
D39-03=0.826 s.mi.=529 acres
(This value is also shown on the Flow Calculation Spreadsheet)




Area = 529 acres
(includes diversion upstream)
Q = 421 cfs
(Area-Flow relationship
Q = 510 x Area (s.mi.))
culvert #76
(2-36" CMP)

10
1437
1
144
L=1437 ft
1110
1105
1100
Culvert #76
(2-36" CMP)

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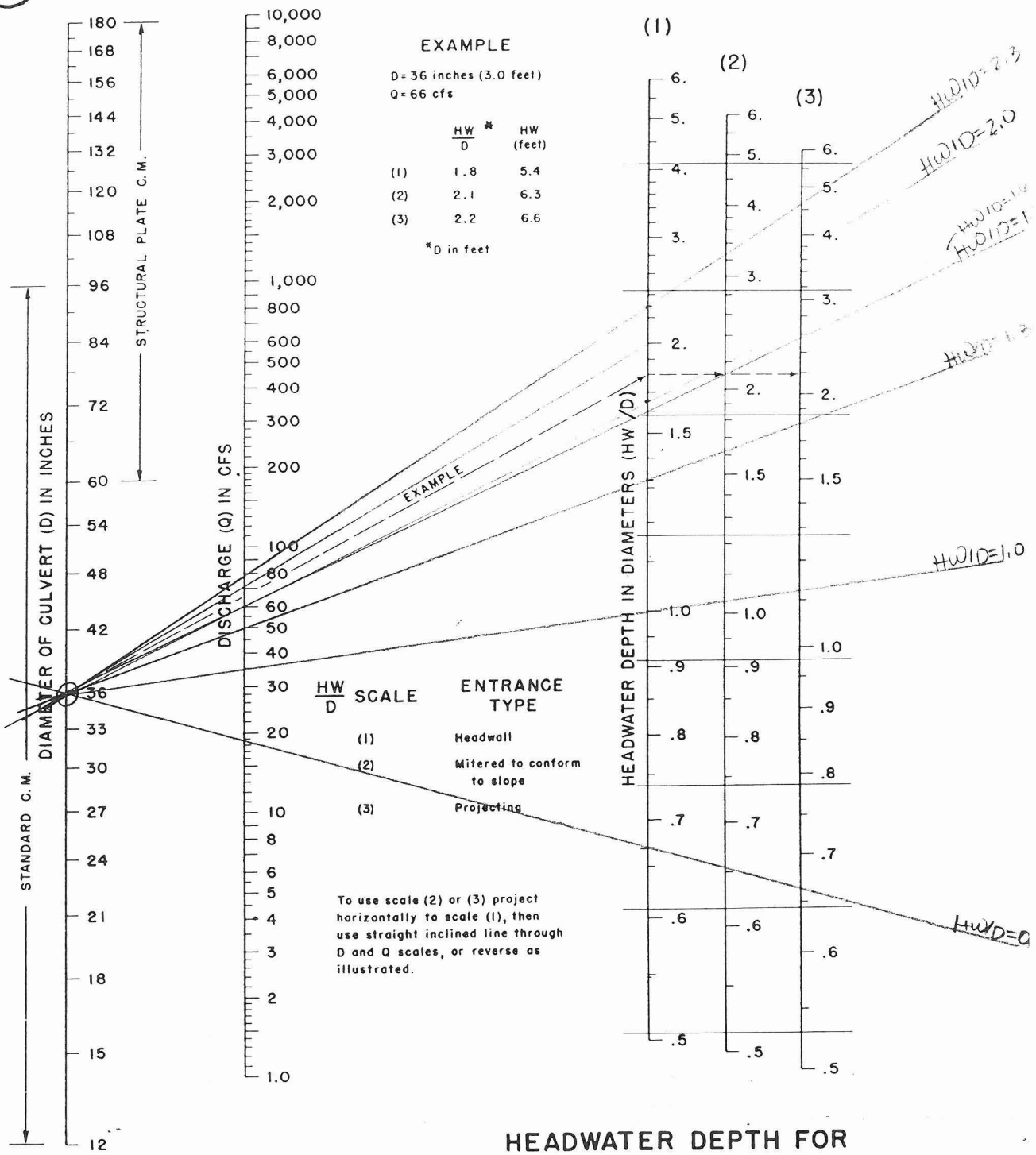
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #76 (2-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

Culvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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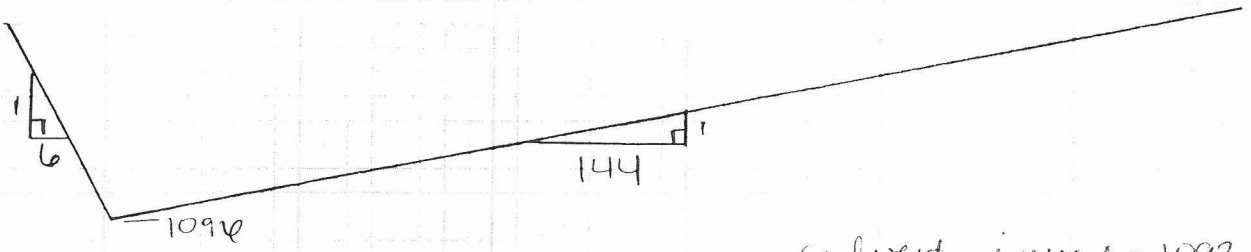
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1096) culvert #76 (2-36" CMP)



culvert invert = 1092

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

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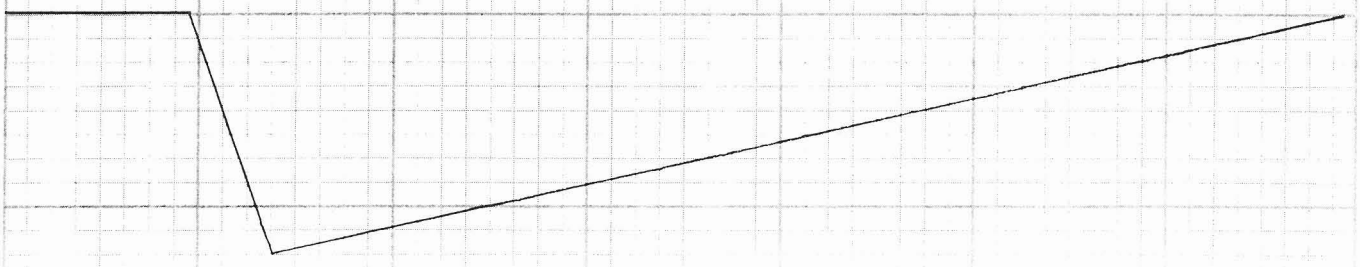
Weir Analysis (at EL >)

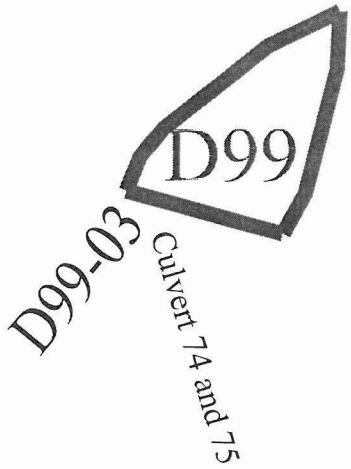


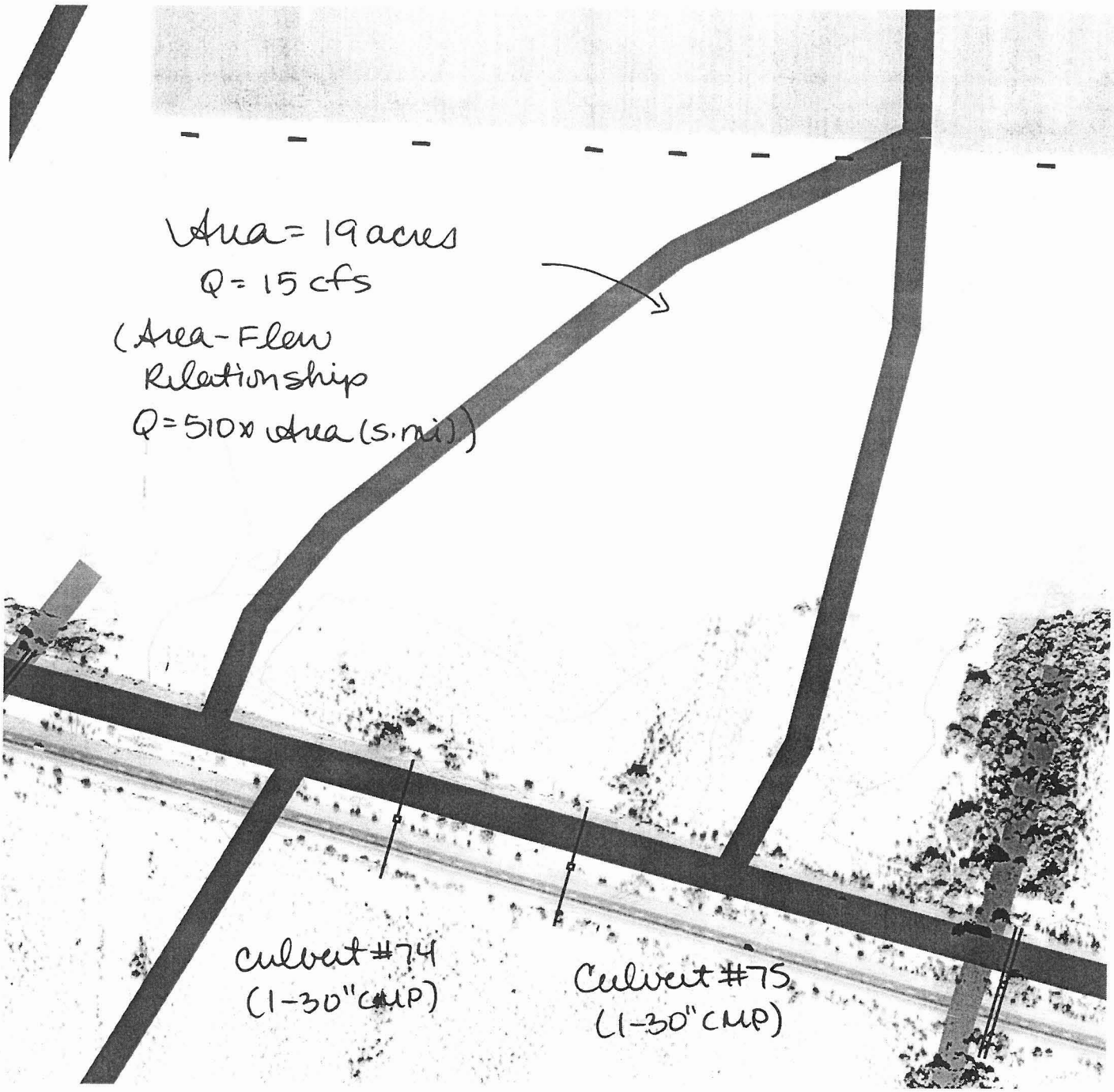
$$Q = C L H^{1.5}$$

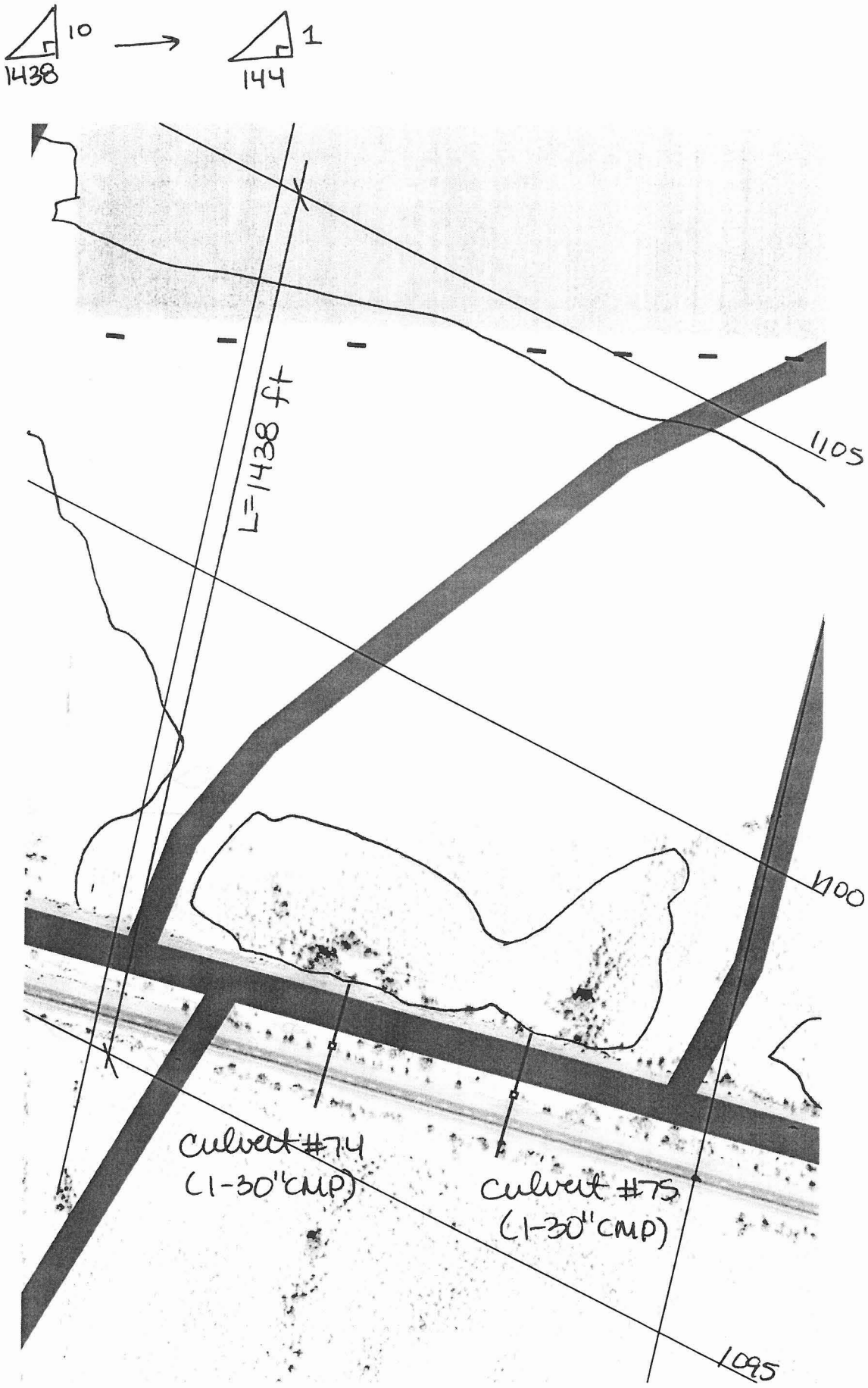
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$

Total Associated Area to
D99-03=0.029 s.mi.=19 acres
(This value is also shown on the Flow Calculation Spreadsheet)




Area = 19 acres
Q = 15 cfs
(Area-Flow
Relationship
Q = 510 x Area (s.mi))
Culvert #74
(1-30" CMP)
Culvert #75
(1-30" CMP)


10
1438
1
144
L=1438 ft
1105
1100
1095
culvert #74
(1-30"CMP)
culvert #75
(1-30"CMP)

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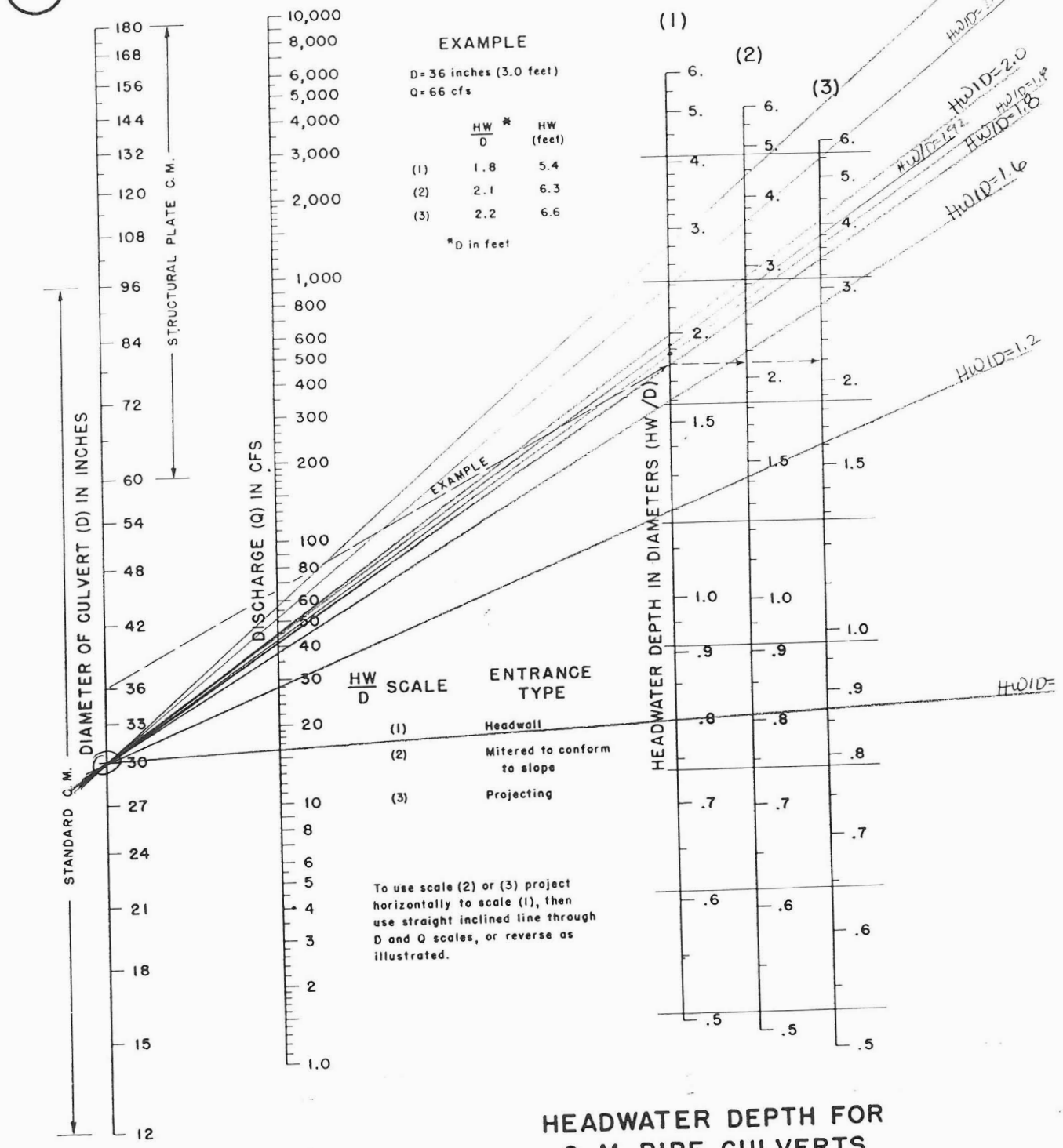
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #74 and #75
(30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

Culvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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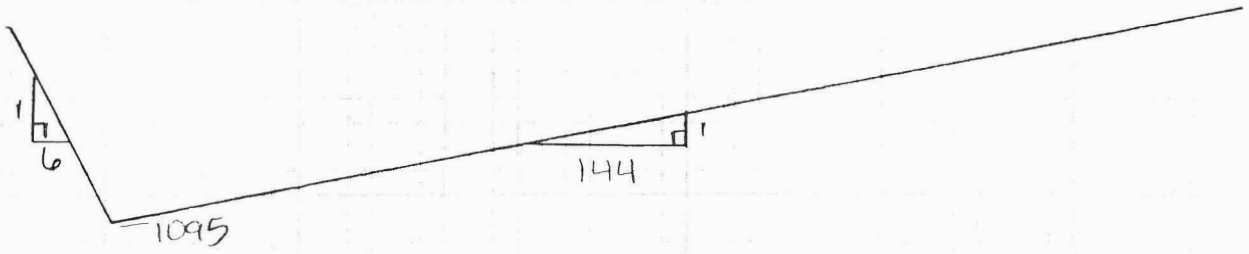
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1095)

Culvert #74 and #75
(30" CMP)



$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

culvert invert = 1092

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

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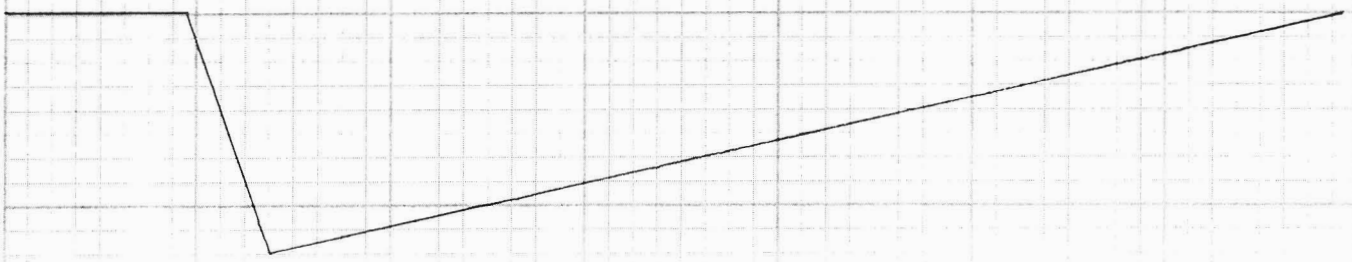
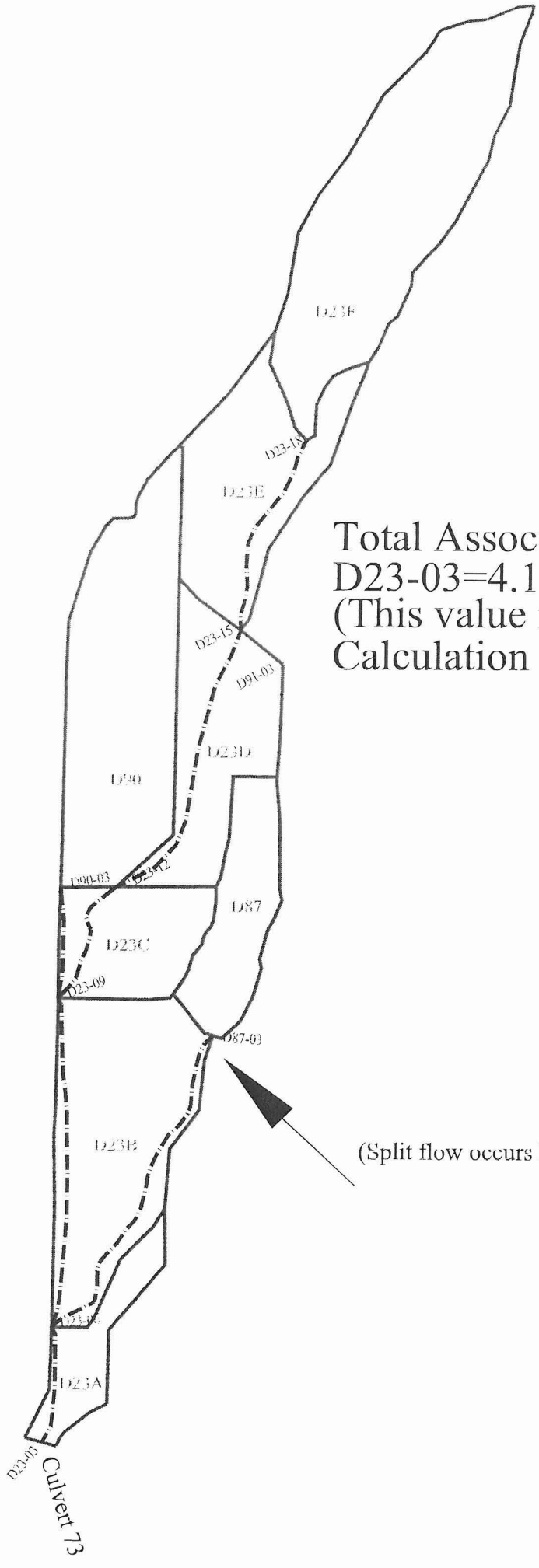
Weir Analysis (at EL>)



$Q = CLH^{1.5}$

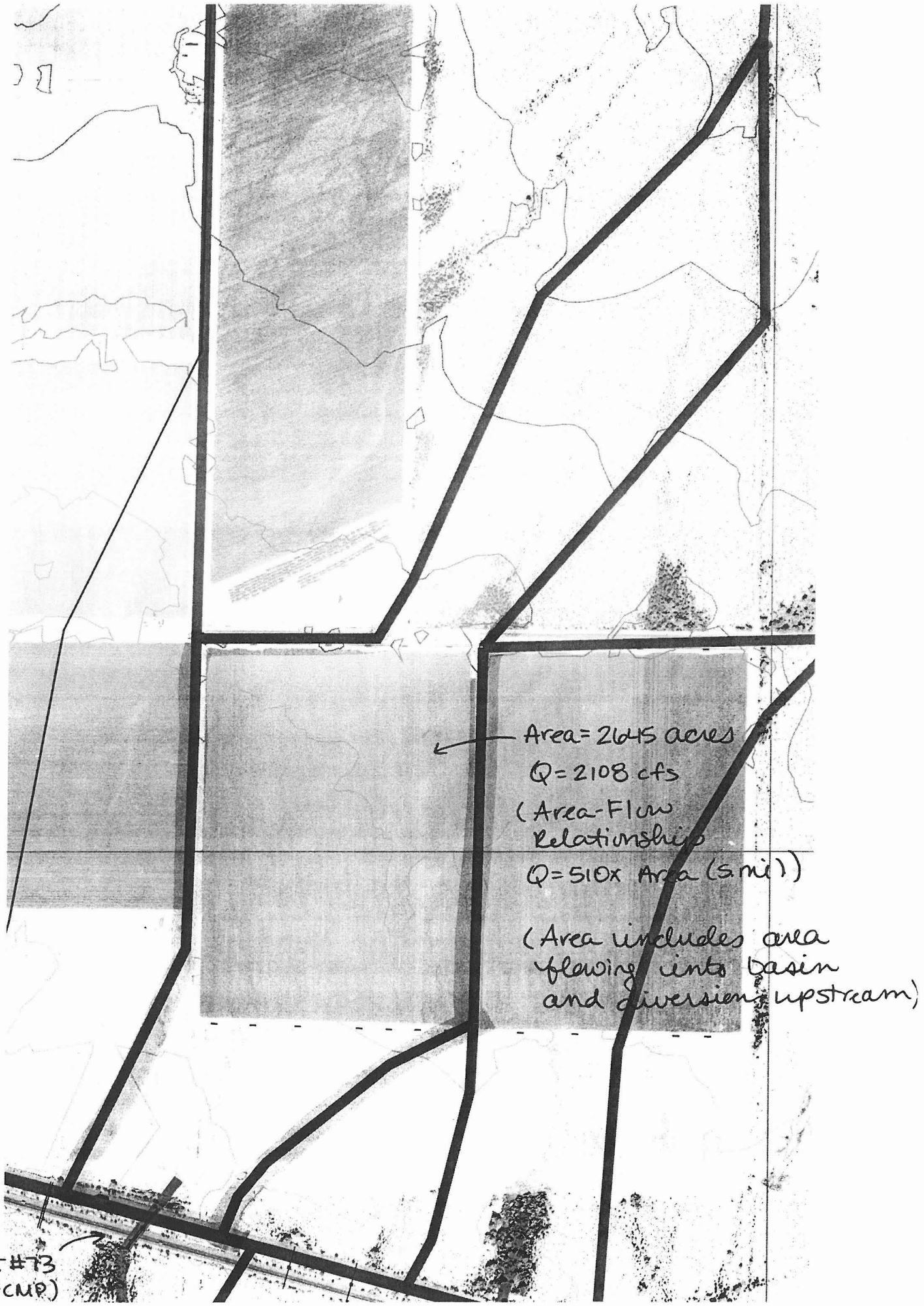
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

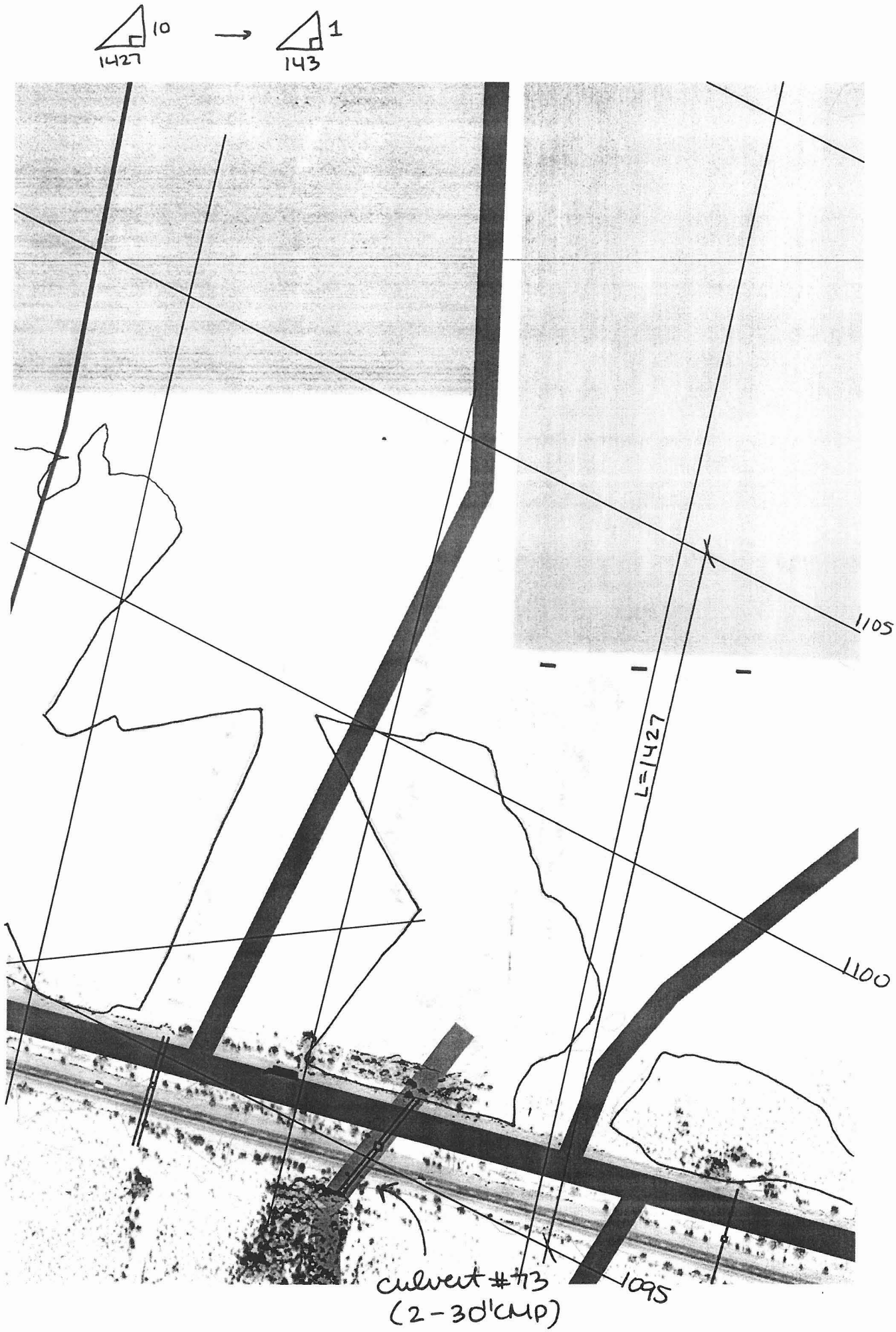
$$\left(H = \frac{L(\bar{H}) + \ell\left(\frac{2}{3}\bar{H}\right)}{L+\ell}\right)$$



Total Associated Area to D23-03=4.133 s.mi.=2645 acres (This value is also shown on the Flow Calculation Spreadsheet)

(Split flow occurs here)


Area = 2645 acres
Q = 2108 cfs
(Area-Flow Relationship
Q = 510x Area (S mi²))
(Area includes area flowing into basin and diversion upstream)
Culvert #73
(2-30" CMP)


10
1427
1
143
1105
L=1427
1100
culvert #13
(2-30'CMP)
1095

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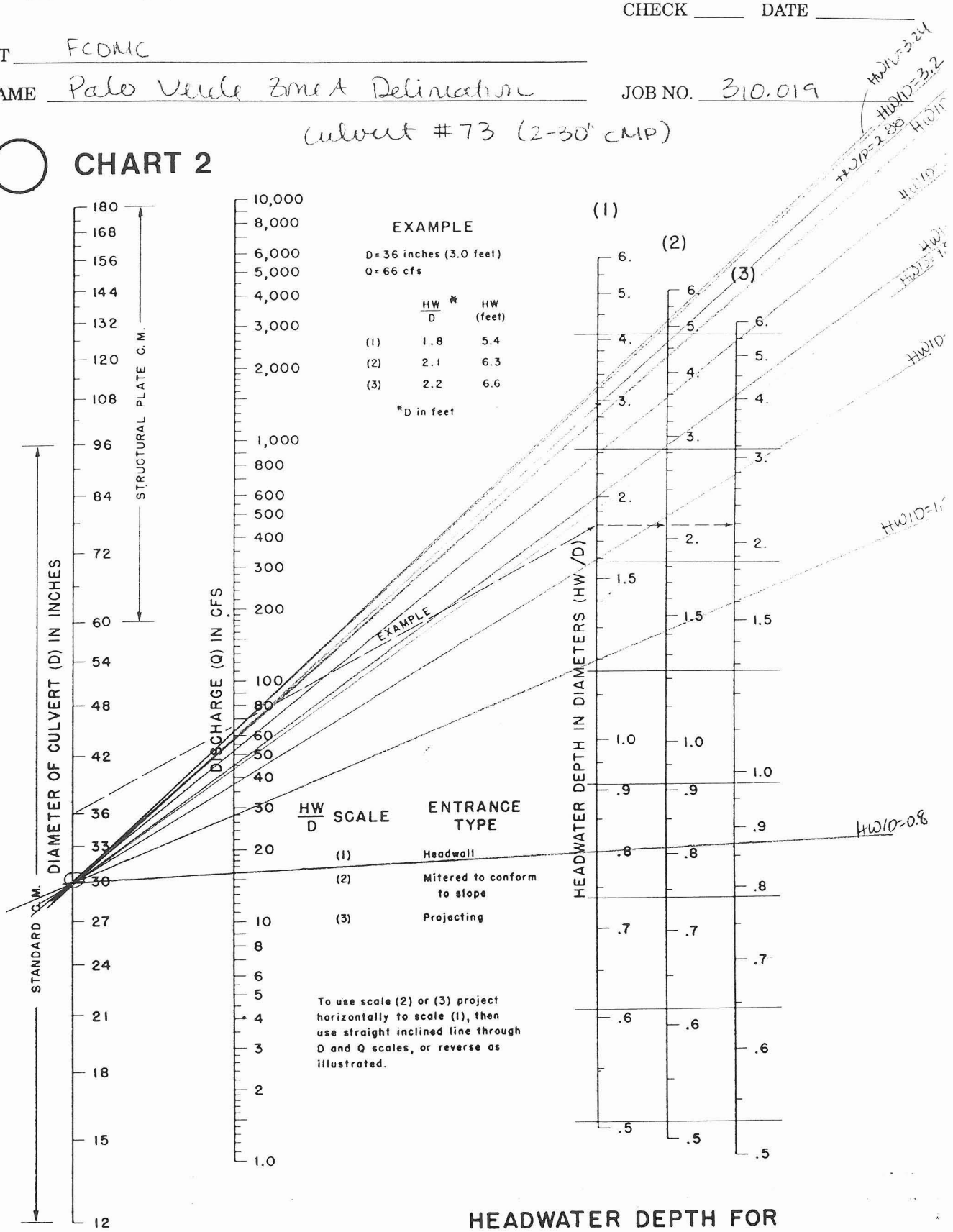
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #73 (2-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

Culvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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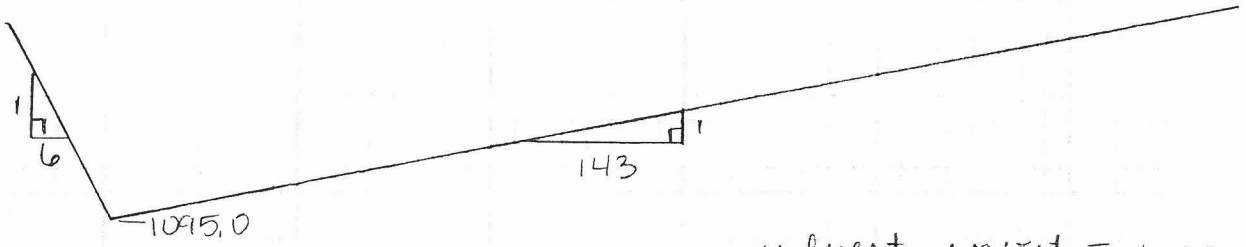
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

Manning's Equ. (at EL > 1095.0)

culvert #73 (2-30" CMP



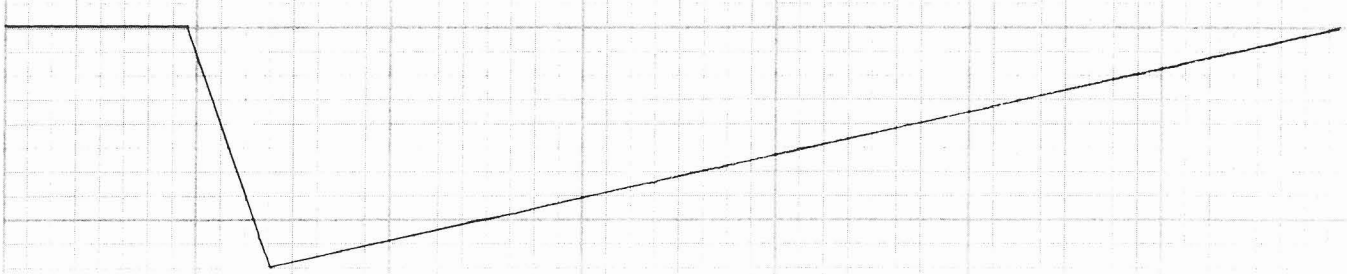
culvert invert = 1092

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where n = 0.065
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL>)

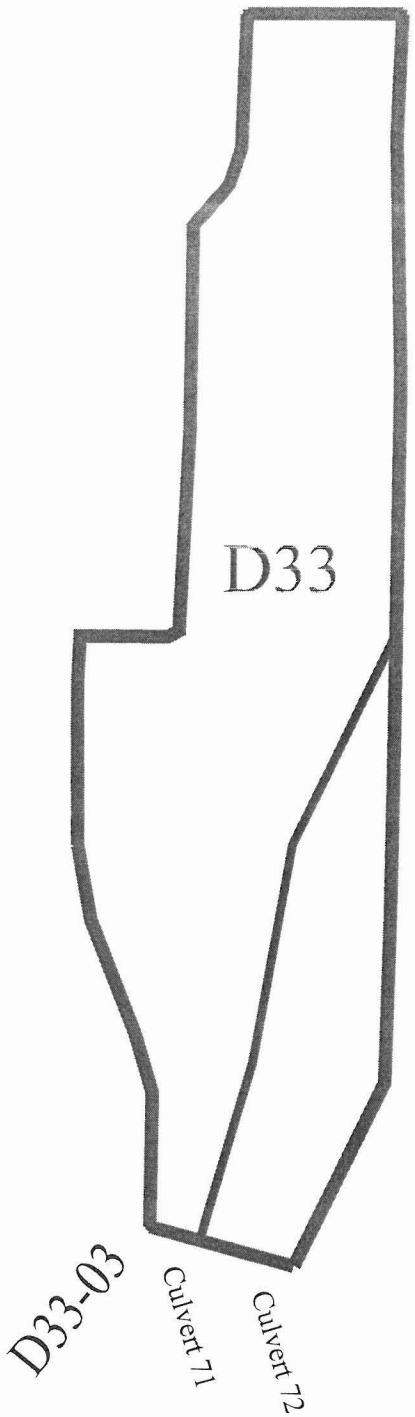


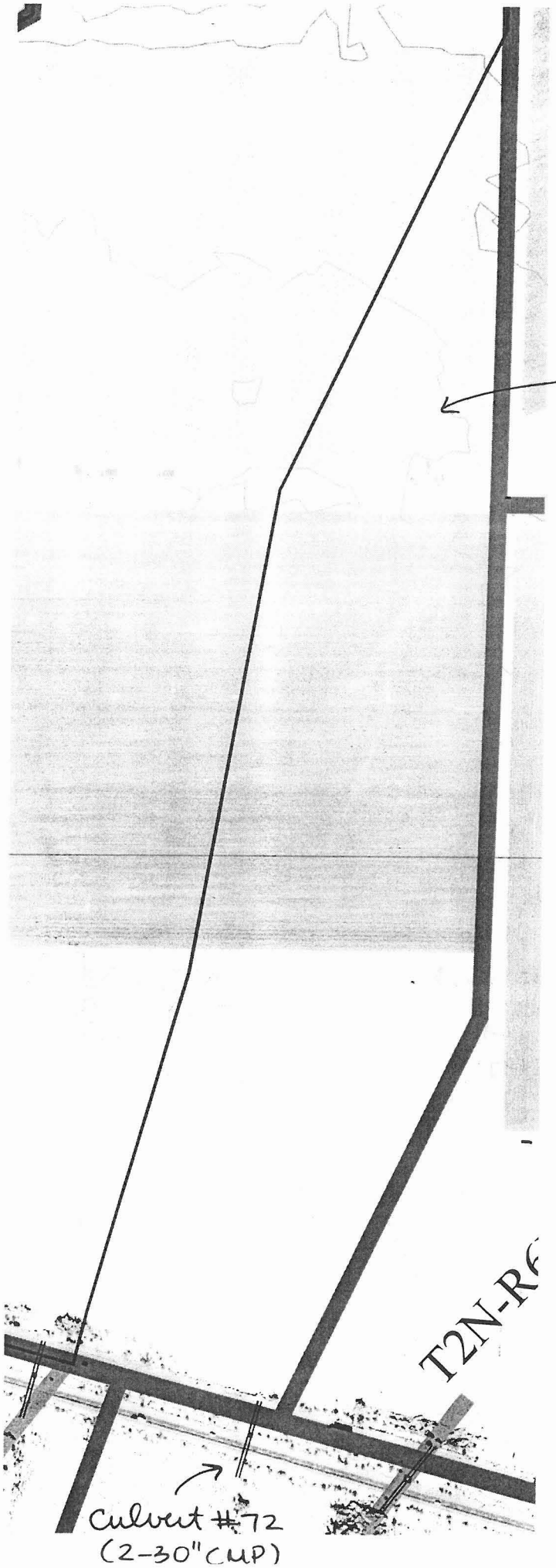
$$Q = CLH^{1.5}$$

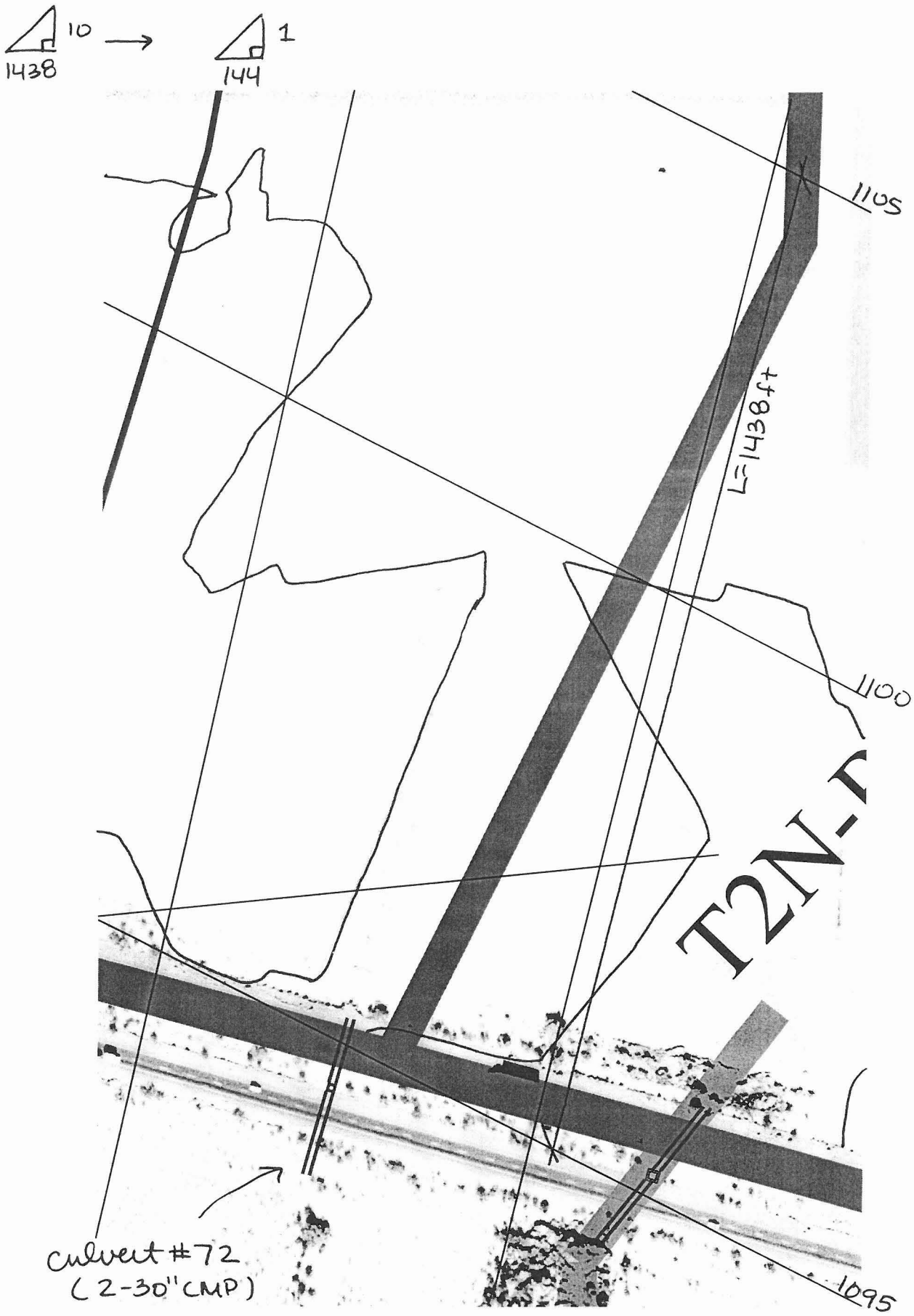
where C = 2.7
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell(\frac{2}{3}\bar{H})}{L+\ell}\right)$$

Total Associated Area to
D33-03=0.146 s.mi.=266 acres
(This value is also shown on the Flow Calculation Spreadsheet)




Area = 56 acres
Q = 45 cfs
(Area - Flow
Relationship
Q = 510 x Area (s.mi
T2N-R
Culvert #72
(2-30" CMP)


10
1438
1
144
1105
L=1438 ft±
1100
T2N-R
culvert #72
(2-30" CMP)
1095

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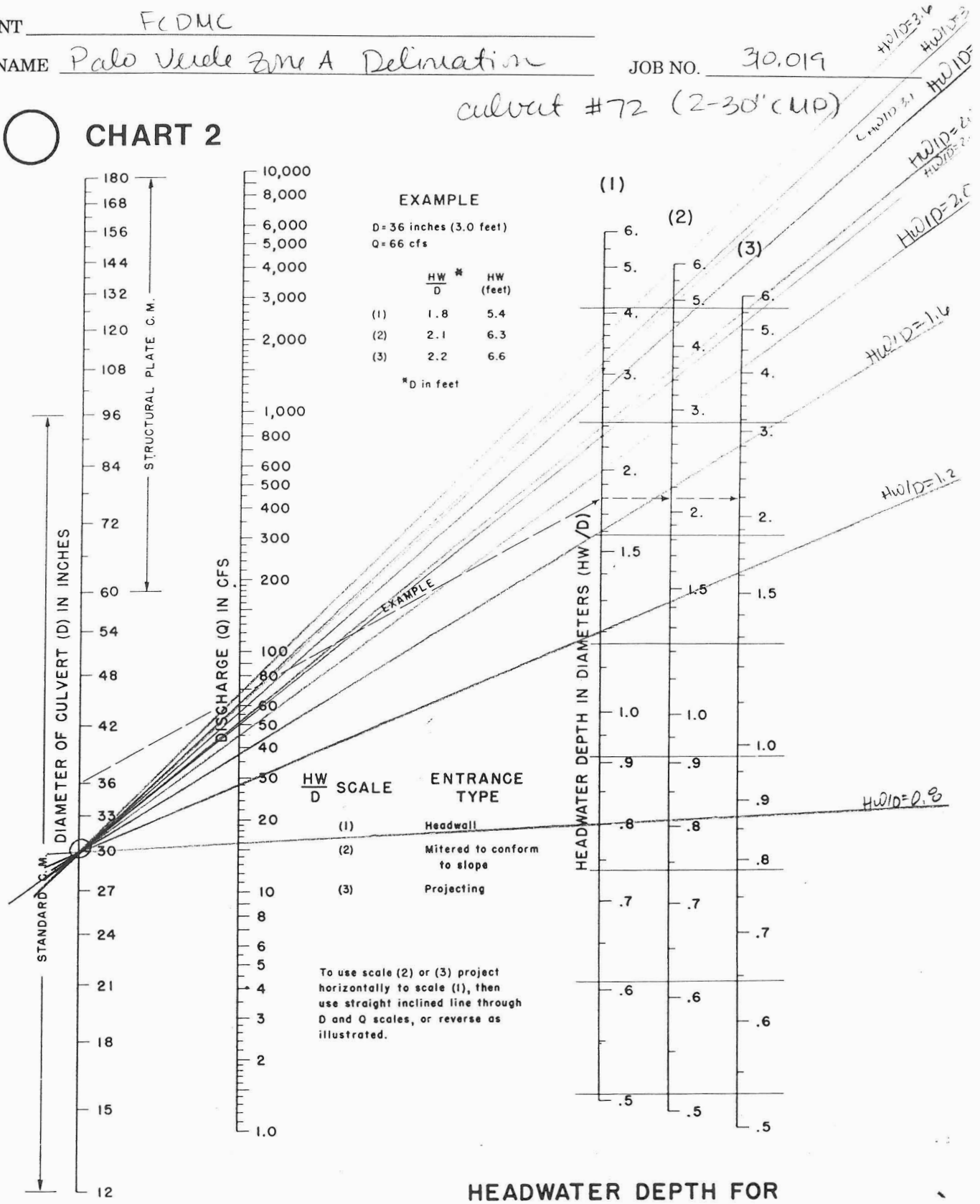
JOB NAME Palo Verde Zone A Delineation JOB NO. 30,019

culvert #72 (2-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

Culvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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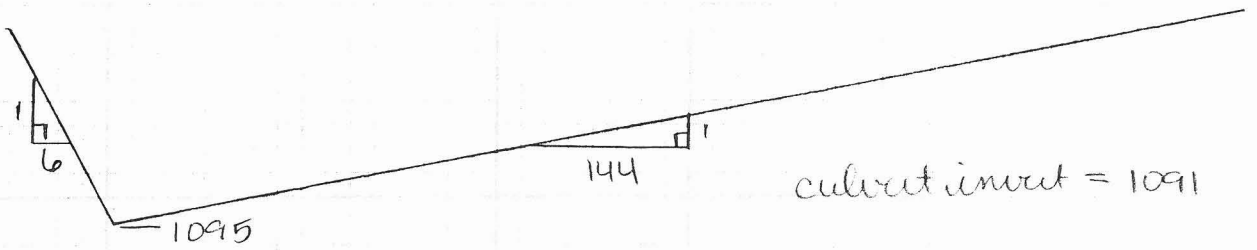
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1095)

culvert #72
(2-30" CMP)

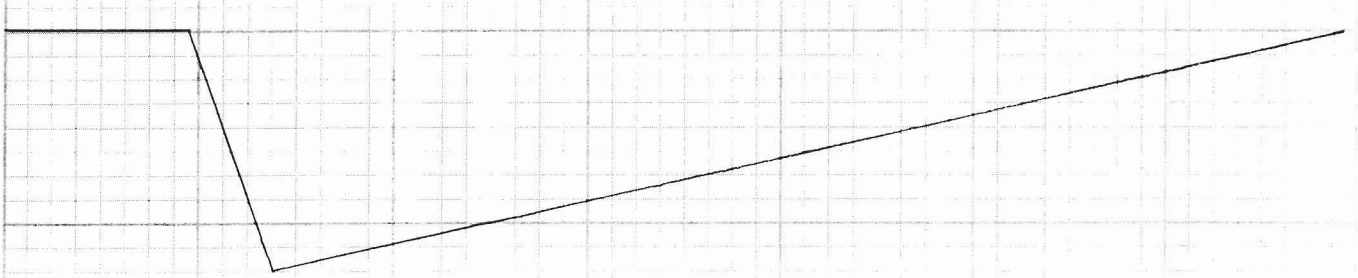


$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

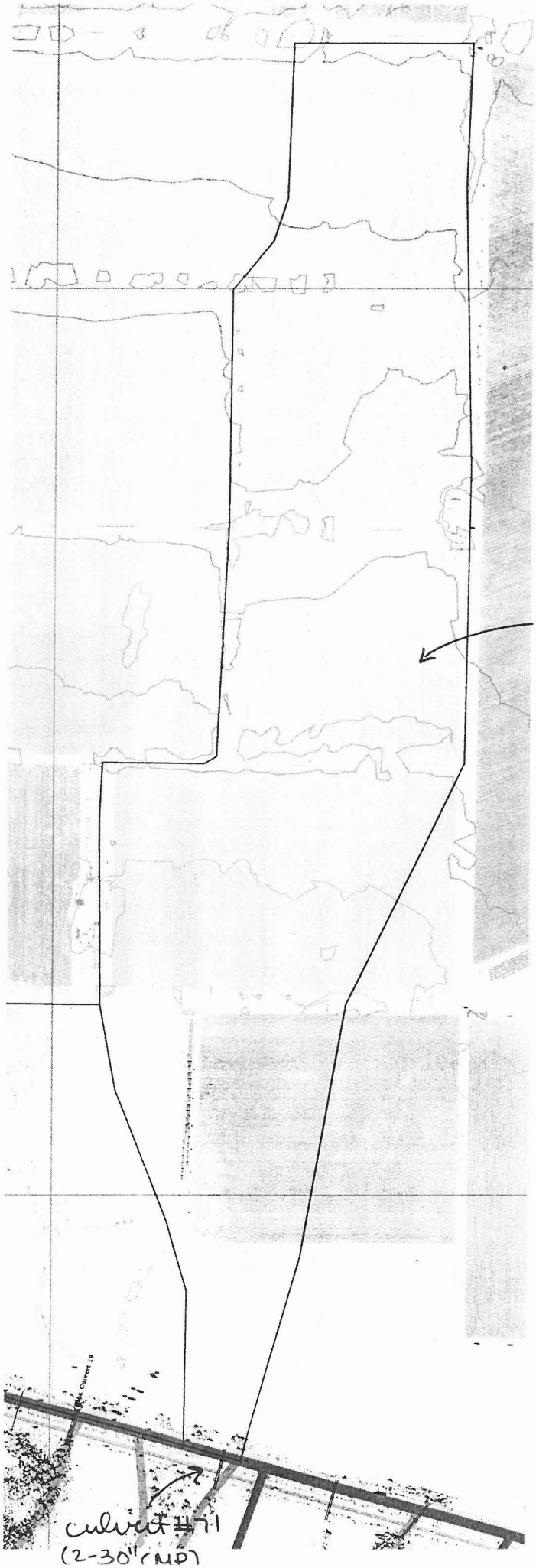
Weir Analysis (at EL >)

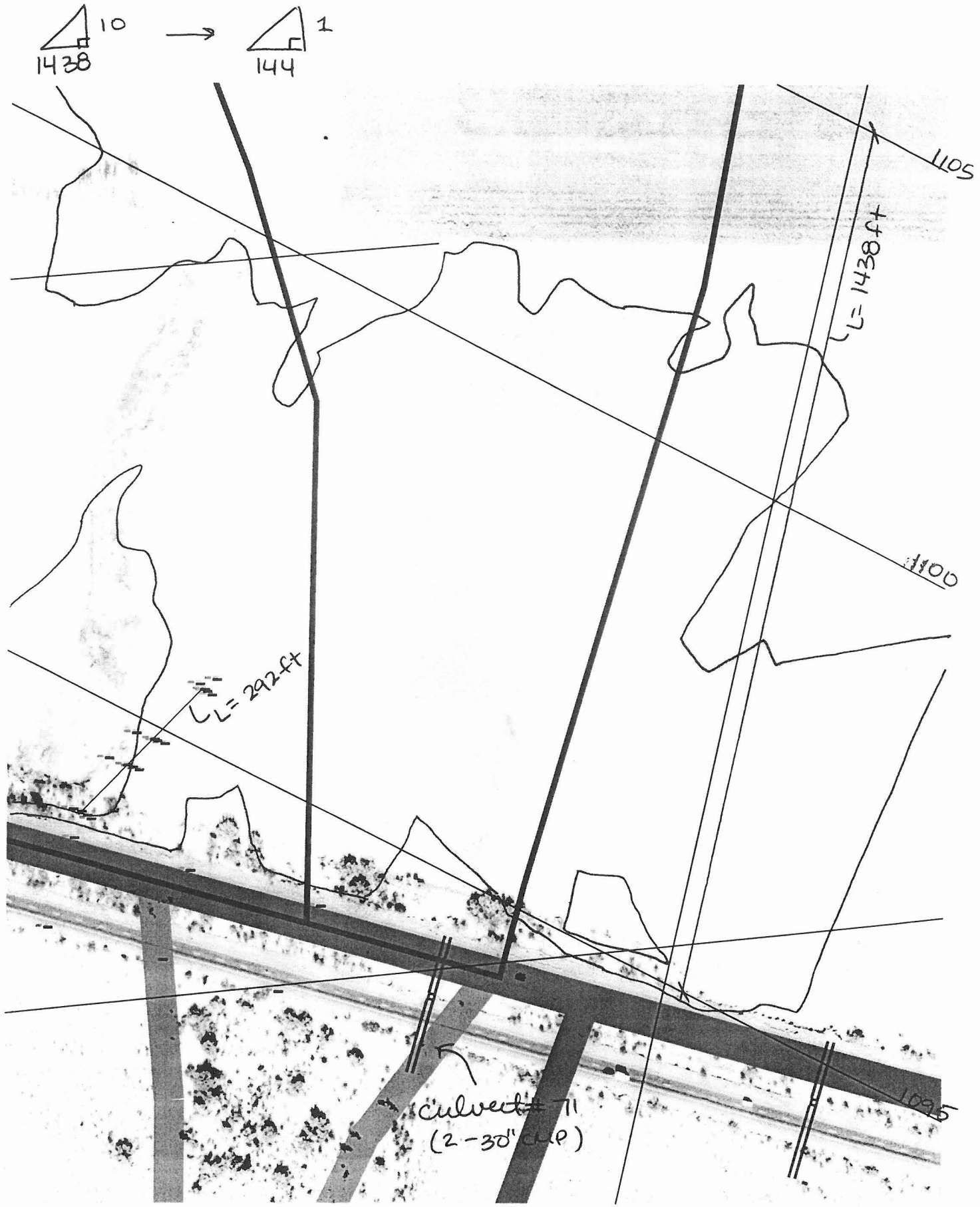


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$


Area = 210 acres
Q = 167 cfs
(Area-Flow
Relationship
Q = 510 x Area(s.mi.)
culvert #11
(2-30" CMP)


10
1438
1
144
1105
L= 1438 ft
1100
L= 292 ft
Culvert #11
(2-30" CMP)
1095

Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	30" CMP Chart 2 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
71	2-30" CMP	1092				
		1097	5	2.00	45	90
		1098	6	2.40	51	102
		1099	7	2.80	58	116
		1100	8	3.20	63	126

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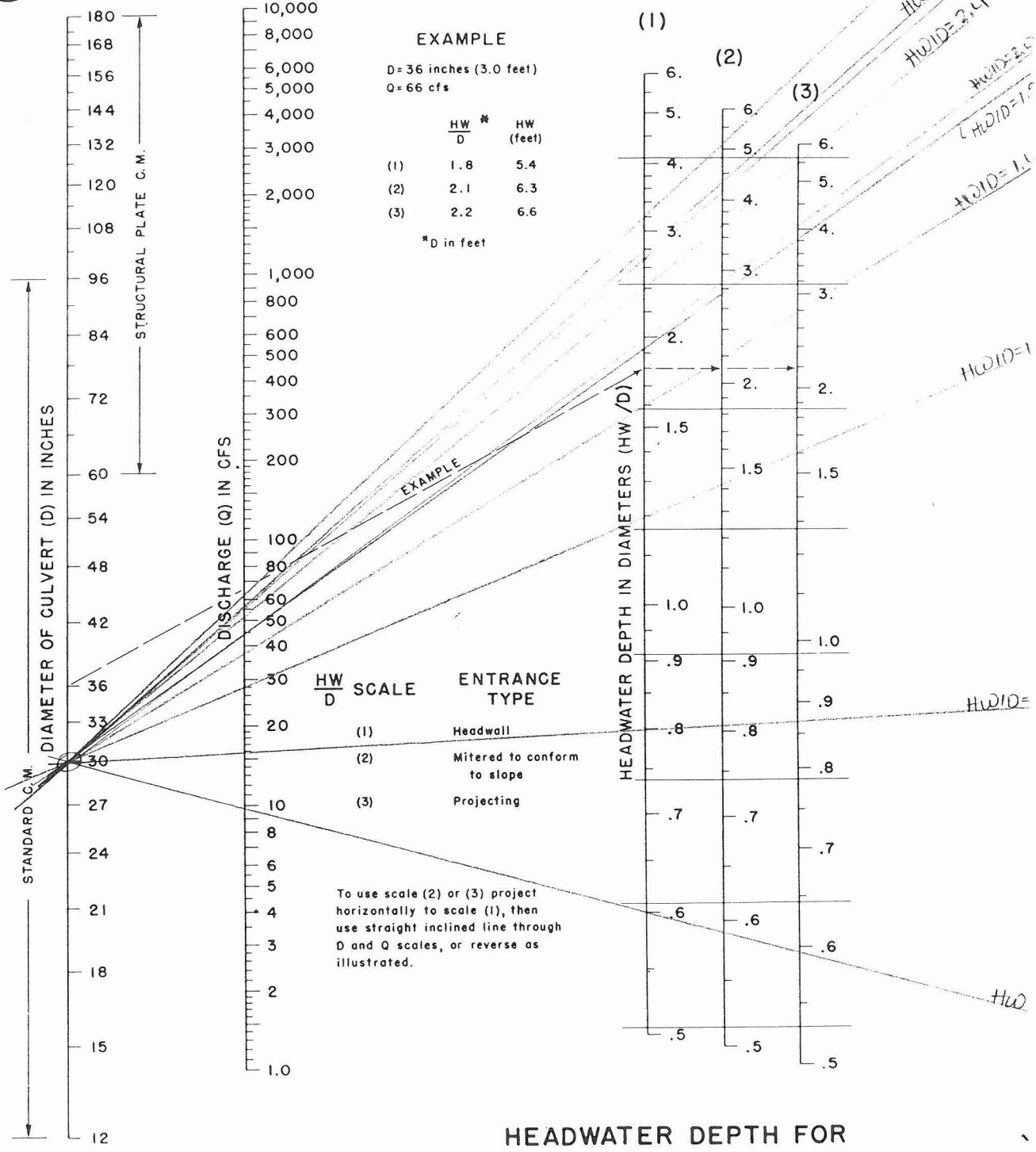
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Culvert #71 (2-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culverts 78 to 71

The following shows flows going through the culvert, these are added together are specified elevations on the main spreadsheet.

Culvert ID	Culvert Type	Elevation (ft)	Culvert 78 HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
78	1-30" CMP	1094.1				
		1096	1.9	0.76	14.8	14.8
	Top EL of Weir	1096.8	2.7	1.08	24.3	24.3
	east of Culvert 71 and	1097	2.9	1.16	27	27
	west of Culvert 70	1098	3.9	1.56	37	37
		1099	4.9	1.96	45	45

Culvert ID	Culvert Type	Elevation (ft)	Culvert 77 HW (ft)	3-5' x 10' Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
77 (20)	3-5' x 10' RCB	1094.1					
		1096	1.9	0.38	7.50	225	225
	Top EL of Weir	1096.8	2.7	0.54	13.10	393	393
	east of Culvert 71 and	1097	2.9	0.58	14.50	435	435
	west of Culvert 70	1098	3.9	0.78	22.00	660	660
		1099	4.9	0.98	32.00	960	960

Culvert ID	Culvert Type	Elevation (ft)	Culvert 76 HW (ft)	2-36" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
76	2-36" CMP	1092				
		1096	4	1.33	100	100
	Top EL of Weir	1096.8	4.8	1.60	120	120
	east of Culvert 71 and	1097	5	1.67	122	122
	west of Culvert 70	1098	6	2.00	140	140
		1099	7	2.33	160	160

Culvert ID	Culvert Type	Elevation (ft)	Culverts HW (ft)	6-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
75	1-30" CMP	1092				
74	1-30" CMP	1096	4	1.60	228	228
73	2-30" CMP	1096.8	4.8	1.92	270	270
71	2-30" CMP	1097	5	2.00	300	300
		1098	6	2.40	312	312
		1099	7	2.80	342	342

Culvert ID	Culvert Type	Elevation (ft)	Culvert 72 HW (ft)	2-30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	Total Q-culvert (cfs)
72	2-30" CMP	1091				
		1096	5	2.00	90	90
	Top EL of Weir	1096.8	5.8	2.32	100	100
	east of Culvert 71 and	1097	6	2.40	104	104
	west of Culvert 70	1098	7	2.80	112	112
		1099	8	3.20	124	124

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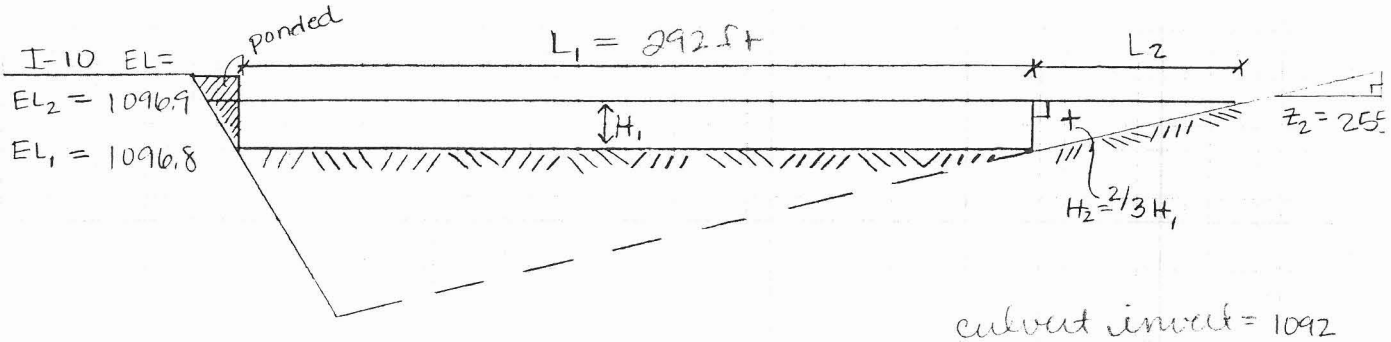
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1096.8) culvert #71 (2-30" CMP



culvert invert = 1092

$H_1 = E_2 - E_1 = 1096.9 - 1096.8 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(255) = 25.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\overline{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(292)(0.10) + (25.5)(0.0667)}{292 + 25.5} = 0.0$

$L_T = L_1 + L_2 = 292 + 25.5 = 317.5$ ft

Weir Flow $Q = C L_T \overline{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \overline{H}^{1.5} = 2.7 (317.5) (0.0973)^{1.5} = \underline{\underline{26 \text{ cfs}}}$

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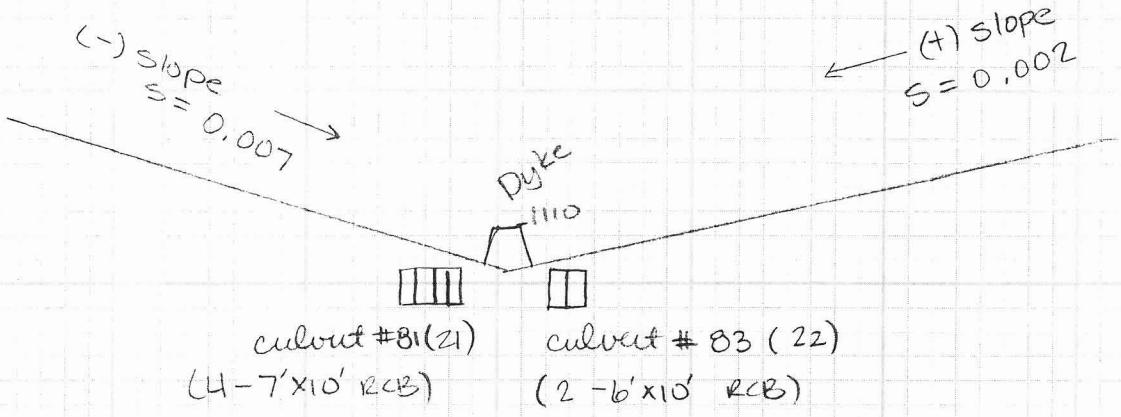
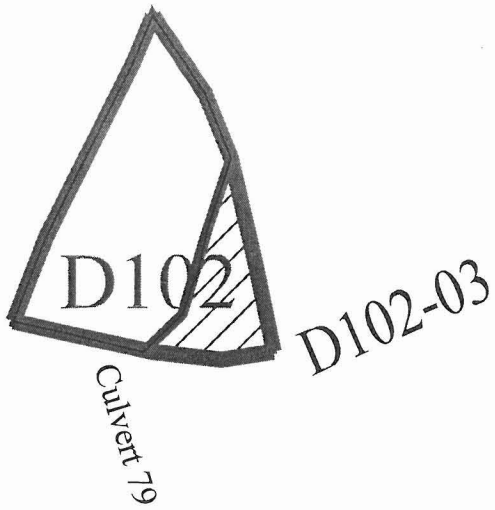
JOB NAME Palo Verde Zone A Relinement JOB NO. 310.019



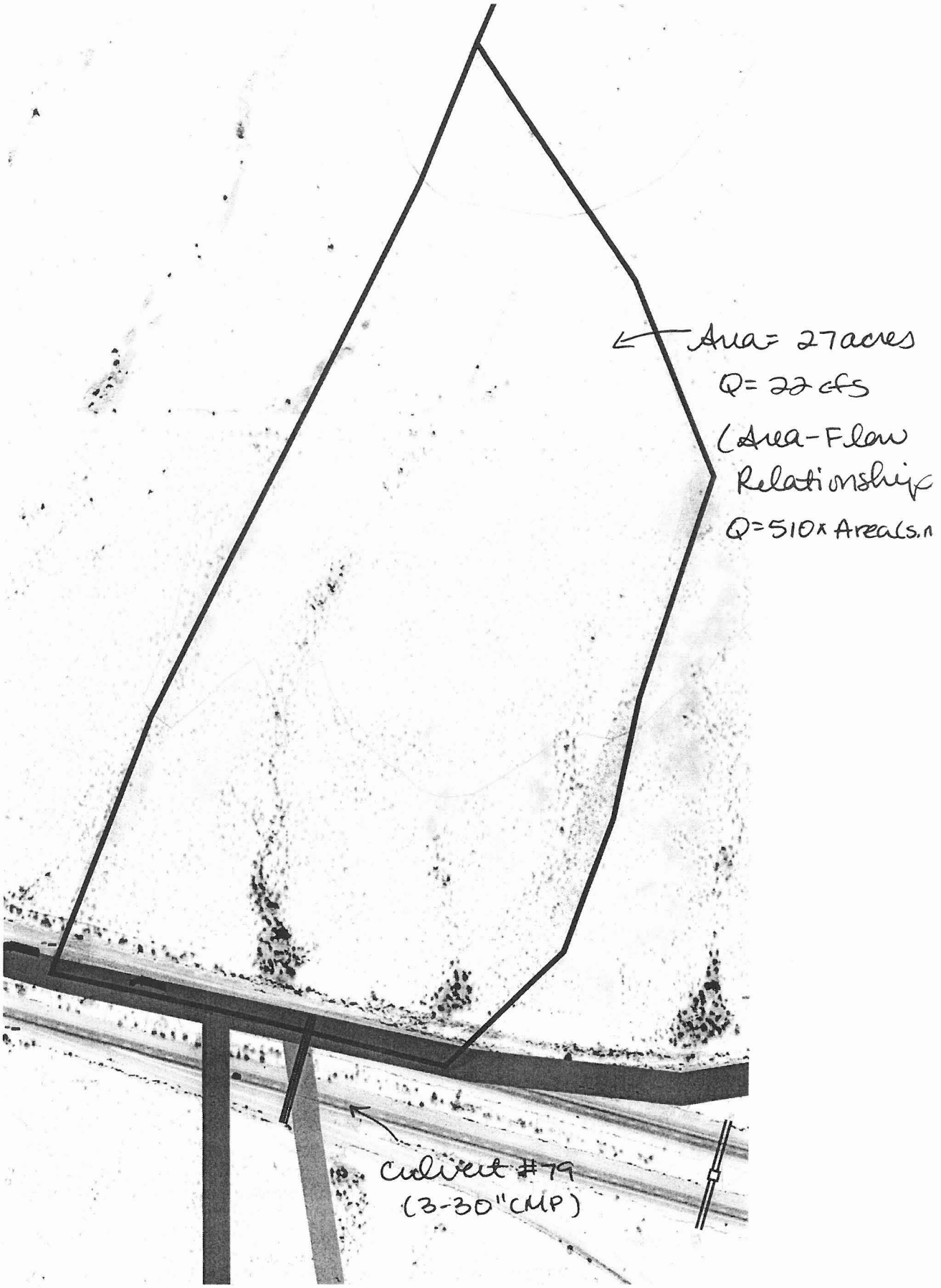
culverts 79 to 81

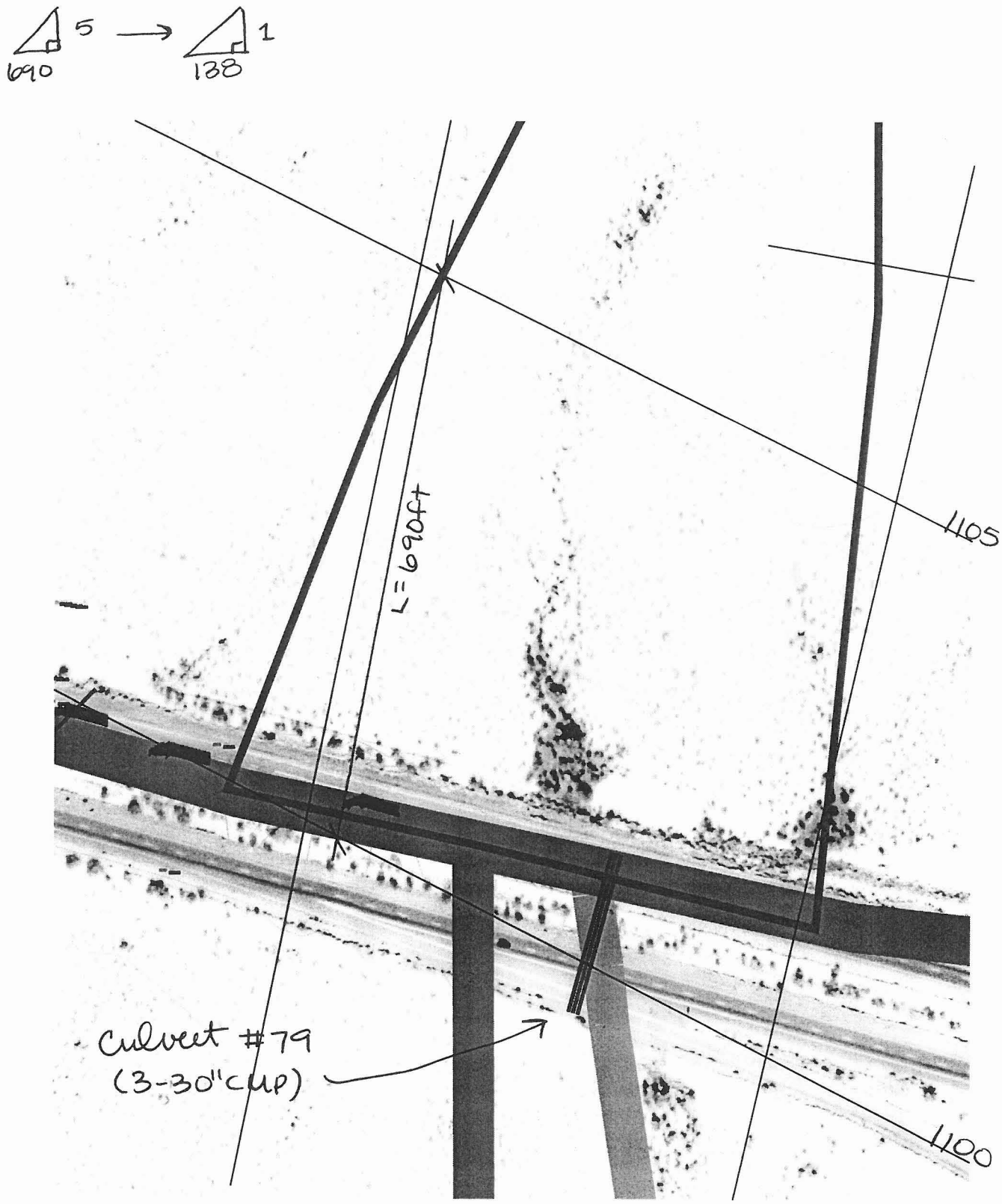
culverts 83 and 85

Total Associated Area to
D102-03=0.054 s.mi.=34.56 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The shaded area is included with the analysis of Culverts 80 and 81)


Area = 27 acres
Q = 22 cfs
(Area-Flow
Relationship
Q = 510 x Area^0.n
Culvert #79
(3-30" CMP)


5
690
1
138
L=690ft
1105
Culvert #79
(3-30"CMP)
1100

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BY ____ DATE ____

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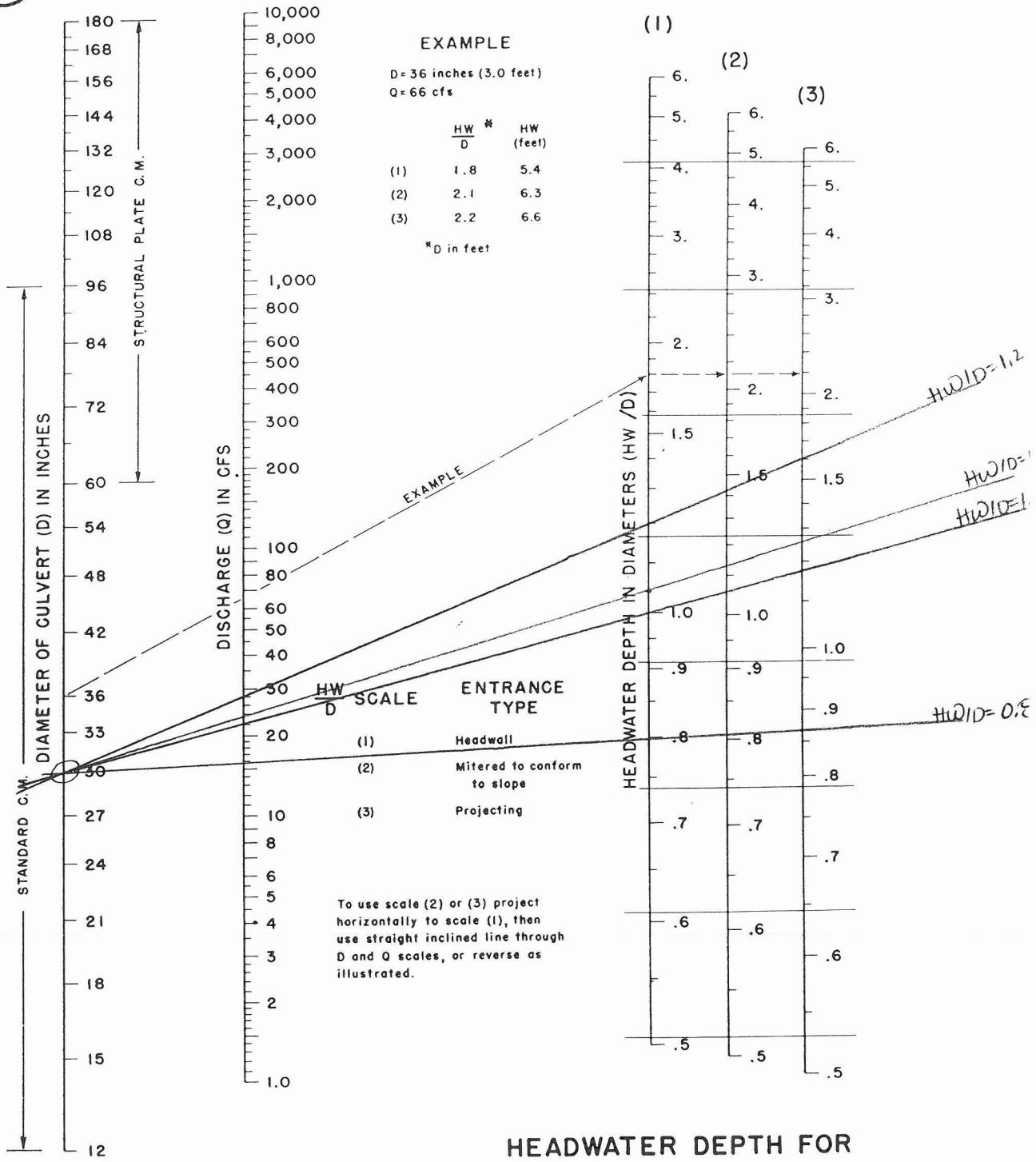
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #79 (3-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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BY _____ DATE _____

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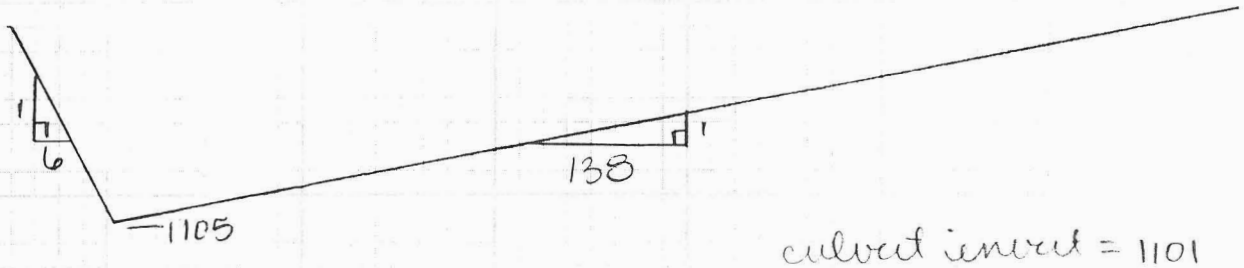
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1105) Culvert # 79 (3-30'CM



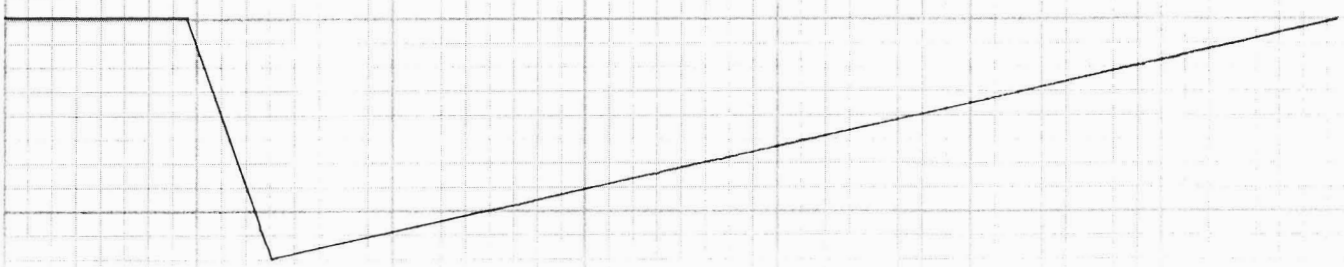
culvert invert = 1101

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.002
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

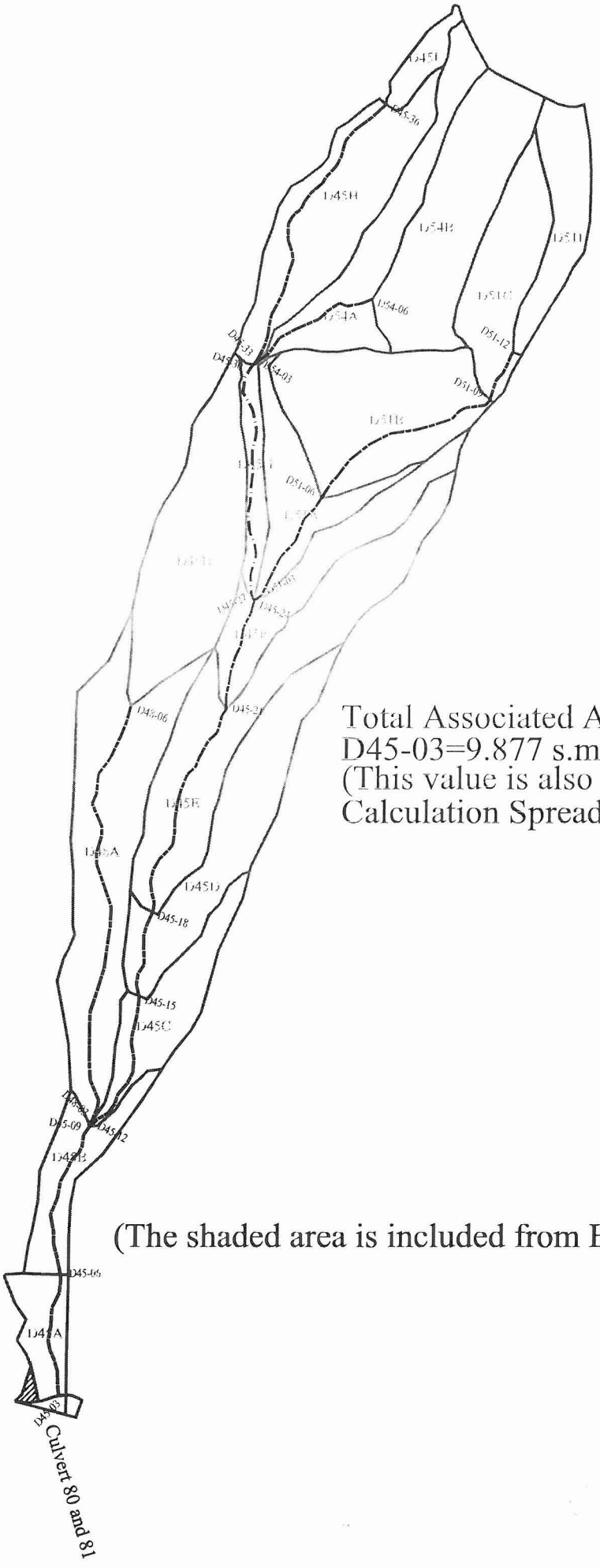
Weir Analysis (at EL >)



$$Q = C L H^{1.5}$$

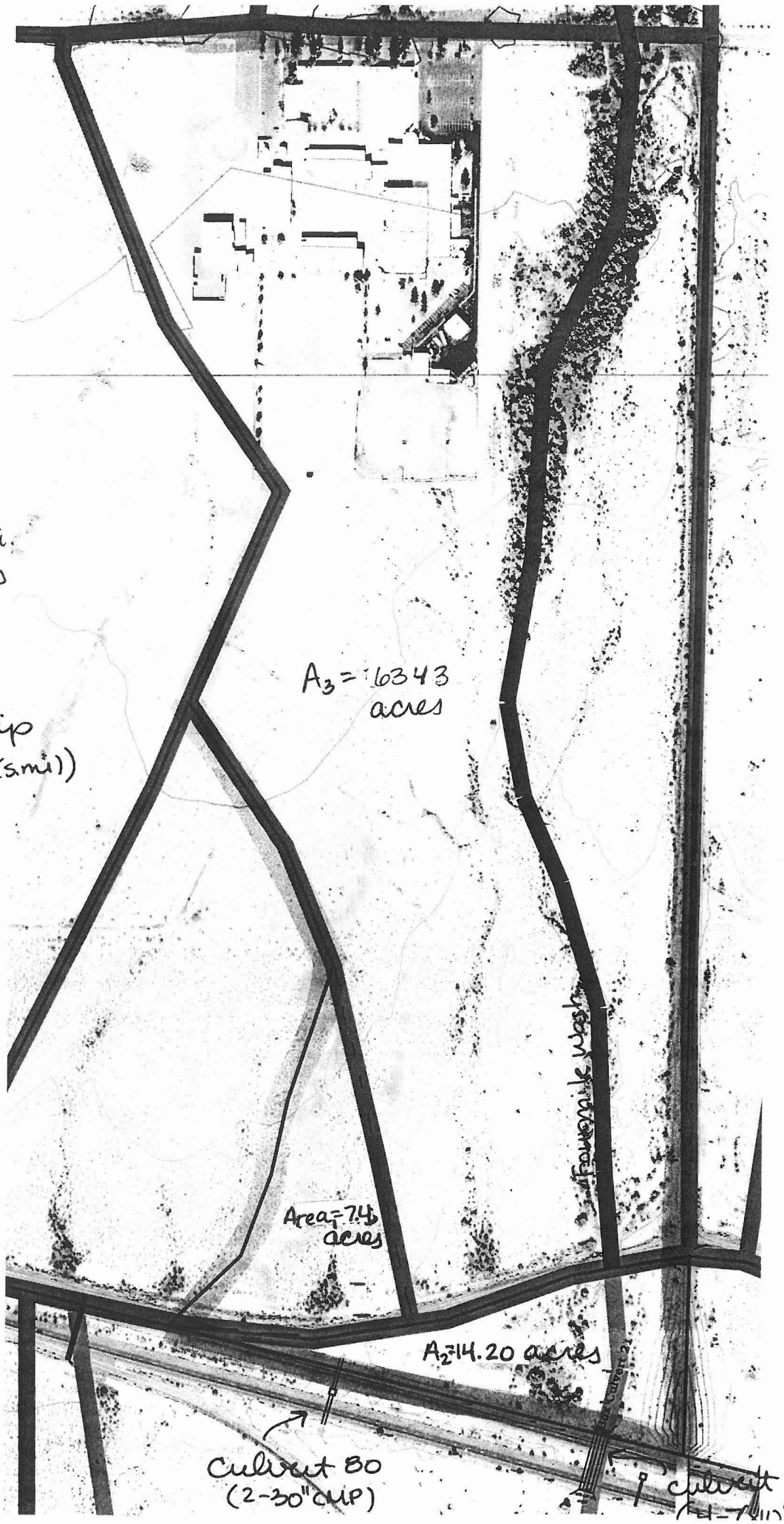
where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell\left(\frac{2}{3}\bar{H}\right)}{L + \ell}\right)$$



Total Associated Area to
D45-03=9.877 s.mi.=6321 acres
(This value is also shown on the Flow Calculation Spreadsheet)

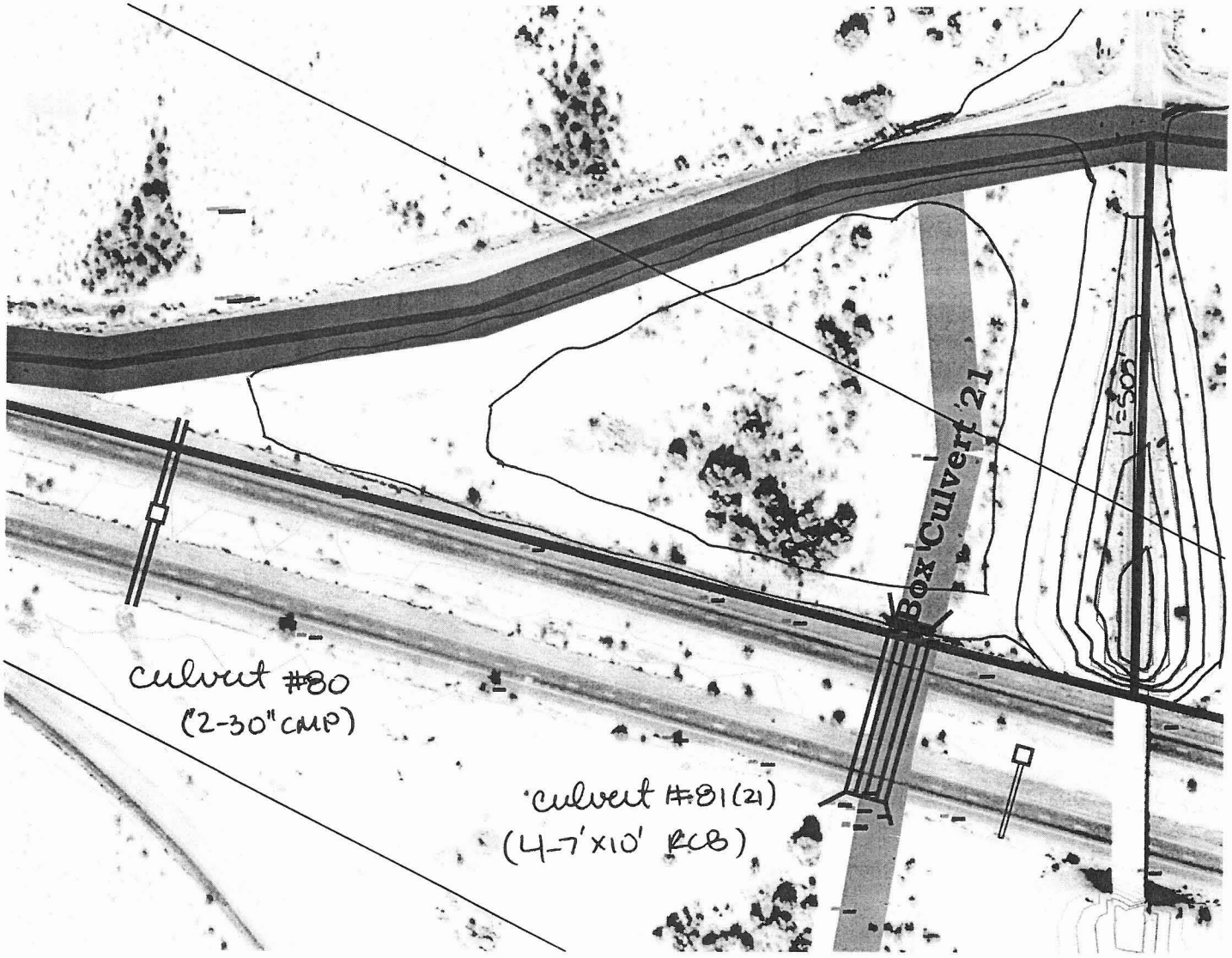
(The shaded area is included from Basin C102)



Total Area =
$A_1 + A_2 + A_3$
= 9.91 s.mi.
≃ 6343 acres

Q = 5054 cfs

(Area-Flow Relationship
Q = 510 x Area (s.mi))



* assumed culverts were side-by-side, therefore they were at the same invert 1089.2 ft.

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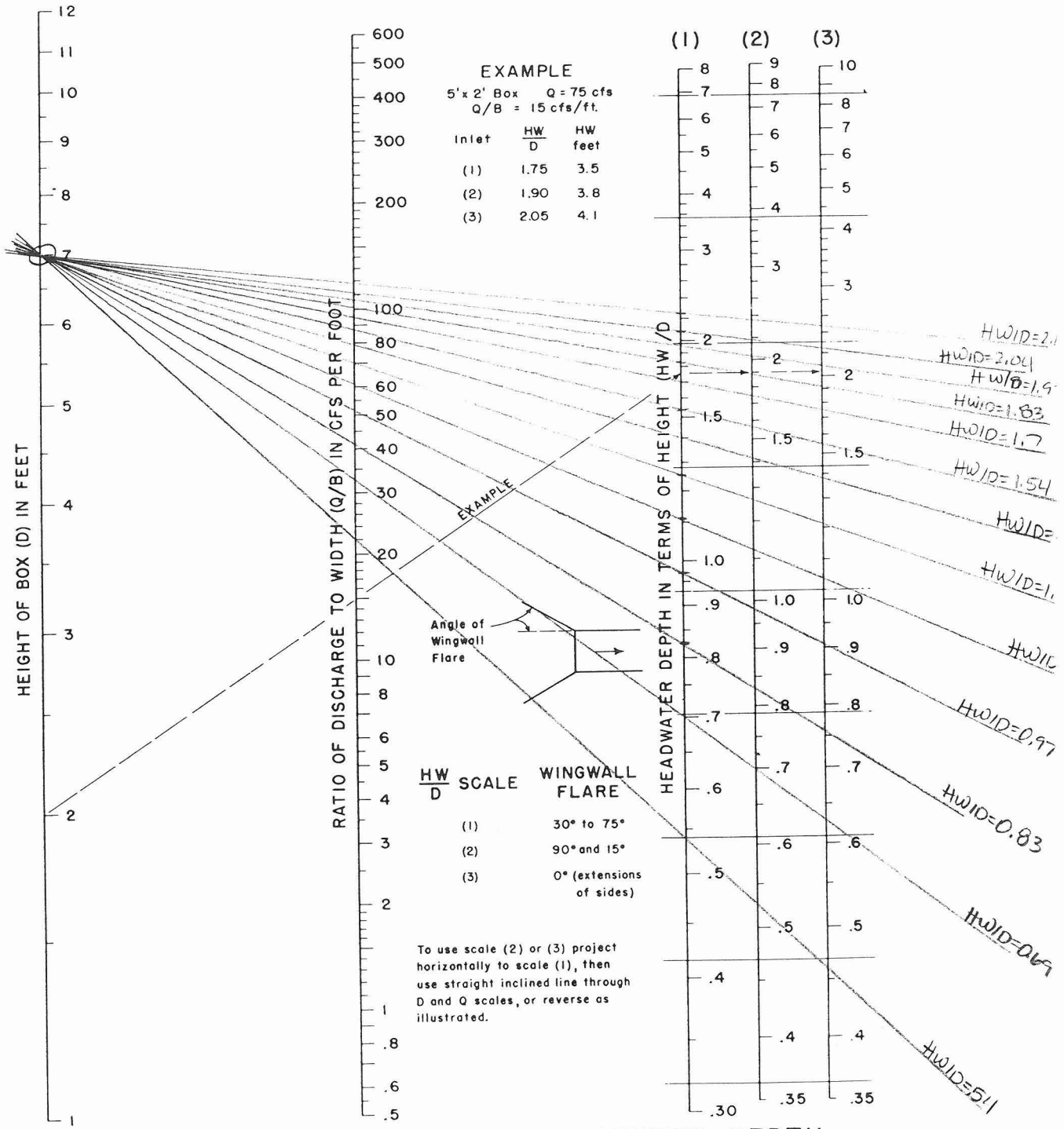
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #81 (21)
(4-7'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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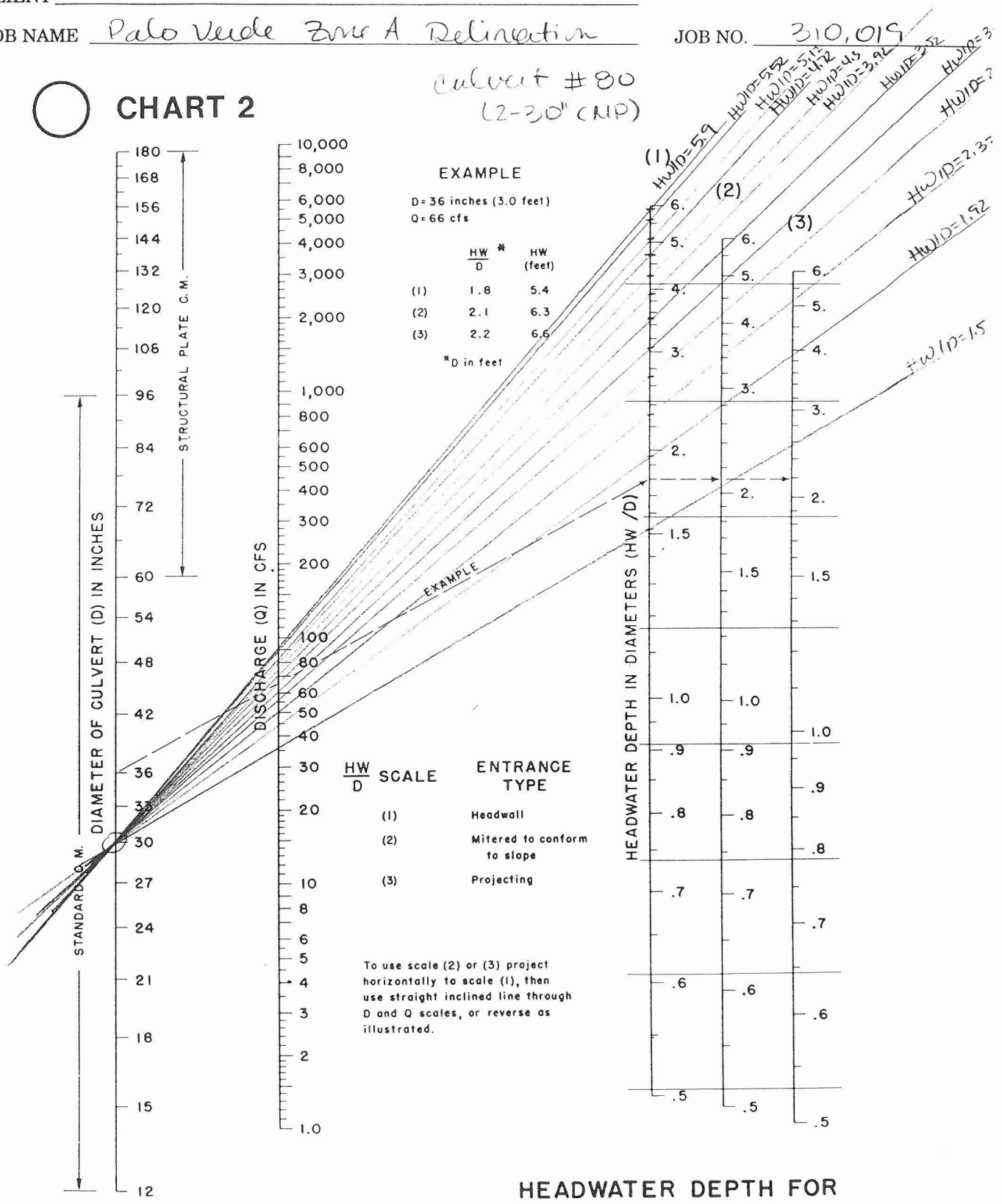
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. 310,019

Culvert #80
(2-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Culvert ID	Culvert Type	Elevation (ft)	HW (ft)	30" CMP Chart 2 or 8 HW/D	Q-culvert (cfs)	7' x 10' RCB Chart 2 or 8 HW/D	Q/B Chart 8 (cfs/ft)	Q-culvert (cfs)	Total Q-culvert (cfs)
80 and	2-30" CMP	1089.2							
81 (21)	4-7' x 10' RCB	1093	3.8	1.52	72	0.54	22.00	880	952
		1094	4.8	1.92	90	0.69	33.00	1320	1410
		1095	5.8	2.32	100	0.83	41.00	1640	1740
		1096	6.8	2.72	112	0.97	51.00	2040	2152
		1097	7.8	3.12	120	1.11	60.00	2400	2520
		1098	8.8	3.52	132	1.26	70.00	2800	2932
		1099	9.8	3.92	140	1.40	80.00	3200	3340
		1100	10.8	4.32	150	1.54	88.00	3520	3670
		1101	11.8	4.72	160	1.69	95.00	3800	3960
		1102	12.8	5.12	168	1.83	100.00	4000	4168
		1103	13.8	5.52	180	1.97	106.00	4240	4420
		1103.5	14.3	5.72	182	2.04	110.00	4400	4582
		1103.6	14.4	5.76	184	2.06	113.00	4520	4704
		1104	14.8	5.92	186	2.11	119.00	4760	4946

SHEET ____ OF ____
BY ____ DATE ____
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JOB NO. 310.019

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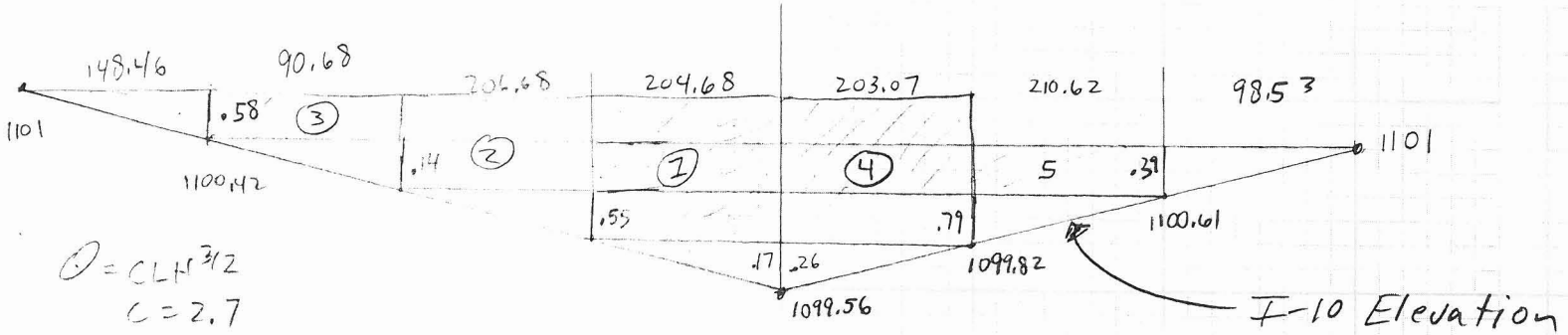
JOB NAME PALO VERDE

WSEL is 1101 over I-10 for both culverts 81 & 83.



$Q = CLH^{3/2}$

$C = 2.7$

$Q_1 = 2.7(204.68)(1.27)^{3/2} = 791\,cfs$

$Q_2 = 2.7(206.68)(.72)^{3/2} = 341\,cfs$

$Q_3 = 2.7(90.68)(.58)^{3/2} = 108\,cfs$

$Q_4 = 2.7(203.07)(1.18)^{3/2} = 703\,cfs$

$Q_5 = 2.7(210.62)(.39)^{3/2} = 139\,cfs$

2082 cfs
5580
1780
9442

Culverts 81 & 83
WSEL = 1101

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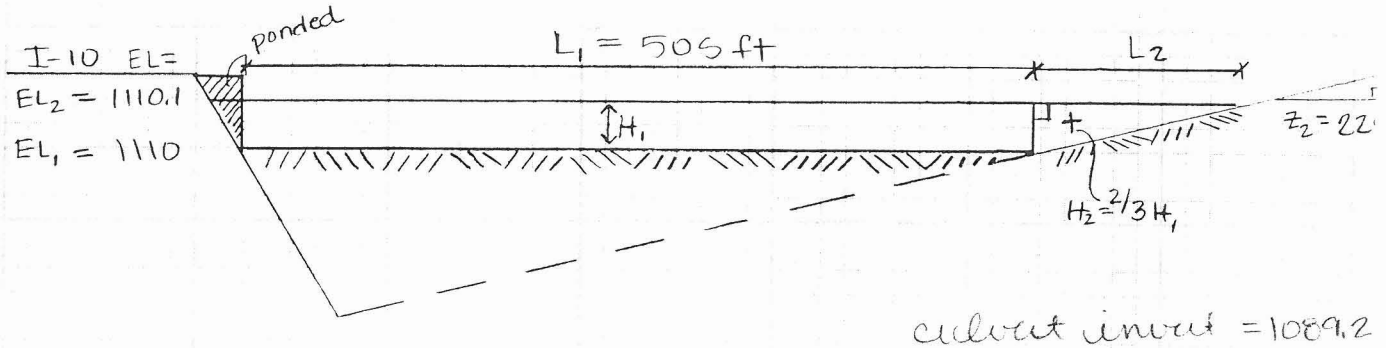
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL >1110)



culvert invert = 1089.2

$H_1 = E_2 - E_1 = 1110.1 - 1100 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(229) = 22.9$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(505)(0.10) + (22.9)(0.0667)}{505 + 22.9} = 0.$

$L_T = L_1 + L_2 = 505 + 22.9$ ft $= 527.9$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(527.9)(0.0986)^{1.5} = 44.1$ cfs

$\simeq$ 44 cfs

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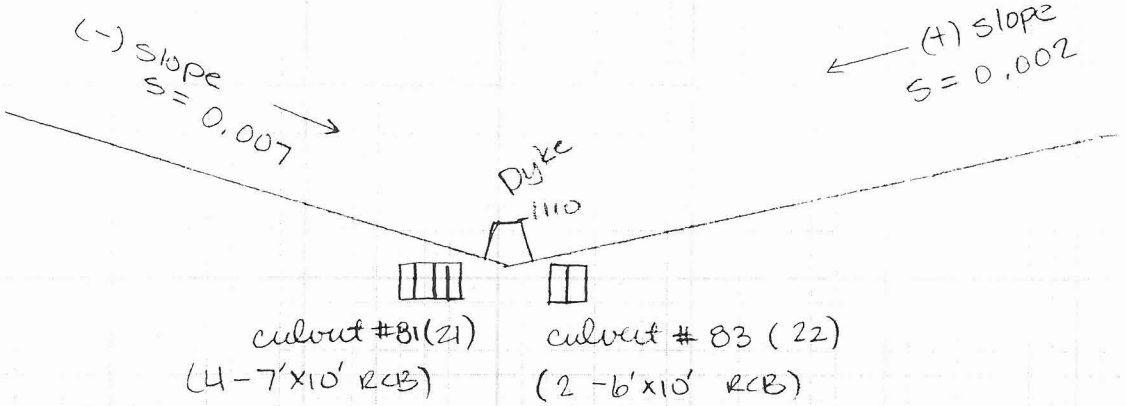
JOB NAME Palo Verde Zone A Relinecali...

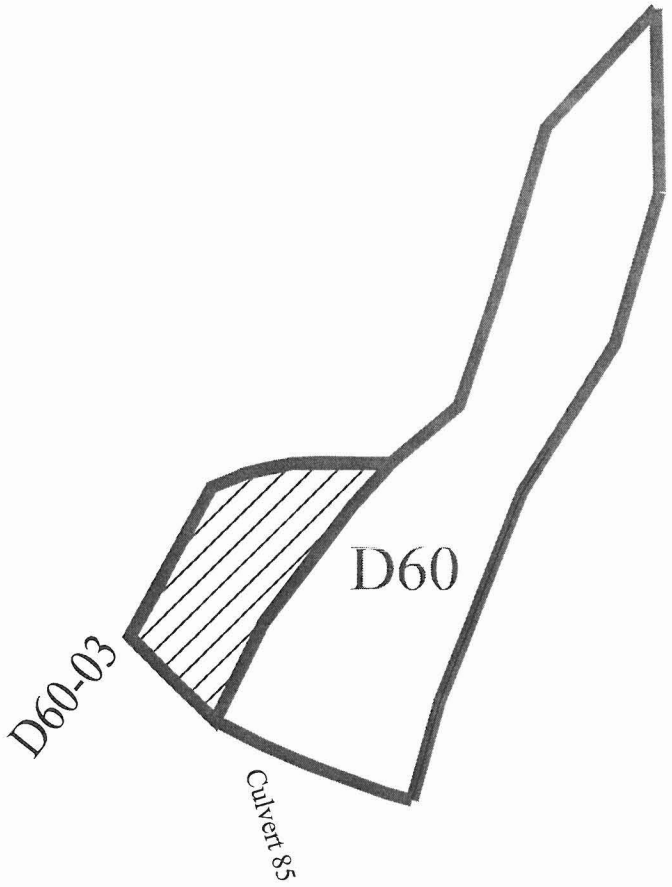
JOB NO. 310.019



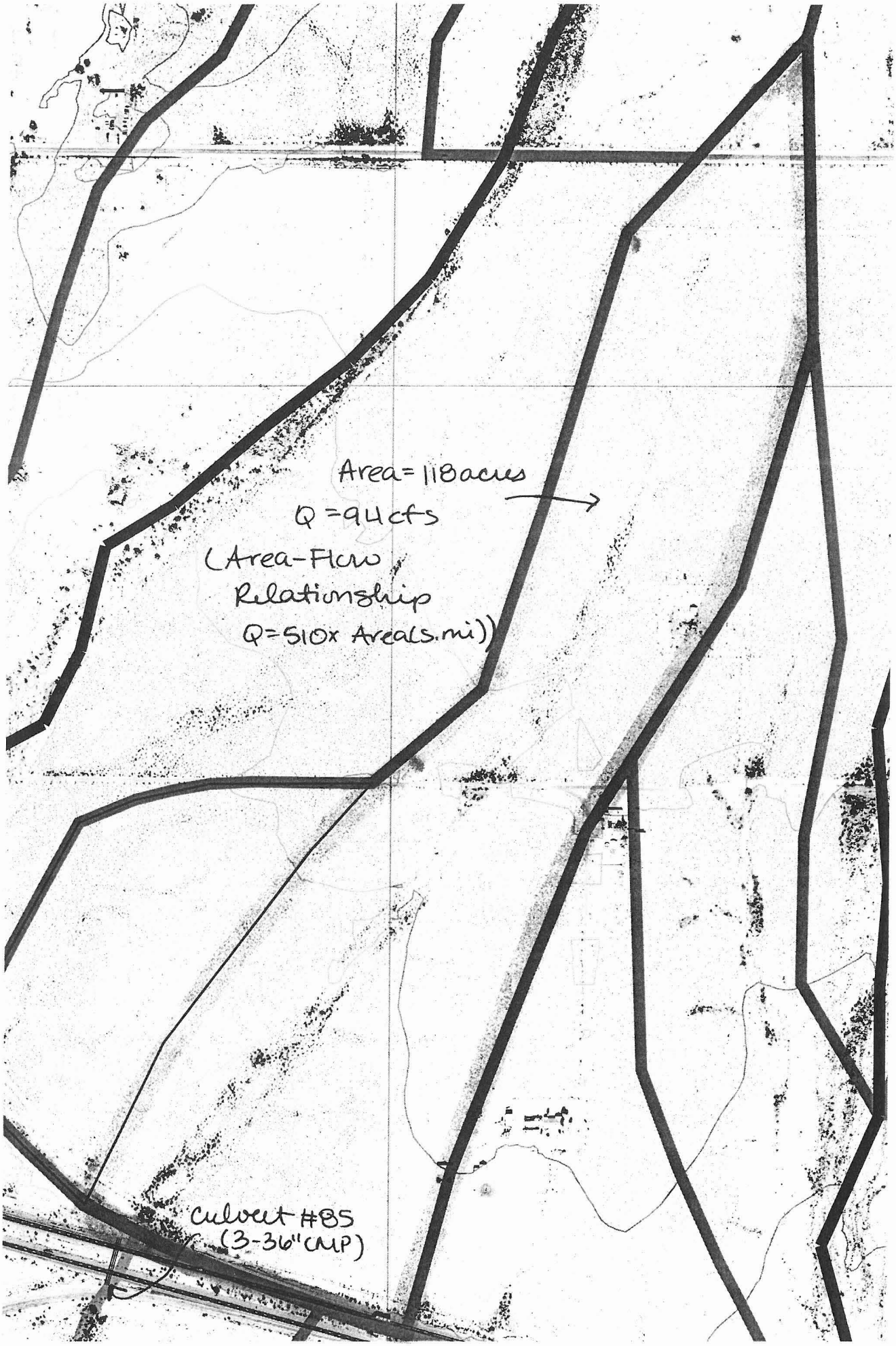
culverts 79 to 81

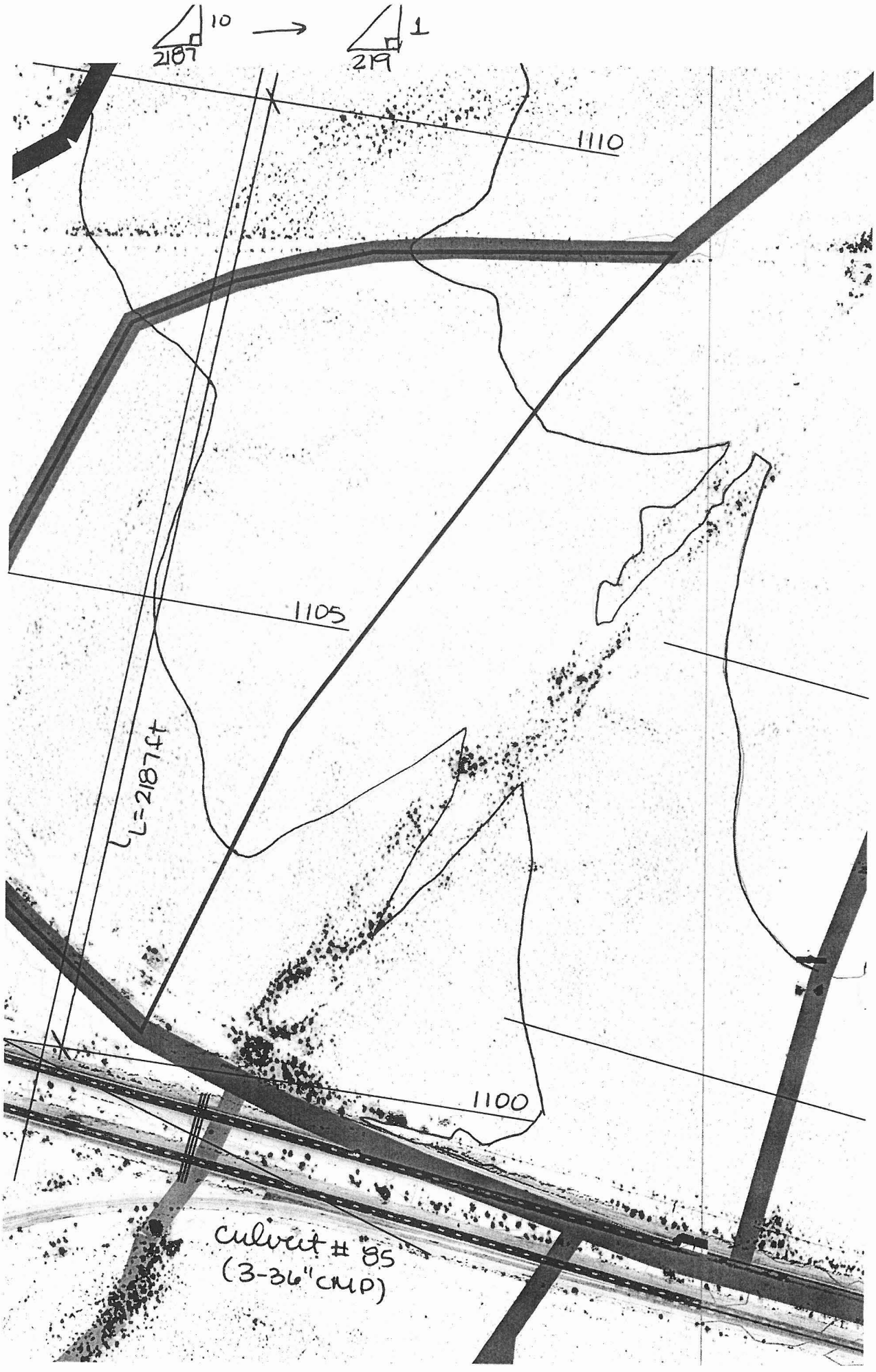
culverts 83 and 85

Total Associated Area to
D60-03=0.234 s.mi.=150 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The shaded area is included in the analysis of Culvert #83)


Area = 118 acres
Q = 94 cfs
(Area-Flow
Relationship
Q = 510 x Area(s.mi))
culvert #85
(3-36" CMP)


10
2187
1
219
1110
1105
L=2187ft
1100
culvert # 85
(3-36" CMP)

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BY ____ DATE ____

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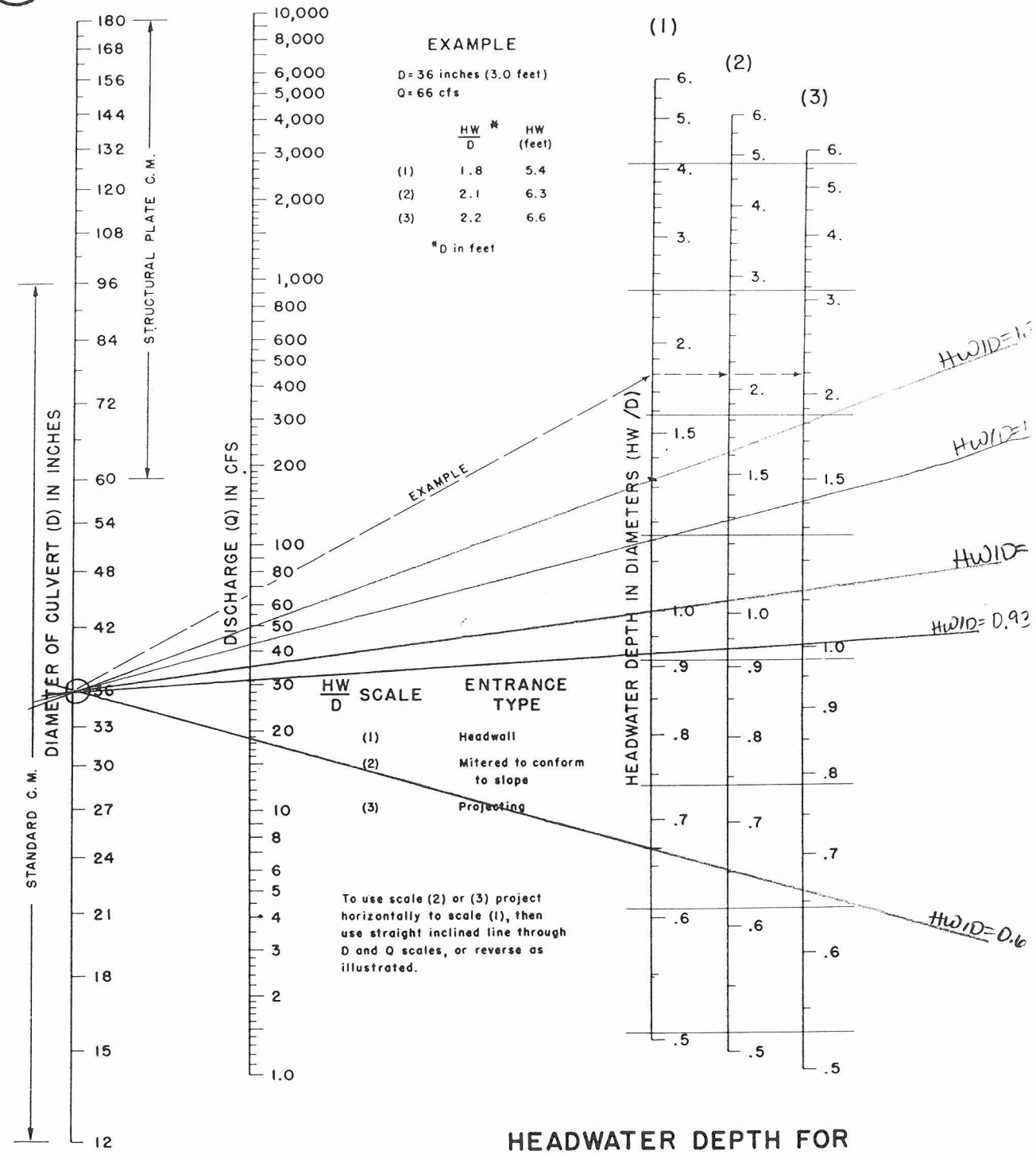
JOB NAME Palo Verde Zone A Relineation JOB NO. 310.019

culvert #85 (3-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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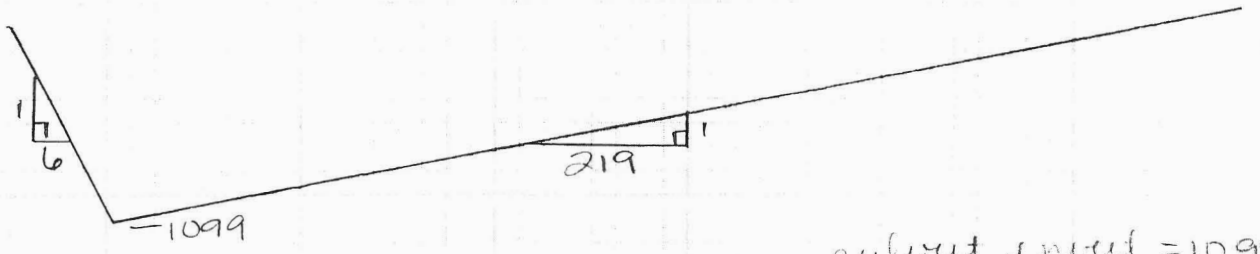
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1099)

culvert # 85
(3-36" CMP)



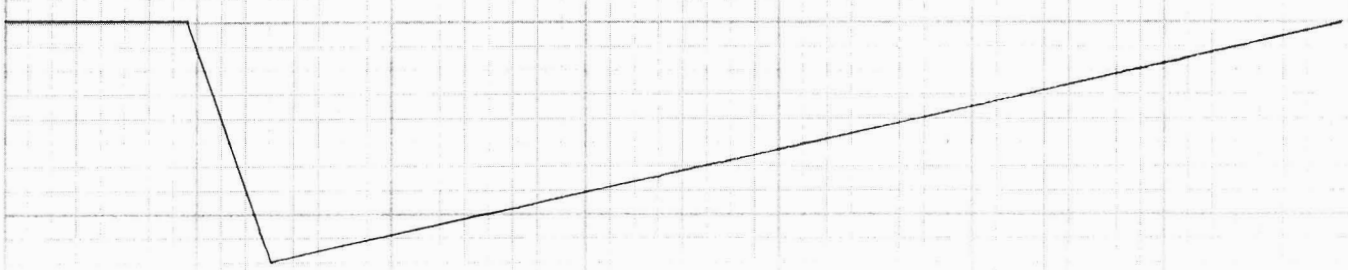
culvert invert = 1094

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where n = 0.065
S = downstream slope = 0.002
A = Area of channel cross section
R = $(\frac{A}{P})^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL >)

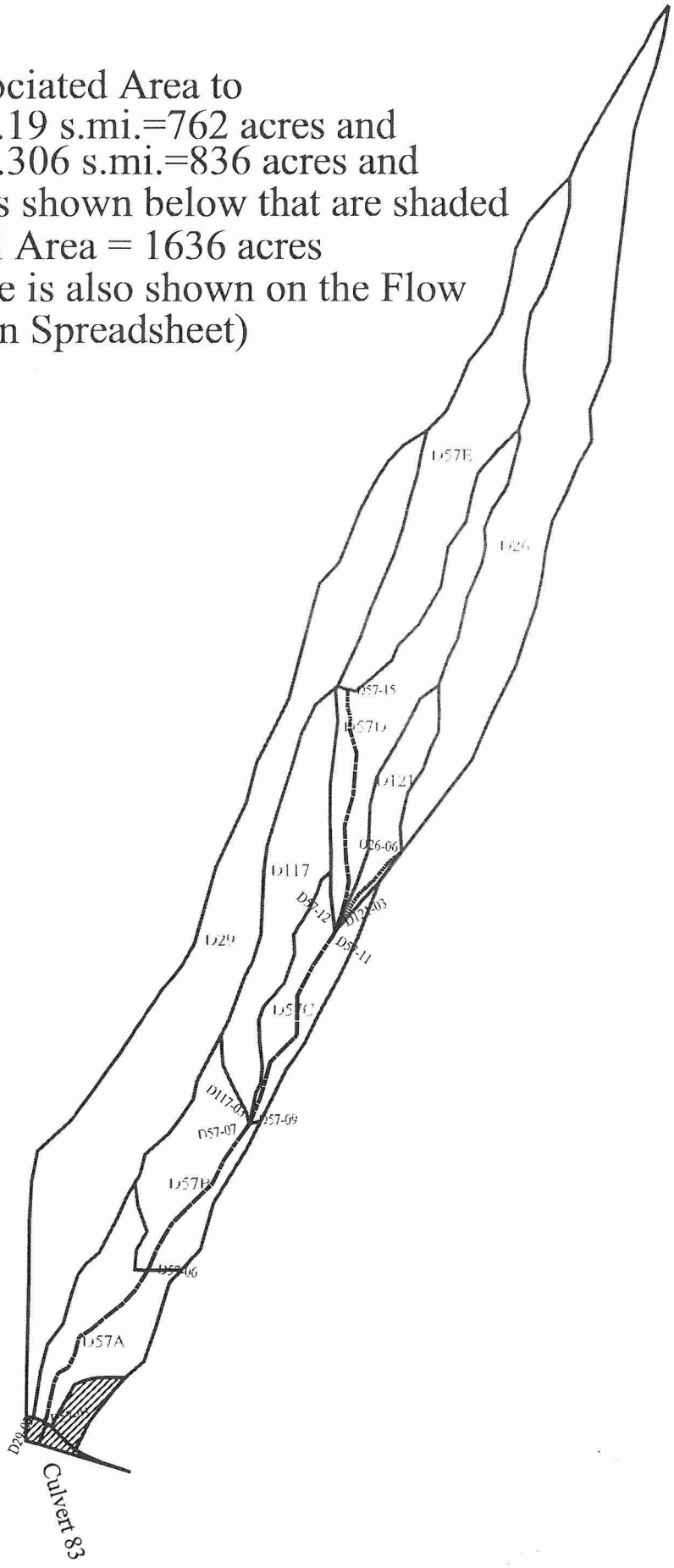


$$Q = C L H^{1.5}$$

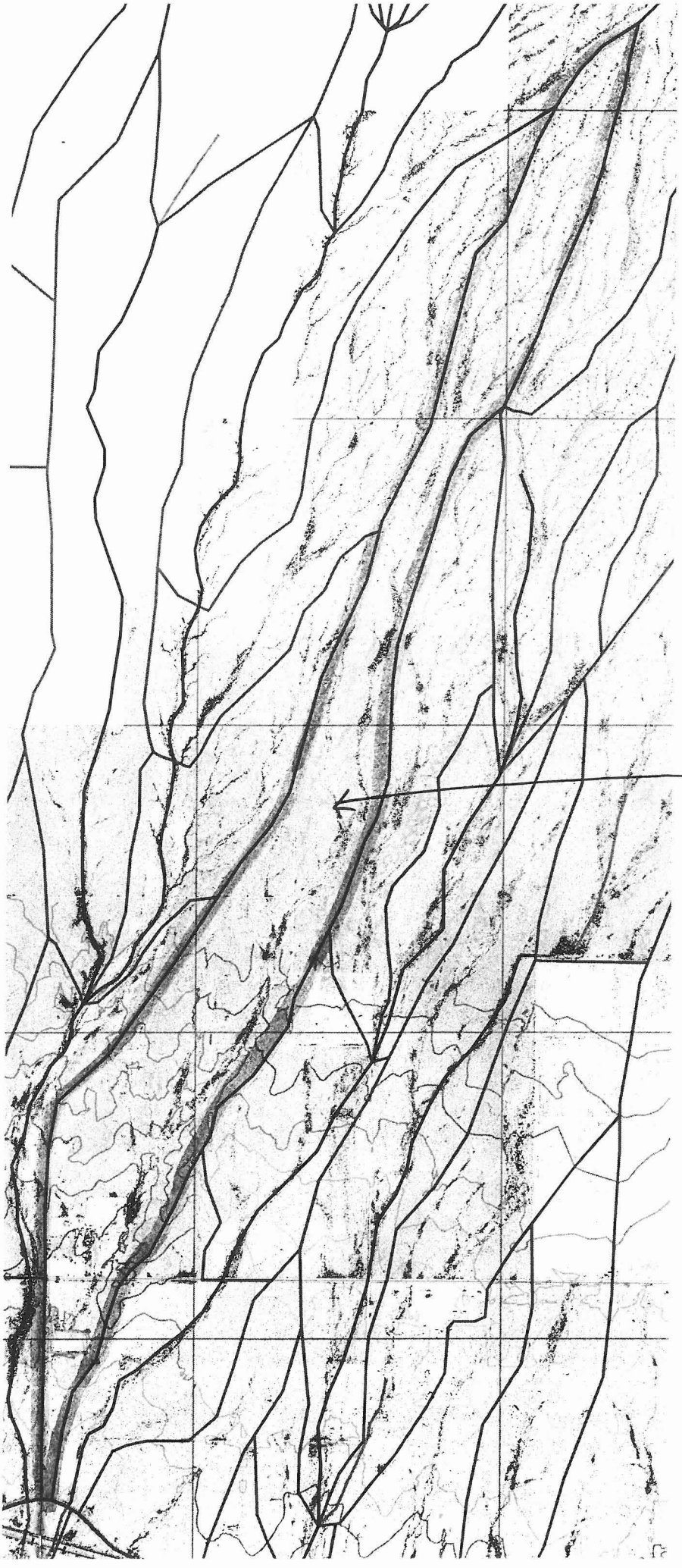
where C = 2.7
L = length of berm/dyke
H = weighted avg $\overline{H}$

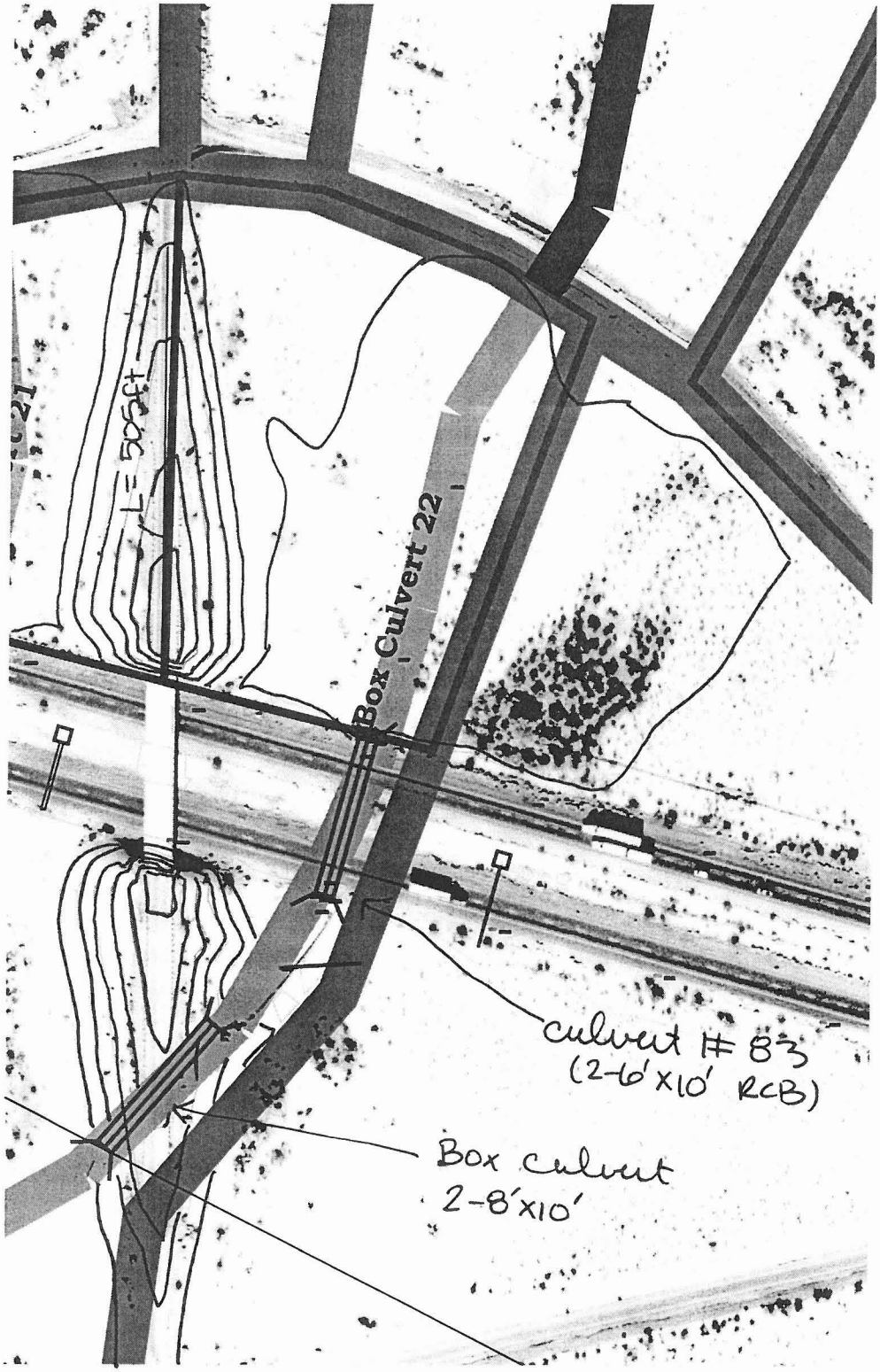
$$\left(H = \frac{L(\overline{H}) + \ell(\frac{2}{3}\overline{H})}{L+\ell}\right)$$

Total Associated Area to
D29-03=1.19 s.mi.=762 acres and
D57-03=1.306 s.mi.=836 acres and
small areas shown below that are shaded
for a Total Area = 1636 acres
(This value is also shown on the Flow
Calculation Spreadsheet)



D57B
A_3 = 762 ac.
(Entire basin shown on next page)
A_1 = 836 ac.
Total Area = $A_1+A_2+A_3+A_4+A_5$ = 1636 ac.
Q = 1304 cfs
(Area-Flow Relationship
Q = 510x Area (s.mi.)
D57A
A_2 = 31.6 acres (Area from Basin D60)
A_4
A_5 = 5.59 ac.
A_4 = 0.804 ac.
Culvert #83 (2-6'x10' RCB)


$A_3 = 7.62$ acres


Box Culvert 22
culvert # 83
(2-6'x10' RCB)
Box culvert
2-8'x10'

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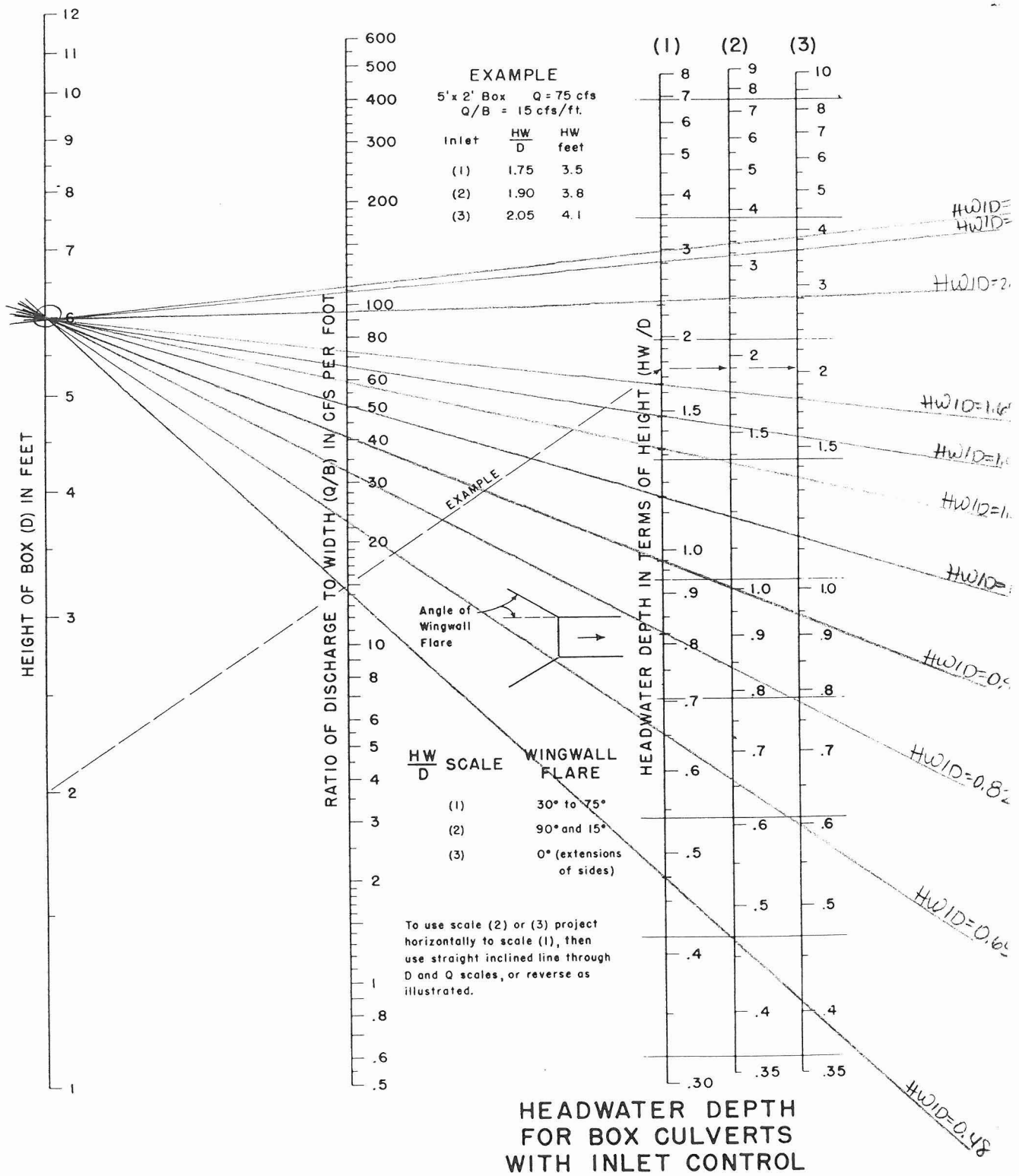
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #83 (2-6'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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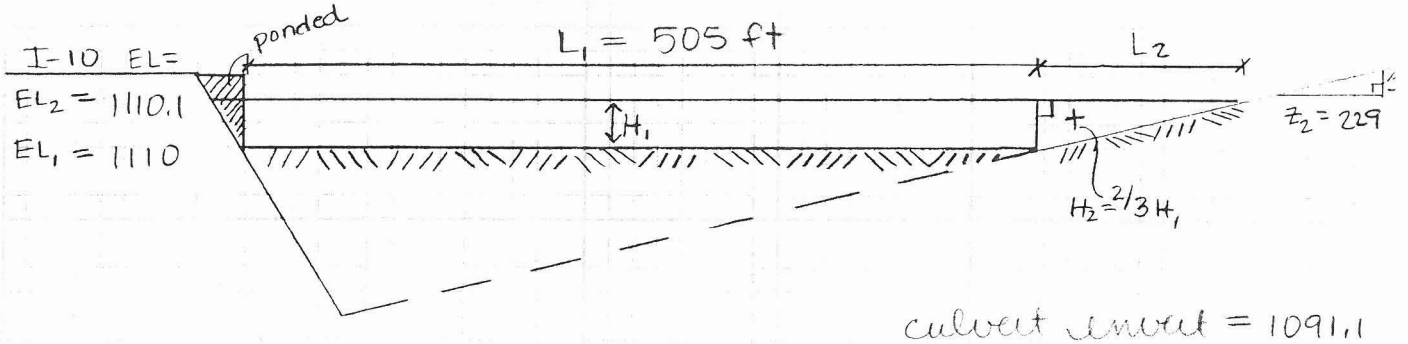
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1110)

culvert #83
(2-6'x10' RCB)



culvert invert = 1091.1

$H_1 = E_2 - E_1 = 1110.1 - 1110 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(22.9) = 22.9$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(505)(0.10) + (22.9)(0.0667)}{505 + 22.9}$

$= 0.0986$ ft

$L_T = L_1 + L_2 = 505 + 22.9 = 527.9$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7(527.9)(0.0986)^{1.5} = \underline{\underline{44 \text{ cfs}}}$

Box Culvert 22
All flow from culvert #83(22) is directed to the culvert down stream.
2-8'x10' Box Culvert (No Survey for this)

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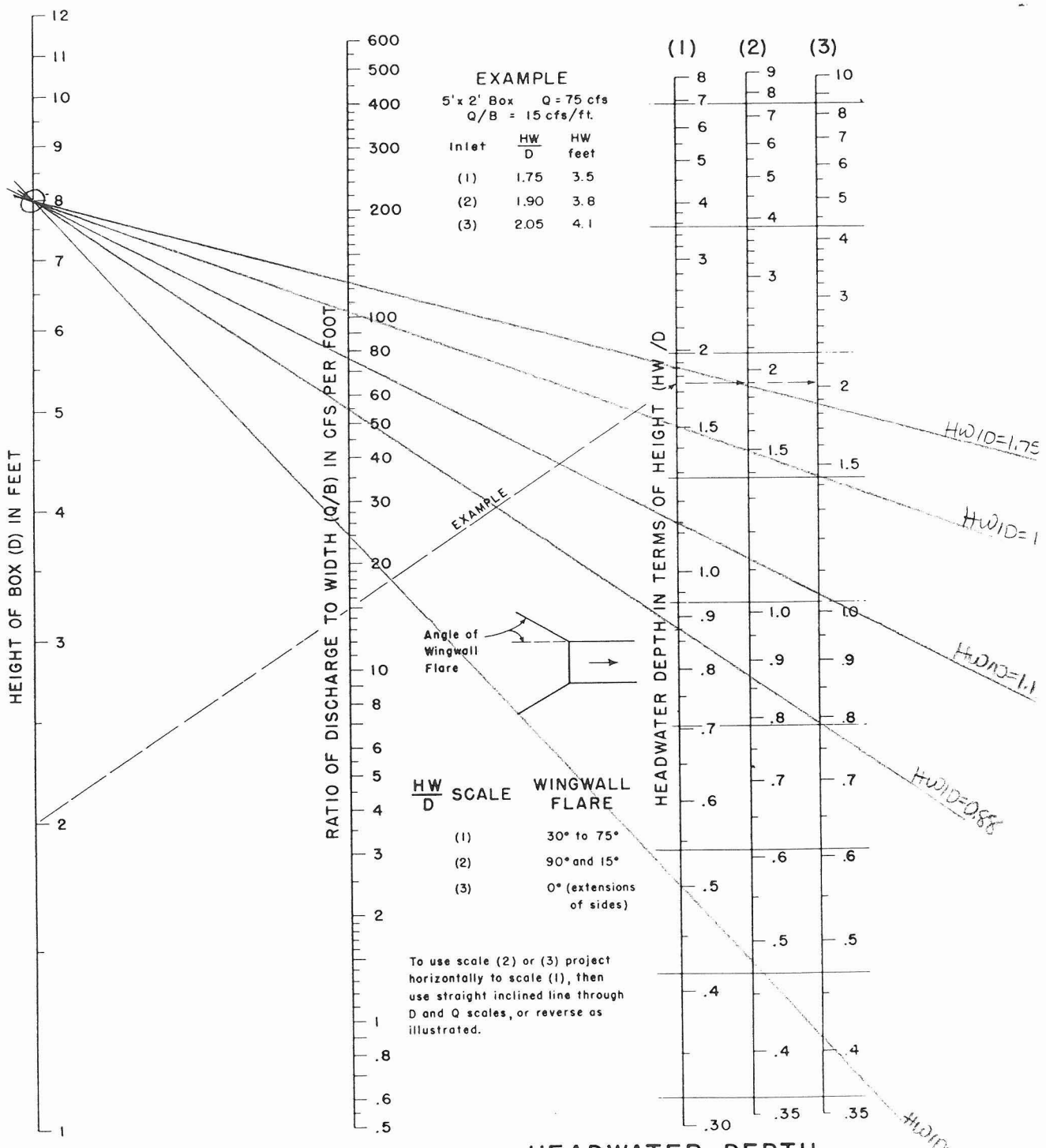
JOB NAME Palo Verde Zone A Relineation JOB NO. 310.019

Box culvert (2-8'x10')
(No survey for this culvert)

☐ CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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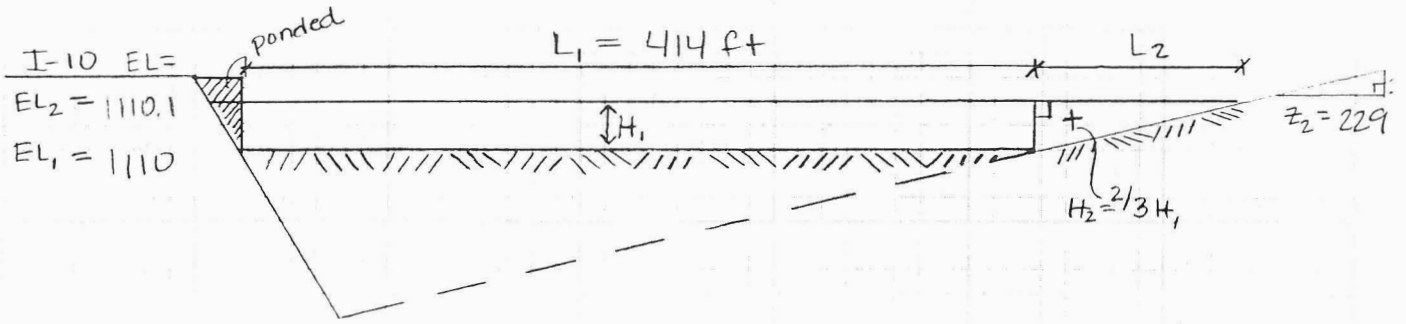
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1110)

Box Culvert (2-8'x10'
(No survey for this cul



culvert invert = 1086 ft

$H_1 = E_2 - E_1 = 1110.1 - 1110 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(229) = 22.9$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.067$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(414)(0.10) + (22.9)(0.067)}{414 + 22.9} = 0.0983$

$L_T = L_1 + L_2 = 414 + 22.9 = 436.9$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = (2.7)(436.9)(0.0983)^{1.5} = 36$ cfs

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BY _____ DATE _____

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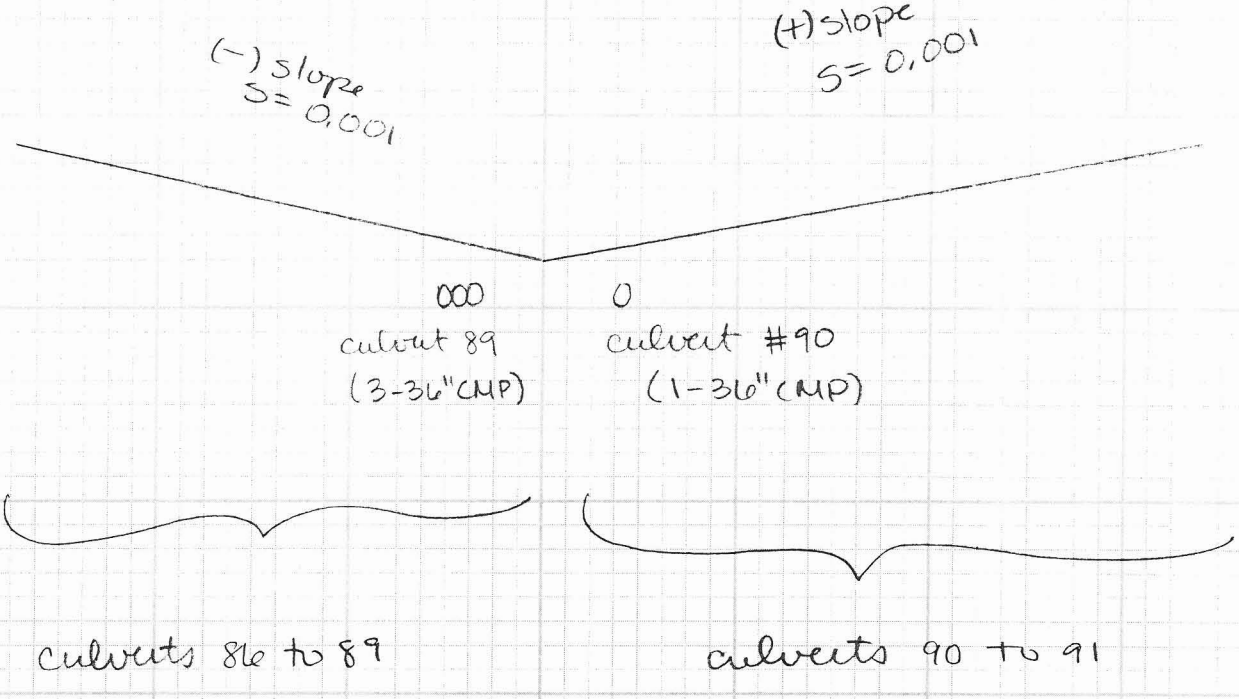
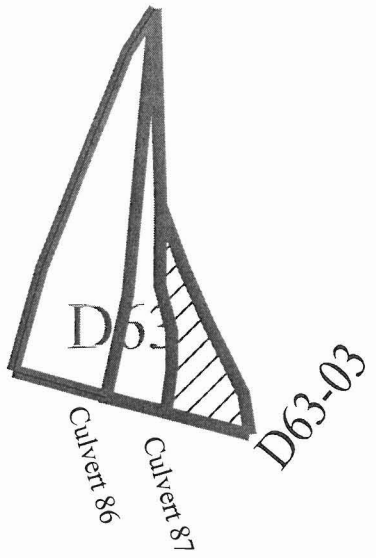
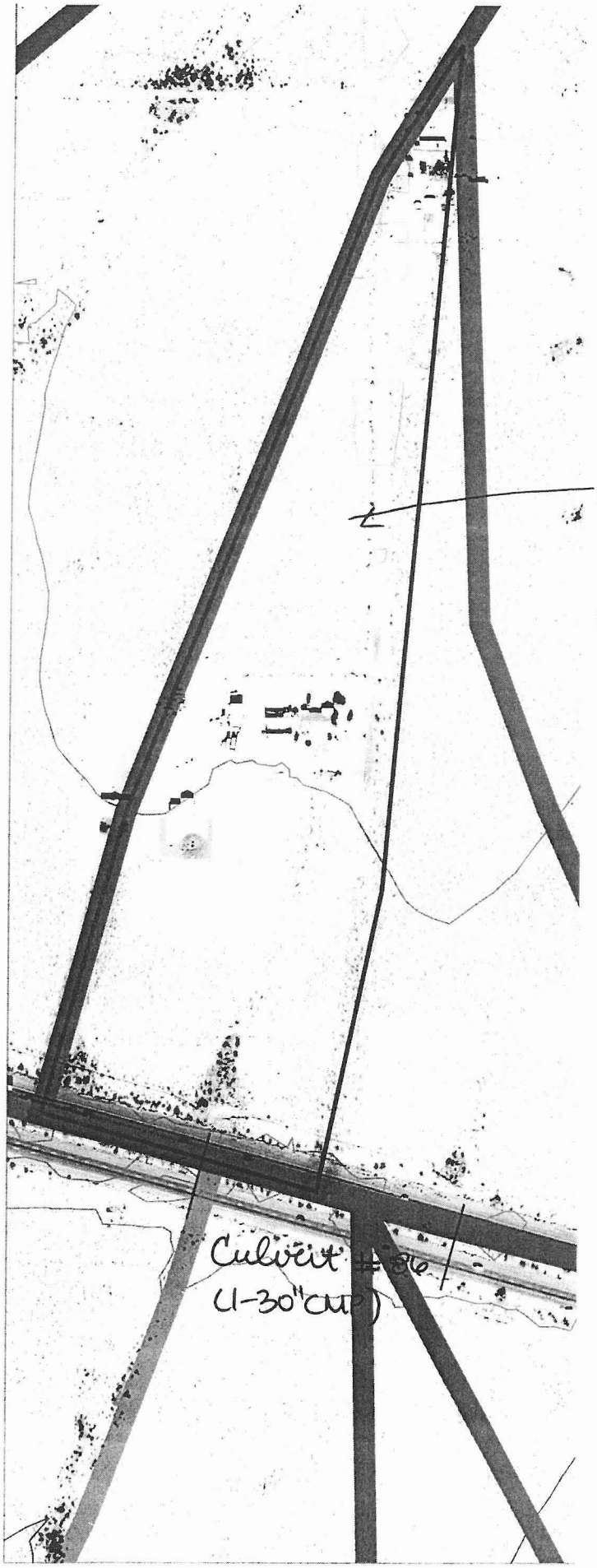
JOB NAME Palo Verde Zone A Relineation JOB NO. 310.019



Total Associated Area to
D63-03=0.07 s.mi.=44.8 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The shaded area is included with the Culvert #88 Analylsis)


Area=24 acres
Q=19 cfs
(Area-Flow
Relationship
Q=510 x Area(s.mi)^.5
Culvert #36
(1-30" CMP)

5
926
1
185
1110
L= 926 ft
1105
culvert #86
(1-30" CMP)

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BY ____ DATE ____

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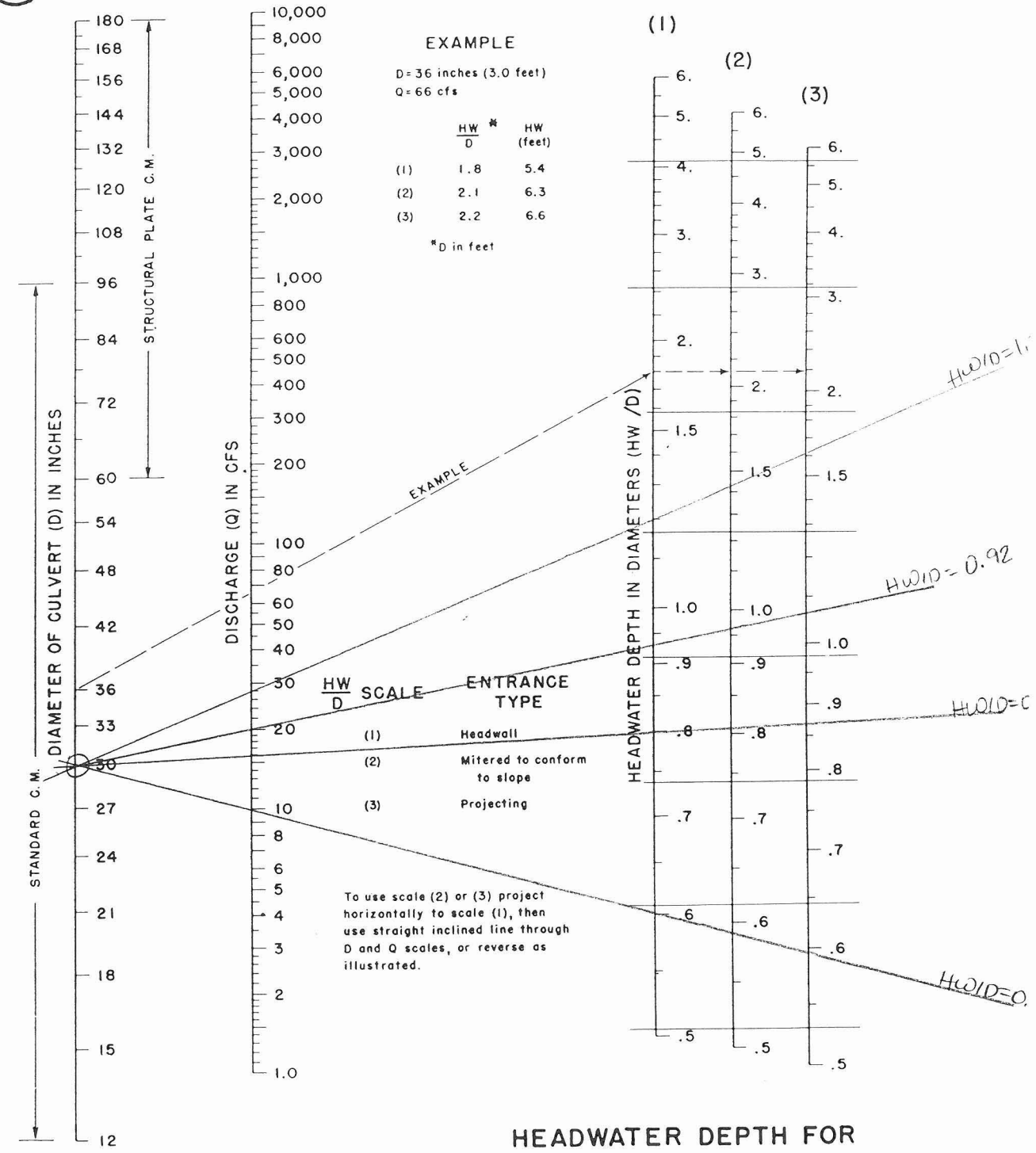
CLIENT FCDMC

JOB NAME Palo Verde Zone A Relocation JOB NO. 3110.019

culvert #86 (1-30" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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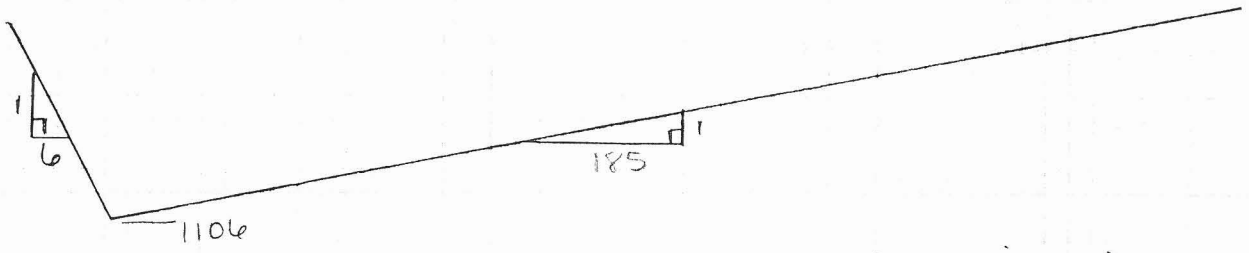
JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1106) culvert #86 (1-30" CMP)



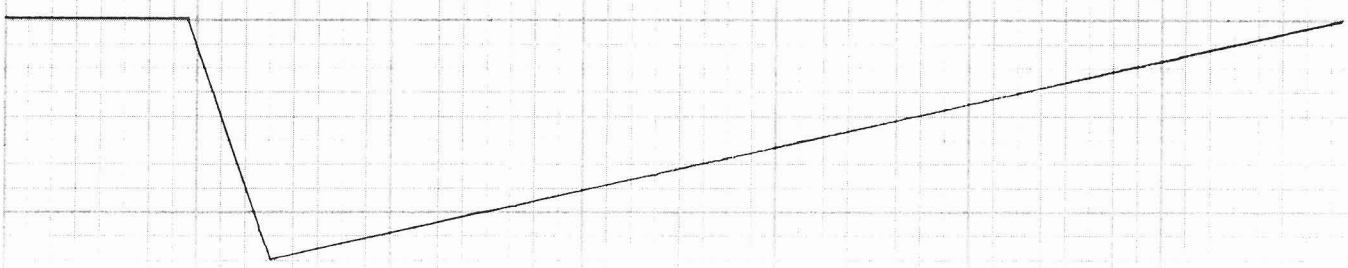
culvert invert = 1102

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

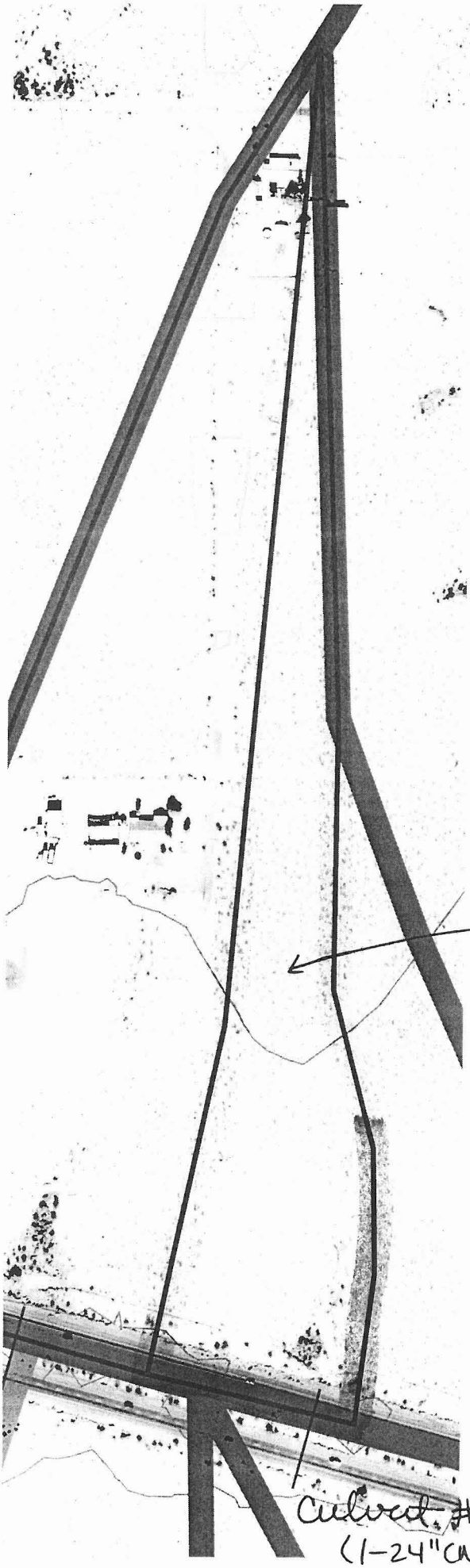
Weir Analysis (at EL>)

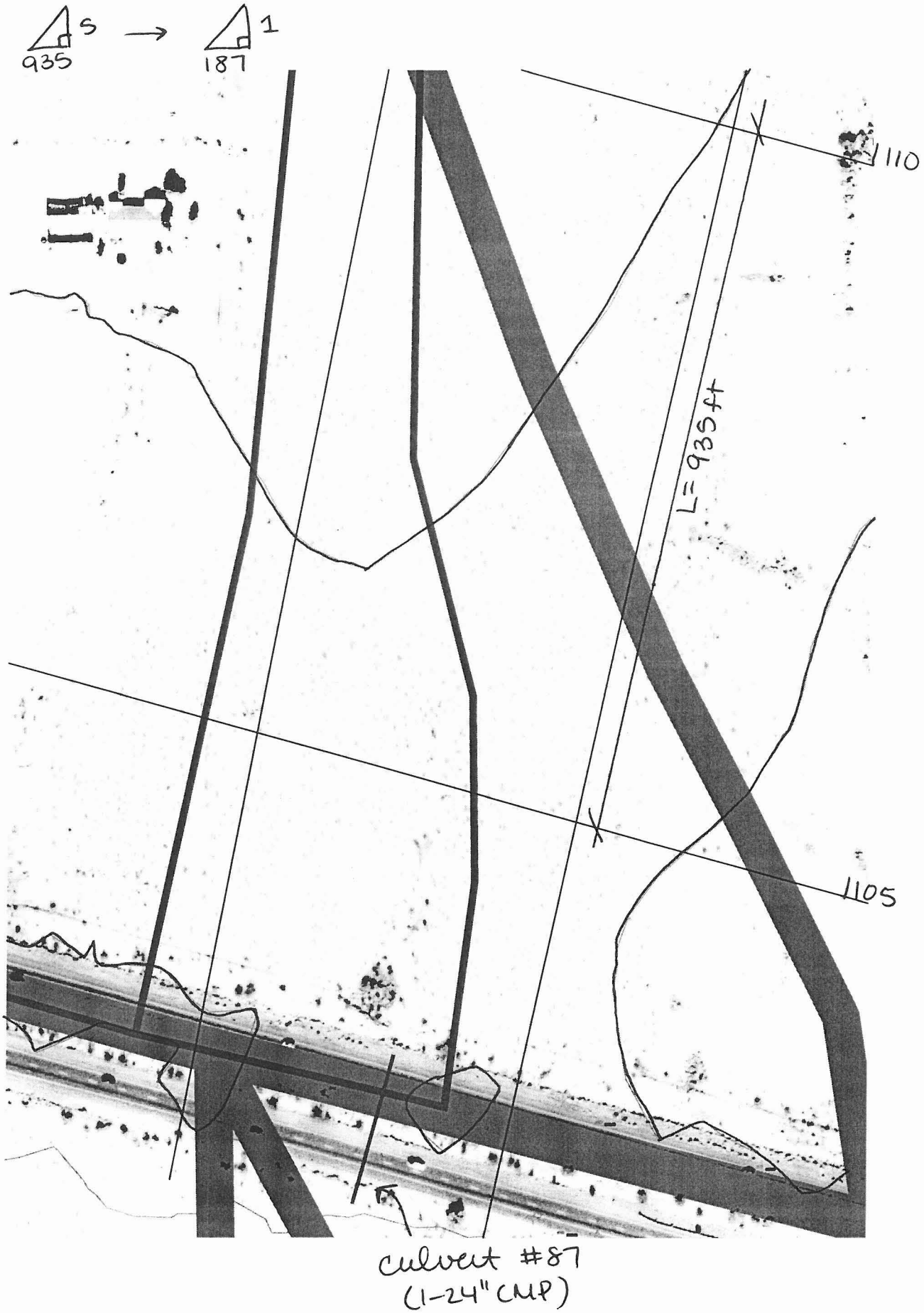


$$Q = C L H^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell\left(\frac{2}{3}\overline{H}\right)}{L + \ell}\right)$$


Area = 11 acres
Q = 9 cfs
(Area-Flow
Relationship
Q = 510 x Area (s mi
Culvert #87
(1-24" CMP)


5
935
1
187
110
L=935ft
1105
culvert #87
(1-24" CMP)

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BY ____ DATE ____

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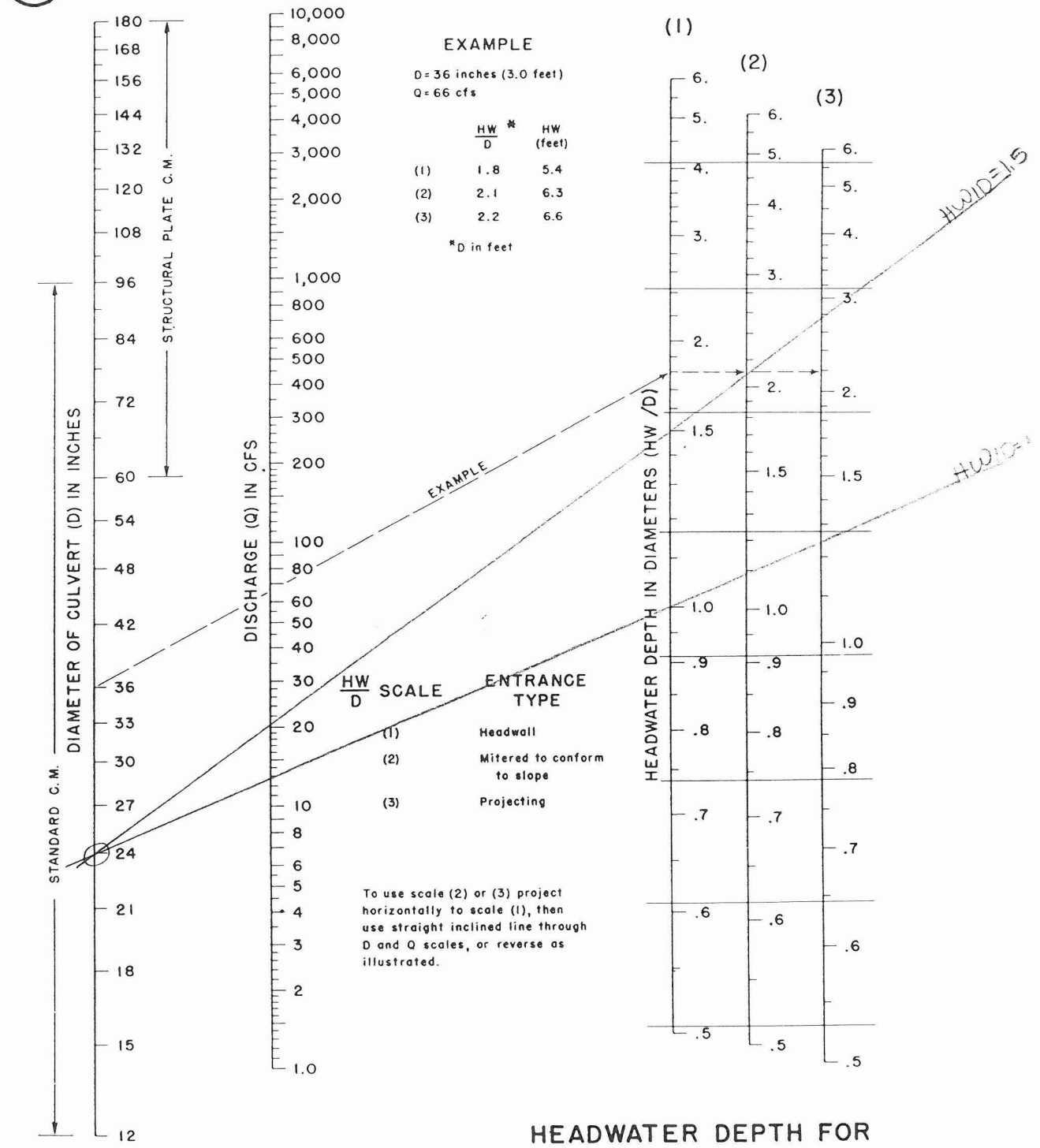
JOB NAME Palo Verde Zone A Relocation JOB NO. 310.019

Culvert #87 (1-24" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

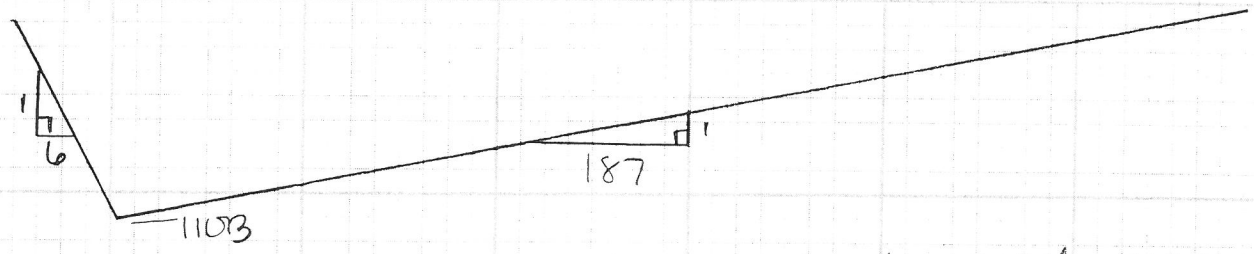
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1103)

culvert #87
(1-24 CMP)



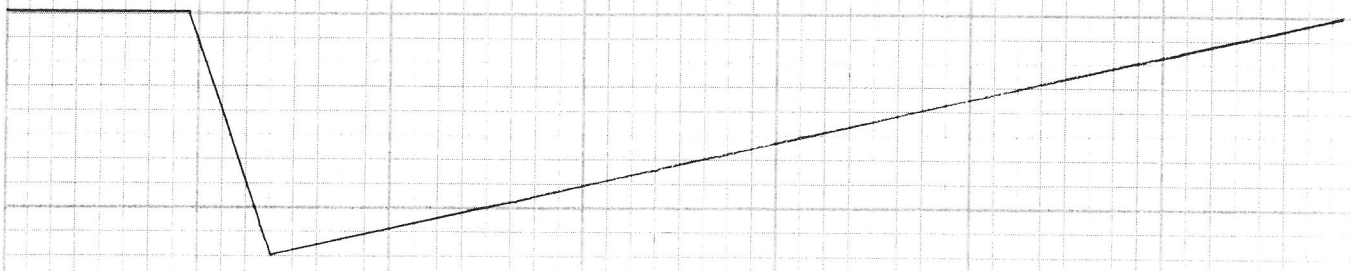
culvert invert = 1100

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope $= 0.001$
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL >)

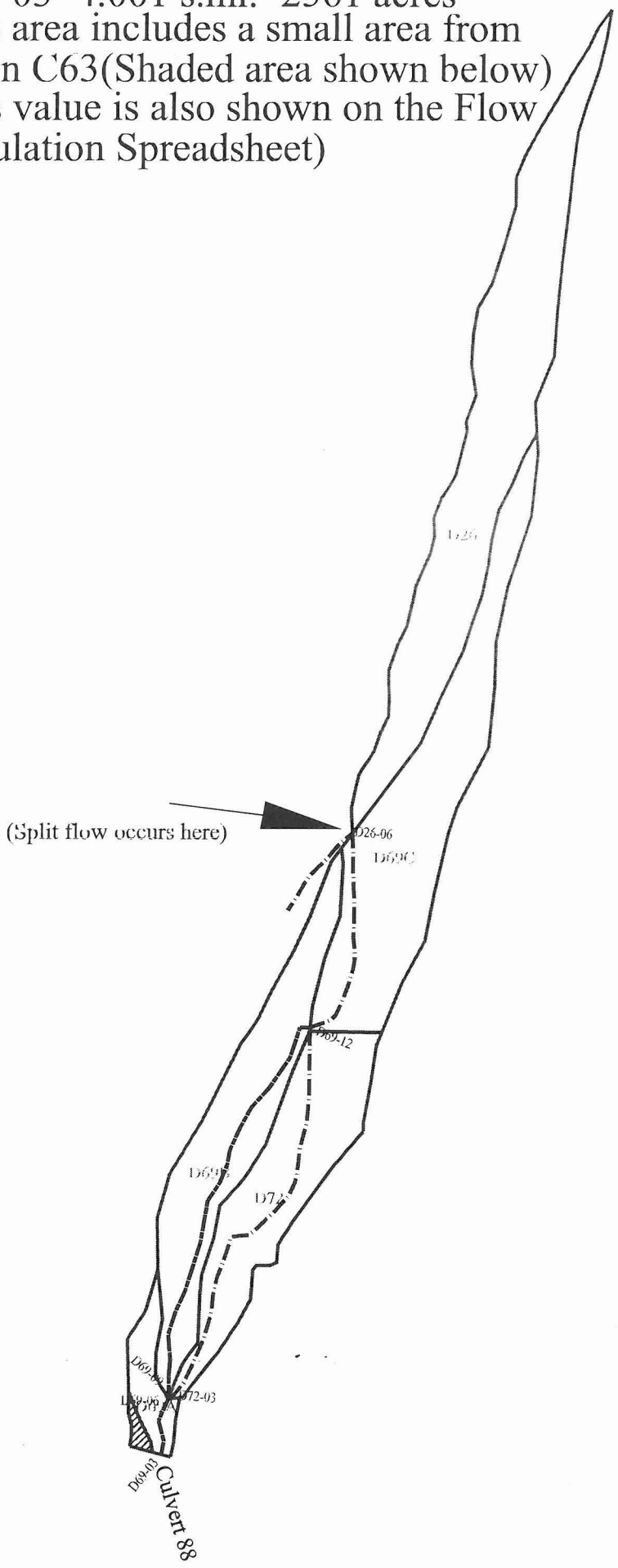


$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + \ell(2/3\,\overline{H})}{L+\ell}\right)$$

Total Associated Area to
D69-03=4.001 s.mi.=2561 acres
This area includes a small area from
Basin C63(Shaded area shown below)
(This value is also shown on the Flow
Calculation Spreadsheet)



Total Area
$= A_1 + A_2$
= 2570 acres

Q = 2048 cfs

(Area-Flow Relationship
Q = 510 x Area (sq m

culvert #88(23A)
(5-5'x10' RCB)

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BY _____ DATE _____

CHECK _____ DATE _____

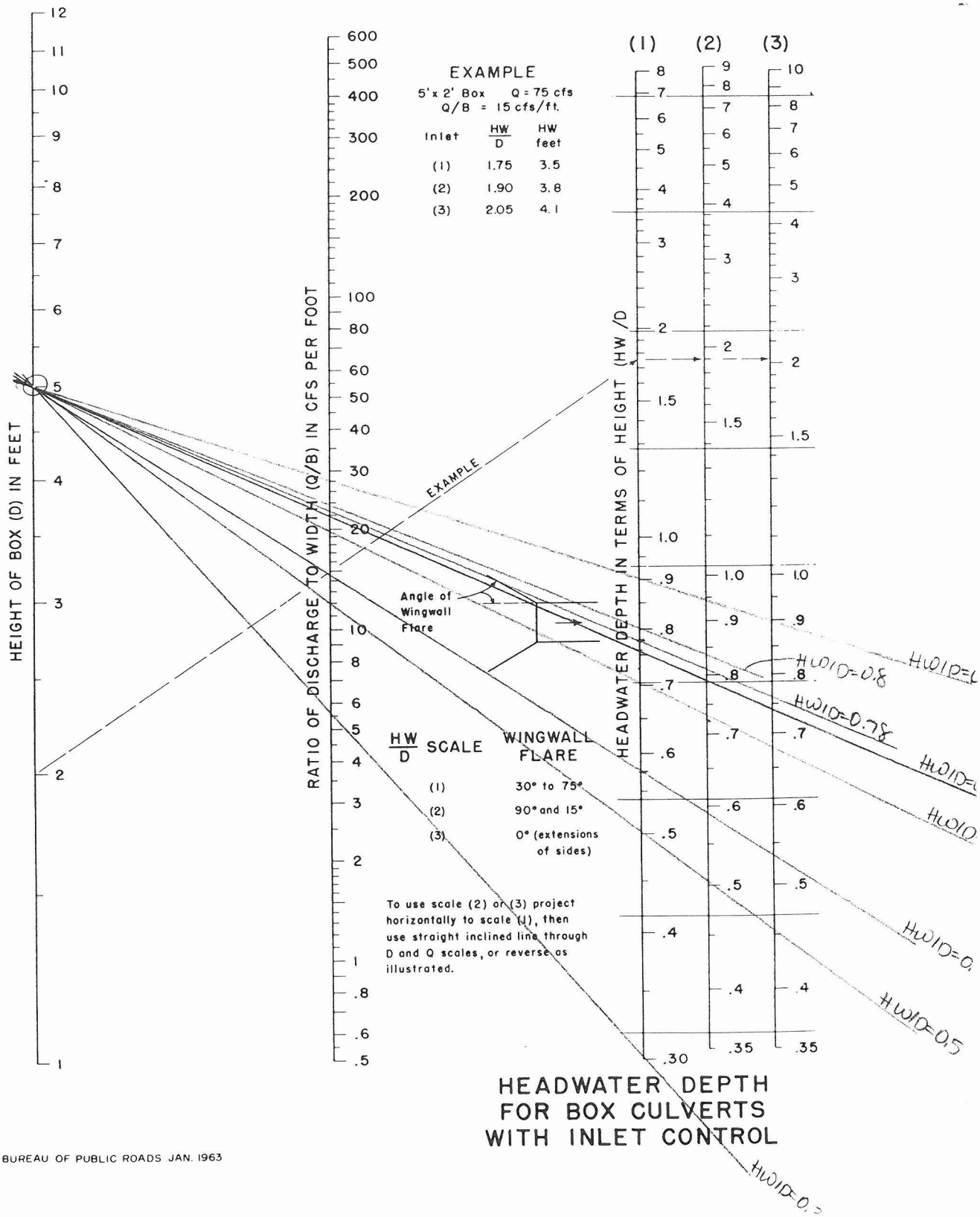
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

culvert #88 (23A)
(5-5'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Entellus™

SHEET _____ OF _____

BY _____ DATE _____

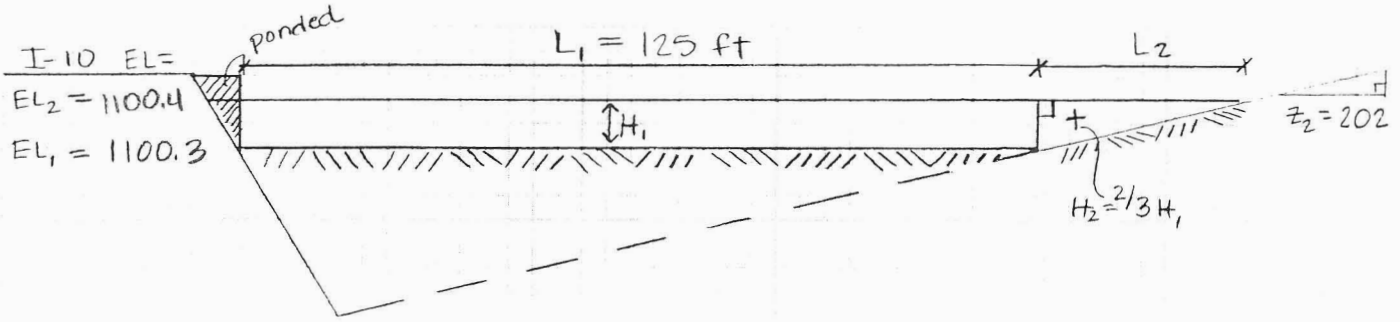
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1100.3)

culvert #88 (23A)
(5-5'x10' RCB)



culvert invert = 1096.5

$H_1 = E_2 - E_1 = 1100.4 - 1100.3 = 0.10$ ft

$L_2 = H_1 Z_2 = (0.10)(202) = 20.2$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(125)(0.10) + (20.2)(0.0667)}{125 + 20.2} = 0.095$

$L_T = L_1 + L_2 = 125 + 20.2 = 145.2$ ft

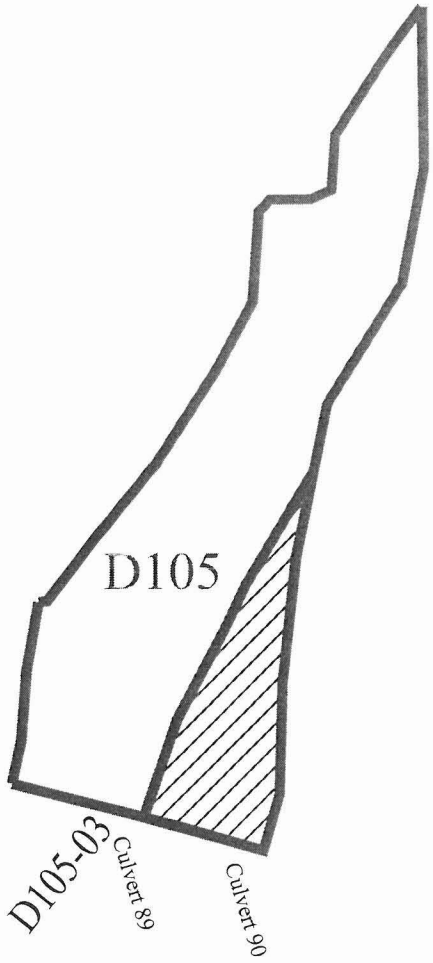
Weir Flow $Q = C L_T \bar{H}^{1.5}$

$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = 2.7 (145.2)(0.095)^{1.5} = 11.5$ cfs

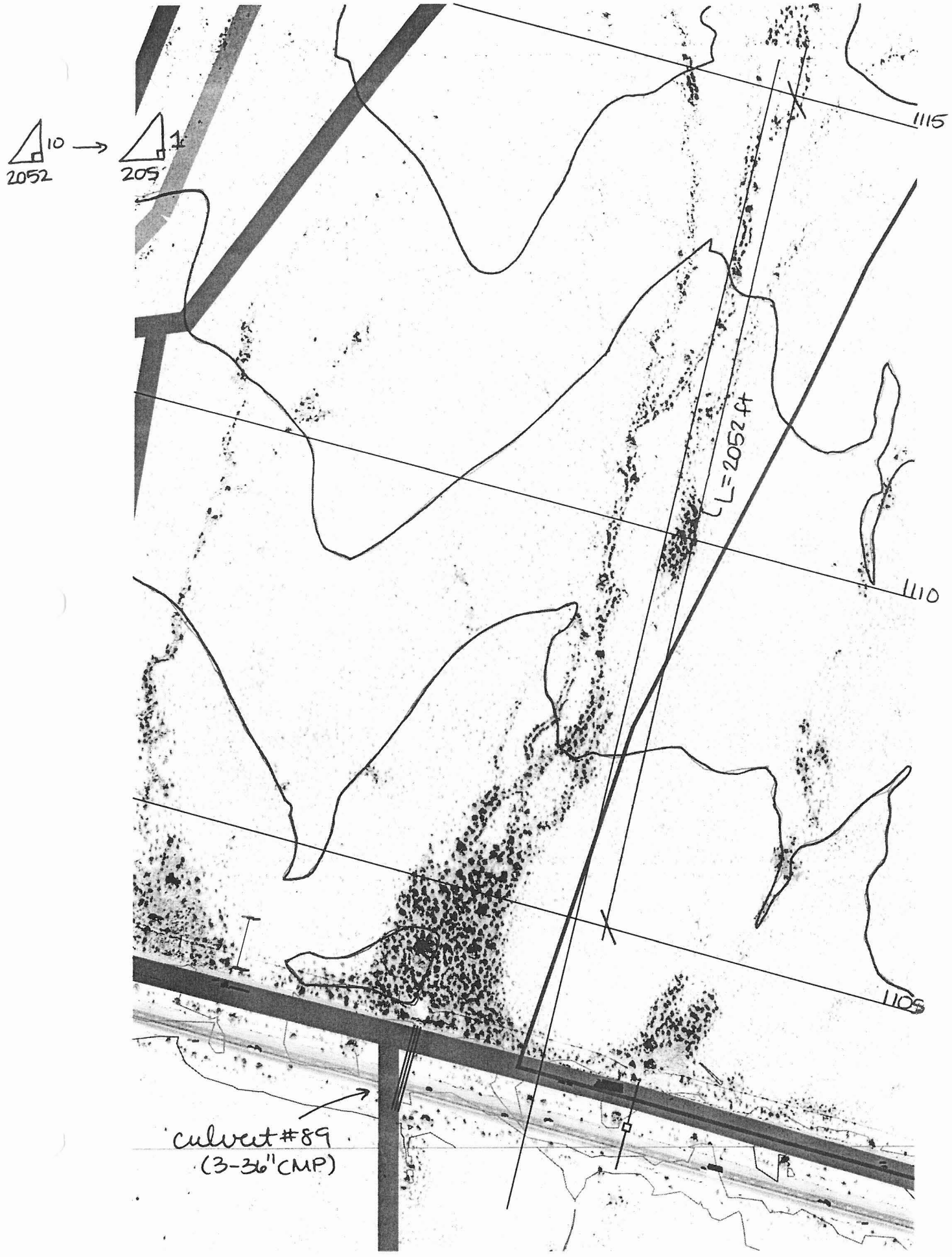
$\approx$ 12 cfs

Total Associated Area to
D105-03=0.325 s.mi.=208 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The shaded area is included with the Culvert #90 Analysis)

Area = 167
Q = 133 cfs
(Area-Flow Relationship
Q = 510 x Area (s mi)
culvert #89
(3-3½" (110)


10
2052
1
205
1115
1110
1105
L=2052 ft
culvert #89
(3-36" CMP)

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BY _____ DATE _____

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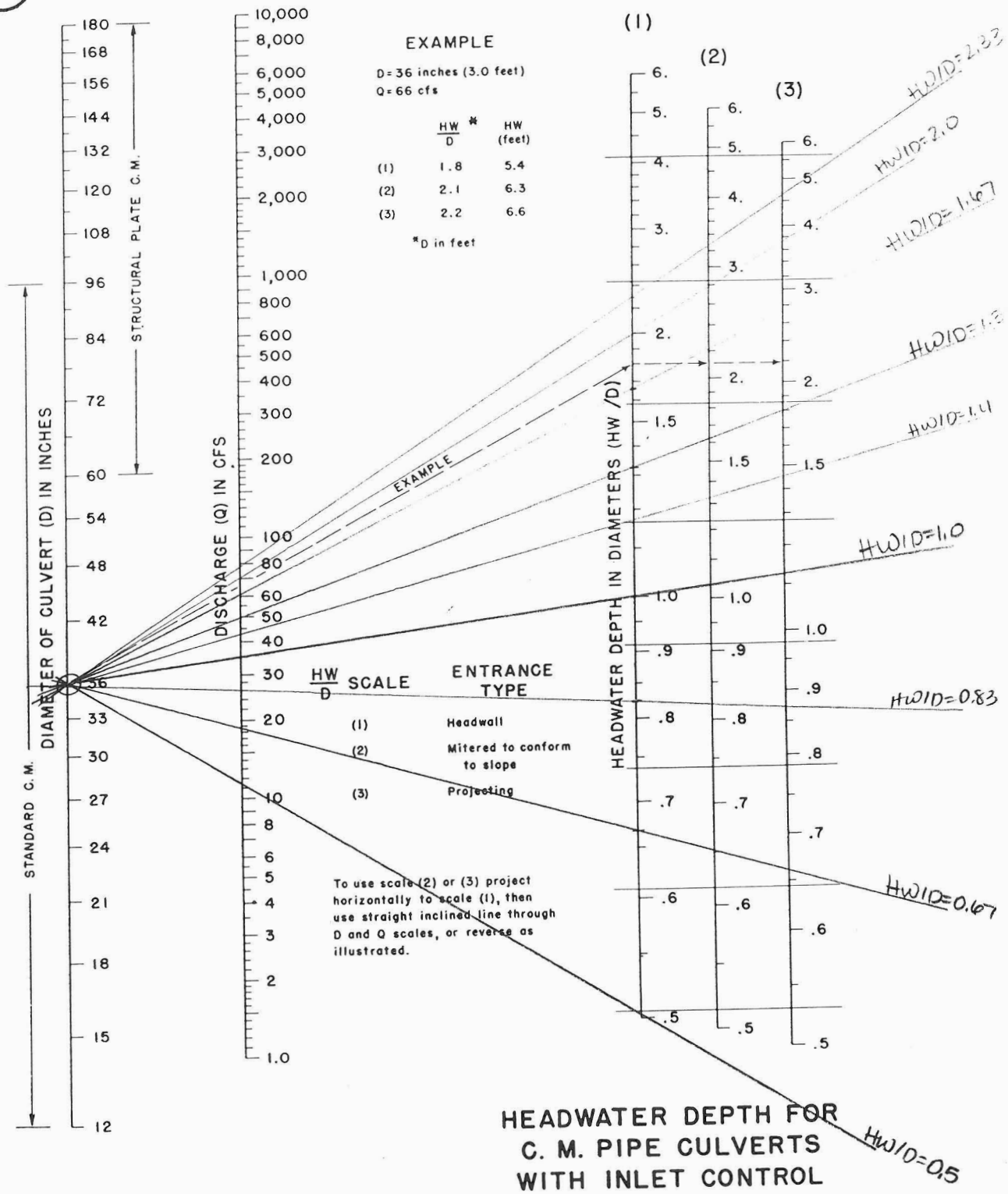
JOB NAME Palo Verde Zone A Delineation

JOB NO. 310.019

culvert #89
(3-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET _____ OF _____

BY _____ DATE _____

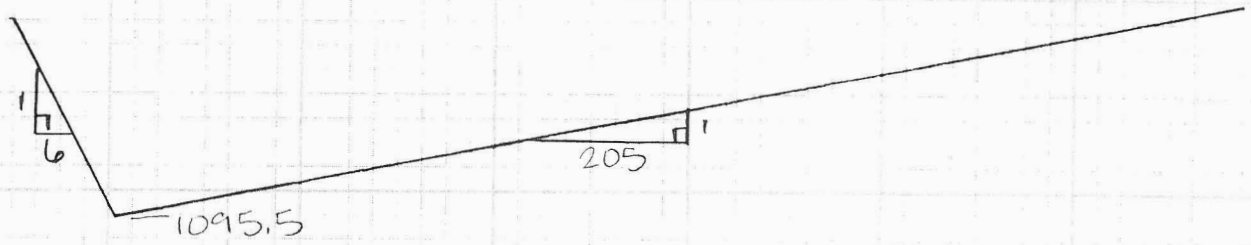
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1095.5)

Culvert # 89
(3-36" CMP)



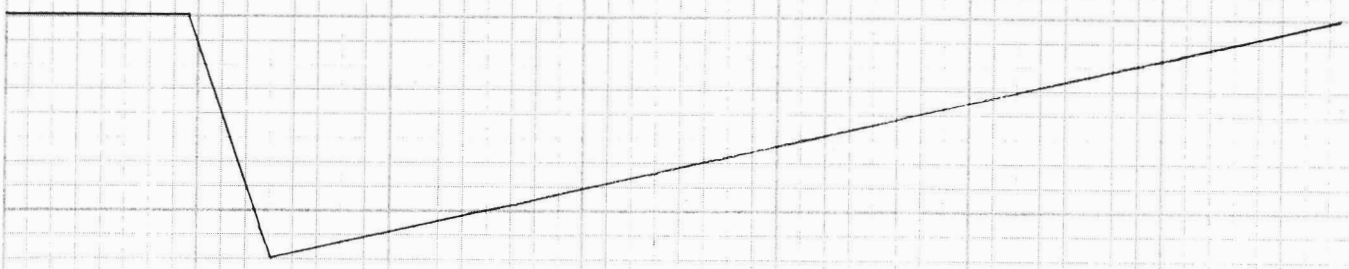
Culvert invert = 1094

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL>)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\bar{H}$

$$\left(H = \frac{L(\bar{H}) + \ell\left(\frac{2}{3}\bar{H}\right)}{L + \ell}\right)$$

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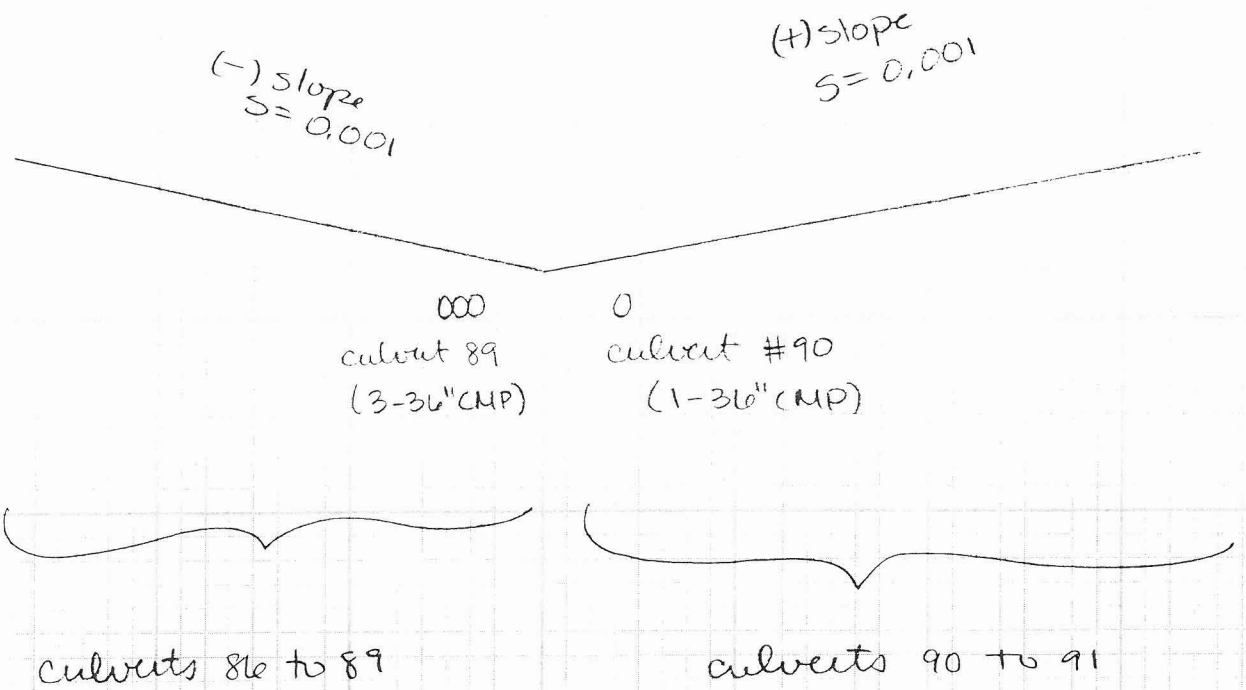
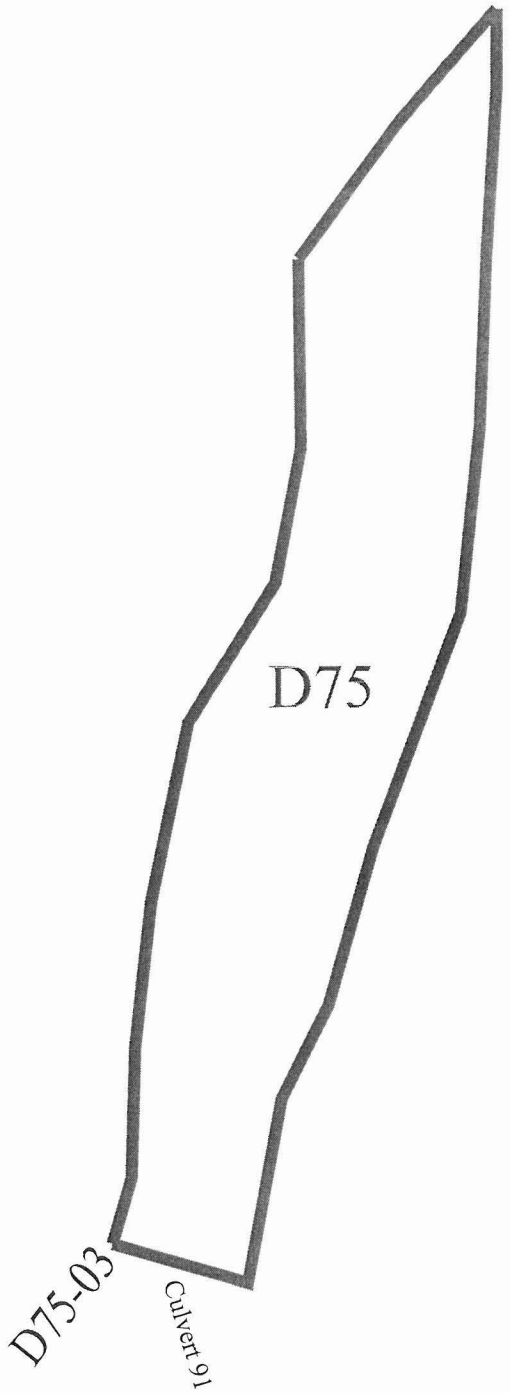
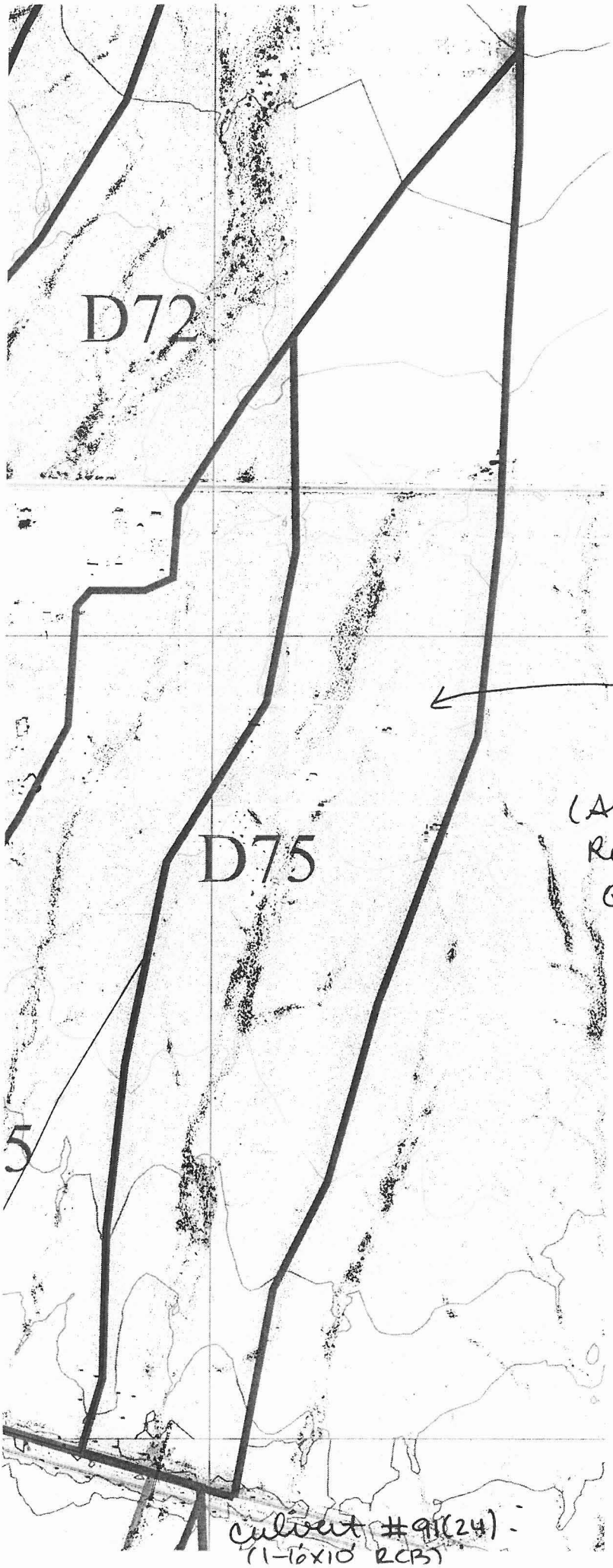
CLIENT FCDMC

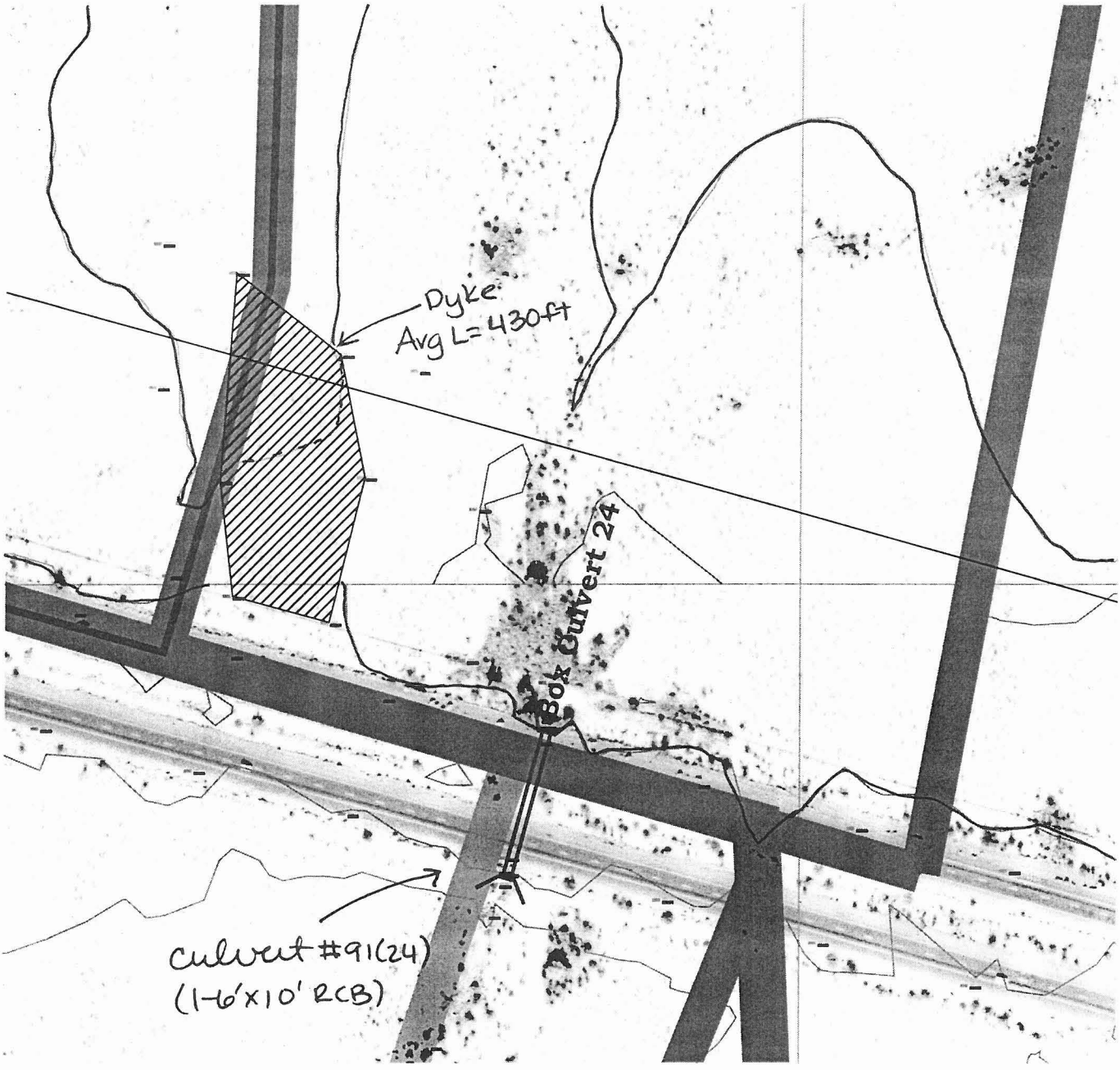
JOB NAME Polo Verde Zone A Relineation JOB NO. 310.019



Total Associated Area to
D75-03=0.383 s.mi.=245 acres
(This value is also shown on the Flow Calculation Spreadsheet)




D72
D75
5
Area = 245 acre
Q = 195 cfs
(Area-Flow
Relationship
Q = 510 x Area(s.mi)
culvert #91(24)
(1-16x10 RCB)


Dyke
Avg L=430ft
Box Culvert 24
culvert #91(24)
(1-6'x10' RCB)

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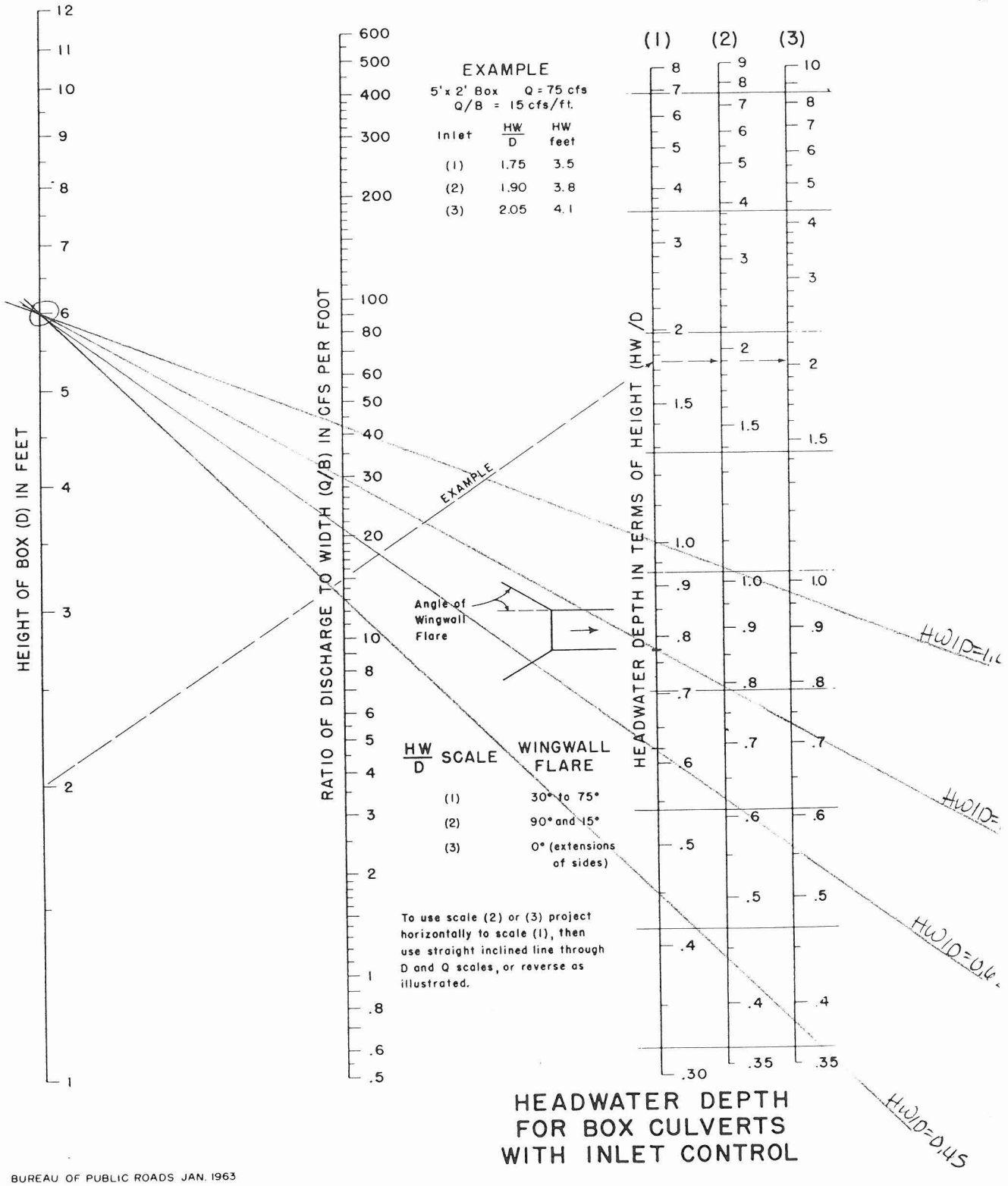
JOB NAME Palo Verde Zone A Relocation JOB NO. 310.019

culvert #91(24)
(1-6'x10' RCB)

CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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BY _____ DATE _____

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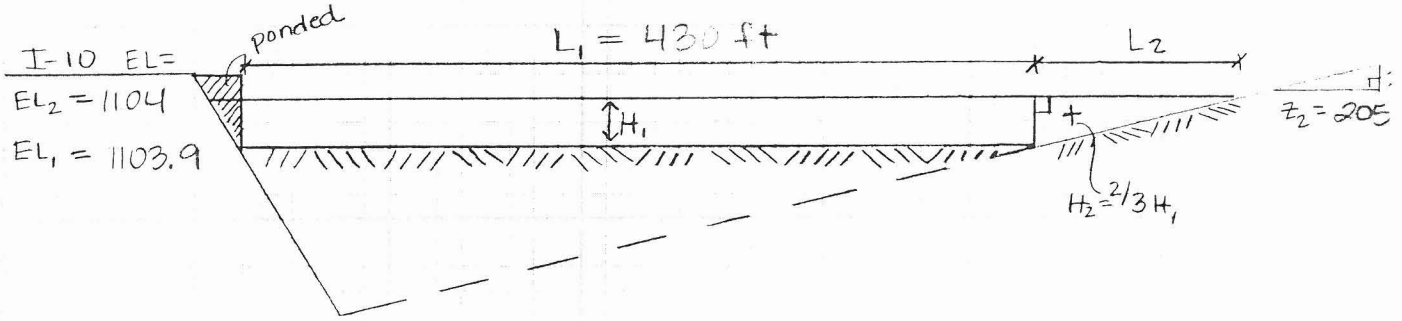
CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Weir Analysis (at EL > 1103.9)

culvert #91 (24)
(1-6'x10' RCB)



culvert invert = 1097.3

$H_1 = E_2 - E_1 = 1104 - 1103.9 = 0.10$ ft

$L_2 = H_1 z_2 = (0.10)(205) = 20.5$ ft

$H_2 = \frac{2}{3} H_1 = \frac{2}{3} \times (0.10) = 0.0667$ ft

Avg. Head $\bar{H} = \frac{(L_1)(H_1) + (L_2)(H_2)}{L_1 + L_2} = \frac{(430)(0.10) + (20.5)(0.0667)}{430 + 20.5} = 0.098$

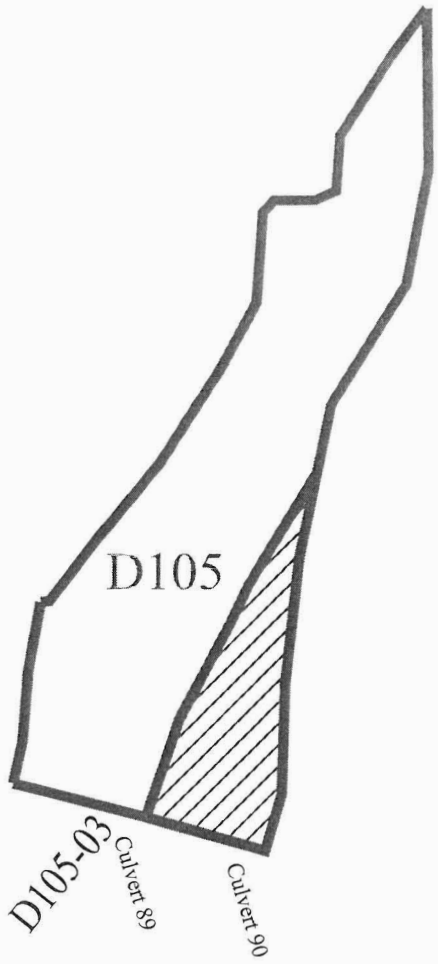
$L_T = L_1 + L_2 = 430 + 20.5 = 450.5$ ft

Weir Flow $Q = C L_T \bar{H}^{1.5}$

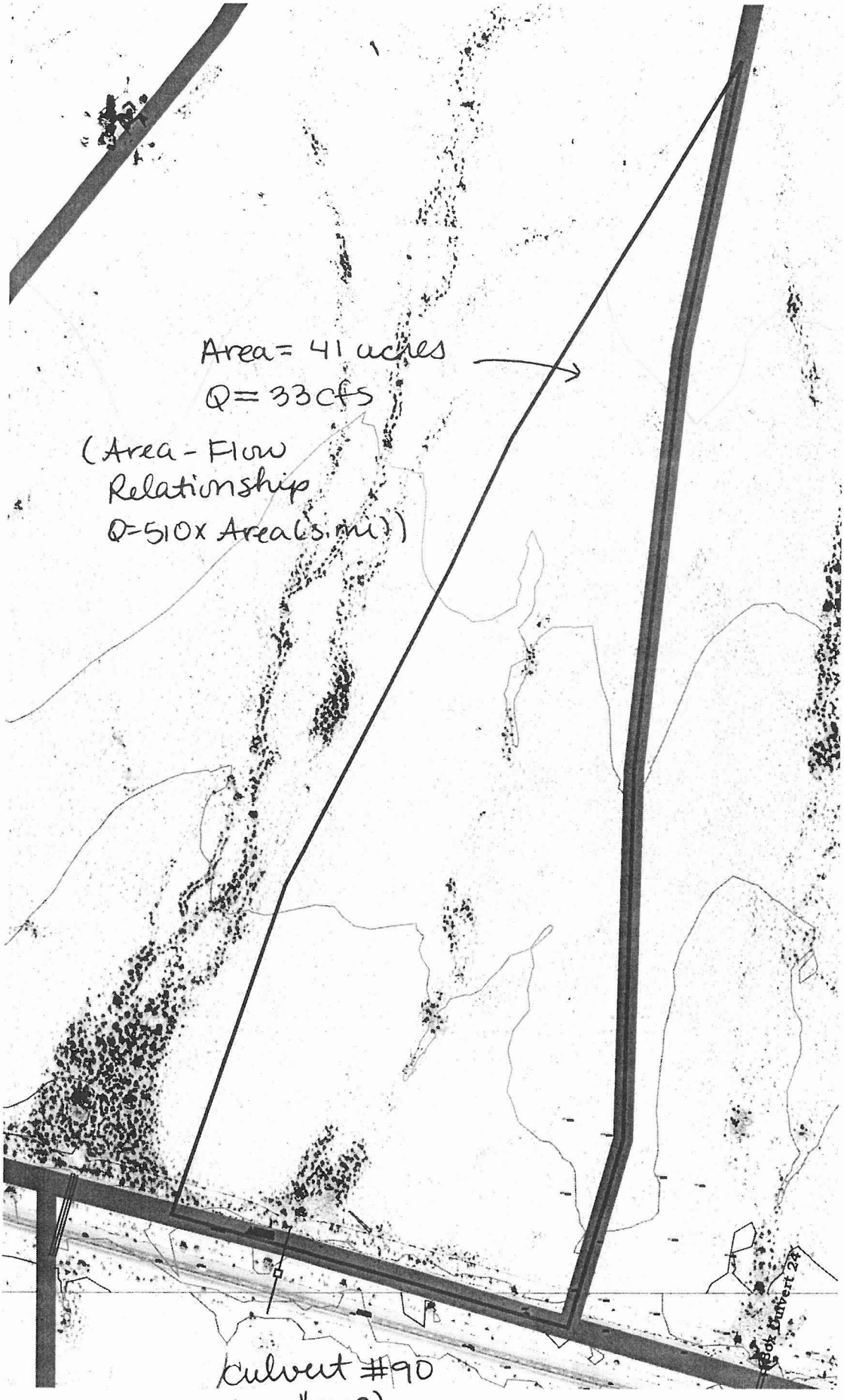
$C = 2.7$

$Q = 2.7 L_T \bar{H}^{1.5} = (2.7)(450.5)(0.0985)^{1.5} = 38$ cfs

Total Associated Area to
D105-03=0.325 s.mi.=208 acres
(This value is also shown on the Flow Calculation Spreadsheet)



(The shaded area is included with the Culvert #90 Analysis)


Area = 41 acres
Q = 33 cfs
(Area - Flow
Relationship
Q = 510 x Area(s.mi))
Box Culvert 24
Culvert #90
(1-36" CMP)

10
2052
1
205
1115
1110
1105
L=2052 ft
culvert #90
(1-36" CMP)

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BY _____ DATE _____

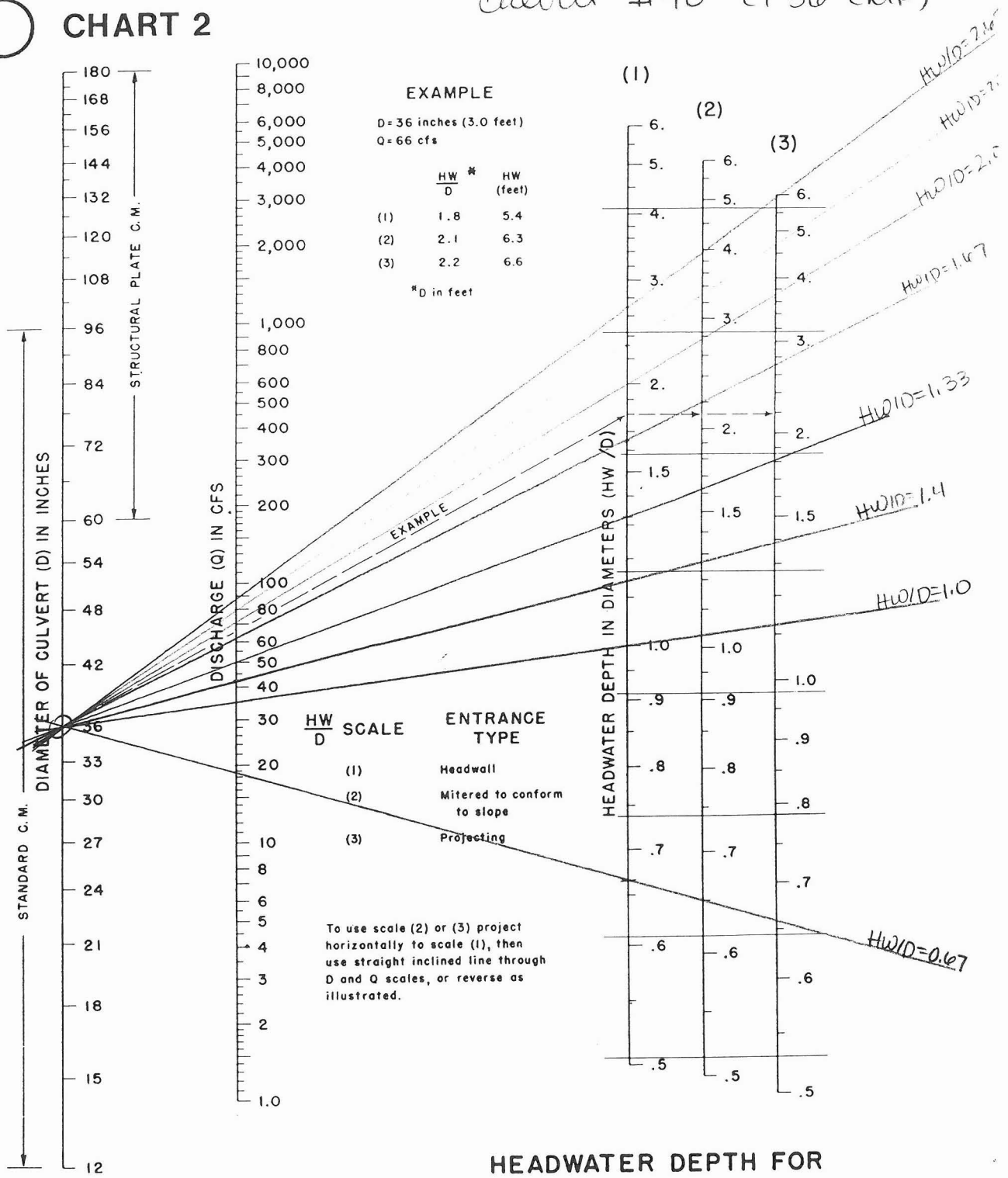
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

culvert #90 (1-36" CMP)

CHART 2



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

BUREAU OF PUBLIC ROADS JAN. 1963

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SHEET _____ OF _____

BY _____ DATE _____

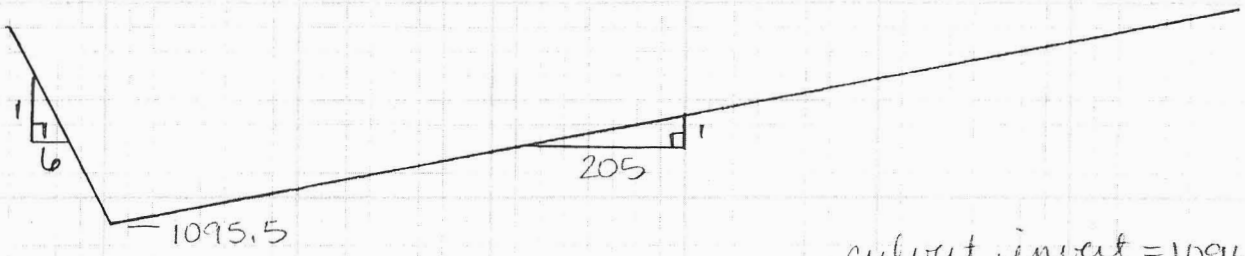
CHECK _____ DATE _____

CLIENT FCDMC

JOB NAME Palo Verde Zone A Delineation JOB NO. 310.019

Manning's Equ. (at EL > 1095.5)

culvert #90
(1-36" CMP)



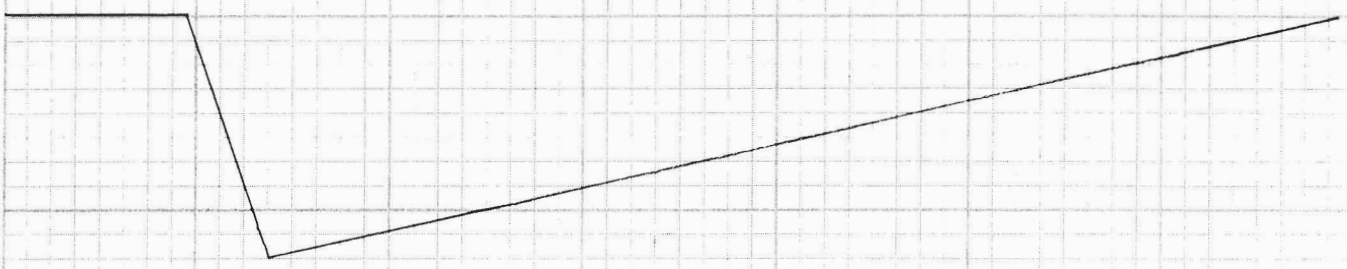
culvert invert = 1094

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where $n = 0.065$
S = downstream slope = 0.001
A = Area of channel cross section
$R = \left(\frac{A}{P}\right)^{2/3}$, where P is the wetted perimeter of channel

---

Weir Analysis (at EL >)



$$Q = CLH^{1.5}$$

where $C = 2.7$
L = length of berm/dyke
H = weighted avg $\overline{H}$

$$\left(H = \frac{L(\overline{H}) + l(2/3\,\overline{H})}{L + l}\right)$$

E.3 Hydraulic Parameters Summary

AREA A

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
T2N-R7W-S19W	751	390	0.0125	0.044	0.0782	0.044
	756	390	0.0125	0.044	0.0782	0.044
	761	390	0.0125	0.044	0.0782	0.044
	766	390	0.0125	0.044	0.0782	0.044
	771	390	0.0125	0.044	0.0782	0.044
	776	390	0.0125	0.044	0.0782	0.044
	781	390	0.0125	0.044	0.0782	0.044
	786	390	0.0125	0.044	0.0782	0.044
	791	390	0.0125	0.044	0.0782	0.044
	796	390	0.0125	0.044	0.0782	0.044
	801	390	0.0125	0.044	0.0782	0.044
	806	390	0.0125	0.044	0.0782	0.044
	811	390	0.0125	0.044	0.0782	0.044
	816	390	0.0125	0.044	0.0782	0.044
	821	390	0.0125	0.044	0.0782	0.044
	826	390	0.0125	0.044	0.0782	0.044
	831	390	0.0125	0.044	0.0782	0.044
	836	390	0.0125	0.044	0.0782	0.044
	841	390	0.0125	0.044	0.0782	0.044
	846	390	0.0125	0.044	0.0782	0.044
T2N-R7W-S20E	755	13450	0.0112	0.032	0.07	0.032
	760	13450	0.0112	0.032	0.07	0.032
	765	13450	0.0112	0.032	0.07	0.032
	770	13260	0.0112	0.032	0.07	0.032
	780	13260	0.0112	0.032	0.07	0.032
	785	13260	0.0112	0.032	0.07	0.032
T2N-R7W-S20W	755	4580	0.0116	0.032	0.07	0.032
	765	4580	0.0116	0.032	0.07	0.032
	775	4580	0.0116	0.032	0.07	0.032
	785	4580	0.0116	0.032	0.07	0.032
	795	4580	0.0116	0.032	0.07	0.032
	805	4580	0.0116	0.032	0.07	0.032
	815	4580	0.0116	0.032	0.07	0.032
	825	4580	0.0116	0.032	0.07	0.032
	835	4580	0.0116	0.032	0.07	0.032
	845	4580	0.0116	0.032	0.07	0.032
	855	4580	0.0116	0.032	0.07	0.032
	865	4580	0.0116	0.032	0.07	0.032
	875	7460	0.0116	0.032	0.07	0.032
	885	7460	0.0116	0.032	0.07	0.032
	895	7230	0.0116	0.032	0.07	0.032
T2N-R8W-S01	755	6880	0.0124	0.032	0.07	0.032
	760	6880	0.0124	0.032	0.07	0.032
	765	6880	0.0124	0.032	0.07	0.032
	770	6880	0.0106	0.032	0.07	0.032
	775	6880	0.0106	0.032	0.07	0.032
	780	6480	0.0106	0.032	0.07	0.032
	785	6480	0.0106	0.032	0.07	0.032
	790	6480	0.0106	0.032	0.07	0.032

AREA A

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	795	6480	0.009	0.032	0.07	0.032
	800	6340	0.009	0.032	0.07	0.032
	805	6340	0.009	0.032	0.07	0.032
	810	13550	0.009	0.032	0.07	0.032
	815	13550	0.009	0.032	0.07	0.032
	820	13550	0.009	0.044	0.0782	0.044
	825	13550	0.009	0.044	0.0782	0.044
	830	13550	0.009	0.044	0.0782	0.044
	835	3310	0.009	0.044	0.0782	0.044
	840	10240	0.009	0.044	0.0782	0.044
	845	3310	0.009	0.044	0.0782	0.044
	850	13310	0.0100	0.044	0.0782	0.044
	855	13310	0.0100	0.044	0.0782	0.044
	860	13310	0.0100	0.044	0.0782	0.044
	865	13310	0.0100	0.044	0.0782	0.044
	870	13310	0.0100	0.044	0.0782	0.044
	875	13310	0.0100	0.044	0.0782	0.044
	880	13310	0.0100	0.044	0.0782	0.044
	885	13310	0.0100	0.044	0.0782	0.044
	890	13310	0.0100	0.044	0.0782	0.044
	895	13310	0.0100	0.044	0.0782	0.044
	900	11490	0.0150	0.048	0.092	0.048
	905	6090	0.0150	0.048	0.092	0.048
	910	6090	0.0150	0.048	0.092	0.048
	915	6090	0.0150	0.048	0.092	0.048
	920	4610	0.0150	0.048	0.092	0.048
	925	2640	0.0182	0.048	0.092	0.048
T2N-R8W-S02E	755	4500	0.0125	0.044	0.0782	0.044
	760	4500	0.0125	0.044	0.0782	0.044
	765	4500	0.0125	0.044	0.0782	0.044
	770	2200	0.0125	0.044	0.0782	0.044
	775	2200	0.0125	0.044	0.0782	0.044
	780	2200	0.0125	0.044	0.0782	0.044
	785	2200	0.0125	0.044	0.0782	0.044
	790	2200	0.0125	0.044	0.0782	0.044
	795	2200	0.0125	0.044	0.0782	0.044
	800	2200	0.0125	0.044	0.0782	0.044
	805	2200	0.0125	0.044	0.0782	0.044
	810	2200	0.0125	0.044	0.0782	0.044
	815	2200	0.0125	0.044	0.0782	0.044
	820	2200	0.0125	0.044	0.0782	0.044
	825	2200	0.0125	0.044	0.0782	0.044
	830	2200	0.0125	0.044	0.0782	0.044
	835	2200	0.0105	0.044	0.0782	0.044
	840	2200	0.0105	0.044	0.0782	0.044
	845	2200	0.0105	0.044	0.0782	0.044
	850	2200	0.0105	0.044	0.0782	0.044
	855	2200	0.0105	0.044	0.0782	0.044
	860	2200	0.0105	0.044	0.0782	0.044
	865	2200	0.0105	0.044	0.0782	0.044
	870	1230	0.0105	0.044	0.0782	0.044

AREA A

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	875	1230	0.0105	0.044	0.0782	0.044
	880	1230	0.0105	0.044	0.0782	0.044
	885	1230	0.0105	0.044	0.0782	0.044
	890	1230	0.0101	0.044	0.0782	0.044
	895	1230	0.0101	0.044	0.0782	0.044
	900	1230	0.0101	0.044	0.0782	0.044
	905	1230	0.0101	0.044	0.0782	0.044
	910	1230	0.0101	0.044	0.0782	0.044
	915	1230	0.0101	0.044	0.0782	0.044
	920	1230	0.0101	0.044	0.0782	0.044
	925	1230	0.0101	0.044	0.0782	0.044
	930	1230	0.0101	0.044	0.0782	0.044
	935	1230	0.0101	0.044	0.0782	0.044
	940	1230	0.0101	0.044	0.0782	0.044
	945	1230	0.0101	0.044	0.0782	0.044
	950	1230	0.0101	0.044	0.0782	0.044
	955	1230	0.0101	0.044	0.0782	0.044
	960	1230	0.0101	0.044	0.0782	0.044
	965	1230	0.0101	0.044	0.0782	0.044
	970	1230	0.0101	0.044	0.0782	0.044
	975	1230	0.0101	0.044	0.0782	0.044
	980	1230	0.0101	0.044	0.0782	0.044
T2N-R8W-S02W	755	2310	0.0102	0.044	0.0782	0.044
	760	2310	0.0102	0.044	0.0782	0.044
	765	2310	0.0102	0.044	0.0782	0.044
	770	2310	0.0102	0.044	0.0782	0.044
	775	2310	0.0102	0.044	0.0782	0.044
	780	2310	0.0102	0.044	0.0782	0.044
	785	2310	0.0102	0.044	0.0782	0.044
	790	2310	0.0102	0.044	0.0782	0.044
	795	2310	0.0102	0.044	0.0782	0.044
	800	2310	0.0102	0.044	0.0782	0.044
	805	2310	0.0102	0.044	0.0782	0.044
	810	2310	0.0102	0.044	0.0782	0.044
	815	2310	0.0102	0.044	0.0782	0.044
	820	2310	0.0102	0.044	0.0782	0.044
	825	2310	0.0102	0.044	0.0782	0.044
	830	2310	0.0102	0.044	0.0782	0.044
	835	2310	0.0102	0.044	0.0782	0.044
	840	2310	0.0102	0.044	0.0782	0.044
	845	2310	0.0102	0.044	0.0782	0.044
	850	2310	0.0102	0.044	0.0782	0.044
	855	2310	0.0102	0.044	0.0782	0.044
	860	2310	0.0102	0.044	0.0782	0.044
	865	2310	0.0102	0.044	0.0782	0.044
	870	2310	0.0102	0.044	0.0782	0.044
	875	2310	0.0102	0.044	0.0782	0.044
	880	2310	0.0102	0.044	0.0782	0.044
	885	2310	0.0102	0.044	0.0782	0.044
	890	2310	0.0102	0.044	0.0782	0.044
	895	2310	0.0102	0.044	0.0782	0.044

AREA A

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	900	2310	0.0102	0.044	0.0782	0.044
	905	2310	0.0102	0.044	0.0782	0.044
	910	280	0.0102	0.044	0.0782	0.044
	915	280	0.0102	0.044	0.0782	0.044
	920	280	0.0102	0.044	0.0782	0.044
	925	280	0.0102	0.044	0.0782	0.044
	930	280	0.0102	0.044	0.0782	0.044
	935	280	0.0102	0.044	0.0782	0.044
T3N-R7W-S06	755	1390	0.0202	0.048	0.092	0.048
	760	1390	0.0202	0.048	0.092	0.048
	765	1390	0.0202	0.048	0.092	0.048
	770	1390	0.0202	0.048	0.092	0.048
	775	1390	0.0202	0.048	0.092	0.048
	780	1390	0.0202	0.048	0.092	0.048
	785	1390	0.0202	0.048	0.092	0.048
	790	1390	0.0202	0.048	0.092	0.048
	795	1390	0.0202	0.048	0.092	0.048
	800	1390	0.0202	0.048	0.092	0.048
	805	1390	0.0202	0.048	0.092	0.048
	810	1390	0.0202	0.048	0.092	0.048
	815	1390	0.0202	0.048	0.092	0.048
	820	1390	0.0202	0.048	0.092	0.048
	825	1390	0.0202	0.048	0.092	0.048
	830	1390	0.0202	0.048	0.092	0.048
	835	1390	0.0202	0.048	0.092	0.048
	840	1390	0.0202	0.048	0.092	0.048
	845	1390	0.0202	0.048	0.092	0.048
	850	1390	0.0202	0.048	0.092	0.048
	855	1390	0.0202	0.048	0.092	0.048
	860	1390	0.0202	0.048	0.092	0.048
	865	1390	0.0202	0.048	0.092	0.048
	870	1390	0.0202	0.048	0.092	0.048
	875	1390	0.0202	0.048	0.092	0.048
	880	1390	0.0202	0.048	0.092	0.048
	885	1390	0.0202	0.048	0.092	0.048
	890	1390	0.0202	0.048	0.092	0.048
	895	1390	0.0202	0.048	0.092	0.048
	900	1390	0.0202	0.048	0.092	0.048
	905	1390	0.0202	0.048	0.092	0.048
	910	1390	0.0202	0.048	0.092	0.048
	915	1390	0.0202	0.048	0.092	0.048
T3N-R7W-S31E	756	4860	0.0112	0.032	0.07	0.032
	760	4860	0.0112	0.032	0.07	0.032
	762	4860	0.0112	0.032	0.07	0.032
	764	4860	0.012	0.032	0.07	0.032
	766	4860	0.012	0.032	0.07	0.032
	768	4130	0.012	0.032	0.07	0.032
	770	4750	0.012	0.032	0.07	0.032
	772	4750	0.012	0.032	0.07	0.032
	774	4750	0.012	0.032	0.07	0.032

AREA A

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	776	4750	0.0173	0.032	0.07	0.032
	778	4750	0.0173	0.032	0.07	0.032
	780	4750	0.0173	0.032	0.07	0.032
	782	4750	0.0173	0.032	0.07	0.032
	784	4750	0.0173	0.032	0.07	0.032
	786	4750	0.0173	0.032	0.07	0.032
	788	4750	0.0173	0.032	0.07	0.032
	790	4750	0.0173	0.032	0.07	0.032
	792	4750	0.0173	0.032	0.07	0.032
	794	4750	0.0173	0.044	0.0782	0.044
	796	4750	0.0173	0.044	0.0782	0.044
	798	4750	0.0173	0.044	0.0782	0.044
	800	4750	0.0173	0.044	0.0782	0.044
	802	4750	0.0173	0.044	0.0782	0.044
	804	4750	0.0173	0.044	0.0782	0.044
	806	4750	0.0173	0.044	0.0782	0.044
	808	4750	0.0173	0.044	0.0782	0.044
	810	3400	0.0153	0.044	0.0782	0.044
	812	3400	0.0153	0.044	0.0782	0.044
	814	3400	0.0153	0.044	0.0782	0.044
	816	3400	0.0153	0.044	0.0782	0.044
	818	3400	0.0153	0.044	0.0782	0.044
	820	3400	0.0153	0.044	0.0782	0.044
	822	3400	0.0153	0.044	0.0782	0.044
	824	3400	0.0153	0.044	0.0782	0.044
	826	3400	0.0153	0.044	0.0782	0.044
	828	3400	0.0153	0.044	0.0782	0.044
	830	810	0.0153	0.044	0.0782	0.044
	832	810	0.0153	0.044	0.0782	0.044
	834	810	0.0153	0.044	0.0782	0.044
	836	810	0.0153	0.044	0.0782	0.044
	838	810	0.0153	0.044	0.0782	0.044
	840	810	0.0153	0.044	0.0782	0.044
	842	810	0.0153	0.044	0.0782	0.044
	844	810	0.058	0.044	0.0782	0.044
	846	810	0.058	0.048	0.092	0.048
T3N-R7W-S31S	755	7000	0.011	0.032	0.07	0.032
	760	7000	0.011	0.032	0.07	0.032
	765	6390	0.011	0.032	0.07	0.032
	775	6390	0.011	0.032	0.07	0.032
	785	6390	0.011	0.032	0.07	0.032
	795	5720	0.011	0.032	0.07	0.032
	805	5160	0.011	0.032	0.07	0.032
	815	5160	0.0117	0.032	0.07	0.032
	825	5160	0.0117	0.032	0.07	0.032
	835	5160	0.0117	0.032	0.07	0.032
	845	5160	0.0117	0.032	0.07	0.032
	855	5160	0.0117	0.032	0.07	0.032
	865	7180	0.0117	0.032	0.07	0.032
	875	7180	0.0117	0.032	0.07	0.032

AREA A

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
T3N-R7W-S31W	755	9200	0.0112	0.032	0.07	0.032
	760	9020	0.0112	0.032	0.07	0.032
	765	3330	0.0112	0.032	0.07	0.032
	775	3330	0.0134	0.032	0.07	0.032
	780	3100	0.0134	0.032	0.07	0.032
	790	3100	0.0134	0.032	0.07	0.032
	795	3100	0.0134	0.032	0.07	0.032
	800	3100	0.0134	0.032	0.07	0.032
	810	3100	0.0115	0.032	0.07	0.032
	815	5050	0.0115	0.032	0.07	0.032
	820	5050	0.0115	0.032	0.07	0.032
	825	5050	0.0115	0.044	0.0782	0.044
	830	5050	0.0115	0.044	0.0782	0.044
	835	5050	0.0115	0.044	0.0782	0.044
	840	5050	0.0115	0.044	0.0782	0.044
	845	5050	0.0115	0.044	0.0782	0.044
	850	5050	0.0144	0.044	0.0782	0.044
	855	5050	0.0144	0.044	0.0782	0.044
	860	5050	0.0144	0.044	0.0782	0.044
	865	5050	0.0144	0.048	0.092	0.048
	870	5050	0.0144	0.048	0.092	0.048
	875	4250	0.0144	0.048	0.092	0.048
	880	4250	0.0144	0.048	0.092	0.048
	885	4250	0.0168	0.048	0.092	0.048
	890	4250	0.0168	0.048	0.092	0.048
	895	4250	0.0168	0.048	0.092	0.048
	900	4250	0.0168	0.048	0.092	0.048
	905	4250	0.0168	0.048	0.092	0.048
	910	4250	0.0168	0.048	0.092	0.048
	915	4250	0.0168	0.048	0.092	0.048
	920	4250	0.0168	0.048	0.092	0.048
	925	3500	0.0168	0.048	0.092	0.048
	930	2130	0.0168	0.048	0.092	0.048
	935	2130	0.0168	0.048	0.092	0.048
	940	1960	0.0171	0.044	0.0782	0.044
T3N-R7W-S32	755	1500	0.011	0.032	0.07	0.032
	760	1500	0.011	0.032	0.07	0.032
	765	1500	0.011	0.032	0.07	0.032
	770	1500	0.011	0.032	0.07	0.032
	775	1500	0.011	0.032	0.07	0.032
	780	5010	0.011	0.032	0.07	0.032
	785	5010	0.011	0.032	0.07	0.032
	786	2886	0.011	0.032	0.07	0.032
	787	1924	0.011	0.032	0.07	0.032
	795	4810	0.011	0.032	0.07	0.032
	800	4810	0.011	0.032	0.07	0.032
	805	4810	0.011	0.032	0.07	0.032
	810	4810	0.011	0.032	0.07	0.032
	815	4390	0.012	0.032	0.07	0.032
	820	2110	0.012	0.032	0.07	0.032
	825	2110	0.012	0.032	0.07	0.032

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	830	2110	0.012	0.032	0.07	0.032
	835	2110	0.012	0.032	0.07	0.032
	840	2110	0.012	0.044	0.0782	0.044
	845	2110	0.012	0.044	0.0782	0.044
	850	1530	0.012	0.044	0.0782	0.044
	853	1530	0.012	0.044	0.0782	0.044
	855	1530	0.012	0.044	0.0782	0.044
	860	1530	0.012	0.044	0.0782	0.044
	865	1530	0.012	0.044	0.0782	0.044
	870	1530	0.012	0.044	0.0782	0.044
	875	1530	0.012	0.044	0.0782	0.044
	880	1530	0.012	0.044	0.0782	0.044
	882	1530	0.012	0.044	0.0782	0.044
	883	1530	0.0151	0.044	0.0782	0.044
	885	1530	0.0151	0.044	0.0782	0.044
	890	1530	0.0151	0.044	0.0782	0.044
	895	1530	0.0151	0.044	0.0782	0.044
	900	1530	0.0151	0.044	0.0782	0.044
	905	1530	0.0151	0.044	0.0782	0.044
	910	1530	0.0151	0.044	0.0782	0.044
	915	1530	0.0151	0.044	0.0782	0.044
	920	1530	0.0151	0.048	0.092	0.048
	925	1530	0.0151	0.048	0.092	0.048
T3N-R8W-S05E	751	5050	0.0144	0.048	0.092	0.048
	754	5050	0.0144	0.048	0.092	0.048
	757	5050	0.0144	0.048	0.092	0.048
	760	5050	0.0144	0.048	0.092	0.048
	763	5050	0.0144	0.048	0.092	0.048
	766	5050	0.0144	0.048	0.092	0.048
	769	5050	0.0144	0.048	0.092	0.048
	772	5050	0.0144	0.048	0.092	0.048
	775	5050	0.0144	0.048	0.092	0.048
	778	5050	0.0144	0.048	0.092	0.048
	781	5050	0.0144	0.048	0.092	0.048
	784	5050	0.0144	0.048	0.092	0.048
	787	5050	0.0144	0.048	0.092	0.048
	790	5050	0.0144	0.048	0.092	0.048
	793	5050	0.0144	0.048	0.092	0.048
	796	5050	0.0144	0.048	0.092	0.048
	799	5050	0.0144	0.048	0.092	0.048
	802	5050	0.0144	0.048	0.092	0.048
	805	5050	0.0144	0.048	0.092	0.048
	808	5050	0.0144	0.048	0.092	0.048
	811	5050	0.0144	0.048	0.092	0.048
	814	5050	0.0144	0.048	0.092	0.048
	817	5050	0.0144	0.048	0.092	0.048
	823	2330	0.0144	0.048	0.092	0.048
	826	2330	0.0144	0.048	0.092	0.048
	829	2330	0.0144	0.048	0.092	0.048
	832	2330	0.0144	0.048	0.092	0.048
	835	2330	0.0144	0.048	0.092	0.048

AREA A

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	838	2330	0.0144	0.048	0.092	0.048
	841	2330	0.0144	0.048	0.092	0.048
	844	2330	0.0144	0.048	0.092	0.048
	847	2330	0.0144	0.048	0.092	0.048
	850	2330	0.0144	0.048	0.092	0.048
	859	1670	0.0144	0.048	0.092	0.048
	862	1670	0.0144	0.048	0.092	0.048
	865	1670	0.0144	0.048	0.092	0.048
	868	1670	0.0144	0.048	0.092	0.048
	871	1670	0.0144	0.048	0.092	0.048
	874	1670	0.0144	0.048	0.092	0.048
	880	1600	0.0276	0.044	0.0782	0.044
	883	1330	0.0276	0.044	0.0782	0.044
	886	1330	0.0276	0.044	0.0782	0.044
	889	1330	0.0276	0.044	0.0782	0.044
	892	1330	0.0276	0.044	0.0782	0.044
	895	1330	0.0276	0.044	0.0782	0.044
	898	1330	0.0276	0.044	0.0782	0.044
	901	1330	0.0276	0.044	0.0782	0.044
	904	1330	0.0276	0.044	0.0782	0.044
	907	1330	0.0276	0.044	0.0782	0.044
	910	1330	0.0276	0.048	0.092	0.048
	913	1330	0.0276	0.048	0.092	0.048
	916	1330	0.0276	0.048	0.092	0.048
	919	1330	0.0276	0.048	0.092	0.048
	922	650	0.0276	0.048	0.092	0.048
	925	650	0.0276	0.048	0.092	0.048
	928	650	0.0276	0.048	0.092	0.048
	931	650	0.0276	0.048	0.092	0.048
	934	650	0.0276	0.048	0.092	0.048
	937	650	0.0276	0.048	0.092	0.048
	940	650	0.0276	0.048	0.092	0.048
	943	650	0.0276	0.048	0.092	0.048
T3N-R8W-S05W	760	1380	0.0208	0.048	0.092	0.048
	765	1380	0.0208	0.048	0.092	0.048
	770	1380	0.0208	0.048	0.092	0.048
	775	1380	0.0208	0.048	0.092	0.048
	780	1380	0.0208	0.048	0.092	0.048
	785	1380	0.0208	0.048	0.092	0.048
	790	1380	0.0208	0.048	0.092	0.048
	795	1380	0.0208	0.048	0.092	0.048
	800	1380	0.0208	0.048	0.092	0.048
	805	1380	0.0208	0.048	0.092	0.048
	810	1380	0.0208	0.048	0.092	0.048
	815	1380	0.0208	0.048	0.092	0.048
	820	1380	0.0208	0.048	0.092	0.048
	825	1380	0.0208	0.048	0.092	0.048
	830	1380	0.0208	0.048	0.092	0.048
	835	1380	0.0208	0.048	0.092	0.048
	840	1380	0.0208	0.048	0.092	0.048
	845	1380	0.0208	0.048	0.092	0.048

AREA A

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	850	1380	0.0208	0.048	0.092	0.048
	855	1380	0.0208	0.048	0.092	0.048
	860	1380	0.0208	0.048	0.092	0.048
	865	1380	0.0208	0.048	0.092	0.048
	870	1380	0.0208	0.048	0.092	0.048
	875	1380	0.0208	0.048	0.092	0.048
	880	1380	0.0208	0.048	0.092	0.048
	885	1380	0.0208	0.048	0.092	0.048
	890	1380	0.0208	0.048	0.092	0.048
	895	1380	0.0208	0.048	0.092	0.048
T3N-R8W-S10	785	1330	0.0156	0.044	0.0782	0.044
	795	1330	0.0156	0.044	0.0782	0.044
	805	1330	0.0156	0.044	0.0782	0.044
	815	1330	0.0156	0.044	0.0782	0.044
	825	1330	0.0156	0.044	0.0782	0.044
	835	1330	0.0156	0.044	0.0782	0.044
	845	1330	0.0156	0.044	0.0782	0.044
	855	1330	0.0156	0.044	0.0782	0.044
	865	760	0.0156	0.044	0.0782	0.044
	875	760	0.0156	0.044	0.0782	0.044
	885	760	0.0156	0.044	0.0782	0.044
	895	760	0.0156	0.044	0.0782	0.044
	905	760	0.0156	0.044	0.0782	0.044
	915	760	0.0156	0.044	0.0782	0.044
	925	760	0.0156	0.044	0.0782	0.044
T3N-R8W-S11E	770	3560	0.0219	0.044	0.0782	0.044
	780	3560	0.0219	0.044	0.0782	0.044
	790	3560	0.0219	0.044	0.0782	0.044
	800	3560	0.0219	0.044	0.0782	0.044
	810	3560	0.0219	0.044	0.0782	0.044
	820	3560	0.0219	0.044	0.0782	0.044
	830	3630	0.0219	0.044	0.0782	0.044
	840	3630	0.0219	0.044	0.0782	0.044
	850	3630	0.0219	0.044	0.0782	0.044
T3N-R8W-S11W	770	1050	0.0219	0.044	0.0782	0.044
	775	1050	0.0219	0.044	0.0782	0.044
	780	1050	0.0219	0.044	0.0782	0.044
	785	1050	0.0219	0.044	0.0782	0.044
	790	1050	0.0219	0.044	0.0782	0.044
	795	1050	0.0219	0.044	0.0782	0.044
	800	1050	0.0219	0.044	0.0782	0.044
	805	1050	0.0219	0.044	0.0782	0.044
	810	1050	0.0219	0.044	0.0782	0.044
	815	1050	0.0219	0.044	0.0782	0.044
	820	1050	0.0219	0.044	0.0782	0.044
	825	1050	0.0219	0.044	0.0782	0.044
	830	1050	0.0219	0.044	0.0782	0.044
	835	1050	0.0219	0.044	0.0782	0.044
	840	1050	0.0219	0.044	0.0782	0.044

AREA A

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	845	1050	0.0219	0.044	0.0782	0.044
	850	1050	0.0219	0.044	0.0782	0.044
	855	1050	0.0219	0.044	0.0782	0.044
	860	1050	0.0219	0.044	0.0782	0.044
	865	1050	0.0219	0.044	0.0782	0.044
	870	1050	0.0219	0.044	0.0782	0.044
	875	1050	0.0219	0.044	0.0782	0.044
	880	1050	0.0219	0.044	0.0782	0.044
	885	1050	0.0219	0.044	0.0782	0.044
	890	2290	0.0219	0.044	0.0782	0.044
T3N-R8W-S12	770	490	0.0149	0.032	0.07	0.032
	780	490	0.0149	0.032	0.07	0.032
	790	490	0.0149	0.032	0.07	0.032
	800	490	0.0149	0.032	0.07	0.032
	810	490	0.0149	0.032	0.07	0.032
	820	490	0.0149	0.032	0.07	0.032
	830	490	0.0149	0.032	0.07	0.032
	850	490	0.0149	0.032	0.07	0.032
T3N-R8W-S13E	760	1560	0.0158	0.032	0.07	0.032
	770	1560	0.0158	0.032	0.07	0.032
	780	1560	0.0158	0.032	0.07	0.032
	790	1560	0.0158	0.032	0.07	0.032
	800	1560	0.0158	0.032	0.07	0.032
	810	1560	0.0208	0.032	0.07	0.032
	815	1200	0.0208	0.044	0.0782	0.044
	820	1200	0.0208	0.044	0.0782	0.044
	830	1200	0.0208	0.044	0.0782	0.044
	840	1200	0.0208	0.044	0.0782	0.044
	850	1200	0.0208	0.044	0.0782	0.044
	860	1200	0.0212	0.044	0.0782	0.044
	870	1200	0.0212	0.044	0.0782	0.044
	880	1200	0.0212	0.044	0.0782	0.044
T3N-R8W-S13S	765	1320	0.0117	0.032	0.07	0.032
	770	1260	0.0117	0.032	0.07	0.032
	775	1260	0.0149	0.032	0.07	0.032
	780	1260	0.0149	0.032	0.07	0.032
	785	1260	0.0149	0.032	0.07	0.032
	790	1260	0.0149	0.032	0.07	0.032
	800	1260	0.0149	0.032	0.07	0.032
	805	770	0.0156	0.032	0.07	0.032
	810	770	0.0156	0.032	0.07	0.032
	815	770	0.0156	0.048	0.092	0.048
	820	770	0.0156	0.048	0.092	0.048
	825	770	0.0156	0.048	0.092	0.048
	830	770	0.0156	0.048	0.092	0.048
	835	770	0.0156	0.048	0.092	0.048
T3N-R8W-S13W	780	5860	0.0117	0.032	0.07	0.032
	790	5860	0.0117	0.032	0.07	0.032

AREA A

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	800	5860	0.0117	0.032	0.07	0.032
	820	4300	0.0117	0.032	0.07	0.032
	830	4300	0.0117	0.032	0.07	0.032
	840	4060	0.0219	0.044	0.0782	0.044
T4N-R8W-S28E	760	1090	0.0183	0.044	0.0782	0.044
	770	1090	0.0183	0.044	0.0782	0.044
	780	1090	0.0183	0.044	0.0782	0.044
	790	1090	0.0183	0.044	0.0782	0.044
	800	1090	0.0183	0.044	0.0782	0.044
	810	1090	0.0183	0.044	0.0782	0.044
	820	1090	0.0183	0.044	0.0782	0.044
	830	1090	0.0183	0.048	0.092	0.048
	840	1090	0.0183	0.048	0.092	0.048
	850	1090	0.0183	0.048	0.092	0.048
	860	1020	0.0183	0.048	0.092	0.048
T4N-R8W-S28W	770	870	0.0171	0.044	0.0782	0.044
	780	870	0.0171	0.044	0.0782	0.044
	790	870	0.0171	0.044	0.0782	0.044
	800	870	0.0171	0.044	0.0782	0.044
	810	870	0.0171	0.044	0.0782	0.044
	820	870	0.0171	0.044	0.0782	0.044
	830	870	0.0171	0.044	0.0782	0.044
	840	870	0.0171	0.044	0.0782	0.044
	850	870	0.0171	0.044	0.0782	0.044
T4N-R8W-S29E	765	1380	0.0238	0.044	0.0782	0.044
	770	1380	0.0238	0.044	0.0782	0.044
	775	1380	0.0238	0.044	0.0782	0.044
	780	1380	0.0238	0.044	0.0782	0.044
	785	1380	0.0238	0.044	0.0782	0.044
	790	1380	0.0238	0.044	0.0782	0.044
	795	1380	0.0238	0.044	0.0782	0.044
	800	1380	0.0238	0.044	0.0782	0.044
	805	1380	0.0238	0.044	0.0782	0.044
	810	1380	0.0238	0.044	0.0782	0.044
	815	1380	0.0238	0.044	0.0782	0.044
	820	1380	0.0238	0.044	0.0782	0.044
	825	1380	0.0238	0.044	0.0782	0.044
	830	1380	0.0238	0.044	0.0782	0.044
	835	1380	0.0238	0.044	0.0782	0.044
	840	1380	0.0238	0.044	0.0782	0.044
	845	1380	0.0238	0.044	0.0782	0.044
	850	1380	0.0238	0.044	0.0782	0.044
	855	620	0.0426	0.048	0.092	0.048
	860	620	0.0426	0.048	0.092	0.048
	865	620	0.0426	0.048	0.092	0.048
	870	620	0.0426	0.048	0.092	0.048
	875	620	0.0426	0.048	0.092	0.048
	880	620	0.0426	0.048	0.092	0.048
	885	620	0.0426	0.048	0.092	0.048

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	890	620	0.0426	0.048	0.092	0.048
	895	620	0.0426	0.048	0.092	0.048
	900	620	0.0426	0.048	0.092	0.048
	905	620	0.0426	0.048	0.092	0.048
	910	620	0.0426	0.048	0.092	0.048
	915	620	0.0426	0.048	0.092	0.048
	920	620	0.0426	0.048	0.092	0.048
	925	620	0.0426	0.048	0.092	0.048
	930	620	0.0426	0.048	0.092	0.048
T4N-R8W-S29W	760	410	0.0267	0.048	0.092	0.048
	770	410	0.0267	0.048	0.092	0.048
	780	410	0.0267	0.048	0.092	0.048
	790	410	0.0267	0.048	0.092	0.048
	800	410	0.0267	0.048	0.092	0.048
	810	410	0.0267	0.048	0.092	0.048
	820	410	0.0267	0.048	0.092	0.048
	830	410	0.0267	0.044	0.0782	0.044
	840	410	0.0267	0.044	0.0782	0.044
T4N-R8W-S31E	755	1890	0.015	0.048	0.092	0.048
	760	1890	0.015	0.048	0.092	0.048
	765	1890	0.015	0.048	0.092	0.048
	770	1890	0.015	0.048	0.092	0.048
	775	1890	0.015	0.048	0.092	0.048
	780	1890	0.015	0.048	0.092	0.048
	785	1890	0.015	0.048	0.092	0.048
	790	1890	0.015	0.048	0.092	0.048
	795	1890	0.015	0.048	0.092	0.048
	800	1890	0.015	0.048	0.092	0.048
	805	1890	0.015	0.048	0.092	0.048
	810	1890	0.015	0.048	0.092	0.048
	815	1890	0.0395	0.048	0.092	0.048
	820	1890	0.0395	0.048	0.092	0.048
	825	1890	0.0395	0.048	0.092	0.048
	830	720	0.0395	0.048	0.092	0.048
T4N-R8W-S31N	760	2590	0.0179	0.048	0.092	0.048
	770	570	0.0179	0.048	0.092	0.048
	780	570	0.0179	0.048	0.092	0.048
	790	570	0.0179	0.048	0.092	0.048
	800	570	0.0179	0.048	0.092	0.048
	810	570	0.0179	0.048	0.092	0.048
	820	570	0.0179	0.048	0.092	0.048
	830	570	0.0179	0.048	0.092	0.048
	840	570	0.0179	0.048	0.092	0.048
	850	570	0.0179	0.048	0.092	0.048
	860	570	0.0179	0.048	0.092	0.048
T4N-R8W-S31S	780	620	0.0167	0.048	0.092	0.048
	790	620	0.0167	0.048	0.092	0.048
	800	620	0.0167	0.048	0.092	0.048

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	810	620	0.0167	0.048	0.092	0.048
	820	620	0.0167	0.048	0.092	0.048
	830	620	0.0167	0.048	0.092	0.048
	840	620	0.0167	0.048	0.092	0.048
	850	620	0.0167	0.048	0.092	0.048
T4N-R8W-S31W	765	2020	0.0182	0.048	0.092	0.048
	770	2020	0.0182	0.048	0.092	0.048
	775	2020	0.0182	0.048	0.092	0.048
	780	2020	0.0182	0.048	0.092	0.048
	785	2020	0.0182	0.048	0.092	0.048
	790	2020	0.0182	0.048	0.092	0.048
	795	2020	0.0182	0.048	0.092	0.048
	800	2020	0.0182	0.048	0.092	0.048
	805	1610	0.0182	0.048	0.092	0.048
	810	1610	0.0182	0.048	0.092	0.048
	815	1610	0.0182	0.048	0.092	0.048
	820	1610	0.0182	0.048	0.092	0.048
	825	1150	0.0182	0.048	0.092	0.048
	830	1150	0.0182	0.048	0.092	0.048
	835	1150	0.0182	0.048	0.092	0.048
	840	1150	0.0182	0.048	0.092	0.048
	845	1150	0.0182	0.048	0.092	0.048
	850	1150	0.0182	0.048	0.092	0.048
	855	1150	0.0182	0.048	0.092	0.048
	860	1150	0.0182	0.048	0.092	0.048
T4N-R8W-S33	765	1370	0.0218	0.048	0.092	0.048
	775	1370	0.0218	0.044	0.0782	0.044
	785	1370	0.0218	0.044	0.0782	0.044
	795	1370	0.0218	0.044	0.0782	0.044
	805	1370	0.0218	0.044	0.0782	0.044
	815	1370	0.0218	0.044	0.0782	0.044
	825	1370	0.0218	0.044	0.0782	0.044
	835	1370	0.0218	0.048	0.092	0.048
	845	1370	0.0218	0.048	0.092	0.048
	855	1370	0.0218	0.048	0.092	0.048
	865	1370	0.0218	0.048	0.092	0.048
T4N-R8W-S35E	760	2790	0.0212	0.044	0.0782	0.044
	775	1640	0.0212	0.044	0.0782	0.044
	780	1640	0.0212	0.044	0.0782	0.044
	785	1640	0.0212	0.044	0.0782	0.044
	790	1640	0.0267	0.044	0.0782	0.044
	795	1640	0.0267	0.044	0.0782	0.044
	800	1640	0.0267	0.044	0.0782	0.044
	805	1640	0.0267	0.044	0.0782	0.044
	810	1640	0.0267	0.044	0.0782	0.044
	815	1640	0.0267	0.044	0.0782	0.044
	820	1640	0.0267	0.044	0.0782	0.044
	825	1640	0.0301	0.044	0.0782	0.044
	830	1640	0.0301	0.048	0.092	0.048

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	835	1640	0.0301	0.048	0.092	0.048
	840	1640	0.0301	0.048	0.092	0.048
	845	1640	0.0301	0.048	0.092	0.048
	850	1640	0.0301	0.048	0.092	0.048
	855	1640	0.0301	0.048	0.092	0.048
	860	1640	0.0301	0.048	0.092	0.048
	865	1640	0.0301	0.048	0.092	0.048
	870	1640	0.0301	0.048	0.092	0.048
	875	1640	0.0301	0.048	0.092	0.048
	880	1640	0.0301	0.048	0.092	0.048
T4N-R8W-S35N	755	2290	0.0271	0.044	0.0782	0.044
	760	2290	0.0271	0.044	0.0782	0.044
	765	2290	0.0271	0.044	0.0782	0.044
	775	2290	0.0271	0.044	0.0782	0.044
	785	2290	0.0271	0.048	0.092	0.048
	790	2290	0.0271	0.048	0.092	0.048
	795	2290	0.0271	0.048	0.092	0.048
	800	2290	0.0271	0.048	0.092	0.048
	805	2290	0.0271	0.048	0.092	0.048
	810	2290	0.0271	0.048	0.092	0.048
	815	2290	0.0271	0.048	0.092	0.048
	820	2290	0.0271	0.048	0.092	0.048
	825	2290	0.0271	0.048	0.092	0.048
	830	2290	0.0271	0.048	0.092	0.048
	835	1660	0.0271	0.048	0.092	0.048
	840	1660	0.0253	0.048	0.092	0.048
	845	1660	0.0253	0.048	0.092	0.048
	850	1660	0.0253	0.048	0.092	0.048
	855	1660	0.0253	0.048	0.092	0.048
	860	1660	0.0253	0.048	0.092	0.048
	865	1660	0.0253	0.048	0.092	0.048
	870	1660	0.0253	0.048	0.092	0.048
	875	1660	0.0253	0.048	0.092	0.048
	880	1660	0.0253	0.048	0.092	0.048
	885	1660	0.0253	0.048	0.092	0.048
T4N-R8W-S35W	770	200	0.0219	0.044	0.0782	0.044
	780	200	0.0219	0.044	0.0782	0.044

AREA B

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
T1S-R6W-S29E	755	1050	0.0201	0.037	0.069	0.037
(Winters Wash)	760	1050	0.0201	0.037	0.069	0.037
	765	1050	0.0201	0.037	0.069	0.037
	770	1050	0.0201	0.037	0.069	0.037
	775	1050	0.0201	0.037	0.069	0.037
	780	1050	0.0201	0.037	0.069	0.037
	785	1050	0.0201	0.037	0.069	0.037
	790	1050	0.0201	0.037	0.069	0.037
	795	1050	0.0201	0.037	0.069	0.037
	800	1050	0.0201	0.037	0.069	0.037
	805	1050	0.0201	0.037	0.069	0.037
T2N-R6W-S05W	755	1650	0.0193	0.037	0.069	0.037
	760	1650	0.0193	0.037	0.069	0.037
	765	1650	0.0193	0.037	0.069	0.037
	770	1210	0.0193	0.037	0.069	0.037
	775	400	0.0193	0.037	0.069	0.037
	780	400	0.0193	0.037	0.069	0.037
	785	1210	0.0193	0.037	0.069	0.037
	790	1610	0.0193	0.037	0.069	0.037
	795	1610	0.0193	0.037	0.069	0.037
	800	1610	0.0193	0.037	0.069	0.037
	805	1610	0.0193	0.037	0.069	0.037
	810	1610	0.0193	0.051	0.07	0.051
	815	1610	0.0193	0.051	0.07	0.051
	820	1610	0.0217	0.051	0.07	0.051
	825	1610	0.0217	0.051	0.07	0.051
	830	1610	0.0217	0.051	0.07	0.051
	835	1610	0.0217	0.051	0.07	0.051
	840	1610	0.0217	0.051	0.07	0.051
	845	1610	0.0217	0.051	0.07	0.051
	850	1610	0.0217	0.051	0.07	0.051
	855	1610	0.0217	0.051	0.07	0.051
	860	1610	0.0217	0.051	0.07	0.051
	865	1610	0.0217	0.051	0.07	0.051
	870	1610	0.0217	0.051	0.07	0.051
	875	1610	0.0217	0.051	0.07	0.051
T2N-R6W-S18W	752	10060	0.0131	0.032	0.057	0.032
(Old Camp Wash)	754	4520	0.0131	0.032	0.057	0.032
	756	4520	0.0131	0.032	0.057	0.032
	758	4520	0.0131	0.032	0.057	0.032
	760	4250	0.0131	0.032	0.057	0.032
	762	5520	0.0131	0.032	0.057	0.032
	764	5520	0.0131	0.032	0.057	0.032
	766	5440	0.0131	0.032	0.057	0.032
	768	5440	0.0131	0.032	0.057	0.032
	770	7620	0.0131	0.051	0.07	0.051
	772	7620	0.0131	0.051	0.07	0.051
	774	1340	0.0131	0.051	0.07	0.051
	776	13450	0.0131	0.051	0.07	0.051
	778	13360	0.0131	0.051	0.07	0.051
	780	6100	0.0131	0.051	0.07	0.051

AREA B

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	782	8960	0.0131	0.051	0.07	0.051
	784	8960	0.0131	0.051	0.07	0.051
	786	8770	0.0216	0.051	0.07	0.051
	788	8340	0.0216	0.051	0.07	0.051
	790	9430	0.0216	0.051	0.07	0.051
	792	9430	0.0216	0.051	0.07	0.051
	794	4630	0.0216	0.051	0.07	0.051
	796	4630	0.0216	0.051	0.07	0.051
	798	4630	0.0216	0.051	0.07	0.051
	800	4630	0.0216	0.053	0.105	0.053
	802	4630	0.0216	0.053	0.105	0.053
	804	4630	0.0225	0.053	0.105	0.053
	806	4630	0.0225	0.053	0.105	0.053
	808	4630	0.0225	0.053	0.105	0.053
	810	4630	0.0225	0.053	0.105	0.053
	812	4180	0.0209	0.053	0.105	0.053
	814	3540	0.0209	0.053	0.105	0.053
	816	3540	0.0209	0.053	0.105	0.053
	818	3540	0.0209	0.053	0.105	0.053
	820	3540	0.0209	0.053	0.105	0.053
	822	3540	0.0209	0.053	0.105	0.053
	824	3540	0.0209	0.053	0.105	0.053
	826	3540	0.0276	0.053	0.105	0.053
	828	3540	0.0276	0.053	0.105	0.053
	830	3540	0.0276	0.053	0.105	0.053
	832	3540	0.0276	0.053	0.105	0.053
	834	3540	0.0276	0.053	0.105	0.053
	836	3540	0.0276	0.053	0.105	0.053
	838	3540	0.0276	0.053	0.105	0.053
	840	3540	0.0276	0.053	0.105	0.053
	842	3540	0.0276	0.053	0.105	0.053
	844	3540	0.0276	0.053	0.105	0.053
	846	3540	0.0276	0.053	0.105	0.053
	848	3540	0.0276	0.053	0.105	0.053
	850	720	0.0276	0.053	0.105	0.053
	852	720	0.0276	0.053	0.105	0.053
	854	720	0.0276	0.053	0.105	0.053
T2N-R6W-S19	755	2450	0.0132	0.032	0.057	0.032
	760	2450	0.0132	0.032	0.057	0.032
	765	2450	0.0132	0.032	0.057	0.032
	770	5910	0.0132	0.032	0.057	0.032
	775	5910	0.0132	0.032	0.057	0.032
	780	5910	0.0132	0.032	0.057	0.032
	785	5910	0.0132	0.032	0.057	0.032
	790	5830	0.0132	0.032	0.057	0.032
	795	5830	0.0132	0.032	0.057	0.032
	800	5830	0.0132	0.051	0.07	0.051
	805	5830	0.0132	0.051	0.07	0.051
	810	13450	0.0132	0.051	0.07	0.051
T3N-R6W-S14W	755	420	0.0204	0.037	0.069	0.037
	760	420	0.0204	0.037	0.069	0.037

AREA B

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	765	420	0.0204	0.037	0.069	0.037
	770	420	0.0204	0.037	0.069	0.037
	775	420	0.0318	0.037	0.069	0.037
T3N-R6W-S15N	755	970	0.015	0.037	0.069	0.037
	760	970	0.015	0.037	0.069	0.037
	765	970	0.015	0.037	0.069	0.037
	770	560	0.015	0.037	0.069	0.037
	775	560	0.015	0.037	0.069	0.037
	780	560	0.015	0.037	0.069	0.037
	785	560	0.015	0.037	0.069	0.037
	790	560	0.015	0.051	0.07	0.051
	795	560	0.015	0.051	0.07	0.051
	800	560	0.015	0.051	0.07	0.051
T3N-R6W-S15S	755	1280	0.0148	0.037	0.069	0.037
	760	1280	0.0148	0.037	0.069	0.037
	765	1280	0.0148	0.037	0.069	0.037
	770	1280	0.0148	0.051	0.07	0.051
	775	1280	0.0148	0.051	0.07	0.051
	785	640	0.0204	0.051	0.07	0.051
	790	640	0.0204	0.051	0.07	0.051
	795	640	0.0204	0.051	0.07	0.051
	800	640	0.0204	0.051	0.07	0.051
T3N-R6W-S16E	765	1460	0.021	0.037	0.069	0.037
	770	850	0.021	0.037	0.069	0.037
	775	850	0.021	0.037	0.069	0.037
	780	850	0.021	0.037	0.069	0.037
	785	850	0.021	0.037	0.069	0.037
	790	850	0.021	0.037	0.069	0.037
	795	850	0.021	0.037	0.069	0.037
	800	850	0.021	0.037	0.069	0.037
	805	850	0.021	0.037	0.069	0.037
	810	850	0.021	0.037	0.069	0.037
	815	850	0.021	0.037	0.069	0.037
	820	850	0.021	0.037	0.069	0.037
T3N-R6W-S16S	755	930	0.0201	0.037	0.069	0.037
	760	930	0.0201	0.037	0.069	0.037
	765	930	0.0201	0.037	0.069	0.037
	770	930	0.0201	0.037	0.069	0.037
	775	930	0.0201	0.037	0.069	0.037
	780	930	0.0201	0.037	0.069	0.037
	785	930	0.0201	0.037	0.069	0.037
	790	930	0.0201	0.037	0.069	0.037
T3N-R6W-S16W	755	1660	0.0174	0.037	0.069	0.037
	760	1660	0.0174	0.037	0.069	0.037
	770	610	0.0174	0.037	0.069	0.037
	775	610	0.0174	0.037	0.069	0.037
	780	610	0.0174	0.037	0.069	0.037
	785	610	0.0174	0.037	0.069	0.037

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	790	610	0.0174	0.037	0.069	0.037
	795	610	0.0174	0.037	0.069	0.037
T3N-R6W-S18W	760	3500	0.019	0.037	0.069	0.037
	765	3500	0.019	0.037	0.069	0.037
	770	3500	0.019	0.037	0.069	0.037
	775	4240	0.019	0.037	0.069	0.037
	780	3920	0.019	0.037	0.069	0.037
	785	3920	0.019	0.037	0.069	0.037
	790	3450	0.019	0.037	0.069	0.037
	795	3450	0.019	0.037	0.069	0.037
	800	3450	0.019	0.037	0.069	0.037
	805	3450	0.019	0.037	0.069	0.037
	810	3920	0.019	0.037	0.069	0.037
	815	2630	0.019	0.037	0.069	0.037
	820	2630	0.019	0.037	0.069	0.037
	825	2630	0.023	0.053	0.105	0.053
	830	2630	0.023	0.053	0.105	0.053
	835	2630	0.023	0.053	0.105	0.053
	840	2630	0.023	0.053	0.105	0.053
	845	2630	0.023	0.037	0.069	0.037
	850	2630	0.023	0.037	0.069	0.037
	860	1290	0.023	0.037	0.069	0.037
	865	1290	0.023	0.037	0.069	0.037
	870	1290	0.023	0.053	0.105	0.053
	875	1290	0.023	0.053	0.105	0.053
	880	1290	0.023	0.053	0.105	0.053
	885	1290	0.023	0.053	0.105	0.053
	890	1290	0.0274	0.053	0.105	0.053
	895	1290	0.0274	0.053	0.105	0.053
	900	1290	0.0274	0.053	0.105	0.053
	905	1290	0.0274	0.053	0.105	0.053
	910	1290	0.0274	0.053	0.105	0.053
T3N-R6W-S19	755	4880	0.0188	0.037	0.069	0.037
	760	4880	0.0188	0.037	0.069	0.037
	765	1240	0.0188	0.037	0.069	0.037
	770	1240	0.0188	0.037	0.069	0.037
	775	1240	0.0188	0.051	0.07	0.051
	780	1240	0.0188	0.051	0.07	0.051
	785	1240	0.0188	0.051	0.07	0.051
	790	1240	0.0188	0.051	0.07	0.051
	795	1240	0.0188	0.051	0.07	0.051
	800	1240	0.0188	0.051	0.07	0.051
	805	1240	0.0188	0.051	0.07	0.051
	810	1240	0.0188	0.051	0.07	0.051
T3N-R6W-S20	755	1070	0.0205	0.037	0.069	0.037
	760	1070	0.0205	0.037	0.069	0.037
	765	1680	0.0205	0.037	0.069	0.037
	770	1680	0.0205	0.037	0.069	0.037
	775	1680	0.0205	0.037	0.069	0.037
	780	1680	0.0205	0.037	0.069	0.037

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	785	1680	0.0223	0.051	0.07	0.051
	790	1680	0.0223	0.051	0.07	0.051
	795	1440	0.0223	0.051	0.07	0.051
	800	1130	0.0223	0.051	0.07	0.051
	805	1180	0.0223	0.051	0.07	0.051
	810	1180	0.0223	0.051	0.07	0.051
	815	1180	0.0223	0.051	0.07	0.051
	820	1180	0.0223	0.051	0.07	0.051
	825	1180	0.0223	0.051	0.07	0.051
	830	1180	0.0223	0.053	0.105	0.053
T3N-R6W-S21	755	150	0.0087	0.037	0.069	0.037
	760	150	0.0087	0.037	0.069	0.037
	765	150	0.0087	0.037	0.069	0.037
T3N-R7W-S05	760	430	0.0216	0.051	0.07	0.051
	765	430	0.0216	0.051	0.07	0.051
	770	430	0.0216	0.051	0.07	0.051
	775	430	0.0216	0.051	0.07	0.051
	780	430	0.0216	0.051	0.07	0.051
T3N-R7W-S09E	765	3300	0.0128	0.051	0.07	0.051
	770	3300	0.0128	0.051	0.07	0.051
	775	3300	0.0128	0.051	0.07	0.051
	780	410	0.0128	0.051	0.07	0.051
	785	190	0.0128	0.051	0.07	0.051
	790	190	0.0128	0.051	0.07	0.051
T3N-R7W-S09W	765	3630	0.0128	0.051	0.07	0.051
	770	2720	0.0128	0.051	0.07	0.051
	775	910	0.0128	0.051	0.07	0.051
	780	910	0.0128	0.051	0.07	0.051
	785	6950	0.0128	0.051	0.07	0.051
	790	6050	0.0128	0.051	0.07	0.051
	795	6050	0.0128	0.051	0.07	0.051
	800	6050	0.0128	0.051	0.07	0.051
	805	6050	0.0128	0.051	0.07	0.051
	810	6050	0.0128	0.051	0.07	0.051
	825	4800	0.0128	0.053	0.105	0.053
	830	4530	0.0128	0.053	0.105	0.053
	835	2640	0.0128	0.053	0.105	0.053
	840	2640	0.0128	0.053	0.105	0.053
T3N-R7W-S11	755	2320	0.0264	0.037	0.069	0.037
	760	1030	0.0264	0.053	0.105	0.053
	765	1030	0.0264	0.053	0.105	0.053
	770	1030	0.0264	0.053	0.105	0.053
	775	1030	0.0264	0.053	0.105	0.053
	780	1030	0.0264	0.053	0.105	0.053
	785	1030	0.0264	0.053	0.105	0.053
	790	1030	0.0264	0.053	0.105	0.053
	795	1030	0.0264	0.053	0.105	0.053
	800	1030	0.0264	0.053	0.105	0.053

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	805	1030	0.0264	0.053	0.105	0.053
	810	1030	0.0264	0.053	0.105	0.053
	815	1030	0.0264	0.053	0.105	0.053
	820	1030	0.0264	0.053	0.105	0.053
T3N-R7W-S12	760	1130	0.0212	0.037	0.069	0.037
	765	1130	0.0212	0.037	0.069	0.037
	770	1130	0.0212	0.037	0.069	0.037
	775	1130	0.0212	0.053	0.105	0.053
	780	1130	0.0212	0.053	0.105	0.053
	785	1130	0.0212	0.053	0.105	0.053
	790	1130	0.0212	0.053	0.105	0.053
	795	1130	0.0212	0.053	0.105	0.053
	800	1130	0.0212	0.053	0.105	0.053
	805	1130	0.0212	0.053	0.105	0.053
	810	1130	0.0212	0.053	0.105	0.053
	815	1130	0.0212	0.053	0.105	0.053
T3N-R7W-S15	765	1850	0.0219	0.032	0.057	0.032
	770	1850	0.0219	0.032	0.057	0.032
	775	2330	0.0219	0.032	0.057	0.032
	780	2330	0.02	0.053	0.105	0.053
	785	700	0.02	0.053	0.105	0.053
	790	1630	0.02	0.053	0.105	0.053
	795	2330	0.02	0.053	0.105	0.053
	800	2330	0.02	0.053	0.105	0.053
	805	2330	0.02	0.053	0.105	0.053
	810	2330	0.02	0.037	0.069	0.037
	815	2330	0.02	0.037	0.069	0.037
	820	2330	0.0234	0.037	0.069	0.037
	825	2330	0.0234	0.053	0.105	0.053
	830	2330	0.0234	0.053	0.105	0.053
	835	2330	0.0234	0.053	0.105	0.053
	840	2330	0.0317	0.053	0.105	0.053
	845	2330	0.0317	0.053	0.105	0.053
	850	2330	0.0317	0.053	0.105	0.053
	855	2330	0.0317	0.053	0.105	0.053
	860	2330	0.0317	0.053	0.105	0.053
	865	2330	0.0317	0.053	0.105	0.053
	870	990	0.0274	0.053	0.105	0.053
	875	990	0.0274	0.053	0.105	0.053
	880	990	0.0274	0.053	0.105	0.053
	885	990	0.0274	0.053	0.105	0.053
	890	990	0.0274	0.053	0.105	0.053
	895	990	0.0274	0.053	0.105	0.053
	900	990	0.0274	0.053	0.105	0.053
T3N-R7W-S17	755	960	0.0185	0.032	0.057	0.032
	760	960	0.0185	0.032	0.057	0.032
	765	960	0.0185	0.032	0.057	0.032
	770	960	0.0185	0.032	0.057	0.032
	775	960	0.0185	0.051	0.07	0.051
	780	960	0.0185	0.051	0.07	0.051

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	785	960	0.0185	0.051	0.07	0.051
	790	960	0.0185	0.051	0.07	0.051
	795	960	0.0185	0.051	0.07	0.051
	800	960	0.0185	0.051	0.07	0.051
	805	960	0.0185	0.051	0.07	0.051
	810	960	0.0185	0.051	0.07	0.051
	815	960	0.0185	0.051	0.07	0.051
T3N-R7W-S20	760	2850	0.0184	0.032	0.057	0.032
	765	2850	0.0184	0.032	0.057	0.032
	770	2850	0.0184	0.032	0.057	0.032
	775	1860	0.0184	0.032	0.057	0.032
	780	1860	0.0184	0.032	0.057	0.032
	785	1860	0.0184	0.032	0.057	0.032
	790	1860	0.0184	0.051	0.07	0.051
	795	1860	0.0184	0.051	0.07	0.051
	800	3390	0.0184	0.051	0.07	0.051
	805	3390	0.0184	0.051	0.07	0.051
	810	3390	0.0184	0.051	0.07	0.051
	815	850	0.0184	0.051	0.07	0.051
	820	2540	0.0184	0.051	0.07	0.051
	825	3390	0.0184	0.051	0.07	0.051
	830	3390	0.0184	0.051	0.07	0.051
	835	3390	0.0184	0.051	0.07	0.051
T3N-R7W-S24	755	780	0.0197	0.037	0.069	0.037
	760	780	0.0197	0.037	0.069	0.037
	765	730	0.0197	0.037	0.069	0.037
	770	730	0.0197	0.037	0.069	0.037
	775	730	0.0197	0.037	0.069	0.037
	780	730	0.0197	0.037	0.069	0.037
	785	730	0.0197	0.037	0.069	0.037
	790	730	0.0197	0.037	0.069	0.037
	795	290	0.0197	0.037	0.069	0.037
	800	440	0.0197	0.037	0.069	0.037
	805	290	0.0197	0.037	0.069	0.037
	810	440	0.0197	0.037	0.069	0.037
	815	730	0.0197	0.037	0.069	0.037
	820	730	0.0197	0.037	0.069	0.037
	825	570	0.0197	0.037	0.069	0.037
	830	570	0.0197	0.037	0.069	0.037
	835	570	0.0197	0.037	0.069	0.037
	840	570	0.0197	0.037	0.069	0.037
	845	570	0.0197	0.037	0.069	0.037
	850	570	0.0197	0.037	0.069	0.037
T3N-R7W-S26	765	10060	0.0133	0.032	0.057	0.032
	775	5560	0.0133	0.032	0.057	0.032
	780	5560	0.0133	0.032	0.057	0.032
	785	5380	0.0133	0.032	0.057	0.032
	790	5380	0.0133	0.032	0.057	0.032
	795	3740	0.0133	0.032	0.057	0.032
	800	3740	0.0133	0.032	0.057	0.032

AREA B

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	805	3740	0.0133	0.032	0.057	0.032
	810	1150	0.0133	0.032	0.057	0.032
	815	840	0.0133	0.051	0.07	0.051
	820	840	0.0133	0.051	0.07	0.051
	825	840	0.0133	0.032	0.057	0.032
	830	840	0.0133	0.032	0.057	0.032
	835	840	0.0133	0.032	0.057	0.032
	840	840	0.024	0.032	0.057	0.032
T3N-R7W-S28E	755	2290	0.0131	0.032	0.057	0.032
	760	2290	0.0131	0.032	0.057	0.032
	765	2290	0.0131	0.032	0.057	0.032
	770	2290	0.0131	0.032	0.057	0.032
	775	2290	0.0131	0.032	0.057	0.032
	780	2290	0.0131	0.032	0.057	0.032
	785	2290	0.0131	0.032	0.057	0.032
	790	2040	0.0131	0.032	0.057	0.032
	795	360	0.0131	0.032	0.057	0.032
	800	360	0.0131	0.032	0.057	0.032
	805	360	0.0131	0.032	0.057	0.032
	810	360	0.0131	0.032	0.057	0.032
	815	360	0.0131	0.032	0.057	0.032
	820	360	0.0131	0.032	0.057	0.032
	825	230	0.0131	0.032	0.057	0.032
	830	230	0.0131	0.032	0.057	0.032
	835	230	0.0131	0.032	0.057	0.032
	840	230	0.0131	0.032	0.057	0.032
	845	230	0.0131	0.051	0.07	0.051
T3N-R7W-S28W	752	4930	0.0133	0.032	0.057	0.032
	754	4930	0.0133	0.032	0.057	0.032
	756	4930	0.0133	0.032	0.057	0.032
	758	4930	0.0133	0.032	0.057	0.032
	760	4650	0.0133	0.032	0.057	0.032
	762	4550	0.0133	0.032	0.057	0.032
	764	4550	0.0133	0.032	0.057	0.032
	766	4440	0.0133	0.032	0.057	0.032
	768	2890	0.0187	0.032	0.057	0.032
	770	2890	0.0187	0.032	0.057	0.032
	772	2170	0.0187	0.032	0.057	0.032
	774	720	0.0187	0.032	0.057	0.032
	776	2170	0.0187	0.032	0.057	0.032
	778	720	0.0187	0.032	0.057	0.032
	780	2890	0.0187	0.032	0.057	0.032
	782	2890	0.0187	0.032	0.057	0.032
	784	2890	0.0187	0.032	0.057	0.032
	786	2890	0.0187	0.032	0.057	0.032
	788	2890	0.0187	0.051	0.07	0.051
	790	2890	0.0187	0.051	0.07	0.051
	792	2890	0.0187	0.051	0.07	0.051
	796	2610	0.0187	0.051	0.07	0.051
	798	2610	0.0187	0.051	0.07	0.051
	802	2610	0.0187	0.051	0.07	0.051

AREA B

FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	N-VALUE		
				LEFT BANK	MIDDLE	RIGHT BANK
	804	2610	0.0187	0.051	0.07	0.051
	806	2610	0.0187	0.051	0.07	0.051
	808	2610	0.0187	0.051	0.07	0.051
	810	2610	0.0187	0.051	0.07	0.051
	812	2610	0.0187	0.051	0.07	0.051
	814	2610	0.0187	0.051	0.07	0.051
	816	2610	0.0187	0.053	0.105	0.053
	818	2610	0.0187	0.053	0.105	0.053
	820	2610	0.0209	0.053	0.105	0.053
	822	2610	0.0209	0.053	0.105	0.053
	824	2610	0.0209	0.053	0.105	0.053
	826	2610	0.0209	0.053	0.105	0.053
	828	2610	0.0209	0.053	0.105	0.053
	830	2610	0.0209	0.053	0.105	0.053
	832	2610	0.0209	0.053	0.105	0.053
	834	2610	0.0209	0.053	0.105	0.053
	836	2610	0.0209	0.053	0.105	0.053
	838	2610	0.0209	0.053	0.105	0.053
	840	2610	0.0209	0.053	0.105	0.053
	842	920	0.0209	0.053	0.105	0.053
	844	920	0.0209	0.053	0.105	0.053
	846	920	0.0209	0.053	0.105	0.053
	848	920	0.0209	0.053	0.105	0.053
T4N-R7W-S28S	765	210	0.0211	0.053	0.105	0.053
	770	210	0.0211	0.053	0.105	0.053
	775	210	0.0211	0.053	0.105	0.053
	780	210	0.0211	0.053	0.105	0.053
	785	210	0.0211	0.053	0.105	0.053
	790	210	0.0211	0.053	0.105	0.053
	795	210	0.0211	0.053	0.105	0.053
	800	210	0.0211	0.053	0.105	0.053
	805	210	0.0211	0.053	0.105	0.053
T4N-R7W-S28W	755	1050	0.0224	0.053	0.105	0.053
	760	820	0.0224	0.053	0.105	0.053
	765	390	0.0224	0.053	0.105	0.053
	770	390	0.0224	0.053	0.105	0.053
	775	390	0.0224	0.053	0.105	0.053
	780	390	0.0224	0.053	0.105	0.053
	785	390	0.0224	0.053	0.105	0.053
	790	390	0.0224	0.053	0.105	0.053
T4N-R7W-S30	765	640	0.0215	0.053	0.105	0.053
	770	640	0.0215	0.053	0.105	0.053
	775	640	0.0215	0.053	0.105	0.053
	780	640	0.0215	0.053	0.105	0.053
T4N-R7W-S32	760	1880	0.0228	0.053	0.105	0.053
	765	1880	0.0228	0.053	0.105	0.053
	770	1880	0.0228	0.053	0.105	0.053
	775	1880	0.0228	0.053	0.105	0.053
	780	1880	0.0228	0.053	0.105	0.053

AREA B

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	785	1880	0.0228	0.053	0.105	0.053
	790	1880	0.0228	0.053	0.105	0.053
	795	1880	0.0228	0.053	0.105	0.053
	800	1880	0.0228	0.053	0.105	0.053
	805	1880	0.0228	0.053	0.105	0.053
	810	1880	0.0228	0.053	0.105	0.053
	820	1880	0.0228	0.053	0.105	0.053
	825	1880	0.0228	0.053	0.105	0.053
	830	1880	0.0228	0.053	0.105	0.053
	835	1880	0.0228	0.053	0.105	0.053
	840	1880	0.0228	0.053	0.105	0.053
	850	1880	0.0228	0.053	0.105	0.053
T4N-R7W-S33N	760	1930	0.0196	0.053	0.105	0.053
	765	1930	0.0196	0.053	0.105	0.053
	770	1930	0.0196	0.053	0.105	0.053
	775	1930	0.0196	0.053	0.105	0.053
	780	1930	0.0196	0.053	0.105	0.053
	785	1880	0.0196	0.053	0.105	0.053
	790	1080	0.0224	0.053	0.105	0.053

AREA C

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T1S-R6W-S29E	505	8910	0.006	0.034	0.061	0.034
	510	7110	0.006	0.034	0.061	0.034
	515	7040	0.006	0.034	0.061	0.034
	520	6960	0.006	0.034	0.061	0.034
	525	5310	0.006	0.034	0.061	0.034
	530	5200	0.006	0.034	0.061	0.034
	535	2160	0.0071	0.034	0.061	0.034
	540	2160	0.0071	0.034	0.061	0.034
	545	2160	0.0071	0.034	0.061	0.034
	550	1910	0.0071	0.034	0.061	0.034
	555	1910	0.0071	0.034	0.061	0.034
	560	1550	0.0071	0.034	0.061	0.034
	565	1550	0.0071	0.034	0.061	0.034
	570	1550	0.0071	0.034	0.061	0.034
	575	1230	0.0071	0.040	0.071	0.040
	580	920	0.0101	0.040	0.071	0.040
	585	430	0.0101	0.040	0.071	0.040
	590	430	0.0101	0.040	0.071	0.040
	595	430	0.0101	0.040	0.071	0.040
	600	430	0.0101	0.040	0.071	0.040
	605	380	0.0101	0.040	0.071	0.040
	610	380	0.0101	0.040	0.071	0.040
	615	380	0.0101	0.040	0.071	0.040
T2N-R6W-S18E	510	1470	0.0067	0.034	0.061	0.034
	515	1470	0.0067	0.034	0.061	0.034
	520	1470	0.0067	0.034	0.061	0.034
	525	1470	0.0067	0.034	0.061	0.034
	530	1270	0.0067	0.034	0.061	0.034
	535	750	0.0067	0.034	0.061	0.034
	540	750	0.0067	0.034	0.061	0.034
	545	750	0.0067	0.034	0.061	0.034
	550	750	0.0067	0.034	0.061	0.034
	555	750	0.0100	0.034	0.061	0.034
	560	750	0.0100	0.040	0.071	0.040
	565	750	0.0100	0.040	0.071	0.040
	570	390	0.0100	0.040	0.071	0.040
	575	390	0.0100	0.040	0.071	0.040
	580	390	0.0100	0.040	0.071	0.040
	585	390	0.0100	0.040	0.071	0.040
T2N-R6W-S18W	510	3030	0.006	0.034	0.061	0.034
	515	3030	0.006	0.034	0.061	0.034
	520	2910	0.006	0.034	0.061	0.034
	525	1440	0.006	0.034	0.061	0.034
	530	1440	0.006	0.034	0.061	0.034
	535	1440	0.006	0.034	0.061	0.034
	540	1440	0.006	0.034	0.061	0.034
	545	1440	0.008	0.034	0.061	0.034

AREA C

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	550	1440	0.008	0.034	0.061	0.034
	555	1440	0.008	0.034	0.061	0.034
	560	1440	0.008	0.04	0.071	0.04
	565	1050	0.008	0.04	0.071	0.04
	570	690	0.0128	0.04	0.071	0.04
	575	690	0.0123	0.04	0.071	0.04
	580	690	0.0123	0.04	0.071	0.04
	585	690	0.0123	0.04	0.071	0.04
	590	690	0.0123	0.04	0.071	0.04
	595	690	0.0123	0.04	0.071	0.04
T2N-R6W-S19	510	1650	0.0066	0.034	0.061	0.034
	515	1650	0.0066	0.034	0.061	0.034
	520	1650	0.0066	0.034	0.061	0.034
	525	1430	0.0066	0.034	0.061	0.034
	530	1430	0.0066	0.034	0.061	0.034
	535	1070	0.0066	0.034	0.061	0.034
	540	360	0.0066	0.034	0.061	0.034
	545	1430	0.0066	0.034	0.061	0.034
	550	1430	0.0066	0.034	0.061	0.034
	555	1430	0.0066	0.034	0.061	0.034
	560	1430	0.0066	0.034	0.061	0.034
	565	1050	0.0066	0.034	0.061	0.034
	570	1050	0.0102	0.04	0.071	0.04
	575	1050	0.0102	0.04	0.071	0.04
	580	1050	0.0102	0.04	0.071	0.04
	585	780	0.0102	0.04	0.071	0.04
	590	780	0.0102	0.04	0.071	0.04
	595	630	0.0102	0.04	0.071	0.04
	600	630	0.0102	0.04	0.071	0.04
	605	630	0.0102	0.04	0.071	0.04
	610	630	0.0102	0.04	0.071	0.04
T2N-R6W-S30W	505	1720	0.0064	0.034	0.061	0.034
	510	1720	0.0064	0.034	0.061	0.034
	515	1720	0.0064	0.034	0.061	0.034
	520	1720	0.0064	0.034	0.061	0.034
	525	1720	0.0064	0.034	0.061	0.034
	530	1720	0.0064	0.034	0.061	0.034
	535	1460	0.0064	0.034	0.061	0.034
T2N-R7W-S02	510	360	0.0094	0.04	0.071	0.04
	515	360	0.0094	0.04	0.071	0.04
T2N-R7W-S07E	510	170	0.0083	0.04	0.071	0.04
	515	170	0.0083	0.04	0.071	0.04
	520	170	0.0083	0.04	0.071	0.04
T2N-R7W-S07S	510	150	0.0083	0.034	0.061	0.034

AREA C

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	515	150	0.0083	0.04	0.071	0.04
	520	150	0.0083	0.04	0.071	0.04
T2N-R7W-S10	505	2050	0.0067	0.061	0.054	0.061
	510	1040	0.0098	0.061	0.054	0.061
	515	1040	0.0098	0.04	0.071	0.04
	520	270	0.0098	0.04	0.071	0.04
	525	400	0.0098	0.04	0.071	0.04
	530	670	0.0098	0.04	0.071	0.04
	535	670	0.0098	0.04	0.071	0.04
	540	670	0.0098	0.04	0.071	0.04
	545	230	0.0098	0.04	0.071	0.04
T2N-R7W-S15E	510	490	0.0089	0.034	0.061	0.034
	515	490	0.0089	0.04	0.071	0.04
	520	490	0.0089	0.04	0.071	0.04
	525	490	0.0089	0.04	0.071	0.04
	530	490	0.0089	0.04	0.071	0.04
	535	490	0.0089	0.04	0.071	0.04
	540	490	0.0089	0.04	0.071	0.04
	545	80	0.0089	0.04	0.071	0.04
T2N-R7W-S15W	510	710	0.0087	0.034	0.061	0.034
	515	710	0.0087	0.034	0.061	0.034
	520	710	0.0087	0.04	0.071	0.04
	525	710	0.0087	0.04	0.071	0.04
	530	260	0.0089	0.04	0.071	0.04
	535	260	0.0089	0.04	0.071	0.04
T2N-R7W-S18E	510	1060	0.0073	0.034	0.061	0.034
	515	350	0.0083	0.034	0.061	0.034
	520	350	0.0083	0.034	0.061	0.034
	525	320	0.0083	0.034	0.061	0.034
T2N-R7W-S18W	505	370	0.0071	0.034	0.061	0.034
	510	370	0.0071	0.034	0.061	0.034
	515	370	0.0071	0.034	0.061	0.034
	520	370	0.0074	0.034	0.061	0.034
	525	370	0.0074	0.034	0.061	0.034
	530	370	0.0074	0.034	0.061	0.034
T2N-R7W-S19E	505	750	0.0071	0.034	0.061	0.034
	510	380	0.0071	0.034	0.061	0.034
	515	380	0.0071	0.034	0.061	0.034
	520	380	0.0071	0.034	0.061	0.034
T2N-R7W-S19W	505	1020	0.007	0.034	0.061	0.034
	510	1020	0.007	0.034	0.061	0.034
	515	1020	0.007	0.034	0.061	0.034

AREA C

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	520	590	0.007	0.04	0.071	0.04
	525	460	0.007	0.04	0.071	0.04
	530	460	0.007	0.04	0.071	0.04
	535	460	0.007	0.04	0.071	0.04
T2N-R7W-S20E	505	1150	0.0084	0.034	0.061	0.034
	510	850	0.0084	0.034	0.061	0.034
	515	850	0.0084	0.034	0.061	0.034
	520	770	0.0084	0.034	0.061	0.034
	525	770	0.0084	0.034	0.061	0.034
	530	770	0.0084	0.04	0.071	0.04
	535	770	0.0084	0.04	0.071	0.04
	540	690	0.0089	0.04	0.071	0.04
	545	690	0.0089	0.04	0.071	0.04
	550	690	0.0089	0.04	0.071	0.04
	555	690	0.0089	0.04	0.071	0.04
	560	690	0.0089	0.04	0.071	0.04
	565	690	0.0089	0.04	0.071	0.04
T2N-R7W-S20W	505	1330	0.0073	0.034	0.061	0.034
	510	1300	0.0073	0.034	0.061	0.034
	515	1160	0.0073	0.034	0.061	0.034
	520	1160	0.0073	0.034	0.061	0.034
	525	1060	0.0073	0.034	0.061	0.034
	530	710	0.0082	0.034	0.061	0.034
	535	710	0.0082	0.04	0.071	0.04
	540	540	0.0082	0.04	0.071	0.04
	545	470	0.0075	0.04	0.071	0.04
	550	470	0.0075	0.04	0.071	0.04
	555	470	0.0075	0.04	0.071	0.04
	560	470	0.0075	0.04	0.071	0.04
	565	470	0.0075	0.04	0.071	0.04
	570	470	0.0075	0.04	0.071	0.04
	575	470	0.0075	0.04	0.071	0.04
	580	470	0.0075	0.04	0.071	0.04
T2N-R7W-S25E	510	2900	0.0064	0.034	0.061	0.034
	515	2900	0.0064	0.034	0.061	0.034
	520	2900	0.0064	0.034	0.061	0.034
	525	2900	0.0064	0.034	0.061	0.034
	530	2900	0.0064	0.034	0.061	0.034
	535	2900	0.0064	0.034	0.061	0.034
	540	2900	0.0042	0.034	0.061	0.034
	545	2390	0.0042	0.061	0.054	0.061
	550	2390	0.0067	0.061	0.054	0.061
	555	2390	0.0067	0.061	0.054	0.061
	560	1010	0.0096	0.061	0.054	0.061
	565	1010	0.0096	0.04	0.071	0.04
	570	1010	0.0096	0.04	0.071	0.04

AREA C

					N-VALUE	
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	575	1010	0.0096	0.04	0.071	0.04
	580	1010	0.0096	0.04	0.071	0.04
	585	1010	0.0096	0.04	0.071	0.04
	590	760	0.0096	0.04	0.071	0.04
	595	760	0.0096	0.04	0.071	0.04
	600	760	0.0096	0.04	0.071	0.04
	605	760	0.0096	0.04	0.071	0.04
	610	760	0.0096	0.04	0.071	0.04
	615	760	0.0096	0.04	0.071	0.04
T2N-R7W-S26E	510	1220	0.0068	0.034	0.061	0.034
	520	1220	0.0068	0.034	0.061	0.034
	530	1220	0.0068	0.034	0.061	0.034
	540	1100	0.0068	0.061	0.054	0.061
	550	1100	0.0068	0.034	0.061	0.034
	560	1100	0.0068	0.034	0.061	0.034
	570	1100	0.0068	0.034	0.061	0.034
	580	1200	0.0087	0.034	0.061	0.034
T2N-R7W-S26W	510	980	0.0072	0.034	0.061	0.034
	520	980	0.0072	0.034	0.061	0.034
	530	980	0.0072	0.034	0.061	0.034
	540	540	0.0072	0.034	0.061	0.034
	550	540	0.0072	0.034	0.061	0.034
	560	540	0.0072	0.034	0.061	0.034
	570	540	0.0072	0.034	0.061	0.034
T2N-R7W-S27W	510	860	0.0087	0.034	0.061	0.034
	515	860	0.0087	0.034	0.061	0.034
	520	560	0.0087	0.034	0.061	0.034
	525	560	0.0087	0.034	0.061	0.034
	530	560	0.0087	0.04	0.071	0.04
	535	440	0.0087	0.04	0.071	0.04
	540	340	0.0087	0.04	0.071	0.04
	545	340	0.0087	0.04	0.071	0.04
	550	340	0.0087	0.04	0.071	0.04

AREA D

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T1N-R6W-S18	590	4750	0.0052	0.061	0.044	0.061
	600	11390	0.0052	0.061	0.044	0.061
	610	11180	0.0052	0.061	0.044	0.061
	620	10820	0.0052	0.061	0.044	0.061
	640	10820	0.0052	0.061	0.044	0.061
	650	10320	0.0052	0.061	0.044	0.061
	660	10320	0.0052	0.061	0.044	0.061
	670	10060	0.0052	0.061	0.044	0.061
	690	10060	0.0052	0.061	0.044	0.061
T1N-R6W-S20E	510	5040	0.0047	0.038	0.071	0.038
	520	5040	0.0047	0.038	0.071	0.038
	530	4950	0.0047	0.038	0.071	0.038
	540	4950	0.0047	0.038	0.071	0.038
	550	3790	0.0047	0.038	0.071	0.038
	560	3790	0.006	0.038	0.071	0.038
	570	3620	0.006	0.038	0.071	0.038
	580	3320	0.006	0.038	0.071	0.038
	590	3320	0.006	0.038	0.071	0.038
	600	3320	0.006	0.038	0.071	0.038
	610	3320	0.006	0.038	0.071	0.038
	620	2870	0.006	0.038	0.071	0.038
	630	1570	0.007	0.038	0.071	0.038
	640	1570	0.007	0.038	0.071	0.038
	650	1570	0.007	0.038	0.071	0.038
	660	1490	0.007	0.038	0.071	0.038
	670	770	0.0075	0.038	0.071	0.038
	680	770	0.0075	0.038	0.071	0.038
	700	770	0.0075	0.038	0.071	0.038
	710	770	0.0075	0.038	0.071	0.038
	720	770	0.0075	0.038	0.071	0.038
	730	670	0.0075	0.038	0.071	0.038
	750	670	0.0075	0.038	0.071	0.038
T1S-R6W-S27	510	1180	0.005	0.038	0.071	0.038
	520	1180	0.005	0.038	0.071	0.038
	530	750	0.005	0.038	0.071	0.038
	540	750	0.005	0.038	0.071	0.038
	550	750	0.005	0.038	0.071	0.038
	560	750	0.005	0.038	0.071	0.038
	570	750	0.0062	0.038	0.071	0.038
	580	560	0.0062	0.038	0.071	0.038
T2N-R6W-S02	505	2660	0.0065	0.038	0.071	0.038
	510	1100	0.0065	0.038	0.071	0.038
	520	1100	0.0065	0.038	0.071	0.038
	530	1100	0.0065	0.038	0.071	0.038
	540	930	0.0065	0.038	0.071	0.038

AREA D

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	550	930	0.0065	0.038	0.071	0.038
	560	930	0.0065	0.038	0.071	0.038
	570	930	0.0065	0.038	0.071	0.038
	580	420	0.0065	0.038	0.071	0.038
	590	420	0.0065	0.038	0.071	0.038
	600	150	0.0065	0.038	0.071	0.038
T2N-R6W-S05E	510	8390	0.0058	0.038	0.071	0.038
	550	5140	0.0058	0.038	0.071	0.038
	560	5120	0.0058	0.038	0.071	0.038
	570	5120	0.0058	0.038	0.071	0.038
	580	5120	0.0058	0.038	0.071	0.038
	590	5120	0.0058	0.038	0.071	0.038
	600	5120	0.0058	0.038	0.071	0.038
	610	5120	0.0058	0.038	0.071	0.038
	620	4850	0.006	0.038	0.071	0.038
	630	2800	0.006	0.038	0.071	0.038
	640	2110	0.006	0.038	0.071	0.038
	650	1350	0.006	0.038	0.071	0.038
T2N-R6W-S05N	520	1670	0.0064	0.038	0.071	0.038
	530	1520	0.0064	0.038	0.071	0.038
	540	1180	0.0064	0.038	0.071	0.038
	550	450	0.0093	0.038	0.071	0.038
	560	450	0.0093	0.038	0.071	0.038
	570	450	0.0093	0.038	0.071	0.038
	580	450	0.0093	0.038	0.071	0.038
T2N-R6W-S05S	520	670	0.0087	0.038	0.071	0.038
	530	670	0.0087	0.038	0.071	0.038
	540	670	0.0087	0.038	0.071	0.038
	550	490	0.0087	0.038	0.071	0.038
	560	320	0.0087	0.038	0.071	0.038
	570	170	0.0087	0.038	0.071	0.038
	580	150	0.0087	0.038	0.071	0.038
T2N-R6W-S05W	510	8320	0.0082	0.038	0.071	0.038
	520	8320	0.0082	0.038	0.071	0.038
	530	3040	0.0082	0.038	0.071	0.038
	540	1370	0.0082	0.038	0.071	0.038
	550	1370	0.0082	0.038	0.071	0.038
	560	1370	0.0082	0.038	0.071	0.038
	570	1370	0.0082	0.038	0.071	0.038
	580	1370	0.0082	0.038	0.071	0.038
	590	830	0.0082	0.038	0.071	0.038
	600	410	0.0114	0.038	0.071	0.038
	610	410	0.0114	0.038	0.071	0.038
	620	410	0.0114	0.038	0.071	0.038
	630	410	0.0114	0.038	0.071	0.038

AREA D

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	640	410	0.0114	0.038	0.071	0.038
	650	410	0.0114	0.038	0.071	0.038
	660	410	0.0114	0.038	0.071	0.038
	670	410	0.0114	0.038	0.071	0.038
T2N-R6W-S22	510	4810	0.006	0.038	0.071	0.038
	520	1020	0.006	0.038	0.071	0.038
	530	1020	0.006	0.038	0.071	0.038
	540	1020	0.006	0.038	0.071	0.038
	550	1020	0.006	0.038	0.071	0.038
	560	1020	0.006	0.038	0.071	0.038
	570	700	0.006	0.038	0.071	0.038
	575	180	0.006	0.038	0.071	0.037
	580	390	0.006	0.038	0.071	0.038
T2N-R6W-S27	530	380	0.005	0.038	0.071	0.038
T2N-R6W-S28	510	1520	0.0052	0.038	0.071	0.038
	530	1520	0.0052	0.038	0.071	0.038
	550	1370	0.0052	0.038	0.071	0.038
	560	1370	0.0052	0.038	0.071	0.038
	570	1030	0.0052	0.038	0.071	0.038
	580	930	0.0077	0.038	0.071	0.038
	590	500	0.0077	0.038	0.071	0.038
	600	500	0.0077	0.038	0.071	0.038
T3N-R6W-S21	510	360	0.008	0.038	0.071	0.038
	520	360	0.008	0.038	0.071	0.038
	530	360	0.008	0.038	0.071	0.038
	540	360	0.008	0.038	0.071	0.038
	550	360	0.008	0.038	0.071	0.038
	560	360	0.008	0.038	0.071	0.038
T3N-R6W-S21E	600	2400	0.01	0.038	0.071	0.038
	610	2110	0.01	0.038	0.071	0.038
	620	2110	0.01	0.038	0.071	0.038
T3N-R6W-S27S	520	720	0.007	0.038	0.071	0.038
	530	720	0.007	0.038	0.071	0.038
	540	720	0.007	0.038	0.071	0.038
T3N-R6W-S27W	520	2480	0.0078	0.038	0.071	0.038
	530	2400	0.0078	0.038	0.071	0.038
	540	360	0.0078	0.038	0.071	0.038
T3N-R6W-S29	520	430	0.0091	0.038	0.071	0.038
	530	430	0.0091	0.038	0.071	0.038

AREA D

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T3N-R6W-S33	520	720	0.0064	0.038	0.071	0.038
	530	720	0.0064	0.038	0.071	0.038

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T1N-R6W-S03E	310	3000	0.0046	0.072	0.046	0.072
	320	230	0.0046	0.072	0.046	0.072
	330	230	0.0046	0.072	0.046	0.072
	340	230	0.0046	0.072	0.046	0.072
	350	230	0.0046	0.072	0.046	0.072
T1N-R6W-S03W	310	610	0.0038	0.072	0.046	0.072
	320	610	0.0038	0.072	0.046	0.072
T1N-R6W-S04E	310	340	0.0044	0.072	0.046	0.072
	320	340	0.0044	0.072	0.046	0.072
T1N-R6W-S05E	310	11150	0.0049	0.072	0.046	0.072
	320	2770	0.0049	0.072	0.046	0.072
	330	2770	0.0049	0.053	0.04	0.053
	340	1820	0.0049	0.072	0.044	0.072
	350	1820	0.0049	0.072	0.046	0.072
T1N-R6W-S05W	320	450	0.0049	0.053	0.04	0.053
	330	450	0.0049	0.072	0.046	0.072
	340	450	0.0049	0.072	0.046	0.072
T1N-R6W-S07	305	15340	0.0047	0.072	0.046	0.072
	310	13450	0.0047	0.072	0.046	0.072
	315	13450	0.0047	0.072	0.046	0.072
	325	13140	0.0053	0.072	0.046	0.072
	330	13140	0.0053	0.072	0.046	0.072
	335	12060	0.0053	0.072	0.046	0.072
	340	10380	0.0053	0.072	0.046	0.072
	345	9970	0.0053	0.072	0.046	0.072
	350	3510	0.0071	0.072	0.046	0.072
	355	2950	0.0071	0.072	0.046	0.072
	400	2950	0.0071	0.072	0.046	0.072
	405	2450	0.0071	0.072	0.046	0.072
	410	1580	0.0071	0.072	0.046	0.072
	415	1580	0.0071	0.072	0.046	0.072
	420	1120	0.0071	0.072	0.046	0.072
T1N-R6W-S09E	320	220	0.044	0.072	0.046	0.072
T1N-R6W-S16	310	710	0.0038	0.072	0.046	0.072
	320	280	0.0038	0.072	0.046	0.072
	330	280	0.0038	0.072	0.046	0.072
	340	280	0.0038	0.072	0.046	0.072
T1N-R6W-S17E	340	12680	0.0044	0.072	0.046	0.072
	350	840	0.0044	0.072	0.046	0.072
	360	750	0.0044	0.072	0.046	0.072
	370	420	0.0044	0.072	0.046	0.072

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	380	340	0.0044	0.072	0.046	0.072
	390	340	0.0044	0.072	0.046	0.072
	400	340	0.0044	0.072	0.046	0.072
T1N-R6W-S17W	310	12850	0.0044	0.072	0.046	0.072
	320	170	0.0044	0.072	0.046	0.072
	330	170	0.0044	0.072	0.046	0.072
	340	170	0.0044	0.072	0.046	0.072
	350	170	0.0044	0.072	0.046	0.072
T1N-R6W-S18	310	15590	0.0046	0.072	0.046	0.072
	320	4190	0.0049	0.072	0.046	0.072
	330	12500	0.0049	0.072	0.046	0.072
	340	12500	0.0049	0.072	0.046	0.072
	350	12500	0.0049	0.072	0.046	0.072
	360	11760	0.0049	0.072	0.046	0.072
	370	4590	0.0049	0.072	0.046	0.072
	380	4590	0.0049	0.072	0.046	0.072
T1N-R6W-S20E	310	12850	0.0044	0.072	0.046	0.072
	320	12680	0.0044	0.072	0.046	0.072
	330	11840	0.0044	0.072	0.046	0.072
	340	11840	0.0044	0.072	0.046	0.072
	350	11840	0.0044	0.072	0.046	0.072
	360	8380	0.0049	0.072	0.046	0.072
	370	8380	0.0049	0.072	0.046	0.072
	390	6980	0.0049	0.072	0.046	0.072
T1N-R6W-S20W	310	16110	0.0041	0.072	0.046	0.072
	320	3860	0.0041	0.072	0.046	0.072
	330	15590	0.0041	0.072	0.046	0.072
T1N-R6W-S22E	310	4720	0.004	0.072	0.046	0.072
	330	810	0.004	0.072	0.046	0.072
T1N-R6W-S22N	310	230	0.0038	0.072	0.046	0.072
	320	230	0.0038	0.072	0.046	0.072
	330	230	0.0038	0.072	0.046	0.072
T1N-R6W-S26	320	680	0.004	0.072	0.046	0.072
	330	680	0.004	0.072	0.046	0.072
	340	680	0.004	0.072	0.046	0.072
	350	680	0.004	0.072	0.046	0.072
T1N-R6W-S27S	320	180	0.0066	0.072	0.046	0.072
T1N-R6W-S29	310	16320	0.0031	0.072	0.046	0.072
	320	3870	0.0042	0.072	0.046	0.072
	330	3870	0.0042	0.072	0.046	0.072

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	340	3870	0.0042	0.072	0.046	0.072
	350	3870	0.0042	0.072	0.046	0.072
	360	1480	0.0042	0.05	0.092	0.05
	370	1480	0.0042	0.05	0.092	0.05
	380	1480	0.0042	0.05	0.092	0.05
	390	1480	0.0042	0.05	0.092	0.05
T1N-R7W-S01	310	2010	0.0056	0.05	0.092	0.05
	320	2010	0.0056	0.072	0.046	0.072
	330	2010	0.0056	0.05	0.092	0.05
	340	2010	0.0056	0.05	0.092	0.05
	350	2010	0.0056	0.05	0.092	0.05
	360	2010	0.0056	0.05	0.092	0.05
T1N-R7W-S02	320	680	0.0095	0.072	0.046	0.072
	330	680	0.0095	0.082	0.047	0.082
	340	680	0.0095	0.082	0.047	0.082
	350	680	0.0095	0.082	0.047	0.082
T1N-R7W-S05	320	260	0.0094	0.082	0.047	0.082
T1S-R6W-S08	310	1240	0.0038	0.072	0.046	0.072
	320	1100	0.0038	0.072	0.046	0.072
	340	420	0.0038	0.072	0.046	0.072
	350	420	0.0038	0.072	0.046	0.072
	360	420	0.0038	0.072	0.046	0.072
T1S-R6W-S27	310	6380	0.004	0.072	0.046	0.072
	320	5140	0.004	0.072	0.046	0.072
	330	4930	0.004	0.072	0.046	0.072
	340	3940	0.004	0.072	0.046	0.072
	345	4570	0.0038	0.072	0.046	0.072
	350	4570	0.0038	0.072	0.046	0.072
	360	2770	0.0044	0.072	0.046	0.072
	370	2110	0.005	0.072	0.046	0.072
	380	2110	0.005	0.072	0.046	0.072
T1S-R6W-S29E	320	24200	0.0041	0.072	0.046	0.072
	325	20330	0.0041	0.072	0.046	0.072
	330	15590	0.0041	0.072	0.046	0.072
	340	14140	0.0042	0.053	0.04	0.053
	350	13190	0.0042	0.053	0.04	0.053
	360	12120	0.0046	0.072	0.046	0.072
	370	8780	0.0046	0.072	0.046	0.072
T2N-R6W-S29W	310	4590	0.0049	0.053	0.04	0.053
	320	4590	0.0049	0.053	0.04	0.053
	330	4590	0.0049	0.053	0.04	0.053

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T2N-R6W-S31N	310	13170	0.0046	0.053	0.04	0.053
	320	990	0.0046	0.053	0.04	0.053
	330	990	0.0046	0.053	0.04	0.053
T2N-R6W-S31S	310	8430	0.0045	0.053	0.04	0.053
	330	6750	0.0045	0.053	0.04	0.053
	340	4020	0.0045	0.072	0.046	0.072
	350	4020	0.0045	0.072	0.046	0.072
	360	4020	0.0045	0.072	0.046	0.072
	370	3800	0.0071	0.053	0.04	0.053
	380	1040	0.0071	0.072	0.046	0.072
	390	340	0.0071	0.072	0.046	0.072
	400	340	0.0071	0.053	0.04	0.053
	410	180	0.0071	0.053	0.04	0.053
T2N-R6W-S32E	310	12110	0.0049	0.053	0.04	0.053
	320	360	0.0049	0.053	0.04	0.053
	330	360	0.0049	0.053	0.04	0.053
T2N-R6W-S32N	310	11620	0.0049	0.053	0.04	0.053
	320	7140	0.0049	0.053	0.04	0.053
	330	7140	0.0049	0.053	0.04	0.053
T2N-R6W-S33E	310	6980	0.0049	0.072	0.046	0.072
	320	220	0.0049	0.072	0.046	0.072
	330	220	0.0049	0.072	0.046	0.072
T2N-R6W-S33S	310	8150	0.0049	0.072	0.046	0.072
	320	1170	0.0049	0.072	0.046	0.072
	330	1170	0.0049	0.072	0.046	0.072
T2N-R6W-S34	310	2580	0.0049	0.072	0.046	0.072
	320	460	0.0049	0.072	0.046	0.072
	330	460	0.0049	0.072	0.046	0.072
T2N-R7W-S19E	320	750	0.0071	0.072	0.046	0.072
	330	750	0.0071	0.072	0.046	0.072
T2N-R7W-S19W	320	1020	0.0071	0.072	0.046	0.072
	330	1020	0.0071	0.072	0.046	0.072
T2N-R7W-S20E	320	950	0.0071	0.072	0.046	0.072
	330	950	0.0071	0.072	0.046	0.072
T2N-R7W-S20W	320	1600	0.0071	0.072	0.046	0.072
	330	1600	0.0071	0.072	0.046	0.072
	340	1600	0.0071	0.072	0.046	0.072
	350	1600	0.0071	0.072	0.046	0.072

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T2N-R7W-S25E	310	11650	0.0046	0.072	0.046	0.072
	320	2870	0.0046	0.072	0.046	0.072
	330	2610	0.0046	0.072	0.046	0.072
T2N-R7W-S25S	320	430	0.0046	0.072	0.046	0.072
	330	430	0.0046	0.072	0.046	0.072
	340	430	0.0046	0.072	0.046	0.072
	350	430	0.0046	0.072	0.046	0.072
	360	430	0.0046	0.072	0.046	0.072
T2N-R7W-S25W	320	120	0.0046	0.072	0.046	0.072
	330	120	0.0046	0.072	0.046	0.072
	340	120	0.0046	0.072	0.046	0.072
T2N-R7W-S26E	320	1420	0.0072	0.053	0.04	0.053
	340	1420	0.0072	0.072	0.046	0.072
	360	1420	0.0072	0.072	0.046	0.072
T2N-R7W-S26W	320	610	0.0072	0.053	0.04	0.053
	330	610	0.0072	0.053	0.04	0.053
	340	1110	0.0072	0.053	0.04	0.053
	350	1110	0.0072	0.072	0.046	0.072
	360	1110	0.0072	0.072	0.046	0.072
T2N-R7W-S27E	310	870	0.0071	0.072	0.046	0.072
	320	870	0.0071	0.072	0.046	0.072
	330	870	0.0071	0.072	0.046	0.072
	340	590	0.0071	0.072	0.046	0.072
T2N-R7W-S27W	330	590	0.071	0.072	0.046	0.072
	340	590	0.071	0.072	0.046	0.072
	350	590	0.071	0.072	0.046	0.072
	360	1020	0.071	0.072	0.046	0.072
	370	1020	0.071	0.072	0.046	0.072
T2N-R7W-S29	330	120	0.0071	0.072	0.046	0.072
	340	120	0.0071	0.072	0.046	0.072
	350	120	0.0071	0.072	0.046	0.072
T2N-R7W-S30N	310	2200	0.0071	0.072	0.046	0.072
	320	640	0.0071	0.072	0.046	0.072
	330	640	0.0071	0.072	0.046	0.072
T2N-R7W-S30S	310	2650	0.0071	0.072	0.046	0.072
	320	210	0.0071	0.072	0.046	0.072
	330	210	0.0071	0.082	0.047	0.082
	340	210	0.0071	0.082	0.047	0.082
	350	210	0.0071	0.082	0.047	0.082

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T2N-R7W-S32E	310	4010	0.0071	0.072	0.046	0.072
	320	2910	0.0071	0.072	0.046	0.072
	330	2750	0.0071	0.072	0.046	0.072
	340	2750	0.0071	0.072	0.046	0.072
	350	2560	0.0071	0.072	0.046	0.072
T2N-R7W-S32N	310	4780	0.0071	0.072	0.046	0.072
	320	980	0.0071	0.072	0.046	0.072
	330	980	0.0071	0.072	0.046	0.072
	340	980	0.0071	0.072	0.046	0.072
	350	980	0.0071	0.072	0.046	0.072
	360	980	0.0071	0.072	0.046	0.072
T2N-R7W-S32S	320	780	0.0094	0.082	0.047	0.082
	330	780	0.0094	0.082	0.047	0.082
	340	680	0.0094	0.082	0.047	0.082
	350	420	0.0094	0.082	0.047	0.082
	360	420	0.0094	0.082	0.047	0.082
	370	420	0.0094	0.082	0.047	0.082
T2N-R7W-S32W	310	560	0.008	0.082	0.047	0.082
	320	560	0.008	0.072	0.046	0.072
	330	560	0.008	0.072	0.046	0.072
	340	560	0.008	0.082	0.047	0.082
T2N-R7W-S33N	320	450	0.0094	0.072	0.046	0.072
	330	450	0.0094	0.072	0.046	0.072
	340	450	0.0094	0.082	0.047	0.082
T2N-R7W-S33S	310	2450	0.0094	0.072	0.046	0.072
	320	2000	0.0094	0.072	0.046	0.072
	330	1960	0.0094	0.072	0.046	0.072
	340	1180	0.0094	0.082	0.047	0.082
	350	1180	0.0094	0.082	0.047	0.082
	380	1180	0.0026	0.082	0.047	0.082
	390	1180	0.0026	0.082	0.047	0.082
	400	1180	0.0026	0.082	0.047	0.082
T2N-R7W-S34E	310	1370	0.0071	0.072	0.046	0.072
	320	1370	0.0071	0.072	0.046	0.072
	330	620	0.0071	0.072	0.046	0.072
T2N-R7W-S34N	310	10970	0.0058	0.072	0.046	0.072
	320	590	0.0058	0.072	0.046	0.072
	330	590	0.0058	0.072	0.046	0.072
	340	590	0.0058	0.072	0.046	0.072
T2N-R7W-S34S	310	12990	0.0062	0.072	0.046	0.072
	320	1090	0.0062	0.072	0.046	0.072

AREA E

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	330	1090	0.0062	0.072	0.046	0.072
	340	1090	0.0062	0.072	0.046	0.072
	350	1090	0.0062	0.082	0.047	0.082
T2N-R7W-S34W	310	1040	0.0071	0.072	0.046	0.072
	320	570	0.0071	0.072	0.046	0.072
	330	340	0.0071	0.072	0.046	0.072
	340	340	0.0071	0.072	0.046	0.072
T2N-R7W-S36E	310	6750	0.0045	0.053	0.04	0.053
	320	2450	0.0045	0.053	0.04	0.053
	330	2450	0.0045	0.053	0.04	0.053
	340	2100	0.0072	0.053	0.04	0.053
T2N-R7W-S36W	320	280	0.0045	0.072	0.046	0.072
	330	280	0.0045	0.072	0.046	0.072
	340	280	0.0045	0.072	0.046	0.072

AREA F

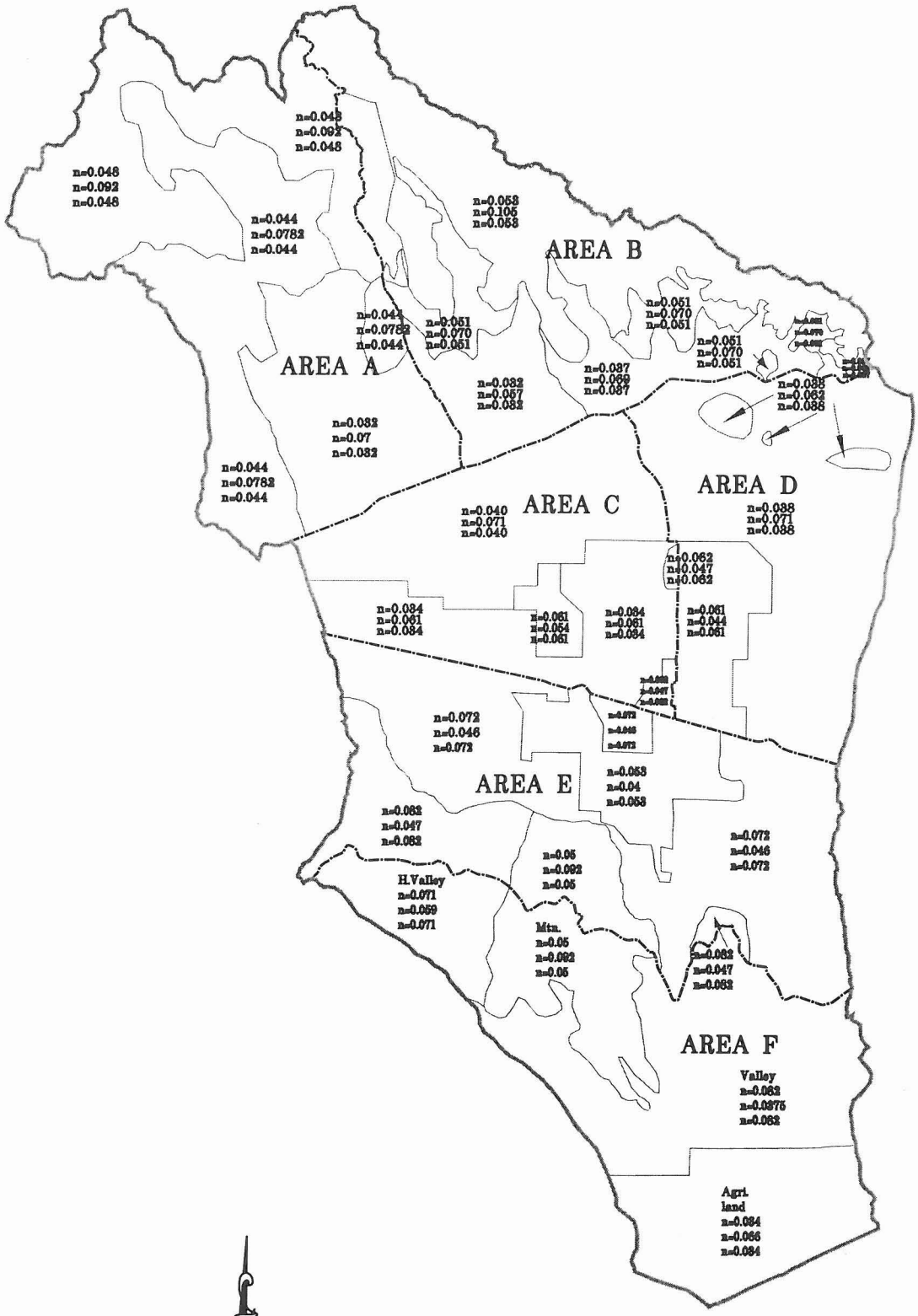
				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
T1N-R6W-S30E	70	880	0.0031	0.082	0.0375	0.082
	80	880	0.0031	0.082	0.0375	0.082
	90	880	0.0031	0.082	0.0375	0.082
	100	880	0.0031	0.082	0.0375	0.082
T1N-R6W-S30W	20	1340	0.0035	0.082	0.0375	0.082
	30	1340	0.0035	0.05	0.092	0.05
	40	1340	0.0035	0.05	0.092	0.05
	50	1340	0.0035	0.05	0.092	0.05
	60	1340	0.0035	0.05	0.092	0.05
	70	1340	0.0035	0.05	0.092	0.05
T1N-R7W-S17						
	10	1010	0.0077	0.071	0.059	0.071
	20	320	0.0077	0.071	0.059	0.071
	30	320	0.0077	0.071	0.059	0.071
	40	320	0.0077	0.071	0.059	0.071
T1N-R7W-S21E	10	2180	0.0077	0.071	0.059	0.071
	20	310	0.0077	0.071	0.059	0.071
T1N-R7W-S21W	10	2850	0.0077	0.071	0.059	0.071
	20	620	0.017	0.071	0.059	0.071
	30	620	0.017	0.071	0.059	0.071
	40	620	0.017	0.071	0.059	0.071
	50	620	0.017	0.071	0.059	0.071
	60	620	0.017	0.071	0.059	0.071
	70	620	0.017	0.071	0.059	0.071
	80	380	0.017	0.071	0.059	0.071
	90	380	0.017	0.071	0.059	0.071
	100	380	0.017	0.071	0.059	0.071
	110	380	0.017	0.071	0.059	0.071
T1N-R7W-S26E	50	370	0.006	0.082	0.0375	0.082
	60	370	0.006	0.082	0.0375	0.082
	70	370	0.006	0.05	0.092	0.05
T1N-R7W-S26W	100	670	0.006	0.082	0.0375	0.082
	110	670	0.006	0.082	0.0375	0.082
	120	670	0.006	0.082	0.0375	0.082
	130	670	0.006	0.082	0.0375	0.082
	140	670	0.006	0.05	0.092	0.05
T1N-R7W-S28E	20	2050	0.0076	0.071	0.059	0.071
	30	2050	0.0076	0.071	0.059	0.071
	40	2050	0.0076	0.071	0.059	0.071
	50	2050	0.0076	0.071	0.059	0.071
	60	2050	0.0076	0.071	0.059	0.071
	70	1090	0.0076	0.071	0.059	0.071
	80	1090	0.0076	0.071	0.059	0.071

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	90	1090	0.0076	0.071	0.059	0.071
	100	1090	0.0076	0.071	0.059	0.071
T1N-R7W-S28W	20	3020	0.0077	0.071	0.059	0.071
	30	3020	0.0077	0.071	0.059	0.071
	40	2220	0.0077	0.071	0.059	0.071
	50	1870	0.0077	0.071	0.059	0.071
	60	1870	0.0077	0.071	0.059	0.071
	70	1870	0.0077	0.071	0.059	0.071
	75	390	0.0075	0.071	0.059	0.071
	80	300	0.0075	0.071	0.059	0.071
	90	690	0.0075	0.071	0.059	0.071
	100	690	0.0075	0.071	0.059	0.071
	110	690	0.0075	0.071	0.059	0.071
	120	690	0.0075	0.071	0.059	0.071
T1N-R7W-S35	10	1510	0.006	0.082	0.0375	0.082
T1N-R7W-S36	20	1170	0.006	0.082	0.0375	0.082
	30	1170	0.006	0.082	0.0375	0.082
	40	1170	0.006	0.082	0.0375	0.082
	50	1170	0.006	0.05	0.092	0.05
T1S-R6W-S05E	10	3560	0.0031	0.082	0.0375	0.082
	20	3560	0.0031	0.082	0.0375	0.082
	30	3560	0.0031	0.082	0.0375	0.082
	40	3560	0.0031	0.082	0.0375	0.082
T1S-R6W-S05N	20	12450	0.0025	0.082	0.0375	0.082
	30	510	0.0025	0.082	0.0375	0.082
T1S-R6W-S05S	10	8450	0.0049	0.082	0.0375	0.082
	20	8450	0.0049	0.082	0.0375	0.082
	30	8450	0.0053	0.082	0.0375	0.082
	40	8450	0.0053	0.082	0.0375	0.082
	50	5760	0.006	0.082	0.0375	0.082
	60	5490	0.006	0.082	0.0375	0.082
	70	5490	0.006	0.082	0.0375	0.082
	80	5490	0.006	0.082	0.0375	0.082
	90	5070	0.006	0.071	0.059	0.071
T1S-R6W-S05W	10	720	0.0031	0.082	0.0375	0.082
	20	720	0.0031	0.082	0.0375	0.082
	30	720	0.0031	0.082	0.0375	0.082
	40	720	0.0031	0.082	0.0375	0.082
T1S-R6W-S08	10	13505	0.0021	0.082	0.0375	0.082
	20	13410	0.0025	0.082	0.0375	0.082
	30	13390	0.0025	0.082	0.0375	0.082

AREA F

				N-VALUE		
FLOODING SOURCE	CROSS SECTION #	Q (cfs)	SLOPE	LEFT BANK	MIDDLE	RIGHT BANK
	40	13390	0.0025	0.082	0.0375	0.082
	50	2430	0.0025	0.082	0.0375	0.082
	60	1900	0.0025	0.082	0.0375	0.082
	70	1900	0.0029	0.082	0.0375	0.082
T1S-R6W-S22W	10	1310	0.0041	0.034	0.066	0.034
	20	1310	0.0041	0.034	0.066	0.034
	30	1310	0.0041	0.034	0.066	0.034
T1S-R6W-S23	10	1070	0.0037	0.034	0.066	0.034
	20	1070	0.0037	0.034	0.066	0.034
T1S-R6W-S27	10	11540	0.0039	0.034	0.066	0.034
	20	11540	0.0039	0.034	0.066	0.034
	30	11540	0.0039	0.034	0.066	0.034
	40	11540	0.0039	0.034	0.066	0.034
	50	9840	0.004	0.034	0.066	0.034
	55	9840	0.004	0.082	0.0375	0.082
	60	6790	0.004	0.082	0.0375	0.082
	70	6380	0.004	0.082	0.0375	0.082
	80	6380	0.0036	0.082	0.0375	0.082
	90	6380	0.0036	0.082	0.0375	0.082
T1S-R6W-S28N	20	2480	0.0025	0.034	0.066	0.034
	30	1770	0.0042	0.034	0.066	0.034
	40	1770	0.0047	0.034	0.066	0.034
	50	1770	0.0047	0.034	0.066	0.034
	60	1770	0.0058	0.034	0.066	0.034
	70	1770	0.0058	0.034	0.066	0.034
T1S-R6W-S29E	10	36430	0.0026	0.034	0.066	0.034
	20	19320	0.0026	0.034	0.066	0.034
	30	18870	0.0033	0.034	0.066	0.034
	40	17410	0.0021	0.034	0.066	0.034
	50	16930	0.0021	0.082	0.0375	0.082
	60	16320	0.0031	0.082	0.0375	0.082
	70	16320	0.0031	0.082	0.0375	0.082
	75	16320	0.0031	0.082	0.0375	0.082
T1S-R6W-S29W						
	10	17550	0.0037	0.034	0.066	0.034
	20	1800	0.0037	0.034	0.066	0.034
	30	18870	0.0037	0.034	0.066	0.034
	40	1460	0.0037	0.034	0.066	0.034
	50	1460	0.0037	0.034	0.066	0.034

E.4 Manning's Coefficient Calculations



Entellus

PALO VERDE WATERSHED
ZONE A FLOODPLAIN DELINEATION STUDY
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FCD PROJECT NO. 2000C021

Manning's Values

FIGURE E.1

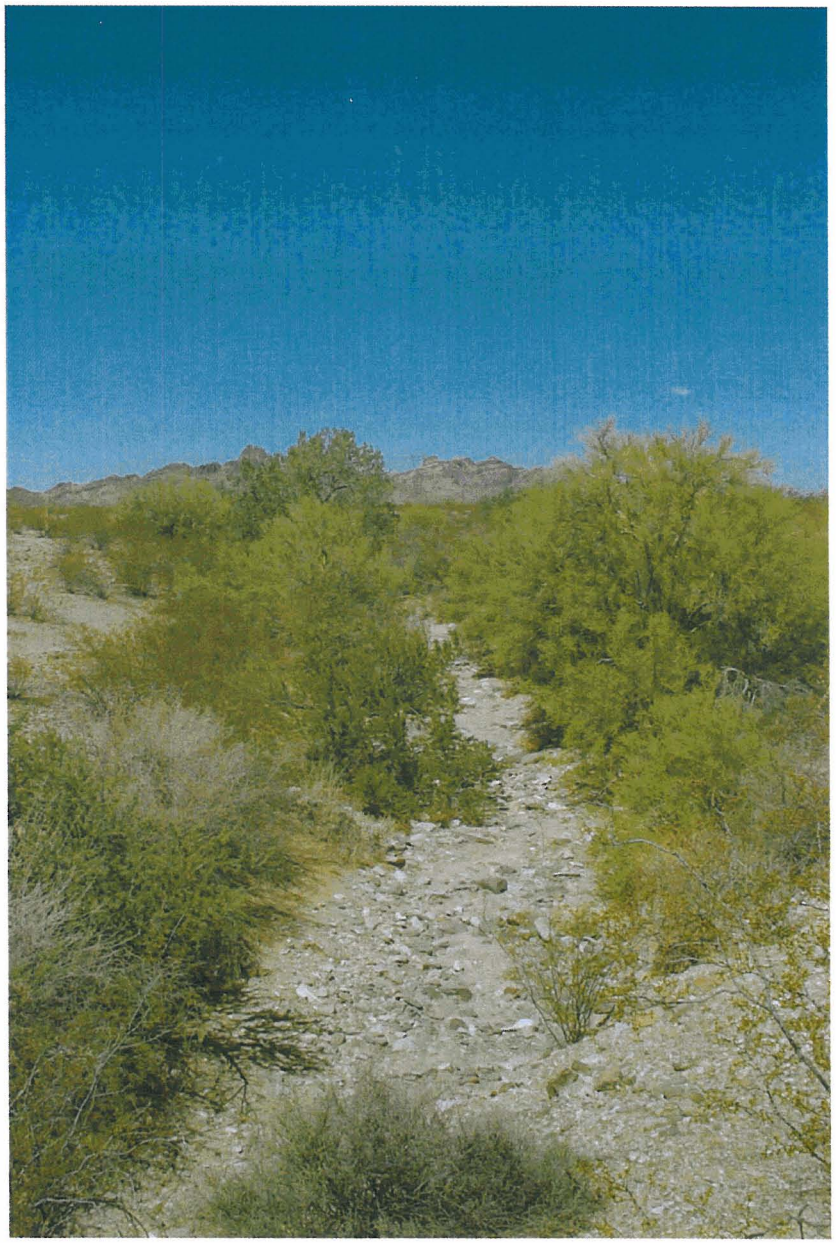
Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area A - Mountain area
Location: **Reaches** - North-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.007	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.015		0.015
	Large		.025 - .050		0.04	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.002	0.005	0.002
	Freq. Alt.		.010 - .015			
				0.048	0.08	0.048
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.048**	**0.092**	**0.048**

Figure E-A1

Upstream of T3N-R7W-S31S



Southern Panoramic shots of wash T2N-R5W-S31W

Surrounding area of T2N-R7W-S20W

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area A - High Valley Area
Location: **Reaches** - North-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.007	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.012		0.012
	Large		.025 - .050		0.030	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.003	0.001
	Freq. Alt.		.010 - .015			
				0.044	0.068	0.044
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.044**	**0.0782**	**0.044**

Figure E-A2

Near wash T2N-R8W-S01

Typical bank for wash T2N-R5W-S31W

Westbank of wash T3N-R5W-S28N at CAP floodway opening

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area A - Valley Area
Location: **Reaches** - North-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010	0.005		0.005
	Medium		.010 - .025			
	Large		.025 - .050		0.035	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.002	
	Freq. Alt.		.010 - .015			
				0.032	0.07	0.032
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.032**	**0.07**	**0.032**

Figure E-A3

Typical bank for wash T2N-R7W-S19W

Looking downstream of T2N-R8W-S02E

Looking upstream of T2N-R8W-S01

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area B - Mountain area
Location: **Reaches** - North-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.008	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.02		0.02
	Large		.025 - .050		.05	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.002	0.005	0.002
	Freq. Alt.		.010 - .015			
				0.053	0.091	0.053
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.053**	**0.105**	**0.053**

Figure E-B1

Near upstream of T2N-R6W-S18W looking east

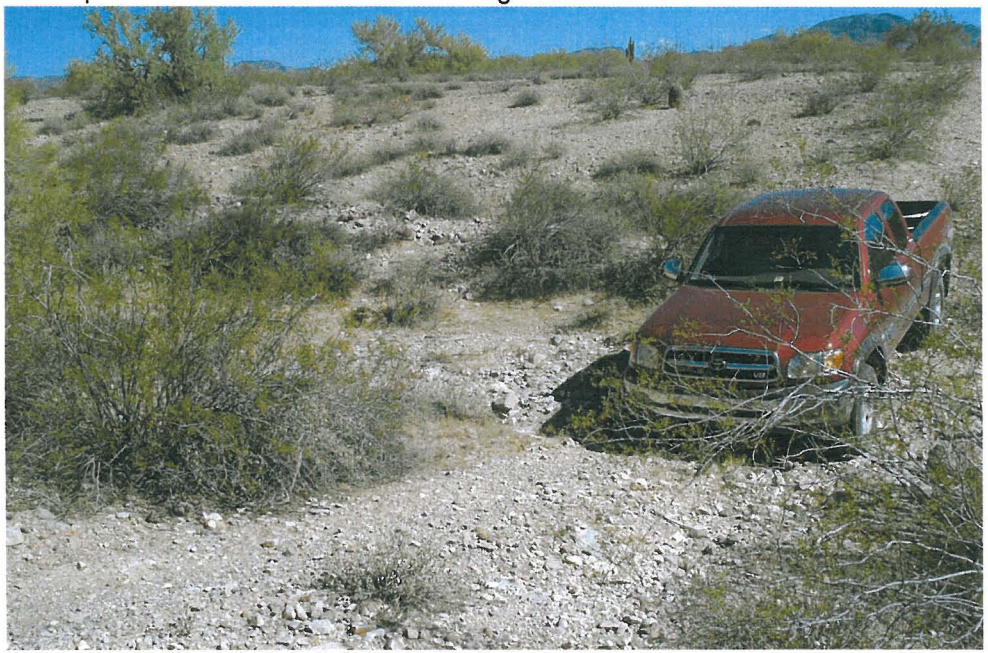


Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area B - High Valley Area
Location: **Reaches** - North-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.03		0.03
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.006	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.015		0.015
	Large		.025 - .050		0.033	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.003	0.001
	Freq. Alt.		.010 - .015			
				0.051	0.07	0.051
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.051**	**0.070**	**0.051**

Figure E-B2

Downstream of T3N-R6W-S19

Downstream of T3N-R6W-S18E

Downstream of Winters Wash

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area B - Valley Area West
Location: **Reaches** - North-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.003	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010	0.005		0.005
	Medium		.010 - .025		0.025	
	Large		.025 - .050			
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.001	
	Freq. Alt.		.010 - .015			
				0.032	0.057	0.032
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.032**	**0.057**	**0.032**

Figure E-B3

Downstream of T3N-R7W-S28W

Downstream of T2N-R6W-S19

Downstream of Old Camp Wash

Table E-1

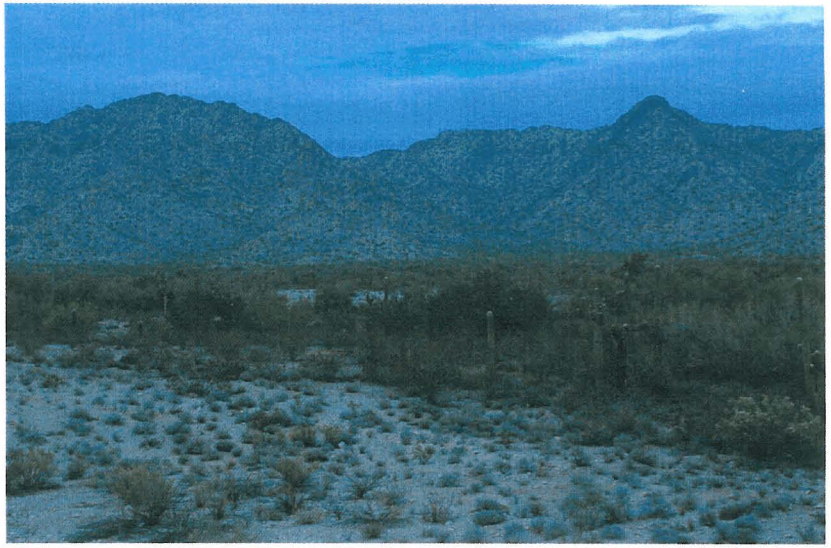
Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area B - Valley Area East
Location: **Reaches** - North-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.010		0.010
	Large		.025 - .050		0.025	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.002	
	Freq. Alt.		.010 - .015			
				0.037	0.06	0.037
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.037**	**0.069**	**0.037**

Figure E-B4

Downstream of T3N-R6W-S21

Downstream of T3N-R6W-21



Downstream of T3N-R6W-S16B

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area C - High Valley Area
Location: **Reaches** - Mid-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.003	0.005	0.003
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.010		0.010
	Large		.025 - .050		0.035	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.003	0.001
	Freq. Alt.		.010 - .015			
				0.04	0.071	0.04
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.040**	**0.071**	**0.040**

Figure E-C1

Upstream of T2N-R6W-S18E looking south

Channel bed of T2N-R6W-S19

Upstream of Old Camp Wash

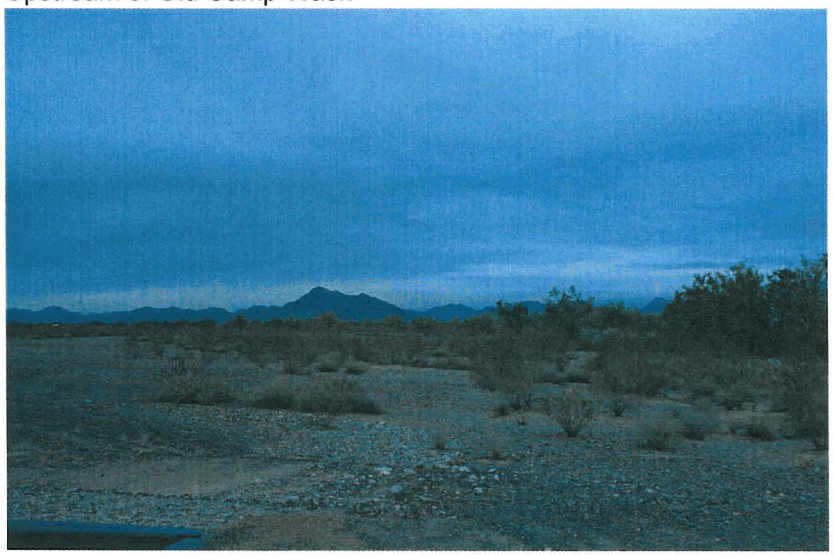


Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area C - Valley Area
Location: **Reaches** - Mid-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.028	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.003	0.005	0.003
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010	0.005		0.005
	Medium		.010 - .025		0.025	
	Large		.025 - .050			
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.003	
	Freq. Alt.		.010 - .015			
				0.034	0.061	0.034
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.034**	**0.061**	**0.034**

Figure E-C2

Typical overbank of T2N-R6W-S18E

Downstream of T2N-R6W-S18E

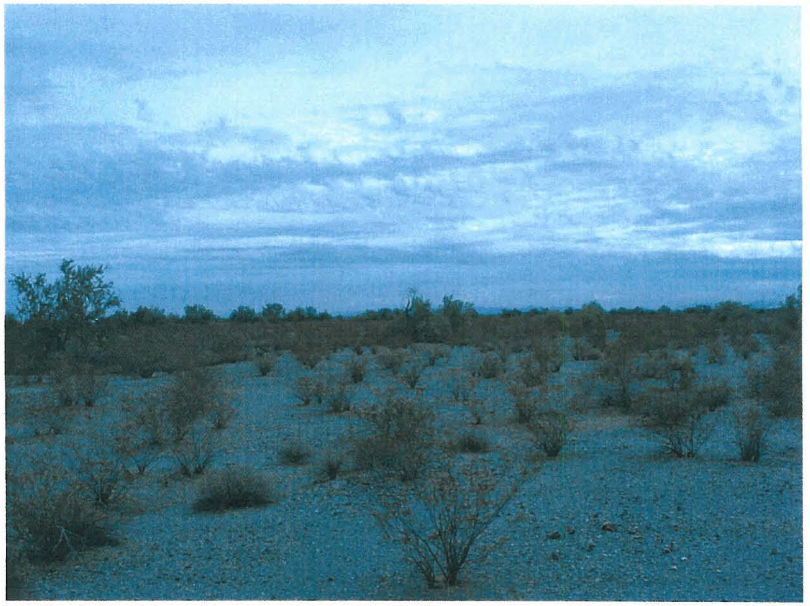


Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area C - Agricultural Area West
Location: **Reaches** - Mid-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032	0.025	0.032	0.025
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035			
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.003	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0.004	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025		0.015	
	Large		.025 - .050	0.035		0.035
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0	0	0
	Occ. Alt.		.001 - .005			
	Freq. Alt.		.010 - .015			
				0.061	0.054	0.061
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.061**	**0.054**	**0.061**

Figure E-C3

Near upstream of T2N-R6W-S19

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area C - Agricultural Area East
Location: **Reaches** - Mid-west portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032	0.025	0.032	0.025
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035			
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0	0	0	0
	Minor		.001 - .005			
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0.002		0.002
	Minor		.005 - .015		0.005	
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		0.010	
	Medium		.010 - .025			
	Large		.025 - .050	0.035		0.035
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0	0	0
	Occ. Alt.		.001 - .005			
	Freq. Alt.		.010 - .015			
				0.062	0.047	0.062
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.062**	**0.047**	**0.062**

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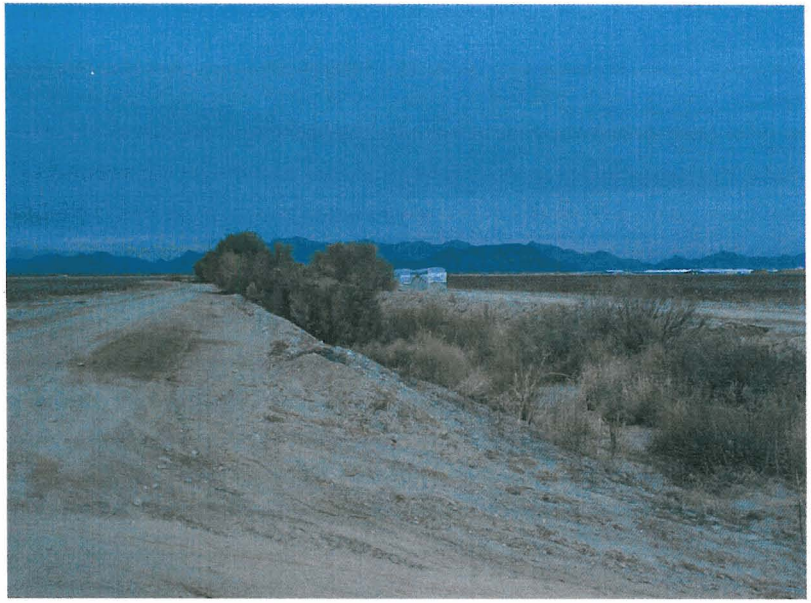
Figure E-C4

Eastern portion of agricultural area

From eastern side of agricultural land looking south



From eastern side of agricultural land looking north

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area D - High Valley Area
Location: **Reaches** - Mid-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.030	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.010		0.010
	Large		.025 - .050		0.025	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.002	0.001
	Freq. Alt.		.010 - .015			
				0.038	0.062	0.038
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.038**	**0.062**	**0.038**

Figure E-D1

Downstream of T2N-R6W-S05W looking east

Downstream of T3N-R6W-S16W looking west

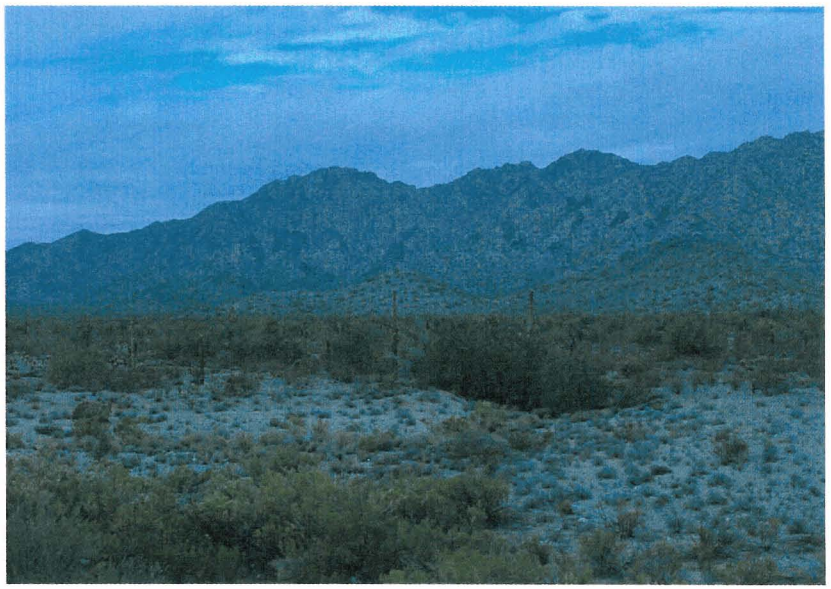


Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area D - Valley Area
Location: **Reaches** - Mid-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026		0.026
	Gravel		.028 - .035		0.030	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.010		0.010
	Large		.025 - .050		0.025	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.002	0.001
	Freq. Alt.		.010 - .015			
				0.038	0.062	0.038
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.038**	**0.071**	**0.038**

Figure E-D2

Downstream of T2N-R6W-S05E looking south

Upstream of T2N-R6W-S05W looking southeast

Upstream of T2N-R6W-S05W looking northeast

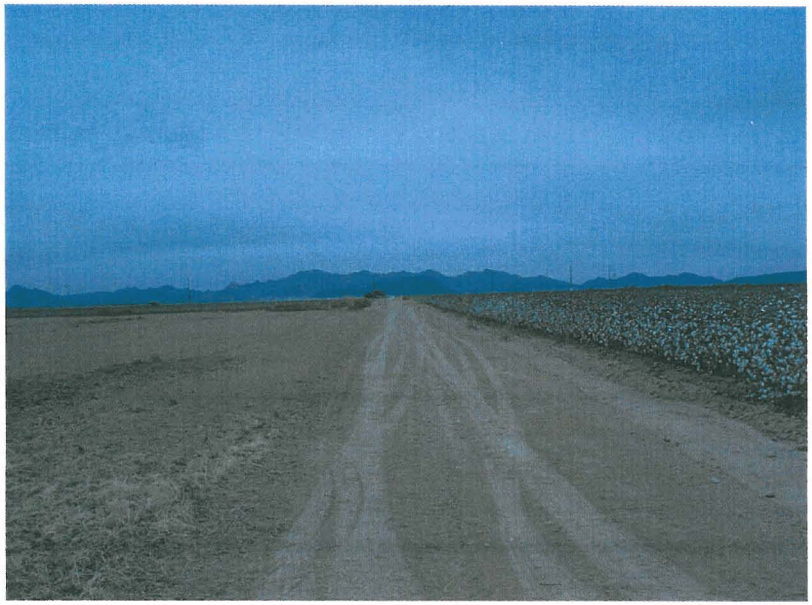
Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area D - Agricultural Area
Location: **Reaches** - Mid-east portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026	0.032	0.026
	Gravel		.028 - .035			
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0	0		0
	Minor		.001 - .005		0.001	
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		0.010	
	Medium		.010 - .025			
	Large		.025 - .050	0.035		0.035
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.001	
	Freq. Alt.		.010 - .015			
				0.061	0.044	0.061
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.061**	**0.044**	**0.061**

Figure E-D3

Upstream of T1N-R6W-S18 looking south



Near downstream of T1N-R6W-S20E (Fourmile Wash)

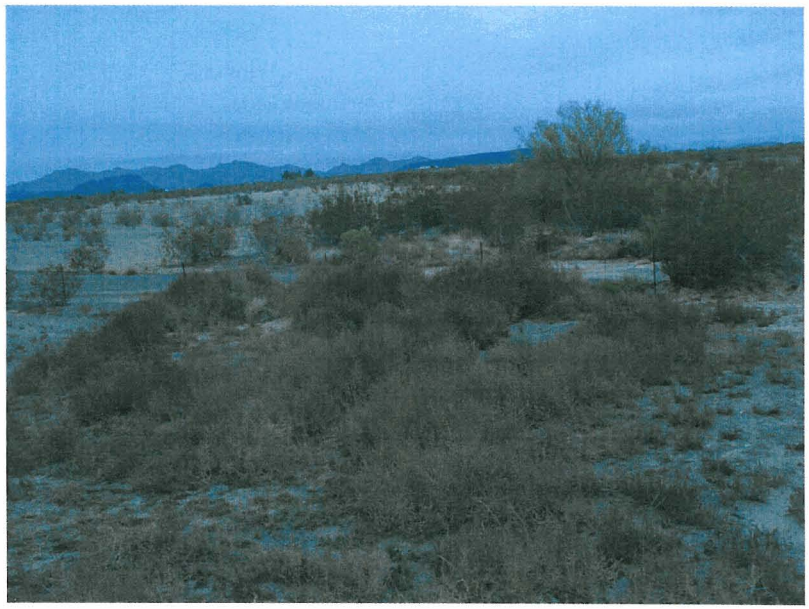


Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area E - High Valley Area
Location: **Reaches** - South-West portion of watershed

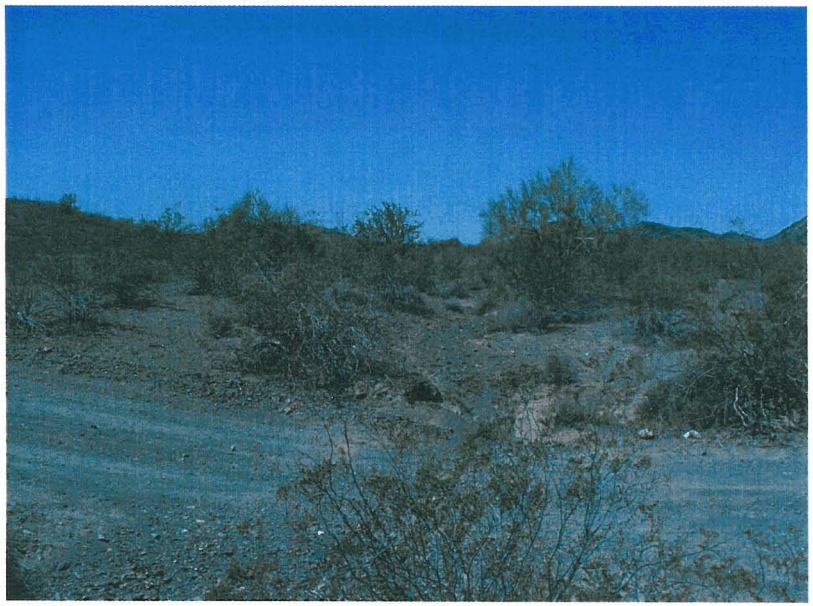
Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035	.030	0.035	.030
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		.005	
	Medium		.010 - .025			
	Large		.025 - .050	.05		.05
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.002	0.001
	Freq. Alt.		.010 - .015			
				0.082	0.047	0.082
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.082**	**0.047**	**0.082**

Figure E-E1

Downstream of T1N-R7W-S05

Near Upstream of T2N-R7W-S33S

Downstream of T2N-R7W-S33S



Near downstream of T2N-R7W-S33S

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area E - Valley Area
Location: **Reaches** - North-west and eastern portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.028		0.028
	Gravel		.028 - .035		0.035	
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005		0.005	
	Moderate		.006 - .010	.006		.006
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0.002	0.002	0.002
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		.002	
	Medium		.010 - .025			
	Large		.025 - .050	.035		.035
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.002	0.001
	Freq. Alt.		.010 - .015			
				0.072	0.046	0.072
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.072**	**0.046**	**0.072**

Figure E-E2

Upstream of T1N-R7W-S01

Downstream of T1N-R7W-S01

Cross section view of T1N-R6W-S07 (Delaney Wash).

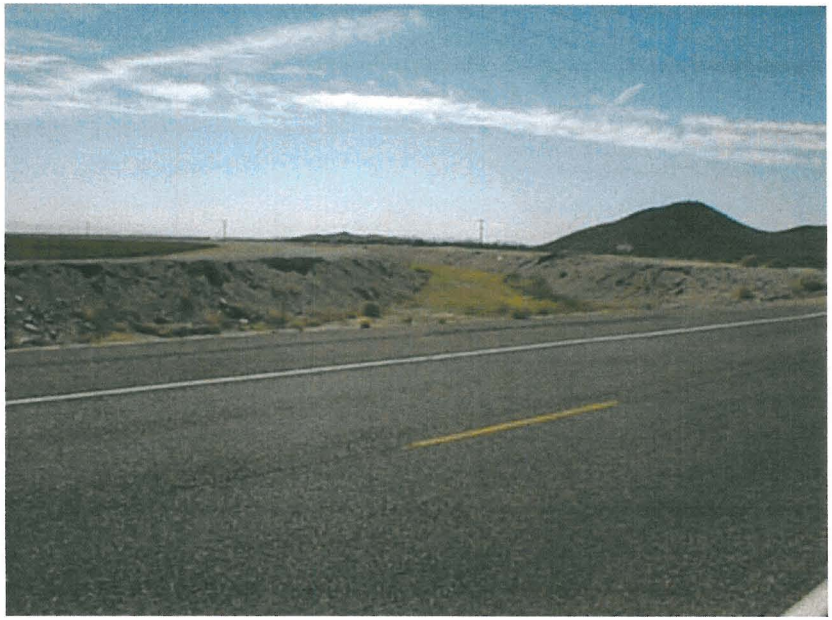
Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area E - Agricultural Area
Location: **Reaches** - Mid-Northern portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035	.028	.03	.028
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0	0	0	0
	Minor		.001 - .005			
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		.01	
	Medium		.010 - .025	0.025		0.025
	Large		.025 - .050			
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0	0	0
	Occ. Alt.		.001 - .005			
	Freq. Alt.		.010 - .015			
				0.053	0.04	0.053
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.053**	**0.04**	**0.053**

Figure E-E3

East side of the road along T2N-R7W-S36E



Near east side of T2N-R7W-S36E

View of the Wash coming into T2N-R7W-S36E.

Westbank of wash T3N-R5W-S28N at CAP floodway opening

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area E - Mountain area
Location: **Reaches** - Mid-southern portion of watershed.

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035	.028		.028
	Cobble		.030 - .050		.030	
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.006	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.015		0.015
	Large		.025 - .050		0.04	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.002	0.004	0.002
	Freq. Alt.		.010 - .015			
				0.05	0.08	0.05
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.05**	**0.092**	**0.05**

Figure E-E4

Downstream of T2N-R7W-S33S

Near Upstream of T1N-R7W-S01

Upstream of T2N-R7W-S02

Near downstream of T1N-R7W-S01

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area F - Mountain area
Location: **Reaches** -Mid-Northern portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035	.028		.028
	Cobble		.030 - .050		.030	
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.006	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010			
	Medium		.010 - .025	0.015		0.015
	Large		.025 - .050		0.04	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.002	0.004	0.002
	Freq. Alt.		.010 - .015			
				0.05	0.08	0.05
Degree of Meandering	Minor	m	1	1		1
	Appreciable		1.15		1.15	
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.05**	**0.092**	**0.05**

Figure E-F1

Near upstream of T1N-R7W-S01

Upstream of T4N-R7W-S21W

Near upstream of T1N-R7W-S28W

Table E-1

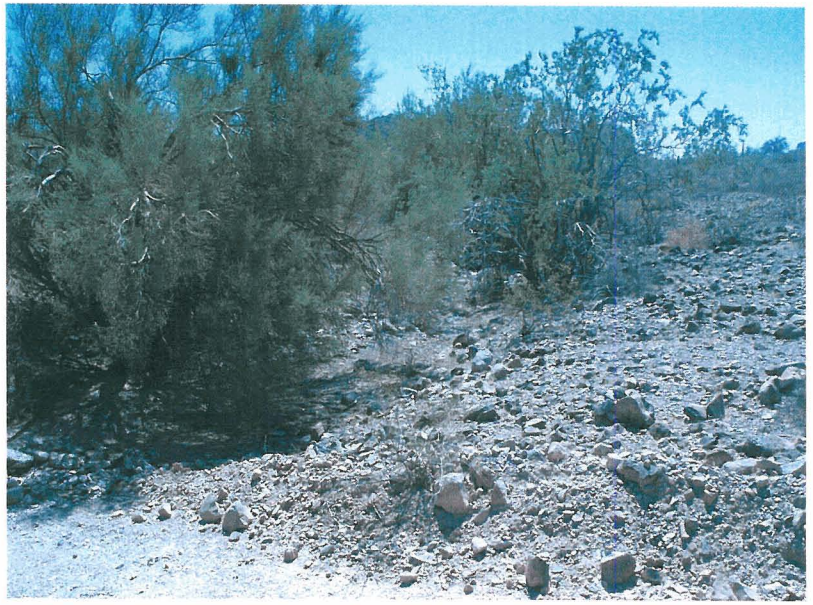
Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area F - High Valley Area
Location: **Reaches** -North-western portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035			
	Gravel		.028 - .035			
	Cobble		.030 - .050	.035		.035
	Boulder		.040 - .070		0.04	
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.005		0.005
	Moderate		.006 - .010		0.006	
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		.010	
	Medium		.010 - .025			
	Large		.025 - .050	.03		.03
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0			
	Occ. Alt.		.001 - .005	0.001	0.003	0.001
	Freq. Alt.		.010 - .015			
				0.071	0.059	0.071
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.071**	**0.059**	**0.071**

Figure E-F2

Near downstream of T1N-R7W-S21W

Downstream of T1N-R7W-S21W



Near upstream of T1N-R7W-S28W

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area F - Valley Area
Location: **Reaches** - Mid-Eastern portion of watershed

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.026	0.030	0.026
	Gravel		.028 - .035			
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.005	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010		.0005	
	Medium		.010 - .025			
	Large		.025 - .050	.055		.055
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.002	
	Freq. Alt.		.010 - .015			
				0.082	0.0375	0.082
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.082**	**0.0375**	**0.082**

Figure E-F3

Downstream of T1S-R6W-S29E (Winters Wash)

Upstream of T1S-R6W-S08

Near upstream of T1S-R6W-S08

Table E-1

Project: Palo Verde Watershed Zone A Floodplain Delineation Study
Stream: Area F - Agricultural Area
Location: **Reaches** -Southern portion of the watershed.

Channel Conditions		Manning's n Adjustment		Left Overbank (West)	Channel	Right Overbank (East)
Channel Material	Concrete	n_b	.012 - .018			
	Firm Soil		.025 -.032			
	Coarse Sand		.026 - .035	0.028	0.028	0.028
	Gravel		.028 - .035			
	Cobble		.030 - .050			
	Boulder		.040 - .070			
Degree of Irregularity	Smooth	n_1	0			
	Minor		.001 - .005	0.001	0.001	0.001
	Moderate		.006 - .010			
	Severe		.011 - .020			
Effects of Obstruction	Negligible	n_2	.000 - .004	0	0	0
	Minor		.005 - .015			
	Appreciable		.020 - .030			
	Severe		.040 - .060			
Vegetation	Small	n_3	.002 - .010	0.005		0.005
	Medium		.010 - .025			
	Large		.025 - .050		0.035	
	Very Large		.050 - .100			
Variations in Channel Cross section	Gradual	n_4	0	0		0
	Occ. Alt.		.001 - .005		0.002	
	Freq. Alt.		.010 - .015			
				0.034	0.066	0.034
Degree of Meandering	Minor	m	1	1	1	1
	Appreciable		1.15			
	Sever		1.3			
$n = (n_b+n_1+n_2+n_3+n_4)m$				**0.034**	**0.066**	**0.034**

Figure E-F4

West of vegetation area along railroad

Near cement plant looking south

Downstream of rail road looking at T1N-R6W-S27

E.5 Normal Depth Calculations

See **Volume 4** for Area A Washes

See **Volume 5** for Area B Washes

See **Volume 6** for Area C and Area D Washes

See **Volume 7** for Area E and Area F Washes