HYDRO LIBRARY

WILLIAM - CHANDLER W.S.

VINEYARD ROAD DAM
Design Computations
2 of 2

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

A320.605

Pipes 24"
No Gates?

Ramps - on So side of #1 & #2
width - 14'

Road @ T&T Line?
Bury ~~Pipe~~? Line?
With culvert or extra pole length -

T&T letter written -
Sponsor will do force account
except dirt work necessary.

Powerline Floodway
1. Weir inlet @ Gen Motor
may be eliminated - Pipe Inlets
will replace at various locations
along R/W,

---

2. Calle Xings will have to add
bridge between Sec 18 & 20.

Lee Ohsiek @ Office - 3-28-67

W.P. Gibbson
Cliff Dobson
Earl Dobson

(2) - Earl Dobson
doesnot want one inside
Lv. 100 yds
See details on this tomorrow.
Needs - pipe & gate -

(1) cliff Dobson

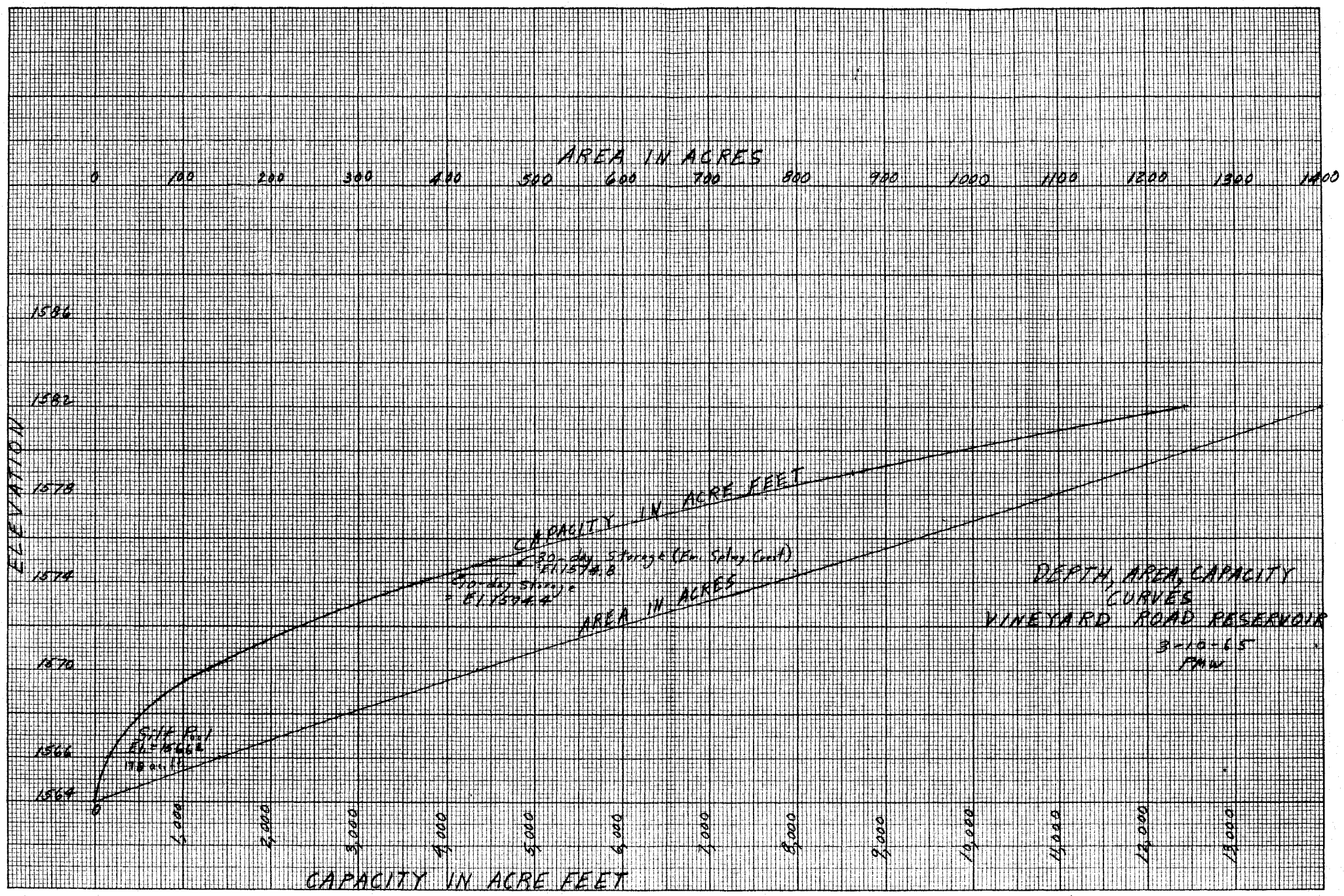
SCS-344a 5-57
Tabular Computations

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Copied for Portlands Copy (P)

Vineyard Road Dam
Depth-Capacity Calculations
Planimetered with Large Planimeter PMW 3-10-65

1. Elev.	2. Planimeter Area	3. (2) x 10.71 = Area in Acres	4. Average End Area	5. Ac. Ft. (4) x diff. in Elev.	6. Acc. Ac. Ft.			
1564°	0	0						
1566°	13.087	140.16	70.08	140.16	140.16			
1570°	40.470	433.43	286.80	1,147.2	1,287.36			
1574°	72.501	776.48	604.95	2,419.8	3,707.16			
1578°	102.011	1,092.54	934.51	3,738.04	7,445.20			
1582°	130.620	1,398.94	1,245.74	4,982.96	12,428.16			
			Check 1582 Cont.					
			Plan.					
			46.7		From Plans			
			59.2		Wall			
			50.3					
			35.4					
		Total	191.6 x 2 = 383.2 sq in					
				383.2 x 3.67 = 1406 Acres = 1398 ac				
							OK	



DEPTH, AREA, CAPACITY CURVES
VINEYARD ROAD RESERVOIR
3-10-65
FMW

4

P

Arizona Vineyard Road Dam.
GDH 11-10-64
Total Drainage Area.

Planimeter: 1st 53.41 □"
2nd 53.33 □"
53.41 □"

Scale 1 □" = 1 mile² Area = 53.4 miles²

P

1

Arizona
JMM 11-17-64
Revision of Tc

Ref.
Page
Hydrology

Powerline
Distance moved up stream = 1.50 mi
Velocity for G3 cross-section = 21.0 '/s 108
$\Delta T = \frac{(1.5)(5280)}{21.0\ (3600)} = .11$

Revised Tc = 2.00 - .11 = 1.89 hr

Vineyard Road
Distance moved up Stream = 1.40 mi
Velocity for G4 cross section = 6.0 '/s 108
$\Delta T = \frac{(1.4)\ 5280}{6.0\ \ 3600} = 0.34$ hr

Revised Tc = 3.01 - .34 = 2.67 hr

Rittenhouse
Distance moved up stream = 0.50 mi
Velocity for H5 = 3.1 '/s 108
$\Delta T = \frac{(0.5)(1.46)}{3.10} = 0.23$ hr

revised Tc = 5.25 - .23 = 5.02 hr

Arizona
JMM 11-17-64

Curve Number Revisions

original documentation P.51

Vineyard Rd DA = 53.4 sq.mi

Unit	Area	CN
7	16.92	83.0
8	1.54	83.5
9	6.50	81.6
10	4.46	84.8
13	8.80	84.2
14	15.23	80.0
	53.45	

wt CN = 82.3
use 82.0

Rittenhouse DA = 49.6
DA. change = 51.8 - 49.6 = 2.20
this is all in unit 14 with CN = 80

Revised CN =

unit	Area	CN
7	25.78	83.0
9	14.16	81.6
13	.18	84.2
14	8.13	80.0
15	1.36	79.1

Composite CN = 82.0

Vineyard Road Dam

PMW 1-29-65

Additional Storage provided by Lengthening Dam 4000' ±.

Constant = $\frac{160,000}{43,560}$ = 3.673 $\frac{\text{Acres}}{\text{Sq. in.}}$ (5)

Elevation	Planimeter	Acres	Accum. Acres.	Contour Interval	Volume Ac.-Ft.	Acc. A.F.
1566	0	0				
1568	8.99	33.02	33.02	2	33	33
1572	21.08	77.43	110.45	4	221	254
1576	26.66	97.92	175.35	4	351	605
1580	41.84	153.68	251.60	4	503	1108
1584	58.30	214.13	367.81	4	736	1844

Total Area and Storage Capacity for Vineyard

Elevation	Acres	Accum. Ac.-Ft.
1562	0	0
1564	37.88	38
1568	287.42	655
1572	562.72	2,422
1576	808.92	5,386
1580	1,091.37	9,537
1584	1,375.42	14,975

Void

Plot on old Depth-Capacity curve of 11-24-64

Required Runoff storage = 4127 A.F.
silt storage = 185 A.F.
Total Req'd Storage = 4312 A.F.

Corresponding Em. Spwy. Crest Elevation from new stage-storage curve is 1574.8. Top of pr. spwy. outlet pipe

74.8
63.8
11.0

$Q_{max.}$ = 327 cfs $\qquad Q = KH^{\frac{1}{2}}$

$K = \frac{327}{\sqrt{11.0}} = \frac{327}{3.32} = 98.4$

$\therefore \underline{Q = 98.4 H^{\frac{1}{2}}}$

Arizona Vineyard Road Dam

JMM 11-17-64

Volume - Duration Study

		Hyd. Page Ref.
DA. = 53.4 Sq. Mi	CN = 82	
Area Reduction = .65		P. 46
Trans. Loss factor = .66		P. 63
1 % 6hr P = 4.10"		P 45

6hr Area P = (.66)(4.10) = 2.70"

Duration	Ratio to 6hr		Area Precip in	Runoff Q in	Adj for Trans. Loss
2hr	0.76	x 2.70 =	1.97	.63	x .66 = 0.41
4hr	0.89	x 2.70 =	2.40	.92	x .66 = 0.60
6hr	1.00	x 2.70 =	2.70	1.14	x .66 = 0.75
12hr	1.23	x 2.70 =	3.32	1.63	x .66 = 1.07
24hr	1.53	x 2.70 =	4.13	2.31	x .66 = 1.52

Runoff for Durations greater than 1 Day computed from ratios to 1 Day runoff P. 69

duration	Ratio To 1 Day		Runoff Q in	Q+10day Release	Q+20	Q+30
1 day	1.00	x 1.52 =	1.52	1.71	1.62	1.61
2 day	1.09	" =	1.65	2.03	1.88	1.83
7 day	1.25	" =	1.90	3.23	2.70	2.52
15 day	1.49	" =	2.26		3.98	3.58
30 day	1.87	" =	2.84			5.98

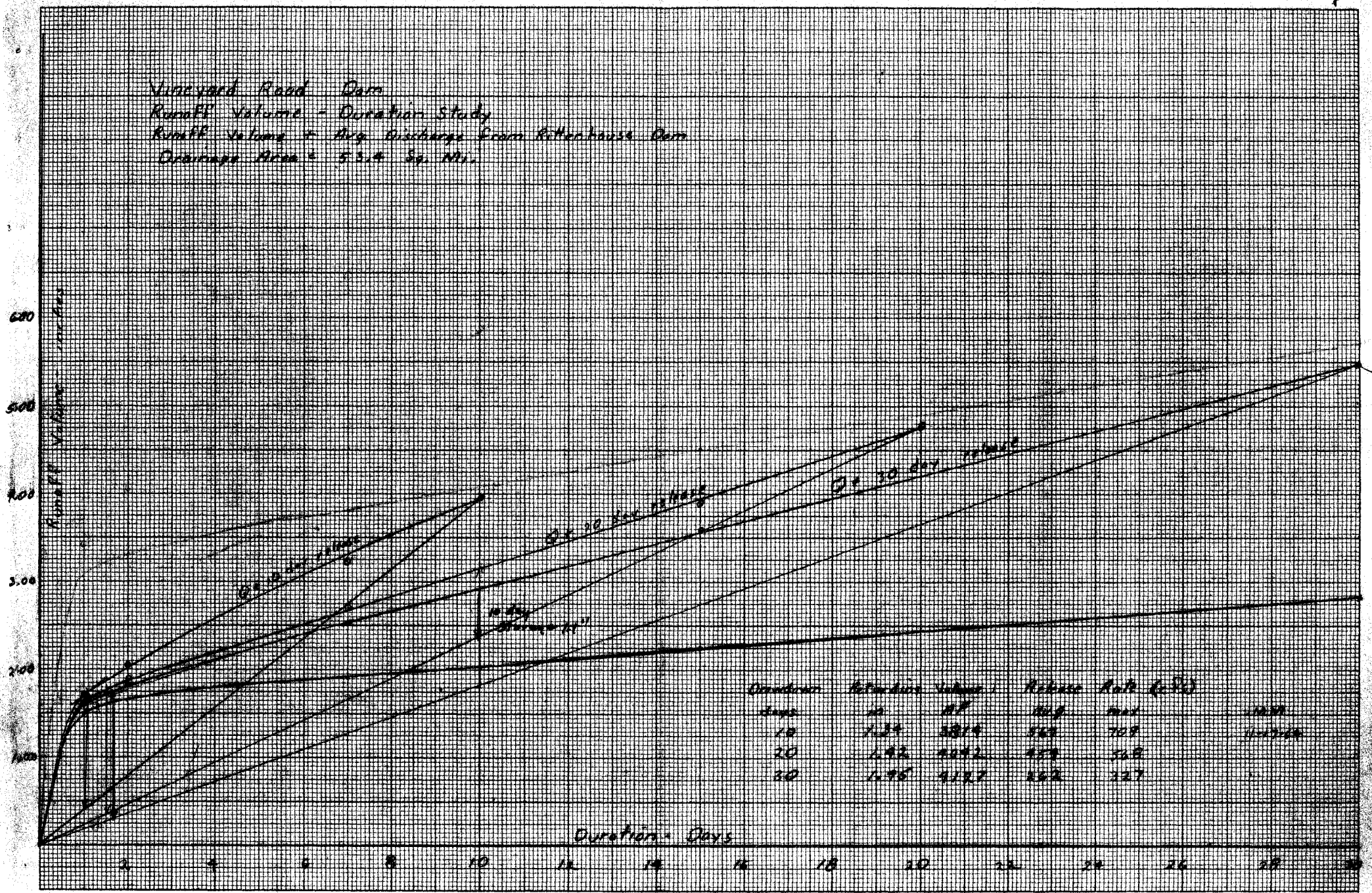
Rittenhouse

10 Day Release rate = 273 cfs = .190"/day

20 Day Release rate = 165 cfs = .115"/day

30 Day Release rate = 127 cfs .088"/day

P


Vineyard Road Dam
Runoff Volume - Duration Study
Runoff Volume + Avg. Discharge from Rittenhouse Dam
Drainage Area = 53.4 Sq. Mi.
Runoff Volume - inches
Duration - Days
Q + 10 day release
Q + 20 day release
Q + 30 day release
10 day Storage 1.1"
Drawdown days
Retarding Volume in
Release Rate (cfs) avg
max
10 1.34 3814 569 709
20 1.42 4042 459 568
30 1.46 4127 262 327
11-17-64

SCS-319
6-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P

Emergency Sp. HYDROGRAPH COMPUTATION

WATERSHED OR PROJECT _____ STATE Arizona

STRUCTURE SITE OR SUBAREA Vineyard Road

DR. AREA 53.4 SQ. MI. T_c 2.67 HR. RUNOFF CONDITION NO. 11

RUNOFF CURVE NO. 82. STORM DISTRIB. CURVE A. HYDROGRAPH FAMILY NO. 3

STORM DURATION 6 HR. RAINFALL: POINT 3.5 IN. AREAL 2.03 IN.

Q .67 IN. COMPUTED T_p 1.87 HR. T_o 5.35 HR..

(T_o/T_p): COMPUTED 2.86 ; USED 3.0 . REVISED T_p 1.78 .

$q_p = \frac{484\ A}{REV.\ T_p}$ = 14,520 CFS. Qq_p = 9728 CFS.

t(COLUMN) = (t/T_p) REV. T_p. q(COLUMN) = (q_c/q_p) Qq_p.

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21			41		
2	.78	418	22			42		
3	1.57	1936	23			43		
4	2.35	3346	24			44		
5	3.13	3950	25			45		
6	3.92	4154	26			46		
7	4.70	4008	27			47		
8	5.48	3,911	28			48		
9	6.26	3,473	29	check		49		
10	7.05	2,276	30	Q =	.68	50		
11	7.83	1,295	31			51		
12	8.61	652	32			52		
13	9.40	350	33			53		
14	10.18	165	34			54		
15	10.96	88	35			55		
16	11.75	39	36			56		
17	12.53	19	37			57		
18	13.31	10	38			58		
19	14.10	0	39			59		
20			40			60		

11

SCS-319
6-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P

Freeboard HYDROGRAPH COMPUTATION

WATERSHED OR PROJECT _____ STATE Arizona

STRUCTURE SITE OR SUBAREA Vineyard Road

DR. AREA 53.9 SQ. MI. T_c 2.67 HR. RUNOFF CONDITION NO. 11

RUNOFF CURVE NO. 82 . STORM DISTRIB. CURVE A . HYDROGRAPH FAMILY NO. 2

STORM DURATION 6 HR. RAINFALL: POINT 7.5 IN. AREAL 4.35 IN.

Q 2.51 IN. COMPUTED T_p 1.87 HR. T_o 5.92 HR..

(T_o/T_p): COMPUTED 3.16 : USED 3.00 . REVISED T_p 1.97 .

$q_p = \frac{484\ A}{REV.\ T_p}$ = 13,120 CFS. Qq_p = 32,930 CFS.

t(COLUMN) = (t/T_p) REV. T_p. q(COLUMN) = (q_c/q_p) Qq_p.

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	14.37	0	41		
2	.74	1614	22			42		
3	1.49	7409	23			43		
4	2.24	12,974	24			44		
5	2.99	14,818	25			45		
6	3.74	14,423	26			46		
7	4.49	13,567	27	check		47		
8	5.24	12,480	28	Q = 2.52	ok	48		
9	5.98	11,460	29			49		
10	6.73	10,241	30			50		
11	7.48	7376	31			51		
12	8.23	4808	32			52		
13	8.98	2667	33			53		
14	9.73	1515	34			54		
15	10.48	889	35			55		
16	11.22	494	36			56		
17	11.97	296	37			57		
18	12.72	165	38			58		
19	13.47	99	39			59		
20	14.22	33	40			60		

P

Arizona Vineyard Road

JMM 12-2-64

Stage - discharge - Emergency Spillway (N)

Trapezoidal channel $b = 300'$ $z = 3$

$n = .030$ $s = .00689$ $s^{1/2} = .0830$

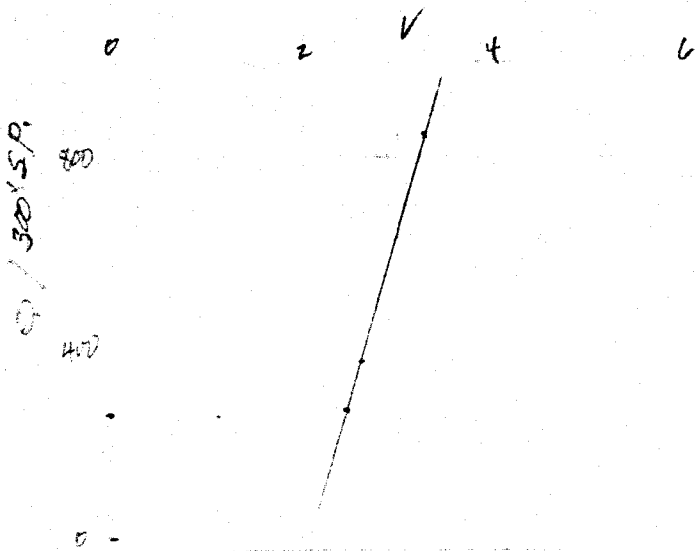
$$V = \frac{1.49}{.030} R^{2/3}(.0830) = 4.122\ R^{2/3}$$

check for critical depth $V_c = \sqrt{g\,d_m}$

$d_m = 1.0$ $V_c = 8.02$, $V_a = 4.12(1)^{2/3} = 4.12$

$\therefore$ flow is sub critical

d ft	A ft²	R ft	$R^{2/3}$	V ft/sec	Q cfs
0.0	0	0	0	0	0
0.4	120.0	.40	.543	2.24	269
0.8	241.8	.80	.861	3.55	858
1.2	364.2	1.18	1.111	4.56	1,668
1.6	487.5	1.57	1.350	5.56	2,712
2.0	612.0	1.93	1.550	6.39	3,910
2.4	737.1	2.33	1.756	7.24	5,335
2.8	836.4	2.70	1.940	8.00 ✓	6,688
3.2	990.6	3.09	2.120	8.74	8,658
3.6	1118.8	3.46	2.288	9.43	10,550
4.0	1248.0	3.83	2.450	10.10	12,600



12A

P

Arizona Vineyard Road Str.

JMM 12-3-64

Em. Spillway Rating Curve (N)

Back water curves

Q = 269 cfs crest elev = ~~1574.90~~ 1574.8

Flo. Lin. El.	Length from Crest	depth	Q	V	$V^2/2g$	elev.
	0	0.4	269cfs			
	0	1.6	2712			
1574.8	50	2.00				
1573.8	100	3.38				
1573.8	950	3.90		2.23	.080	~~1577.87~~ 1577.77
	1788					
	0	2.0	3910			
1574.8	50	2.57				
1573.8	100	3.88				
1573.8	950	4.55		2.73	.11	~~1578.56~~ 1578.46
1573.8	1788					
	0	2.40	5335			
1574.8	50	2.87				
1573.8	100	4.30				
1573.8	604					
1573.8	950	5.04		3.35	.17	~~1579.11~~ 1579.01
	1788					
	0	2.80	6688			
1574.8	50	3.30				
1573.8	100	4.78				
	604					
1573.8	950	5.62		3.75	.21	~~1579.73~~ 1579.63
	1788					

P

Arizona Vineyard Road

JMM 12-3-64

Emergency Spillway (N)

Flo Str El.	dist	depth	Q	V	$V^2/2g$	elev
	0	3.20	8658			
1574.8	50	3.80				
1573.8	100	5.38				
	604					
1573.8	950	6.28		4.32	.28	1580.36 ~~1580.46~~
	1788					

	0	3.60	10,550			
1574.8	50	4.20				
1573.8	100	5.85				
	604					
1573.8	950	6.80		4.84	.36	1580.96 ~~1581.05~~
	1788					

	0	4.00	12,600			
	50	4.63				
?	100	6.40				
	604					
	950	8.20		4.72	.34	1583.34 ~~1582.46~~
	1788	[illegible]				

P

Arizona Vineyard Road

JMM 12-7-64

Stage discharge Curve

Emergency Spillway S. End.

Subcritical $n = .030$ $S = .0063$ $b = 300$

$Q = AV$ $S^{1/2} = .07937$ $z = 3$

$V = \frac{1.49}{n} R^{2/3} S^{1/2} = 3.9435 R^{2/3}$

dm ft	A ft²	R ft	$R^{2/3}$	V ft/sec	Q cfs
0.0	0	0	0		
0.4	120	.40	.543	2.1413	257
0.8	241.8	.80	.861	3.3954	821
1.2	364.2	1.18	1.111	4.3812	1596
1.6	487.5	1.57	1.350	5.3237	2595
2.0	612.0	1.93	1.550	6.1124	3741
2.4	737.1	2.33	1.756	6.9247	5104
2.8	863.4	2.70	1.940	6.8616	5739
3.2	990.6	3.09	2.120	8.3602	8282
3.6	1188.8	3.46	2.288	9.0227	10,726
4.0	1248.0	3.83	2.450	9.6615	12,057

P

Arizona Vineyard Rd. Dam

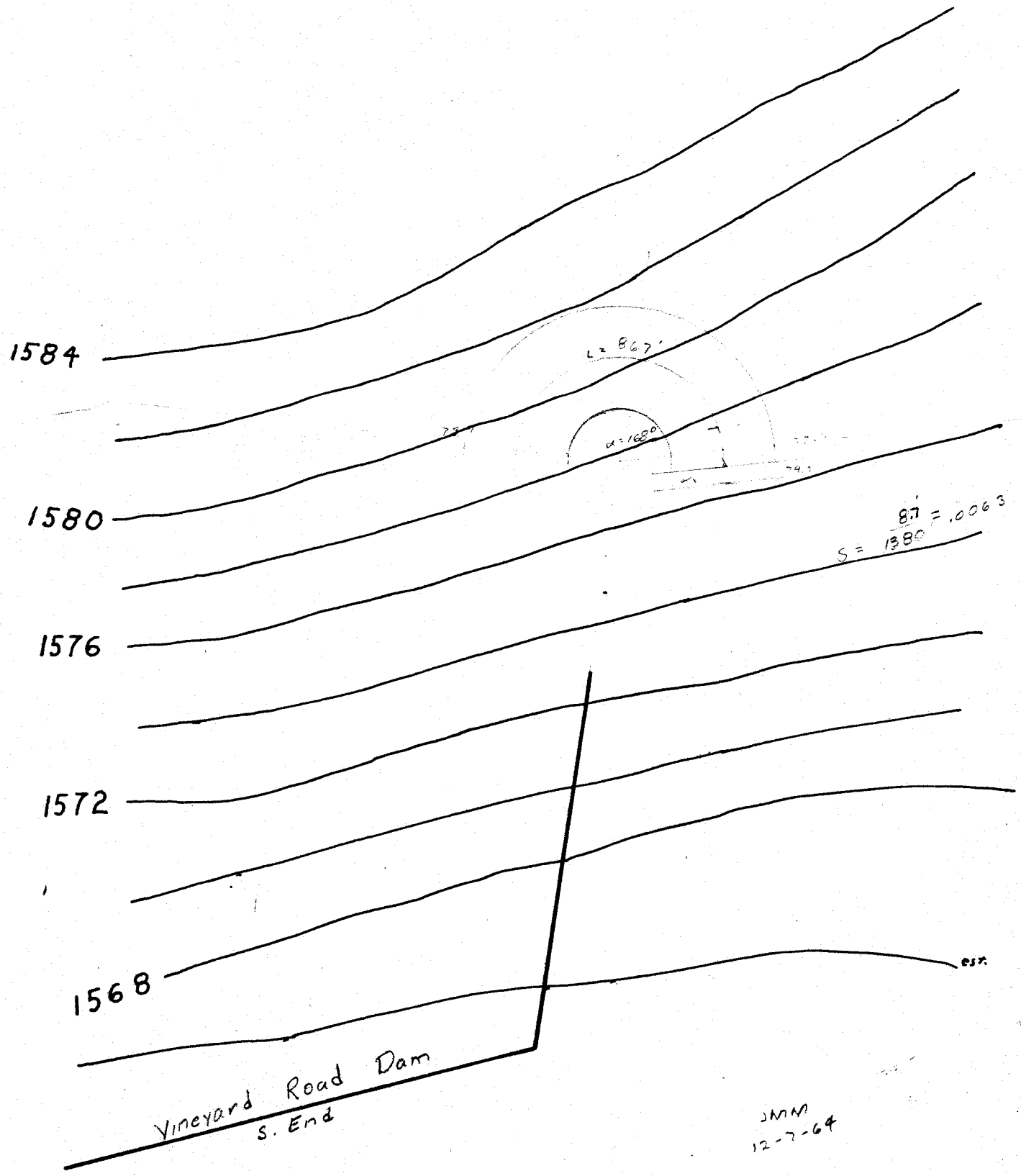
JMM 12-7-64

Emergency Spillway S. End

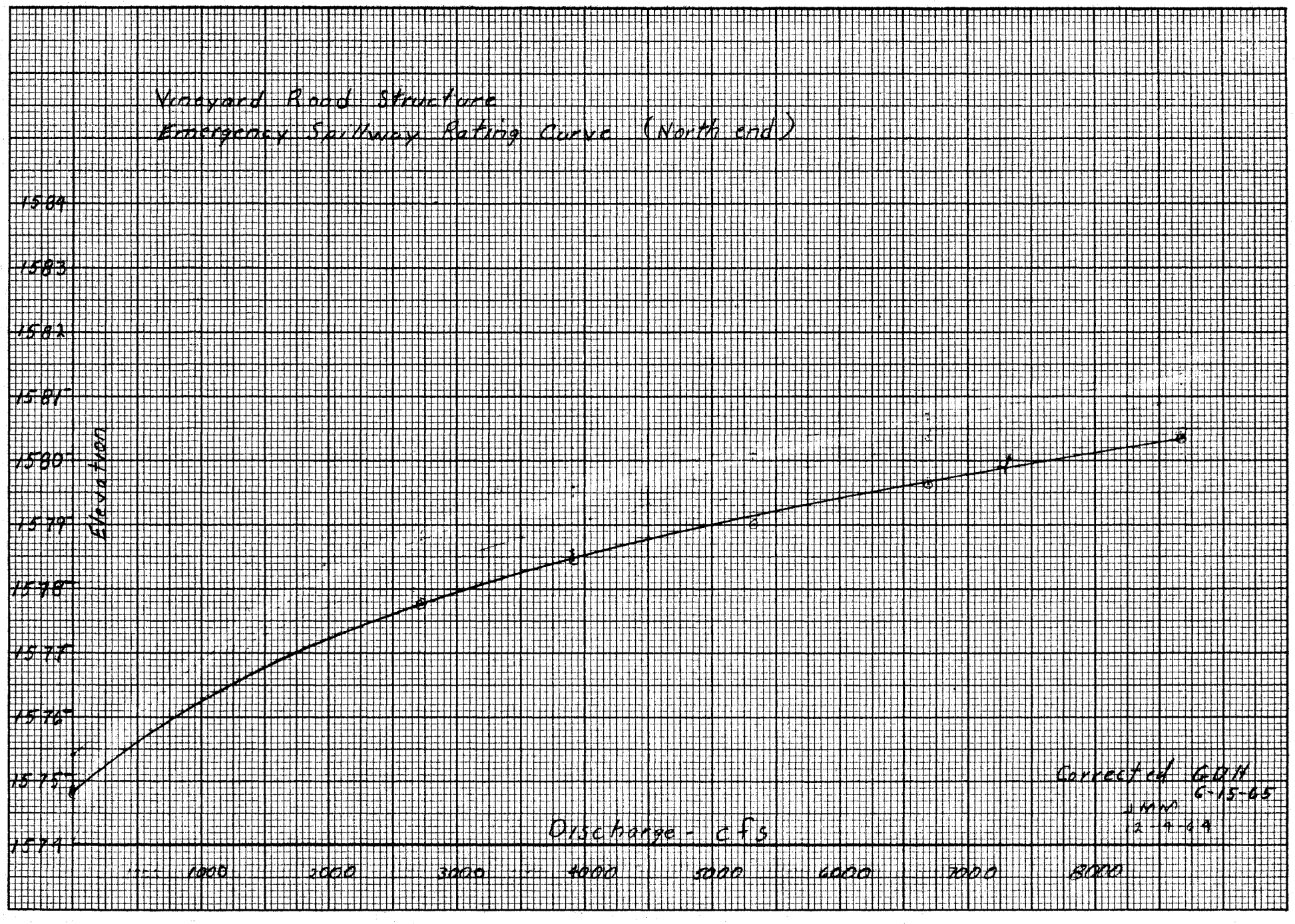
Water Surface Profile U curves

crest = 1574.8 ~~1574.9~~

Flo.Li.El.	dist	depth	Q	V	$V^2/2g$	elev.
1574.8	0	0.8	821			
1574.8	50	1.06				
1573.8	100	2.45				1578.2
1573.8	967	3.40		.32	.00	~~1577.30~~
	0	1.20	1596			
1574.8	50	1.55				
1573.8	100	2.73				1577.04
1573.8	967	3.30		1.61	.04	~~1577.14~~
	0	1.60	2595	1.61	.04	
1574.8	50	1.95				
1573.8	100	3.55				1577.77
1573.8	967	3.90		2.13	.07	~~1577.87~~
	0	2.00	3741			
1574.8	50	2.42				
1573.8	100	3.79				1578.24
1573.8	967	4.35		2.74	.11	~~1578.35~~
	0	2.40	5104			
1574.8	50	2.82				
1573.8	100	4.24				1579.05
1573.8	967	5.05		3.15	.15	1579.10
	0	2.80	8282			
1574.8	50	3.55				
1573.8	100	5.05				1579.77
1573.8	967	5.70		4.19	.27	~~1579.87~~

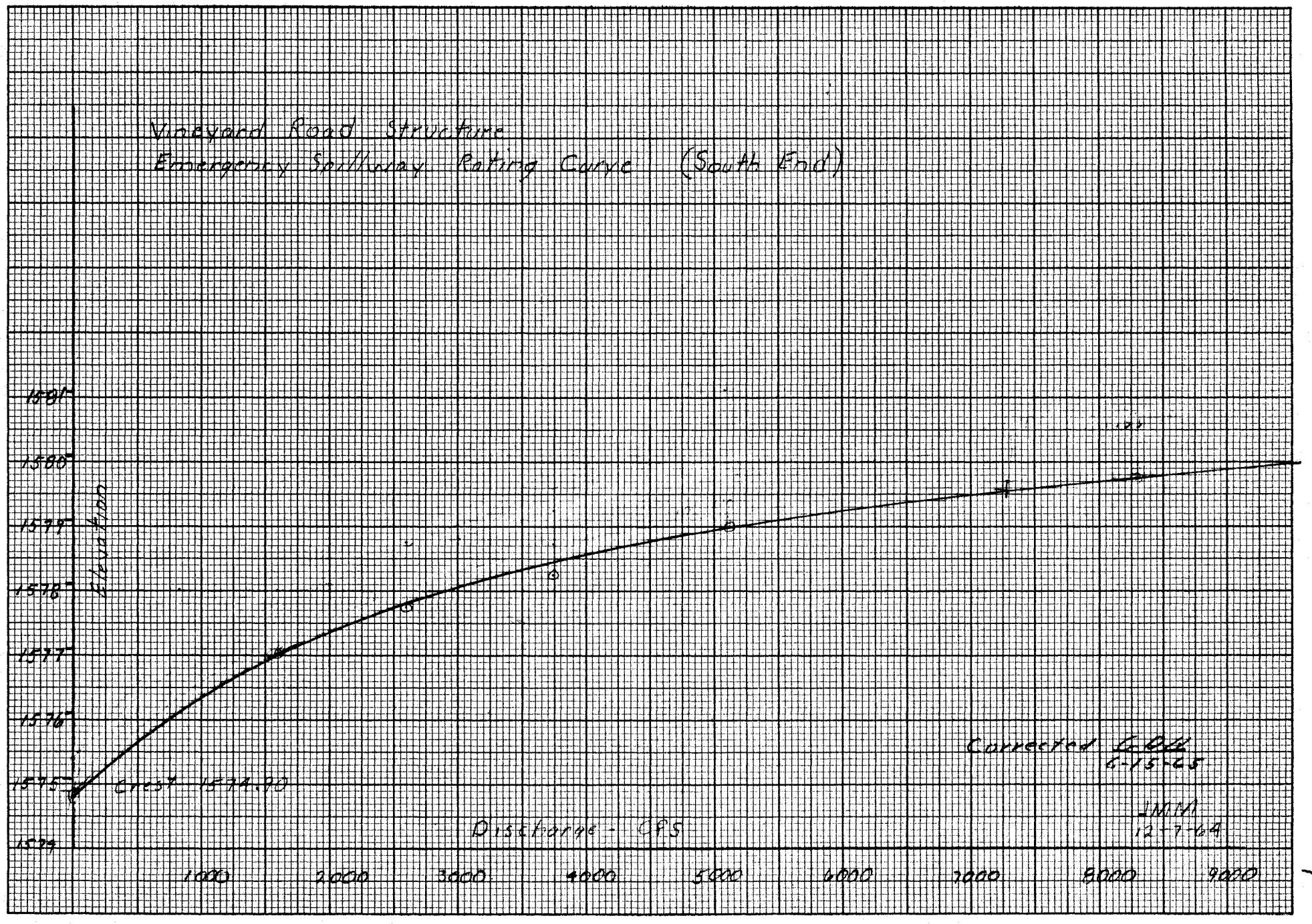

1584
1580
1576
1572
1568
L = 867'
α = 168°
S = 87/1380 = .0063
est.
Vineyard Road Dam
S. End
JMM
12-7-64

K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.

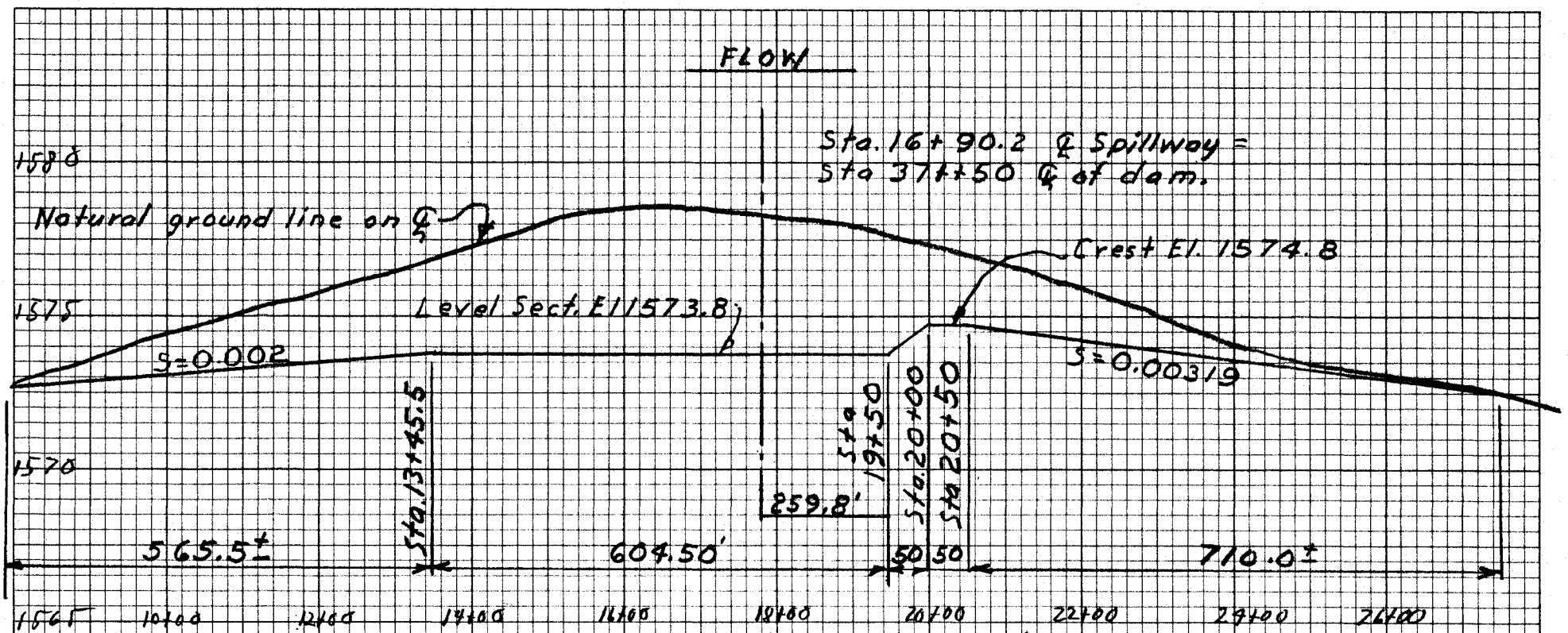


K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.

Vineyard Road Structure
Emergency Spillway Rating Curve (South End)



NO. 340R-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

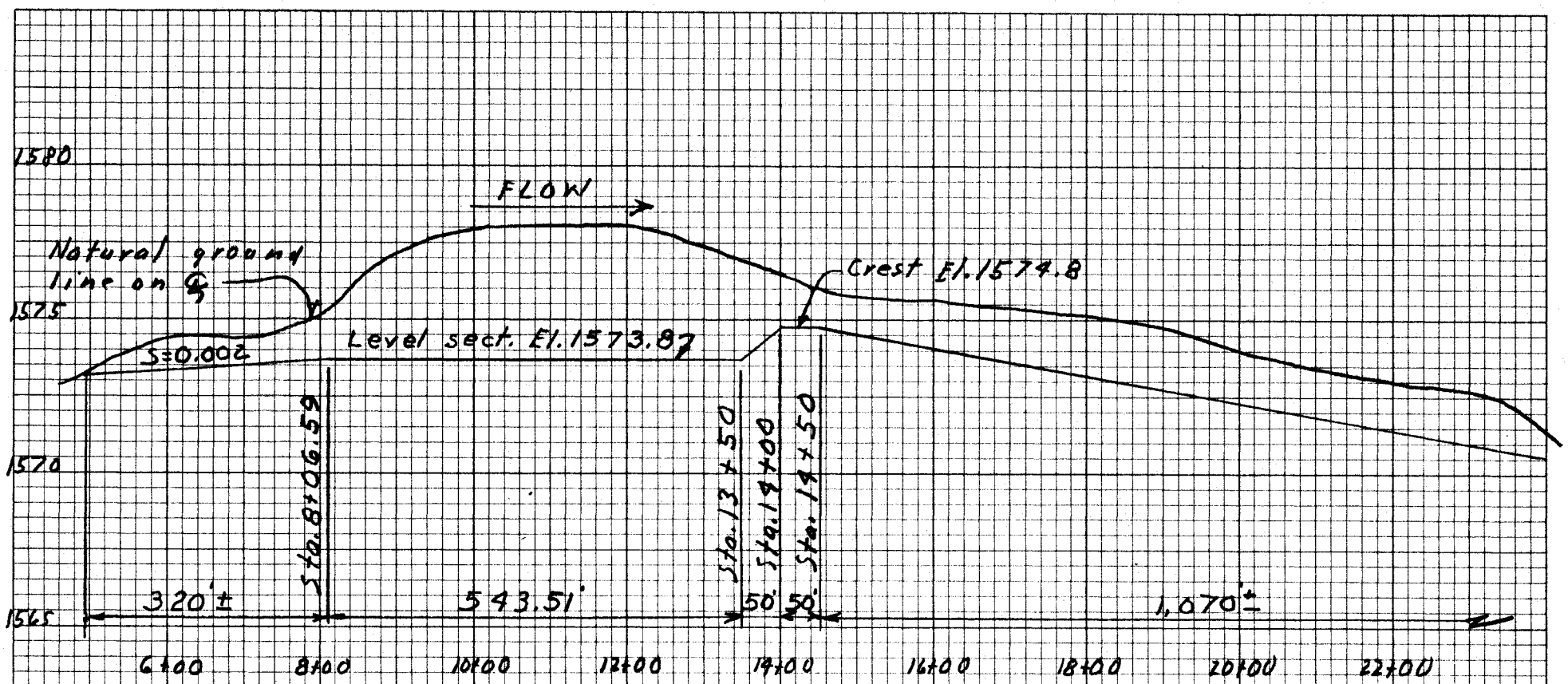


PROFILE NORTH EMERGENCY
VINEYARD ROAD RETARDING DAM
WILLIAMS - CHANDLER W.P.P.
PINAL COUNTY, ARIZ.

8-16-65

NO. 340R-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



PROFILE OF SOUTH EMERGENCY SPILLWAY
VINEYARD ROAD RETARDING DAM
WILLIAMS-CHANDLER W.P.P.
PINAL COUNTY, ARIZ.

8-24-65

21

Arizona Vineyard Road Dam
GOH 8-11-65
Check for capacity of South Emery
Spwy as designed

$$\text{Freeboard } Q = \frac{\frac{2280-326}{2}}{3.00} = 11.6 \text{ CFS/ft}$$

$n = .030$ $S = 0.00053$

$$D = \left(\frac{Qn}{1.486\, S^{1/2}}\right)^{3/5} = \left(\frac{11.6 \times .030}{1.486 \times .0045^{1/2}}\right)^{3/5} = 32.49^{3/5} = 2.12$$

.348
.067082
0.09968

$$\frac{Q^2}{2g} = \frac{11.6^2}{64.3} = 2.09$$

Sta	Depth	Btm Elev	WS Elev	V	h_v	WS Elev	
14+00	2.12	74.8	76.92	5.5	.47		
13+50	2.4	74.8	77.2				
13+00	3.68	73.8	77.48				
8+00	4.05	73.8	77.85				
4+60	5.00	73.0	78.0	2.3	.08	78.08	OK

For Spillway used in Routing

Max WS Elev = 78.2 OK

Friction Loss in approach
76.92 + .47 = 77.39
78.08 − 77.39 = 0.69 ft.

P

Arizona Vineyard Road Dam

GDH 8-11-65

Check for capacity of North Emergency Spillway as designed Using Freeboard Hydrograph Q

$n = 0.030$, $S = 0.00319$

Freeboard $Q = \frac{7280 - 3477 - 326}{300} = 11.6$ cfs/ft.

$D = \left(\frac{Qn}{1.486\, S^{1/2}}\right)^{3/5}$

$= \frac{11.6 \times .030}{1.486 \times .00319^{1/2}} = \left(\frac{0.348}{1.486 \times .05654}\right)^{3/5} = 4.14^{3/5} = 2.35$

$\frac{Q^2}{2g} = \frac{11.6^2}{64.3} = 2.09$

Sta	Depth	Btm Elev.	WS Elev	V	hv	WS Elev.
20+00	2.35	74.8	77.15			
19+50	2.54	74.8	77.34			
19+00	3.75	73.8	77.55			
13+50	4.08	73.8	77.88			
8+50	5.30	72.8	78.10	2.18	07	78.17

For Spillway used in Routing for freeboard Q
Max W.S. 78.2

Designed Emg Sp O.K.

STATE Arizona PROJECT Vineyard Road Dam
BY PMW DATE 2-1-65 CHECKED BY DATE
SUBJECT Principal Spillway Design SHEET 7 OF

El. top of pipe @ outlet end = El. 1563.8

Comparison of Discharges for desired and actual outlet pipes.

Head H	$H^{1/2}$	Flood Routing $Q = 98.4H^{1/2}$	54"ø pipe $Q = 103.4H^{1/2}$	Elevation
0	0	0	0	1563.8
2	1.41	139	146	65.8
4	2.0	197	207	67.8
6	2.45	241	253	69.8
8	2.83	278	293	71.8
10	3.16	311	327	73.8
12	3.46	340	358	75.8
14	3.74	368	387	77.8
16	4.0	393	414	79.8
18	4.24	416	438	81.8
20	4.47	440	462	83.8
22	4.69	461	485	85.8
24	4.90	481	506	87.8
26	5.10	502	527	1589.8

Design 75.5
63.8
11.7

Need

Compute:
Maximum Combined Discharges of Vineyard Road and Powerline principal Spillways using depth in emergency spillway due to flood routing Emergency Spillway Hydrograph through the reservoir.

Vineyard Road:
Depth El. = 1575.5
Top pipe = 1563.8
11.7 H. say 12'
corresponding Q = 358 cfs

Powerline:
Depth El. = 1583.9
Top pipe = 1562.0
21.9 say 22'
corresponding Q = 188 cfs

Combined Discharges = 546 cfs < 550 used in design of channel ∴ O.K.

COMPUTATION SHEET
SCS-523A (REV. 5-58)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE: Arizona
PROJECT: Vineyard Road.
BY: GOH
DATE: 6-14-65
CHECKED BY:
DATE:
JOB NO.:
SUBJECT: Principal Spillway Outflow.
SHEET OF

10 day Release time

$Q = Kh^{1/2}$

$Q_{max} = 709$ cfs.

$h_{max} = 1574.4 - 1564.0 = 10.4'$

$K = \frac{Q}{h^{1/2}} = \frac{709}{3.22} = 220.0$

30 day release time

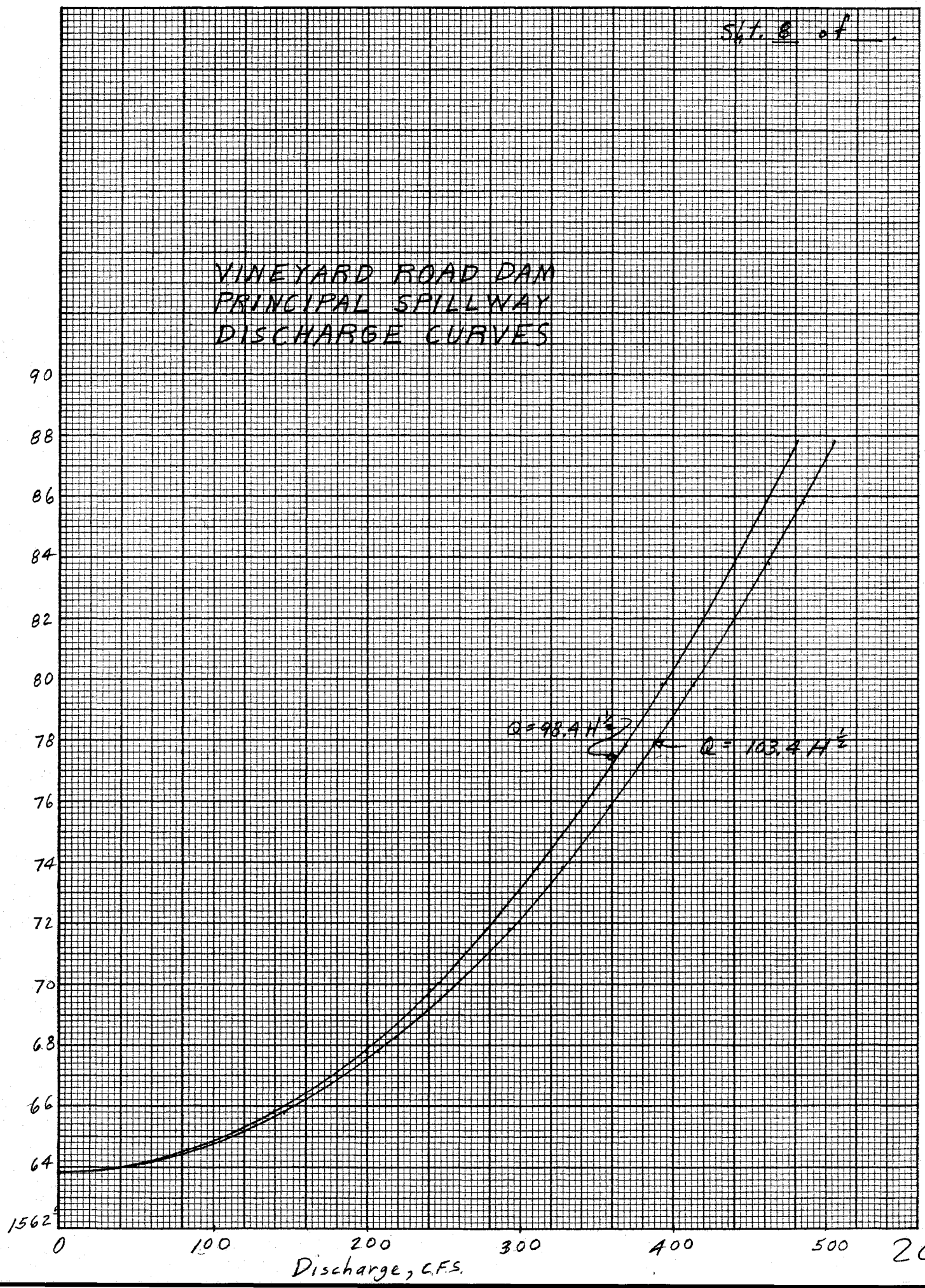
$Q_{max} = 327$ cfs

$h_{max} = 1574.8 - 1569.0 = 10.8$

$K = \frac{Q}{h^{1/2}} = \frac{327}{3.30} = 99.10$

Elev.	h	$h^{1/2}$	10 day Q cfs	30 day Q cfs.
1564	0	0	0	0
1565	1.0	1.0	220	99
1566.2	2.2	1.48	326	147
1567	3.0	1.73	381	171
1568	4.0	2.0	490	198
1569	5.0	2.24	493	222
1570	6.0	2.45	540	243
1571	7.0	2.65	584	262
1572	8.0	2.83	623	281
1573	9.0	3.00	660	296
1573.5	9.5	3.08		305
1574	10.0	3.16	695	313
1574.8	10.8	3.29	724	326
1576	12.0	3.47		344
1577	13.0	3.61		358
1578	14.0	3.74		371
1579	15.0	3.87		389
1580	16.0	4.0		397
1581	17.0	4.13		410
1582	18.0	4.25		421

Sht. 8 of ___.



K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.

COMPUTATION SHEET
SCS-523A REV 5-56

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P

STATE Arizona PROJECT Vineyard Road Dam
BY GDH DATE 6-15-65 CHECKED BY DATE JOB NO.
SUBJECT Storage Vs Cfs-hrs. SHEET OF

From Runoff Volume-duration Curves = 1.1

D. A. = 53.4 Mi² $\frac{640}{12} = 53.33$

Silt Pool El. = 1566.2

Emerg Spwy (@ 30 day drawdown) = El. 1579.8

Storage = (1.1 X 53.4 X 53.33) + 178 = 3,311 Ac. ft. = El. 1573.5

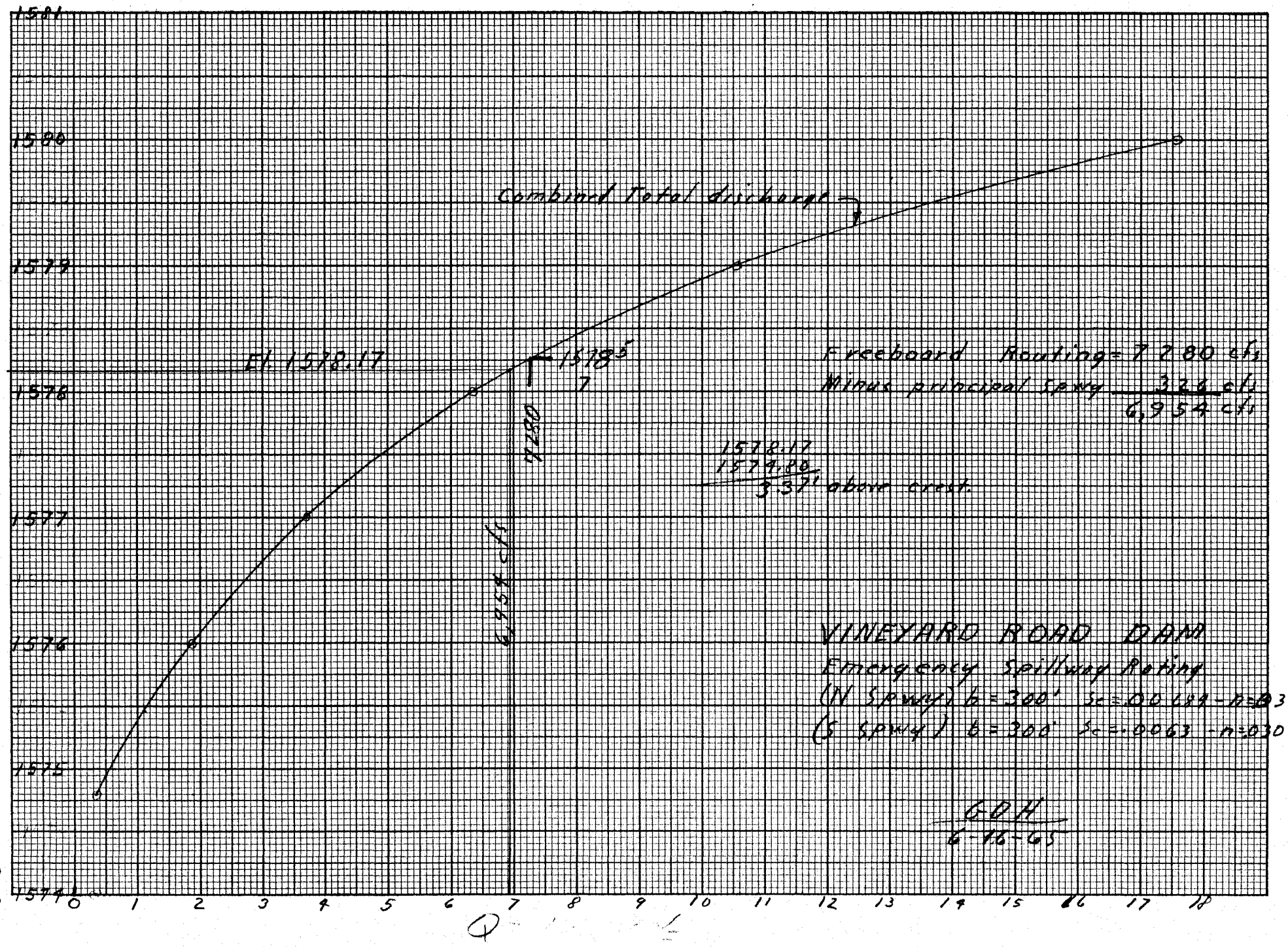
Table (1)

El.	Storage Ac. ft.	Storage above El. 1573.5	Storage X 12.1 = cfs-hrs	Total Disc. cfs. (see table 2)
1573.5	3,311	0		305
1574.0	3,675	364	4,404	313
1574.8	4,325	1,014	12,270	326
1575.0	4,500	1,189	14,387	
1576.0	5,400	2,089	25,277	1,894
1577.0	6,380	3,069	37,135	3,708
1578.0	7,500	4,189	50,687	6,346
1579.0	8,630	5,319	64,660	10,534
1580.0	9,820	6,509	78,759	17,547

Table (2) Principal & Emerg. Spwy. discharge

El.	Pr. Spwy cfs.	(S) Em Spwy cfs	(N) Em. Spwy. cfs.	Total Discharge
1573.5	305			305
1574.0	313			313
1574.8	326	0	0	326
1576.0	344	750	800	1,894
1577.0	358	1600	1,750	3,708
1578.0	371	2900	3,075	6,346
1579.0	389	5150	5,000	10,534
1580.0	397	9,550	7,600	17,547

K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.



28

K+E 10 X 10 TO THE ½ INCH 359-11
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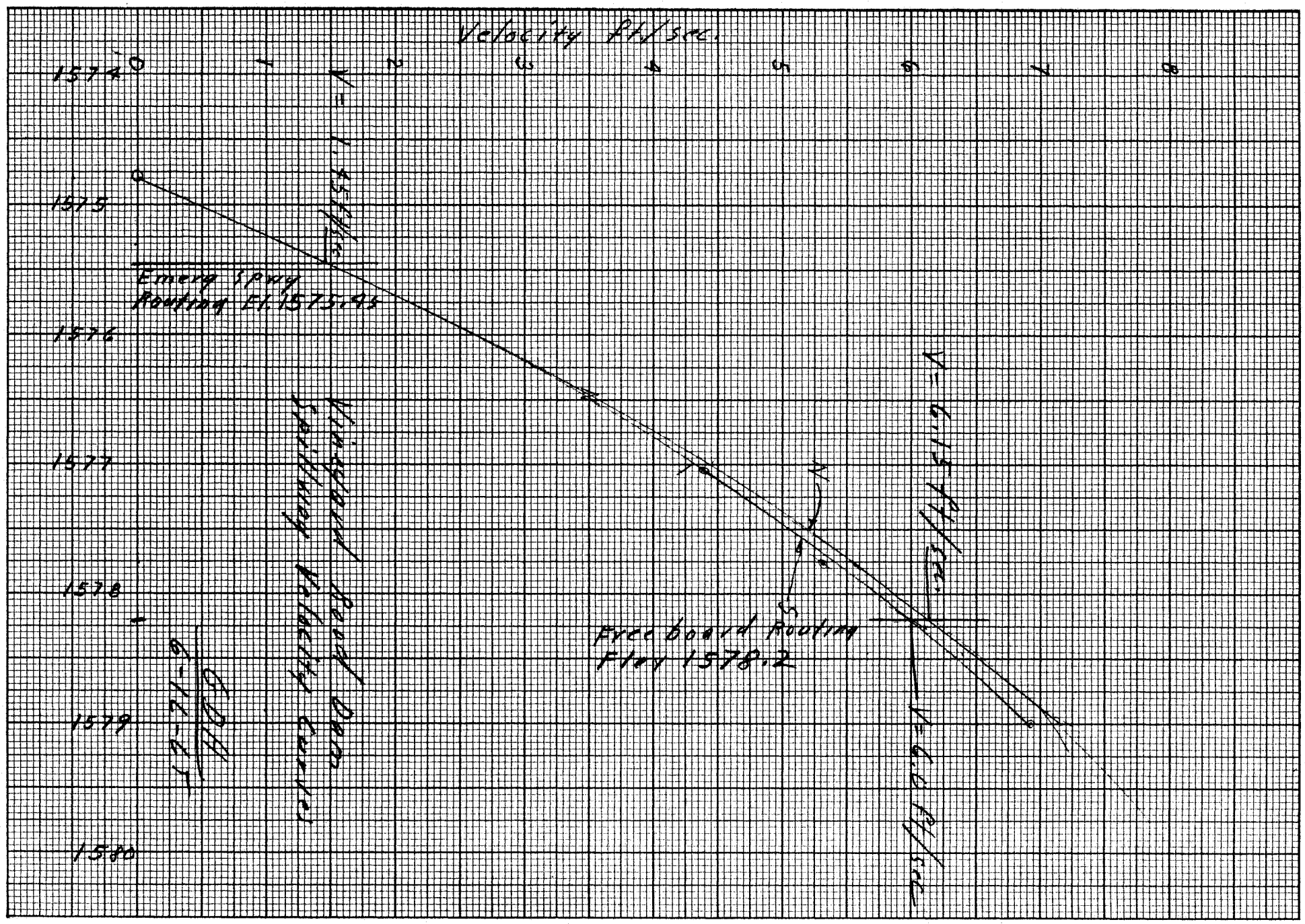
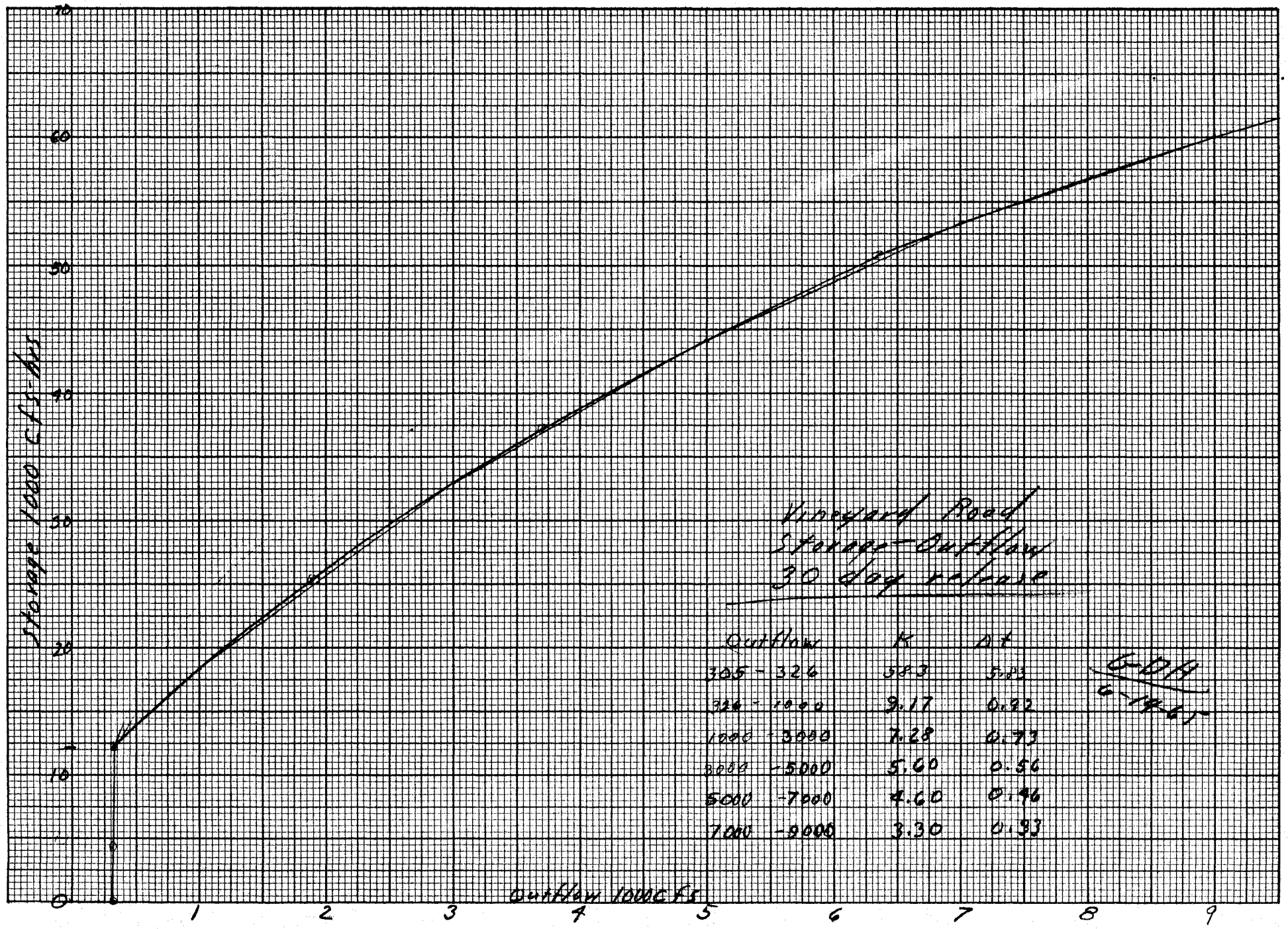


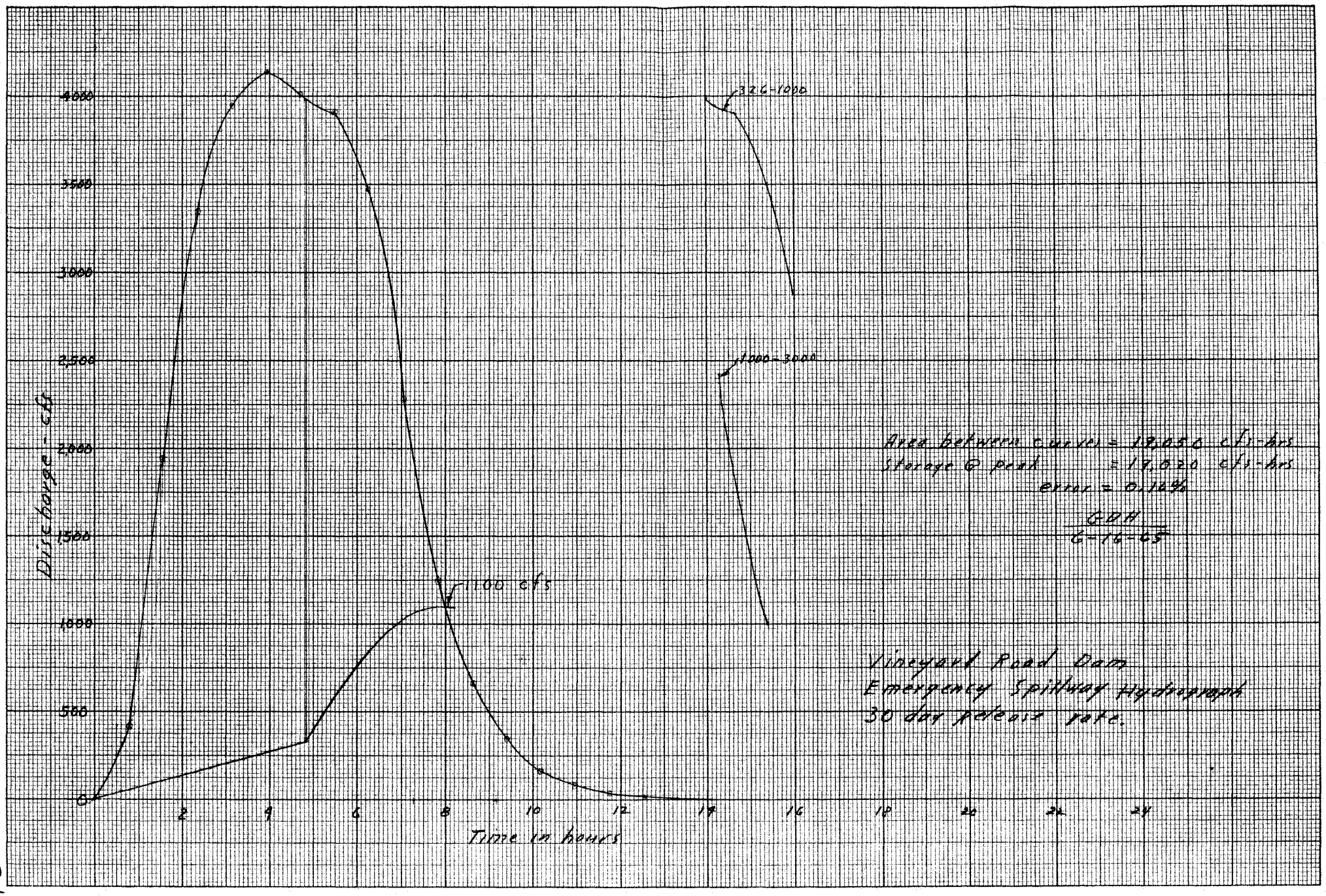
K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.



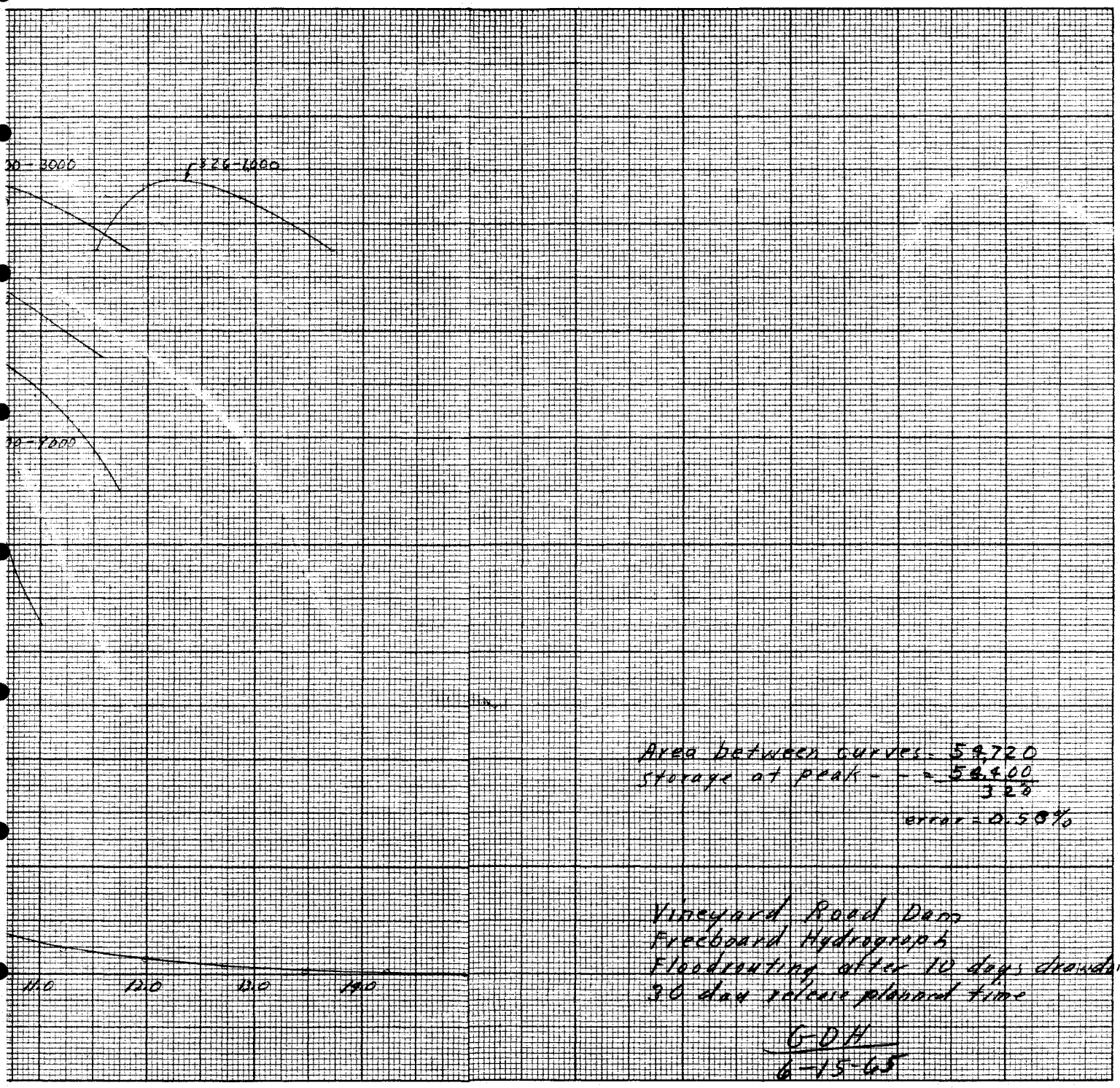
Vineyard Road
Storage-Outflow
30 day release

Outflow	K	Δt
305 - 326	38.2	5.83
326 - 1000	9.17	0.92
1000 - 3000	7.28	0.73
3000 - 5000	5.60	0.56
5000 - 7000	4.60	0.46
7000 - 9000	3.30	0.33

30


Discharge - cfs
4000
3500
3000
2500
2000
1500
1000
500
0
2
4
6
8
10
12
14
16
18
20
22
24
Time in hours
326-1000
1000-3000
1100 cfs
Area between curves = 18,050 cfs-hrs
Storage @ peak = 17,020 cfs-hrs
error = 0.10%
GDH
6-16-65
Vineyard Road Dam
Emergency Spillway Hydrograph
30 day release rate.

3

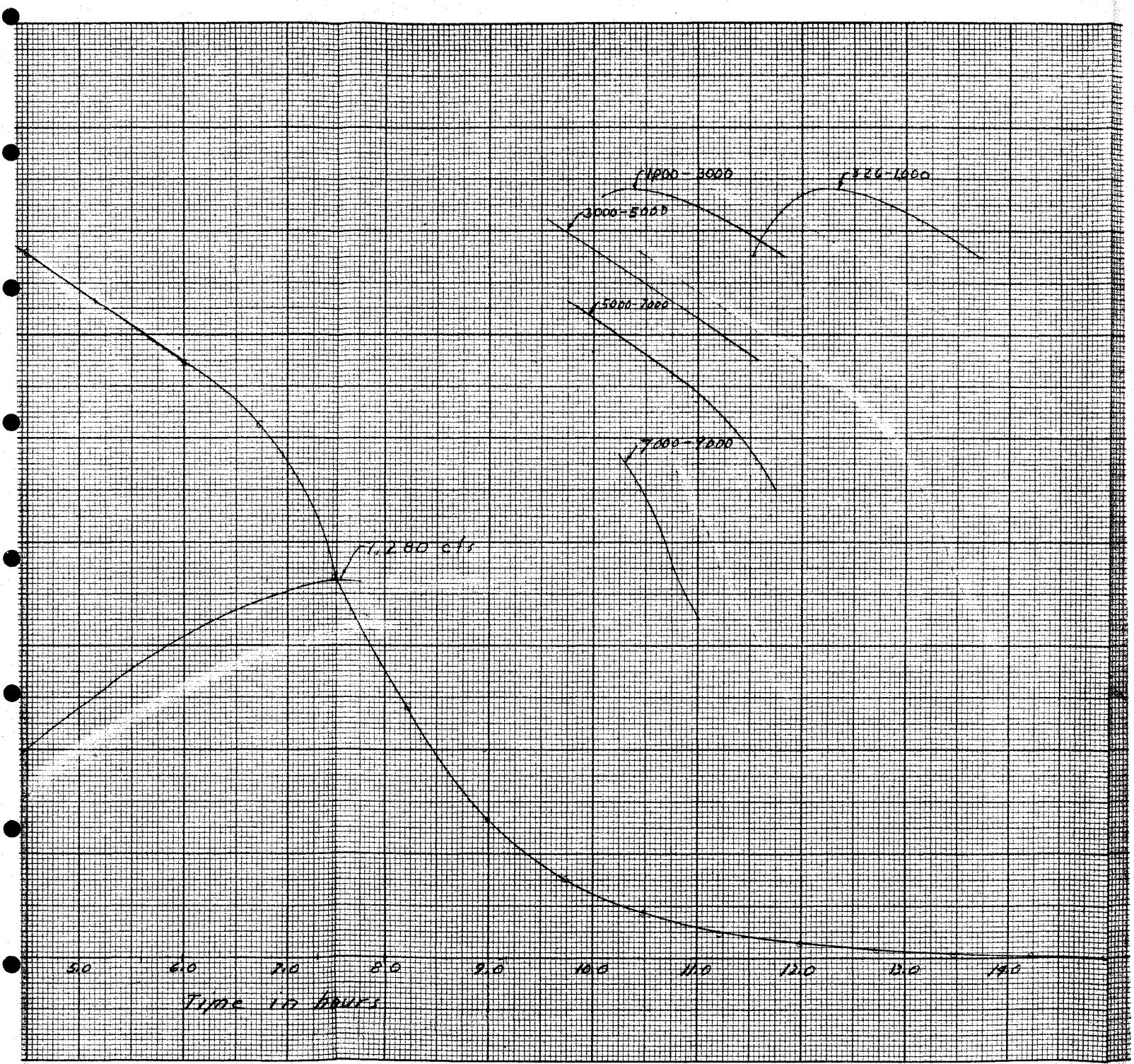


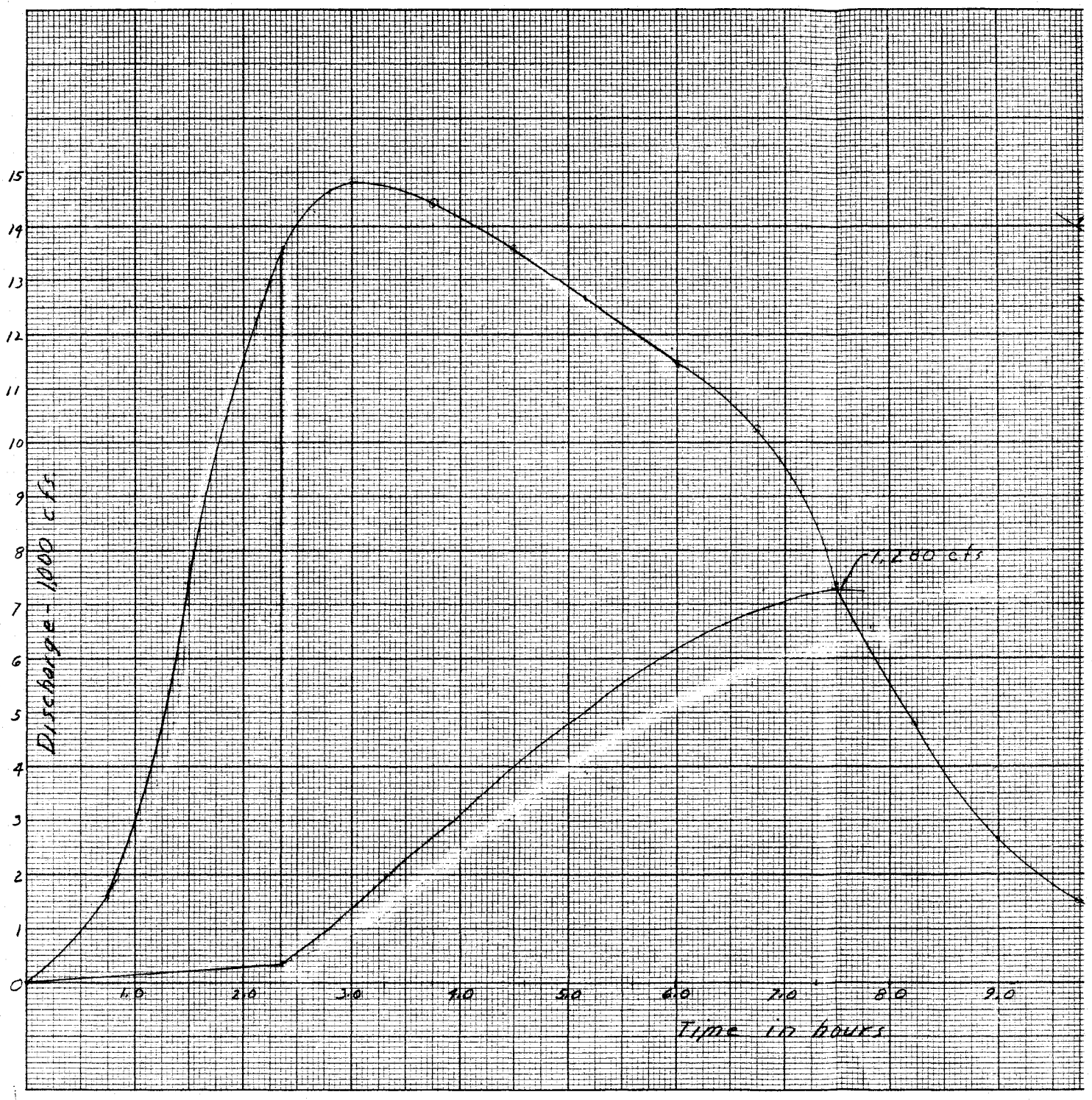
Area between curves - 59,720
storage at peak - - = 58,400
328

error = 0.58%

Vineyard Road Dam
Freeboard Hydrograph
Floodrouting after 10 days drawdown
30 day release planned time

G.D.H.
6-15-65


1000-3000
326-1000
3000-5000
5000-7000
7000-9000
1,280 cfs
4.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
Time in hours



K+E 20 X 20 TO THE INCH 359-10½G KEUFFEL & ESSER CO. MADE IN U.S.A.

Arizona Vineyard Road Dam

JMM 12-10-64

Floodrouting results & elevations

		1% Drawdown Time	
		10 Day	30 Day
Principal Spillway crest	elevation	1565.6	1565.6
Emergency Spillway crest	elevation	1574.9	~~1575.4~~ 1574.5 Ext. Dam
Sediment Volume	AF	185	185
Water Surface after 10 day drawdown		1564.6	1573.5 ~~1574.9~~
Available Storage to crest of em. Sp.		3814	996
Max. W.S. after routing Em. Sp. Hydrograph		1571.8	1575.45 ~~1576.4~~
Max W.S. after routing Fbd. Hydrograph		1577.4	1578.2 ~~1579.2~~ 5.45
Floodwater retarding Volume	AF	3814	4325 ~~4121~~
Pr. Sp. Release Max	cfs	709	327
Maximum Em. Sp. Velocity	ft/sec		N. 6.15, S 6.0

75.5
74.8
0.7

1575.4
~~1.6~~
3.8

P

Arizona Vineyard Rd Dam
Watt 6-20-65
Floodrouting Results

Principal Spillway Crest	1566 ±
Emergency Spillway Crest	1574 ±
Sediment Volume	185 AcFt
Water Surface 10 day drawdown	1573.5
Max W.S. Emg Sp Hydrograph	1575.5
" " Freeboard Hyd.	1578.2
Top Dam 1' Settlement + 3.0' F.B. above 75 ±	1579.5
Floodwater Retarding Volume	4325 AcFt
Vel Emg Sp Design Hyd	1.5 ft/sec
" " " Freeboard Hyd	6.2 ft/sec

3' FB above routed E.S. Design Flow + Settlement
Depth of flow: 0.7'
= 1574.8 + 3.7 = 1578.5

Add 1' Settlement 1579.5'

Arizona Vineyard Road Dam

JMM 12-8-64

Stage - Storage - Discharge Data

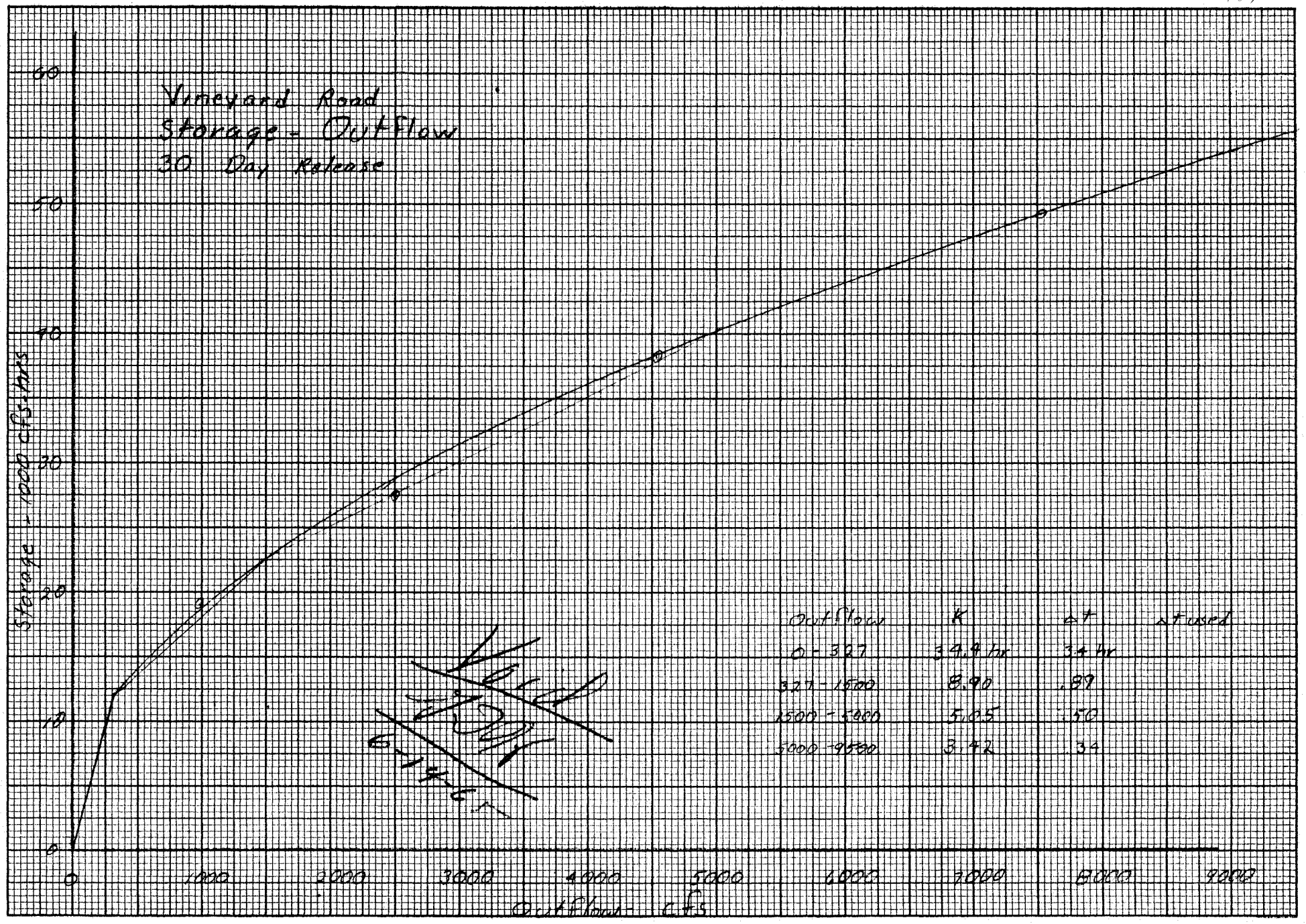
30 Day Release

Available storage after 10day drawdown = 996 at elev 1574.0

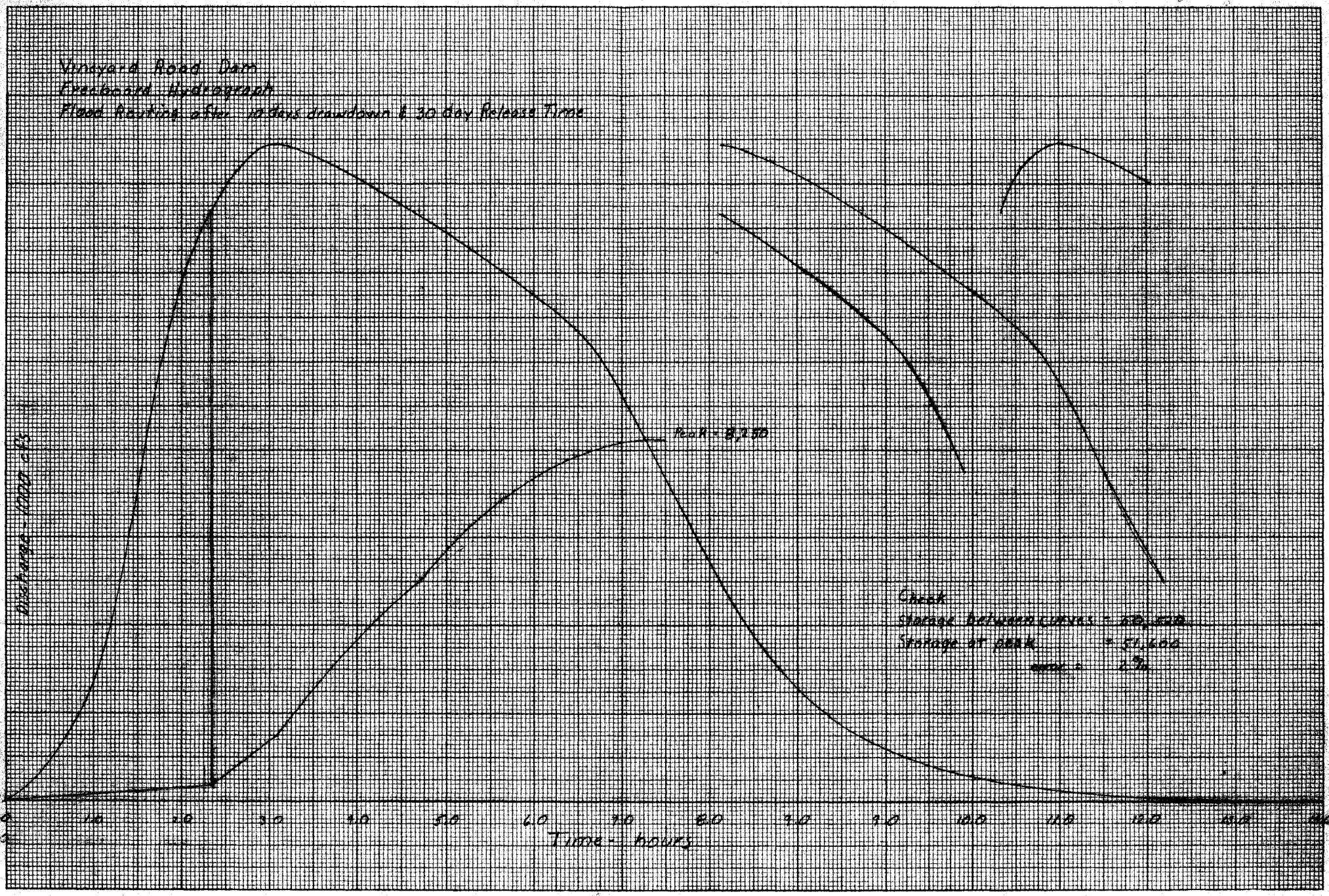
elev	Storage AF	Available cfs-hrs	Pr. Sp. Outflow cfs	Em. Sp Outflow cfs	Total outflow cfs
1574.0	0	0	305	0	0
1575.4	996	12,050	327	0	327
1576.0	1570	19,000	332	660	990
1577.0	2270	27,470	351	2150	2500
1578.0	3150	38,110	364	4170	4530
1579.0	4070	49,250	377	7150	7530
1580.0	5,120	61,950	390	12,100	12,490

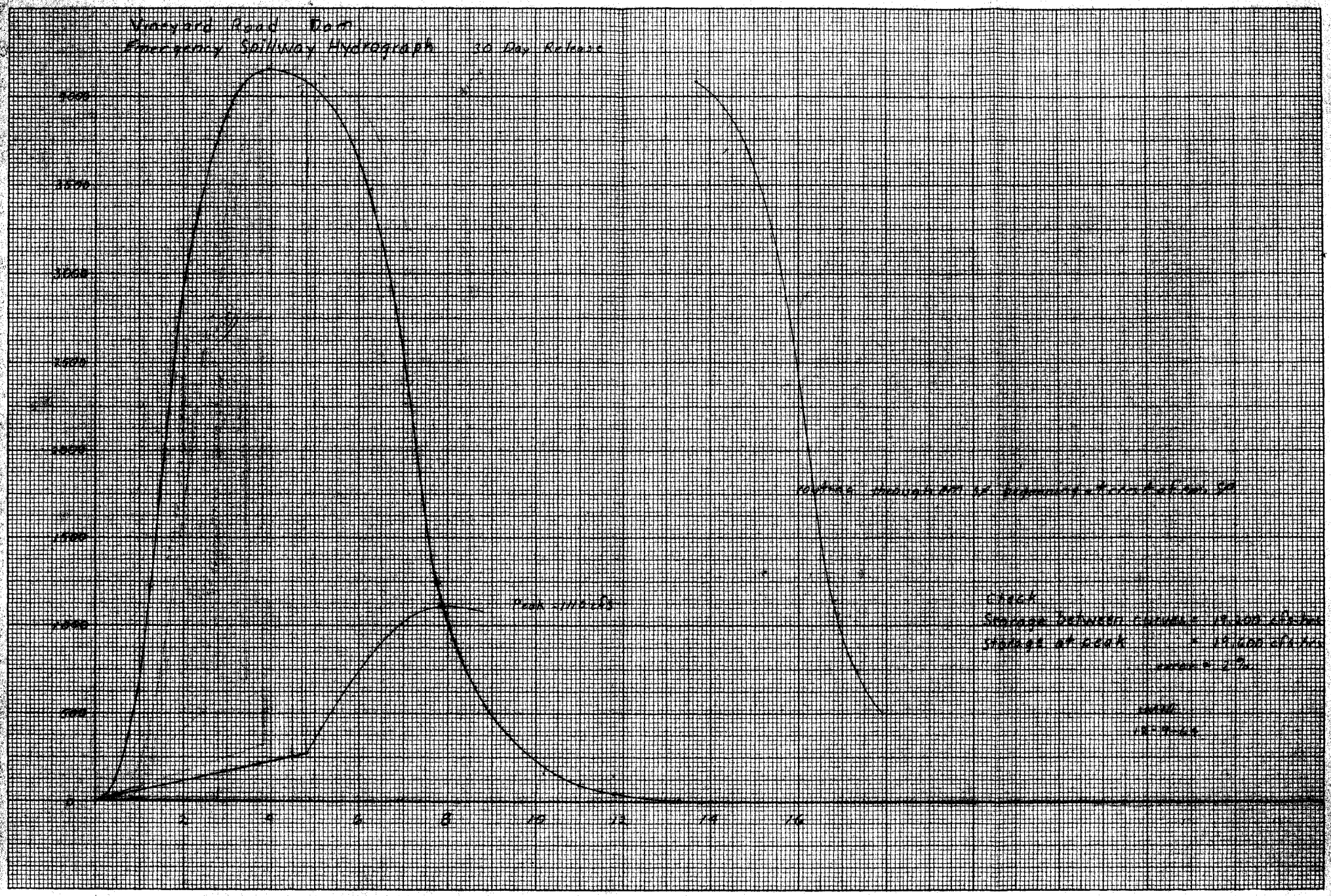
Void
GDH
4-15-65

K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.



Outflow	K	Δt	Δt used
0 - 327	39.9 hr	34 hr	
327 - 1500	8.90	.89	
1500 - 5000	5.05	.50	
5000 - 9500	3.42	.34	


Vineyard Road Dam
Freeboard Hydrograph
Flood Routing after 10 days drawdown & 30 day Release Time
Peak - 8,250
Check
Storage between curves = 60,500
Storage at peak = 51,600
error = 2%
Discharge - 1000 cfs
Time - hours
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15


Vineyard Road Dam
Emergency Spillway Hydrograph 30 Day Release
4000
3500
3000
2500
2000
1500
1000
500
0
2
4
6
8
10
12
14
16
Peak - 1110 cfs
Check
Storage between curves = 19,200 cfs-hrs
Storage at peak = 19,600 cfs-hrs
error = 2%

Arizona Vineyard Road

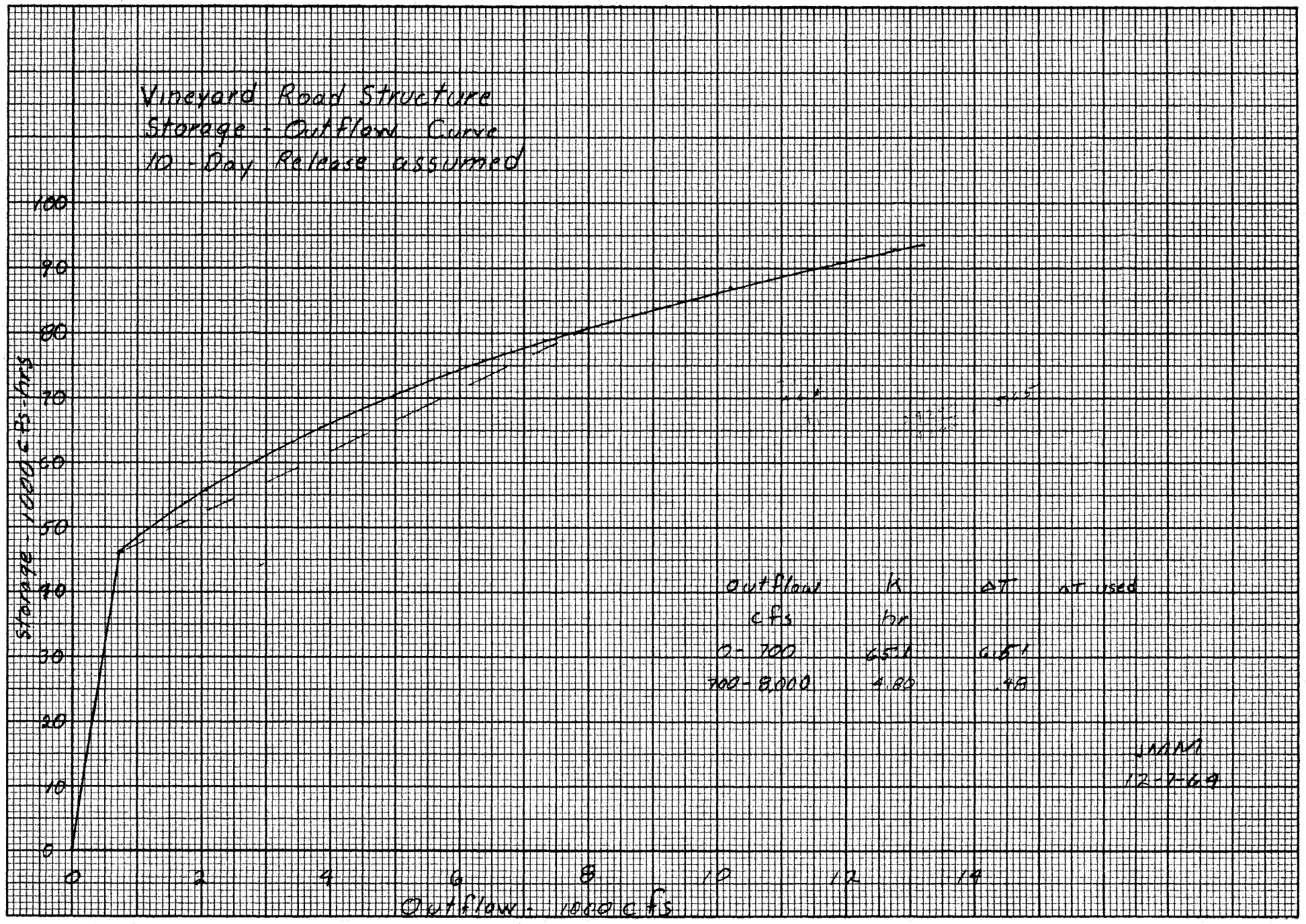
JMM 12-7-64

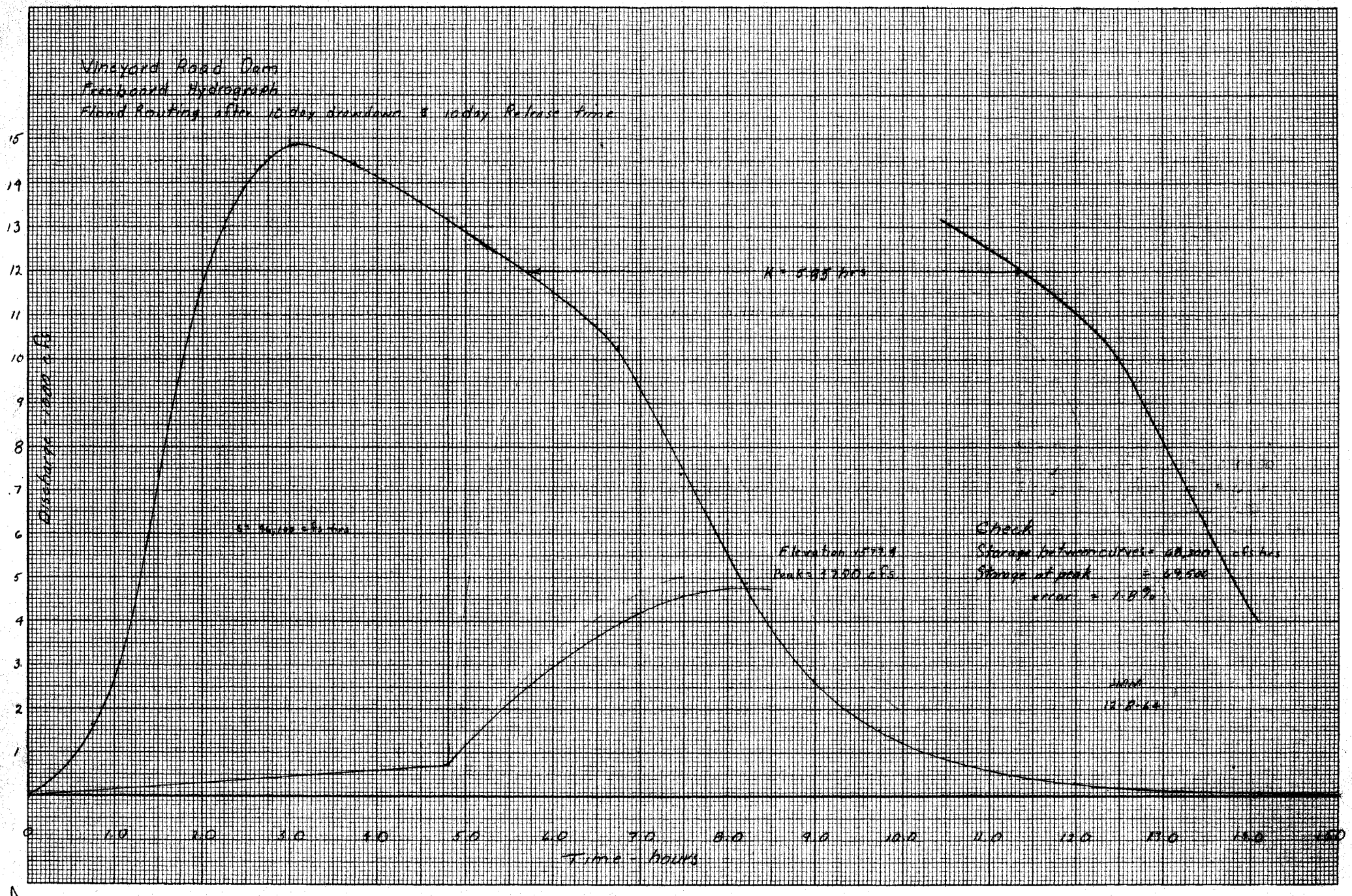
Storage - Outflow data

10 Day Release

Elevation	Floodwater Storage AF	Storage cfs-hrs	Pr. Sp. Outflow cfs	Em. Sp. outflow cfs	Total outflow cfs
1574.9	3814	46,150	709	0	
76.0	4,600	55,660	750	1340	2,090
77.0	5,400	65,340	786	3060	3,846
78.0	6,270	75,870	818	5550	6,368
79.0	7.190	87,000	850	9370	10,220
79.5	7.720	93,410	862	12,350	13,212
1564.6	0	0	0	0	0

K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.




Vineyard Road Dam
Freeboard Hydrograph
Flood Routing after 10 day drawdown & 10 day Release time
K = 5.85 hrs
Elevation 1577.9
Peak = 3750 cfs
Check
Storage between curves = 68,300 cfs hrs
Storage at peak = 69,500
error = 1.8%
12-8-64
Discharge 1000 cfs
Time - hours
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Arizona Vineyard Road Dam

JMM 12-10-64

Flood Routing for State Criteria Comparrison

Hydrographs for 6 hour 10, 25, 100 year Storms will be routed through the emergency spillway beginning at the emergency spillway crest for comparrison with SCS criteria

$T_c = 2.67$ hr DA = 53.4 Sq. Mi

CN = 82

Area correction = .66 P

Transsmission loss correction = .66 Q

Duration of excess Precip = 6hr − $\frac{.4}{\text{Intensity}}$

$T_p = D/2 + .6T_c = D/2 + 1.60$

$q_p = \frac{484 A Q}{T_p}$

		10 %	25 %	100 %
P_{point}	in.	2.78	3.30	4.10
P_{Areal}	in.	1.83	2.18	2.71
Q	in	.54	.77	1.15
.66 Q	in	.36	.51	.76
Duration	hr	5.78	5.82	5.85
T_p	hr	4.49	4.51	4.53
q_p	cfs	2072.	2923	4336

Using Typical Hydrograph coordinates of Table 3.16-1 NEH-4

Avg. T_p = 4.51 hr will be used for all 3 hydrographs

Arizona Vineyard Road Dam

JMM 12-10-64

Flood Routing for State Criteria Comparrison

Hydrograph Computations 6 hour Storm.

T/Tp	q/qp	T hr	q 10% cfs	q 4% cfs	q 1% cfs
0	0				
.1	.015	.45	31	44	65
.2	.075	.90	155	219	325
.3	.16	1.35	332	468	694
.4	.28	1.80	580	818	1214
.5	.43	2.25	891	1257	1864
.6	.60	2.70	1243	1754	2602
.7	.77	3.15	1595	2251	3339
.8	.89	3.60	1844	2601	3859
.9	.97	4.05	2010	2835	4206
1.0	1.00	4.51	2072	2923	4336
1.1	.98	4.96	2031	2864	4249
1.2	.92	5.41	1906	2689	3989
1.3	.84	5.86	1740	2455	3642
1.4	.75	6.31	1554	2192	3252
1.5	.66	6.76	1367	1929	2861
1.6	.56	7.21	1160	1637	2428
1.7	.42	7.66	870	1228	1821
1.8	.32	8.11	663	935	1388
2.0	.24	9.02	497	701	1041
2.2	.18	9.92	373	526	780
2.4	.13	10.82	269	380	564
2.6	.098	11.72	203	286	425
2.8	.075	12.62	155	219	325
3.0	.036	13.53	75	105	156
3.5	.018	15.78	37	53	78
4.0	.009	18.04	19	26	39
4.5	.004	20.29	8	12	17
5.0	0	22.55	0	0	0

Arizona Vineyard Road Dam

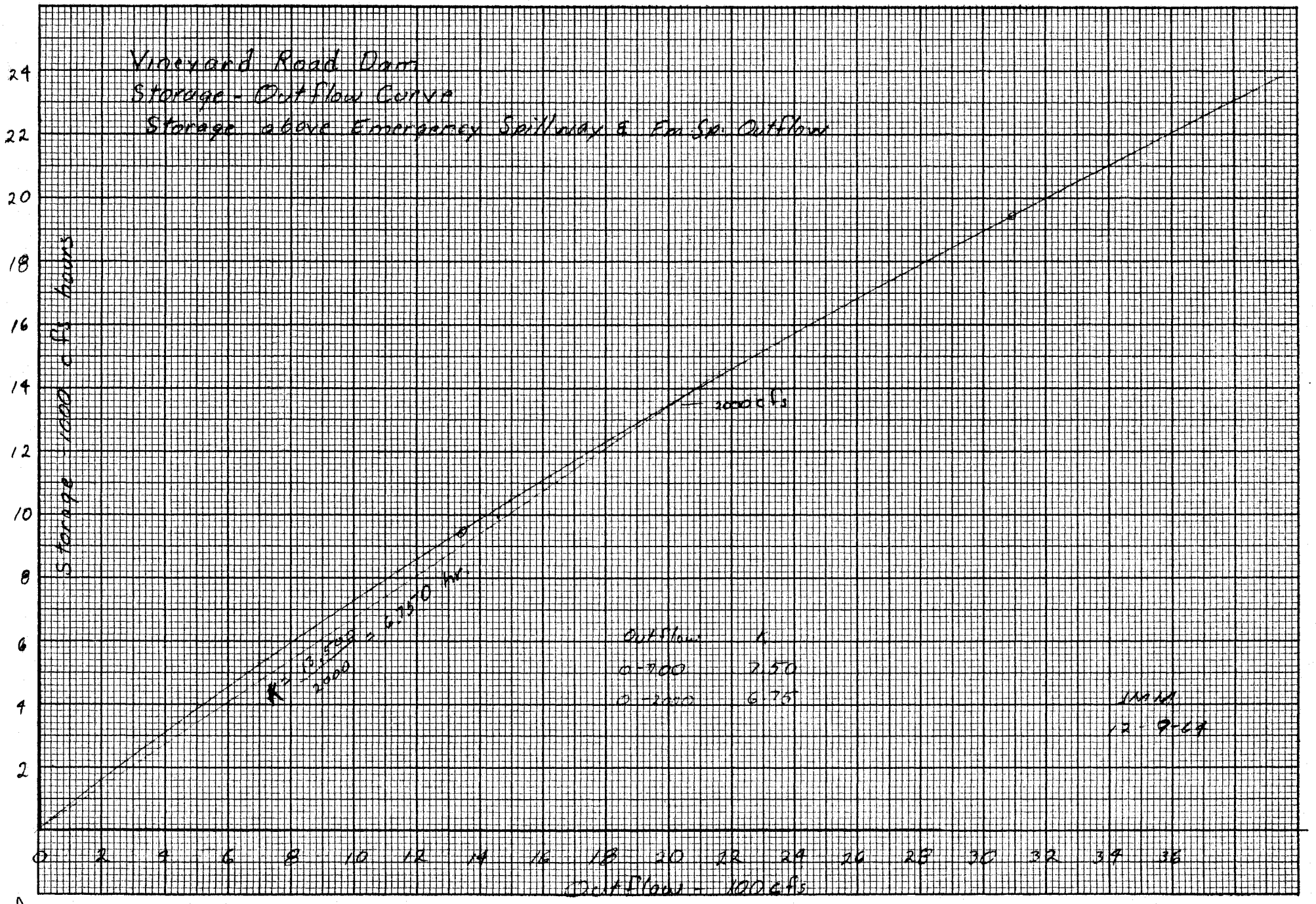
JMM 12-10-64

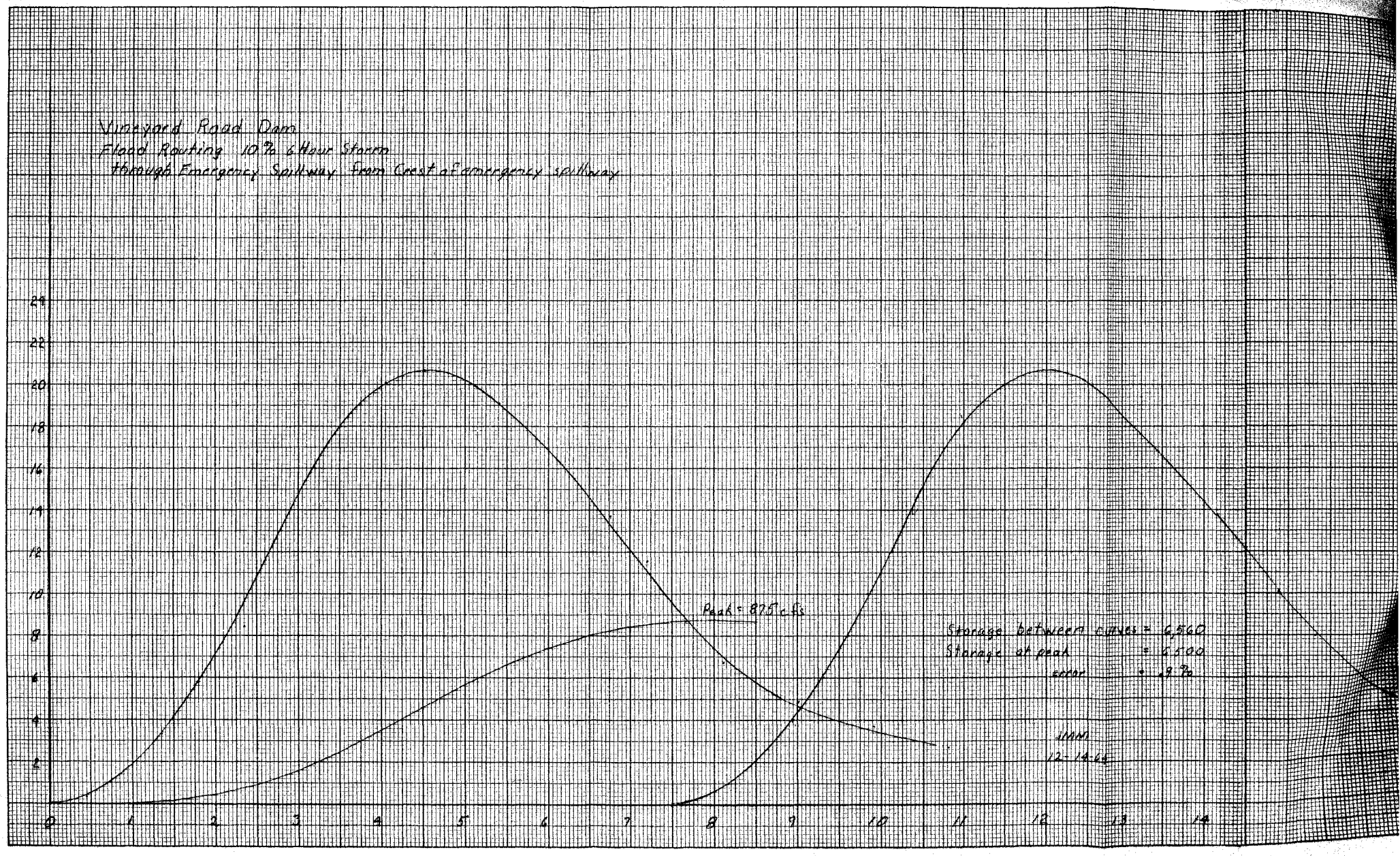
Reservoir Data

Storage above emergency spillway crest and em. sp. outflow

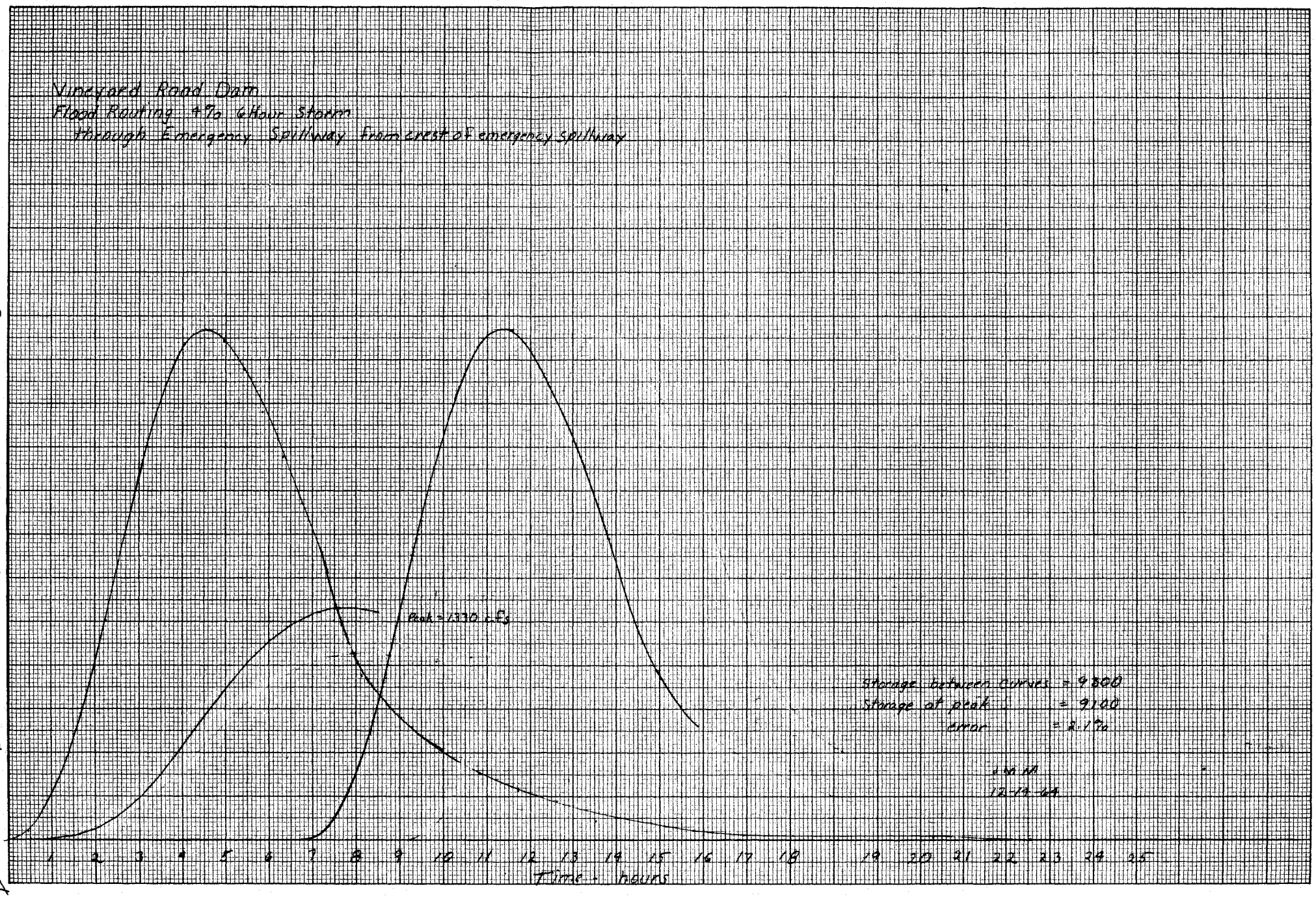
elevation	Available Storage AF	cfs-hrs	Outflow cfs
1574.9	0		0
76	780	9,440	1340
77	1600	19,360	3090
78	2470	29,890	5550
79	3400	41,140	9250
80	4400		
81	5500		
82	6120		

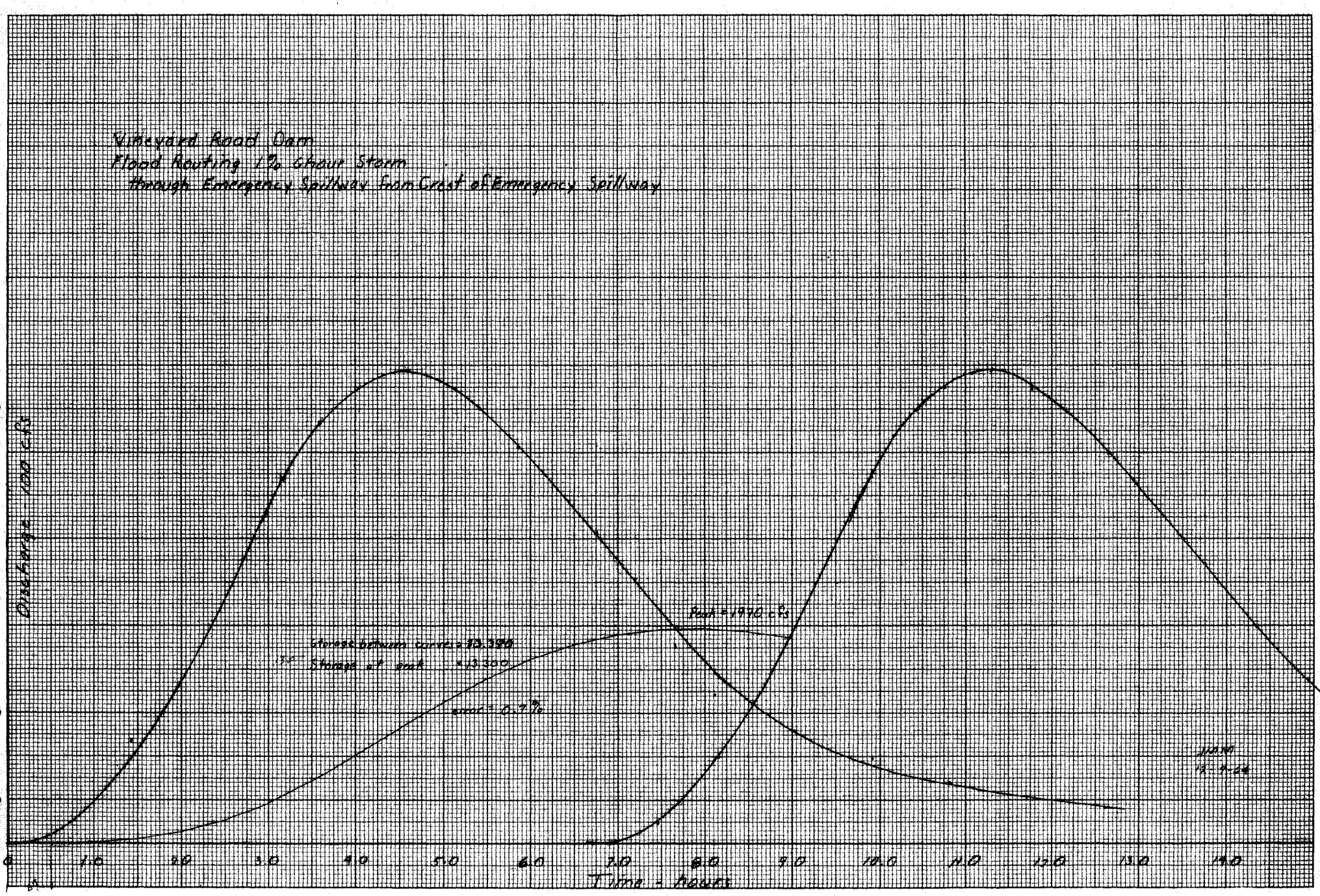
K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.




Vineyard Road Dam
Flood Routing 10% 6 Hour Storm
through Emergency Spillway from Crest of emergency spillway
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Peak = 87.5 cfs
Storage between curves = 6,560
Storage at peak = 6,500
error = .9%
JMM
12-14-66

48


Vineyard Road Dam
Flood Routing 4% 6 Hour Storm
through Emergency Spillway from crest of emergency spillway
Peak = 1370 c.f.s.
Storage between curves = 9300
Storage at peak = 9100
error = 2.1%
J.M.M.
12-19-64
30
25
20
15
10
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Time - hours

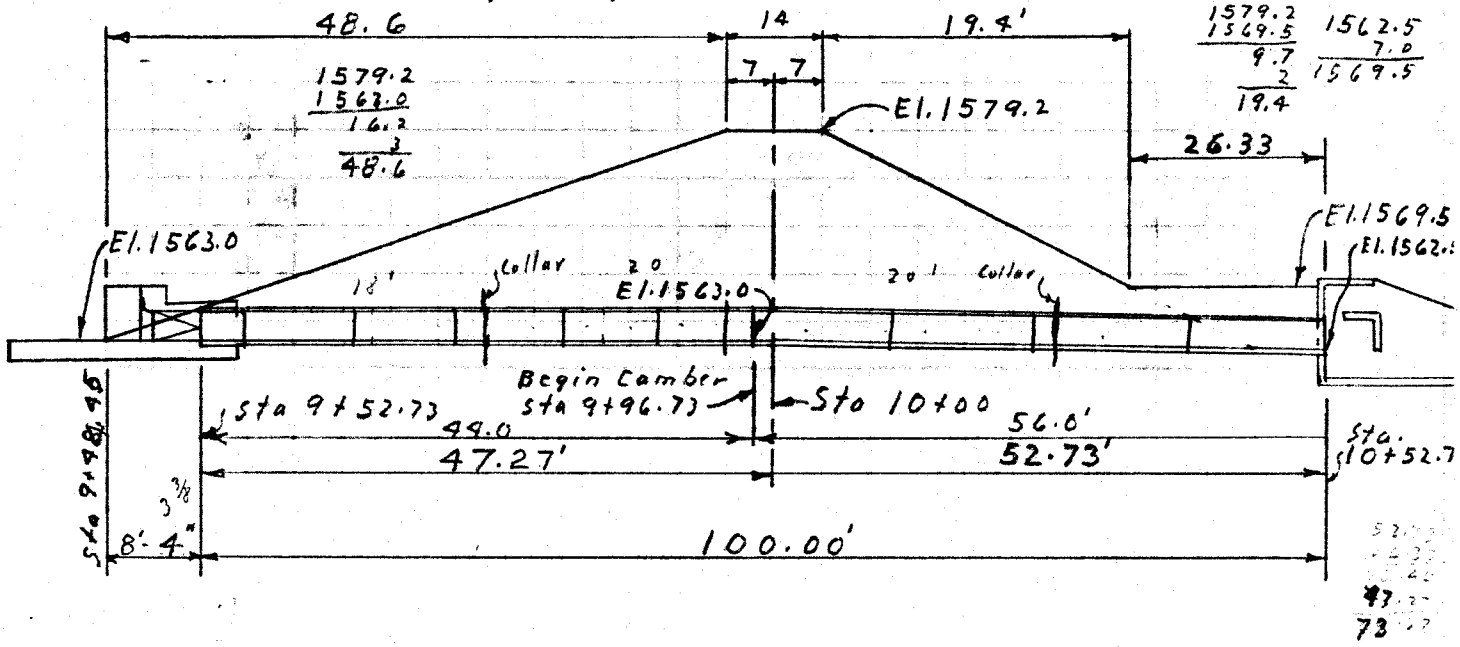

Vineyard Road Dam
Flood Routing 1% 6hour Storm
through Emergency Spillway from Crest of Emergency Spillway
Discharge 100 cfs
44
40
36
32
28
24
20
16
12
8
4
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
Time - hours
Peak = 1940 cfs
storage between curves = 13,380
Storage at peak = 13,300
error = 0.7%

50

Arizona Vineyard Road Dam

CDH 9-3-65

Principal Spillway Layout



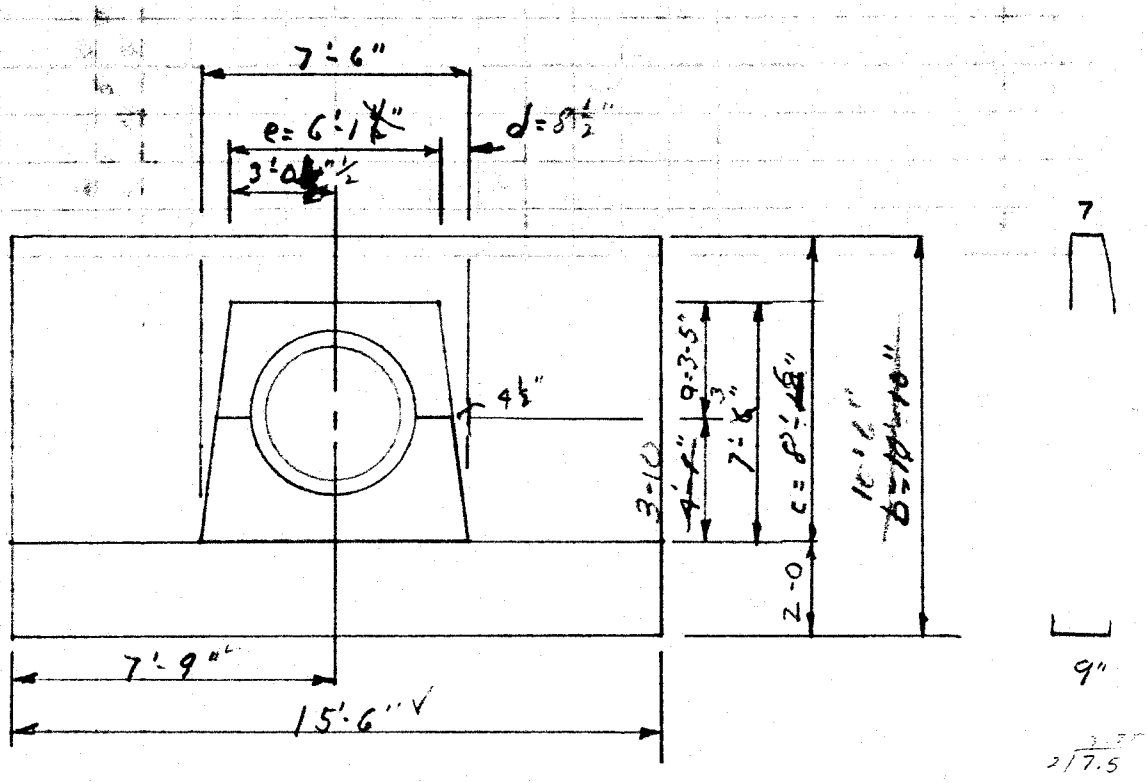
1	2	3	4	5	6	7	8
Sta.	L	x	x/L	$(x/L)^2$	e	y Col. 5 x 6	El.
9+52.73	0	0	0	0	0	0	1563.0
9+96.73	44	44	1	1	0	0	1563.0
10+12.73	56	16	0.28571	0.081630	.50	0.04	1562.96
10+28.73	56	32	0.57142	0.32652	.50	0.16	1562.84
10+44.73	56	48	0.85714	0.73469	.50	0.37	1562.63
10+52.73	56	56	1.0	1.0	.50	0.50	1562.50

Number of cutoff collars $l = 47.27 + 26.40 = 73.67$ say 74'

$V = 2.0'$

$n = \frac{0.075 l}{V} = \frac{0.075 \times 74}{2} = 2.78$ use 3 collars @ 20' c-c

Arizona Vineyard Road Dam
GDH 8-8-65
Anti-Seep collar design



$a = \frac{54+11}{2} + 8'' = 40\frac{1}{2}'' = 3'-4\frac{1}{2}''$ Call 3'-5"

$b = \cancel{4'-1''} + 2'-0'' + \left(\frac{54+11}{2}\right) + 2.0 = 10'-\cancel{9\frac{1}{2}''}$ 6 1/2" ~~call 10'-10"~~

$d = \frac{\cancel{7.5}\ 7.25 \times 0.375}{\cancel{4.08333}\ 3.83} = \cancel{0.68877}\ 0.70923$ call $\cancel{8\frac{1}{4}''}$ 8 1/2

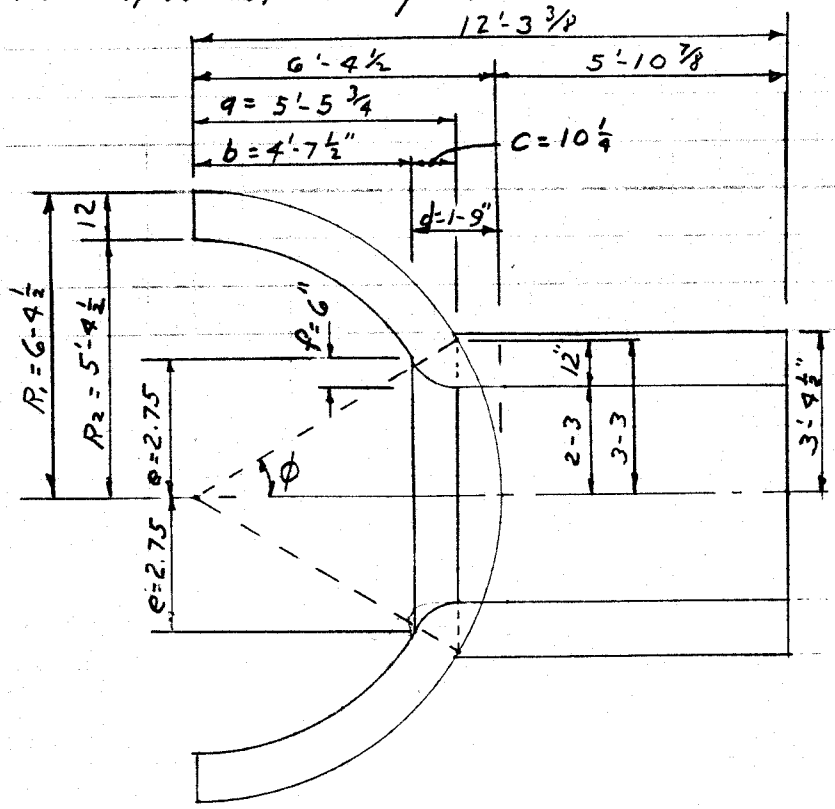
$e = 7.5 - (2 \times \cancel{0.6875}\ 0.70833) = \cancel{6.125}\ 6.0833 = 6'-1\frac{1}{4}''$ 6'-1"

P

Arizona Vineyard Road

GDH 11-17-65

Principal Spillway Inlet.



$\sin\phi = \frac{3.25}{6.375} = 0.5098 = 30°39'02$

$a = 6.375 \overset{0.860293}{\cos 30°39'02''} = 5.4843$

$b = 5.375 \times 0.860293 - - = 4.6240$

$c = a - b - - - - - - = 0.860$

$d = 6.375 - 4.62407 - - = 1.75$

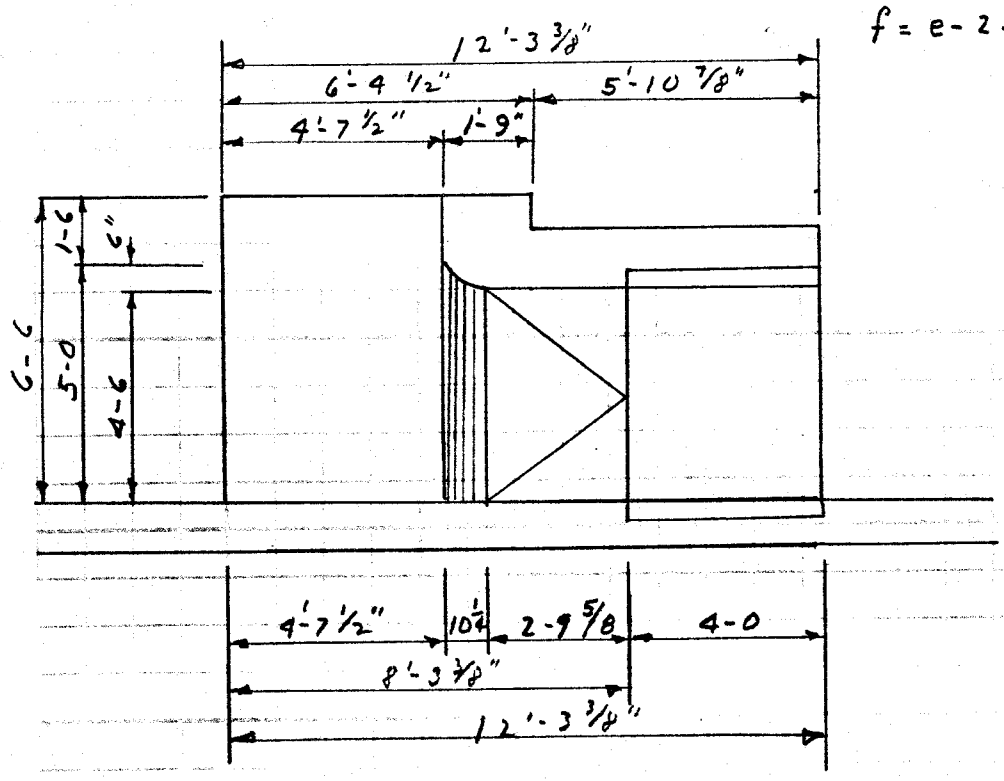
Adjust ϕ using 5'-5 3/4 = a and 6'-4 1/2"

$\cos\phi = \frac{5.4792}{6.375} = 0.85948$

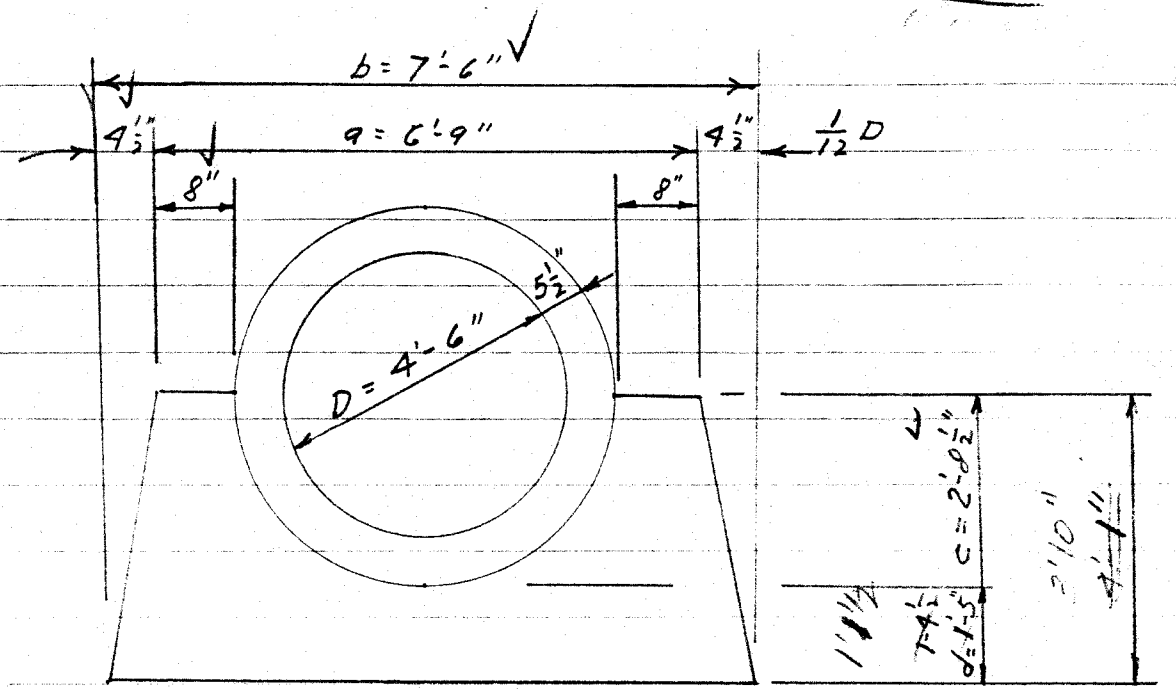
Adj $\phi = 30°\ 44'\ 31''$

$e = 5.375 \overset{0.51117225}{\sin 30°44'31''} = 2.75$

$f = e - 2.25 - - - - = 0.50$



Vineyard Road Principal Spillway
Conduit Cradle.



$a = 54 + 11 + 16 = \frac{81}{12} = 6'\text{-}9''$

$\frac{1}{12}\ 54 = 4\frac{1}{2}''$

$b = 6'\text{-}9'' + 9'' = 7'\text{-}6''$

$c = \frac{54}{2} + 5\frac{1}{2} = \frac{32\frac{1}{2}}{12} = 2'\text{-}8\frac{1}{2}''$ $\quad 2'\text{-}8\frac{1}{2}$

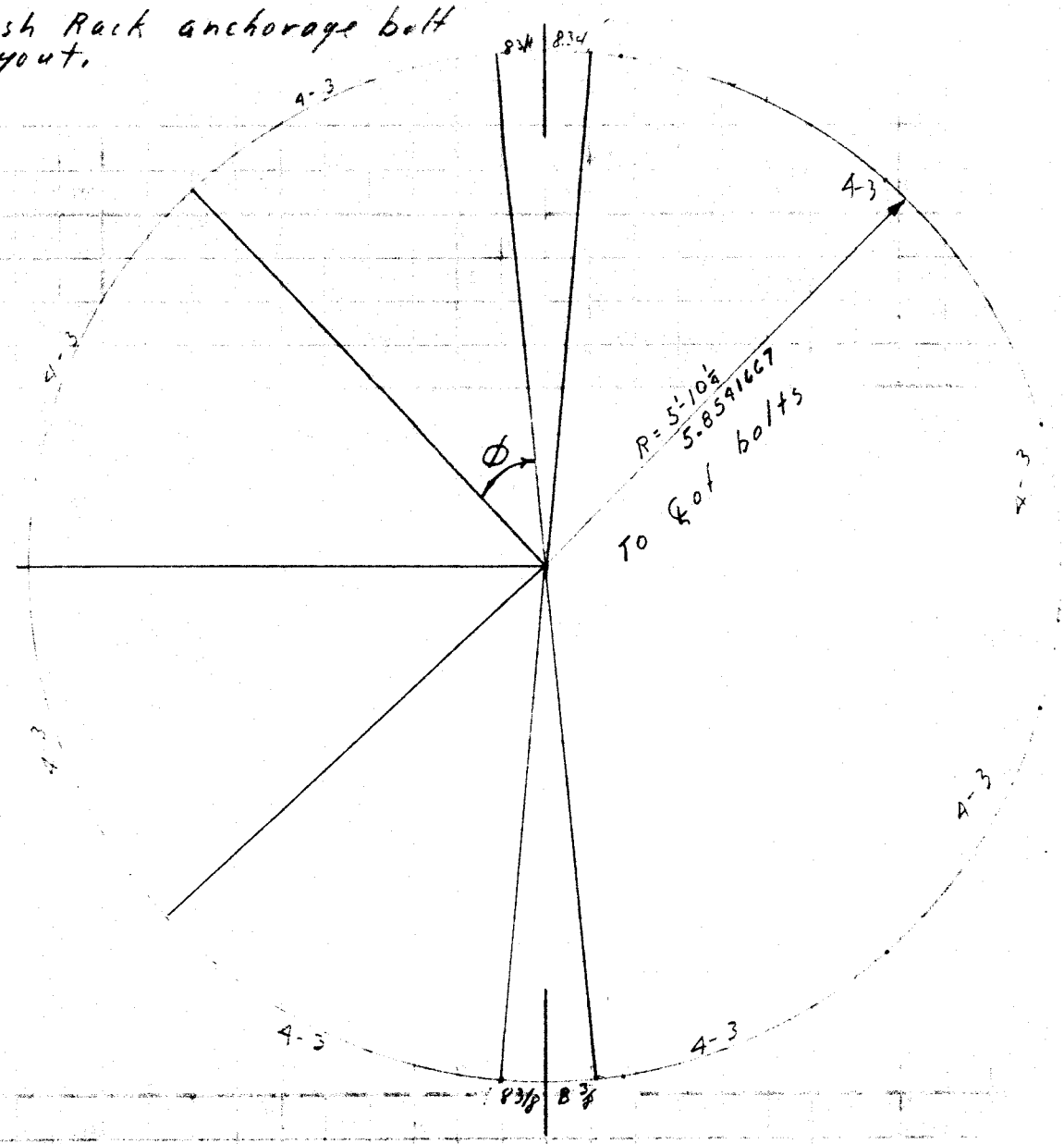
$d = \frac{1}{4}\ D = \frac{1}{4} \times 54 = \frac{\cancel{17}\ 13}{12}'' = 1'\text{-}5''$ $\quad 1 - 1\frac{1}{2}$ $\quad 4 - 1\frac{1}{2}$ $\quad$ use $\cancel{1'\text{-}4\frac{1}{2}}$ $\quad 1 - 1\frac{1}{2}$ $\quad \cancel{4' - 1''}$ $\quad 3'\text{-}10''$ $\quad \cancel{1'2''}$

Collar width = 7'-6" + 8' = 15'-6"

Arizona Vineyard Road Dam

GDH 9-15-65

Trash Rack anchorage bolt Layout.



Circumference = (2)(3.14159 27)(5.8541667) = $\frac{36.7828147}{2}$ = 18.3914'
= 18'-4 $\frac{3}{4}$"

use 5 bolts in each half. @ 3'-4" c-c

$\phi = \frac{180 \times 4.25}{3.14159 \times 5.85417}$ = 41.5955° use 42°

765
18.391402

P

Check Inlet Dimensions
G Watt 1-28-66

$$\frac{3.25}{6.375} = \frac{a}{5.375}$$

$a = 2.74'$

$$5.375^2 - 2.74^2 = (5.375 - b)^2$$

$$-2.74^2 = -10.75b + b^2$$

$$b = \frac{10.75 \pm \sqrt{10.75^2 - 4 \times 2.74^2}}{2}$$

$b = 0.751$

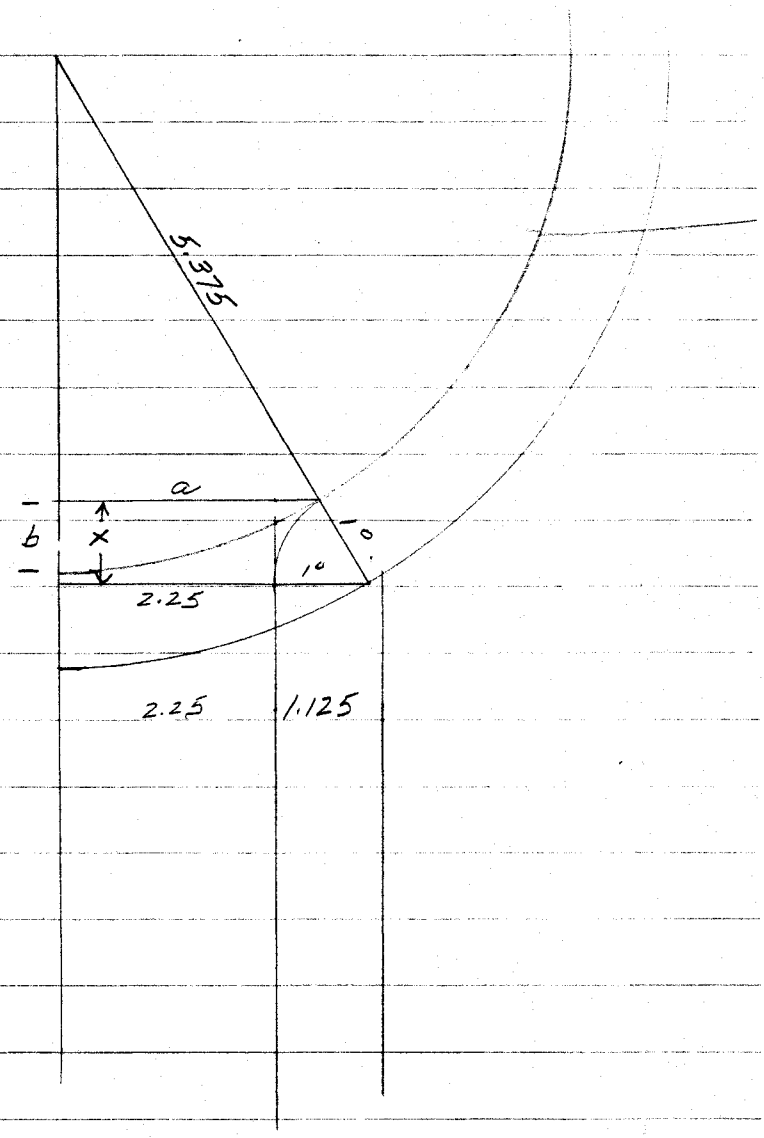
$1 + b = 1.751 = 1'9''$

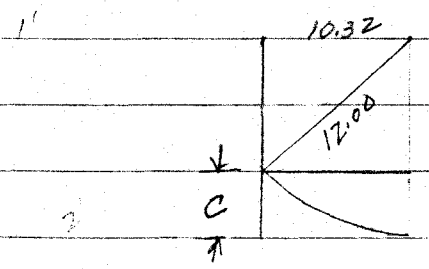
$5.375 - .751 = 4.624$

$$\frac{x}{1.0} = \frac{4.624}{5.375} = 0.860$$

$= 10.32''$

$10\frac{1}{4}''$





$$\cancel{12^2} - 10.32^2 = (12 - c)^2 = \cancel{12^2} - 24c + c^2$$

$$c^2 - 24c + 10.32^2 = 0$$

$$c = \frac{+24 \pm \sqrt{24^2 - 4 \times 10.32^2}}{2} = 5.88''$$

$= 5\frac{7}{8}''$

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE Arizona		PROJECT Vinyard Rd Dam		
BY Watt	DATE 7-12-65	CHECKED BY	DATE	JOB NO.
SUBJECT Vinyard Rd Dam Inlet Structure				SHEET ____ OF ____

Btm of inlet = 1563.0
Crest of Emg Spillway = 1574.8
Top of Dam = 1579.5 (Inc. 1' for settlement)
Top of silt Pool = 1566.2
Size of Prime. Sp. 54" Pipe
Max Q = 313 C.F.S.

For Q of 313 CFS & Vel of 1'/sec

A = 313 Sq ft.

Ht of opening = 74.8 - 66.2 = 8.5'

Circum = 313/8.5 = 36.82 ft

$D = \frac{36.82}{3.14} = 11.7$ ft

Call 12'0" Diam

Max Spacing 2/3 of 4.5' = 3.0 ft

$\frac{36.82}{3} = 12.3$ Spaces Call 13

$\frac{12 \times 3.1416}{13} = 2.90$ ft = 2'10 3/4"

Ht = 74.8 - 63.0 + 1.0 = 12.8 Call 13.0'

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO . 1958 O—470868

STATE	PROJECT			
Arizona	Vineyard Rel Dam			
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	2-1-66			
SUBJECT				SHEET ____ OF ____
Floor Slab on Inlet Str				

Wt Trash Rack

Long ½

Pipe 6×14×10.25	=	861 lbs
Base L 17.8×6.1	=	109
H Beam 2×18 (6.7+3.8)	=	378
	Sub-Total	1348

Short ½

Pipe 7×7.5×10.25	=	538
Base L 17.8×6.1	=	109
H Beam 18×10.5	=	189
	Sub-Total	836

Total 2186

Wt Conc (Yardage From Conc. Comp.)

Slab 16×16×150	=	38,400
4.29×6.75×150	=	4,344
Block = (264.7 − 148.6) 150	=	17,415
Headwall (96.8) 150	=	14,520
	Total	76,865

Center gravity ½ Ring 12' Diam

= .42×6 = 2.5

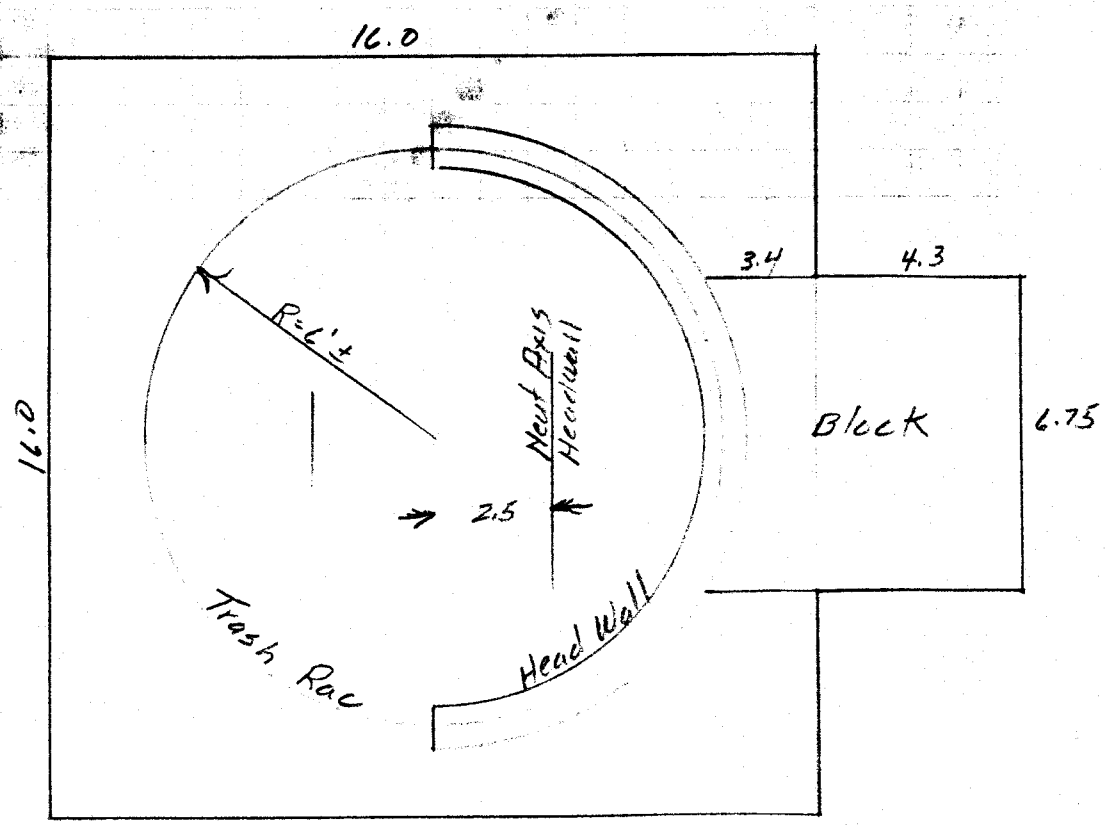
84
420
5.04

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vinyard Road Dam		
BY Watt	DATE 2-1-66	CHECKED BY	DATE	JOB NO.
SUBJECT Check on Inlet Foundation			SHEET ____ OF ____



COMPUTATION SHEET
SCS-522 REV 5-58

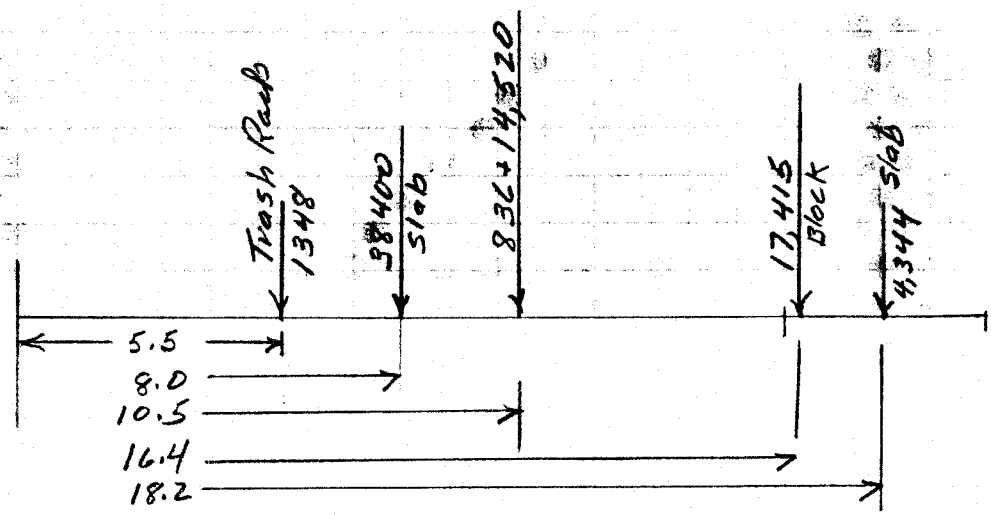
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vineyard Rd Dam		
BY Watt	DATE 2-1-66	CHECKED BY	DATE	JOB NO.

SUBJECT Check on Inlet Foundation Inlet Floor Slab

SHEET ____ OF ____



Resultant at

$$\frac{1348 \times 5.5 + 38400 \times 8.0 + (836 + 14520)\,10.5 + 17415 \times 16.4 + 18.2 \times 4344}{\Sigma F = 76{,}863}$$

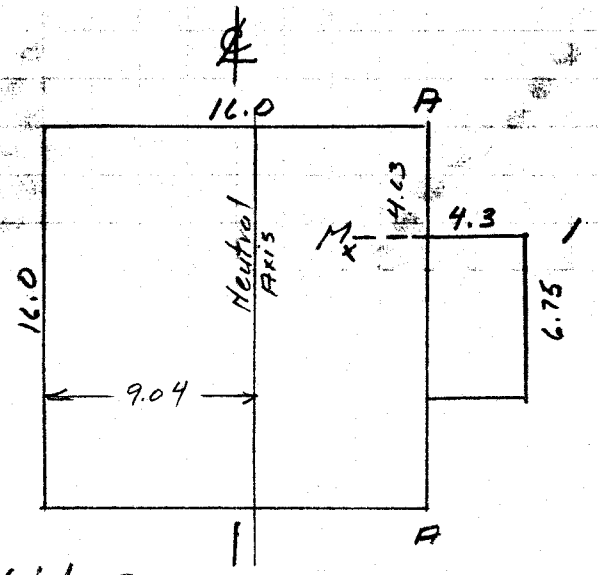
$$= \frac{840518.8}{76{,}863} = 10.94$$

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vineyard Rd Dam		
BY: Watt	DATE: 2-1-66	CHECKED BY	DATE	JOB NO.
SUBJECT: Check on Inlet Foundation			SHEET ____ OF ____



$$\text{Neut Axis} = \frac{16\times16\times8 + 4.3\times6.75\times18.25}{16\times16 + 4.3\times6.75} =$$

$$\frac{2577.70}{285} = 9.04$$

$$I_T = \frac{16\times16^3}{12} + 16\times16(9.04-8)^2 + \frac{6.75\times4.3^3}{12} + 6.75\times4.3\times9.11^2$$

$$5461 + 277 + 48 + 95 + 2409 = 8290\ ft^4$$

10.13
1.04
9.11

$$M = 76{,}863(10.94-9.04) = 146040$$

12.3
1.04

$$S = \frac{Mc}{I} = \frac{146{,}040}{8290}\times 9.04 = 160\#/ft^2$$

$$\frac{146{,}040}{8290}\times 11.26 = 198\#/ft^2$$

$$P = \frac{76{,}863}{285} = 269.7\#/ft^2$$

P_{max} = 270 + 198 = 468 #

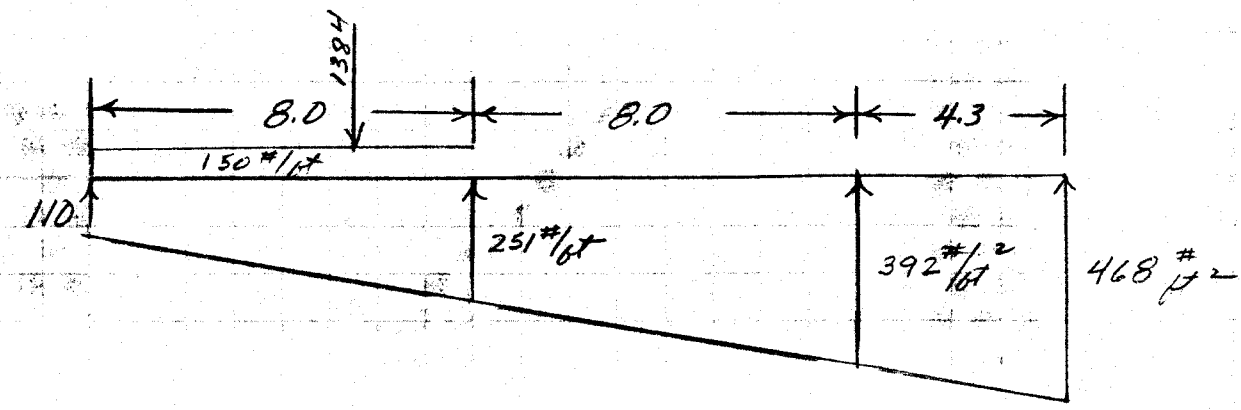
P_{min} 270 − 160 = 110 #

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO . 1958 O—470868

STATE	PROJECT		
Arizona	Vineyard Road Dam		
BY Watt	DATE 2-1-66	CHECKED BY	DATE	JOB NO.
SUBJECT Moments on Inlet Foundation slab.			SHEET ____ OF ____



$$(468-110)\frac{16}{20.3}+110 = 392\ \#/ft^2$$

$$(468-110)\frac{8}{20.3}+110 = 251\ \#/ft^2$$

$$M_{\mathcal{L}} = 110\times 8\times 4 + \frac{141\times 8}{2}\times\frac{8}{3} - 150\times 8\times 4 - \frac{1384}{16}\times 2.5 =$$

$$= 3520 + 1504 - 4800 - 216 = 8\ ft\ lbs/ft$$

negligible

$$M_x = (392-150)\,4.3 = 1040\ ft\ lbs$$

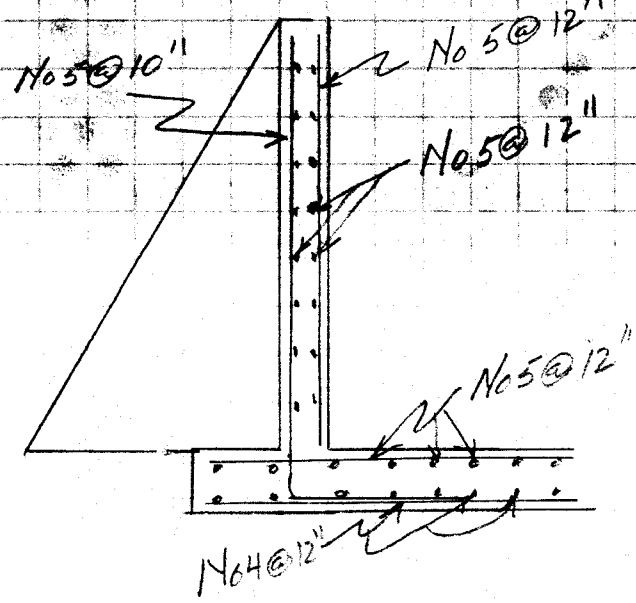
Use Min Temp Steel in foundation.

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vineyard Rd Dam		
BY Hatt	DATE 7-15-65	CHECKED BY	DATE	JOB NO.
SUBJECT Steel in Inlet Str			SHEET ____ OF ____



Assume Earth +
Soil 100#/ft
Voids 39%

Bouyant Wt Soil
100 - .61 × 62.5 = 62#/ft
Hydrostatic Wt 62.5

Total 124.5
Call 125#/ft

If Wall Cantilever from floor

$$M = \frac{6.6^3 \times 125}{6} = 5990 \text{ ft lb}$$

For 12" Wall d = 9½" A_s = .38

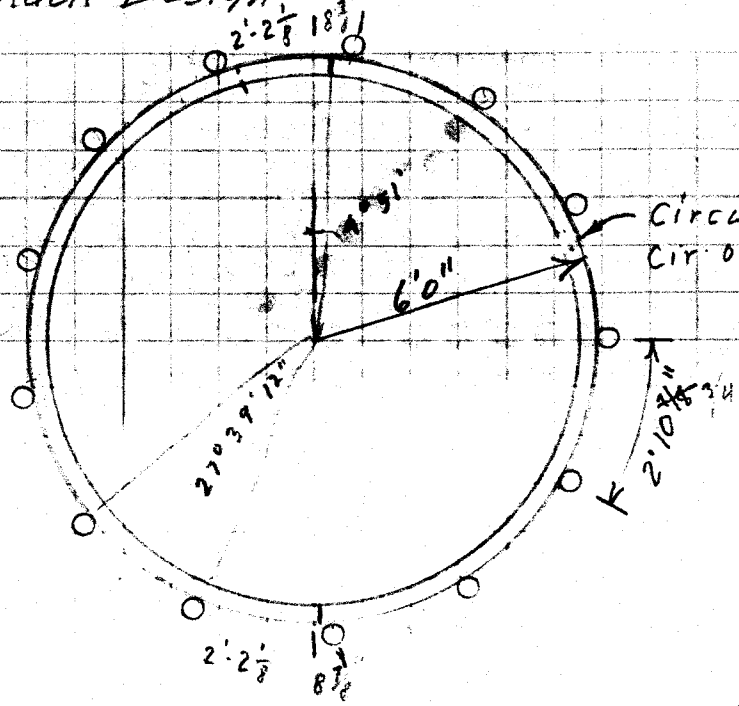
No's 12 @ 6"
No 5 @ 10"
Temp Steel No 5 @ 13" Exposed
4 @ 12" Unexposed Face

COMPUTATION SHEET
SCS-522 REV 5-58

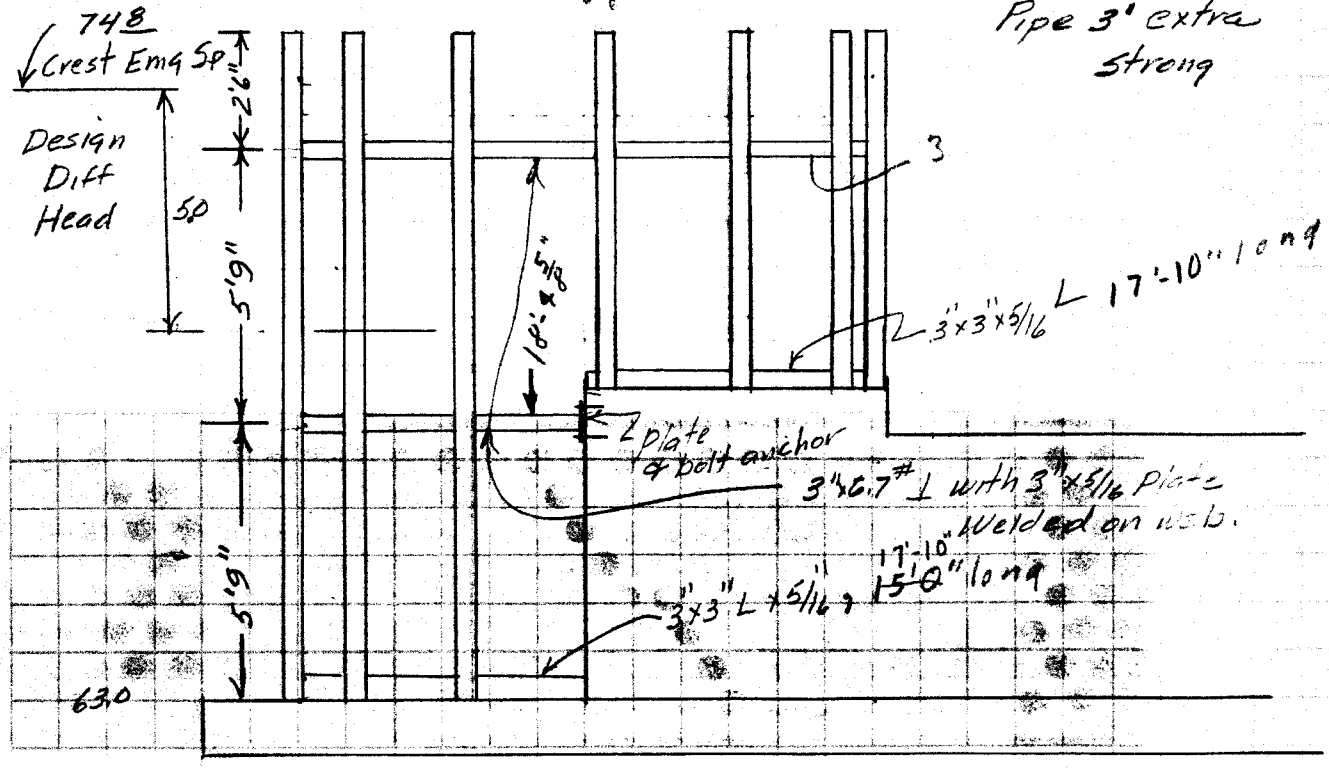
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vinyard Rd. Dam.		
BY Watt	DATE 7-12-65	CHECKED BY	DATE	JOB NO.
SUBJECT Trash Rack Design			SHEET ____ OF ____



Circum. @ OD = 37'-8 3/8"
Cir. of plate =



Pipe 3' extra strong

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vinyard Rd Str		
BY / DATE	CHECKED BY / DATE		JOB NO.
Watt / 7-13-65			
SUBJECT			SHEET ____ OF ____
Trash Rack Design			

Assuming Center Ring is hinged Arch and one half has 5' hydrostatic load & other half has 2.5' hydrostatic load.

(Don't know how it could happen)

Space loads equally around arch at vertical pipes.

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE Arizona		PROJECT Vineyard		
BY Watt	DATE 7-12-65	CHECKED BY	DATE	JOB NO.
SUBJECT Trash Rack				SHEET ____ OF ____

Size of vertical Pipes Spacing = 2.9'

Load = 5.0' differential head

$= 5 \times 62.5 = 313\ \#/ft^2$

Load per lineal ft $= 313 \times 2.9 = 906\ \#/ft$

Assume simple span

$$M = \frac{wl^2}{8} = \frac{900}{8} l^2$$

$$l = \sqrt{\frac{8}{900} \times M} = .0943\sqrt{M}$$

For 3" extra strong $S = \frac{I}{c} = \frac{3.894}{1.75} = 2.23$

$$M = \frac{20{,}000 \times 2.23}{12} = 3717$$

$$l = .0943\sqrt{3717} = 5.75\ ft$$

COMPUTATION SHEET
SCS-522 REV 5-58

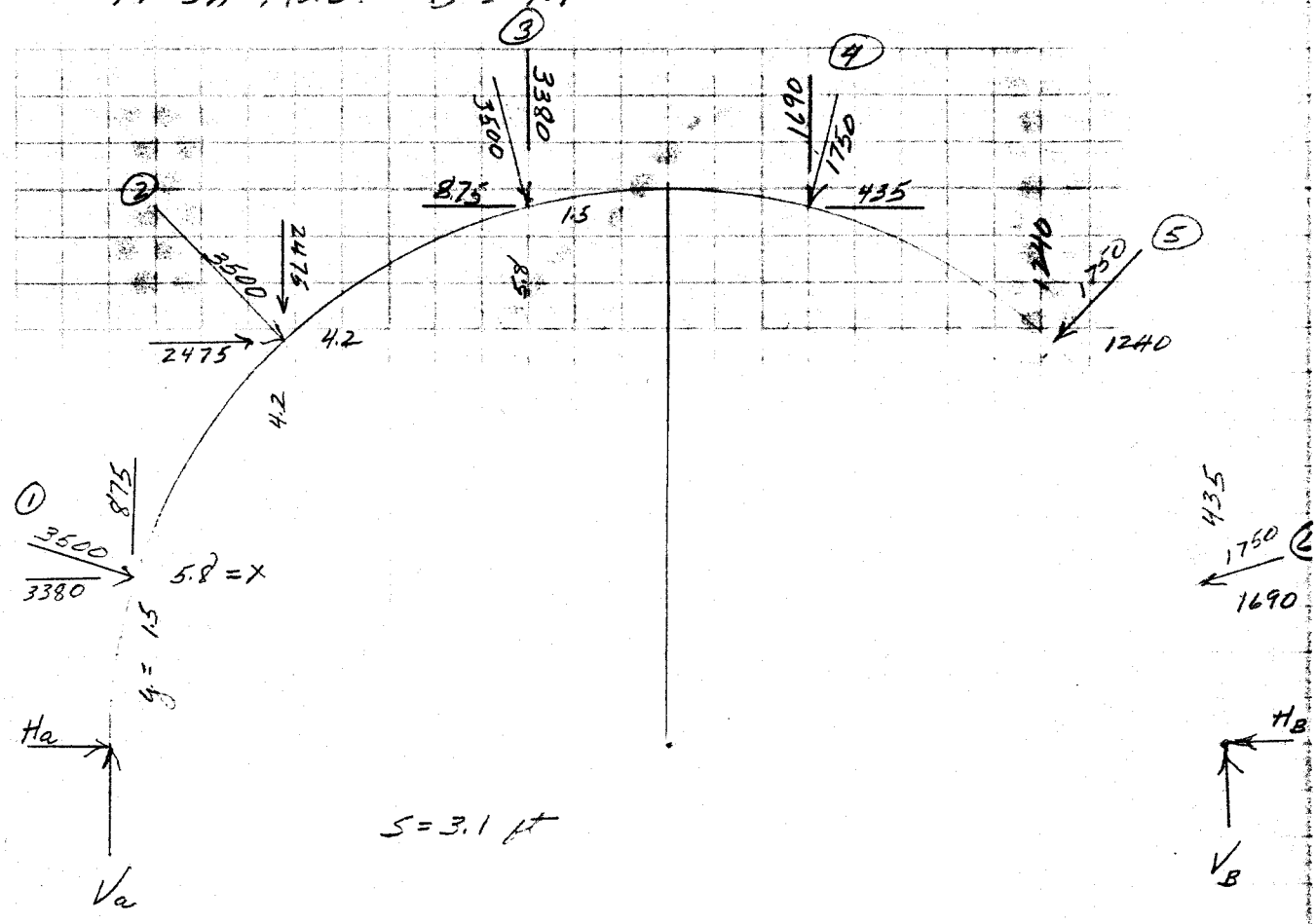
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Arizona		Vineyard Rd Dam		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	7-13-65			

SUBJECT Trash Rack Design

SHEET ____ OF ____



S = 3.1 ft

ΣF_x

$-H_a + H_B = 3380 + 2475 + 875 - 435 - 1240 - 1690 = 3365$

$-H_a + H_B = 3365$

$\Sigma F_y \quad V_a + V_B = 875 + 2475 + 3380 + 1690 + 1240 + 435 = 10{,}095$

$V_a + V_B = 10{,}095$

$\Sigma M_a \quad V_B \times 12 + 1690 \times 1.5 + 1240 \times 4.2 + 435 \times 5.8 - 435 \times 1.8 - 1240 \times 10.2$

$-1690 \times 7.5 - 875 \times 5.8 - 2475 \times 4.2 - 3380 \times 1.5 - 3380 \times 4.5$

$-2475 \times 1.8 - 875 \times 0.2$

$12 V_B = 605700 \qquad V_B = 5046$

all forces go through center so $V_a = V_B$

$V_a = 10095 - 5046 = 5049$

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE	PROJECT		
Arizona	Vinyard Rd Dam		
BY: Watt	DATE: 7-13-65	CHECKED BY:	DATE:	JOB NO.

SUBJECT: Trash Rack Design

SHEET ____ OF ____

Comp. + Tension −

	ΣF_x H_B+	ΣF_y		$F(x)$		$F(y)$	Total (F)
6	1690	+4615	$\frac{1.5}{6}$	420	$\frac{5.8}{6}$	4460	$4880 + .25 H_b$
5	2930	+3375	.707	2070	.707	1470	$3540 + .71 H_b$
4	3365	+1685	$\frac{5.8}{6}$	3250	$\frac{1.5}{6}$	420	$3670 + .97 H_b$
3	2490	−1695	$\frac{5.8}{6}$	2410	$-\frac{1.5}{6}$	420	$2830 + .97 H_b$
2	15	−4170	.707	10	−.707	2950	$2960 + .71 H_b$
1	−3365	+5050	$\frac{1.5}{6}$	−840	$-\frac{5.8}{6}$	4800	$3960 + .25 H_b$

$F \quad \overset{3.1x}{dx} \quad - \quad F dx$

$(4880 + .25 H_b)\, 3.1 \times .25 = 3782 + .19 H$

$(3540 + .71 H)\, 3.1 \times .71 = 7791 + 1.56 H$

$(3670 + .97 H)\, 3.1 \times .97 = 11{,}035 + 2.92 H$

$(2830 + .97 H)\, 3.1 \times .97 = 8510 + 2.92 H$

$(2960 + .71 H)\, 3.1 \times .71 = 6515 + 1.56 H$

$(3960 + .25 H)(3.1 \times .25) = 3069 + .19 H$

$\Sigma F dx \quad 40{,}702 + 9.34 H_B$

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO . 1958 O—470868

STATE		PROJECT		
Arizona		Vinyard Rd		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	6-29-65			
SUBJECT				SHEET ____ OF ____

For 54" Pipe $A = 15.90$ $K_f = .00249$ for $n = .010$

Entrance loss = 0.10 hv
$H_f = 112 \times .00249$ = 0.28 hv
Vel head = 1.00 hv
Total H = 1.38 hv

$$Q = \frac{8.02 \times 15.90}{1.38^{1/2}} \sqrt{H} = 108.52 \sqrt{H}$$

For $H = 8.3$ $Q = \underline{313 \text{ CFS}}$

Close Enough for Eng.

327 used in Flood Routing

$$V = \frac{3.13}{15.90} = 19.7 \text{ ft/sec}$$

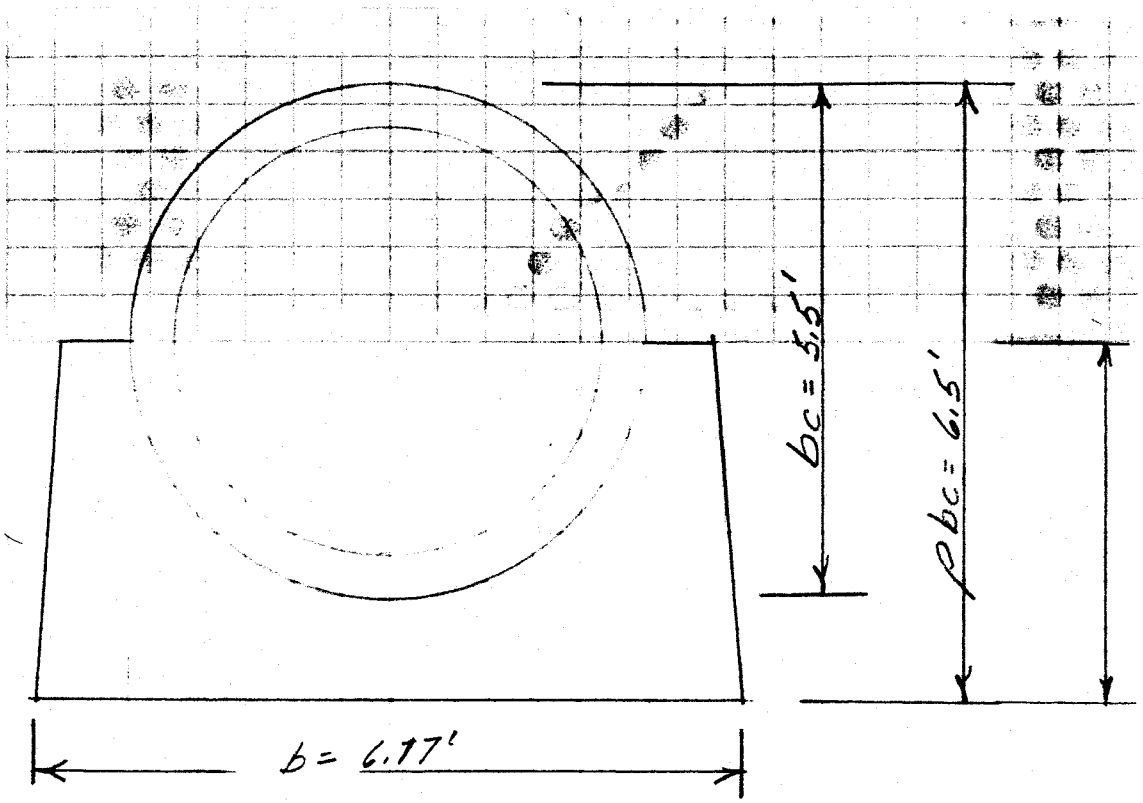
For Outlet Use PWD Basin Raise Dimension Ⓐ from 5 to 6' because of high tail water 4.25'±. Make bigger wings

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE Arizona		PROJECT Vinyard Rd Dam		
BY WaH	DATE 7-28-65	CHECKED BY	DATE	JOB NO.
SUBJECT				SHEET ____ OF ____



Ht of fill = 18'
γ = 130#/cu ft
K_w = 0.19
K = 0.37

$\rho = \frac{6.5}{5.5} = 1.18$

δ = 0.5 for equal conditions of embankment & foundation

$\delta\rho = 1.18 \times .5 = .59$

From E.S. 117

$\frac{H_e'}{b} = 1.6$ $\frac{H_e}{b} = \frac{18}{6.5} = 2.8$

Incomplete Condition

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Arizona		Vingard Rd Dam		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	7-28-65			
SUBJECT				SHEET ____ OF ____

$2K_w S_p = 2 \times .19 \times .59 = .224$

$2K_w \frac{H_c}{b_c} = .38 \times \frac{18}{5.5} = .38 \times 3.27 = 1.24$

From E.S. 118

$2K_w C_p = 2.0$

$C_p = \frac{2.0}{.38} = 5.26$

From ES 121 $T = 2.4$

For Cradle $X_p = 0.400$

$F_{sr} = C_p X_p - KT = 5.26 \times .40 - .37 \times 240 = 1.21$

$SYF_{sr} = 130 \times 1.33 \times 1.21 = 209.$

$Rep = \frac{b_c^2 SYF_{sr}}{1.431} = \frac{5.5^2 \times 209}{1.431} = 4420^{\#}$

Use Class III Pipe

DX Dload = 1320 × 4.5 = 5800#

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE		PROJECT		
Arizona		Vineyard Rd Dam		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	7-28-65			

SUBJECT Settlement Computations

SHEET ____ OF ____

Hole 301 0.0 - 5.0 SM
5.0 - 10.0 G.P.
10 - 0 Siltstone

Elev Gr. Surface 64.3
Btm Cradle 61.8
2.5'

Density of Fill = 135 #/ft³
Ht. of Fill 17.4'
b = 17.4+5+14 = 101 ft

$\frac{17.4 \times 135}{2000}$ = 1.2 Tons/ft

Dry Density in place material 95
Moist Density 107 (assumed)

a $P_o = \frac{3.5 \times 105}{2000} = 0.2$ Ave = 0.1

P_o $\frac{4.0 \times 105}{2000} = 0.2$ Ave = 0.2+0.1 = 0.3

ΔP @ =

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Arizona		Vineyard Rd Dam		
BY Watt	DATE 7-28-65	CHECKED BY	DATE	JOB NO.

SUBJECT Settlement Computations

SHEET ____ OF ____

Sample	Depth	H	P_o	ΔP	$P+\Delta P$	e_o	e_f	e_o-e_f	$\frac{\Delta e}{1+e_o}$	ΔS
301-1	4.2	3.5	0.1	1.2	1.3	0.75	.64	.11	.063	0.22
"	8.0	4.0	0.3	1.1	1.4	0.75	.635	.115	.066	0.26

δ = Total = 0.48

Elongation of Conduit By T.H. -18

$b/d = \frac{101}{7.5} = 13.5$

$\frac{b}{h} = \frac{101}{17.5} = 5.7$

$R = 0.19$

$\delta/d = \frac{.48}{7.5} = .064$ .0346

$g_s = .064 \times 10 \times 12 \times .19 = 1.46''$ (.94) .28

$a = \frac{2 \times .48}{101} = .0095$ .26 .0051

$g_r = \frac{.0095 \times 60}{2} = 0.28$ = .15

Total = 1.46 + 0.28 = 1.74 .15 + .94 = 1.09

I don't believe it, on all our conduits we have never had more than 1/16" crack.

Call for 2" Joint lengthening

72

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO . 1958 O—470868

STATE Arizona		PROJECT Vinyard Dam		
BY Watt	DATE	CHECKED BY	DATE	JOB NO.
SUBJECT Impact Basin.				SHEET ____ OF ____

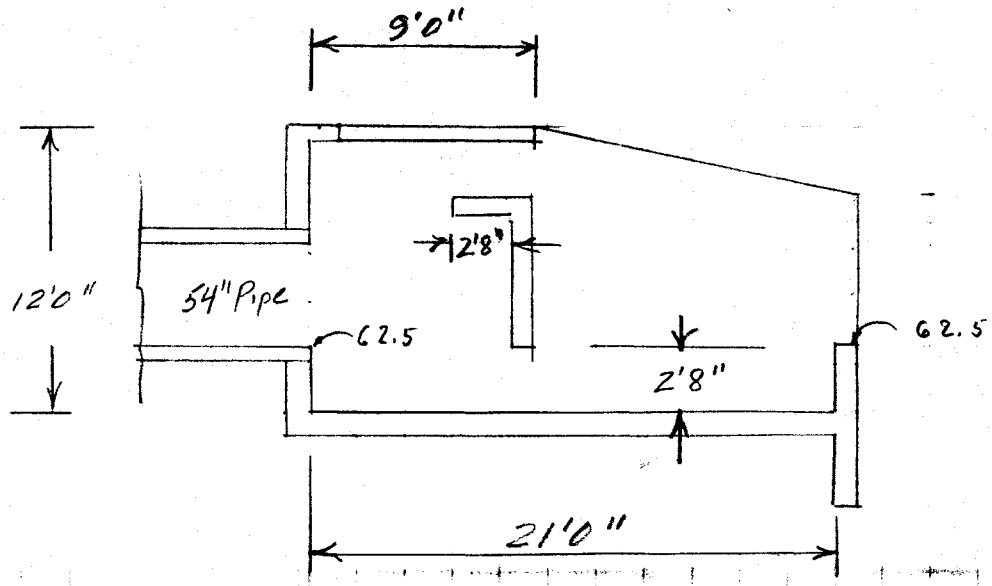
Q = 312

By "Design of Small Dams

$W = 16'$ $\quad L = \frac{16 \times 4}{3} = 21.33'$

$.58W = .58 \times 16 = 9.3$ Make 9'0"

$\frac{W}{6} = \frac{16}{6} = 2.66 = 2'8"$



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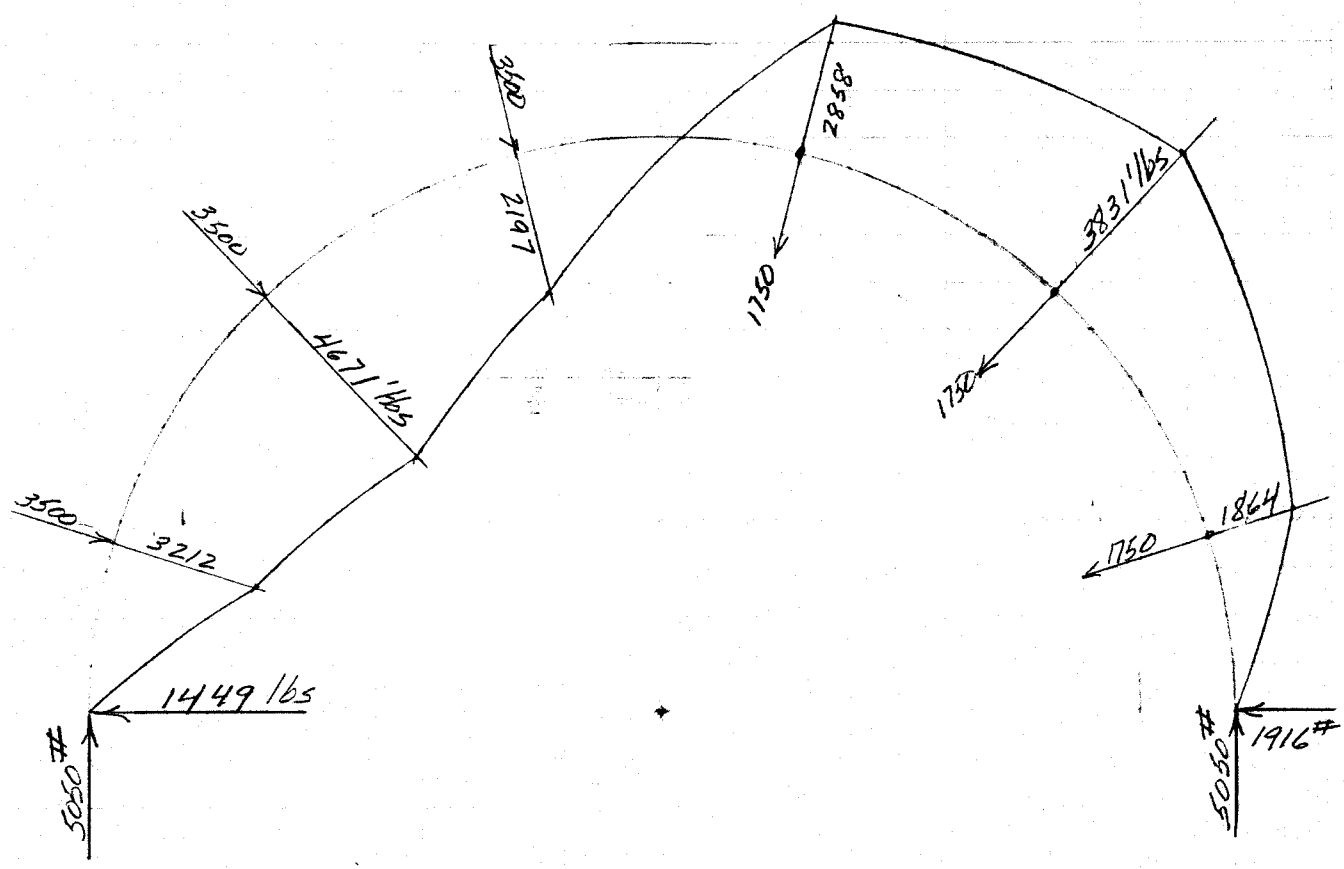
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Arizona		Vineyard Rd Dam		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	7-15-65			

SUBJECT
Trash Rack Design

SHEET ____ OF ____



Moment Diagram

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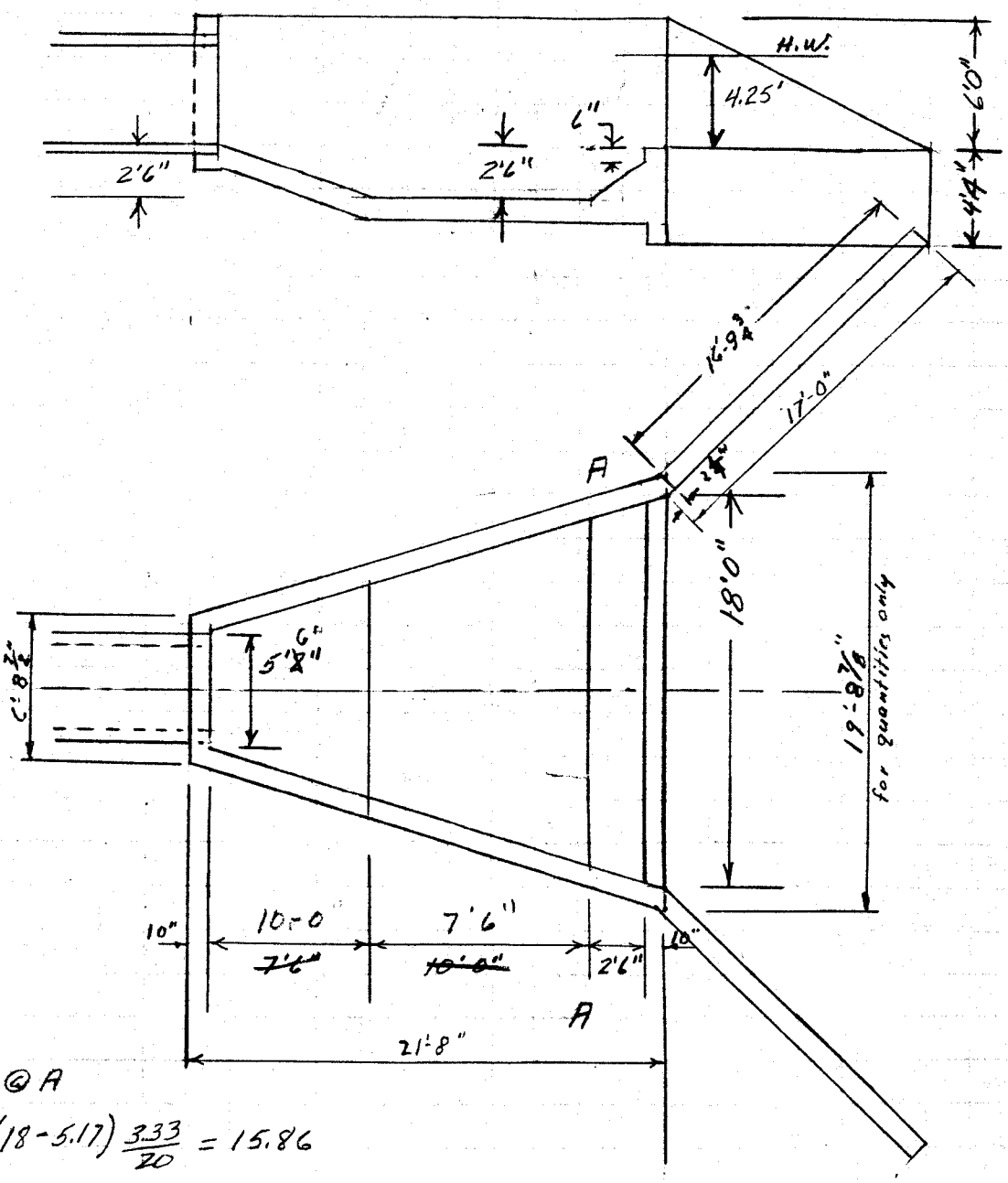
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO . 1958 O—470868

STATE Arizona		PROJECT Vingard Rd Dam		
BY Watt	DATE 7-1-65	CHECKED BY	DATE	JOB NO.
SUBJECT PWD Basin for Outlet				SHEET ____ OF ____



Width @ A

$18.0 - (18 - 5.17)\frac{3.33}{20} = 15.86$

COMPUTATION SHEET
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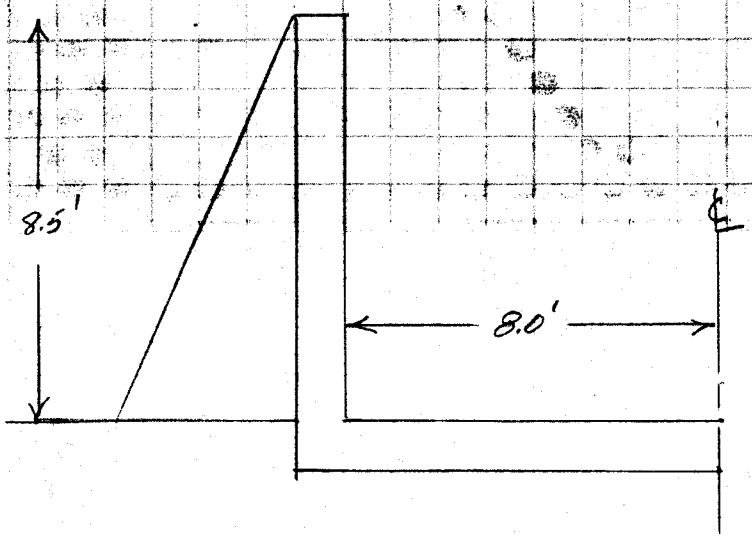
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Arizona		Vineyard Rd Dam		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	7-1-65			
SUBJECT				SHEET ____ OF ____
Sidewall Design Outlet Basin				

Critical Section @ A



Equ. Fluid Pressure 40 #/ft²

Wt. Earth 110 #/ft³

Wt Conc 150 #/ft³

Min Wall thickness 10.0"

P

Arizona Vinyard Rd Dam
Watt 7-6-65

Sidewall Steel

$M_o = \frac{Wl^3}{6} = \frac{40 \times 8.5^3}{6} = 4094.$ ft lbs

Where $M = 2050 = \frac{40 l^3}{6}$ $l = 6.75$ (cut of 1/2 of Steel

Floor

Wt of wall $= \frac{10}{12} \times 8.5 \times 150 = 1063^{\#}$

Wt on floor $= \frac{2 \times 1063}{15.86 + .83} = 127.3^{\#}/ft$

Center Moment (Simple) $= \frac{127.3 \times 16.7^2}{8} = 4,438$ ft lbs

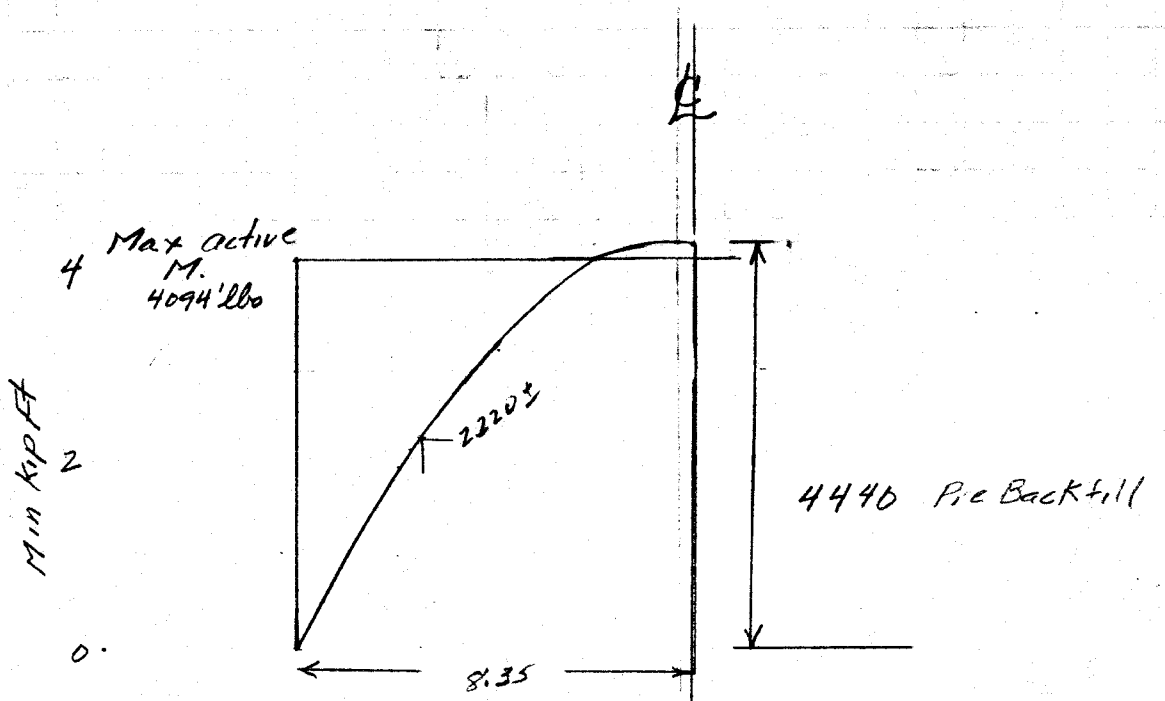
End Moments Fixed $\frac{127.3 \times 16.7^2}{12} = 2960$ ft lbs

$M_s = \frac{WL}{2} l - \frac{Wl^2}{2}$

For l	M	M	l
$\frac{L}{2}$	$\frac{WL^2}{8}$	4,438	8.35
$L/4$	$\frac{3WL^2}{32}$	3,330	4.17
$L/8$	$\frac{7}{128}L^2$	1,940	2.08
$3L/8$	$\frac{15}{128}L^2$	4,150	6.25

P

Arizona Vineyard Rd Dam
Watt 7-1-65
Steel in Floor Slab Outlet Basin



Pre Backfill
For min 10" wall $d = 7\frac{1}{2}''$

$A_s =$ 0.40 sq in/lin ft = No 4 @ 6"

Because Temp Steel = 4 II @ 10" Use 4 @ 5" & 10"

M = 2220 @ 2½' from ℄ of Wall 2' from inside face.

Width of Str. where center M = 2220 ft. lbs.

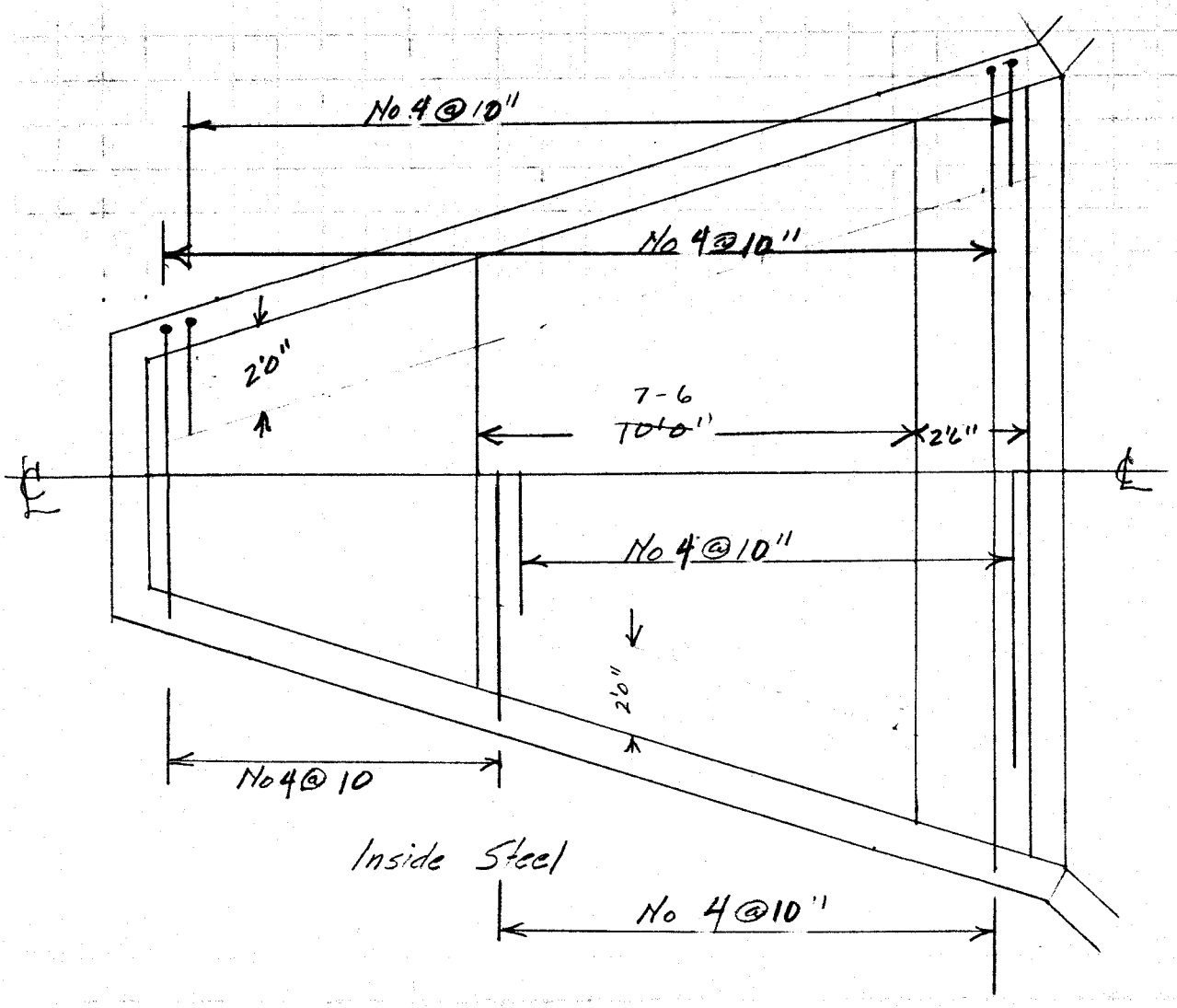
$$\frac{2 \times 1063 \times l}{8} = 2220 \quad l = 8.35$$

P

Arizona
Watt 7-6-65
Floor Steel

Vineyard Rd Dam

Outside Steel

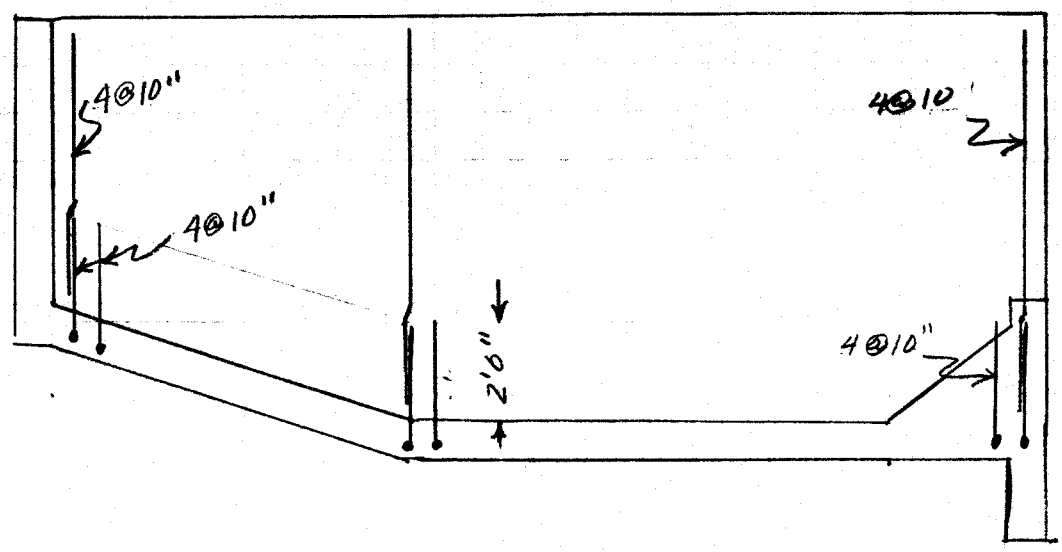


Longtitudinal Steel No 4 @ 10"

P

Arizona Vinyard Rd Dam
Watt 7-6-65
Sidewall Steel Outlet Basin

Outside Steel



Inside Steel No 4 @ 10"

Longtitudnal No 4 @ 10"

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE	PROJECT			
Arizona	Vinyard Rd Dam			
BY	DATE	CHECKED BY	DATE	JOB NO.
Witt	7-6-65			

SUBJECT Check on Shear & Bond

SHEET ____ OF ____

Max Shear Side Walls $= \frac{wl^2}{2} = \frac{40 \times 8.5^2}{2} = 1445$ #/lin ft

Floor = 1063 #/lin ft

Check on Shear

$$V = \frac{1445 \times 8}{12 \times 7\frac{1}{2} \; 7} = \underline{18.5 \text{ lbs/in}^2} \quad \text{OK}$$

Bond $\frac{1445 \times 8}{7.5 \times 210 \times 7} = \Sigma_o = \underline{\underline{1.04 \text{ per. req}}}$ OK

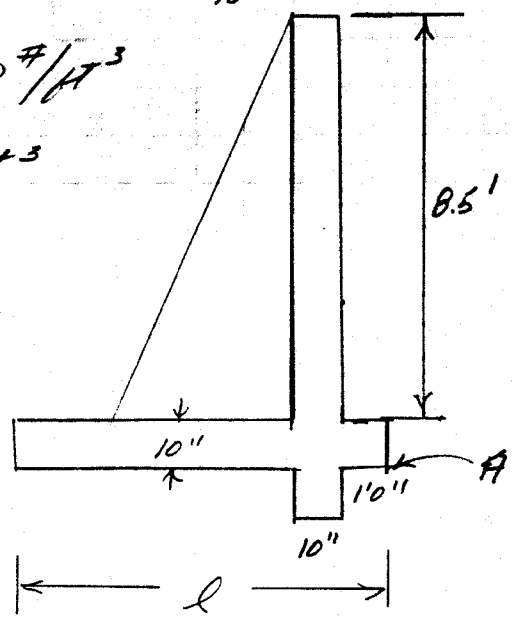
P

Arizona Vingard Rd Dam
Watt 7-7-65
Width of Footing on Wing of Outlet Basin.

Equiv. Fluid Pressure 40 lbs/ft³

Wt of Earth 110#/ft³

Concrete 150#/ft³



ΣM_a

Wall	$8.5 \times .83 \times 150 \times 1.42$	=	1503
Fluid Press	$\frac{40 \times 8.5^2}{2} \times \left(\frac{8.5}{3} + .83\right)$	=	5297
Floor	$.83 \times \ell \times 150 \times \frac{\ell}{2}$		$62.47\ell^2$
Wt Earth	$110 \times 8.5 \times (\ell - 1.83)\left(\frac{\ell - 1.83}{2} + 1.83\right)$		
	$= 110 \times 8.5 \frac{(\ell^2 - 1.83^2)}{2}$		$467.5\ell^2 - 1571$

ΣF_y	Wall $= 8.5 \times .83 \times 150$	=	1062
Floor	$.83\,\ell \times 150$	=	125ℓ
Earth	$110 \times 8.5(\ell - 1.83)$	=	$935\ell - 1714$

P

Arizona Vineyard Road Dam
Watt 7-7-65
Width of footing on Wing

For Stability

$$\frac{\Sigma M_A}{\Sigma F_y} = \frac{l}{3} = \frac{1503 - 5297 + 62.47l^2 + 467.5l^2 - 1571}{1062 + 125l - 1717 + 935l}$$

$$\frac{l}{3} = \frac{530l^2 - 5365}{1060l - 652}$$

$$1060l^2 - 652l = 1590l^2 - 16{,}095$$

$$530l^2 + 652l - 16{,}095 = 0$$

$$l^2 + 1.23l - 30.36 = 0$$

$$l = \frac{-1.23 \pm \sqrt{1.51 + 121.44}}{2}$$

$$l = \frac{-1.23 \pm 11.09}{2} = 4.92 \quad \text{Call } 5^{\circ}$$

Check M_A

Wall		+1503
Fluid Pressure		-5297
Earth	$110 \times 8.5(5-1.83)\left(\frac{5-1.83}{2} + 1.83\right) =$	10,122
Floor	$5 \times .833 \times 150 \times 2.5 =$	1562
ΣM_A Total		7890 ft lbs

$\Sigma F_y =$

Wall		1062
Floor	$5 \times .83 \times 150$	625
Earth	$110 \times 8.5(5-1.833) =$	2961
	Total =	4648

$$\frac{7890}{4648} = 1.7 \qquad \frac{5}{3} = 1.67 \quad \text{OK}$$

P

Arizona Vineyard Rd Dam
Watt

Moments on Wing Wall
Outlet Basin
Equiv Fluid Pres. = 40#/ft³

$$M = \frac{wl^3}{6} = \frac{40 \times 8.5^3}{6} = 4090 \text{ ft lbs}$$

Use 4# @ 5"

Where M = 2045 ft lbs

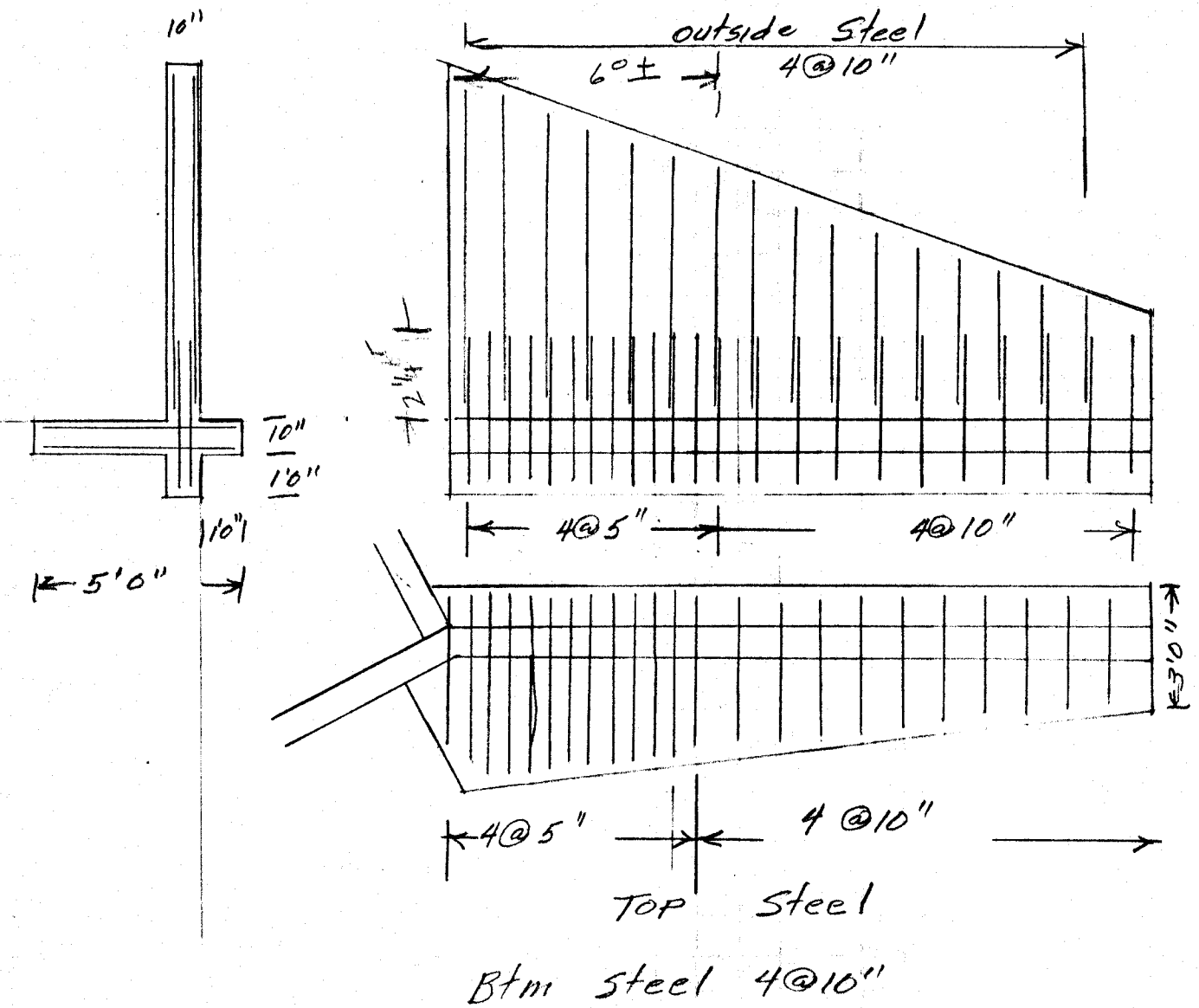
$$M = 2045 = \frac{40 \times l^3}{6}$$

$$l^3 = 307$$

$$l = 6.75$$

Use 4@10" when ht of wall = 6.5 ft

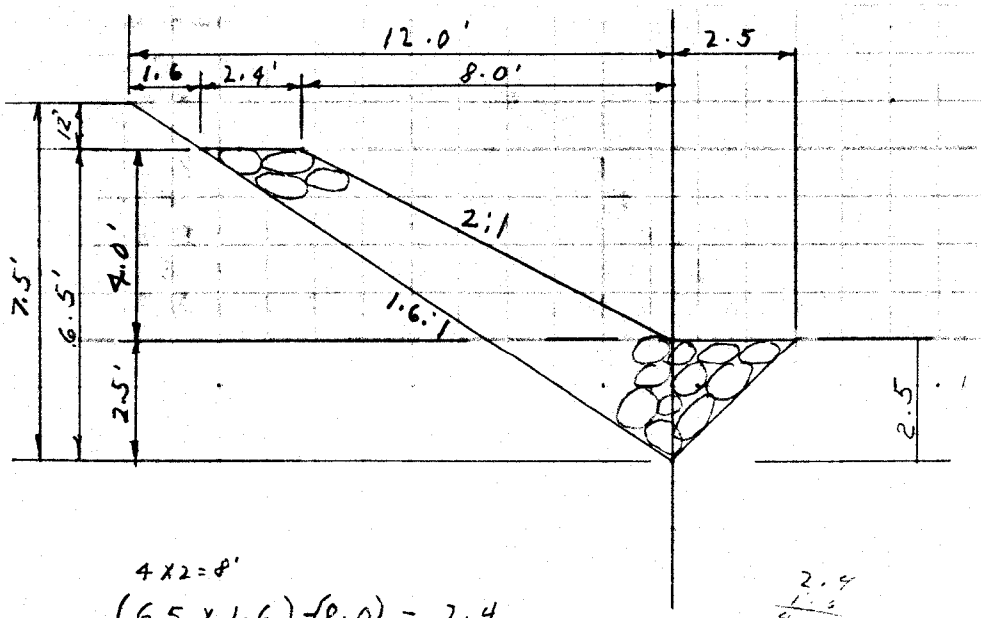
Arizona
Watt 7-7-65
Reinforcing of wing Wall Outlet Basin
Vingard Rd Dam



Arizona
GOH 9-7-65

Powerline Channel & Vineyard outlet channel to sta 11+50

Riprap Section of channel.



4 X 2 = 8'

(6.5 X 1.6) - (8.0) = 2.4

7.5 X 1.6 = 12.0

2.4
1.6
9.6
8
12.0

℄ 24' wide channel to ℄ Access Road!

12.0' + 12.0' + 6.5' = 30.5' 30'-6"

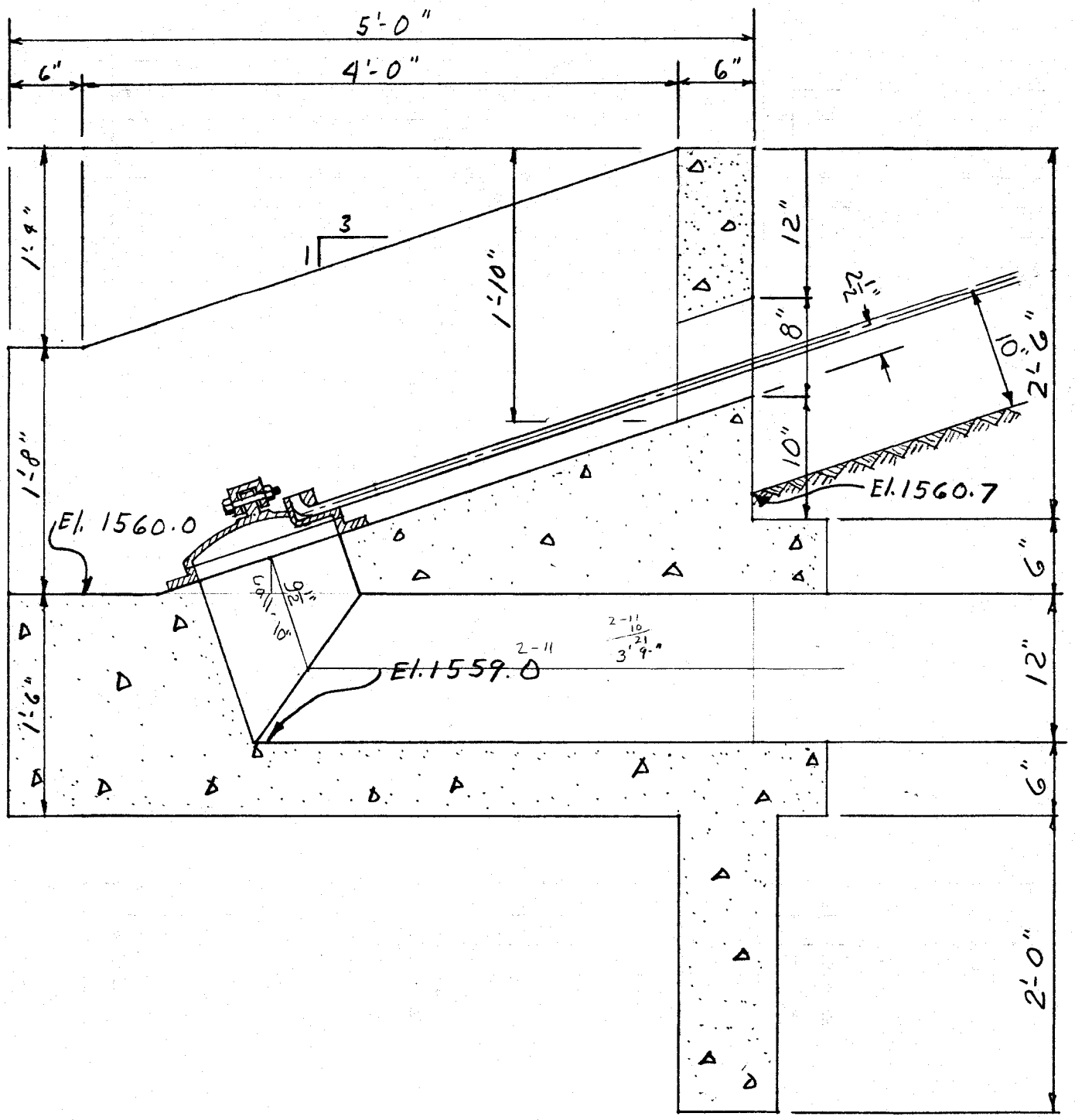
℄ 40'- wide channel to ℄ access Road.

20 + 12 + 6.5 = 38.5'

℄ 50' wide channel to ℄ access road

25 + 12 + 6.5 = 43.5

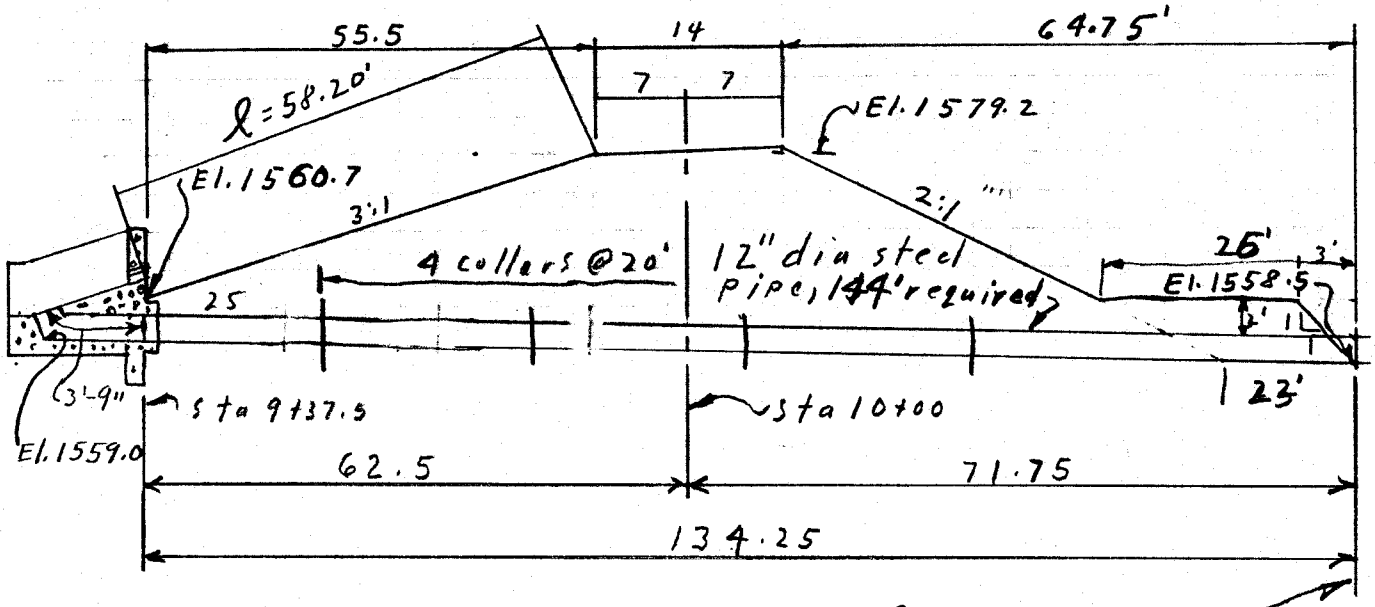
P



5'-0"
6"
4'-0"
6"
1'-4"
3
1
1'-10"
12"
8"
2½"
10"
2'-6"
10"
1'-8"
El. 1560.0
El. 1560.7
6"
12"
6"
2'-0"
1'-6"
El. 1559.0
2-11
2-11
10
21
3' 9"

P

Arizona Vineyard Rd Dam
GOH 11-29-66
~~Stock pond~~ Gated outlet



1579.2
1560.7
18.5
3
55.5

Add on about 6' for cantilever

Anti Seep Collars $N = \frac{0.075 \times 105}{2} = 3.95 = 4$ collars

Pipe Camber Computations

Sta	L	x	x/L	x/L²	4e	y	El.
9+37.5	0	0	0	0	0	0	1559.0
9+97.5	60	0	1	1	0	0	1559.00
10+07.5	50	10	0.20	0.04	0.5	0.02	1558.98
10+17.5	"	20	0.40	0.16	"	0.08	1558.92
10+27.5	"	30	0.60	0.36	"	0.18	1558.82
10+37.5	"	40	0.80	0.64	"	0.32	1558.68
10+47.5	50	50	1.00	1.0	"	0.50	1558.50
10+63.25	16.25	16.25	1.00	1.0	"		1558.50

$$\ell = \sqrt{55.5^2 + 17.534^2} = \sqrt{3,387.69116} = 58.20'$$

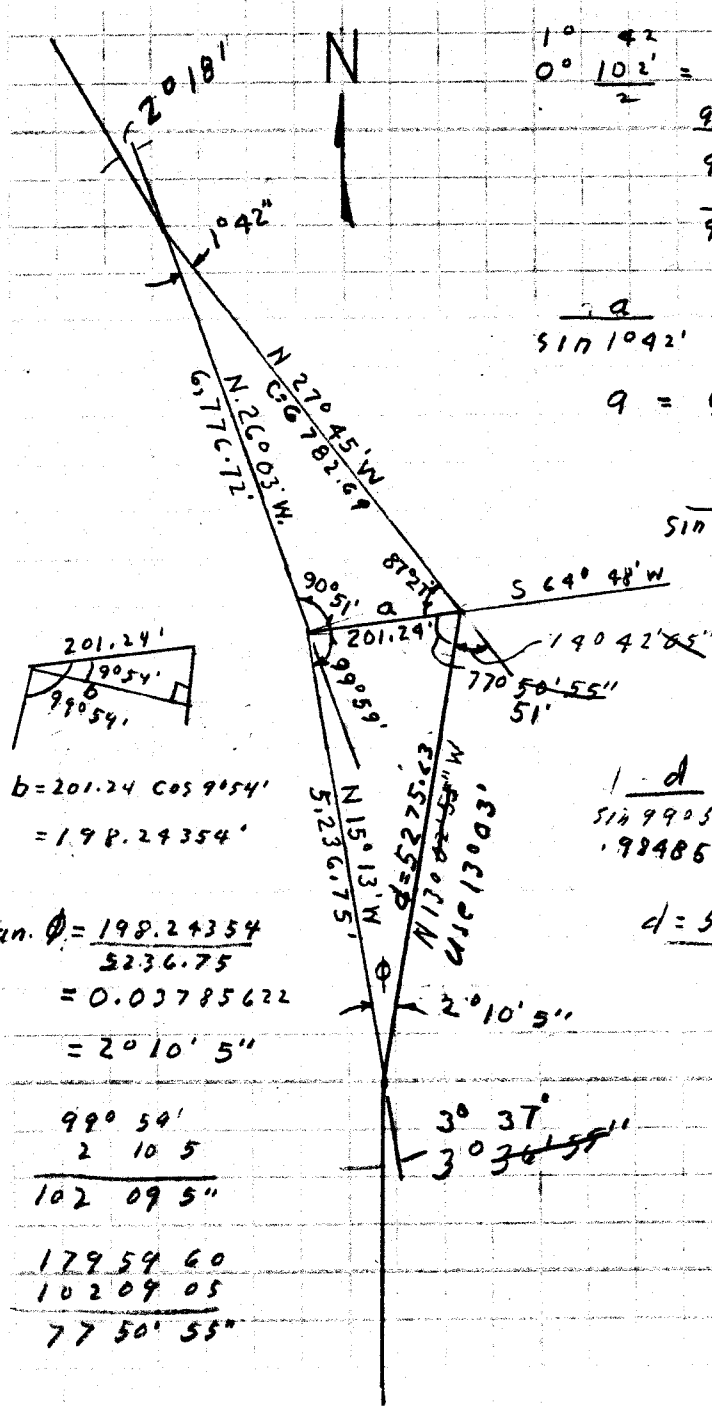
$\frac{1.0208}{10} = 0.10208$ use 1"

copied

Arizona Vineyard Road Dam

G. Hanley 3-24-67

Revise alignment to clear stock 1 2
tant at approx. sta. 253+00



$1^\circ\ 42$
$0^\circ\ \frac{102'}{2} = 0^\circ\ 51''$

90°

$90^\circ\ 51'$ $\quad 179^\circ\ 60'$
$1\ \ 42$ $\quad 92\ \ 33$
$92^\circ\ 33'$ $\quad 87^\circ\ 27'$

$$\frac{a}{\sin 1^\circ 42'} = \frac{6\,776.72}{\sin 87^\circ 27'}$$

$$a = \frac{6{,}776.72 \times .029666}{.9990098} = 201.24'$$

$$\frac{c}{\sin 90^\circ 51'} = \frac{6{,}776.72}{\sin 87^\circ 27'}$$

$$c = \frac{6{,}776.72 \times .99989}{.99901} = 6{,}782.69$$

$b = 201.24 \cos 9^\circ 54'$
$= 198.24354'$

$$\tan \phi = \frac{198.24354}{5236.75}$$
$= 0.03785622$
$= 2^\circ 10' 5''$

$99^\circ\ 54'$
$2\ \ 10\ \ 5$
$102\ \ 09\ \ 5''$

$179\ 59\ 60$
$102\ 09\ 05$
$77\ 50'\ 55''$

$$\frac{d}{\sin 99^\circ 59'} = \frac{5236.75}{\sin 77^\circ 51'}$$
$.984858 \qquad .977500$

$$d = \frac{5{,}236.75 \times .984858}{.9776} = 5{,}275.63$$

Arizona Vineyard Rd. Dam

G. Honley 3-29-67

Solving for curve data for realignment around stock pond sta 253 ± 2 2

PI sta. 320+85.08

2.3°

$\Delta = 2°18'$ $\frac{1}{2}\Delta = 1°9'$

$R = 4,981.57$ $R = \frac{100}{\tan 1°9'} = 4,981.5682$ (0.020079)

$T = 100'$

$L = 199.97'$ $L = \frac{\pi\, 4,981.5682 \times 2.3}{180} = 199.97$

$D = 1°09'$

$D = \frac{5,729.58}{4,981.57} = 1.15° = 1°9'$

PI sta. 253+55.30

14.7°

$\Delta = 14°42'$ $\frac{1}{2} = 7°21'$ $R = \frac{100}{\tan 7°21'} = 775.2539$ (.12899)

$R = 775.25'$

$T = 100'$ $L = 0.017453 \times 14.7 \times 775.2539 =$

$L = 198.84$

$D = 7°23'$ $D = \frac{5729.58}{775.2539} = 7.39° = 7°23'$

PI sta. 321+36.83

3.61667°

$\Delta = 3°37'$ $\frac{1}{2}\Delta = 1°48'30''$ $R = \frac{100}{\tan 1°48'30''} = 3,167.3635$ (0.031572)

$R = 3,167.36'$

$T = 100'$

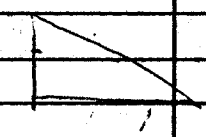
$L = 199.93$ $L = 0.017453 \times 3.61667 \times 3,167.3635$

$D = 1°49'$ $D = \frac{5729.58}{3,167.3635} = 1.81° = 1°49'$

P.C. sta.	199+79.74	PI = 200+79.74
+ L	1 99.93	
P.T.	201+79.67	
+ dist-200	50 25.63	
P.C.	252+55.30	PI = 253+55.30
+ L	1 98.84	
P.T.	254+54.14	
+ dist-200	65+82.69	
P.C.	320+36.83	PI = 321+36.83
+ L	1 99.97	
P.T.	322+36.80	
+ dist-200	27 52.32	
P C	349+89.12	PI = 350+89.12
+ L	1 60.64	
P T	351+49.76	

Project _____ By _____ Date _____ Checked _____ Date _____

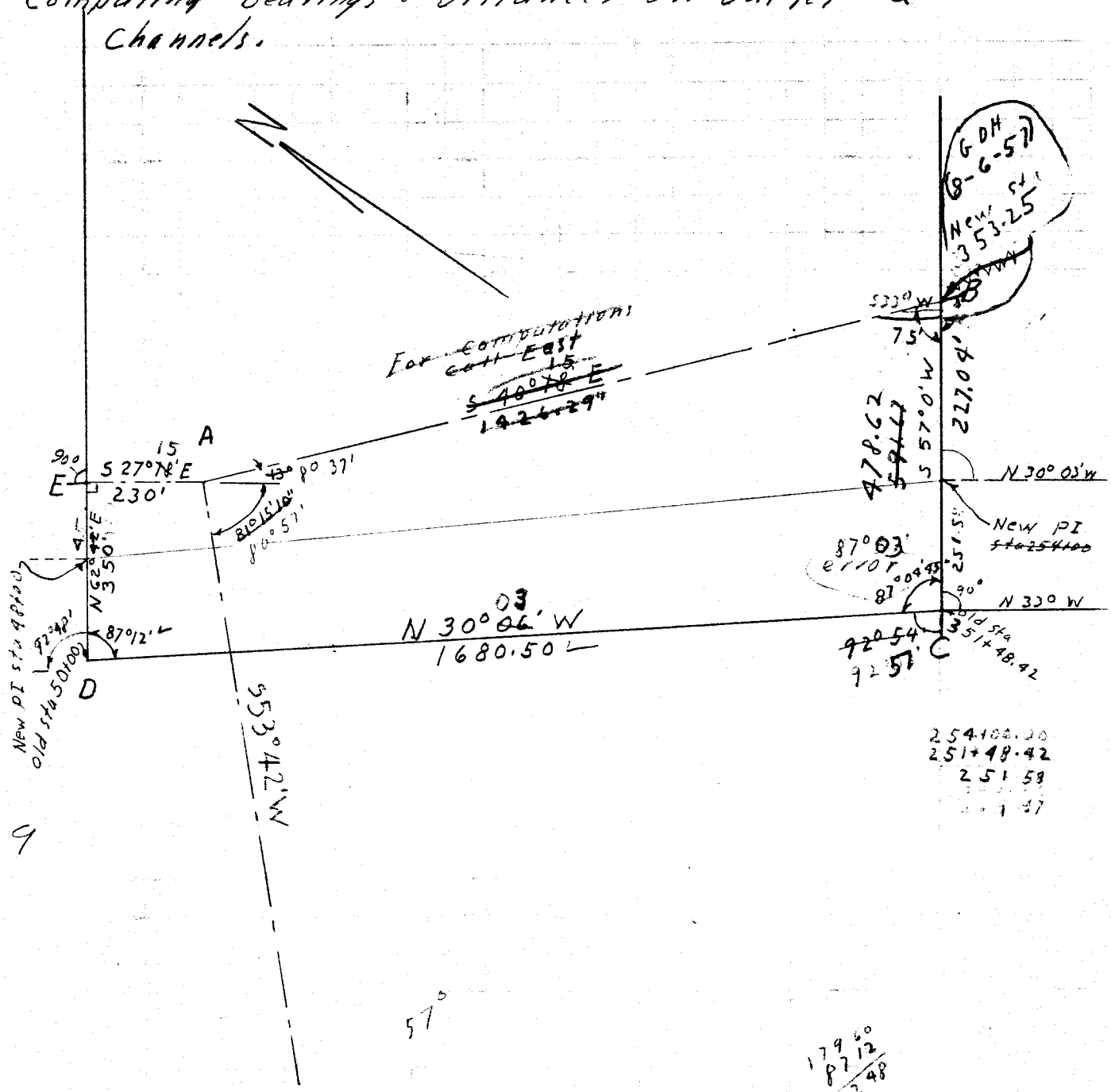
Stations	Deflections	Bearings	Length In Feet	Cos	Sin	Latitudes North	Latitudes South	Departures East	Departures West
		N 15° 13' W	5,236.75	.964940	.262470	5,053.15			1,374.49
		N 26° 03' W	6,776.72	.898411	.439155	6,088.28			2,976.03
		S 27° 45' E	6,782.69	.884988	.465615		6,002.60	3158.12	
		S 13° 02' ~~55~~ 03" E	5,275.63	~~.974179~~ 974172	~~.225770~~ 225801		~~5,140.77~~ 5139.38	~~1,141.44~~ 1191.24	
			24,073.19			11,141.43	11,141.98	4,349.36	4,350.52
							0.55		~~0.96~~ 1.16
								OK	
							$\sqrt{0.55^2 + 1.16^2}$ = ~~4.6852~~		~~2.1645~~
						~~2.1645~~			
						24,073.19			



Arizona Powerline & Vineyard Rd Dams

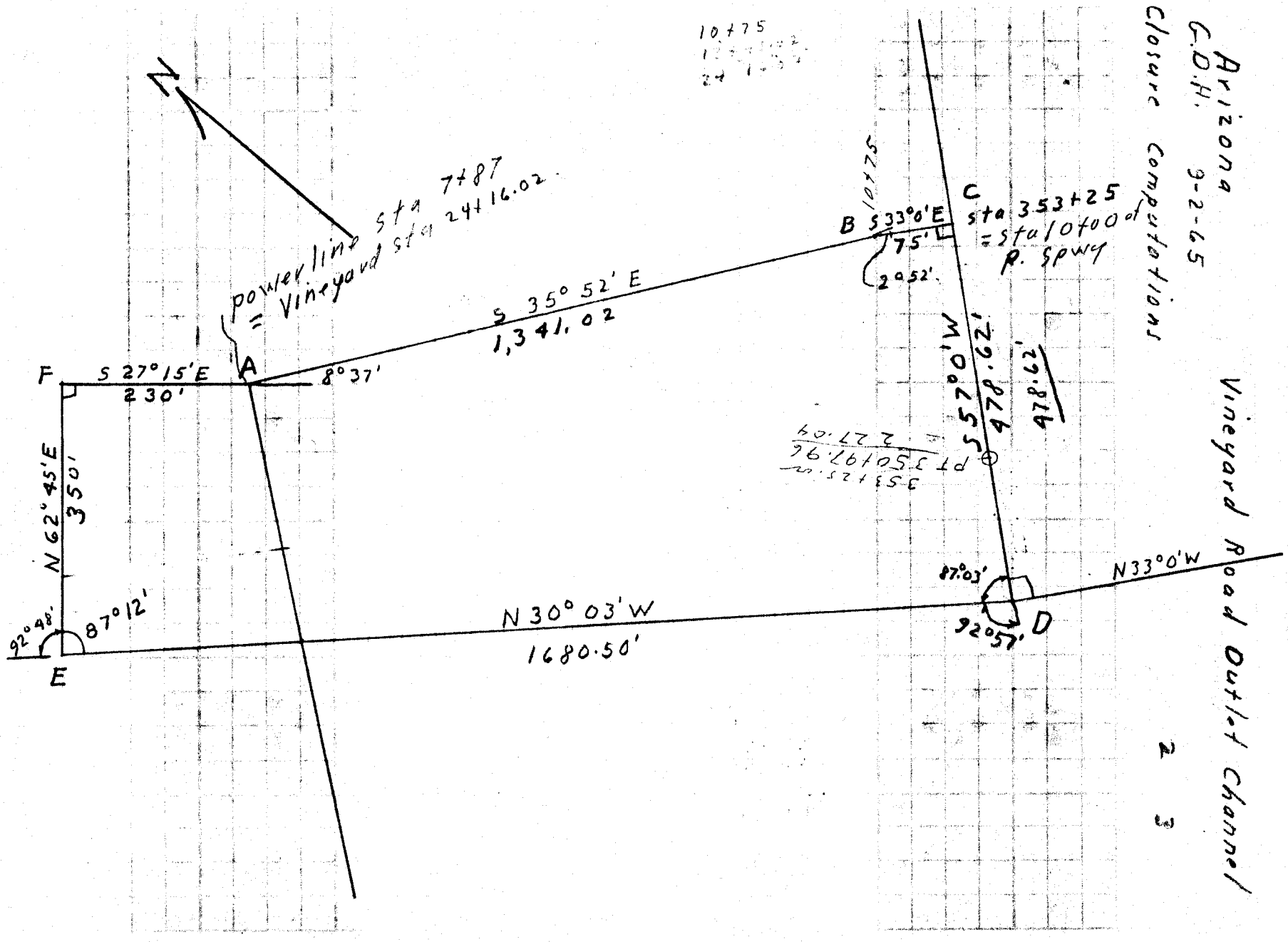
GDH 4-16-65

Computing Bearings & Distances on outlet Channels. 1 3



Arizona
C.D.H. 9-2-65
Closure Computations

Vineyard Road Outlet Channel



Project Powerline & Vineyard Outlet Chan By GDH Date 9-1-65 Checked _____ Date _____

3 - 3

Stations	Deflections	Bearings	Length In Feet	Cos	Sin	Latitudes North	Latitudes South	Departures East	Departures West
A-B		S35°52'E	1341.02	.810 ~~4345~~ 5530	.585 ~~8224~~ 6652		~~1,086.968~~ 1,086.829	~~785.389~~ 785.610	
B-C		S33°00'E	75.00	.8386706	.5446390		62.900	40.848	
C-D		S57°00'W	478.62	.5446390	.8386706		260.675		401.405
D-E		N30°03'W	1,680.50	.8655887	.5007556	1,454.622			841.520
E-F		N62°45E	350.00	.4578739	.8890171	160.256		311.156	
F-A		S27°15'E	230.00	.8890171	.4578739		204.474	105.311	
			4,156.60			1614.878	~~528.049~~	~~457.315~~	1,242.925
							1,615.017	1,242.704	
							0.139		0.221

$\tan \frac{785.61}{1086.829} = .7228460 = 35°51'40''$ call $35°52'$

$\sqrt{785.61^2 + 1086.829^2} = \sqrt{1,798,378.173684} = 1341.01'$

$\sqrt{0.139^2 + 0.221^2} = \sqrt{0.06.82} = 0.261$ error

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COMPUTATION SHEET
SCS-522 REV 5-58

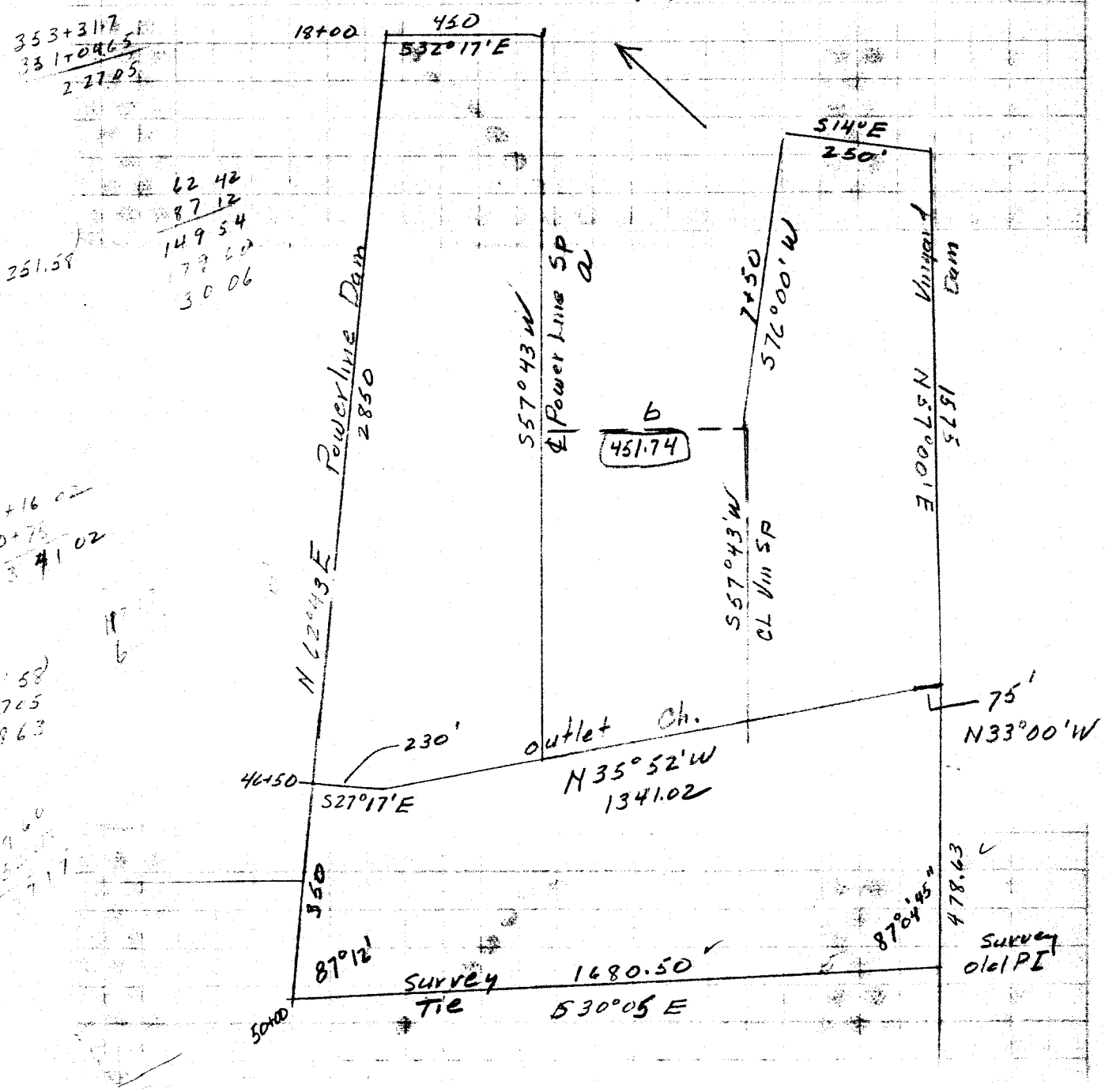
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE	PROJECT		
Arizona	Vinyard & Powerline Dam		
BY: Watt	DATE: 1-26-66	CHECKED BY:	DATE:
JOB NO.			

SUBJECT: Combined Spillway & Outlet Channel Ties (Check)

SHEET ____ OF ____



COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE	PROJECT			
Arizona	Vinyard Dam			
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt				

SUBJECT Check Combined spillway Widths

SHEET ____ OF ____

		sin	E-W	cos	N-S
750	N 76°00'E	.97030	+727.73	.24192	+181.44
250	S 14° E	.24192	+60.48	.97030	−242.58
1575	S 57°00'W	.83867	−1320.91	.54464	−857.80
75	N 33°00'W	.54464	−40.85	.83867	+62.90
1341.02	N 35°52'W	.58590	−785.70	.81038	+1086.74
230	N 27°17'W	.45839	−105.43	.88875	+204.41
2850	N 62°43'E	.88875	+2532.94	.45839	+1306.41
450	S 32°17'E	.53411	+240.35	.84542	−380.44
a 1833.26	S 57°43'W	.84542		.53411	
b 451.74	S 32°17'E	.53411		.84542	
			+1308.60		+1361.08

$$.84542\,a - .53411\,b = 1308.60$$

$$.53411\,a + .84542\,b = 1361.08$$

$$-\,.53411\,a + .33743\,b = -826.73$$

$$.18285\,b = 534.35$$

$$b = 451.74 \checkmark$$

$$a = 1833.26 \checkmark$$

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE	PROJECT		
Arizona	Vineyard Rd Dam		
BY Watt	DATE	CHECKED BY	DATE	JOB NO.
SUBJECT Check Outlet Channel Vineyard Rd.			SHEET ____ OF ____

Dist	Bear	Sin	E-W	cos	N-S
350	N62°43'E	.88875	+ 311.06 ✓	.45839	+ 160.44 ✓
230	S27°17'E	.45839	+ 105.43	.88875	− 204.41
1391.02	S35°52'E	.58590	+ ~~779.84~~ 785.70	.81038	~~= 1078.63~~ 1026.63
75.0	S33°00'E	.54464	+ 40.85	.83867	− 62.90
478.63	S57°00'W	.83867	− 401.41	.54464	− 260.68
1680.50	N30°05'W	.50126	− 842.37	.86530	+ 1454.14
			− .15		− 0.13 OK
With 3rd Course			− 786.44		+ 1086.59

$$\sqrt{786.44^2 + 1086.59^2} = 1341.37$$

$$\tan\theta = \frac{786.44}{1086.59} = .72377$$

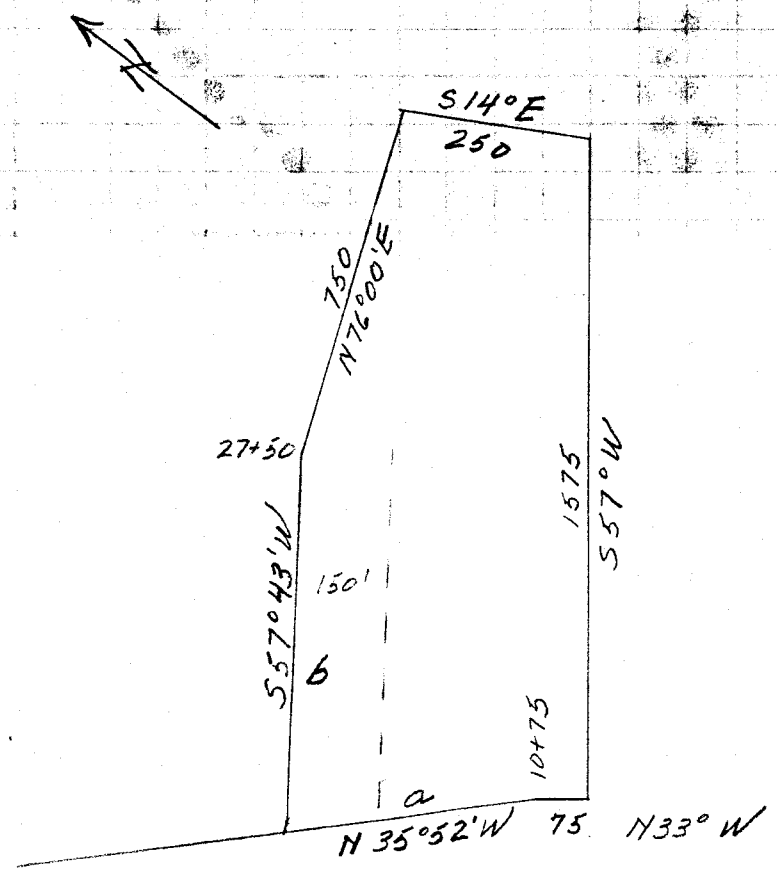
Bearing = S 35° 54' E

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE Ariz		PROJECT Vineyard Rd		
BY Watt	DATE 1-26-66	CHECKED BY	DATE	JOB NO.
SUBJECT Check on Sta Sp + Outle Int				SHEET ____ OF ____



$$\begin{array}{r} -35^\circ\ 52' \\ -57^\circ\ 43' \\ \hline -92^\circ\ 95' \\ 178^\circ\ 120' \\ \hline 86^\circ\ 25' \end{array}$$

$10+75+418.19 = 14+93.19$

$27+50 + 968.24 \quad 37+18.24$

$$\frac{150}{\sin 86^\circ 25'} = \frac{150}{.99804} = 150.29$$

$$\begin{array}{r} 14+93.19 \\ 150.29 \\ \hline 13+42.90 \end{array}$$

$-$ top W 6
4 x 3 $-$ 12
13 + 24.90

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470868

STATE		PROJECT		
Ariz		Vineyard Rd		
BY	DATE	CHECKED BY	DATE	JOB NO.
Watts	1-27-66			

SUBJECT Check Spillway & Outlet Sta Int.

SHEET ____ OF ____

Dist	Bear	Sin	E-W	Cos	N-S
750	N76°00'E	.97030	+727.73	.24192	+181.44
250	S14°00'E	.24192	+60.48	.97030	-242.58
1575	S57°00'W	.83867	-1320.91	.54464	-857.80
75	N33°00'W	.54464	-40.85	.83867	+62.90
a	N35°52'W	.58590		.81038	
b	N57°43'E	.84542		.53411	
			-573.55		-856.04

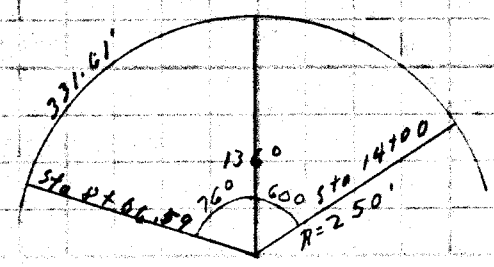
$$-.58590\,a + .84542\,b = 573.55$$
$$.81038\,a + .53411\,b = 856.04$$
$$-.81038\,a + 1.16933\,b = 793.30$$
$$1.70344\,b = 1649.34$$
$$b = 968.24 \checkmark$$
$$a = 418.19 \checkmark$$

Arizona Vineyard Road Dam

GDH 8-11-65

South Emergency Spillway Layout.

$$\begin{array}{r} 60 \\ 76 \\ 2\overline{)136^\circ} \\ \hline 68^\circ \end{array}$$



2.475D8685

$T = 250 \tan \frac{1}{2} \Delta = 68^\circ = 618.77'$ ✓

$L = \frac{3.14159 \times 250 \times 136}{180} = 593.41$ ✓

L to intersection of ℄ of dam:

$= \frac{3.14159 \times 250 \times 76}{180} = 331.61$ ✓

60° L = 261.90
331.61
593.41 ✓

Sta @ beginning of level crest = 14+00
sta @ beginning of Level sect = 14+00 − 593.41 = 806.59
sta @ ℄ of dam = 806.59 + 331.61 = 11+38.20

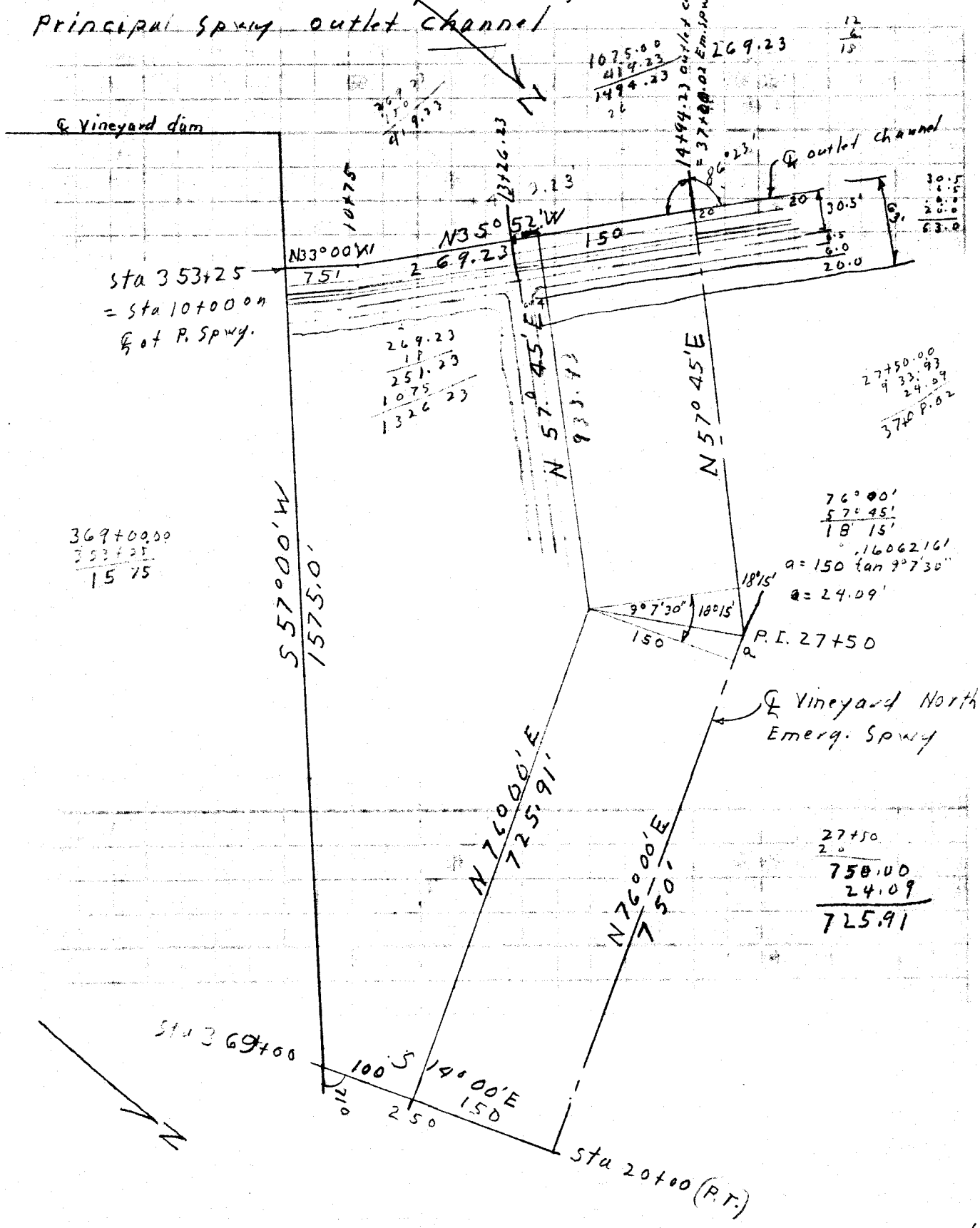
Intrance slope = 0.002

Arizona Vineyard Road

GDH 9-3-65

Closure on end of emerg. Spillway with 1 A 3

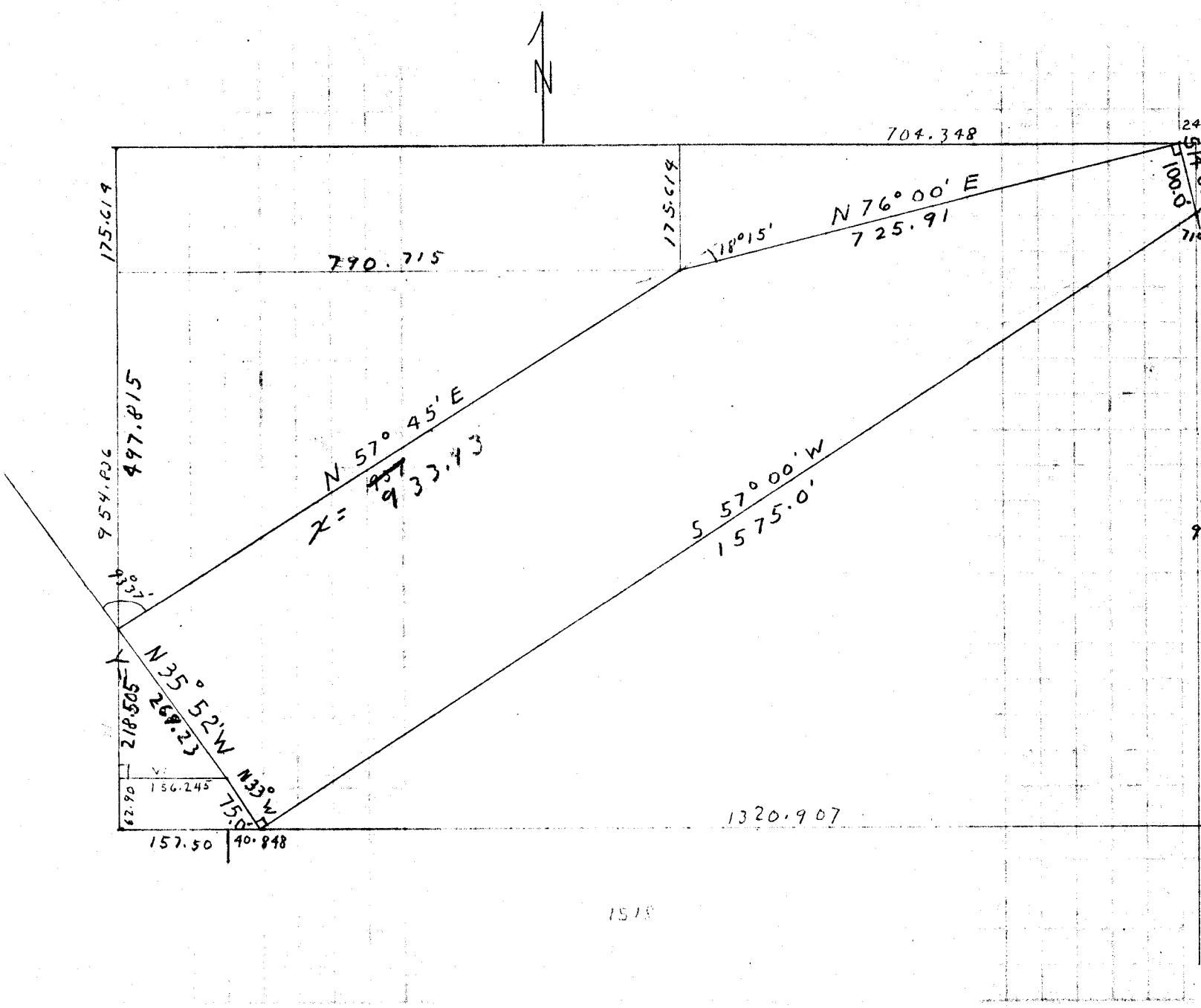
Principal Spwy outlet channel



Arizona
GDH 9-7-65

Vineyard Road Dam

N. Emery. Sowy. & Principal Sowy Intersectionite 16 #3



1518

Project Vineyard Road Dam By GDH Date 9-7-65 Checked _____ Date _____

N. Emery Spwy. & Principal Spwy. Intersection tie. 2-E3

Stations	Deflections	Bearings	Length In Feet	Cos	Sin	Latitudes North	Latitudes South	Departures East	Departures West
a		N 57°45'E	933.934	.5336145	.8457278	~~498.257~~ ~~447.815~~		~~789.859~~ ~~790.715~~	
		N 76°00'E	725.91	.2419219	.9702957	175.614		704.348	
		S 14°00'E	100.00'	.9702957	.2419219		97.030	24.192	
		S 57°00'W	1575.00'	.5446390	.8386706		857.806		1320.907
		N. 33°00'W	75.00	.8386706	.5446390	62.900			40.848
b		N. 35°52'W	269.225	.8103826	.5859010	218.175 ~~214.645~~			157.739 ~~157.500~~
						955.046	954.836	1518.394	1519.494
						954.834	0.21	1.10	
						238.514	954.836	1519.251	1517.255
						716.322			
		+.810383b + .533614a = 716.332							

XERO COPY

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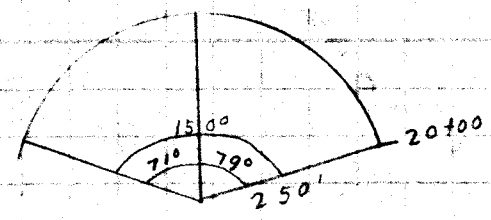
Arizona Vineyard Road Dam
GDH 8-11-65
North Emery. Spwy. layout



$$\text{Tan } T = 250 \tan \tfrac{1}{2} \overset{3.7321}{150^\circ} = 933.03$$

$$L = \frac{3.14159 \times 250 \times 150}{180} = 654.5$$

$$L \text{ to } ℄ \text{ dam } \frac{3.14159 \times 250 \times 79}{180} = 344.7$$

Begin level Sect. 20+00 − 654.5 = sta 13+45.5

sta @ ℄ dam = 1345.5 + 344.7 = 1690.20

Profile

Sta	El.	Sta	El
4+60	1570	31+70	1570
7+10	1572	35+60	68
9+30	74	38+60	66
12+25	76		
14+85	78		
16+00	78.5		
17+00	78.5		
19+00	78.0		
22+00	76.0		
24+20	74.0		
27+70	72.5		
28+40	72.0		

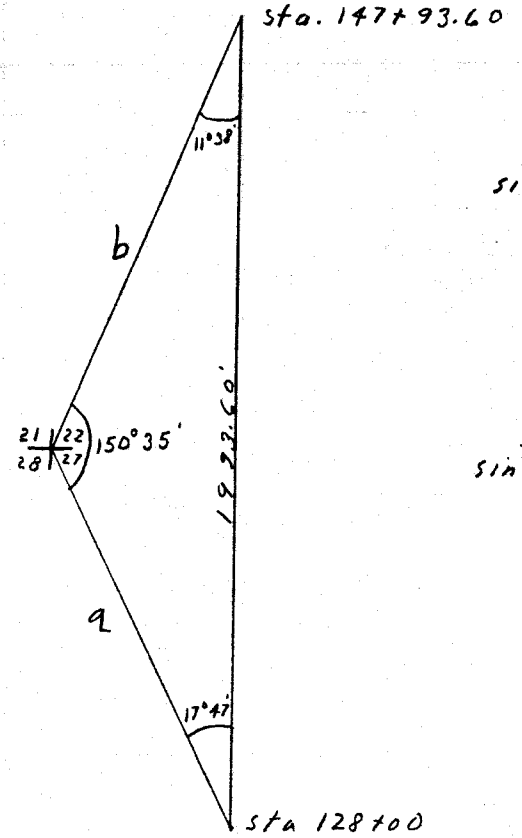
27+70 74.8
20+50 72.5
7+20 2.3

$$\text{slope} = \frac{2.3}{720} = 0.00319$$

Arizona Vineyard Dam

GDH 12-7-64

Dam alignement & Section line ties 2 3



$$\begin{array}{r} 147+93.60 \\ 128+00.00 \\ \hline 1993.60 \end{array}$$

$$\frac{a}{\sin 11°38'} = \frac{1993.60}{\sin 150°35'}$$

$$a = \frac{1,993.60 \times .20165}{0.49116} = 818.49'$$

$$\frac{b}{\sin 17°47'} = \frac{1993.60}{\sin 150°35'}$$

$$b = \frac{1993.60 \times .30542}{.49116} = 1,239.69$$

$$\frac{a}{\sin 11°38'} = \frac{b}{\sin 17°47'}$$

$$\frac{819.00}{.20165} = \frac{b}{.30542} \qquad b = 1,240.46$$

Arizona — Powerline & Vineyard Road Dam's.

G.D.H. 1-7-65 — D.H.H. 1-8-64

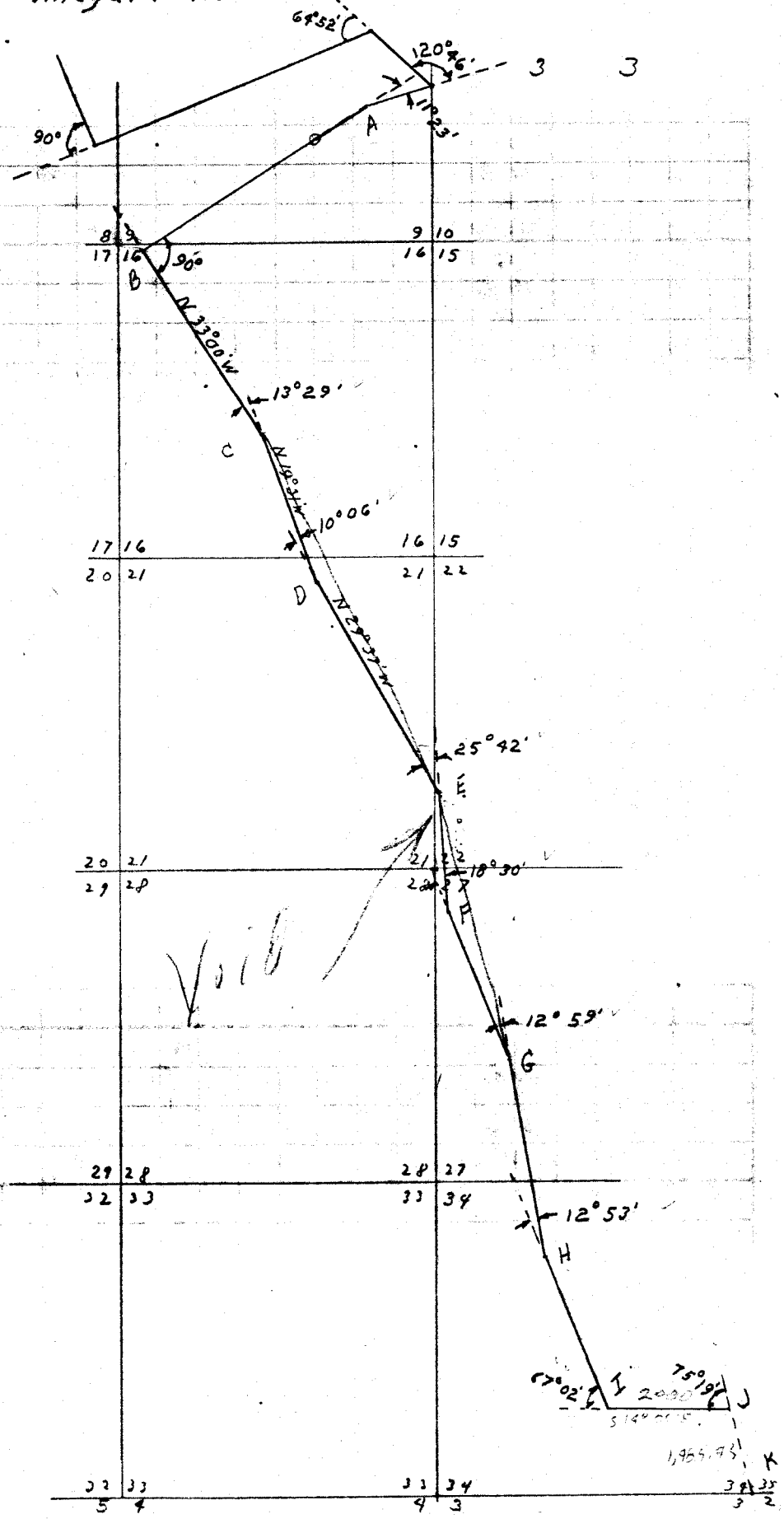
Dam ℄ alignment

	Original Stations	∡ angle	Bearings	New Stations	
Powerline Dam	161+39.62			End. 160+67.73	Powerline Dam
			S 0° 56'E		
	111+31.53	R 64°26'		P.I. 110+81.18	
			S 65° 22'E		
	78+67.38	L 38°07'		P.I. 78+67.38	
			S 27°15'E		
	50+00	R 90°00'		P.I. 50+00	
			N 62°45'E		
	0+00	R 64°52'		Begin 0+00	
			S 52°23'E		
	9/10 1/4 cor.	R 120°46'			
			S 68°23'W		
	P.I.	L 11°23'			
			S 57°00'W		
Vineyard Road Dam	251+48.42	L 90°00'		PI = 251+16.82	Vineyard Road Dam
			S 33°00'E		
	214+72.30	R 13°29'		PI = 214+41.62	
			S 19°31'E		
	188+25.50	L 10°06'		PI = 187+95.34	
			S 29°37'E		
	147+93.60	R 25°42'		PI = 147+66.80	
			S 3°55'E		
	128+00	L 18°30'		PI = 127+74.94	
			S 22°25'E		
	101+09.20	R 12°59'		PI = 100+85.00	
			S 9°26'E		
	67+50.23	L 12°53'		PI = 67+26.88	
			S 22°19'E		
	40+00	L 67°02'		PI = 40+00	
			S 89°21'E		
	20+00	R 75°19'			
			S 14°02'E	Begin 20+00	
	39/3 35/2				

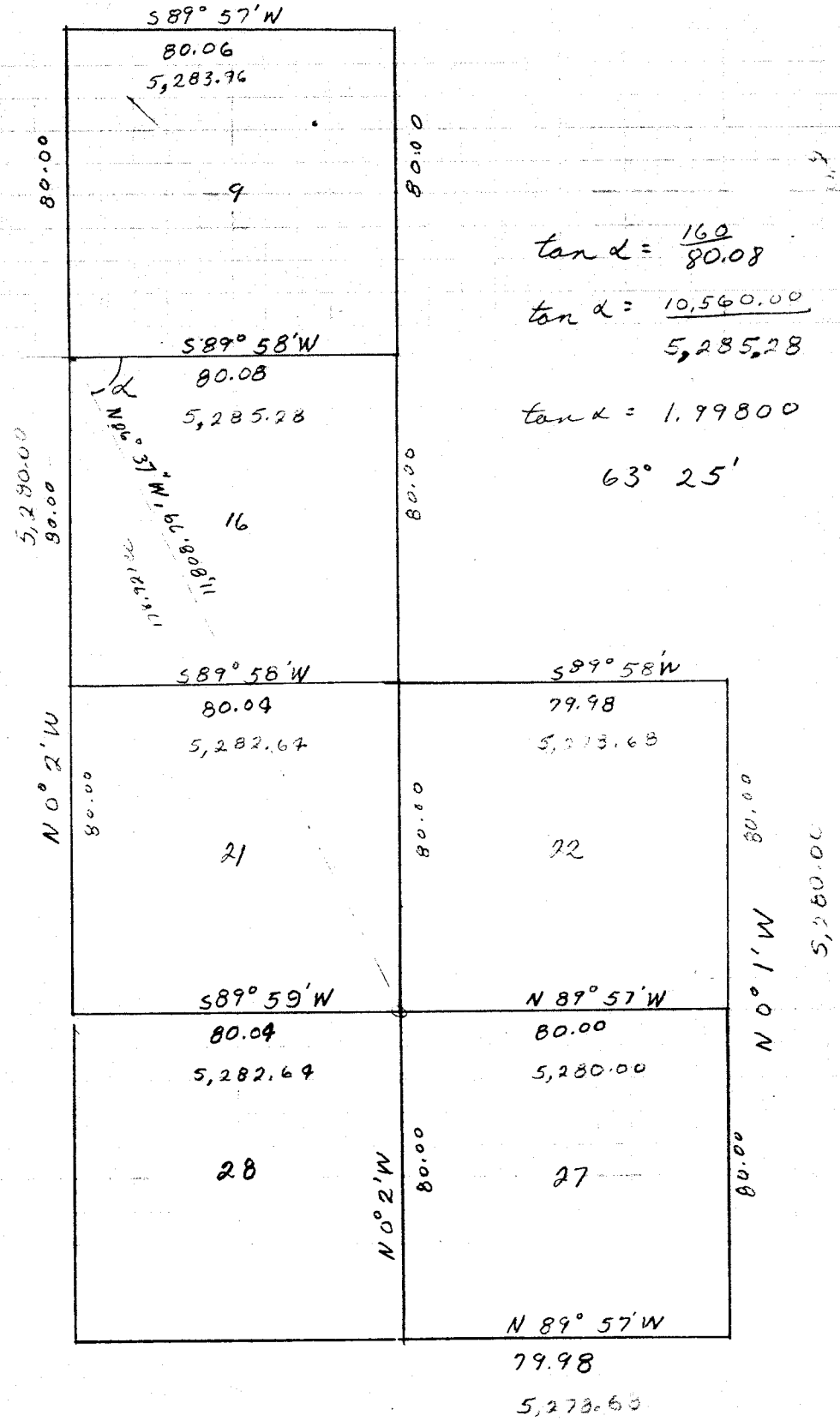
Arizona Vineyard Road dam

GDH 12-B-64

Dam alignment



R8E, T1S

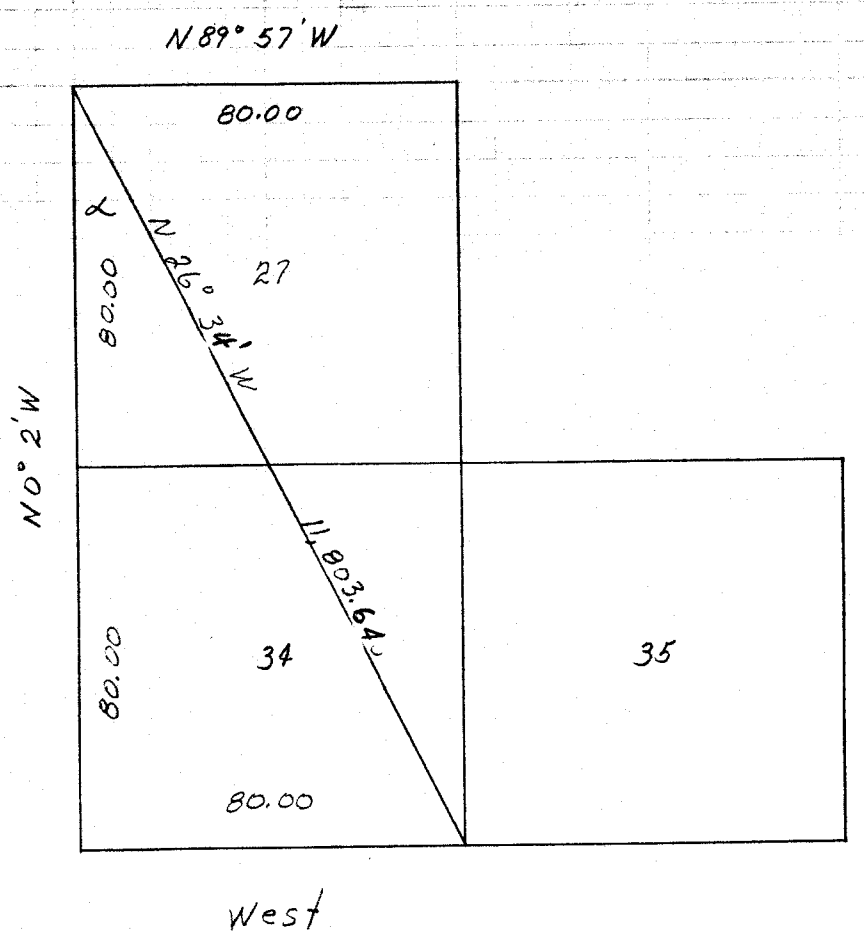


$\tan \alpha = \frac{160}{80.08}$

$\tan \alpha = \frac{10,560.00}{5,285.28}$

$\tan \alpha = 1.99800$

63° 25'



$a^2 = (80)^2 + (160)^2 - 2(80)(160) \cos A$ .00058

89° 58'

$a^2 = 32{,}000 - 14.848$

$a^2 = 31{,}985.152$

178.893

$\frac{178.843}{\sin 89° 58'}$ $\frac{80.00}{\alpha}$ $\alpha = .447311 = 26° 39°$

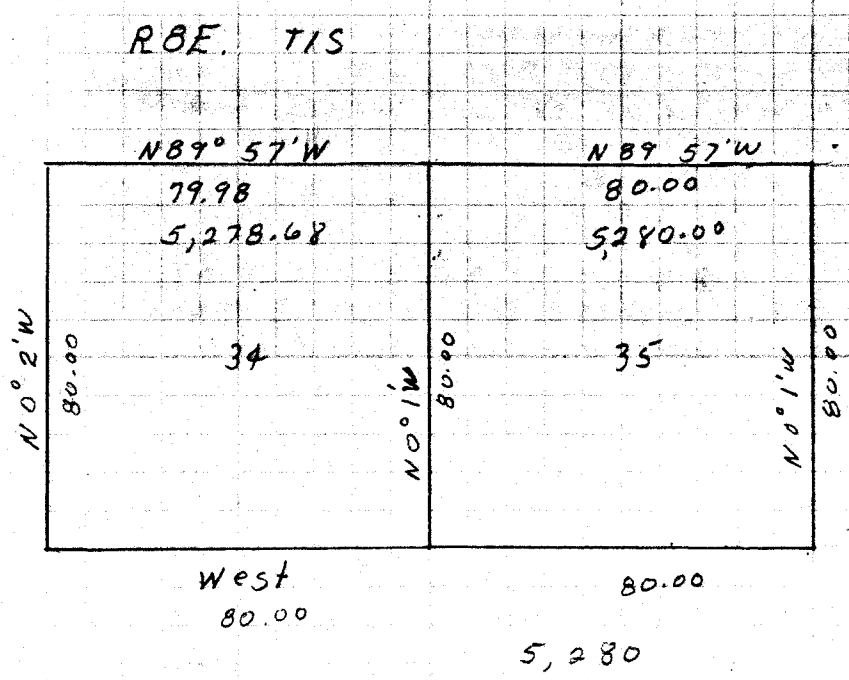
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE PROJECT

DATE CHECKED BY DATE JOB NO.

SHEET OF

R8E. T1S



SCS-347-5-57
Tabular Computations

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Project _____ Checked By _____ Date _____

By _____ Date _____ Sheet _____ of _____

Stations	Δ	Bearings	Length in Feet	cos	sin	Latitudes North	Latitudes South	Departures East	Departures West	Bal. Latitudes North	Bal. Latitudes South	Bal. Departures East	Bal. Departures West		
1-2		N	632.30			632.30									
2-3		N 33° 45' E	3,676.12	.83197	.55557	3,056.58		2,042.34							
3-4		N 47° 14' E	2,646.80	.67901	.73413	1,297.20		1,943.10					9,032.42		
4-5		N 37° 08' E	4,031.20	.79723	.60367	3,214.35		2,433.94				B			
5-6		N 79° 28' E	1,239.69	.26780	.96347	331.99		1,194.40				7,613.78	9,032.42	49° 52'	
6-1		S 40 08' W	11,913.70	.76455	.64457								7,613.78		
						9,032.42		7,613.78		11,813.70			1.18632		
							9,032.16		7,619.76						
1-2															
2-3		N33°00'W					Assumed Bear S40°08'W								
3-4		N19°31'W					True Bearing N26°37'W								
4-5		N29°37'W					Diff 66°45'				Sub from NE & SW Bear				
5-6		N7°43'E to									Add to NW & SE Bear				
6-1															
6-7		N	818.49			818.49									
7-8		N 0° 43' W	2,690.80	.99992	.01251	2,690.58			33.66						
8-9		N 12° 16' E	3,358.97	.97717	.21246	3,282.28		713.65							
9-10		N 0° 37' W	2,750.23	.99994	.01076	2,750.06			29.59			1,001.19			
10-11		N 67° 39' W	3,000.00	.38026	.92488	760.52			1,849.76			11,774.08		4° 52'	
11-12		N 7° 40' E	1,485.43	.99106	.13341	1,472.15		198.17							
12-6		S 4° 52' E										.08503			
						11,724.08		911.82	1,913.06						
6-7	N21° 42' W														
7-8	N22° 25' W		11,816.44					1,001.19							
8-9	N9° 26' W									S4°52'E		Assumed			
9-10	N22° 19' W									S26° 34' E		True			
10-11	N89° 21' W									21° 42		add to SE & NW Bear			
11-12	N14° 02' W											Sub to SW & NE "			

139,631,341.26

GPO: 1957 O - 431049

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE: Arizona
PROJECT: Vineyard Road Dam
D.H.H. DATE 1-8-65 CHECKED BY GDH DATE 1-8-65 JOB NO.

SHEET 1 OF 3

Curve I

P.I. 40+00
P.C. 39+00
P.T. ~~40+69.75~~
40+76.65

Δ = 67° 02' (33° 31")
R = 150.99
T = 100
L = 176.65
D = 37° 56' 99" use 37° 57'

$R = \frac{T}{\tan \frac{1}{2}\Delta} = \frac{100}{.66230} = 150.98897$

$D = \frac{5729.58}{150.98897} = 37.94701$

$L = \frac{\pi R \Delta}{180} = 176.65$

PT-PC

2550.23

Void

Curve II

P.C. 66+26.88
P.I. 67+26.88
P.T 68+26.03

Δ 12° 53' (6° 26' 30")
R 885.66
T 100
L 199.15
D 6° 28'

$R = \frac{100}{.11291} = 885.66114$ 885.66114

$D = \frac{5729.58}{885.66114} = 6.46926$
6° 28' 9"

$L = \frac{\pi R \Delta}{180}$

PT-PC

3158.97

Curve III

P.C. 99+85.00
P.I. 100+85.00
P.T. 101+84.~~72~~ 14

Δ 12° 59' (6° 29' 30")
R 878.~~73~~ 81
T 100
L 199.~~72~~ 14
D 6° 31'

$R = \frac{100}{.11380} = \cancel{878.73462}$ 878.81184
11379

$D = \frac{5729.58}{878.\cancel{73462}\ 81184} = 6.\cancel{52086}\ 51968$ 6°

$L = \frac{\pi R \Delta}{180}$

Arizona — Vineyard Road Dam

D.H.H. 1-8-65 GDH 1-8-65

2 3

Curve IV

P.C. 126+74.~~92~~ 94

P.I. 127+74.~~78~~ 94

P.T. 128+73.~~78~~ 20

Δ 18°30' (9°15')

R 614.02'

T 100'

L 198.26'

D 9° 19' 52" use 9° 20'

$R = \frac{100}{.16286'} = 614.02431'$

$L = \frac{\pi R \Delta}{180}$

$D = \frac{5729.58}{614.02431} = 9.33119$

Curve V

P.C. 146+66.~~78~~ 80

P.I. 147+66.~~78~~ 80

P.T. 148+63.~~42~~ 44

Δ 25° 42' (12° 51') .70°

R 438.38

T 100

L 196.64

D 13° 4'

$R = \frac{100}{.22811'} = 438.38498'$

$L = \frac{\pi R \Delta}{180}$

$D = \frac{5729.58}{438.38498} = 13.06974'$

Curve VI

P.C. 186+95.~~32~~ 34

P.I. 187+95.~~32~~ 34

P.T. 188+94.~~80~~ 82

$R = \frac{100}{.08837} = 1,131.60574$

Δ. 10° 06' (5° 03' .10

R 1,131.61

T 100

L 199.48

D 5° 3' 48" use 5° 0.4'

$D = \frac{5729.58}{1,131.60574}$ 5.06322

$L = \frac{\pi R \Delta}{180}$

Curve VII

P.C. 213+41.~~60~~ 62

P.I 214+41.~~60~~ 62

P.T. 215+40.~~68~~ 70

$R = \frac{100}{.11821} = 845.95211$

Δ= 13° 29' (6°49'30") 983.33

R: 845.95

T 100

L 199.08

D 6° 46'

$D. \frac{5729.58}{845.95211} = 6.77293$

$L = \frac{\pi R \Delta}{180}$

Arizona Vineyard

D.H.H. 1-8-64 GOH 1-8-65

3 3

Curve ~~VIII~~

P.C. 250+16.~~80~~ 82

P.I. 251+16.~~80~~ 82

P.T. 251+73.~~80~~ 82 $D = \frac{5729.58}{100}$

Δ 90°0' (45°0')

R 100'

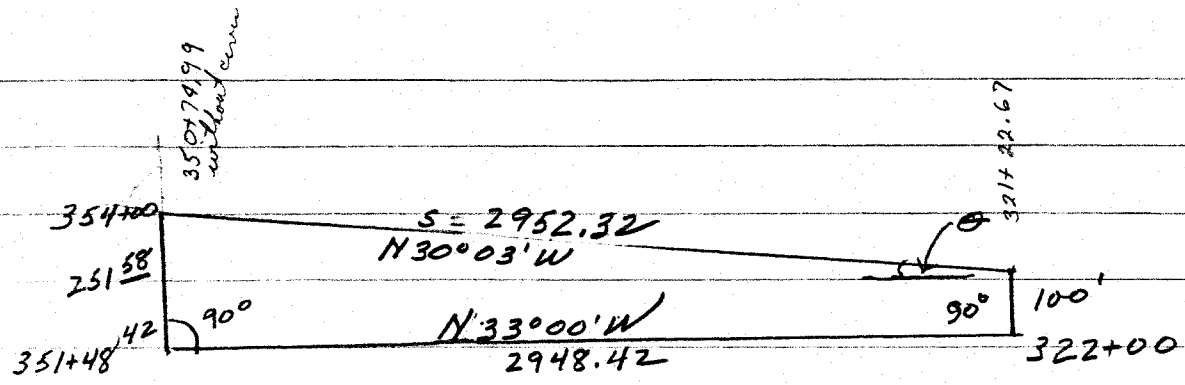
T 100'

L 157.08'

D 57° 17' 45"

use 57° 18'

New Alignment Vineyard Rd Dam
Walt 3-9-65



$$S = \sqrt{2948.42^2 + 151.58^2} = 2952.32$$

$$S = 2948.42 + \frac{151.58^2}{2 \times 2948.42} = 2952.32$$

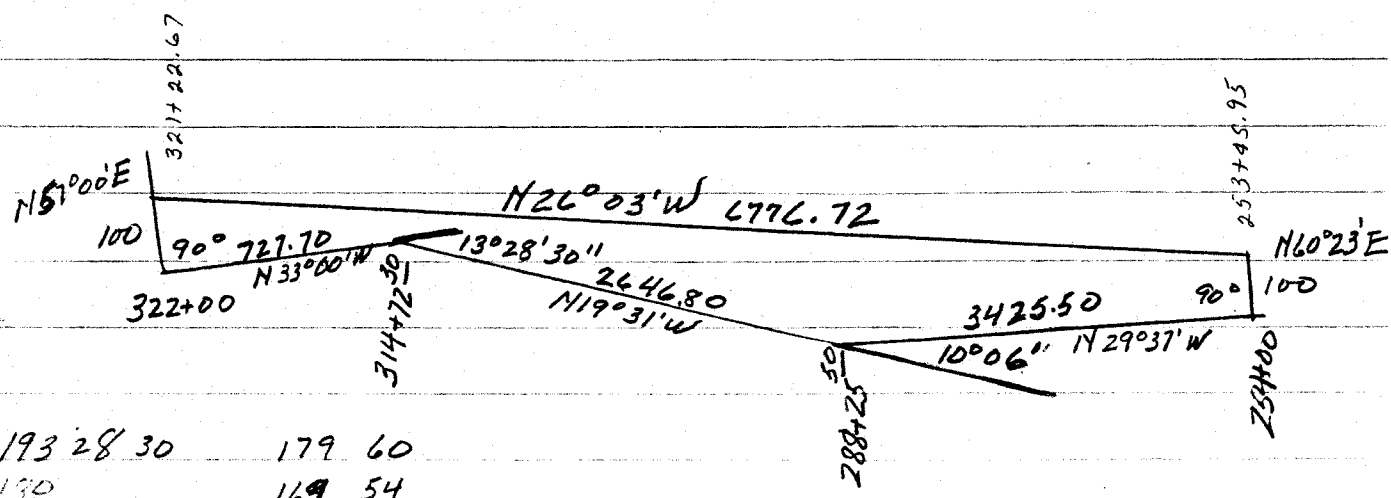
$$\tan\theta = \frac{151.58}{2948.42} = .0514$$

$$\theta = 2°57'$$

Bearing = 33°00' - 2°57' = N30°03'W

New Alignment Vineyard Rd Dam

Watt 3-9-65



193 28 30
180
13°28 30

179 60
169 54
10 06

Dist	Bear	Sin	Cos	E-W	N-S
100	N57°00'E	.83867	.54464	−83.87	+54.46
727.70	N33°00'W	.54464	.83867	396.33	610.30
2646.80	N19°31'W	.33408	.94254	884.24	2494.71
3425.50	N29°37'W	.49419	.86935	1692.85	2977.96
100	S60°23'W	.86935	.49419	+86.94	−49.42
				2976.49	6088.01

$S = \sqrt{2976.49^2 + 6088.01^2} = 6776.72$

Bearing $\angle$ tan $= \frac{2976.49}{6088.01} = .48891$

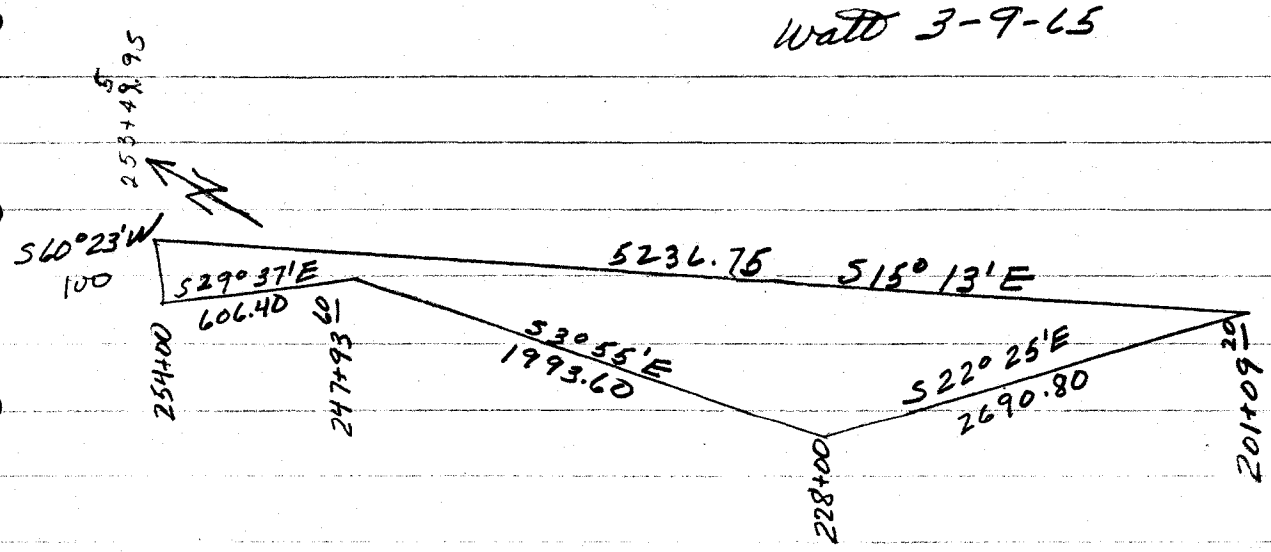
N 26°03' W
150 13
10° 50'

Bearing = N 26° 03' W

116

New Alignment Vinyard Rd Dam

Watt 3-9-65



Dist	Bear	Sin	Cos	E-W	N-S
100.00	S60°23'W	.86935	.49419	− 86.94	+ 49.42
606.40	S29°37'E	.49419	.86935	+ 299.68	+ 527.17
1993.60	S 3°55'E	.06831	.99766	+ 136.18	+ 1988.93
2690.80	S22°25'E	.38134	.92444	+ 1026.11	+ 2487.48
		Totals		1375.03	5053.00

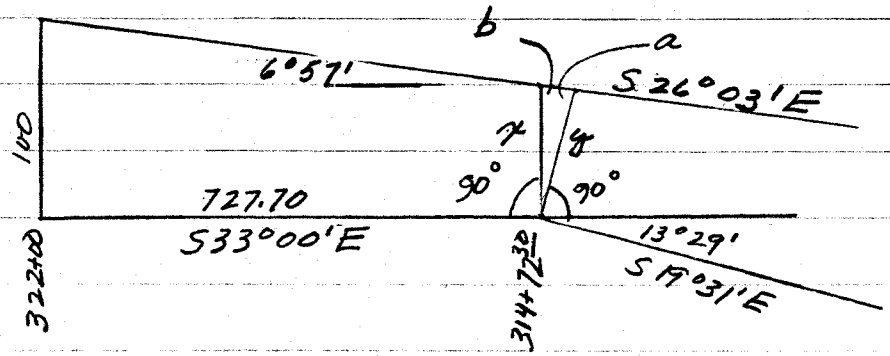
$$S = (1375.03^2 + 5053.00^2)^{1/2} = 5236.75$$

$$\text{Tan Bear} = \frac{1375.03}{5053.00} = .2721.2 \qquad S15^\circ 13'E$$

27,42,35,15,5009

Ties From P.I.'S

3-10-65



$x = 100 - 727.70 \tan 6°57'$

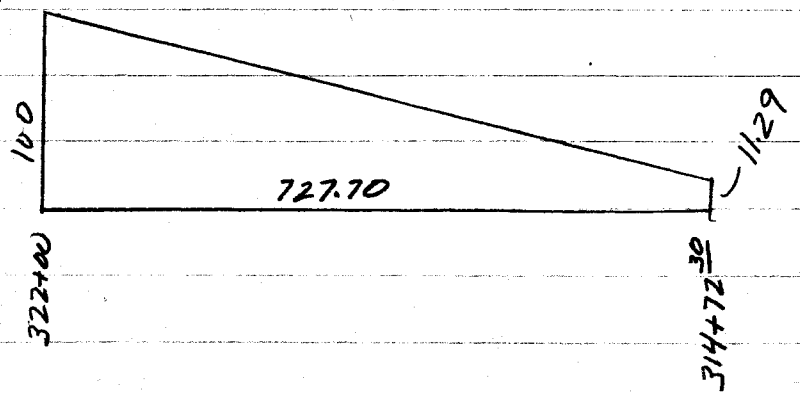
$= 100 - 727.70 \times .12190 = 11.29$

$a = 90° + 6°57' - 13°29' = 83°\ 28'$

$b = 90° - 6°57' \qquad = 83°\ 03'$

$$\frac{11.29}{\sin 83°28'} = \frac{y}{83°03'} = \frac{11.29}{.99351} = \frac{y}{.99265}$$

$y = 11.28$



offset

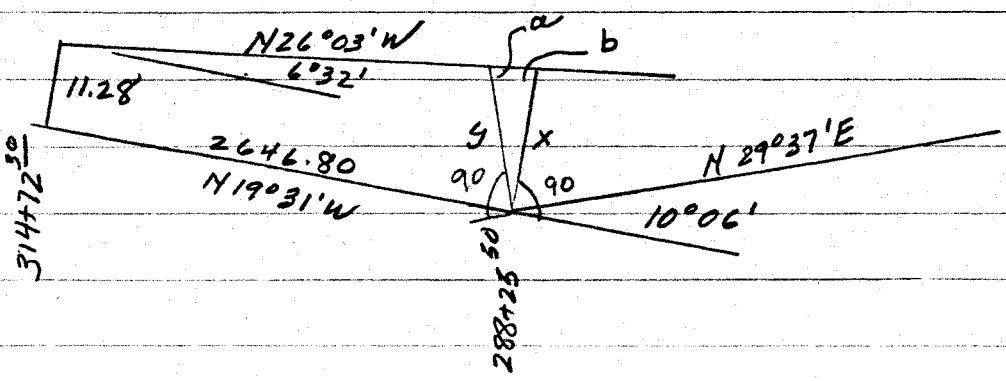
add 12.19'/sta

96 32
10 06
86 26

89 60
6 32
83 28

Ties From P.I.'s
3-10-65

25 63
19 31
6 32

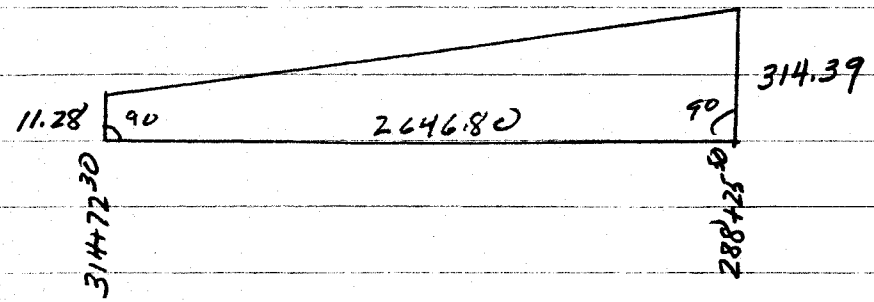


$$X = 11.28 + 2646.80 \tan 6°32'$$
$$= 11.28 + 2646.80 \times .11452 = 314.39$$

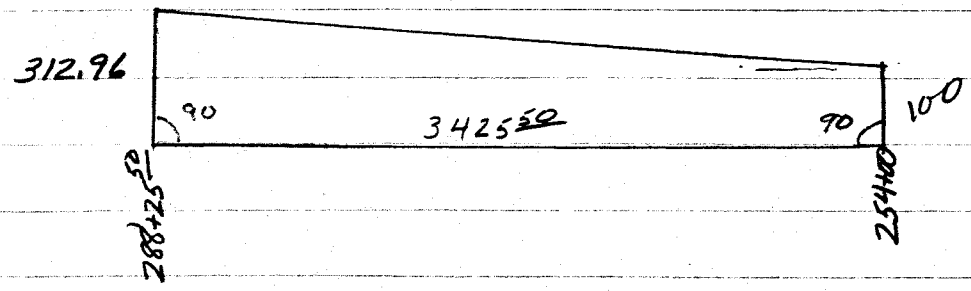
$$a = 90° + 6°32' - 10°06' = 86°26'$$
$$b = 90° - 6°32' = 83°28'$$

$$y = \frac{314.39}{\sin 86°26'} \times \sin 83°28' = \frac{314.39 \times .99351}{.99806} = 312.96$$

Check $y = 100 + 3425.50 \tan 3°34'$ (.06233) $= 313.51$



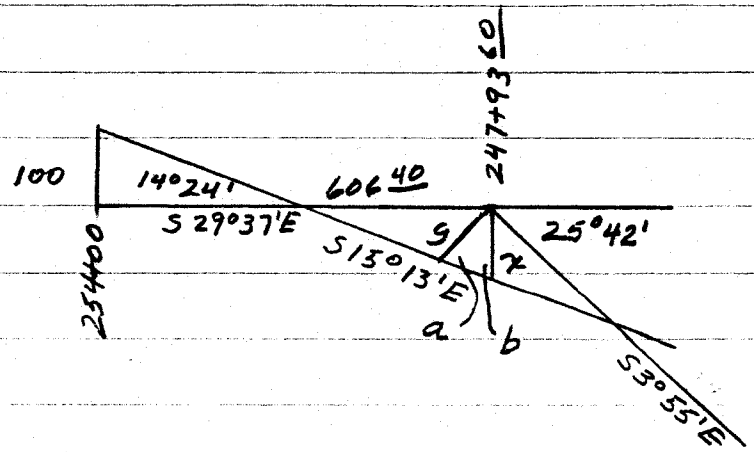
11.45 ft/sta



6.22 ft/sta

Ties From PI'S

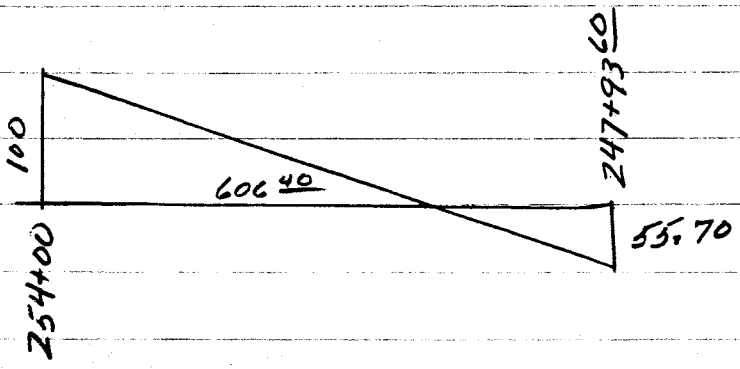
3-10-65



$$X = 606\tfrac{40}{} \times \tan 14°24' - 100$$
$$= 606\tfrac{40}{} \times .25676 - 100 = 55.70$$

$$a = 90° + 14°24' - 25°42' = 78°42'$$
$$b = 90° - 14°24' = \quad = 75°36'$$

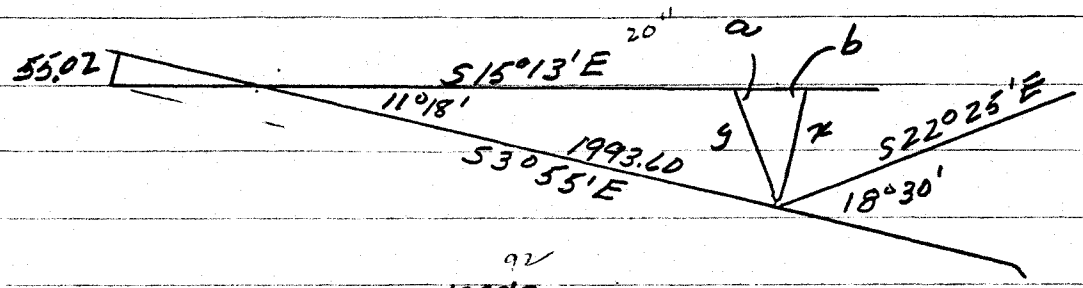
$$y = \frac{56.70 \times \sin 75°36'}{\sin 78°42'} = 56.70 \times \frac{.96858}{.980.61} = 55.02$$



25.68 ft/sta

Ties From PI's

3-10-65



$$x = 1993.60 \tan 11°18' - 55.02 = 343.34$$

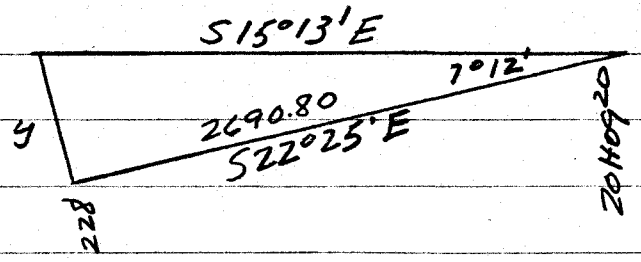
$$a = 90° + 11°18' - 18°30' = 82°48'$$

$$b = 90° - 11°18' = 78°42'$$

$$y = \frac{342.36 \times \sin 78°42'}{\sin 82°48'} = \frac{343.34 \times .98061}{.99211} = 339.36$$

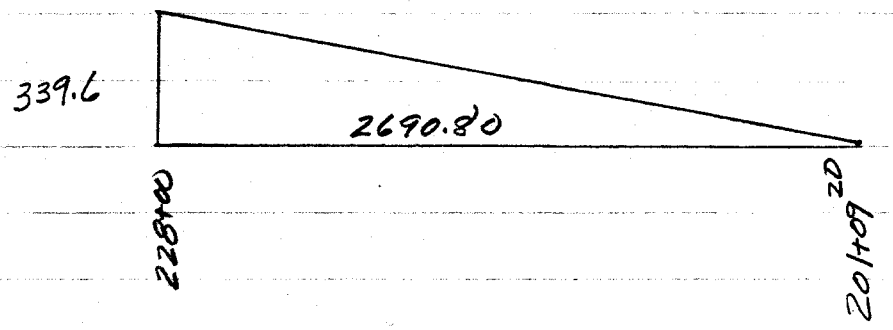
Ties From PI's

3-10-65



$y = 2690.80 \times \tan 7°12'$

$= 2690.80 \times .12633 = 339.93$ OK



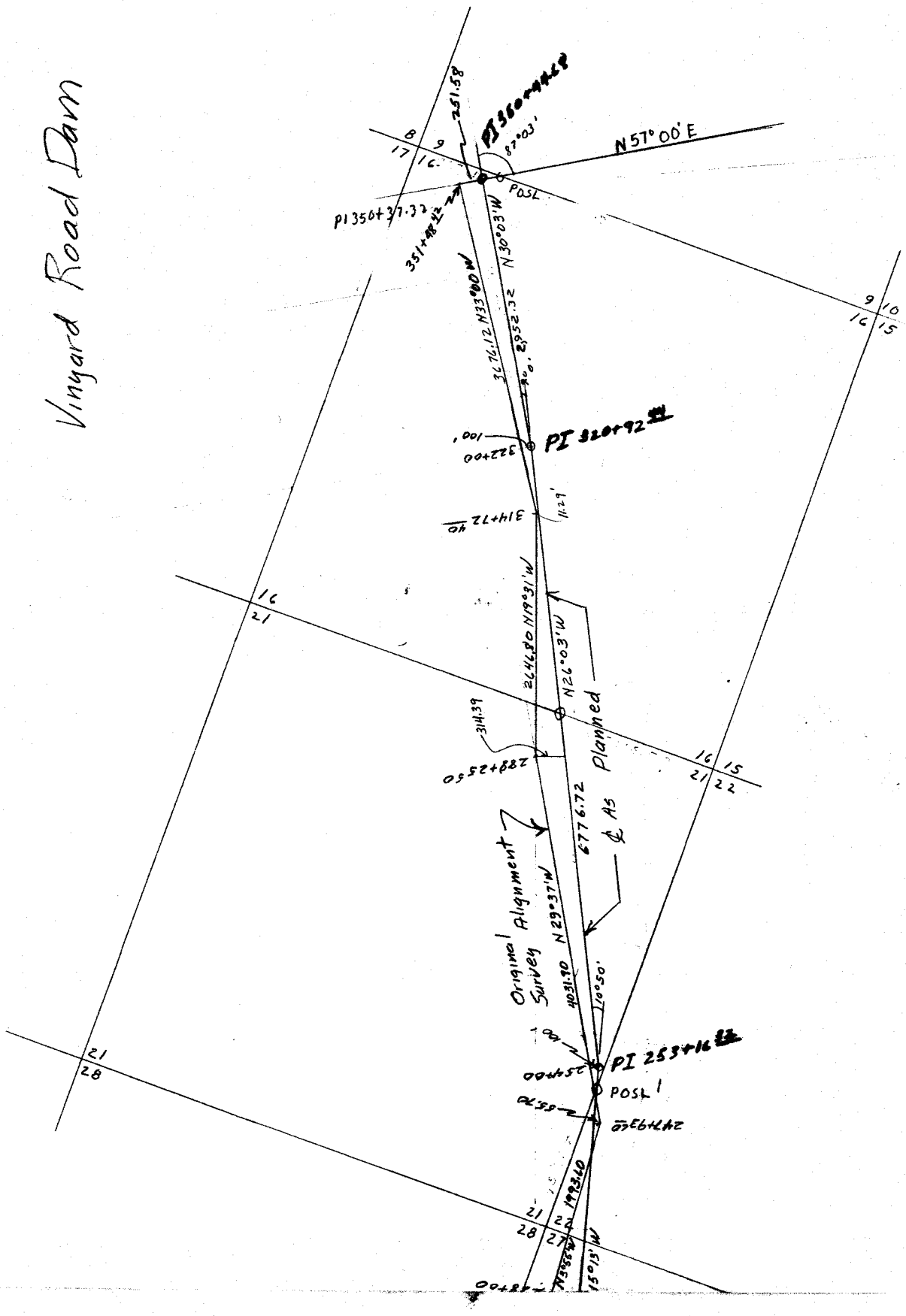
12.62 ft/sta

Check on Calculations
3-10-65

Dist	Bear	Sin	Cos	E W	N S
251.58	S 57°00'W	.83867	.54464	− 210.99	− 137.02
3676.12	S 33°00'E	.54464	.83867	2002.16	− 3083.05
2646.80	S 19°31'E	.33408	.94254	884.24	− 2494.71
4031.90	S 29°37'E	.49419	.86935	1992.52	− 3505.13
1993.60	S 3°55'E	.06831	.99766	136.18	− 1988.93
2690.77	S 22°25'E	.38134	.92444	1026.10	− 2487.46
5236.75	N 15°13'W	.26247	.96494	− 1374.49	+ 5053.15
6776.72	N 26°03'W	.43916	.89841	− 2976.06	+ 6088.27
2952.32	N 30°03'W	.50076	.86559	− 1478.40	+ 2555.50
2952.32				+ 1.26'	+ 0.62

OK
for ∠s to minutes

Vingard Road Dam



As planned PI's with Correction for Curves

Arizona Vineyard Road Dam 2007

D.H.H. 3-16-65

Curve Data

P.C Sta 97+32.50
P.I. Sta 98+32.50
P.T. Sta 99+03.88

Δ	74° 01'	$\frac{\Delta}{2}$ = (37° 0' 30")
R	132.66	
T	100	
L	171.38	
D	43° 11'	

$R = \frac{T}{\tan \frac{1}{2}\Delta} = \frac{100}{.7537822} = 132.66931$

$D = \frac{5729.58}{132.66931} = 43° 11'$

$L = 1.2915436$
$.0002909$
$1.2918345 \times 132.66931 = 171.38$

old PI. 167+50.23
old PI. 98+32.50 ✓
69+17.73

P.C. 166+21.61
P.I. 167+21.61
P.T. 168+20.77

Δ	12° 33'	$\frac{\Delta}{2}$ = (6° 26' 30")
R	885.71	
T	100	
L	199.16	
D	6° 28'	

$R = \frac{T}{\tan \frac{1}{2}\Delta} = \frac{100}{.1129094} = 885.70507$

$D = \frac{5729.58}{885.70507} = 6° 28'$

old PI. 201+09.20
old PI. 167+50.23
33+58.97

$L = .2094395$
$.0154171$
$.2248566 \times 885.70507 \quad 199.16$

P.C. 199+79.74
P.I. 200+79.74
P.T. 201+79.57

Δ	5° 47'	$\frac{\Delta}{2}$ = (2° 53' 30")
R	1,979.73	
T	100	
L	199.83	
D	2° 54'	

$D = \frac{5729.58}{1,979.72758} = 2° 54'$

$L = .0872665 + .0136717$
$.1009382 \times 1,979.72758 = 199.8301$

$R = \frac{T}{\tan \frac{1}{2}\Delta} = \frac{100}{.0505120} \quad 1,979.72758$

Arizona Vineyard Road Dam 2007

D.H.H. 3-16-65 1-25-66

Curve Data

2 2

52+36.75 P.I. to P.I.

P.C. 252+16.32

P.I. 253+16.32

P.T. 254+08.36

Δ 10°50' $\frac{\Delta}{2}$ = (5°25')

R 1,054.62 ✓

T 100 ✓

L ~~192.04~~ 199.40

D 5°26'

$R = \frac{T}{\tan \frac{1}{2}\Delta}$ $\frac{100}{.0948213}$ = 1,054.61536

5.43283

$D = \frac{5729.58}{1,054.61536}$ = 5° 26'

~~L = .1745329 ?~~

~~.0075631 ?~~

~~.1820960 × 1,054.61536~~ = ~~192.041~~ 199.40

67+76.72 P.I. to P.I.

P.C. ~~319+85.08~~ 319+92.44

P.I. ~~320+85.08~~

P.T. ~~321+85.00~~ 321+92.36

Δ 4°0' $\frac{\Delta}{2}$ = (2°0')

R 2,863.62 ✓

T 100 ✓

L 199.92 ✓

D 2° 0' ✓

$R = \frac{T}{\tan \frac{1}{2}\Delta} = \frac{100}{.0349208}$ = 2,863.62282

$D = \frac{5729.58}{2,863.62282}$ = 2° - 0'

L = .0698132 × 2,863.62282 = 199.918 ✓

29+52.32 P.I. to P.I.

P.C. ~~349+37.32~~

P.I. ~~350+37.32~~

P.T. ~~350+97.96~~

Δ = 87°03' $\frac{\Delta}{2}$ = (43°31'30")

R = 105.29

T = 100

L = ~~160.64~~ 159.97

D = 54° 25'

$R = \frac{T}{\tan \frac{\Delta}{2}} = \frac{100}{.9497943}$ 105.28595

$D = \frac{5729.58}{105.28595}$ = 54° 25'

~~L = 1.5184364 +~~

~~.0072722~~

1.5257086 × 105.28595 = ~~160.635~~ 159.97

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE		PROJECT		
Arizona				
BY	DATE	CHECKED BY	DATE	JOB NO.
Watt	1-25-66			

SUBJECT Check on Alignment Vingard Rd

SHEET ____ OF ____

PI = 98+32.50 ✓
PC = 97+32.50 ✓
Lc 1 71.38 ✓
PT 99+03.88 ✓
− 1 00
Tan + 6917.73
−

Δ = 74°01'
T = 100.00
$R = \frac{100}{\tan 37°00'30''} = 132.66$
$L = 132.66 \times \frac{74.0167 \times \pi}{180} = 171.37$

PI = 167 21.61 ✓
PC = 166+21.61 ✓
Lc 1 99 16
PT = 168+20.77

Δ = 12° 53'
T = 100
R = 885.74
L = 199.16 ✓

− 1+00.00 ✓
+ 33 58.97 ✓

PI = 200+79.74 ✓

Δ 5°47'
T = 100
R = 1979.4
L = 199.80

PC 199+79.74 ✓
L = 1 99.88
PT 201+79.57

− 100.00
15236.75

PI = 253+16.32 ✓
PC 252+16.32 ✓
Lc 1+99.40 ✓
P.T. 254+15 72 ✓

Δ = 10° 50'
T = 100
R = 1054.62
L = 199.40

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O—470868

STATE Arizona		PROJECT		
BY Watt	DATE 1-26-66	CHECKED BY	DATE	JOB NO.
SUBJECT Check Station Computations				SHEET ____ OF ____

PT = 254+15.72

− 1+00.00
+ 6776.72

PI = 320+92.44 ✓
PC 319+92.44 ✓
Lc = 199.92 ✓

Δ = 4°00'
T = 100
R = 2863.7
Lc = 199.92

PT 321+92.36 ✓

− 100
+ 2952.32

PI 350+44.68
PC 349+44.68
Lc 159.97
PT 351+04 65
+97 [illegible]
6.69

Δ = 87°03' ½Δ = 43°31.5'
T = 100
R = 105.29
Lc = 159.97

Return to Arrington

March 7-8, 1968

Vineyard road dam.

Sta.	Depth	↓	Sta.	Depth	
6	3.0	3.0	2	2.5	2.5
125+00	4.0	4.0	1	2.5	2.5
4	5.0 (gravel)	5.0	100+00	2.0	2.0
3	3.5	4.0	9+03	2.0	2.0
2	4.0	4.0	8+32.5	2.0	2.0
1	3.5	3.5	7+32	2.0	2.0
120+00	3.0	3.0	6	2.0	2.0
9	3.0	3.0	95+00	2.0	2.0
8	3.5	3.5	4	2.0	2.0
7	2.0	2.0	3	2.0	2.0
6	2.0	2.0	2	2.5	2.5
115+00	2.0	2.0	1	2.0	2.0
4	1.5	2.0	90+00	2.0	2.0
3	1.5	2.0	9	2.5	2.5
2	1.5	2.0	8	2.0	2.0
1	2.0	2.0	7	2.0	2.0
110+00	1.5	2.0	6	2.0	2.0
9	3.0	3.0	85+00	2.5	2.5
8	2.5	2.5	4	2.0	2.5
7	2.0	2.0	3	3.0	3.0
6	2.0	2.0	82+50	2.5	2.5
105+00	2.5	2.5			
4	2.5	2.5			
3	3.0	3.0			

Sta.	Depth	↓	Sta.	Depth	↓
174+00	5.5 Gravel	5.5	150+00	2.0	3.5
3	5.0 Gravel	5.5	9	3.5	3.5
2	5.5	5.5	8	2.5	3.0
1	5.0+	5.5	7	3.0	3.0
170+00	5.5	5.5	6	3.0	3.0
9	4.5	4.5	145+00	2.0	3.0
8	3.0	3.0	4	3.0	3.0
7	3.0	3.0	3	2.0	3.0
6	5.0+	5.0	2	4.5	4.5
165+00	5.0+	5.0	1	5.0	5.0
4	4.0	5.0	140+00	5.0+	5.0
3	5.0+	5.0	9	4.5 Gravel	5.0
2	5.5	5.5	8	5.0	5.0
1	5.0	5.0	7	5.0	5.0
160+00	4.0	5.0	6	2.0	4.0
9	5.0+	5.0	135+00	4.5	4.5
8	5.0	5.0	4	4.0	4.0
7	3.0	4.0	3	3.5	3.5
6	4.0	4.0	2	4.5	4.5
155+00	4.0	4.0	1	2.5	3.5
4	4.0	4.0	130+00	4.0	4.0
3	4.0	4.0	9	4.0	4.0
2	4.5	4.5	8	2.5	2.5
1	3.5	3.5	7	2.5	2.5

VINEYARD ROAD DAM

FOUNDATION SHELF

3-29-68 RA

Sta.	Depth	New Depth	Sta.	Depth	New Depth	Sta.	Depth	New Depth	Sta.	Depth	New Depth
6	3.0	3.0	2	2.5	2.5	174+00	5.5 (Gravel)	5.5	150+00	2.0	3.5
125+00	4.0	4.0	1	2.5	2.5	3	5.0 (Gravel)	5.5	9	3.5	3.5
4	5.0 (Gravel)	5.0	100+00	2.0	2.0	2	5.5	5.5	8	2.5	3.0
3	3.5	4.0	9+03	2.0	2.0	1	5.0+	5.5	7	3.0	3.0
2	4.0	4.0	8+32.5	2.0	2.0	170+00	5.5	5.5	6	3.0	3.0
1	3.5	3.5	7+32	2.0	2.0	9	4.5	4.5	145+00	2.0	3.0
120+00	3.0	3.0	6	2.0	2.0	8	3.0	3.0	4	3.0	3.0
9	3.0	3.0	95+00	2.0	2.0	7	3.0	3.0	3	2.0	3.0
8	3.5	3.5	4	2.0	2.0	6	5.0+	5.0	2	4.5	4.5
7	2.0	2.0	3	2.0	2.0	165+00	5.0+	5.0	1	5.0	5.0
6	2.0	2.0	2	2.5	2.5	4	4.0	5.0	140+00	5.0+	5.0
115+00	2.0	2.0	1	2.0	2.0	3	5.0+	5.0	9	4.5 (Gravel)	5.0
4	1.5	2.0	90+00	2.0	2.0	2	5.5	5.5	8	5.0	5.0
3	1.5	2.0	9	2.5	2.5	1	5.0	5.0	7	5.0	5.0
2	1.5	2.0	8	2.0	2.0	160+00	4.0	5.0	6	2.0	4.0
1	2.0	2.0	7	2.0	2.0	9	5.0+	5.0	135+00	4.5	4.5
110+00	1.5	2.0	6	2.0	2.0	8	5.0	5.0	4	4.0	4.0
9	3.0	3.0	85+00	2.5	2.5	7	3.0	4.0	3	3.5	3.5
8	2.5	2.5	4	2.0	2.5	6	4.0	4.0	2	4.5	4.5
7	2.0	2.0	3	3.0	3.0	155+00	4.0	4.0	1	2.5	3.5
6	2.0	2.0	82+50	2.5	2.5	4	4.0	4.0	130+00	4.0	4.0
105+00	2.5	2.5				3	4.0	4.0	9	4.0	4.0
4	2.5	2.5				2	4.5	4.5	8	2.5	2.5
3	3.0	3.0				1	3.5	3.5	7	2.5	2.5

Vineyard Road Dam — Apache Junction - Gilbert WPP Arizona

Station	Location	% G	% S	% fines	Gs	% salts	L L	P I	Class Symbol	Opt. Moisture	Max. Density	Remarks
(Design Soil Tests)												
100+00	(2) ℄	0	47	53	2.72	-	35	15	CL	16.5	103.3	Washed
120+00	(4) "	0	47	53	2.71	-	25	9	CL	12.6	112.0	"
150+00	(7) "	0	49	51	2.67	-	26	8	CL	13.2	109.8	"
190+00	(11) "	0	35	65	2.71	-	27	11	CL	5.7	102.3	"
249+50	(17) "	0	41	59	2.71	-	NP	NP	SM	10.7	116.0	"
270+00	(19) "	0	31	69	2.76	-	26	5	CL ML	12.7	110.6	"
300+00	(22) "	0	40	60	2.63	-	29	6	ML	8.28	104.1	"
320+00	(24) "	0	53	47	2.71	-	30	10	SC	11.4	114.2	"
354+25	(301) "	0	39	61	2.68	-	NP	NP	ML	12.4	105.5	"
(Construction Soil Tests)												
355+00±	30' Rt. ℄	0	67.43	32.57					SM	11.7	117.5	Not. Washed
365+00±	30' Rt. ℄	0	73	27					SM	10.7	121.9	" "
17+00±	N. Emerg. Spwy.	0	64	36					SM	10.8	119.8	" "
345+00	℄ dam	0	93.62	6.38					SW	12.8	118.3	" "
343+00	In dam fill	0	82.44	17.56					SM	12.2	119.5	" "
330+00	Borrow Channel	0	70.62	29.38					SM	14.8	116.3	" "
324+00	3' Lt. ℄	0	85.48	14.52					SM	12.8	118.3	" "
316+00	℄	0	85.57	14.43					SM	18.3	104.3	" "
301+00	3' Lt. ℄	0	86.56	13.44					SM	11.8	122.9	" "

TABLE OF DIMENSIONS (Revised 9-15-67) G. Hanley

Structure Station	Size of pipe, dia.	Elevation "A"	Elevation "B"	Elevation "C"	Elevation "D"	Dimension "E"	Dimension "F"	Dimension "G"	Dimension "H"	Length of gate stem "J"	Distance of 0% grade "K"
129+35±	24"	1563.5	1561.5	1561.0	1565.25	3.0'	49.57'	65.43'	114.0'	51.0'	44.0
152+40±	18"	1563.5	1562.0	1561.5	1565.25	3.0'	52.09'	64.91'	116.0	54.0'	46.0
252+00±	24"	1563.25	1561.25	1560.75	1565.00	3.0'	51.32'	64.68'	116.0'	52.0'	46.0
276+80±	18"	1563.25	1561.75	1561.25	1565.00	3.0'	52.84'	66.16'	118.0'	54.0'	48.0
321+50±	24"	1563.0	1561.0	1560.5	1564.75	3.0'	51.07'	65.93'	116.0'	53.0'	46.0

TABLE OF DIMENSIONS (Revised 9-15-67) G. Hanley

Structure Station	Size of pipe, dia.	Elevation "A"	Elevation "B"	Elevation "C"	Elevation "D"	Dimension "E"	Dimension "F"	Dimension "G"	Dimension "H"	Length of gate stem "J"	Distance of 0% grade "K"
129+35±	24"	1563.5	1561.5	1561.0	1565.25	3.0'	49.57'	65.43'	114.0'	51.0'	44.0
152+40±	18"	1563.5	1562.0	1561.5	1565.25	3.0'	52.09'	64.91'	116.0	54.0'	46.0
252+00±	24"	1563.25	1561.25	1560.75	1565.00	3.0'	51.32'	64.68'	116.0'	52.0'	46.0
276+80±	18"	1563.25	1561.75	1561.25	1565.00	3.0'	52.84'	66.16'	118.0'	54.0'	48.0
321+50±	24"	1563.0	1561.0	1560.5	1564.75	3.0'	51.07'	65.93'	116.0'	53.0'	46.0

136

THE ASHTON COMPANY, INC.

Contractors & Engineers

2727 SOUTH COUNTRY CLUB ROAD P. O. BOX 7065

TUCSON, ARIZONA 85713

September 16, 1967

COPY

Flood Control District of Maricopa County
3325 West Durango Street
Phoenix, Arizona 85009

Gentlemen:

Re: Vineyard Road Flood Retarding Structure
Contract No. FCD-3

Subject to your approval, the Hydro Conduit Corporation will furnish Items 10, 11, and 12 for the referenced project. Their address is P. O. Box 2670, Phoenix, Arizona 85002.

They propose to manufacture the pipe in accordance with A.S.T.M. specifications C361-65T. A copy of these specifications is enclosed, and Hydro Conduit Corporation has underlined on pages 18 and 21 the reinforcing steel areas they propose to use.

We also enclose Drawing No. C560-1339 showing the type of joints they propose to use for this pipe.

Very truly yours,

THE ASHTON COMPANY, INC.

John C. Ryan

John C. Ryan
Vice President

JCR:ekb

✓	LOWRY	
✓	OHSIEK	
✓	BREWSTER	
	FILE	
	COMMENTS: needs reply	

SEP 1967
RECEIVED
FLOOD CONTROL
DISTRICT

137

Flood Control District
of
Maricopa County
3325 WEST DURANGO STREET
PHOENIX, ARIZONA 85009

September 22, 1967

copy

Mr. George England
Soil Conservation Office
P. O. Box 808
Apache Junction, Arizona 85220

Subject: Vineyard Road Flood Retarding Structure
Contract No. FCD-3

Dear Mr. England:

The Ashton Company proposes to obtain concrete pipe for Contract No. FCD-3 from the Hydro Conduit Corporation. A copy of the data submitted by them regarding materials to be furnished is enclosed herewith. It is requested that you review this information and indicate approval or disapproval.

Sincerely,

John C. Lowry
Contracting Officer

LEO/sp

Encls.

cc: Robert Cavallo w/encs

Ariz
~~RA~~ 9-67

Vineyard Road F.R.S. 1

JOINT GAP Study -

129 + 35

Hole 5 - shows BC - 18

#7 Looks favorable - CL is somewhat collapsable.
clay layer thru this area -

152 + 40

Hole #7 Log shows all SM
#4 CL - highly collapsable -

will cut off to siltstone
+ excavate major portion under conduit -

Can cure collapsable cond,

Sta 252+00 - Hole 17 - SM - .24e collapse
maybe prob. → no pos. cutoff - deep collapsable profile -
276 + 80 Hole 46 .1e collapse 2' - 2.6'
.14e " 3' - 3.6'

cut off to siltstone then okay.

321 + Hole 24 -

cutoff to siltsome + firm gravels
prob okay -

Since foundation will be excavated for the cutoff trench and bench for the upstream half of the foundation and because the foundation is designed to not allow melting to occur - I believe the conduits will not to be subjected to the conditions assumed in the joint gap computations -

However - Assume 4.0' collapsable soil beneath conduit

$\Delta = .26'$ See comp 7-28-65 - G.W.

$b/d = \frac{101}{4.0} = 25.3$

$b/h = \frac{101}{17.5} = 5.7$

$R = .135$

$S/d = \frac{.26}{4.0} = .065$

$g_s = .065(12)(12)(.135) = 1.26''$ .84

$\alpha = \frac{2(.26)}{101} = .00515$

$g_r = \frac{.00515 \times 54}{2} = .139$ .14 .22 .016 .062

$J = .84 + .01 - 0.85'' - 18''$

$1.26 + .06 - 1.32'' - 24''$

$1.26 + .14 = 1.40'' - 54''$

Mfg. gives $J_{18} = 1.25''$ ∴ Okay

$J_{24} - 1.37''$ ∴ Okay

$J_{54} - 1.37''$ low -

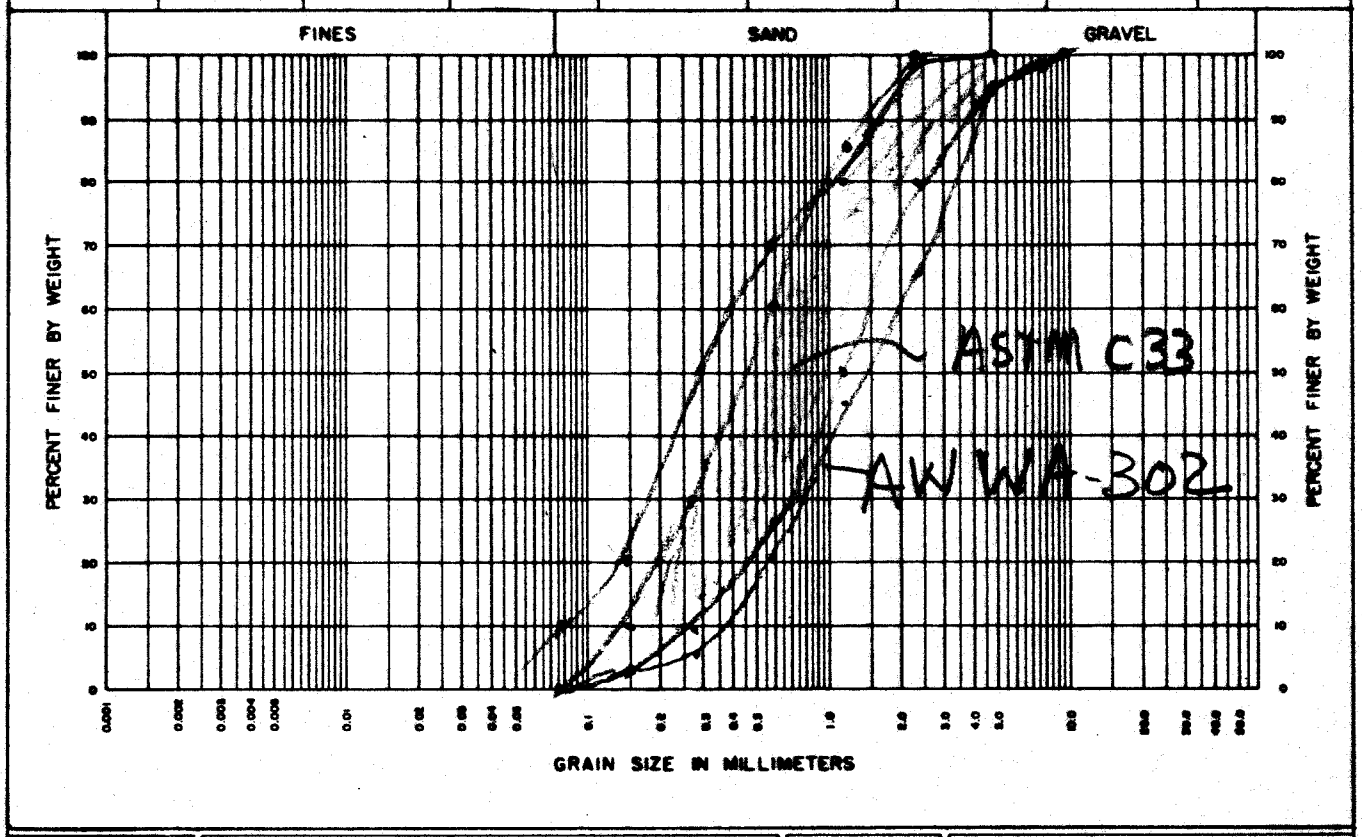
MATERIALS TESTING SECTION REPORT	EWP-5 (10-20-56) Portland, Oregon	SOIL CLASSIFICATION

PROJECT		LOCATION
FIELD SAMPLE No.	TYPE of SAMPLE	ORIGIN
PROPOSED USE	TESTING SECTION SAMPLE No.	SUBMITTED BY

1: SYMBOL	2: DESCRIPTION

3: GRAIN SIZE DISTRIBUTION

D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	$D_{MAX.}$	C_u	C_c



4: SPECIFIC GRAVITY	5: ATTERBERG LIMITS						6: TOTAL SALTS	7: UNDISTURBED CONDITION	
	UNDISTURBED		AIR DRY		OVEN DRY			MOISTURE	UNIT WEIGHT
G	LL	PI	LL	PI	LL	PI	%	%	lb/ft³

8: REMARKS

U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING and WATERSHED PLANNING UNIT PORTLAND, OREGON	SIGNATURE	
	TITLE	DATE

M-2069

7-0-14820-L

141

3'1

20

Vineyard Road

Collapsable Matl

Investigation

on

Foundation Shelf

11-1-67

B. Mildner

	Vineyard		Road	Cut	
Sta.	Depth	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
288	6.0+			6.0	
287	6.0+			6.0	
286	6.0+ gravel			6.0	
285	6.0+ shale not good			6.0	
284	6.0+	✓ ✓	✓	6.0	
283	4.0 gravel			4.0	
282	4.0	gravel		4.0	
281	4.0			4.0	
280	3.0			5.0	
279	6.0+			6.0	
278	3.0			5.0	
277	2.0			5.0	
276	5.0			5.0	
275	2.0			5.0	
274	6.0+			6.0	
273	6.0+			6.0	
272	5.5			5.5	
271	6.0			6.0	
270	5.0			5.0	
269					
268					
267					
266					
SCS-29 (3-60)				GPO : 1960 OF—550816	

20 SEPT 67

VINEYARD RD

DEPTH OF COLLAPSABLE SOIL IN SHELF AREA

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
320+13	0.5			2.0	
319	1.0			2.0	
318	2.5			2.5	
317	1.0			2.0	
316	1.5			2.0	
315	0.5			2.0	
314	1.5			2.0	
313	0.5			2.0	
312	0.5			2.0	

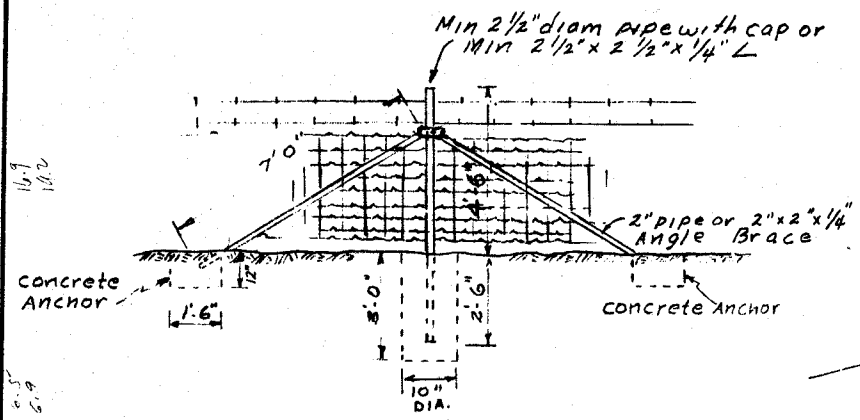
SCS-29 (3-60) GPO : 1960 OF—550816

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
349	1.5	very weak		2.0
350	3.0	gravel		3.0
351	6.0+			6.0
351+48	6.0+			6.0
353	2.0			3.0
354	3.5	gravel		3.5
355	2.0			3.0
356	3.0			3.0
357	4.0			4.0
358	5.0			5.0
359	5.0	gravel		5.0
360	5.0+			5.0
361	4.0	gravel		5.0
362	5.0	gravel		5.0
363	5.0	gravel		5.0
364	5.0+			5.0
365	3.5			5.0
366	4.5	gravel		4.5
325	1.0			2.0
324	0.5			2.0
323	0.5			2.0
322+33	0.5			2.0
32+33	1.0			2.0

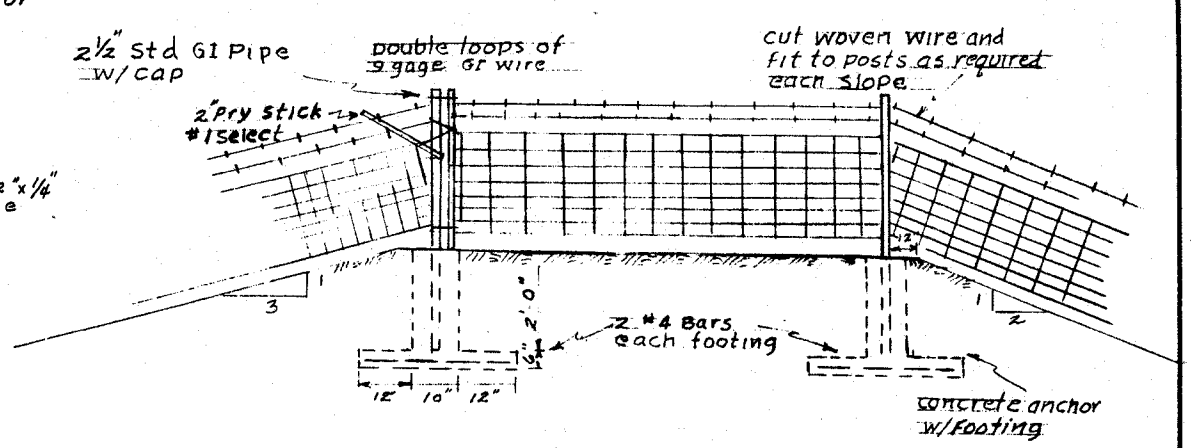
SCS-29 (3-60) GPO : 1960 OF—550816

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
326	1.5			2.0	
327	1.5			2.0	
328	5.0	gravel		5.0	
329	2.0			5.0	
330	2.5			5.0	
331	3.5			4.0	
332	1.5			5.5	
333	6.5+			6.5	
334	2.0			2.0	
335	1.0			2.0	
336	0.5			2.0	
337	0.5			2.0	
338	1.5			2.0	
339	0.5			2.0	
340	0.5			2.0	
341	1.0			2.0	
342	1.0			2.0	
343	1.0			3.0	
344	7.0+			7.0	
345	1.0			6.5	
346	6.5+			6.5	
347	1.5			2.0	
348	1.5			2.0	

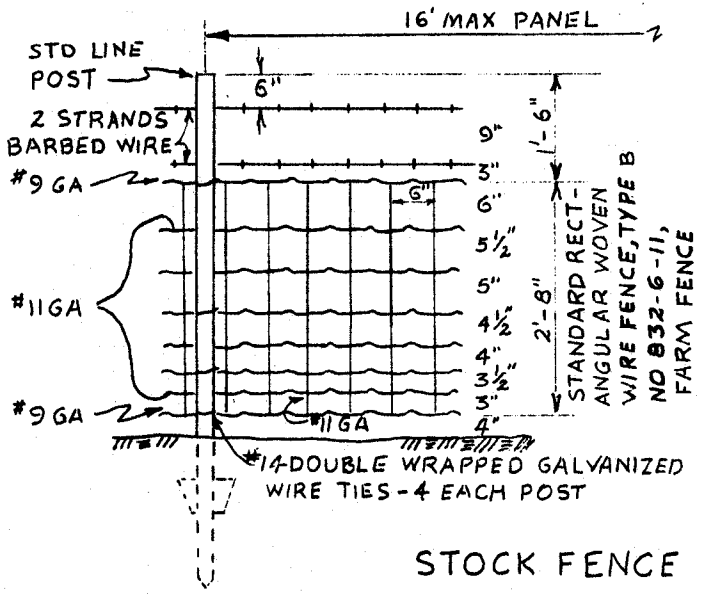
SCS-29 (3-60) GPO : 1960 OF—550816



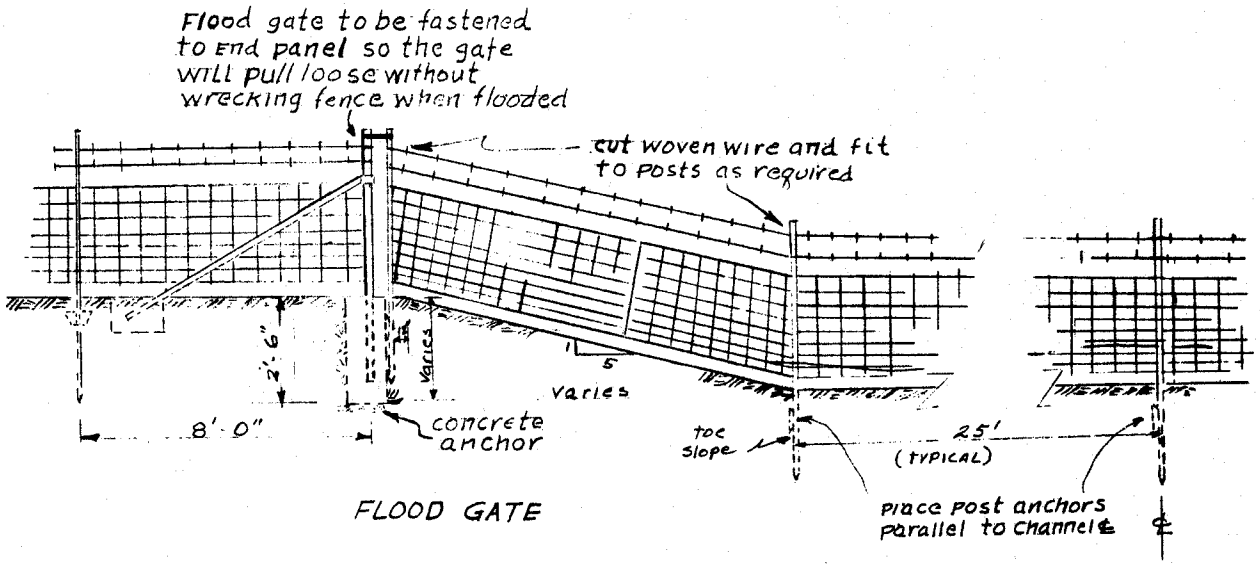
PULL POST ASSEMBLY
Maximum spacing 660'



WIRE GATE



STOCK FENCE



FLOOD GATE

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
DESIGNED BY (WW) RMA	APPROVED BY
CHECKED BY RMA	DRAWING NO.
DATE: 7/28/67	SHEET 26 OF 26

Form SCS-313A (March 1957)

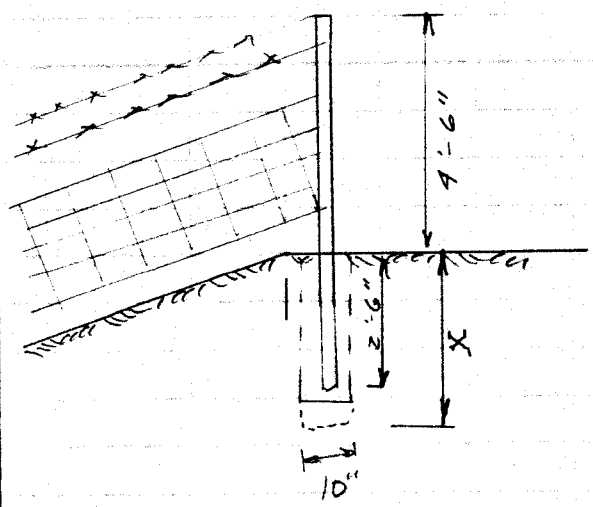
U. S. GOVERNMENT PRINTING OFFICE : 1957 O - 425475

148

Ariz
RA 9-67

Vineyard Road Dam

Fence Gate Footing



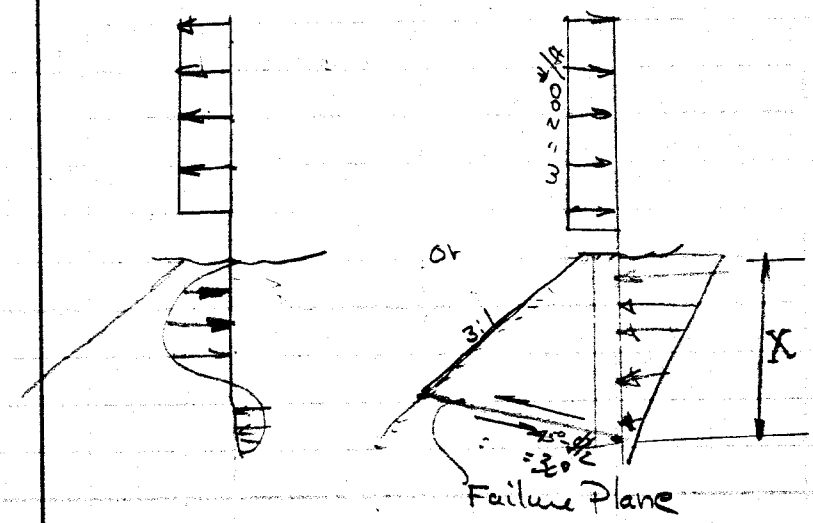
Assume 200#/ft pull

Dry strength: $\phi = 35°$ $\gamma = 125$#
wet strength: $\phi = 30°$

Assume dry Cond.

Width of block = 10"

$N_\phi = \tan^2(45° + \phi/2)$
$= 3.7$



$R = \gamma X N_\phi = 125 \times X \cdot 3.7 \times \frac{10}{12} = 4.5(200) = 900$

$X = \frac{900}{386} = 2.34$ ft. $< 2.5'$

Use 3'-0"

Profile on Gated Outlet
Str. on Vinyard Rd. Dam
Williams - Chandler W.P.P.

8 VINEYARD ROAD DAM - DESIGN PROFILE
GATED OUTLET STRUCTURE - @ STA 321+50

STA	(+)	H.I.	(−)	ELEV.
B.M. →				1561.02
	5.65	1566.67		
7+50			3.8	62.9
8+00			4.1	62.6
9+00			4.7	62.0
10+00			5.4	61.3
10+80			6.3	60.4
12+00			7.2	59.5
13+00			8.0	58.7
14+00			9.2	57.5
15+00			9.7	57.0
B.M. →			5.65	61.02

20-JUNE-1967
CLOUDY - HOT - BREEZE

HARRIS
RUTLEDGE
WARE
CUTTER

8

CONC. MON. @ P.C. 320+33.66

SHOTS TAKE @ RT. ∠'S TO ℄ DAM —

SHOTS TAKE IN FLOW LINE OF NATURAL WATER COURSE —

CONC MON. @ P.C. 320+33.66 —

Note:
Sta 10+00 = Sta 321+50 on ℄ of Dam

7 VINEYARD ROAD DAM - PROFILE DESIGN
FORGATED OUTLET STRUCTURE - STA 276+80

20-JUNE-1967
CLOUDY - WARM - QUIET

* HARRIS
¢ RUTLEDGE WARE
CUTTER

7

STA	(+)	H.I.	(-)	ELEV.	
B.M. →				1564.80	
	5.78	1570.58			
7+50			3.5	67.1	
8+00			3.8	66.8	
9+00			4.0	66.6	
10+00			6.5	64.1	
10+80			6.9	63.7	
12+00			6.9	63.7	
13+00			7.0	63.6	
14+00			7.8	62.8	
15+00			8.5	62.1	
B.M. →			5.90	1564.68	CORR. EL 1564.71

CONC. MON. @ 275+00 -

SHOTS TAKEN RT. X'S TO ℄ DAM.

~~ALL~~ SHOTS TAKEN IN FLOWLINE OF NATURAL WATER COURSE -

CONC. BENCH MON. @ 270+00 -

Note:
Sta. 10+00 = 276+80 on ℄ of Dam

VINEYARD ROAD DAM - DESIGN PROFILE

GATED OUTLET STRUCTURE - @ STA 252+00

STA ~~H.I.~~ →	(+)	H.I.	(−)	ELEV.
B.M. →				1564.38 ~~1568.49~~
	5.44	1569.82		
7+50			4.5	65.3
8+00			4.7	65.1
9+00			5.0	64.8
10+00			5.4	64.4
10+50			5.5	64.3
12+00			6.9	62.9
13+00			8.5	61.3
14+00			9.4	60.4
15+00			10.0	59.8
B.M. →			5.59	64.23

9-JUNE-1967
LOUDY - HOT BREEZE

HARRIS
WARE
RUTLEDGE
CUTTER

CONC. MON. @ P.C. 252+05.82 -

SHOTS TAKEN RT. ∡'S TO ℄ DAM -

SHOTS TAKEN IN FLOW LINE OF NATURAL WATER COURSE -

CONC. MON. @ 250+00 -

Note:
Sta 10+00 = 252+00 on ℄ of Dam.

5 VINEYARD ROAD DAM - DESIGN PROFILE

GATED OUTLET STRUCTURE @ STA 152+40

STA	(+)	H.I.	(−)	ELEV.
B.M. →				1563.14
	7.14	1570.28		
7+50			4.9	65.4
8+00			5.4	64.9
9+00			6.0	64.3
10+00			6.1	64.2
10+80			9.2	61.1
12+00			10.2	60.1
13+00			11.4	58.9
14+00			12.9	57.4
15+00			14.0	56.3
B.M. →			3.12	67.16

JUNE-19-1967

CLOUDY - HOT - HUMID - BREEZE

WHITE
DELONEY
CUTTER

5

CONC. MON. @ 150+00 —

SHOTS TAKEN RT & TO ℄ DAM

SHOTS TAKE IN FLOW LINE OF NATURAL WATE COURSE —

CONC. MON. @ 155+00 —

Note:
Sta 10+00 = Sta 152+40 on ℄ of Dam

154

4 VINEYARD ROAD DAM – DESIGN PROFILE

GATED OUTLET STRUCTURE @ STA 129+35

STA	(+)	H.I.	(–)	ELEV.
B.M. →				1563.51
	6.19	1569.70		
7+50			4.3	65.4
8+00			4.5	65.2
9+00			4.5	65.2
10+00			5.9	63.8
10+80			10.1	59.6
12+00			12.0	57.7
13+00			14.1	55.6
14+00			15.0	54.7
15+00			15.6	54.1
B.M.			5.23	64.47

19-JUNE-1967
CLOUDY-HOT-HUMID-QUIET

WHITE
DELONEY
CUTTER

4

CONC. MON. @ STA 130+00

SHOTS AT RIGHT ∡ TO ℄ DAM –

SHOTS TAKEN IN NATURAL WATER COURSE FLOW LINE –

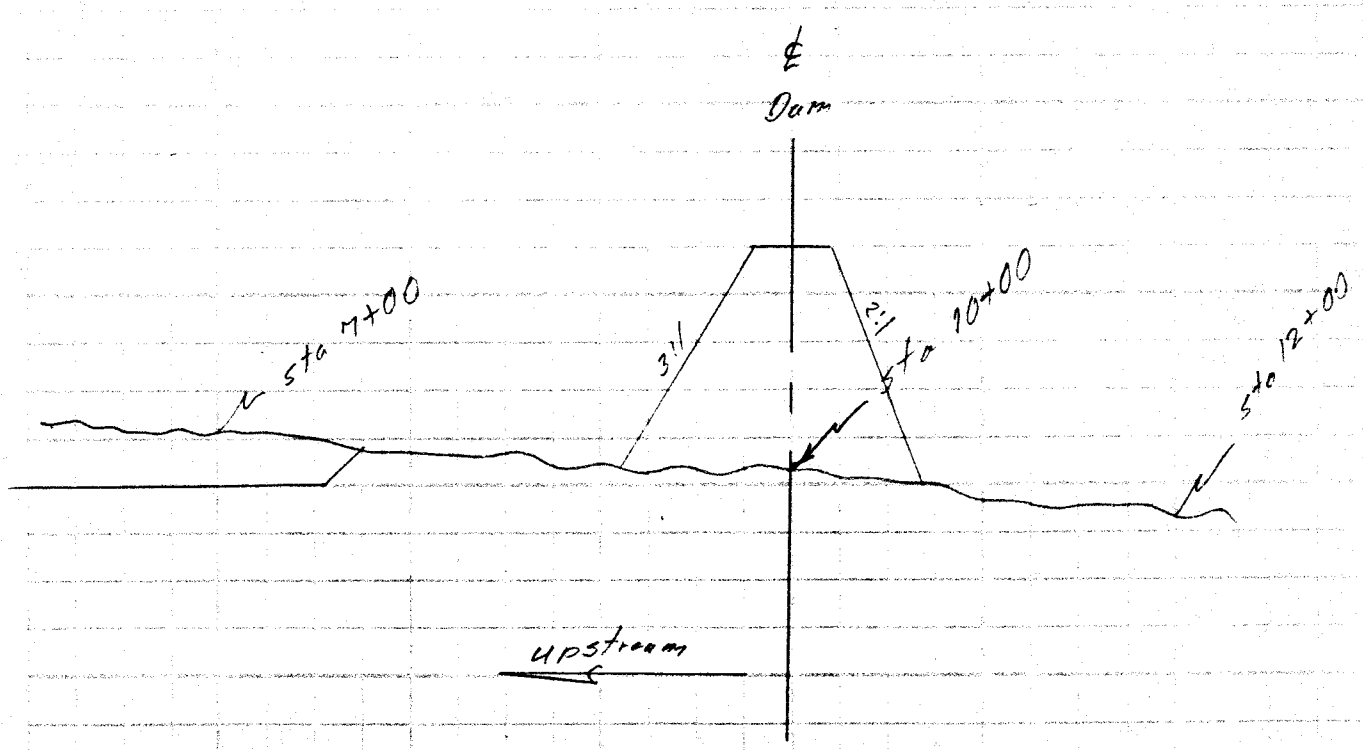
CONC. MON. @ 125+00

Note:
Sta 10+00 = Sta 129+35 on ℄ of Dam

To: Ralph Arrington
Design Section

from: Watershed Div.
Apache Jct. Ariz.

1500
7+50
7+50



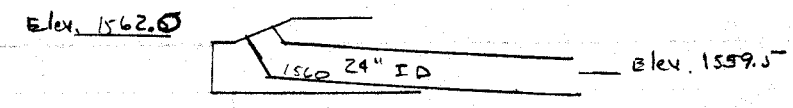
Typical Layout

Vineyard Road

RA 9-67

Air Demand - Gated Outlets

Max. W.S. = 1575.5



Area = 3.14 ft²

Dia = 2.0 ft

C_D = .6

Check @ 80% gate opening

depth of flow = 80% x .6 x 2 = 0.96 ft. or 48%

Effective head - H = 1575.5 − (1560 + .96) = 14.54 ft.

Water Discharge - $Q = CAV = .475(3.14)\sqrt{64.4(14.54)}$ 936

From ES-97 $\frac{a}{D^2} = .373$ $a = .373(4) = 1.49$

Q_w = 45.7 cfs.

$V = \frac{Q}{A} = \frac{45.7}{1.49} = 30.6$ '/sec

$F = \frac{V}{\sqrt{gy}} = \frac{30.6}{\sqrt{32.2 \times .96}} = 5.5$ 5.56

$(F-1) = 4.5$

Design Chart CoE - 050-2

$\beta = .155$

$Q_a = \beta Q_w = .155(45.7) = 7.08$ cfs.

$\frac{100 \cdot 5280}{3600}$

Allow Max V_a = 150'/sec

$A_v = \frac{7.08}{150} = .047$ ft² or 0.68 in²

Dia for Air Vents 0.86 in say 1 inc

Arizona State Office
August 21, 1967

Robt. J. Cavallo, Acting State Administrative Officer
SCS, Phoenix, Arizona

Ralph M. Arrington, Head, Design Unit
SCS, Phoenix, Arizona

ENG - Construction Equipment, Ashton Co. - FCD #3, Vineyard Road Structure

In my trip report addressed to the files, dated April 25, 1967, I included the inspection of earth-moving equipment owned by the Ashton Construction Company.

I would like to restate that the Ashton Construction Company has the types and quantities of equipment capable of and satisfactory for completing the Vineyard Road Structure.

cc to:

M. E. Strong, Asst. State Conservationist-
Watersheds
J. J. Turner, State Conservation Engineer
Geo. N. England, Project Engineer

RMA:cw

Letterer equip -

36,540

Arizona State Office
August 18, 1967

Gerald B. Welsh, Staff Leader
River Basin-Watershed Planning
SCS, Phoenix, Arizona

J. J. Turner, State Conservation Engineer
SCS, Phoenix, Arizona

ENG - Vineyard Road Dam, Foundation Evaluation - Scheduling of Geologist

The contract for construction of the Vineyard Road Dam is expected to be awarded during the first week of September, 1967. We anticipate construction work to begin September 18, 1967.

In order to keep ahead of the contractor in the foundation work we would like to schedule Bill Mildner, Geologist, one day during the week of September 18 and for a full week beginning October 16th to evaluate the foundation for cutoff depth and settlement prevention.

Your consideration of the above schedule is appreciated.

cc to:
R. M. Arrington, Design Unit
Geo. England, Project Engineer

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO : 1958 O—470666

STATE	PROJECT		
Arizona	Williams-Chandler WS Supplement		
BY JPC / DATE 5/26/67	CHECKED BY	DATE	JOB NO.
SUBJECT Table 4 Revised			SHEET ____ OF ____

Evaluation unit	Amortization Installation Cost		Operations & Maintance	Rounded	total
FRS	nearest 10				
Rittenhouse $879,390	$ 33,370 lumped	463,690	2,272	2,270	35,640
Vineyard 1,191,560	45,220	630,730	3,090	3,090	48,310
Pipes- 17,540	660	14,620	72	70	730
43,850	1,660	36,540	179	180	1,840
Floodways					
Rittenhouse 18,930	7,720		384	380	1,100
Vineyard Floodway 9,650	370		185	190	560
RWCD 816,000	30,970		13,421	13,420	44,390
Irrig Features 10,100	380		38	40	420
Σ 2,987,020	113,350		19,641	19,640	132,990
x(0.03795) =	113,357.41		19,640		
	use 113,360	use	19,640		use 133,000

Avg ANN Cost 133,000

O&M long time basis (0.98)

Factor FRS, Pipes, Irrig Str } (0.005)(0.98) = 0.0049

RWCD, Floodways } (0.030)(0.98) = 0.0294

3270
90
3360
43500

O&M cost = Const cost x factor.

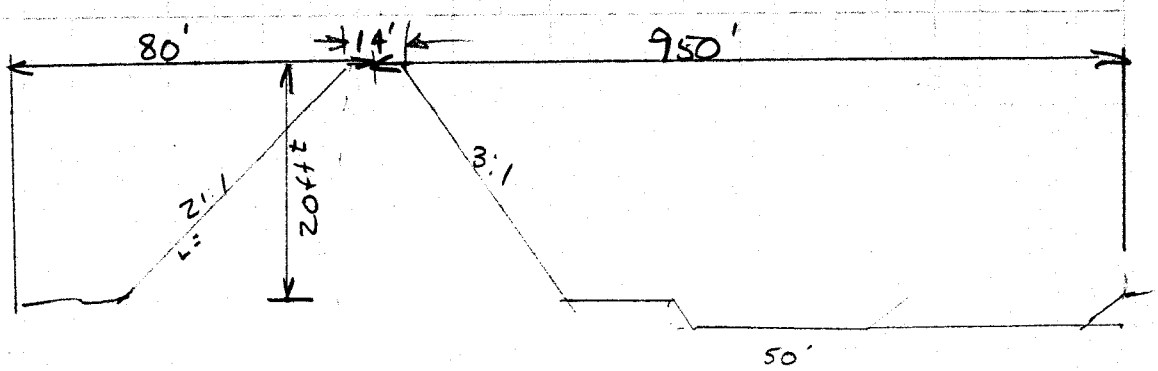
Ariz
RA 7-67

Wm Chandler - WPP

Vineyard Road FRS

Fence Replacement

Determine lineal feet of fence within R/W.



1600
400
2000

3600
400
4000

Length = (80-47) + 44.7 + 14 + 63.3 + (950 - 67) = 1038 ft.

4 fences = 4(1038) = 4152 ft.

Arrington
~~[illegible]~~
Burdick

Arizona State Office
6029 Federal Building
Phoenix, Arizona 85025

July 14, 1967

Mr. Wendell G. Swank
Director, Arizona Game & Fish Department
120 Arizona State Building
1688 West Adams Street
Phoenix, Arizona 85007

Dear Mr. Swank:

Invitations to bid for the Vineyard Road Dam were issued by the Maricopa County Flood Control District on July 12, 1967. In accordance with your suggestion outlined in your letter dated April 5, 1967 we have included in the Special Provisions for that project the following item:

Item 7 - Placement of Woody Vegetation (trees):

"In order to enhance the habitat for small game, all large, woody vegetation (trees) from adjacent clearing operations is to be placed in loose piles downstream of the toe of the structure at locations specified by the Contracting Officer. Such locations (10 minimum) will be staked and clearly marked prior to the clearing operations."

The cost for the work to be performed is included in the "Clearing and Grubbing" bid item.

We would like to proceed with the staking of the specified locations prior to July 26, 1967, when we will hold our first showing of the site to interested contractors. We believe a more reasonable bid will be submitted for the clearing item if the extent of this work is clearly understood.

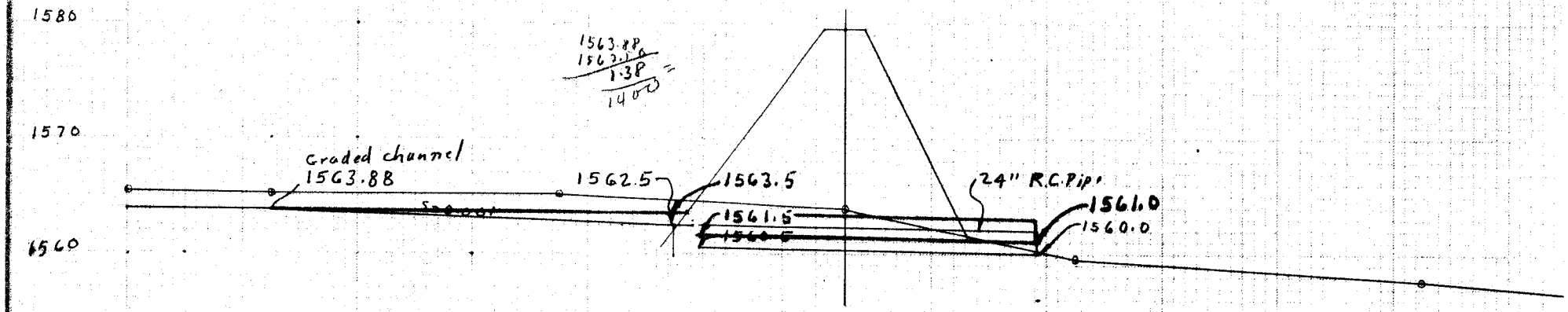
I understand that tentative arrangements have already been discussed with Mr. Donald Vance, Wildlife Manager, and Mr. Dick Endress, Land & Water Projects Specialist, of your staff and Mr. George England, Project Engineer and our Government Representative. I trust that their continued cooperation meets with your approval.

Very truly yours,

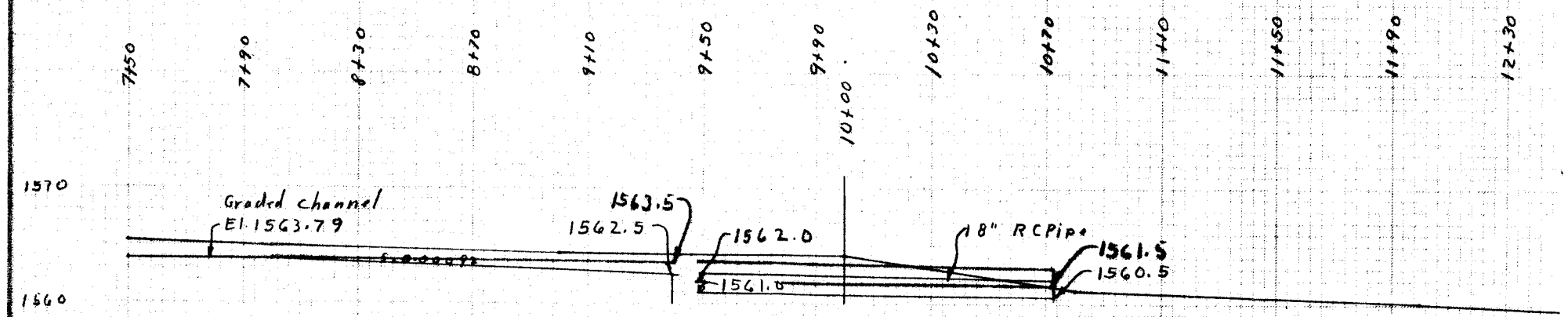
P.T.O.

For: M. D. Burdick
State Conservationist

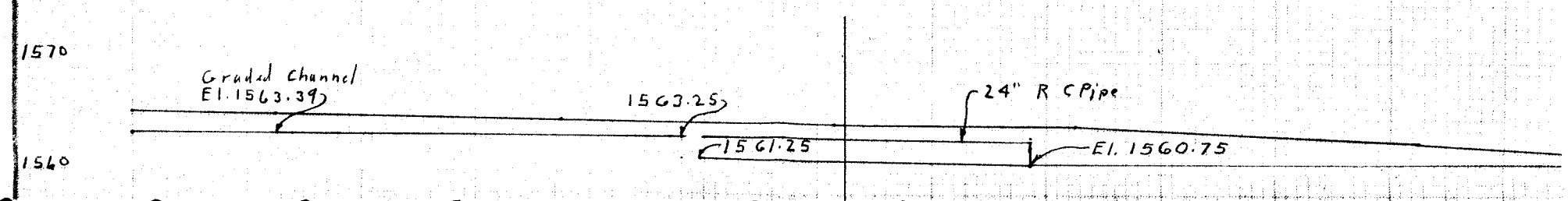
cc to:
Col. John C. Lowry
Gen. Mgr. & Chief Engr.
Maricopa County FCD
George England
J. J. Turner
L. A. Hill
RMA:cw



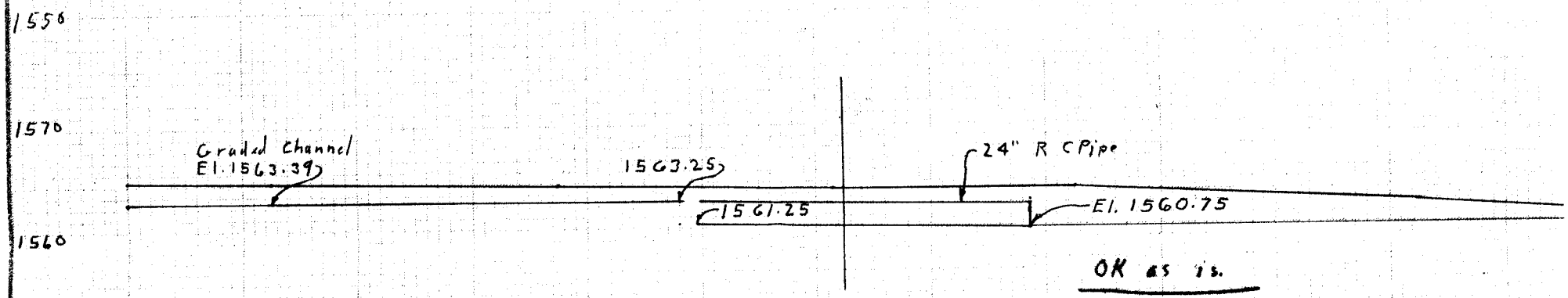
OUTLET AT STA. 129+35



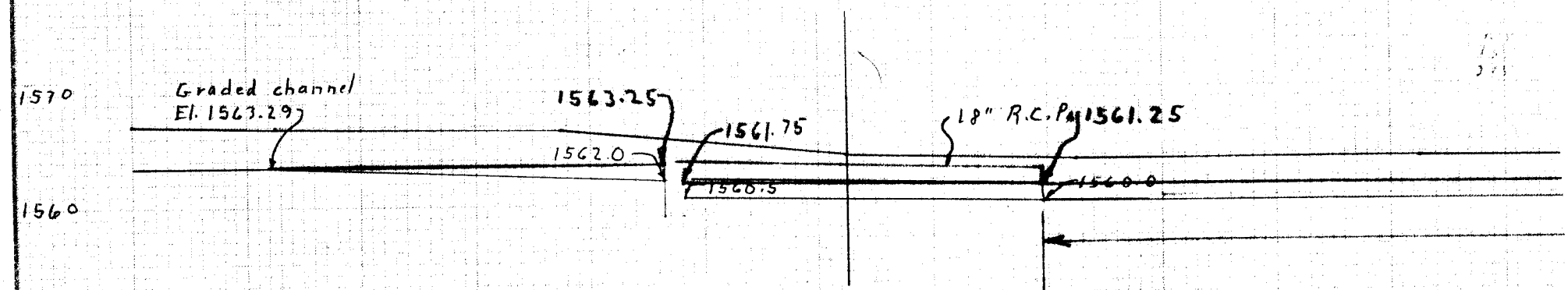
OUTLET AT STA 152+40



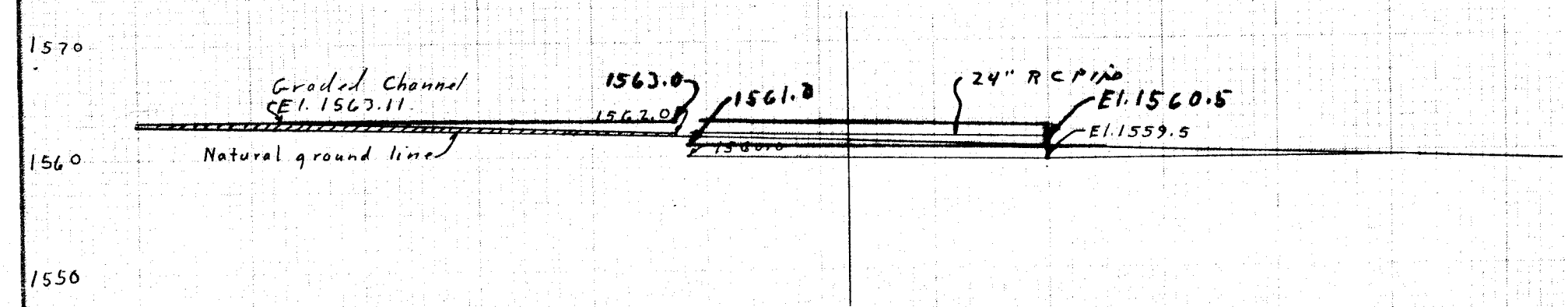
OUTLET AT STA 152+40



OUTLET AT STA. 252+00



OUTLET AT STA 276+80



OUTLET AT STA. 321+50

Arizona Vineyard Rd. Dam

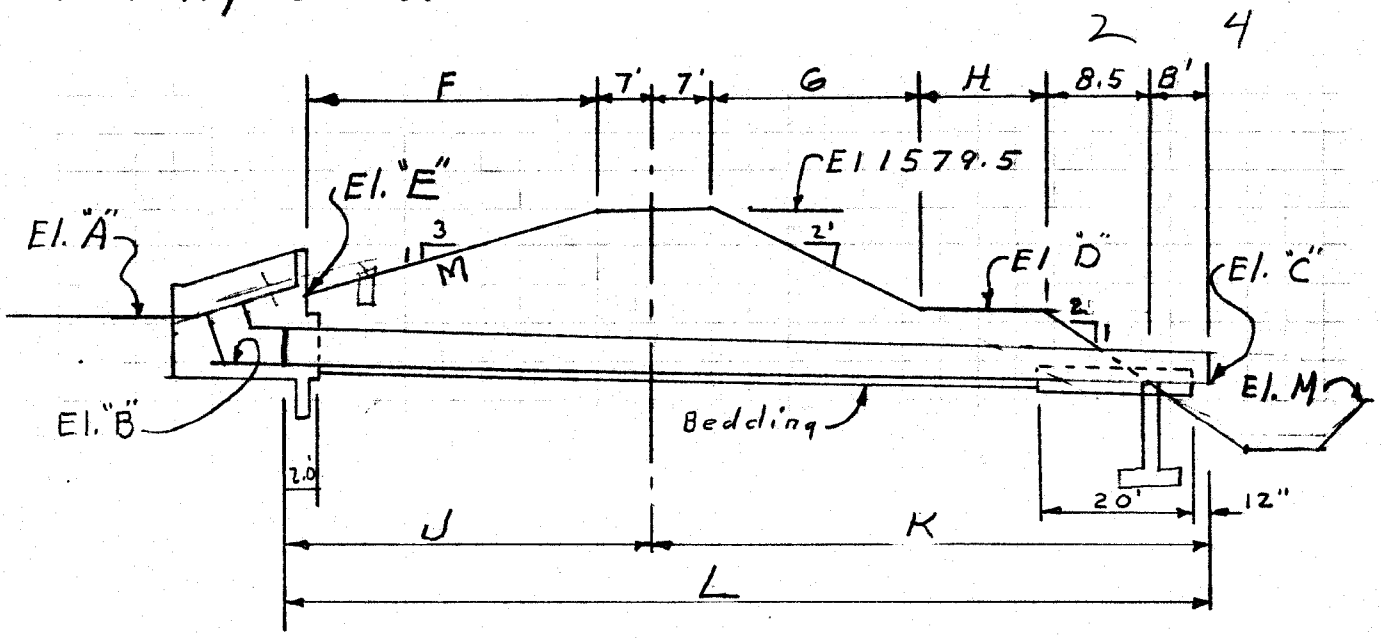
G. Hanley 5-19-67

Location & Elev. of gated outlets

	Sta.	Min Borrow Ch. El.	Size Pipe	"A" Inlet Apron El.	"B" Inlet Invert	"C" Outlet El.	"D" Berm El.	"E" Inlet Hd.wl. El.
4'	129+60	1563.88	24"	1563.5	1561.5	1561.0	1564.25	1564.31
2'	152+50	1563.79	18"	1563.5	1562.0	1561.5	1564.25	1563.47
3'	252+00 ~~251+50~~	1563.39	24"	1563.25	1561.25	1560.75	1565.00	1565.06
4.5'	292+00	1563.23	18"	1563.25	1561.75	1561.25	1565.00	1564.22
2'	321+50	1563.11	24"	1567.0	1561.0	1560.5	1564.75	1564.81

Arizona Vineyard Rd. Dam

G. Hanley 5-19-67

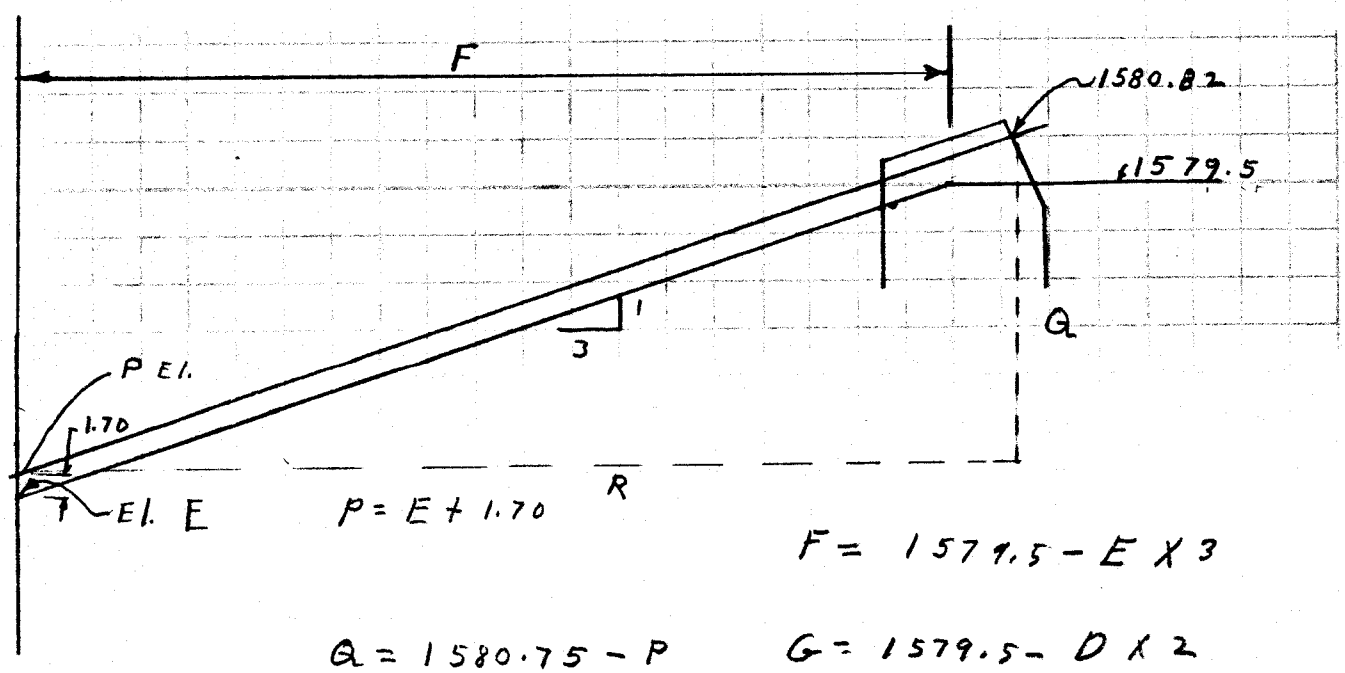


M	Sta.	F	G	H	M	J K	K K	L * M	Length Bedding
48.03	129+60	42.57, ~~45.57~~	28.50 ~~30.50~~	13.43 ~~12.43~~	1558.0	49.57 ~~53.57~~	65.43 ~~66.43~~ ~~67.0~~	114.00 ~~120.00~~	97.0'
50.07	152+50	45.09 ~~48.09~~	28.50 ~~30.50~~	12.91, ~~13.91~~	1559.5	52.09 ~~56.09~~	64.91 ~~67.91~~ ~~67.00~~	116.00 ~~124.00~~	101.0'
45.66	251+50	43.32	29.00	12.18	1560.75	51.32	64.68 ~~65.50~~	116.00	93.0'
52.27	292+00	45.84 ~~49.59~~	29.00 ~~31.50~~	13.66 ~~13.41~~	1558.0	52.34 ~~57.59~~	66.16 ~~68.41~~ ~~68.00~~	118.00 ~~126.00~~	103.0'
49.62	321+50	44.07 ~~47.07~~	29.50 ~~31.50~~	12.93 ~~13.93~~	1557.5	51.07 ~~55.07~~	65.93 ~~69.93~~ ~~68.00~~	116.00 ~~124.00~~	101.0'

* Round off to nearest even feet, correct H & K

Length of bedding = L - 23'

Cutoff collars minimum $\frac{37 \times 0.075}{2} = 3.26$ use 4 on all



$P = E + 1.70$

$F = 1579.5 - E \times 3$

$Q = 1580.75 - P$

$G = 1579.5 - D \times 2$

$R = Q \times 3$

Length of stem $M = \sqrt{R^2 + Q^2} + 7.0' \pm$ round up to nearest ft.

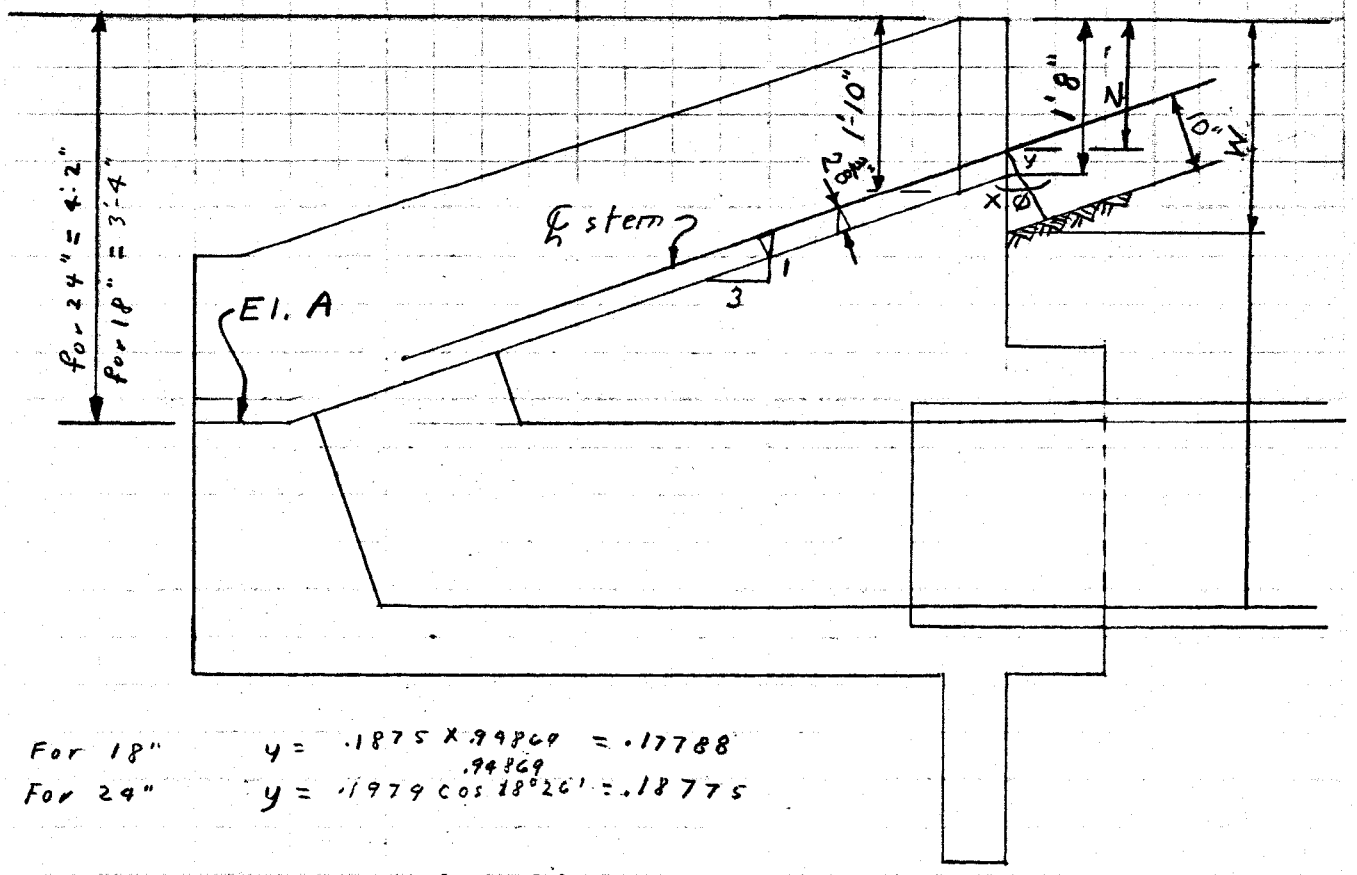
1	2	3	4	5	6	M
Sta	P	Q	R	$Q^2 + R^2$	$\sqrt{5}$	$6 + 7.0' \pm$
129+35	1567.0	13.82	41.46	1909.924	43.70	51.
152+40	1566.17	14.65	43.95	2146.225	46.33	54
252+00	1566.76	14.06	42.18	1976.836	44.46	52
276+80	1565.92	14.90	44.70	2220.10	47.12	54'
321+50	1566.51	14.31	42.93	2042.76	45.25	53'

1579.5-E	F	1579.5-D	G
14.19	42.57	14.25	28.5
15.03	45.09	14.25	28.5
15.28	45.84	14.50	29.0
14.69	44.07	14.75	29.5

Arizona Vineyard Rd Dam

G. Hunter 6-19-67

3 4



For 18" $y = .1875 \times .94869 = .17788$

For 24" $y = .1979 \cos 18°26' = .18775$

$\tan\phi = \frac{1}{3} = 0.33333 = 18°26''$

$x = \frac{.83333}{\cos 18°26''} = 0.87840$

.94869 +

z for 24" = 1.66667 − 0.18775 = 1.47892

z for 18" = 1.66667 − 0.17788 = 1.48879

W for 24" = 1.47892 + 0.87840 = 2.35732

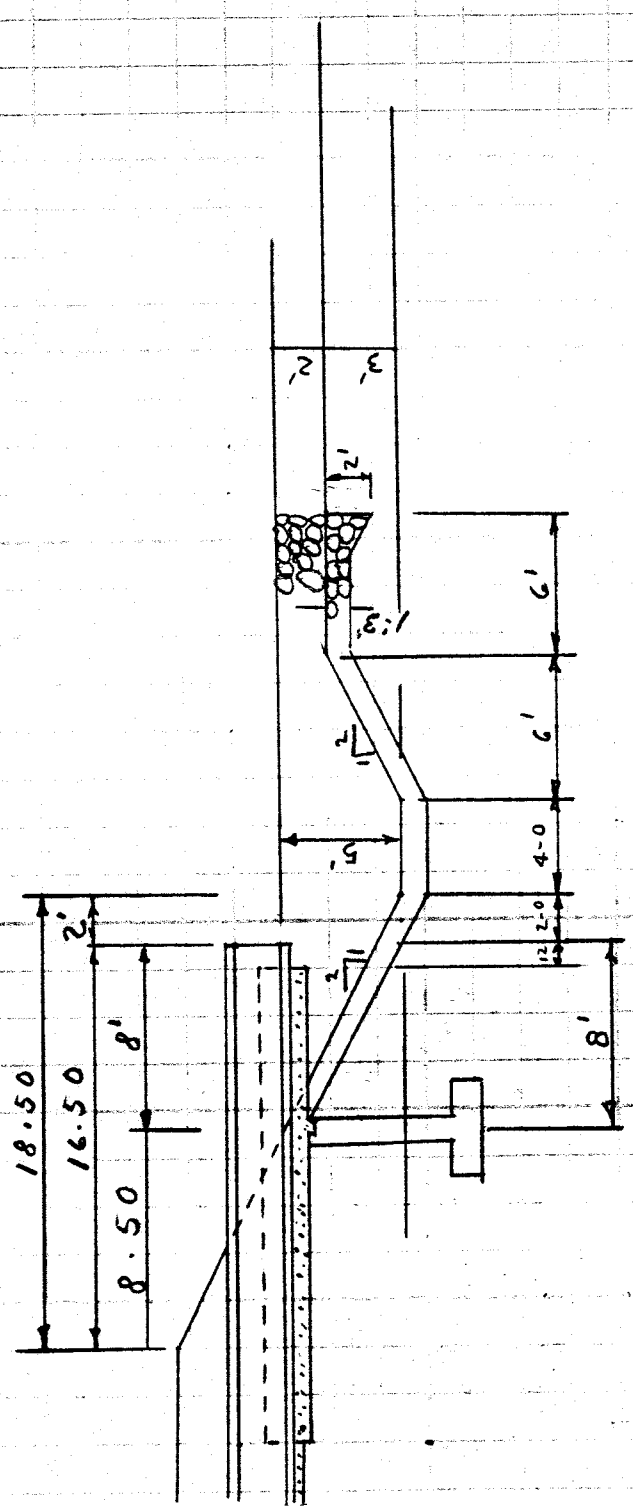
W for 18" = 1.48879 + 0.87840 = 2.36719

96 C-8515

Arizona Vineyard

C. Hartley 5-19-67

4 4



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copy to ~~Phil~~ Robt.
7-28-67

Rev. 7/26/67

BID SCHEDULE

WILLIAMS-CHANDLER WATERSHED

VINEYARD ROAD FLOODWATER RETARDING STRUCTURE

Item No.	Work or Material	Spec. No.	Quantity	Unit	Unit Price	Amount
1.	Clearing & Grubbing	2	685	Acre	$ 30.00	$ 20,550.00
2.	Excavation Channel	4A	120,275	cu.yd.	$ 0.30	$ 36,082.50
3.	Excavation Trench	4A	310,391	cu.yd.	$ 0.30	$ 93,117.30
4.	Excavation Structure	4A	468	cu.yd.	$ 4.00	$ 1,872.00
5.	Earthfill Embankment	5A	1,154,394	cu.yd.	$ 0.35	$ 404,037.90
6.	Structure Backfill	5A	93	cu.yd.	$ 5.00	$ 465.00
7.	Concrete	8B	209	cu.yd.	$ 75.00	$ 15,675.00
8.	Cement	8B	314	bbls.	$ 5.00	$ 1,570.00
9.	Reinforcing Steel	9	13,840	lbs.	$ 0.18	$ 2,491.20
10.	Reinforced Concrete Pipe 54"	11	100	ft.	$ 50.00	$ 5,000.00
11.	Reinforced Concr. Pipe 24"	11	330	ft.	$ 35.00	$ 11,550.00
12.	Reinforced Concr. Pipe 18"	11	230	ft.	$ 30.00	$ 6,900.00
13.	Corrugated Metal Pipe 24"	12	26	ft.	$ 12.00	$ 312.00
14.	Trash Rack	14	1	each	$ 2000.00	$ 2,000.00
15.	Rock Riprap	17	355	cu.yd.	$ 7.00	$ 2,485.00
16.	Slide Gate 24"	18	3	each	$ 500.00	$ 1,500.00
17.	Slide Gate 18"	18	2	each	$ 500.00	$ 1,000.00
18.	Fences	21	4,152	ft.	$ 0.50	$ 2,076.00
				TOTAL		$ 608,683.90
				Contiquency @ 10%		60,868.40
						$ 669,552.30

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ARIZONA STATE OFFICE
BY_____ DATE_____
✓BY JR DATE / /

BID SCHEDULE

STRUCTURE Vineyard Road w/o Gates

Item No.	Work and Material	Quantity	Unit	Unit Price	Amount
1	Clearing & Grubbing	685	Ac.	$ 30.00	$ 20,550 JR ~~2055~~
2	Excavation Channel	120,275	c.y.	.30	36,082.5
3	" Trench	308,495	cy.	.30	92,548.5
4	" structure	380	cy.	4.00	1,520
5	Earthfill Embankment	1,149,785	cy	.35	402,424.75
6	Structure Backfill	53	cy.	5.00	265.0
7	Concrete	121	cy.	75.00	9,075.0
8	Cement	182	Bbls	5.00	910.0
9	Reinforcing Steel	8410	lbs	.18	1513.8
10	Reinforced Concrete Pipe 54"	100	ft.	50.00	5000.0
11	" " " 24"	–		–	
12	" " " 18"	–		–	
13	Corrugated Metal Pipe 24"	26	ft.	12.00	312.0
14	Trash Rack	1	ea.	2000	2000.0
15	Rock Rip Rap	170	cy	7.00	1,190.0
16	Slide Gate 24"	–	–	–	
17	Slide Gate 18"	–	–	–	
					~~573,571.5~~
				$	~~557,896.5~~
				+10% Cont.	~~55,489.6~~
				$	~~610,386.2~~
					630,730.1

Sta 129+60 - 24"
152+50 - 18" GATED Outlets ONLY
251+50 24"
292+00 18"
321+50 24"

ARIZONA STATE OFFICE
BY _____ DATE _____
VBY _____ DATE _____

BID SCHEDULE

STRUCTURE VINEYARD ROAD FRS

Item No.	Work and Material	Spec. No.	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	2	None	—		
2	Excavation Channel	4A	Incl in Borrow for Dam	—		
3	Excavation Trench	4A	1438 458 = 1,896	cy	.30	568.80
4	Excavation Structure	4A	42.7 45.6 88	cy	4.00	352.00
5	Earth Fill Embankment	5A	Ramps - 2800 Exc. Twr 1809 4609	cy	.35	1613.15
6	Structure Backfill	5A	40	cy	5.00	200.00
7	Concrete	8B	88	cy	75.00	6,600.00
8	Cement	8B	132	Bbls	5.0	660.00
9	Reinforcing Steel	9	5430	lbs	.18	977.40
10	Reinforced Concrete Pipe 54"	11	—			
11	Reinforced Conc. Pipe 24"	11	330	ft	35.00	11,550.00 ~~15,500~~
12	Reinforced Conc. Pipe 18"	11	230	ft	30.00	6900.00
13	Corrugated Metal Pipe 24"	12	—			
14	Trash Rack	14	—			
15	Rock Rip Rap	17	185	cy	7.00	1295.00
16	Slide Gate 24"	18	3	ea	500	1500.00
17	Slide Gate 18"	18	2	ea	500	1000.00
						~~33,216.35~~
						~~37,166.00~~
					10%	3717
						36,537.99
					$	~~40,883~~
						~~40,800~~ use 36,540

ARIZONA STATE OFFICE
BY RA DATE 5-25-67
✓BY JPC DATE 5/25/67

BID SCHEDULE

STRUCTURE Vineyard Road Flood Retarding Structure

Item No.	Work and Material	Spec. No.	Quantity	Unit	Unit Price	Amount
1	Clearing & Grubbing	2	685	Ac.	$ 30.00	$ 20,550 JP ~~2055~~
2	Excavation Channel	4A	120,275	cu.yds.	0.30	36,083
3	Excavation Trench	4A	310,391	cu.yd.	0.30	93,117
4	Excavation Structure	4A	468	cu.yd.	4.00	1,872
5	Earthfill Embankment	5A	1,154,394	cu.yd.	.35	404,038
6	Structure Backfill	5A	93	cu.yd.	5.00	465
7	Concrete	8B	209	cu.yd.	75.00	15,675
8	Cement	8B	314	Bbls	5.00	1,570
9	Reinforcing Steel	9	13,840	lbs	0.18	2,491
10	Reinforced Concrete Pipe 54"	11	100	ft.	50.00	5,000
11	Reinforced Concrete Pipe 24"	11	330	ft	35.00	11,550 JPC ~~11,500~~
12	Reinforced Concrete Pipe 18"	11	230	ft	30.00	6,900
13	Corrugated Metal Pipe 24"	12	26	ft	12.00	312
14	Trash Rack	14	1	ea	2000	2000
15	Rock Rip Rap	17	355	cu.yd.	7.20	2,415 JPC ~~2,585~~
16	Slide Gate 24"	18	3	ea.	500	1,500
17	Slide Gate 18"	18	2	ea.	500	1,000
	Check					$ ~~606,608~~ ~~592,163~~
	Gates 33,216.35 / 36,540 USE					
	Dam 573,391.55 / 630,730 USE			Contig.	10%	~~59216~~
	$ 606,607.90 / 667,270 CK O.K.					
	X1.10 = $ 667,268.69 CK O.K.					$ ~~651,379~~
	USE $ 667,270				FINAL	667,269 ~~651,379~~
						667,270

Use $

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Arlington

Arizona State Office
May 26, 1967

E. J. Core, Head, E&WP Unit
SCS, Portland, Oregon

M. D. Burdick, State Conservationist
SCS, Phoenix, Arizona

ENG - Construction Drawings, Vineyard Road Floodwater Retarding Structure, Williams-Chandler Watershed

In accordance with our telephone conversation of May 23, 1967 we are submitting the original tracings (Sheets 2-25) for the subject structure for your final review and approval. We are also submitting two copies of the final specifications for your files.

All items outlined in your design review report dated March 29, 1967 have been incorporated in the plans and specifications.

The original plans have been modified to include details for construction of gated outlets to furnish water to downstream stock ponds. Please review these details included on sheets 16, 17, 18, 19 and 20.

After necessary approval signatures have been placed please submit to the Cartographic Unit for printing. Our SCS - 19 requisition No. AZ-SO-75 dated May 25, 1967 has been forwarded to cartographic.

In order to complete a project agreement with the local sponsoring organization during the week of June 5th we are requesting that a high priority be given to this work. We are requesting printed copies from Cartographic by June 5th. Your help in meeting this deadline will be appreciated.

Murray Cox

Enclosures

Kottle

252-7111
Mar 278 3526

24" dia. class IV 0.01" crack 2,000 ultimate load 3,000 4,000 psi Conc.	With cradle American $5.50	Martin Marietta $8 25
24" dia. class V 0.01 crack 3,000 ultimate 3,750 6,000 psi Conc.	with bedding $8.00	$8.65
18" class IV	$4.50	4.75
18" class V	$5.50	$5.60

		Install
18" gate	100.00	500.00
24" gate	125.00	500.00
1½" stem/4 incl st		
30" Handwheel		

Arizona Vineyard Rd. Dam

G. Hanley

1 Sta 0	2 L_1 0	3 L_2	4 $\frac{L_2}{L_1}$	5 $(L_2/L_1)^2$	6 e	7 Drop col. 5 x 6
10	50	10	0.2	0.04	0.5	0.02
20	50	20	0.4	0.16	0.5	0.08
30	50	30	0.6	0.36	0.5	0.18
40	50	40	0.8	0.64	0.5	0.32
50	50	50	1.0	1.0	0.5	0.5

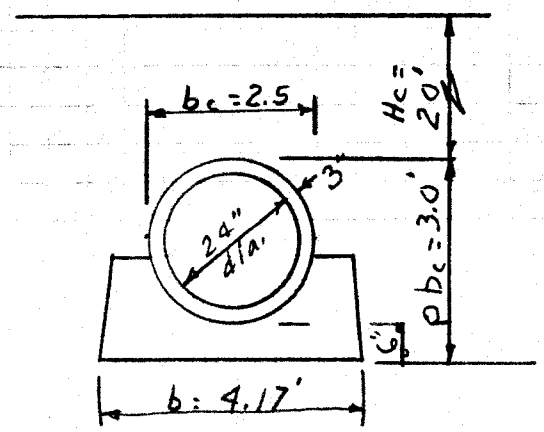
TABLE FOR PIPE CAMBER

Sta.	Drop in ft.	El.
K	0	"B"
K+10	0.02	"B"-0.02
K+20	0.08	"B"-0.08
K+30	0.18	"B"-0.18
K+40	0.32	"B"-0.32
K+50	0.50	"B"-0.50

Arizona Vineyard Rd. Dam

G. Hanley 5-15-67

Solving for class pipe (24" dia.) and cradle or bedding. Try case A. TR-5



Shear Ø

Sta 100	Ø =	25° 08'
" 120	Ø =	25° 06'
" 120	Ø =	26° 33'
" 150	Ø =	26° 02'
" "	Ø =	24° 20'
" 190	Ø =	28° 12"
" "	Ø =	27° 30'
" 250	Ø =	28° 25'
" 270	Ø =	26° 42'
" "	Ø =	23° 35'
" 300	Ø =	20° 50'
" 320	Ø =	27° 10'

Use Ø = 24°

$$p = \frac{pb_c}{b_c} = \frac{3.0}{2.5} = 1.2$$

$$\mu = \tan \phi = 0.44523$$

$$K = \frac{\sqrt{\mu^2+1} - \mu}{\sqrt{\mu^2+1} + \mu} = \frac{\overset{1.19823}{\sqrt{0.44523^2+1}} - 0.44523}{\underset{1.64346}{\sqrt{0.44523^2+1}} + 0.44523} = .045817$$

0.753

$K\mu = 20$ use 0.19

$\gamma = 130$ lbs/ft³

$\left[\frac{\nu_f}{\gamma} \frac{E}{E_f}\right] = 1.0$

Case a $\delta = 1$

$s = 1$

Incomplete

$$\frac{H_e}{b_c} = 2.17 \qquad \frac{H_c}{b_c} = \frac{20}{2.5} = 8.0 > 2.17$$

$$2K\mu \frac{H_c}{b_c} = 8.0 \times 2 \times 0.19 = 3.04$$

$$2K\mu\, \delta p = 2 \times 0.19 \times 1.2 = 0.456$$

$$2K\mu\, C_p = = 6.3$$

$$C_p = \frac{6.3}{0.38} = 16.58$$

$\alpha_p = 0.400$ cradle, $\alpha_p = 0.650$ bedding B1

$T = 5.42$ $\qquad$ $T = 5.42$

Arizona Vineyard Rd. Dam

G. Hanley 5-15-67

Solving for class Pipe with A, cradle 2 3

$$F_{sr} = C_p X_p - KT$$

$$= (16.58 \times 0.4) - (0.045817 \times 5.42) = 6.384$$

6.632 .2483

$S = 1$

$\gamma = 130$

$F_{sr} = F_{sp} = 6.384$

$$s\gamma F_{sr} = 1 \times 130 \times 6.384 = 829.92 = \frac{1.431\, Reb}{b_c^2}$$

$$829.92 = \frac{1.431\, Reb}{2.5^2}$$

$$Reb = \frac{829.92 \times 2.5^2}{1.431} = 3624.74$$

Use class ~~IV~~ pipe with cradle

Arizona Powerline Floodway

G. Hanley 5-15-67

Solving for class pipe with B_1 Bedding 3 3

$$F_{sr} = C_p X_p - KT$$

$$= (16.58 \overset{10.777}{\times} 0.650) - (0.045817 \overset{0.248}{\times} 5.42) = 10.529$$

$s = 1$

$y = 130$

$F_{sr} = F_{sp} = 10.529$

$$syF_{sr} = 1 \times 130 \times 10.529 = 1{,}368.77 = \frac{1.431\ R_{eb}}{b_c^2}$$

$$1{,}368.77 = \frac{1.431\ R_{eb}}{2.5^2}$$

$$R_{eb} = \frac{1{,}368.77 \times 2.5^2}{1.431} = 5{,}978$$

Class V R.C. Pipe with B1 bedding

Ariz Vineyard Road

RA 5-67

Outlet Pipes 1

Determine Pipe requirements: 24"

$H = 16'$

$K_u = 0.19$

$K = .37$

Assume Use of Class IV pipe for 24" $b_c = 2.5$

B, Bedding

$pb_c = 2.25$ $p = \frac{2.25}{2.5} = .89$

$S_{Assume} = 1$ worst condition

From E.S. 117

$\frac{H_c'}{b} = 1.9$

$\frac{H_c}{b} = \frac{16}{2.8} = 5.7$ ∴ In complete Cond

$2k_u S_p = 2(.19).89 = .338$

$2k_u \frac{H_c}{b_c} = .38(5.7) = 2.16$

From E.S. 118

$2k_u C_p = 4.0$

$C_p = \frac{4.0}{.38} = 10.5$

From ES-121. $T = 3.8$

B, Bedding $X_p = .650$

$F_{rs} = C_p X_p - KT = 10.5(.65) - .37(3.8)$ (6.83, 1.4)

$= 5.43$

$S_y F_{rs} = 130(1.33)(5.43)$
$= 940$

$R_{cb} = \frac{b_c^2 S_y F_{sr}}{1.431} = \frac{2.8^2\ 940}{1.43} = 5160\ \#/ft.$

D Load $= \frac{5160}{2} = 2580\#$

Use class V Pipe

Assume $\delta = .5$ & rework to find range.

$\delta P = .89(.5) = .45$

$H_c/b_c = 1.4$

$\frac{H_c}{b} = \frac{1.6}{2.8} = 5.7$ ∴ Incomplete

$2k_u \delta_p = 2.(19)(.45) = .171$

$2k_u \frac{H_c}{b_c} = 2.16$

$2k_u C_p = 3.5$

$C_p = \frac{3.57}{.38} = 9.2$

$X_p = .65 \quad T = 2.5$

$F_{rs} = C_p X_p - KT = \overset{6.0}{9.2(.65)} - \overset{.92}{.37(2.5)}$
$= 5.08$

$$S_y F_{rs} = 130(1.33(5.08)$$
$$= 878$$

$$R_{e_b} = \frac{b_c^2 S_y F_{sr}}{1.431} = \frac{2.8^2(878)}{1.431}$$
$$= 4810 \ \#/\#$$

$$D_{LOAD} = \frac{4810}{2} = 2405^{\#} > 2000$$

Use Class V Pin

Ari 2 Vineyard Road FRS

RA 5-67.

Outlet Pipes

Pipe Loading 18"

$H = 16'$
$K_u = .19$
$K = .37$

Assume Class IV Pipe
$b_c = 1.917'$
& B Bedding

$\rho b_c = 1.75$ $\rho = \frac{1.75}{1.917} = .91$

Assume $\delta = 1$	and $\delta = .5$
ES 117 $S_p = .91$	$S_p = .46$
$\frac{H_e'}{b} = 1.9$	$\frac{H_e'}{b} = 1.4$
$H_e/b_c = \frac{16}{1.917} = 8.35$	$\frac{H_e}{b_c} = 8.35$
$2K_u S_p = .38(.91) = .346$	$2K_u S_p = .38(.46) = .175$
$2K_u \frac{H_e}{b_c} = .38(8.35) = 3.18$	$2K_u S_p = 3.18$
ES-118 $2K_u C_p = 6.1$	$2K_u C_p = 5.2$
$C_p = \frac{6.1}{.38} = 16.0$	$C_p = \frac{5.2}{.38} = 13.7$
ES.121 $T = 5.5$	$T = 3.7$
$X_p = .65$	$X_p = .65$
$F_{rs} = C_p X_p - KT =$	
$= \underset{10.4}{16(.65)} - \underset{2.04}{.37(5.5)}$	$= 13.7(.65) - .37(3.7)$
$= 8.4$	$= 8.9 - 1.37$
	$= 7.5$
$R_{eb} = \frac{b_c^2 S_y F_{rs}}{1.431} = \frac{1.917^2(1.33)(130)8.4}{1.431}$	$= \frac{1.917^2(1.33)130(7.5)}{1.431}$
$= 3720$ #/ft	$= 3310$ #/ft
$D_{Load} = \frac{3720}{1.5} = \underline{\underline{2480\#}}$ Class V	$\frac{3310}{1.5} = \underline{\underline{2210\#}}$ Class V Pipe

Ariz
RA & GDH

Wms Chandler Wshd.

Cost Estimate

Item	Unit	18"		24"
Pipe	126 ft	@35 = 4410	40	5040
Conc.	14.5	75.00 1092	75.00	1092
Conc.	1.65	35 58	35	58
Steel	913#	18 164	.18	164
Rip Rap	87	7.00 609	7.00	609
20-10 Gate	1	500		500
		6,833		7,463

VINEYARD –

3 – 24" Conduits @ 7500 = 22,500

2 18" " @ 6,850 = 13,700

$ 36,200

R. Henhouse

2 – 24" Conduits @ 7,500 = $ 15,000

Wshd Total = $ 51,200

Arizona Vineyard Rd. Dam

G. Hanley 5-10-67

Design of 24" dia. Gated Outlet for stock pond

Use: 24" dia R. C. Pipe (class IV)

" 2010 slide gate, flat back

Assuming a head from crest of emergency spillway = 16'±

use 30" handwheel and 1½" dia. gate stem

Space stem pedestals max. 11' apart

use Lift pedestal "C" 7-N-20544

use Inlet H 7-N-20465

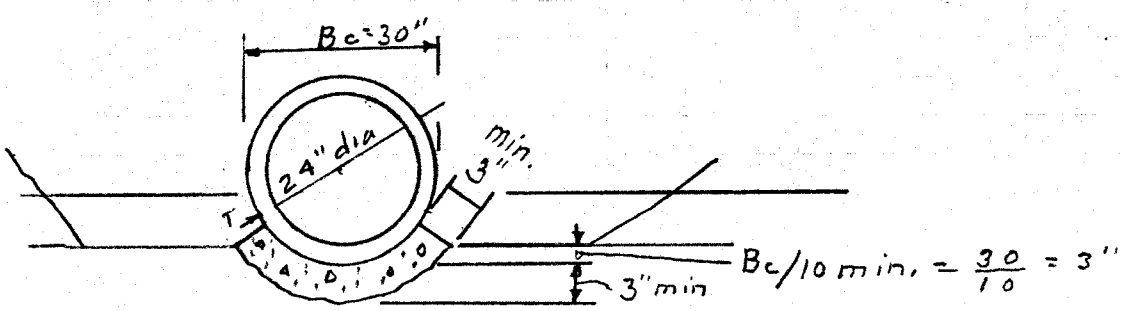
use Impact basin size "D"

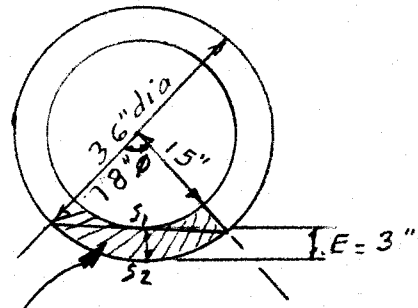
Arizona Vineyard Rd. Dam

G. Hanley 5-17-67

Cost estimate for gated outlets 1

24" dia class V R.C. Pipe with Type B1 concrete bedding.





$\phi = 67°$ $\frac{1}{2}\phi = 33.5°$

$R = 18"$, $R_1 = 15"$

$S_1 = \frac{\pi r^2 \phi}{180} = 1.4617$

$S_2 = \quad = 1.75405$

Area concrete = $\frac{1}{2}$ 0.25 (1.75405 + 1.46170) = 0.40197 ft³/ft

Length of bedding = 123' − thickness of four cutoff collars. = 4 X 0.75 = 3' and bent beam cradle at outlet end. 9' = 111'

$111 \times 0.40197 \times \frac{1}{27} = 1.65\ Yd^3$

At outlet end cantilever sect. use 10' long pipe with 9' std. B1 cradle for Pipe beam support.

From cradle comp. Volume = (9)(4.5455) $\frac{1}{27}$ = 1.52 Yd^3

Arizona Vineyard Rd. Dam

G. Hanley 5-17-67

Cost estimate for gated outlets 3 3
with B_1 Bedding

Summary of quantities

structure	Concrete cu. Yd.	Reinforcing steel Lbs.	Riprap. cu. Yd.
Inlet.	4.28	305	—
Lift. Ped.	0.74	45	—
stem ped.	0.53	67	—
Bedding	1.65	—	—
cradle	1.52	134	—
collars.	6.49	312	—
Bent.	0.90	50	—
Stilling basin	—	—	87
*	14.46	913	87

– 1.65 non reinforced bedding.

Total costs

126' R.C. Pipe class V @ $40/ft. - - - - = 5,040

Concrete 14.56 @ $75/yd³ - - - - 1,092

Non Reinf. Conc. 1.65 @ 35/yd³ - - - - - - = 58

Reinf Steel. 913 lbs. @ 0.18¢/lb. - - - - = 164

Riprap 87 yd³ @ $7.00/yd³ - - - - = ~~435~~ 609

2010 Gate and appurtenances = 1000

7,789
4
31,156

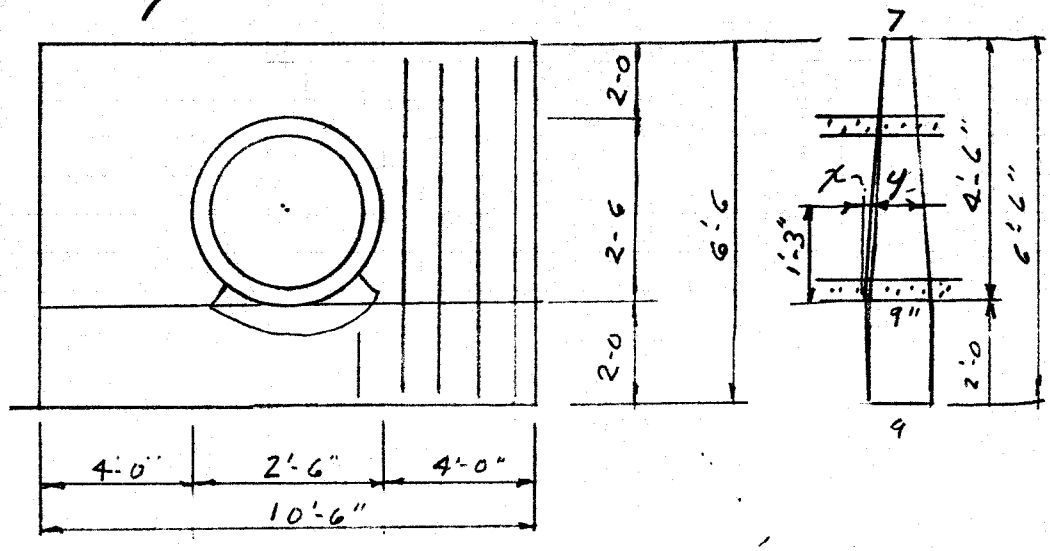
78,00
3
23,400

Arizona Vineyard Rd. Dam

G. Hanley 5 17-67

Cost estimate for gated outlets 2

with B1 Bedding



$9 - 7 = 2''$, $\frac{0.16667}{4.5} = \frac{2x}{1.25}$

$2x = \frac{0.16667 \times 1.25}{4.5} = 0.04629$

$y = 0.75 - 0.04629 = 0.70371$

Volume of concrete for (4 collars)

$+ (4)(10.5)(2.0)(0.75) - - - = + \ 63.00$

$+ (\cancel{4}\,2)(10.5)(4.5)\left(\frac{0.75 + 0.5833}{\cancel{2}}\right) = + \ 126.00$

$- (4)(4.909)(0.70371) - - - = - \ 13.82$

$175.18 \ ft^3$

$= 6.49 \ yd^3$

Reinforcing steel #4 @ 12"

$8 \times 6 = 48$

$4 \times 10 = 40$

$6 \times 3.75 = 22.5$

$4 \times 1.5 = 6.0$

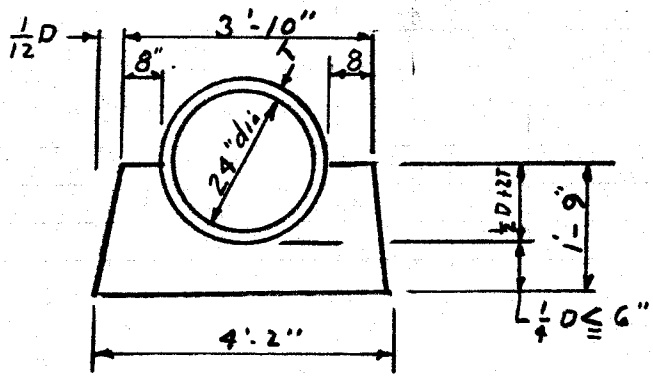
$116.5 \times .668 = \ = 78 \ lbs \times 4 = 312 \ lbs$

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Cost estimate for gated outlets 1 6

24" dia. class IV R. C. Pipe with cradle.



D = 24"
T = 3"

1/12 D = 2"

1/2 D + 2T = 15"

1/4 D = 6"

30"
16"
46
36
3' 10"

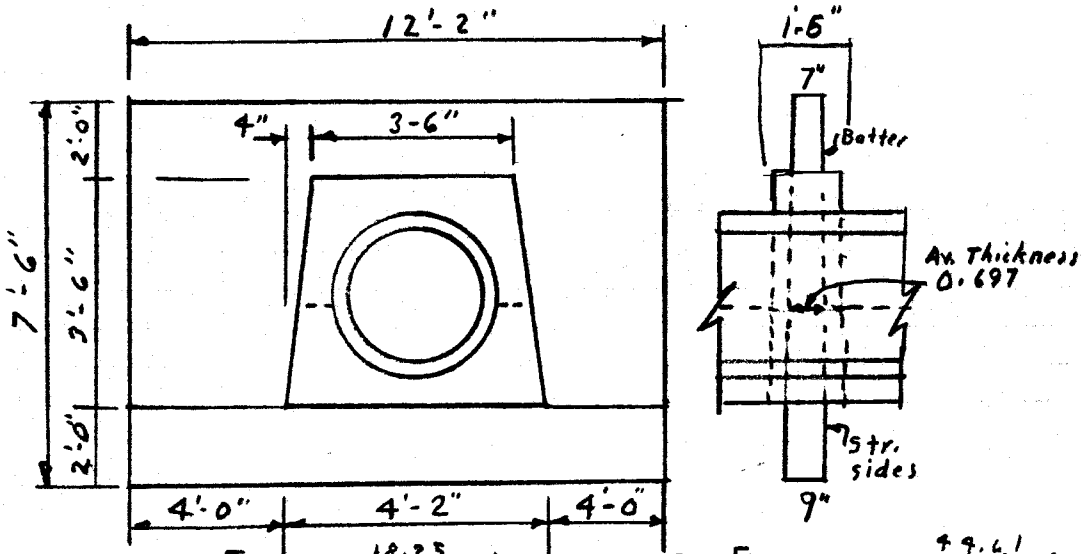
Concrete volume per ft.

$$\left(\frac{3.83333 + 4.16667}{2}\right)(1.75) = +\ 7.0000$$

$$-\ 4.909 \times 1.0 \times 1/2 \ - - - = \underline{-\ 2.4545}$$

Volume per foot = 4.5455 ft³/ft.

Cutoff collars: Vol. concrete for one collar.



Vol. Conc. $\left[(12.167)^{18.25}(2.0)(0.75)\right] + \left[(12.167)^{49.61}(5.5)\left(\frac{0.75+0.583}{2}\right)\right] = +62.86$

−encasement. $\left(\frac{4.167+3.5}{2}\right)(3.5)(0.697)$ - - - - - - - - - - = − 9.35

+encasement. $\left[\left(\frac{4.167+3.5}{2}\right)^{20.13}(3.5)(1.5)\right] - \left[4.909 \times 1.5\right]$ - - - = $\underline{+\ 12.77}$

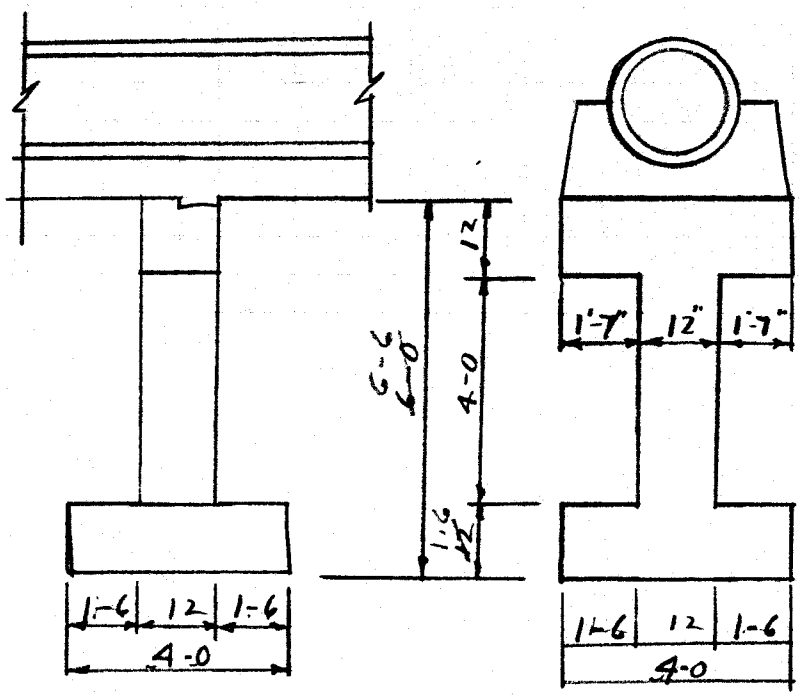
Area Pipe 7.36

Total Vol. for one ft³ = 66.28

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Cost estimate for gated outlets 2 6



Volume of concrete

Base (4.0)(4.0)(1.0) = 16.0

col. (4.0)(1.0)(1.0) = 4.0

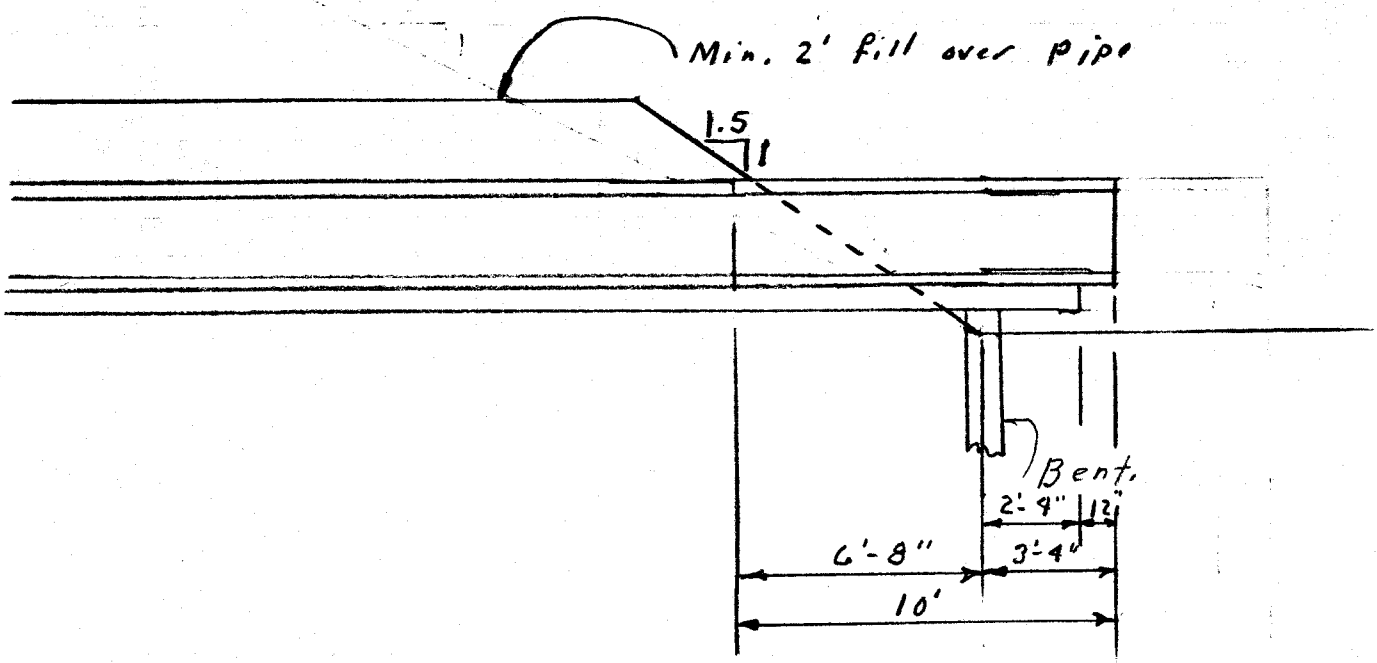
Beam (4.167)(1.0)(1.0) = 4.17

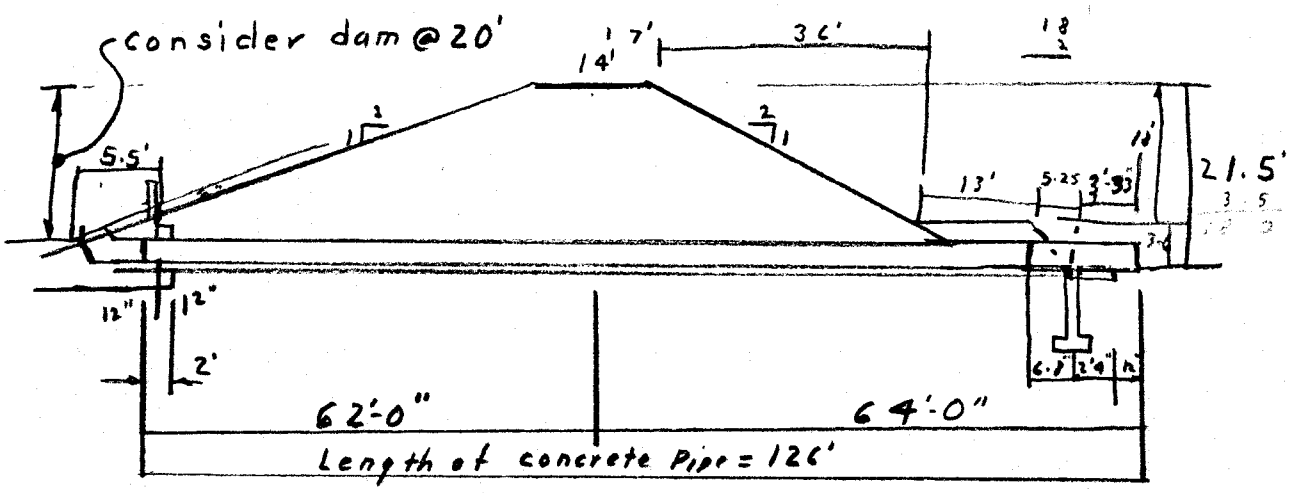
24.17 ft^3 = 0.90 yd^3

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Cost estimate for Gated outlets 3 6





20.00
1.83
18.17
3
54.51
+ .50
55.01
+ 7
62.0

Length of cradle = 123'

Anti seep collars $N = \frac{0.075 \times 105}{2} = 3.95$ use 4 collars

Net length cradle $123 - 4 \times 1.5 = 117'$

Volume of concrete in cradle

$= 117 \times 4.5455 \times 1/27$ — — — $= \underline{19.70\ yd^3}$

Volume of concrete in 4 collars 66.28 = $\underline{9.82}$

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Cost estimate for Gated Outlets 4 6

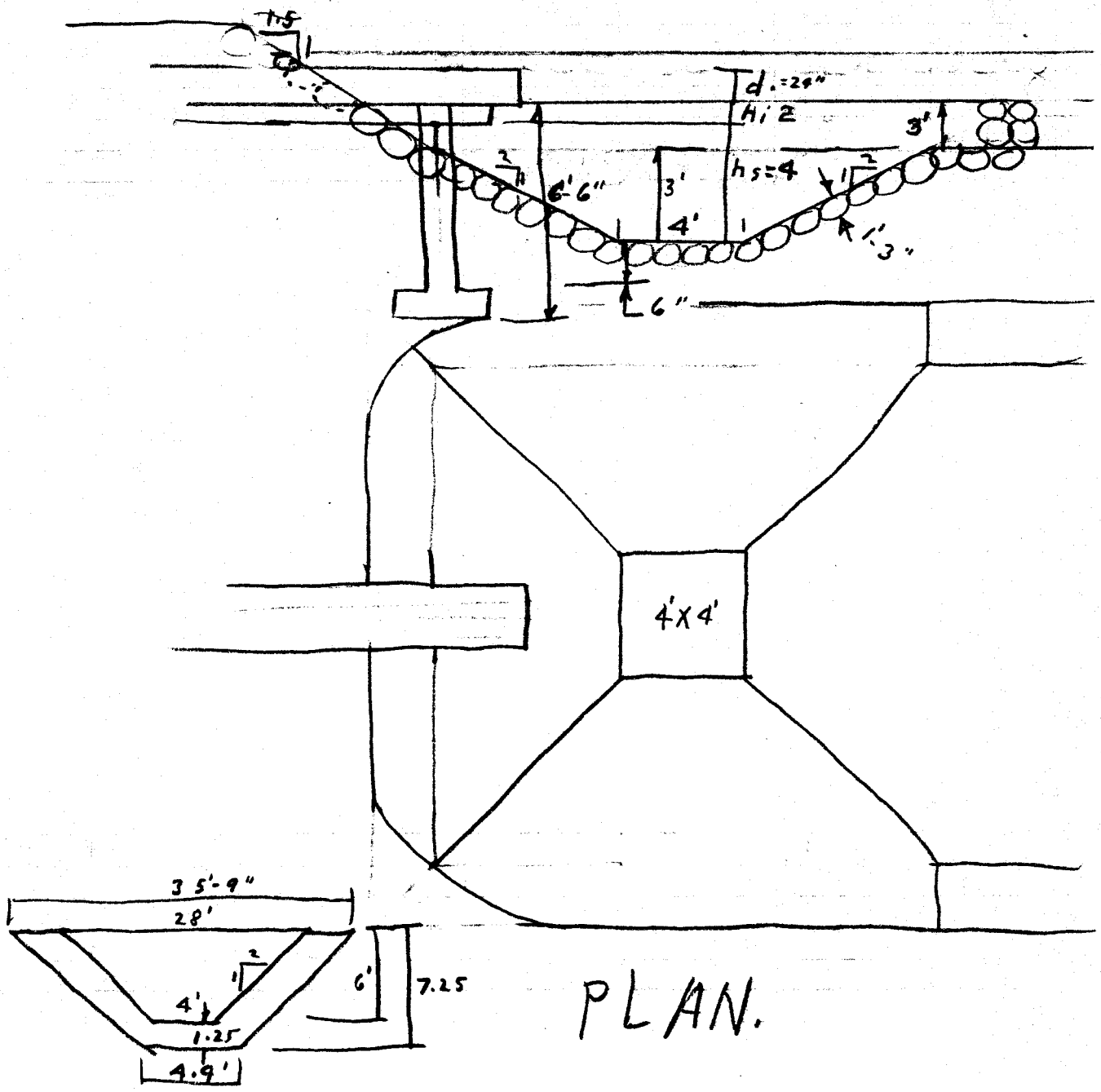
Summary of quantities, (Inlet & gate appurtenances quantities taken from standards.)

Structure	Concrete Cu.Yd.	Reinforcing steel. Lbs.	Riprap. Yd³
Inlet.	4.28	305	
Lift. Ped.	0.74	45	
Stem ped.	0.53	67	
Cradle	19.70	1783	
Collars	9.82	596	
Bent.	0.90	50	
Total	35.97	2846	87

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Cost estimate for gated outlets 5 6



$$\text{Volume Riprap} = \left[\left(\frac{4.4^2 + 35.9^2}{2}\right)(7.25)\right] - \left[\left(\frac{4^2 + 28^2}{2}\right)(6.0)\right] \frac{1}{27} = 87\ \text{Yd}^3$$

Arizona Vineyard Rd. Dam

G. Hanley 5-16-67

Summary of cost estimate for 6 6
24" dia. class IV R.C. Pipe gated outlet with cradle.

126' R.C. Pipe @ $36/ft - - - - - - - -	$4,536
Total Concrete 35.97 Yd³ @ 75.00 - - -	= 2,698
Reinforcing steel 2850 lbs @ 18¢ - - -	= 513
2010 Gate and appurtenances - - - - -	= 1,000
Riprap. 87 Yd³ @ $5.00/yd. - - -	= 435
Total for 1 outlets	$9,182
	4
	$36,728

Arizona Vineyard Rd. Dam

G. Hanley 5-9-67

Cost comparison 12" dia. W. S. Pipe outlet with appurtenances Versis 24" dia. R. C. Pipe with appurtenances.

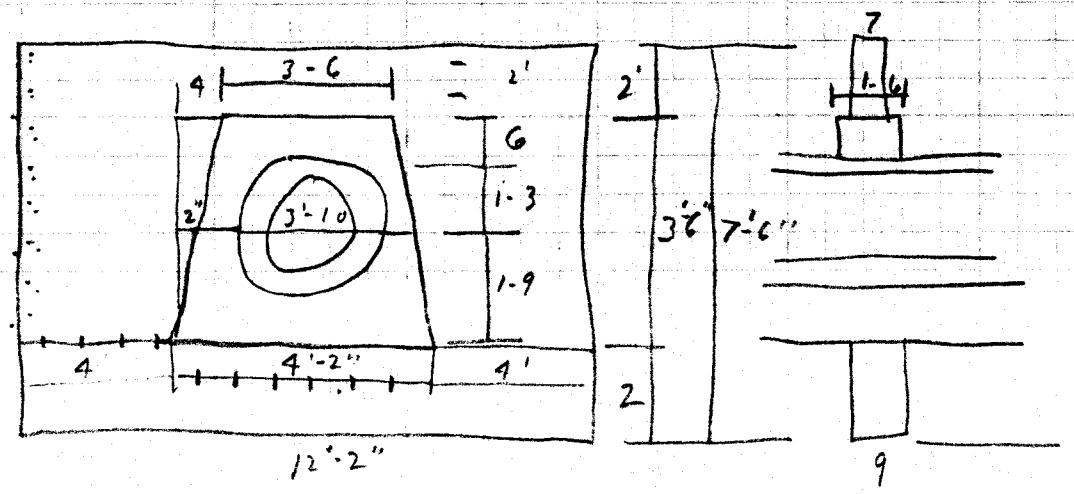
12" W. S. Pipe 130' @ 6.00	$ 780
Concrete total 9.80 yd.³ @ $65	637
Reinforcing steel 362 lbs @ 18¢	65
Gate 2010 -	1,000
	$ 2,482
	4
	$9,928

24" dia. R.C. Pipe 120' @ $36/ft.	$ 4,320
Concrete 44 yd³ @ $75	3,300
Reinforcing Steel 3330 lbs. @ 18¢	600
Gate 2010	1,000
	$ 9,220
	4
	36,880

Ralph: I took the time to compute the quantities accurately for the 24" dia outlet.

Arizona Vineyard Rd Dam
G. Haney 5-11-67

4 collars $4 \times 1.5 = 6'0''$



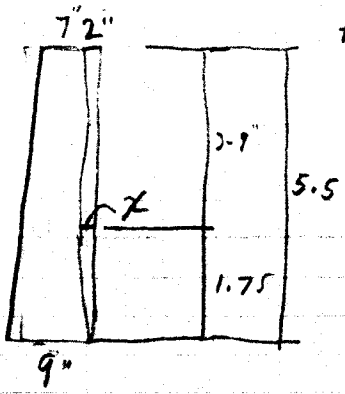
$$\text{Encasement} = +\left(\frac{4.167+3.500}{2}\right)(3.5)(1.5)(\overset{2}{\cancel{4}}) = +80.50$$

$$-(4.909)(1.5)(4) - - - = -29.45$$

$$\text{Collars} \quad (4)(12.167)(2.0)(0.75) - - - = +73.00$$

$$-\text{encasement} \quad -(\overset{2}{\cancel{4}})\left(\frac{4.167+3.50}{2}\right)(3.5)(0.697) = -37.41$$

$$+(4)(12.167)(5.5)\left(\frac{0.75+0.583}{2}\right) = +128.45$$



$$\frac{x}{1.75} = \frac{0.167}{5.5}$$

$$\text{Total} = \frac{265.09 \text{ ft}^3}{9.82 \text{ yds}^3}$$

$$x = \frac{1.75 \times .167}{5.5} = 0.053$$

$$\begin{array}{r} 0.750 \\ .053 \\ \hline .697 \end{array}$$

?

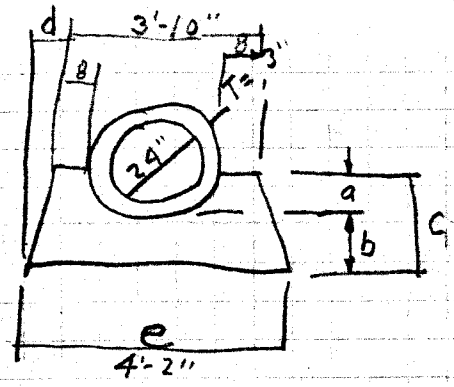
Reinforcing steel

$4 \times 8 \times 7.25 = 232$
$4 \times 8 \times 1.5 = 48$
$4 \times 4 \times 11.75 = 188$
$4 \times 8 \times 4.0 = 128$
596

Arizona
G. Hanley 5-11-67

Vineyard Rd. Dam

Inlet Structure



$a = \frac{1}{2}(D + 2T) = \frac{30}{2} = 15''$

$b = \frac{1}{4} D$ but not less than $6'' = 6''$

$c = a + b = 1'-9''$

$d = \frac{1}{12} D = \frac{24}{12} = 2''$

$e = 3'-10'' + 2d = 4'-2''$

Concrete Volume:

$+ (114)\left(\frac{4.167 + 3.833}{2}\right)(1.75) = + 798 \text{ ft}^3$

$- (114)\left(\frac{4.909}{2}\right) - - - - = - 280$

Total $\frac{518}{27} = 19.19 \text{ yd}^3$

Reinforcing Steel

#6 $114 \times 8 \times 1.502 = 1382$

$10 \times 12 \times 5 \times 0.668 = 401$

1783

Summary

	Concrete	Steel.
Inlet.	4.28	305
Lift. Pd.	0.74	45
Cradle	19.20	1783
Collars	9.82	596
Impact.	8.80	528
Stem Pd.	0.53	67
	43.37	3,324

Arizona. Vineyard Rd. Dam

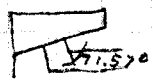
G. Hanley 5-4-67

Solving for pipe flow for Gated Outlets 1 5

12" dia., 10 ga. Welded Steel, $A = 0.751$, $d = 11.732"$, $n = 0.013$

$$K_p = \frac{5087}{\underset{24.05}{11.732^{4/3}}} \times \overset{.000169}{0.013^2} = 0.03596$$

24" dia. R.C. Pipe, $A = 3.14$, $K_p = 0.0124$ (from E.S. 42)



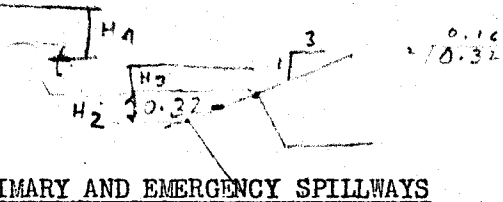
	12" W.S. Pipe		24" R.C. Pipe		18"
K_e =	1.0	$V^2/2g$	1.0	$V^2/2g$	1.0
$K_m = \left[1-\left(\frac{90°-71.57°}{90}\right)^2\right]$	0.95807		0.95807		.95807
$K_f = K_p L$	4.80980		1.61215		2.260
K_o =	1.0		1.0		1.0
K_T =	7.7629	$V^2/2g$	4.57022	$V^2/2g$	5.2184 $V^2/2g$

$$K_T V^2/2g = 11 = \frac{2gh}{K_T} = \frac{Q^2}{H^2} \qquad S = \frac{0.5}{126.25} = 0.00396$$

For 12" pipe $\dfrac{8.02 \times 0.751 \sqrt{H}}{\underset{2.786}{7.763^{1/2}}} = 2.162\sqrt{H}$

For 24" pipe $\dfrac{8.02 \times 3.14 \sqrt{H}}{\underset{2.138}{4.57022^{1/2}}} = 11.779\sqrt{H}$

" 18" " $8.02 \times$ $= 6.21\sqrt{H}$



Vineyard Rd. Dam
Structure Identification

Sheet No.: 2
Initials: G. Hanley
Date: 5-5-67
Checked: _____

CALCULATIONS FOR DISCHARGES OF PRIMARY AND EMERGENCY SPILLWAYS

(1) Porthole dimensions: width _____; height _____; F.L. El. _____

$Q_1 = C_1A_1\sqrt{2gH_1} =$ _____ x _____ x 8.02 $(H_1)^{\frac{1}{2}} =$ _____ $H_1^{\frac{1}{2}}$

(2) Inside dimensions of ~~riser~~ Riser: 0.97' x _____ with headwall on _____ side; L = 3.097 ft.

$Q_2 = C_2LH_2^{3/2} = 3.08 \times 3.097 \times (H_2)^{3/2} = 9.835\ H_2^{3/2}$

(3) F.L. 0.97' dia. pipe at inlet end El. _____; Area 0.97' dia. pipe = 0.751 sq. ft.

$Q_3 = C_3A_3\sqrt{2gH_3} = 0.6 \times 0.751 \times 8.02\ (H_3)^{\frac{1}{2}} = 3.614\ H_3^{\frac{1}{2}}$

* see sheet 1 for pipe Kt = 7.763

$C_4 = \frac{1}{7.763^{1/2}} = .35893$

2.786

(4) F.L. 0.97 dia. pipe at outlet end El. _____; Maximum tailwater El. _____;
Pipe data: Type W.S.; Length of barrel 130' ft.

$Q_4 = C_4A_4\sqrt{2gH_4} = {}^{*}.35893 \times 0.751 \times 8.02\ (H_4)^{\frac{1}{2}} = 2.162\ H_4^{\frac{1}{2}}$

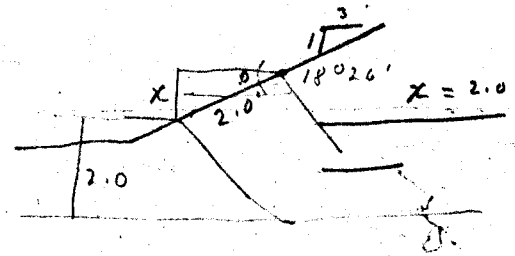
Crest width _____ ft.

(5) Emergency Spillway Data: Crest El. _____; Length of level section _____ ft.; side slopes _____

Reservoir W.S. El.	Porthole Flow $Q_1 =$ _____ $H_1^{\frac{1}{2}}$ (1)			Weir Flow $Q_2 = 9.835 H_2^{3/2}$ (2)			Orifice Flow $Q_3 = 3.614 H_3^{\frac{1}{2}}$ (3)			Pipe Flow $Q_4 = 2.162 H_4^{\frac{1}{2}}$ (4)			Emergency Spillway (5)		Total Outflow
	H_1	$H_1^{\frac{1}{2}}$	Q_1	H_2	$H_2^{3/2}$	Q_2	H_3	$H_3^{\frac{1}{2}}$	Q_3	H_4	$H_4^{\frac{1}{2}}$	Q_4	H_5	Q_5	
0				0						0					
0.15				0.15	0.0581	0.57									0.57
0.25				0.25	0.1250	1.23									1.23
0.3				0.3	0.1643	1.62	0			0					1.62
0.4				0.32	0.181	1.78	0.08	0.283	1.02	0.90	0.949	2.05			1.78
0.6							0.28	0.529	1.91	1.1	1.049	2.27			1.91
0.8							0.48	0.693	2.50	1.3	1.140	2.46			2.46
1.0							0.68	0.825	2.98	1.5	1.225	2.65			2.65
2.0							1.68	1.296	4.68	2.5	1.581	3.42			3.42
4.0							3.98	1.995		4.5	2.121	4.580			4.59
6.0										6.5	2.550	5.51			5.51
8.0										8.5	2.915	6.30			6.30
10.0										10.5	3.240	7.00			7.00

XERO COPY

202



$x = 2.0 \sin 18°26' = 0.632$ (.31620)

Vineyard Rd. Dam
Structure Identification

Sheet No.: _____
Initials : _____
Date : _____
Checked : _____

CALCULATIONS FOR DISCHARGES OF PRIMARY AND EMERGENCY SPILLWAYS

(1) Porthole dimensions: width _____; height _____; F.L. El. _____

$Q_1 = C_1A_1\sqrt{2gH_1} =$ _____ x _____ x 8.02 $(H_1)^{\frac{1}{2}} =$ _____ $H_1^{\frac{1}{2}}$

(2) Inside dimensions of ~~culvert~~ pipe: 2.0 x _____ with headwall on u.s. side; L = 6.28 ft.

$Q_2 = C_2LH_2^{3/2} = 3.08 \times 6.28 \times (H_2)^{3/2} = 19.34\ H_2^{3/2}$

(3) F.L. 24" dia. pipe at inlet end El. _____; Area 24" dia. pipe = 3.14 sq. ft.

$Q_3 = C_3A_3\sqrt{2gH_3} = 0.6 \times 3.14 \times 8.02\ (H_3)^{\frac{1}{2}} = 15.11\ H_3^{\frac{1}{2}}$

* See sheet 1 for pipe $K_T = 4.57022$

$C_4 = \frac{1}{4.57022} = .21880$

(4) F.L. 24" dia. pipe at outlet end El. _____; Maximum tailwater El. _____;
Pipe data: Type R.C.; Length of barrel 130 ft.

$Q_4 = C_4A_4\sqrt{2gH_4} = {}^{*}.21880 \times 3.14 \times 8.02\ (H_4)^{\frac{1}{2}} = 5.51\ H_4^{\frac{1}{2}}$

Crest width _____ ft.

(5) Emergency Spillway Data: Crest El. _____; Length of level section _____ ft.; side slopes _____

Reservoir W.S. El.	Porthole Flow $Q_1 =$ _____ $H_1^{\frac{1}{2}}$ (1)			Weir Flow $Q_2 = 19.34\ H_2^{3/2}$ (2)			Orifice Flow $Q_3 = 15.11\ H_3^{\frac{1}{2}}$ (3)			Pipe Flow $Q_4 = 5.51\ H_4^{\frac{1}{2}}$ (4)			Emergency Spillway (5)		Total Outflow
	H_1	$H_1^{\frac{1}{2}}$	Q_1	H_2	$H_2^{3/2}$	Q_2	H_3	$H_3^{\frac{1}{2}}$	Q_3	H_4	$H_4^{\frac{1}{2}}$	Q_4	H_5	Q_5	
0				0											
0.2				0.2	0.0894	1.73									
0.4				0.4	0.2530	4.89									
0.632				0.632	0.5024	9.72	0			0					
0.8							0.168	0.410	6.20	2.3	1.517	8.36			
1.0							0.368	0.607	9.17	3.3	1.817	10.01			
2.0							1.368	1.170	17.68	4.3	2.074	11.43			
4.0							2.368	1.539	23.25	6.3	2.510	13.83			
6.0										8.3	2.881	15.87			
8.0										10.3	3.209	17.68			
10.0										12.3	3.507	19.33			

Des-5

Sheet 3 of 5

203

Arizona Vineyard Rd. Dam

G. Hanley 5-9-67

4 5

Gated outlet to stock ponds.

The duration of flow time for a 12" dia. and a 24" dia pipe to provide two acre feet of water, with an average head of 5' is as follows.

12" dia pipe, 5' head, 5.1 c.f.s.

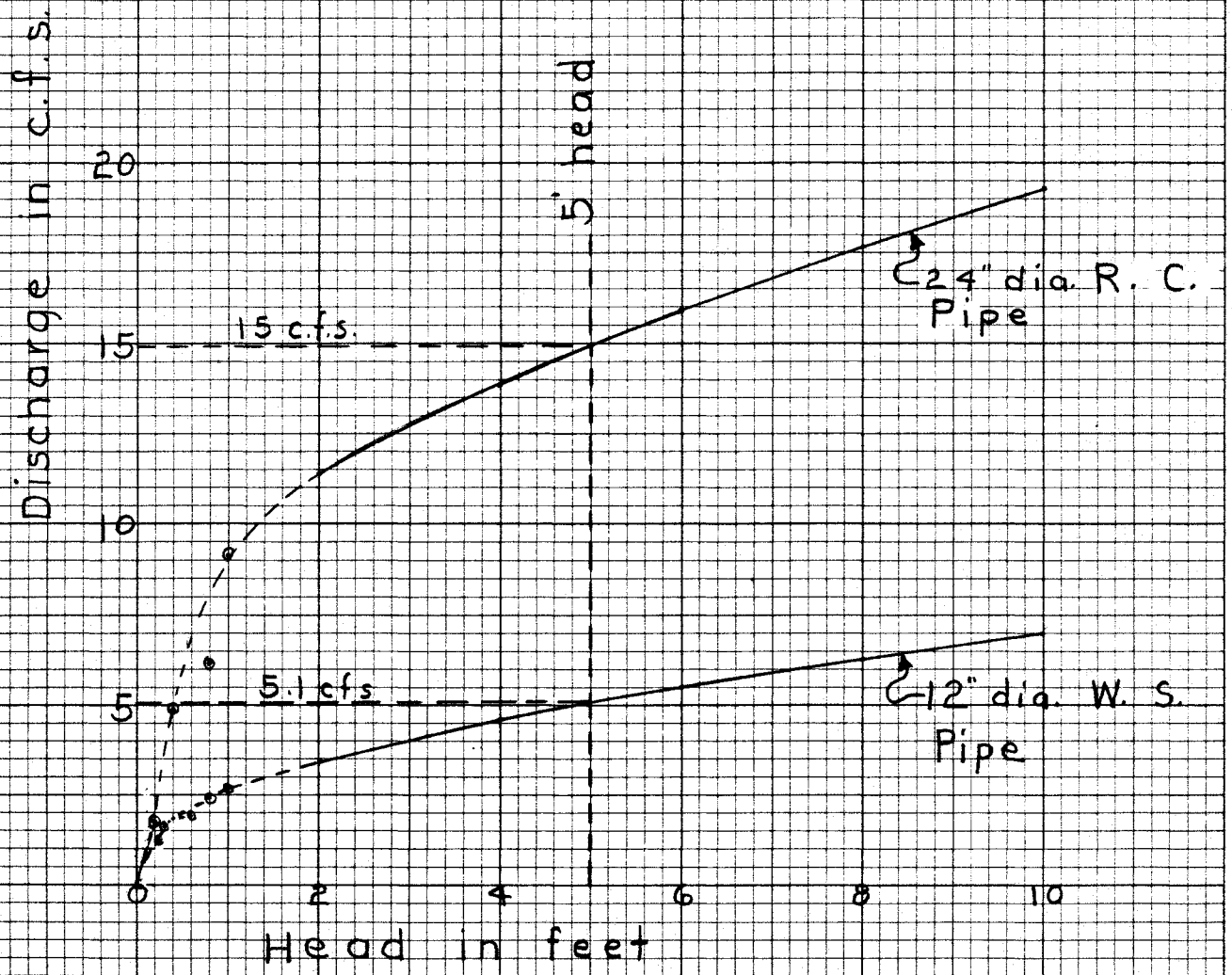
$$hrs = \frac{2 \times 43{,}560}{5.1 \times 3{,}600} = \underline{4.75 \text{ hrs.}}$$

24" dia pipe, 5' head, 15 c.f.s.

$$hrs = \frac{2 \times 43{,}560}{15 \times 3600} = \underline{1.61 \text{ hrs.}}$$

Vineyard Rd. Dam

Graph showing discharge through gated outlets to stock ponds.



EUGENE DIETZGEN CO. MADE IN U.S.A.
NO. 340R-10 DIETZGEN GRAPH PAPER 10 X 10 PER INCH

Ralph:

I completed a preliminary Eng. cost estimat for Vineyard Rd. Dam & Rittenhouse Dam. From this I listed the Floodway costs and the dam costs. This was all that was needed to complete the Supplement to the workplan. I turned this work over to Marv. Sheldon

Copies attached!

P.S.
I talked with Lee Chsiek friday regarding ramps and gated outlets.

Vineyard	4 ramps	4 gated outlets
Rittenhouse	2 ramps	2 " "

SUPPLEMENTAL WORK PLAN AGREEMENT

between the

Flood Control District of Maricopa County

Board of Supervisors of Pinal County

East Maricopa Soil Conservation District

(hereinafter refered to as the Sponsoring Local Organization)

State of Arizona

and the

Soil Conservation Service

United States Department of Agriculture

(hereinafter refered to as the Service)

Whereas, the Watershed Work Plan Agreement for the Williams-Chandler Watershed, State of Arizona, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 25th day of February 1963 and

Whereas, in order to carry out the Watershed Work Plan for said Watershed, it has become necessary to modify said Watershed Work Plan Agreement; and relocate the Vineyard Road Floodwater Retarding Structure 1.1 miles upstream from its original planned location; and relocate the Rittenhouse Floodwater Retarding Structure 0.7 miles upstream from its

original planned location; and shorten Vineyard Road Floodway 3,150' from its original planned length; and shorten Rittenhouse Floodway 5,210' from its original planned length.

Now, therefore, the Sponsoring Local Orginization and the Service hereby agree upon the following modifications of the terms, conditions, and stipulations of said Watershed Work Plan Agreement:

1. Paragraph numbered 3 is modified to read as follows The percentages of construction costs of structural measures to be paid by the Sponsoring Local Orginization and the Service are as follows:

Arizona Williams - Chandler

G. Hanley 5-1-67

Supplement Work Plan Agreement Computations

Vineyard Road Floodway cost:

Item	Quantity		Unit Cost.	Amount
Excavation	9,540	Yd^3	0.30	$2,862
Dike Fill	1,920	"	0.35	672
Str. Excav.	16	"	4.00	64
Str. Backfill	11	"	5.00	55
Riprap	170	"	7.00	1,190
C.M.P. 24"	26	Lin. ft.	12.00	312
C.M.P. 42"	32	" "	18.00	576
				5,731
			+10%	573
				$6,304 Use $6,300

Total Cost of Vineyard Rd. Project, from Eng. cost estimate $682,130

— 6,300

$675,830 = cost of Ret. Str.

Rittenhouse Floodway Cost:

Item	Quantity		Unit Cost	Amount
Excavation	6,765	Yd^3	0.30	$2,030
Dike Fill				
Str. Excav.	185	"	4.00	740
Str. Backfill	66	"	5.00	330
Concrete	61.5		75.00	4,613
Cement	278	Bbls.	5.00	1,390
Reinforcing Steel	9,491	lbs.	0.18	1,709
Riprap	76	Yd^3	7.00	532
C.M. Pipe 18" dia.	26	ft.	8.00	208
				$11,860

Total Cost of Rittenhouse Project, from Eng. Cost. est.

$471,610

— 11,860 = Floodway Cost.

$459,750 = Retarding Str. Cost.

Mtn States Constr. Co.
Sub for earth channel

Constr. Schedule -
Source rock
lining machine
watering
stockpiling -

Lowry
Oshiek
Ashton
Smith
Ryan
England
Riddle
Arrington
L. Hill

Schedule:

Woods
Kimball
Rayco
] lining Contractors.

Build str. @ Ellsworth Rd.

Rock Mtn. Constr. sub on lower channel

Earth Fill within the earth channel c.y.
~~Can~~ Send to Ashton next week-

5/11/67

to: Ralph Arrington
Fm: Pat Cavanough
Subj: Williams-Chandler Supplement - Tables 3,
(Do we need ESWP Clearance?)

Footnote 3/ indicates your hydrology was based on the mar 1965 (revised) Engr. Memo 27. If this is true, and Point rainfalls are selected for the B+ criteria estalished for class of structure, the following values are in order:

ESH

storm rainfall (6 Hr.) In (orig.) 3.5 (No change indicated) | 1965 Memo (Revised) 7.0

sheet 2 - 6" B
sheet 4 - 8" C
Avg 7"

storm runoff was not checked but obviously it would be much greater.

FH

	Orig	Design revision	1965 memo revised
storm rainfall (6 hr.) In	7.0	7.5	10.15

sheet 3 - 10" B
sheet 5 - 19" C
Avg 14.5" Areal Reduction factor = 0.7 or (14.5)(0.7) = 10.15"

where RCN 80 — P_a = 10.15", Q = 7.66"

Why where the RCN changed? the change is insignificant. If the old criteria for memo 27 can be used, why was the 7.0" revised to 7.5"?

(2)

5/11/67

Engr. Memo-27 (Rev.) Mar 19, 1965 states that permission to deviate from the attached criteria must be obtained from the Director of the Engineering Division. Should E&WP be contacted to see if we can use the old criteria? If the structures must use the new criteria, will they need to be re designed?

Was the state dam code checked? A policy letter to Turner (if I remember correctly) indicates that flood routing for a 1% storm event will start at the emergency spillway and that a residual freeboard of 3 feet above design flow will be provided. —

I will be in until 9:00 or so tommorrow if you wish to discuss any of the above.

Pat

Depth of Well _____
Dia well 6" or 8"
Developed capacity _____
Depth to W.S. 210'
Available for Use? _____
Who do we contact? _____

Gardiner

~~7620511~~

Gas powered
Moter

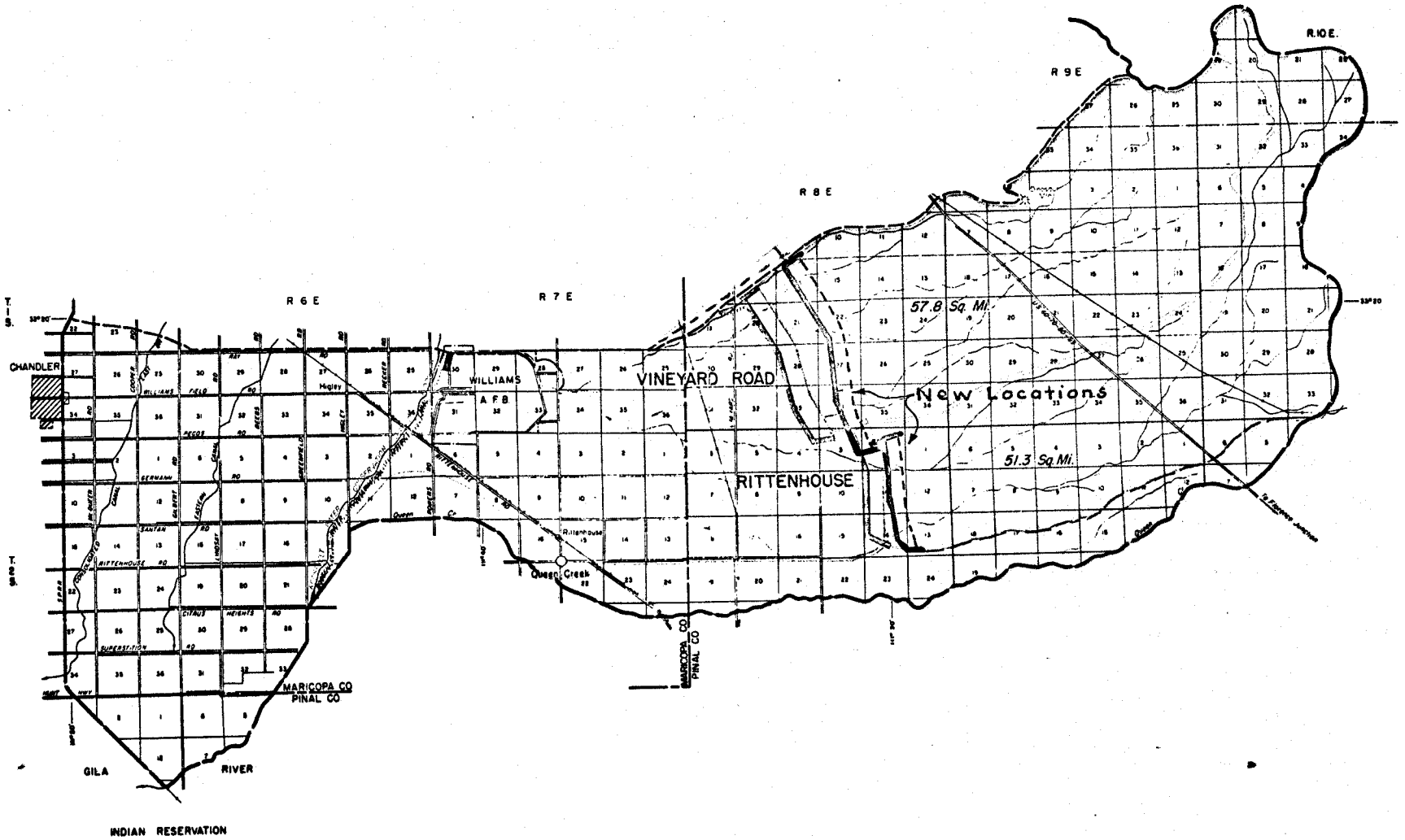
Geologic Survey has
some data on a well
one mile east of the
well you located in
sect. 25. Well owned
by a man named Gardiner

~~Vic Evans.~~

Check about AS BUILT PLAS - on past Jobs - for George -

Check Job Dairy (duplicate sets) 310's

1. Vineyard Specs - E.S. control to be grade within 4' - wet 24" & roll spunkled & cut to grade, rolled & brought to grade -
2. Vineyard stockpond plage grader ditch around pond.



LEGEND

- Drainage Area Controlled by Structure
- Area Benefited
- Floodwater Retarding Structure
- Irrigation Facility
- Floodway

FIGURE 5

PROJECT MAP

WILLIAMS-CHANDLER WATERSHED

MARICOPA & PINAL COUNTIES, ARIZONA

JUNE 1962

1 0 1 2 3
SCALE IN MILES

7-S-17319-N

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE M-3732

216

Vineyard —

1. Leave undisturbed area at entrance to ramps @ section lines - Borrow should not be removed to allow access in times of flow - 30 day release - 80 @ TT others 66' R/W -

2 Appendix -

sheet 3

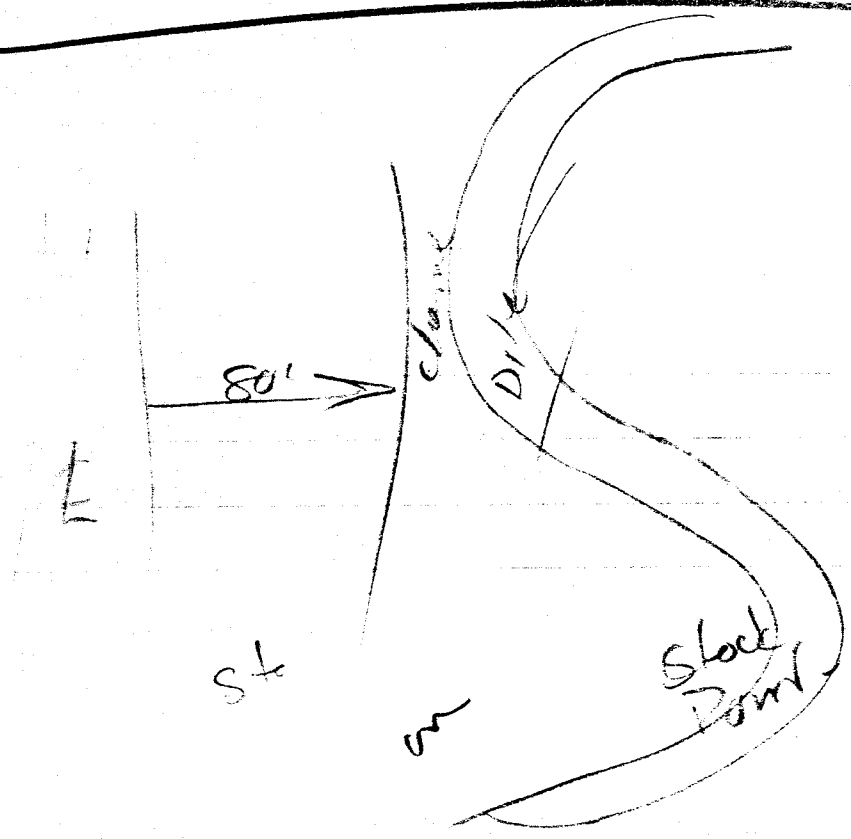
Fish & Game -

Memo to Burdick -

Loosely burnish Mesquite in washes
Downstream for bird habitat.

Will not burn.

Write up in specs - Gen. Prov.
Send copy to F&G for approval



Vineyard Road Dam

Cost comparison

Realignment of dam to clear stock tank

Additional length = 46' @ 39.33 yd^3 per lin. ft.

Using Powerline cost per yd. of .29¢ = $525

Slide gate 1	1,119
Concrete	436
Reinforcing Steel	160
12" dia W.S. Pipe 130' long @ 7.00 / 3.12	919
	$3,150

Dogleg around stocktank (downstream)

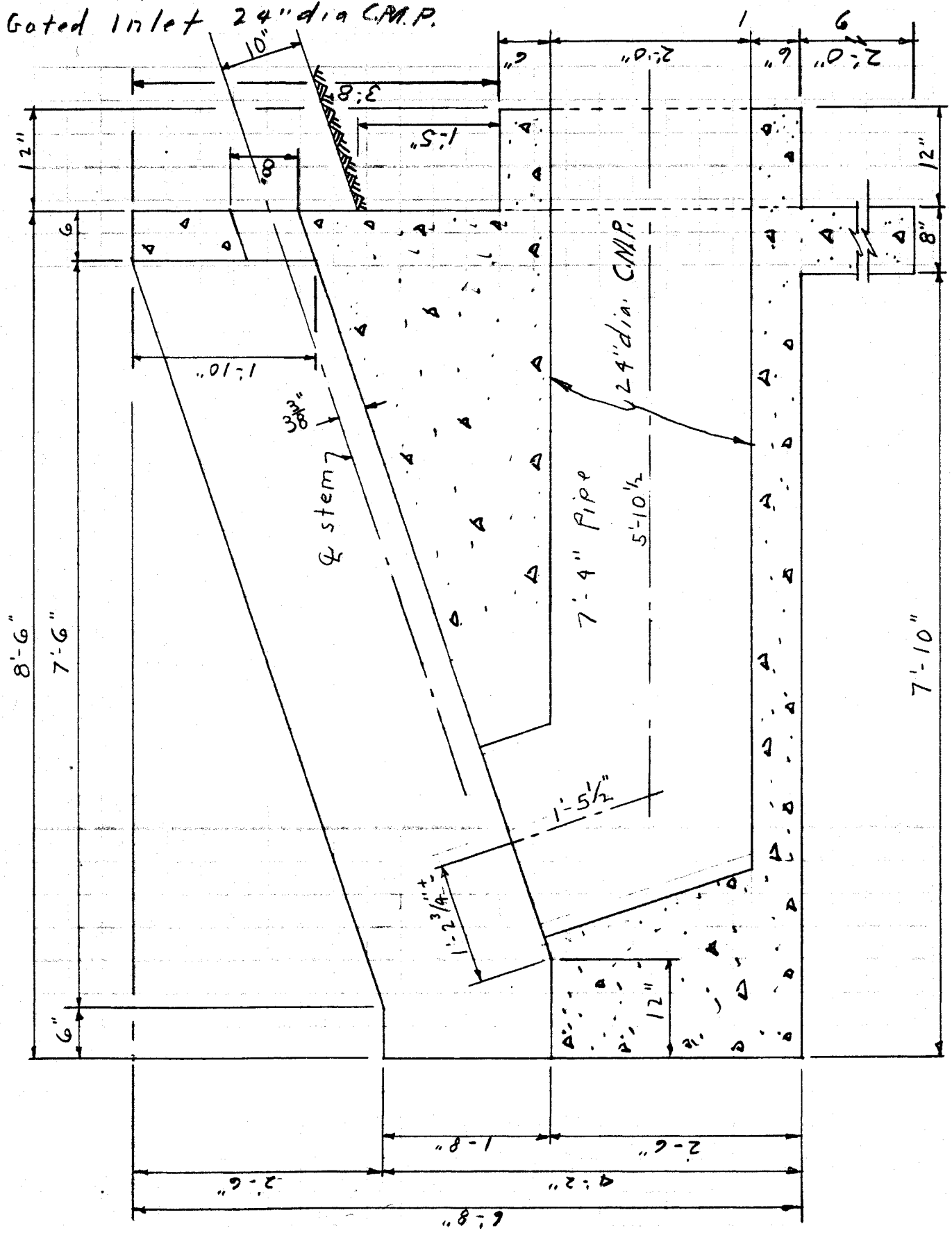
Approx. 450' longer 40 yd^3 per lin ft.

@ 29¢ $5,220

Arizona Vineyard Rd. Dam

G. Hanley 3-28-67

Gated Inlet 24" dia C.M.P.



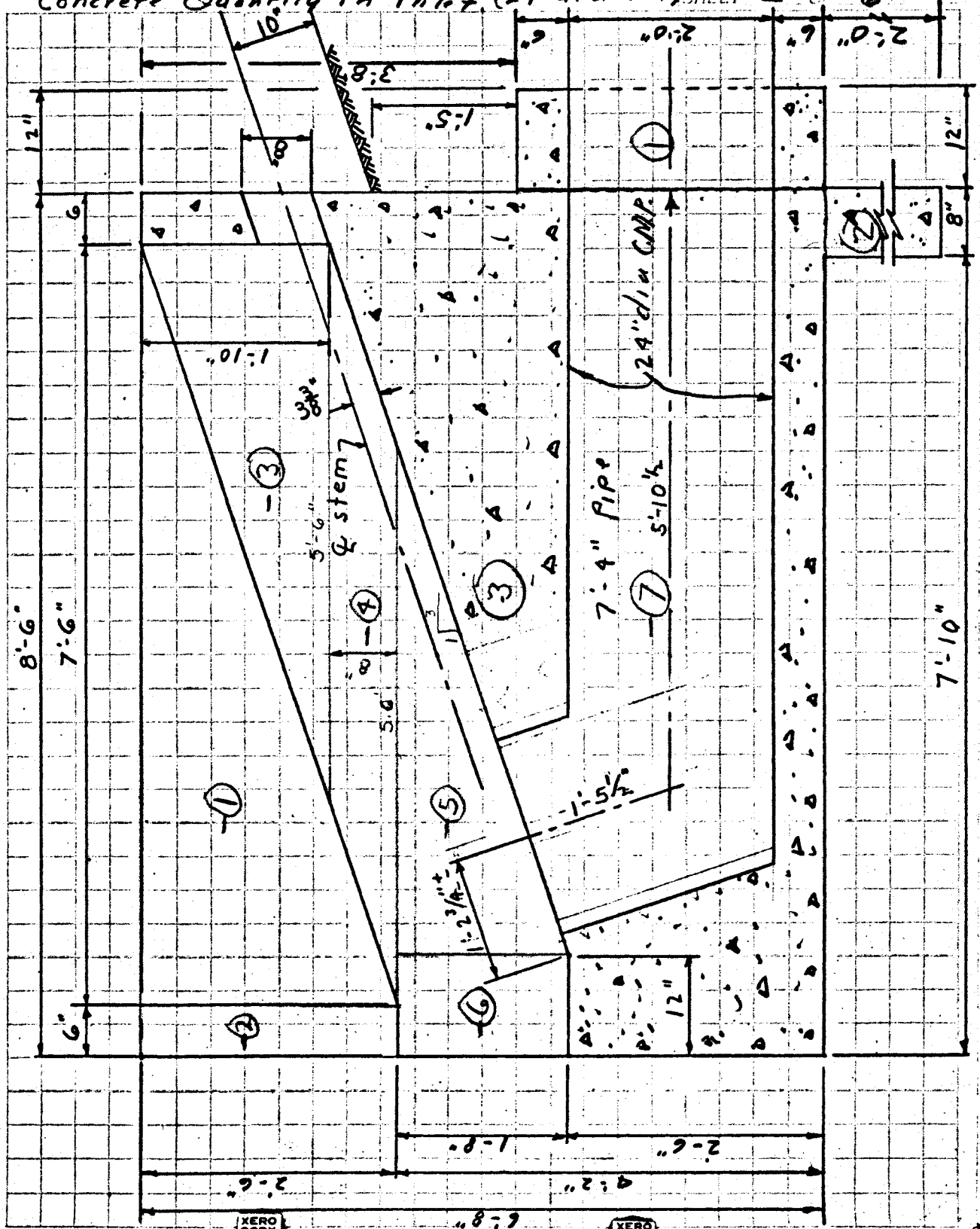
SCS-522A REV 5-58

SOIL CONSERVATION SERVICE

STATE Arizona PROJECT Vineyard Rd Dam

BY G. Hanley DATE 3-28-67 CHECKED BY DATE JOB NO.

SUBJECT Concrete Quantity in Inlet (24" dia. CMP) SHEET 2 OF 6



Arizona Vineyard Rd. Dam

G. Hanley 3-28-67

Concrete quantity in Inlet for 24" dia CMP. 3 6

see diagram sheet 2 for measurements:

1. $\frac{5.0+3.0}{2} \times 3.0 \times 1.0$ - - - - - - - = + 12.000

2. $5.0 \times 2.0 \times 0.66667$ - - - - - - = + 6.667

3. $8.5 \times 5.0 \times 6.66667$ - - - - - - - = + 283.333

-1. $\frac{7.5}{2} \times 5.0 \times 2.5$ - - - - - - - - - - - = - 46.875

-2. $5.0 \times 2.5 \times 0.5$ - - - - - - - - = - 6.250

-3. $\frac{5.5}{2} \times 1.83333 \times 4.0$ - - - - - - - - - - = - 20.167

-4. $5.5 \times 4.0 \times 0.66667$ - - - - - - - = - 14.667

-5. $\frac{5.0}{2} \times 1.66667 \times 4.0$ - - - - - - - - = - 16.667

-6. $4.0 \times 1.66667 \times 1.0$ - - - - - - - = - 6.667

-7. 8.33333×3.14159 - - - - - - = - 26.180

164.529

= 6.1 Yd^3

Arizona Vineyard Rd. Dam

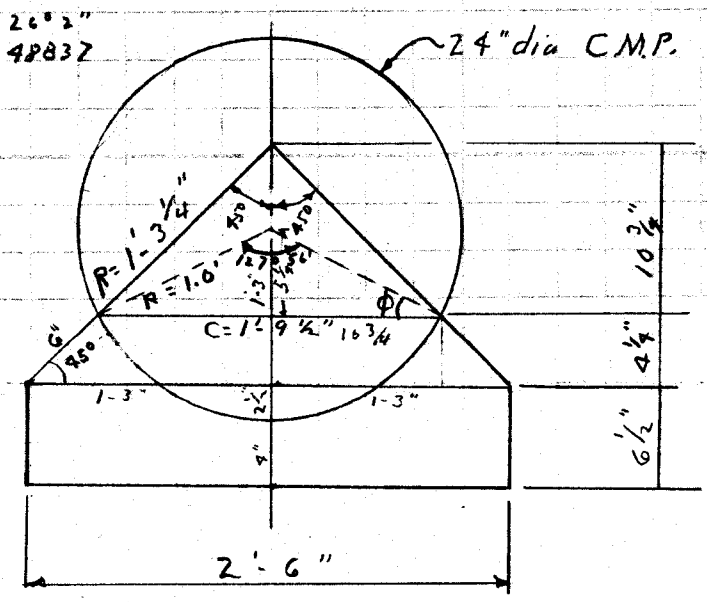
GDH 3-28

Bedding for C.M. Pipe (24" dia) 4 6

$\tan\phi = \frac{0.4375}{0.89583} = .48837$ 26° 2"

26° 2"
26° 2"
52 4"

179 60
52 9
127°56'



$$\text{Area} = (2.5 \times .54167) + \left(\frac{2.5 + 1.79167}{2} \times .375\right) = +\ 2.15887$$

1.35418 0.80469

$$-\ \frac{3.14159 \times 1.0^2 \times 127.93333}{360} - \frac{1.0^2 \times .78873}{2} \quad -\ 0.73205$$

Total area per ft. length. = 1.42682

$130' \times 1.42682 \times 1/27 = 6.87\ Yd^3$

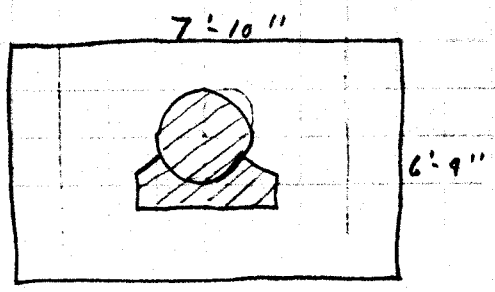
Arizona Vineyard Rd. Dam

G. Hanley 3-8-67

Concrete Quantity in Collars 5 6

5 collars req.

W.	H
2-6	2-4
2-P	2
2-P	2
7-10	



6" thick.

5.0 X 7.83333 X 6.3333 X 0.5 - - - - = + 124.028

-5 X 0.5 X 1.42682 - - - - - = - 3.567

-5 X 0.5 X 3.14159 - - - - - = - 7.854

112.607

= 4.17 Yd³

Arizona Vineyard Rd. Dam
G. Hanley 3-28-67

SUMMARY. 6 6

of concrete quantities for 24" dia. C.M.P. and 12" dia C.M. Pipe.

Structure	12" dia. Steel.		24" dia	steel
	Yd³		Yd³	
Inlet.	1.71	117	6.10	418
Bedding	1.89	None	6.87	None.
Collars.	2.14	1.66	4.17	321
totals	5.74 Yd³	283 lb.	17.14 Yd³	739 Lb.

The 24" dia C. M. Pipe requires.

11.40 Yds³ more concrete @ $75 = $855

456 lbs more steel @ 20¢ = $92

+ structural excavation & backfill around inlet say 5 Yd³ @ $6 = $30

+ Trench excavation $\frac{3 \times 5 \times 140}{27} \times .30$ = $23

+ cost of larger gate? = 80

+ cost of larger pipe = 334

$1,414