PROJECT : Valley Camp Coal - D-12A Runoff Calculation

AREA= .2 ACRES
AVERAGE BASIN SLOPE= 24.4 PERCENT
CURVE NUMBER= 94.6
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 200. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR
USER INPUT TIME OF CONCENTRATION= .09 HOURS

TP= .0585 HOURS QPCFS= 2.58 CFS QPIN=12.8171 INCHES
C3= 63.1756 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
.92	.1131	.0000	.0000	.0	.00
.94	.1151	.0000	.0000	.2	.00
.95	.1172	.0000	.0000	1.3	.00
.97	.1192	.0000	.0000	2.2	.00
.98	.1212	.0000	.0000	2.6	.00
.99	.1233	.0001	.0000	2.3	.00
1.01	.1256	.0002	.0000	1.8	.00
1.02	.1281	.0003	.0001	1.3	.00
1.04	.1306	.0005	.0001	.8	.00
1.05	.1331	.0006	.0001	.5	.00
1.07	.1356	.0008	.0002	.3	.00
1.08	.1381	.0010	.0002	.2	.00
1.10	.1406	.0012	.0002	.0	.00
2.41	.8313	.3993	.0134	.0	.18
2.43	.8481	.4128	.0135	.0	.18
2.44	.8649	.4264	.0136	.0	.18
2.46	.8816	.4401	.0137	.0	.18
2.47	.8984	.4539	.0138	.0	.18
2.49	.9152	.4677	.0138	.0	.19
2.50	.9305	.4804	.0127	.0	.19
2.52	.9351	.4842	.0038	.0	.18
2.53	.9396	.4880	.0038	.0	.17
2.55	.9441	.4918	.0038	.0	.15
2.56	.9487	.4955	.0038	.0	.12
2.57	.9532	.4993	.0038	.0	.10
2.59	.9577	.5031	.0038	.0	.08

HYDROGRAPH PEAK= .19 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .02 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	16-May-89
Project No.:	007.11.100	Time:	02:13 PM
Channel Section:	Ditch D-12A	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.19	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.74	feet
	Area:	0.12	ft2
	Perimeter:	1.09	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	1.60	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.74	feet
	Area:	0.12	ft2
	Perimeter:	1.09	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	1.60	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.02	ft/ft
	Min. Channel Depth:	0.74	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5/11/89

D-12B (Convenience Ditch)

TOTAL AREA = 0.86 ac 0.63 ac Disturbed
0.23 ac Paved

Area	CN	Q
0.63	90	0.723
0.23	98	1.329

$\bar{Q} = 0.885 \rightarrow CN = 92.6$

PRECIP = 1.55 in

Hyd LENGTH = 530'

$$\text{SLOPE} = \frac{(2370)\,5\,(100)}{43560\,(0.86)} = 31.6\%$$

Calculated Runoff $Q_{TOT} = 0.74$ cfs

SMALL DITCH - USE GENERAL DESIGN; $b=0,\ d=1.0,\ m=2$

[illegible] Valley Lake Seal - 2-125 Runoff Calculation

AREA= .9 ACRES
AVERAGE BASIN SLOPE= 31.6 PERCENT
CURVE NUMBER= 92.6
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 530. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0237 HOURS QPCFS= 27.42 CFS QPIN=31.6169 INCHES
C3=155.8398 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.21	.1598	.0000	.0000	.0	.00
1.23	.1638	.0000	.0000	27.4	.00
1.26	.1678	.0000	.0000	8.8	.00
1.28	.1719	.0002	.0000	1.0	.00
1.30	.1759	.0003	.0001	.0	.00
2.35	.7560	.2547	.0181	.0	.67
2.37	.7832	.2732	.0185	.0	.68
2.40	.8104	.2919	.0188	.0	.70
2.42	.8376	.3110	.0191	.0	.71
2.44	.8648	.3304	.0194	.0	.72
2.47	.8920	.3501	.0197	.0	.73
2.49	.9192	.3700	.0199	.0	.74
2.51	.9344	.3813	.0113	.0	.51
2.54	.9418	.3867	.0055	.0	.27
2.56	.9491	.3922	.0055	.0	.21
2.59	.9565	.3977	.0055	.0	.21
2.61	.9639	.4032	.0055	.0	.21
2.67	.9712	.4086	.0055	.0	.21

HYDROGRAPH PEAK= .74 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .06 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
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FEATURE D-12C
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/11/89

D-12C (Convenience Ditch)

Total Area = 36 * 0.00175 = 0.1 ac

CN = 90

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 100'

$$\text{slope} = \frac{(100)(5)(100)}{43{,}560\,(.1)} = 11.5\%$$

Calculated Run-off

Basin Geometry does not provide viable solution using "HYDRO". Calculate t_c using alternate method and then re-run HYDRO. See D-12A for methodology

$$t_c = \frac{1.8(1.1 - C_{10})\sqrt{L}}{\sqrt[3]{S}}$$

where $L = 100'$
$S = 11.5\%$
$C_{10} = 0.50$

$t_c = 4.78$ minutes
$= 0.07975$ hours

Re-run "HYDRO" $\Rightarrow$ $Q_{10} = 0.07$ cfs

No further design anticipated

PROJECT : Valley Camp Coal - D-12C Runoff Calculations

AREA= .1 ACRES
AVERAGE BASIN SLOPE= 11.5 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

PROJECT : Valley Camp Coal - D-12C Runoff Calculation

AREA= .1 ACRES
AVERAGE BASIN SLOPE= 11.5 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR
USER INPUT TIME OF CONCENTRATION= .08 HOURS

TP= .0532 HOURS QPCFS= 1.42 CFS QPIN=14.1061 INCHES
C3= 69.5288 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2215	.0000	.0000	.0	.00
1.56	.2267	.0000	.0000	.3	.00
1.58	.2319	.0000	.0000	1.1	.00
1.59	.2372	.0002	.0001	1.4	.00
1.61	.2424	.0004	.0002	1.2	.00
1.63	.2476	.0006	.0002	.8	.00
1.65	.2528	.0008	.0003	.5	.00
1.67	.2580	.0011	.0003	.2	.00
1.68	.2633	.0015	.0003	.1	.00
1.70	.2685	.0018	.0004	.0	.00
2.39	.8064	.2013	.0115	.0	.06
2.41	.8267	.2130	.0117	.0	.06
2.43	.8470	.2249	.0119	.0	.06
2.45	.8673	.2370	.0121	.0	.07
2.46	.8877	.2492	.0123	.0	.07
2.48	.9080	.2617	.0125	.0	.07
2.50	.9283	.2744	.0126	.0	.07
2.52	.9350	.2786	.0042	.0	.07
2.53	.9405	.2820	.0035	.0	.06
2.55	.9460	.2855	.0035	.0	.05
2.57	.9515	.2890	.0035	.0	.04
2.59	.9570	.2925	.0035	.0	.03
2.60	.9625	.2960	.0035	.0	.02

HYDROGRAPH PEAK= .07 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .00 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-12D
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/12/89

D-12D

Total Area = 930 * 0.00175 = 1.6 ac
paved = 296 = 0.5 ac
disturbed = = 1.1 ac

CN	A	Q
98	0.5	1.329
90	1.1	0.723
		$\bar{Q}$=0.912

$\bar{CN}$=93.0

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 750'

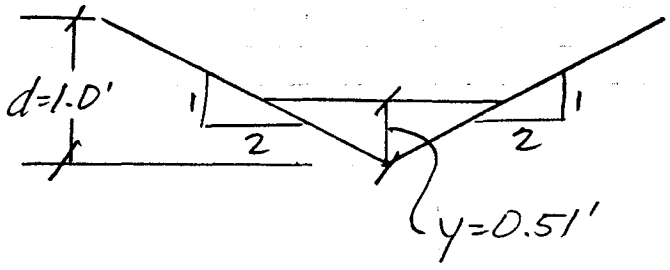
$$\text{slope} = \frac{(1150)(5)(100)}{(43{,}560)(1.6)} = 8.3\%$$

Calculated Runoff Q_{TR} = 1.35 cfs

Ditch Design

Smin = 2%
Smax = 2%

try trapezoidal Channel
b=0, M=2, n=0.03



V=2.60 ft/sec < 5.0 ft/sec
No Lining required

PROJECT : Valley Camp Coal - D-12D Runoff Calculations

AREA= 1.6 ACRES
AVERAGE BASIN SLOPE= 8.3 PERCENT
CURVE NUMBER= 93.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 750. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0600 HOURS QPCFS= 20.17 CFS QPIN=12.5008 INCHES
C3= 61.6165 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.15	.1504	.0000	.0000	.0	.00
1.17	.1530	.0000	.0000	1.9	.00
1.18	.1555	.0000	.0000	9.9	.00
1.20	.1581	.0000	.0000	17.5	.00
1.21	.1607	.0001	.0000	20.2	.00
1.23	.1632	.0002	.0000	18.3	.00
1.24	.1658	.0003	.0000	14.2	.00
1.26	.1683	.0004	.0001	10.0	.00
1.27	.1709	.0005	.0001	6.5	.00
1.29	.1734	.0007	.0001	4.0	.00
1.30	.1760	.0008	.0002	2.3	.00
1.32	.1786	.0010	.0002	1.3	.01
1.33	.1811	.0012	.0002	.7	.01
1.35	.1837	.0014	.0002	.4	.01
1.36	.1862	.0016	.0002	.2	.02
1.38	.1888	.0018	.0002	.1	.02
1.39	.1913	.0021	.0002	.0	.02
2.41	.8325	.3242	.0124	.0	1.28
2.43	.8497	.3367	.0125	.0	1.29
2.45	.8669	.3493	.0126	.0	1.31
2.46	.8841	.3621	.0127	.0	1.32
2.48	.9013	.3749	.0128	.0	1.33
2.49	.9185	.3879	.0129	.0	1.34
2.51	.9316	.3977	.0099	.0	1.35
2.52	.9362	.4013	.0035	.0	1.32
2.54	.9409	.4048	.0035	.0	1.21
2.55	.9455	.4083	.0035	.0	1.04
2.57	.9502	.4119	.0036	.0	.86
2.58	.9548	.4155	.0036	.0	.71
2.60	.9595	.4190	.0036	.0	.59

HYDROGRAPH PEAK= 1.35 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .12 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	08:46 AM
Channel Section:	Ditch D-12D	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.35	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.51	feet
	Qn/1.49(S)1/2=	0.193	
	A(R)2/3=	0.194	
	Required Depth:	1.01	feet
	Area:	0.52	ft2
	Perimeter:	2.28	feet
	Hydraulic Radius:	0.23	feet
	Velocity:	2.60	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.51	feet
	Qn/1.49(S)1/2=	0.193	
	A(R)2/3=	0.194	
	Required Depth:	1.01	feet
	Area:	0.52	ft2
	Perimeter:	2.28	feet
	Hydraulic Radius:	0.23	feet
	Velocity:	2.60	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.02	ft/ft
	Min. Channel Depth:	1.01	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/11/89

D-12E . (Convenience ditch)

Total Area = 220 * 0.00175 = 0.23 ac
paved = 98 = 0.08
disturbed = 90 = 0.15

CN	Area	Q
98	0.08	1.329
90	0.15	0.723

$\bar{Q} = 0.934$ $\bar{CN} = 93.3$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 180'

$$\text{slope} = \frac{(200)(5)(100)}{43{,}560\,(0.23)} = 10.0\%$$

Calculated Run-off $Q_{TOT} = 0.21$ cfs

No further design anticipated

$A_T = 0.23$ ac
.08 paved
$H_L = 180'$

DD DITCH

PROJECT : Valley Camp Coal - D-12E Runoff Calculation

AREA= .2 ACRES
AVERAGE BASIN SLOPE= 10.0 PERCENT
CURVE NUMBER= 93.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 180. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0172 HOURS QPCFS= 10.11 CFS QPIN=43.5800 INCHES
C3=214.8059 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.10	.1412	.0000	.0000	.0	.00
1.12	.1441	.0000	.0000	10.1	.00
1.14	.1470	.0000	.0000	3.3	.00
1.15	.1500	.0000	.0000	.4	.00
1.17	.1529	.0001	.0000	.0	.00
2.39	.8046	.3168	.0143	.0	.20
2.41	.8243	.3312	.0145	.0	.20
2.43	.8440	.3458	.0146	.0	.20
2.44	.8638	.3606	.0147	.0	.20
2.46	.8835	.3755	.0149	.0	.20
2.48	.9032	.3905	.0150	.0	.21
2.49	.9230	.4056	.0151	.0	.21
2.51	.9334	.4137	.0081	.0	.14
2.53	.9388	.4178	.0041	.0	.07
2.55	.9441	.4219	.0041	.0	.06
2.56	.9494	.4261	.0041	.0	.06
2.58	.9548	.4302	.0042	.0	.06
2.60	.9601	.4344	.0042	.0	.06

HYDROGRAPH PEAK= .21 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .02 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-13A
PROJECT NO. 007.11.100

SHEET 1 OF 3
COMPUTED Paul
CHECKED
DATE 5/11/89

D-13A

Total Area = 1150 × 0.00175 = 2.1 ac
sage/grass = 918 = 1.6 ac
disturbed = = 0.5 ac

CN	A	Q
75	1.6	0.1850
90	0.5	0.723

$\bar{Q} = 0.313$ $\bar{CN} = 80.4$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 800 feet

$$\text{slope} = \frac{(1550)(25)(100)}{43{,}560\ (2.1)} = 42.4\ \%$$

Calculated Run-off ⇒ $Q_{TOT} = 0.60$ cfs

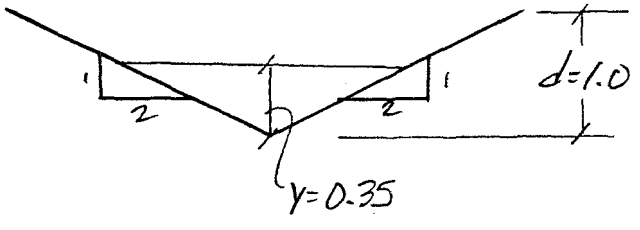
Ditch Design

$S_{min} = 3\%$

$S_{max} = 18\%$

try trapezoidal channel

$b = 0$, $M = 2$, $n = 0.03$



$V = 4.8 < 5.0$ ft/sec

∴ No lining required

PROJECT : Valley Camp Coal - D-12A Runoff Calcualation

AREA= 2.1 ACRES
AVERAGE BASIN SLOPE= 42.4 PERCENT
CURVE NUMBER= 80.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 800. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0452 HOURS QPCFS= 35.12 CFS QPIN=16.5868 INCHES
C3= 81.7565 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.11	.4824	.0000	.0000	.0	.00
2.12	.4997	.0000	.0000	7.1	.00
2.14	.5170	.0002	.0002	26.9	.00
2.16	.5343	.0006	.0004	35.1	.00
2.17	.5516	.0012	.0006	29.7	.02
2.19	.5689	.0020	.0008	19.7	.04
2.20	.5861	.0031	.0011	11.3	.07
2.22	.6034	.0044	.0013	5.8	.10
2.23	.6207	.0059	.0015	2.8	.13
2.25	.6380	.0076	.0017	1.3	.16
2.26	.6553	.0095	.0019	.5	.19
2.28	.6726	.0116	.0021	.2	.22
2.29	.6899	.0139	.0023	.0	.24
2.41	.8281	.0390	.0037	.0	.46
2.43	.8454	.0429	.0039	.0	.48
2.44	.8627	.0470	.0041	.0	.51
2.46	.8800	.0512	.0042	.0	.53
2.47	.8973	.0556	.0044	.0	.55
2.49	.9146	.0601	.0045	.0	.58
2.50	.9305	.0644	.0043	.0	.60
2.52	.9352	.0657	.0013	.0	.59
2.53	.9398	.0670	.0013	.0	.51
2.55	.9445	.0683	.0013	.0	.40
2.56	.9492	.0697	.0013	.0	.31
2.58	.9539	.0710	.0013	.0	.23
2.59	.9585	.0723	.0013	.0	.22

HYDROGRAPH PEAK= .60 cfs
TIME TO PEAK= 2.80 hours
RUNOFF VOLUME= .02 acre-feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	12-Jul-89
Project No.:	007.11.100	Time:	02:13 PM
Channel Section:	D-13A	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.60	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.030	ft/ft
	Max. Bottom Slope:	0.180	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.35	feet
	Qn/1.49(S)1/2=	0.070	
	A(R)2/3=	0.071	
	Required Depth:	0.85	feet
	Area:	0.24	ft2
	Perimeter:	1.57	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	2.45	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.25	feet
	Qn/1.49(S)1/2=	0.029	
	A(R)2/3=	0.029	
	Required Depth:	0.75	feet
	Area:	0.13	ft2
	Perimeter:	1.12	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	4.80	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	3.0	%
	Max. Bottom Slope:	18.0	%
	Min Channel Depth:	0.85	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-13B
PROJECT NO. 007.11-100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/11/89

D-13B

Total Area = 1240 * 0.00175 = 2.2 ac
sage/grass = 1.6 ac
disturbed = 0.6 ac

CN	A	Q
75	1.6	0.185
90	0.6	0.723
		$\bar{Q}$=0.332

$\bar{CN}$ = 80.7

Precipitation = 1.55 inches (10 year, 6 hr)

hydraulic length = 870 feet

$$\text{slope} = \frac{(1675)(25)(100)}{43{,}560\,(2.2)} = 43.7\%$$

Calculated Run-off: Q_{TOT} = 0.66 cfs

Design Ditch

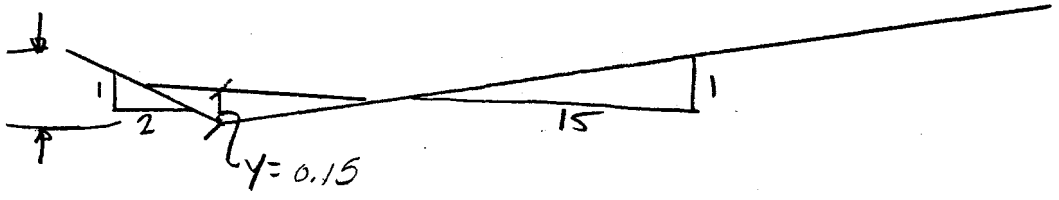
S_{min} = 15%

S_{max} = 35%

try trapezoidal Channel

b = 0, M1=2, M2=15, n=0.03

Use Roadway Design



V_{max} = 4.6 ft/sec < 5.0

∴ No lining required

PROJECT : Valley Gang Goal - V-13B Runoff Calculation

AREA= 2.2 ACRES
AVERAGE BASIN SLOPE= 43.7 PERCENT
CURVE NUMBER= 80.7
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 870. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0467 HOURS QPCFS= 35.60 CFS QPIN=16.0467 INCHES
C3= 79.0943 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.10	.4750	.0000	.0000	.0	.00
2.12	.4929	.0000	.0000	7.2	.00
2.13	.5107	.0004	.0003	27.3	.00
2.15	.5286	.0010	.0006	35.6	.02
2.17	.5465	.0019	.0009	30.1	.04
2.18	.5643	.0030	.0011	20.0	.06
2.20	.5822	.0043	.0013	11.4	.10
2.21	.6001	.0057	.0016	5.9	.13
2.23	.6180	.0077	.0018	2.8	.16
2.24	.6358	.0097	.0020	1.3	.20
2.26	.6537	.0120	.0022	.5	.23
2.27	.6716	.0144	.0025	.2	.26
2.29	.6894	.0171	.0027	.0	.29
2.41	.8324	.0457	.0042	.0	.53
2.43	.8503	.0501	.0044	.0	.55
2.45	.8681	.0546	.0046	.0	.58
2.46	.8860	.0594	.0047	.0	.61
2.48	.9039	.0643	.0049	.0	.63
2.49	.9217	.0694	.0051	.0	.66
2.51	.9326	.0725	.0032	.0	.66
2.52	.9374	.0739	.0014	.0	.62
2.54	.9423	.0754	.0014	.0	.51
2.56	.9471	.0768	.0014	.0	.40
2.57	.9519	.0783	.0015	.0	.32
2.59	.9567	.0798	.0015	.0	.25
2.60	.9616	.0812	.0012	.0	.23

HYDROGRAPH PEAK= .66 cfs
TIME TO PEAK= 2.51 hours
RUNOFF VOLUME= .06 acre-feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	12-Jul-89
Project No.:	007.11.100	Time:	02:18 PM
Channel Section:	D-13B	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.66	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	15.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.150	ft/ft
	Max. Bottom Slope:	0.350	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.15	feet
	Qn/1.49(S)1/2=	0.034	
	A(R)2/3=	0.034	
	Required Depth:	0.65	feet
	Area:	0.19	ft2
	Perimeter:	2.59	feet
	Hydraulic Radius:	0.07	feet
	Velocity:	3.45	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.13	feet
	Qn/1.49(S)1/2=	0.023	
	A(R)2/3=	0.023	
	Required Depth:	0.63	feet
	Area:	0.14	ft2
	Perimeter:	2.25	feet
	Hydraulic Radius:	0.06	feet
	Velocity:	4.59	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	15.0	1/m2
	Min. Bottom Slope:	15.0	%
	Max. Bottom Slope:	35.0	%
	Min Channel Depth:	0.65	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-15
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/11/89

D-15

Total Area = 2543 * 0.00175 = 4.45ac
Paved = = 0.2
Disturbed = = 1.5
Aspen = = 1.5
Sage/Grass = = 1.0
Reclaimed = = 0.25

CN	A	Q
85	0.25	0.484
98	0.2	1.329
90	1.5	0.723
70	1.5	0.096
75	1.0	0.185

$\overline{Q} = 0.405$ $\overline{CN} = 82.8$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 900 feet

$$\text{slope} = \frac{(2565)(25)(100)}{43{,}560\ (4.2)} = 35.0\%$$

Run-off Calculation: $Q_{TOT} = 1.57$ cfs

Ditch Design:

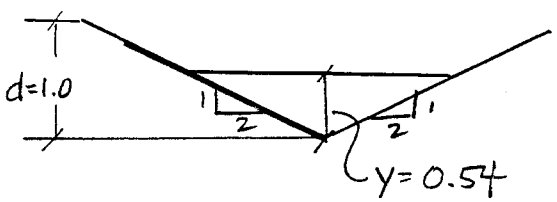
$S_{min} = 2\%$
$S_{max} = 2\%$

try trapezoidal design

$b = 0$, $M = 2$, $n = 0.03$

$V = 2.69$ ft/sec < 5.0 ft/sec OK

NO LINING NECESSARY



PROJECT : Valley Camp Coal - D-15 Runoff Calculations

AREA= 4.2 ACRES
AVERAGE BASIN SLOPE= 35.0 PERCENT
CURVE NUMBER= 82.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0501 HOURS QPCFS= 63.36 CFS QPIN=14.9611 INCHES
C3= 73.7432 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.04	.3994	.0000	.0000	.0	.00
2.05	.4186	.0000	.0000	12.8	.00
2.07	.4377	.0002	.0002	48.5	.00
2.09	.4569	.0008	.0006	63.4	.02
2.10	.4760	.0017	.0009	53.6	.05
2.12	.4952	.0029	.0012	35.7	.11
2.14	.5143	.0045	.0015	20.4	.18
2.15	.5335	.0063	.0019	10.5	.25
2.17	.5526	.0085	.0022	5.0	.33
2.19	.5718	.0109	.0024	2.3	.41
2.20	.5910	.0137	.0027	1.0	.48
2.22	.6101	.0167	.0030	.4	.56
2.24	.6293	.0200	.0033	.2	.63
2.25	.6484	.0235	.0035	.0	.70
2.40	.8208	.0662	.0056	.0	1.28
2.42	.8400	.0720	.0058	.0	1.33
2.44	.8591	.0781	.0060	.0	1.39
2.45	.8783	.0843	.0062	.0	1.44
2.47	.8974	.0908	.0064	.0	1.49
2.49	.9166	.0974	.0066	.0	1.54
2.51	.9316	.1027	.0053	.0	1.57
2.52	.9367	.1046	.0019	.0	1.50
2.54	.9419	.1064	.0019	.0	1.28
2.56	.9471	.1083	.0019	.0	1.00
2.57	.9523	.1102	.0019	.0	.78
2.59	.9574	.1121	.0019	.0	.64
2.61	.9626	.1141	.0019	.0	.56

HYDROGRAPH PEAK= 1.57 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .14 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	11-May-89
Project No.:	007.11.100	Time:	11:39 AM
Channel Section:	Ditch D-15	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.57	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.54	feet
	Qn/1.49(S)1/2=	0.224	
	A(R)2/3=	0.226	
	Required Depth:	1.04	feet
	Area:	0.58	ft2
	Perimeter:	2.41	feet
	Hydraulic Radius:	0.24	feet
	Velocity:	2.69	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.54	feet
	Qn/1.49(S)1/2=	0.224	
	A(R)2/3=	0.226	
	Required Depth:	1.04	feet
	Area:	0.58	ft2
	Perimeter:	2.41	feet
	Hydraulic Radius:	0.24	feet
	Velocity:	2.69	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.02	ft/ft
	Min. Channel Depth:	1.04	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-16A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/11/89

D-16A

Total Area = 2863 * 0.00175 = 5.1 ac
Paved = = 0.2 ac
disturbed = = 2.4 ac
Aspen = = 1.5 ac
Sage/Grass = = 1.0 ac

CN	A	Q
98	0.2	1.3294
90	2.4	0.723
70	1.5	0.096
75	1.0	0.185

$\overline{Q} = 0.457$ $\overline{CN} = 84.32$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 1415

$$\text{slope} = \frac{(2805)(25)(100)}{43{,}650\,(5.1)} = 31.6\%$$

Run-off Calculation: $Q_{TOT} = 2.13$ cfs

Ditch Design UPPER REACH

$S_{min} = 8\%$ S_{max} on upper reach ≈ 15%
$S_{max} = 37\%$ (lower reach into pond, based upon data after the 10/88 pond clean-out)

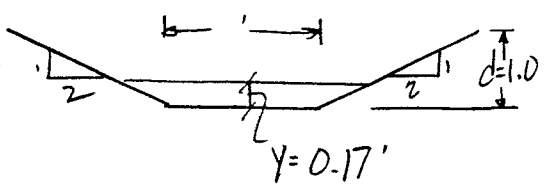
The ditch is currently lined with a conveyor belt. Because of the extreme variation in slope, it is recommended that the ditch be constructed as follows.

The upper portion of the ditch can be designed with the following parameters

b = , M = 2, n = 0.02

V = 4.75 < 5. ft/s

no lining required.



D-16A (Continued) LOWER REACH

The lower end of the channel cannot be designed practically without the use of a rip-rap pad. Therefore, the following is recommended.

Maximum Channel Slope ≈ 37%, Q = 2.13 cfs
d = 0.17 feet

Utilizing information presented in the manual "Design of Stable Channels w/ Flexible Linings", by the Federal Highway Administration. We get the following.

$$D_{50} = \frac{d_{max}\,\gamma\,S}{5}$$

where $d_{max} = 0.17$ ft
$\gamma = 62.4$
$S = 0.37$

$D_{50} = 0.8$ ft

Select $D_{50} = 1.0$ for additional safety factor and reduced maintenance.

From Table 5-1 (Urban Storm Drainage Criteria Manual Vol 2 - Wright-McLaughlin Eng. 1969)

D_{50} rock is classified as follows

TYPE L

% smaller than Given size by weight	Intermediate Rock dimen. (Inches)
70-100	15
50-70	12
35-50	9
2-10	3

The Urban Storm Drainage Criteria Manual suggests that Given the rip-rap type to be L, it is possible to use a single 12" layer of type II bedding as the underlying filter blanket.

The following cross section is proposed.

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FEATURE D-16A
PROJECT NO. 007.11.100

SHEET 3 OF
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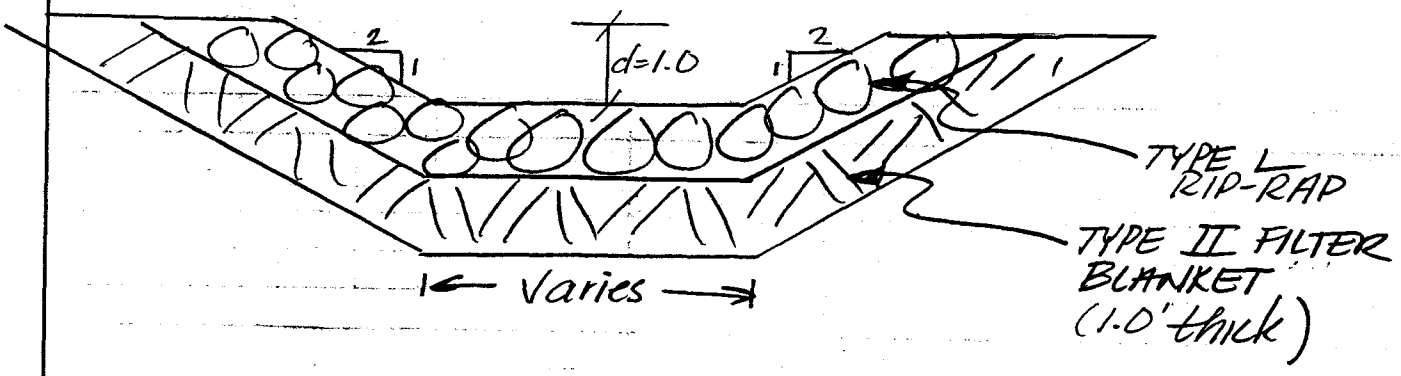
CHECKED
DATE 5/12/89

D-16A (Continued)



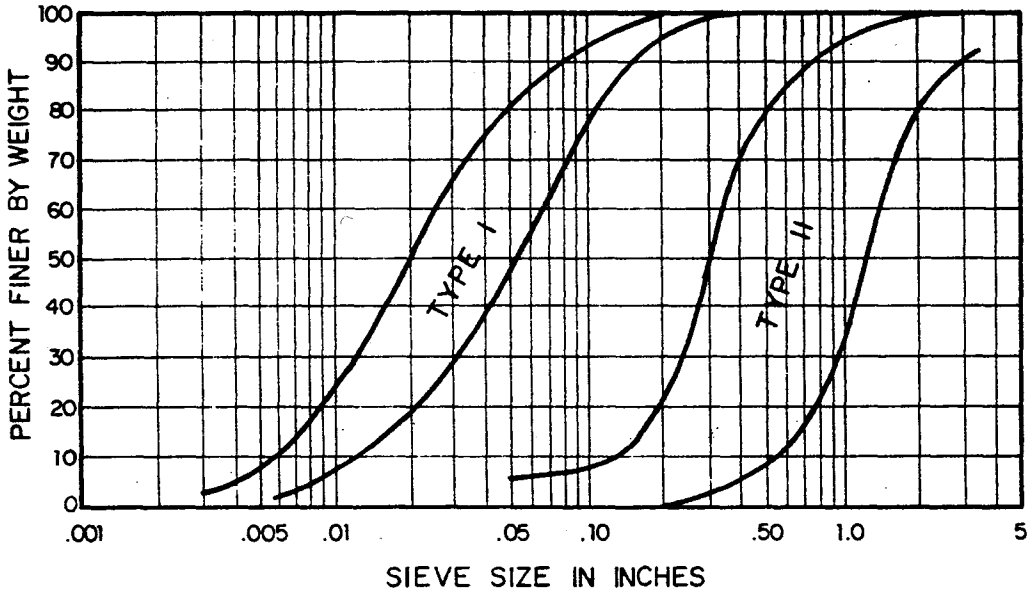


FIGURE 5-2. GRADATION CURVES FOR GRANULAR BEDDING

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FEATURE D-16A
PROJECT NO. 007.11.100

SHEET 4 OF
COMPUTED Paul
CHECKED
DATE 5/12/89

D-16A (Continued)

The intent is to break up the flow and prevent unnecessary erosion from occuring within the pond.

∴ design a transition zone and region to dissipate the stream energy prior to direct pond discharge.

The EPA has developed a methodology for a fan tailed energy dissipator, which receives flow from a culvert. (Erosion and Sediment Control-Surface Mining in the Eastern U.S. - EPA technology transfer Seminar Publication.) See figure 1-15 below

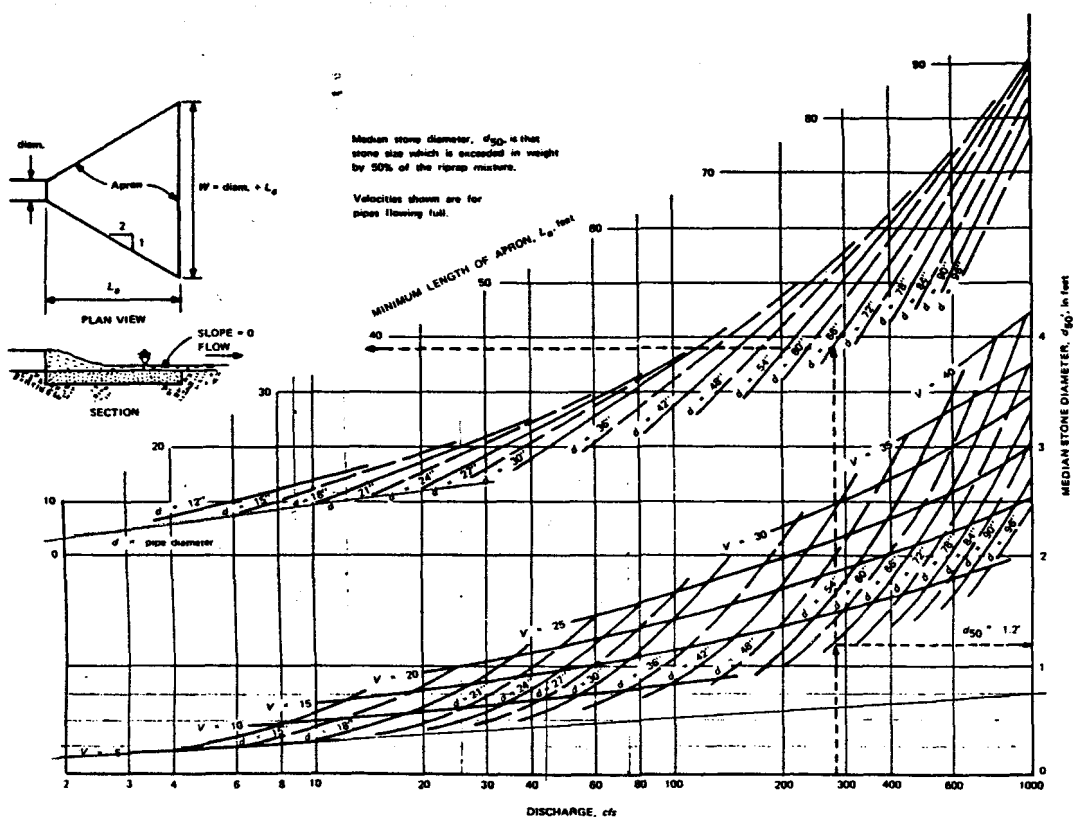

Figure I-15. Design of outlet protection — minimum tailwater condition (T_W < 0.5 diam.)[1]

Note: The Graph indicates a minimum length of 10 feet for a flow of 2-13 cfs (for all pipe diameters). As we are not on a zero % slope as for this method. It is recommended that we use 20' for a transition length.

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CLIENT Valley Camp
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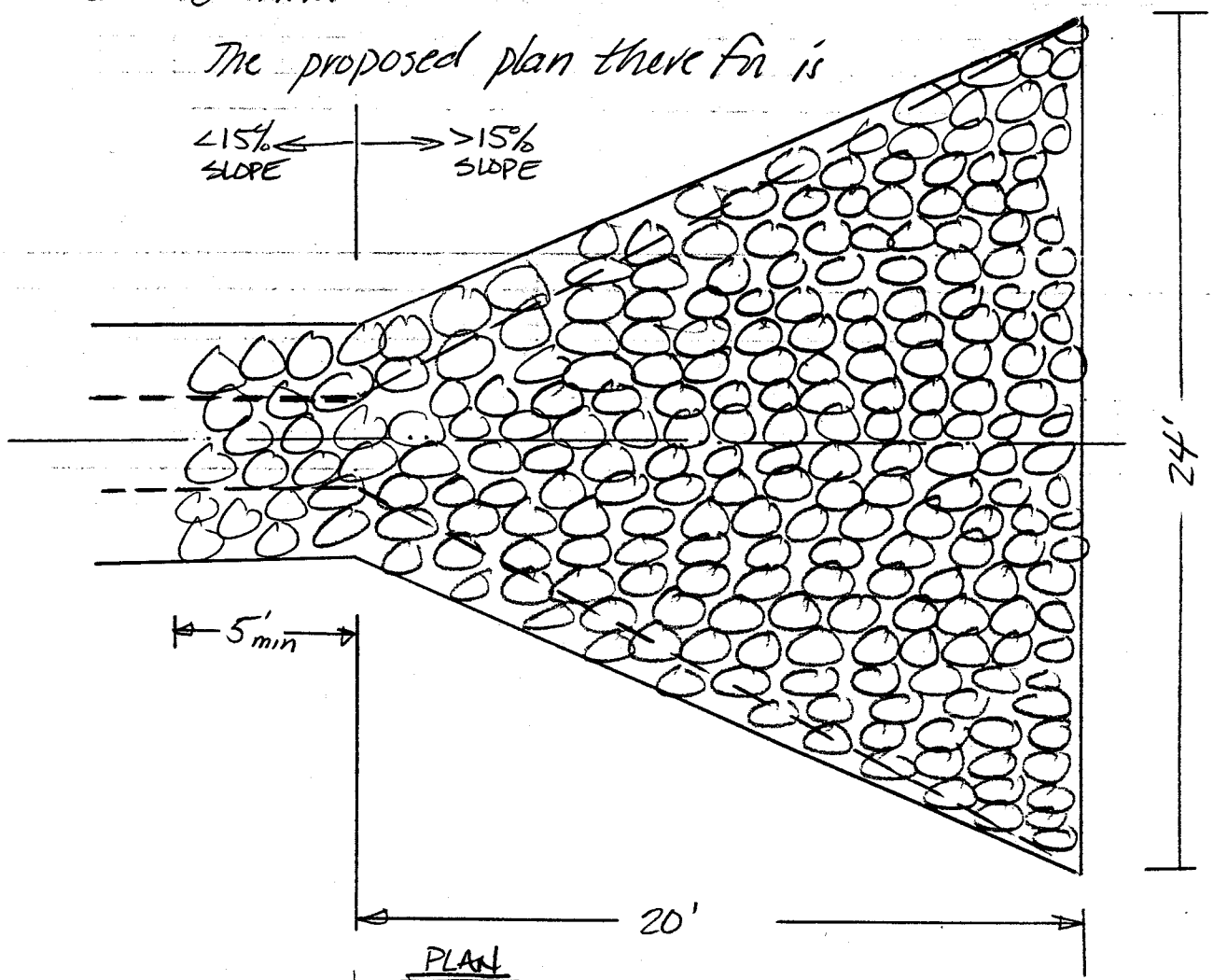
FEATURE D-16A
PROJECT NO. 007-11-100

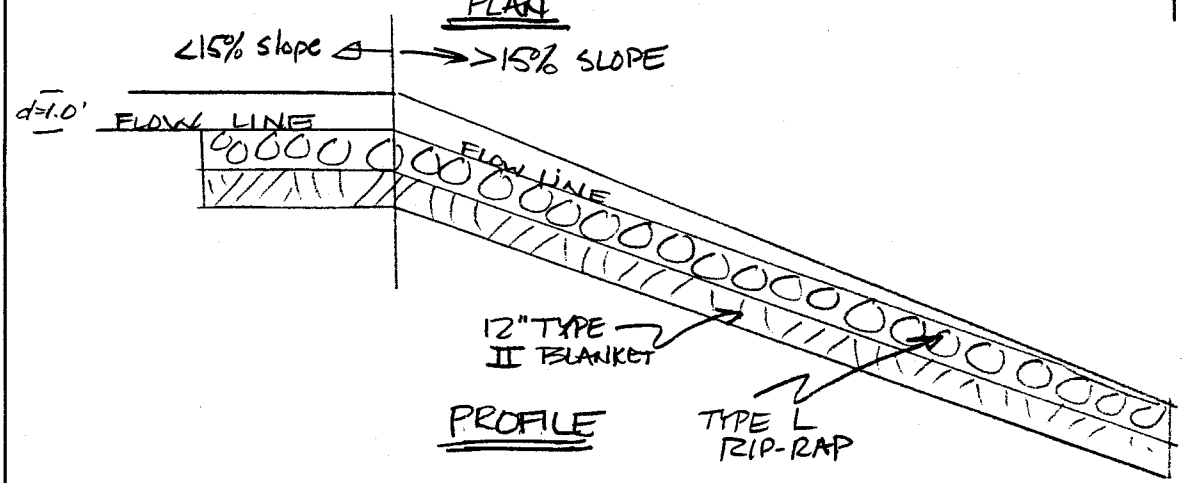
SHEET 5 OF
COMPUTED Paul
CHECKED
DATE 5/12/89

D-16A Continued

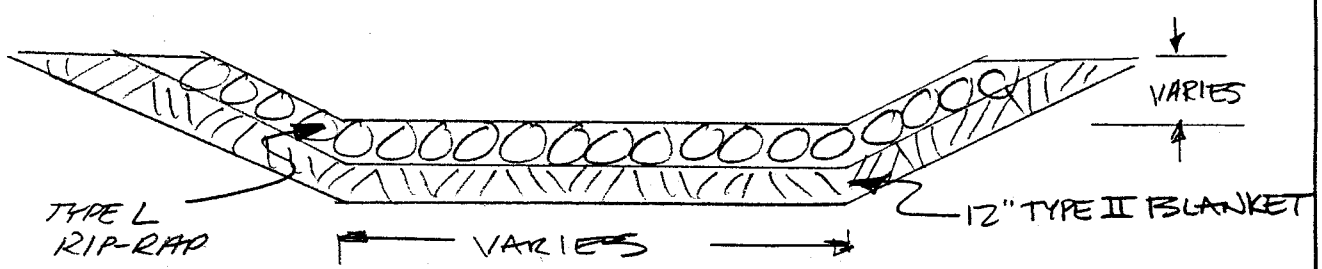
The proposed plan there for is



PLAN



PROFILE



PROJECT : Valley Camp Coal - D-16A Runoff Calculations

AREA= 5.1 ACRES
AVERAGE BASIN SLOPE= 31.6 PERCENT
CURVE NUMBER= 84.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1415. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0720 HOURS QPCFS= 53.55 CFS QPIN=10.4128 INCHES
C3= 51.3249 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.00	.3591	.0000	.0000	.0	.00
2.02	.3756	.0000	.0000	2.7	.00
2.03	.3921	.0002	.0002	16.6	.00
2.05	.4087	.0007	.0005	35.5	.00
2.06	.4252	.0015	.0008	49.2	.02
2.07	.4417	.0025	.0010	53.5	.04
2.09	.4582	.0038	.0013	50.2	.08
2.10	.4748	.0053	.0015	42.3	.14
2.12	.4913	.0071	.0018	33.1	.20
2.13	.5078	.0092	.0020	24.4	.27
2.15	.5243	.0114	.0023	17.2	.35
2.16	.5408	.0140	.0025	11.7	.44
2.18	.5574	.0167	.0027	7.7	.52
2.19	.5739	.0197	.0030	4.9	.61
2.20	.5904	.0228	.0032	3.1	.69
2.22	.6069	.0262	.0034	1.9	.78
2.23	.6235	.0298	.0036	1.2	.86
2.25	.6400	.0336	.0038	.7	.94
2.26	.6565	.0376	.0040	.4	1.02
2.28	.6730	.0418	.0042	.2	1.10
2.29	.6895	.0461	.0044	.1	1.17
2.30	.7061	.0507	.0045	.0	1.25
2.43	.8548	.0992	.0060	.0	1.84
2.45	.8713	.1054	.0062	.0	1.90
2.46	.8878	.1117	.0063	.0	1.96
2.48	.9043	.1181	.0065	.0	2.02
2.49	.9209	.1247	.0066	.0	2.07
2.51	.9320	.1293	.0045	.0	2.12
2.52	.9365	.1311	.0018	.0	2.13
2.54	.9409	.1329	.0018	.0	2.06
2.55	.9454	.1348	.0018	.0	1.90
2.56	.9499	.1366	.0019	.0	1.68
2.58	.9543	.1385	.0019	.0	1.46
2.59	.9588	.1404	.0019	.0	1.25

PROJECT : Valley Camp Coal - D-16A Runoff Calculations
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.61	.9633	.1423	.0019	.0	1.08

HYDROGRAPH PEAK= 2.13 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .19 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	10:45 AM
Channel Section:	Ditch D-16A	Computed:	PGH

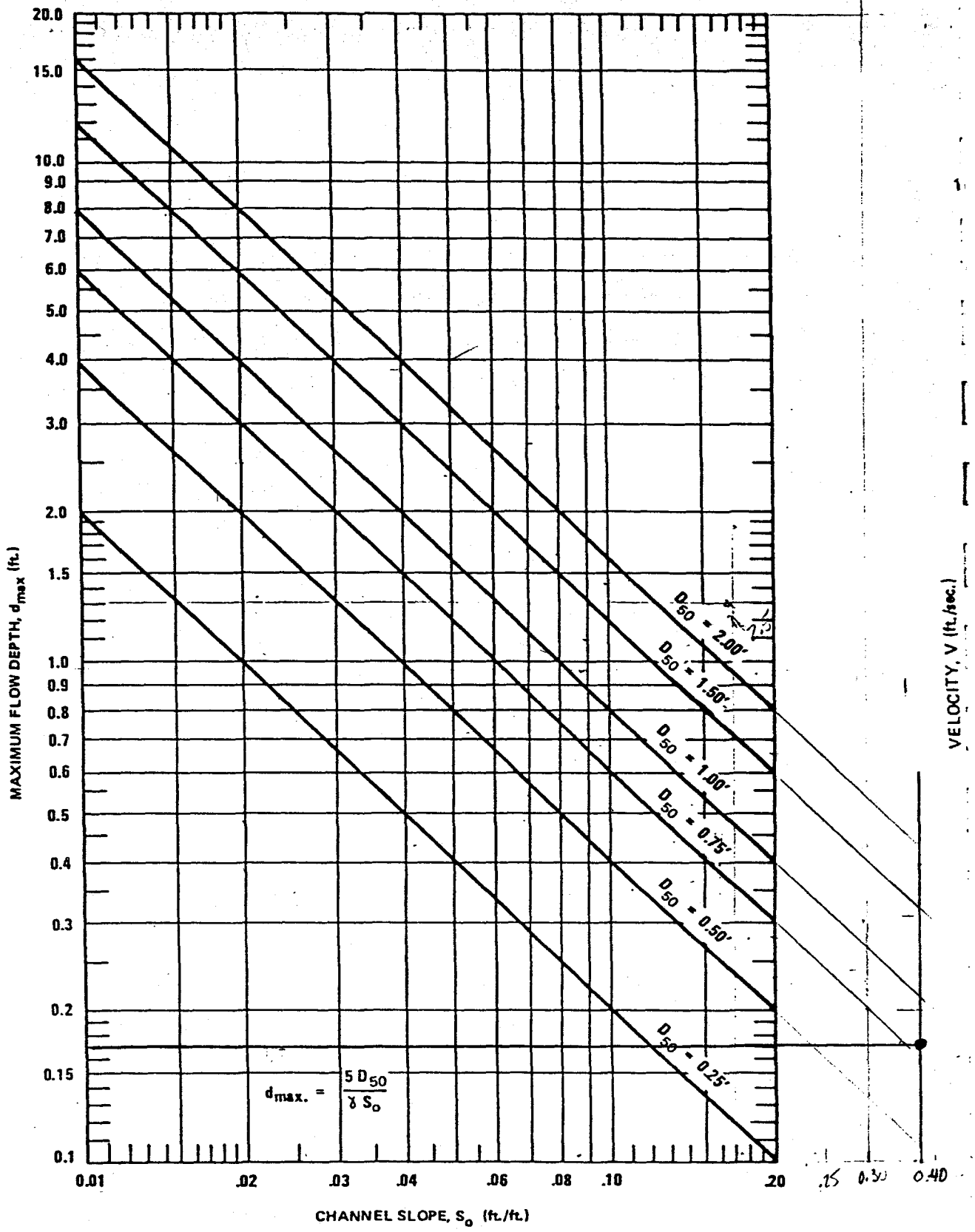
			UNITS
GENERAL CRITERIA:	Design Flow:	2.13	cfs
	Bottom Width:	3.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.08	ft/ft
	Max. Bottom Slope:	0.15	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.152	
	A(R)2/3=	0.153	
	Required Depth:	0.67	feet
	Area:	0.55	ft2
	Perimeter:	3.74	feet
	Hydraulic Radius:	0.15	feet
	Velocity:	3.88	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.14	feet
	Qn/1.49(S)1/2=	0.111	
	A(R)2/3=	0.112	
	Required Depth:	0.64	feet
	Area:	0.45	ft2
	Perimeter:	3.61	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	4.75	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	3.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.08	ft/ft
	Max. Bottom Slope :	0.15	ft/ft
	Min. Channel Depth:	0.67	feet
	Riprap:	Not Needed	

Comment: upper reach where S≤15%

Design of Stable Channels with Flexible Linings - Fed. Highway Administration

Chart 27



MAXIMUM PERMISSIBLE DEPTH OF FLOW (d_{max})
FOR CHANNELS LINED WITH ROCK RIPRAP

$n = .0395 D_{50}^{1/6}$

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-16B
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5/11/89

D-16B

TOTAL AREA = 415 * 0.00175 = 0.7 ac

CN = 90

PRECIPITATION = 1.55 inches (10yr, 6hr)

HYD. LENGTH = 400'

$$\text{SLOPE} = \frac{(2050)\,5(100)}{43560\,(0.7)} = 33.6\%$$

CALCULATED RUNOFF $Q_{TOT} = \underline{0.5\ cfs}$

DITCH DESIGN - UPPER SECTION TO EDGE OF POND SLOPE

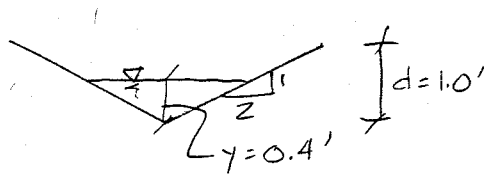
$S_{MIN} = 1\%$
$S_{MAX} = 10\%$

Try Trapezoidal Channel

$b = 0,\ m = 2,\ n = 0.03$

$V = 3.7\ fps < 5.0$ ok

NO LINING REQUIRED



PROJECT : Valley Camp Coal - D-16B Runoff Calculations

AREA= .7 ACRES
AVERAGE BASIN SLOPE= 33.6 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 400. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0205 HOURS QPCFS= 25.77 CFS QPIN=36.5095 INCHES
C3=179.9552 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2203	.0000	.0000	.0	.00
1.56	.2263	.0000	.0000	25.8	.00
1.58	.2324	.0000	.0000	8.4	.00
1.60	.2384	.0002	.0001	.9	.00
1.62	.2444	.0004	.0002	.0	.00
2.36	.7665	.1790	.0128	.0	.45
2.38	.7901	.1920	.0131	.0	.46
2.40	.8136	.2054	.0134	.0	.47
2.42	.8371	.2190	.0136	.0	.48
2.44	.8606	.2329	.0139	.0	.49
2.46	.8841	.2471	.0142	.0	.49
2.48	.9076	.2615	.0144	.0	.50
2.50	.9303	.2756	.0141	.0	.50
2.52	.9367	.2796	.0040	.0	.24
2.54	.9430	.2836	.0040	.0	.15
2.56	.9494	.2876	.0040	.0	.14
2.58	.9557	.2917	.0040	.0	.14
2.60	.9621	.2957	.0041	.0	.14

HYDROGRAPH PEAK= .50 cfs
TIME TO PEAK= 2.48 Hours
RUNOFF VOLUME= .04 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	09:53 AM
Channel Section:	Ditch D-16B	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.50	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.01	ft/ft
	Max. Bottom Slope:	0.10	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.40	feet
	Qn/1.49(S)1/2=	0.101	
	A(R)2/3=	0.102	
	Required Depth:	0.90	feet
	Area:	0.32	ft2
	Perimeter:	1.79	feet
	Hydraulic Radius:	0.18	feet
	Velocity:	1.56	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.26	feet
	Qn/1.49(S)1/2=	0.032	
	A(R)2/3=	0.032	
	Required Depth:	0.76	feet
	Area:	0.14	ft2
	Perimeter:	1.16	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	3.70	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.01	ft/ft
	Max. Bottom Slope :	0.10	ft/ft
	Min. Channel Depth:	0.90	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-18A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/10/89

D-18A

calibrate planimeter $\frac{\frac{(250\ ft)^2}{43560}}{822} = 0.00175$ Ac/#

Total Area = 1200 * 0.00175 = 2.1 Acres
dist. area = 273 = 0.5 Ac
Aspen = 724 = 1.3 Ac
Sage/Grass = = 0.3 Ac

CN	Ac	Q
90	0.5	0.723
70	1.3	0.096
75	0.3	0.185

$\bar{Q} = 0.258$ $\bar{CN} = 78.1$

Precipitation = 1.55 inches (10yr, 6hr)

Hydraulic length = 750 feet

$$\text{slope} = \frac{(1575)(25)(100)}{43{,}560\ (2.1)} = 43\%$$

Run-off Calculation: Q = 0.46 cfs

Ditch Design:

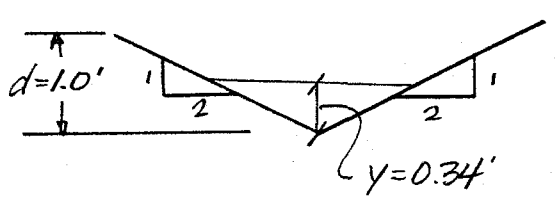
$S_{min} = 2\%$
$S_{max} = 5\%$

Try trapezoidal design

$b = 0$, $M = 2$, $\eta = 0.03$

$V = 2.73$ ft/sec < 5 ft/sec OK

No lining necessary



PROJECT : Valley Camp Coal - D-19A Runoff Calculation

AREA= 2.1 ACRES
AVERAGE BASIN SLOPE= 43.0 PERCENT
CURVE NUMBER= 78.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 750. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0453 HOURS QPCFS= 35.03 CFS QPIN=16.5406 INCHES
C3= 81.5285 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.18	.5582	.0000	.0000	.0	.00
2.19	.5755	.0000	.0000	7.1	.00
2.21	.5929	.0004	.0003	26.8	.00
2.22	.6102	.0009	.0005	35.0	.01
2.24	.6275	.0015	.0007	29.6	.03
2.25	.6448	.0024	.0009	19.7	.05
2.27	.6622	.0035	.0011	11.3	.08
2.28	.6795	.0048	.0013	5.8	.10
2.30	.6968	.0063	.0015	2.8	.13
2.31	.7142	.0080	.0017	1.3	.16
2.33	.7315	.0098	.0018	.5	.18
2.34	.7488	.0118	.0020	.2	.21
2.36	.7662	.0140	.0022	.0	.24
2.37	.7835	.0164	.0024	.0	.26
2.39	.8008	.0189	.0025	.0	.29
2.40	.8182	.0216	.0027	.0	.31
2.42	.8355	.0245	.0029	.0	.34
2.43	.8528	.0275	.0030	.0	.36
2.45	.8702	.0307	.0032	.0	.38
2.46	.8875	.0341	.0034	.0	.41
2.48	.9048	.0376	.0035	.0	.43
2.49	.9221	.0412	.0037	.0	.45
2.51	.9326	.0435	.0023	.0	.46
2.52	.9372	.0446	.0010	.0	.43
2.54	.9419	.0456	.0010	.0	.36
2.55	.9466	.0467	.0011	.0	.29
2.57	.9513	.0477	.0011	.0	.23
2.58	.9560	.0488	.0011	.0	.19
2.60	.9607	.0499	.0011	.0	.17

HYDROGRAPH PEAK= .46 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .05 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	10-May-89
Project No.:	007.11.100	Time:	03:00 PM
Channel Section:	Ditch D-18A	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.46	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.34	feet
	Qn/1.49(S)1/2=	0.066	
	A(R)2/3=	0.066	
	Required Depth:	0.84	feet
	Area:	0.23	ft2
	Perimeter:	1.52	feet
	Hydraulic Radius:	0.15	feet
	Velocity:	1.99	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.29	feet
	Qn/1.49(S)1/2=	0.042	
	A(R)2/3=	0.043	
	Required Depth:	0.79	feet
	Area:	0.17	ft2
	Perimeter:	1.30	feet
	Hydraulic Radius:	0.13	feet
	Velocity:	2.73	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Channel Depth:	0.84	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-18B
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/10/89

D-18-B (Convenience Ditch)
Tributary Area

Area D-18B = 943 * 0.00175 = 1.65 ac
sage/grass = 377 = 0.7
aspen = = 0.2
Disturbed = 286 = 0.5
Reclam = 143 = 0.25

CN	Area	Q
85	0.25	0.184
75	0.7	0.185
70	0.2	0.096
90	0.5	0.723

$\bar{Q} = 0.383$ $\bar{CN} = 82.3$

Precipitation = 1.55 inches (10yr, 6hr)

hydraulic length = 850 ft

$$\text{slope} = \frac{(850)(25)(100)}{43{,}560\ (1.4)} = 34.8$$

Run-Off Calculation: Q = 0.59 cfs

No additional design anticipated

PROJECT : Valley Camp Coal - D-18B Runoff Calculations

AREA= 1.6 ACRES
AVERAGE BASIN SLOPE= 34.8 PERCENT
CURVE NUMBER= 82.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 850. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0488 HOURS QPCFS= 25.56 CFS QPIN=15.3608 INCHES
C3= 75.7135 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.05	.4153	.0000	.0000	.0	.00
2.07	.4340	.0000	.0000	5.2	.00
2.08	.4527	.0002	.0002	19.6	.00
2.10	.4713	.0008	.0005	25.6	.00
2.12	.4900	.0016	.0008	21.6	.02
2.13	.5087	.0028	.0011	14.4	.04
2.15	.5274	.0042	.0014	8.2	.07
2.17	.5460	.0059	.0017	4.2	.09
2.18	.5647	.0079	.0020	2.0	.12
2.20	.5834	.0102	.0023	.9	.15
2.21	.6021	.0127	.0025	.4	.18
2.23	.6207	.0155	.0028	.2	.21
2.25	.6394	.0186	.0030	.0	.24
2.41	.8261	.0616	.0053	.0	.48
2.43	.8448	.0670	.0055	.0	.50
2.44	.8635	.0727	.0056	.0	.52
2.46	.8821	.0785	.0058	.0	.54
2.47	.9008	.0845	.0060	.0	.56
2.49	.9195	.0907	.0062	.0	.58
2.51	.9322	.0950	.0043	.0	.59
2.52	.9373	.0968	.0017	.0	.55
2.54	.9423	.0985	.0017	.0	.46
2.56	.9473	.1003	.0018	.0	.36
2.57	.9524	.1020	.0018	.0	.28
2.59	.9574	.1038	.0018	.0	.23
2.60	.9625	.1056	.0018	.0	.21

HYDROGRAPH PEAK= .59 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .05 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-19A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/18/89

D-19A

Total Area = 5 * 1.401 = 7.0 Acres

CN = 75

Precip = 1.55 inches (10 yr, 6 hr)

hydraulic length = 1,200 ft

$$\text{Slope} = \frac{(900)(80)(100)}{43{,}560\,(7)} = 23.6\%$$

Calculated Runoff $Q_{TOT_{10\,yr}} = 0.74$ cfs

Ditch Design

$S_{min} = 3\%$

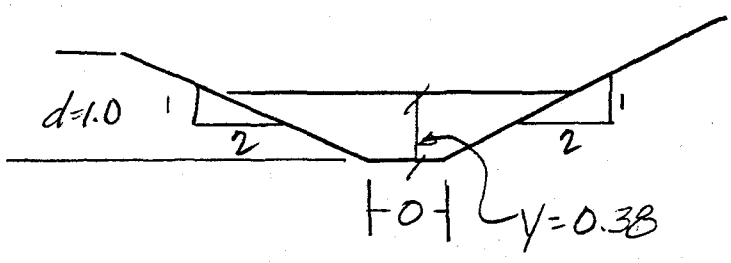
$S_{max} = 4\%$

try trapezoidal channel

$b = 0,\ m = 2,\ n = 0.03$

$V_{max} = 2.85 < 5.0$ fps ok

No Lining Required



AREA= 7.0 ACRES
AVERAGE BASIN SLOPE= 23.6 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1200. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0976 HOURS QPCFS= 54.21 CFS QPIN= 7.6803 INCHES
C3= 37.8561 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6610	.0000	.0000	.0	.00
2.28	.6834	.0000	.0000	2.7	.00
2.30	.7058	.0005	.0004	16.8	.00
2.32	.7282	.0011	.0007	36.0	.01
2.34	.7506	.0021	.0009	49.8	.03
2.36	.7730	.0033	.0012	54.2	.07
2.38	.7954	.0048	.0015	50.8	.12
2.40	.8178	.0066	.0018	42.9	.18
2.42	.8402	.0086	.0020	33.5	.25
2.44	.8626	.0109	.0023	24.7	.34
2.46	.8850	.0134	.0025	17.4	.42
2.48	.9074	.0162	.0028	11.8	.51
2.50	.9298	.0193	.0030	7.8	.61
2.52	.9360	.0201	.0009	5.0	.69
2.54	.9421	.0210	.0009	3.1	.74
2.56	.9481	.0219	.0009	1.9	.74
2.58	.9542	.0228	.0009	1.2	.70
2.60	.9602	.0238	.0009	.7	.64
2.62	.9663	.0247	.0009	.4	.57
2.64	.9723	.0257	.0010	.2	.50
2.66	.9784	.0267	.0010	.1	.45
2.68	.9844	.0277	.0010	.0	.42

HYDROGRAPH PEAK= .74 cfs
TIME TO PEAK= 2.56 Hours
RUNOFF VOLUME= .11 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	12-Jul-89
Project No.:	007.11.100	Time:	02:31 PM
Channel Section:	D-19A	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.74	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.030	ft/ft
	Max. Bottom Slope:	0.040	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.38	feet
	Qn/1.49(S)1/2=	0.086	
	A(R)2/3=	0.086	
	Required Depth:	0.88	feet
	Area:	0.28	ft2
	Perimeter:	1.68	feet
	Hydraulic Radius:	0.17	feet
	Velocity:	2.63	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.36	feet
	Qn/1.49(S)1/2=	0.075	
	A(R)2/3=	0.077	
	Required Depth:	0.86	feet
	Area:	0.26	ft2
	Perimeter:	1.61	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	2.85	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	3.0	%
	Max. Bottom Slope:	4.0	%
	Min Channel Depth:	0.88	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-19B
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

D-19B

Total Area = 530 * 0.00087 = 0.5 Acres

CN = 75

Precipitation = 1.55" (10yr, 6hr)

hydraulic length = 625'

$$\text{slope} = \frac{(250)(5)(100)}{43{,}560(0.5)} = 5.7\%$$

Calculated Run-off = $Q_{TOT_{100yr}} = 0.05$ cfs

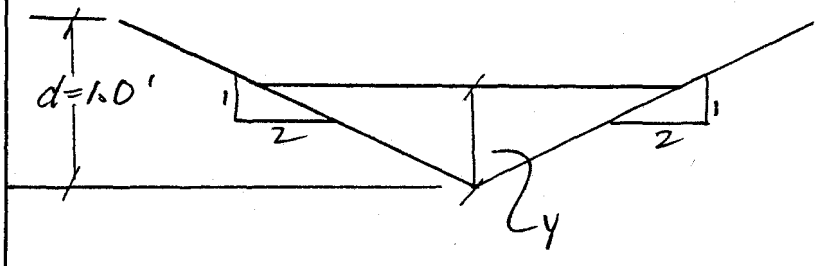
Ditch Design

$S_{min} = 2\%$

$S_{max} = 4\%$

try trapezoidal channel

$b=0,\ m=2,\ n=0.03$



FLOW IS MINIMAL
USE GENERAL DESIGN

PROJECT : Bailey Camp Coal - D-195 Runoff Calculation

AREA= .5 ACRES
AVERAGE BASIN SLOPE= 5.7 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 625. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1179 HOURS QPCFS= 3.21 CFS QPIN= 6.3606 INCHES
C3= 31.3515 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6591	.0000	.0000	.0	.00
2.29	.6862	.0001	.0001	.2	.00
2.31	.7132	.0006	.0005	1.0	.00
2.33	.7403	.0016	.0009	2.1	.00
2.36	.7673	.0030	.0014	2.9	.00
2.38	.7944	.0047	.0018	3.2	.00
2.41	.8214	.0069	.0022	3.0	.00
2.43	.8485	.0094	.0025	2.5	.02
2.45	.8755	.0123	.0029	2.0	.02
2.48	.9026	.0156	.0033	1.5	.03
2.50	.9296	.0192	.0036	1.0	.04
2.52	.9372	.0203	.0011	.7	.04
2.55	.9445	.0214	.0011	.5	.05
2.57	.9518	.0225	.0011	.3	.05
2.59	.9591	.0236	.0011	.2	.05
2.62	.9664	.0247	.0011	.1	.04
2.64	.9738	.0259	.0012	.0	.04
2.67	.9811	.0271	.0012	.0	.04
2.69	.9884	.0283	.0012	.0	.03
2.71	.9957	.0296	.0012	.0	.03

HYDROGRAPH PEAK= .05 cfs
TIME TO PEAK= 2.57 Hours
RUNOFF VOLUME= .00 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/20/89

D-29A

Tributary Area = 1.7ac

			Q
Undisturbed	= 0.67ac	CN = 70	0.096
Disturbed	= 1.03ac	CN = 90	0.723

$\bar{Q} = 0.476$ $\bar{CN} = 84.8$

Precipitation = 1.55 in (10yr-6hr)

Hydraulic Length = 500 ft

$$\text{Slope} = \frac{(1490)\,25(100)}{43560\,(1.7)} = 50.3\%$$

Runoff Calculation: $Q_{TOT} = 0.80$ cfs

DITCH LIES IN STORAGE YARD - USE GENERAL DESIGN

b=0, m=2, d=1.0' max

PROJECT : Valley Camp Coal - D-292 Runoff Calculation

AREA= 1.7 ACRES
AVERAGE BASIN SLOPE= 50.3 PERCENT
CURVE NUMBER= 84.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0244 HOURS QPCFS= 52.67 CFS QPIN=30.7227 INCHES
CN=151.4323 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.99	.3536	.0000	.0000	.0	.00
2.00	.3593	.0000	.0000	25.8	.00
2.01	.3733	.0001	.0001	52.7	.00
2.03	.3873	.0005	.0003	37.1	.02
2.04	.4013	.0010	.0005	16.9	.04
2.05	.4153	.0017	.0007	6.1	.06
2.06	.4293	.0027	.0009	1.9	.09
2.08	.4433	.0038	.0011	.5	.12
2.09	.4573	.0052	.0013	.1	.15
2.10	.4713	.0067	.0015	.0	.17
2.42	.8355	.1002	.0052	.0	.71
2.43	.8495	.1056	.0053	.0	.73
2.44	.8635	.1110	.0054	.0	.74
2.45	.8775	.1165	.0055	.0	.76
2.47	.8915	.1222	.0056	.0	.77
2.48	.9055	.1279	.0057	.0	.79
2.49	.9195	.1337	.0058	.0	.80
2.50	.9309	.1386	.0048	.0	.79
2.52	.9347	.1402	.0016	.0	.66
2.53	.9385	.1418	.0016	.0	.45
2.54	.9423	.1434	.0016	.0	.32
2.55	.9461	.1451	.0016	.0	.26
2.56	.9499	.1467	.0016	.0	.24

HYDROGRAPH PEAK= .80 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .07 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

D-29B

Tributary Area = 1.2ac

			Q
Undisturbed Area	= 0.86ac	CN=70	0.096
Disturbed Area	= 0.34ac	CN=90	0.723

$\bar{Q} = 0.274$ $\overline{CN} = 78.7$

Precipitation = 1.55 inches (10yr, 6hr)

Hydraulic Length = 440 feet

Slope = $\frac{(1400)25(100)}{43560\,(1.2)}$ = 66.9%

Runoff Calculation: Q_{TOT} = 0.31cfs

DITCH LIES IN STORAGE YARD - USE GENERAL DESIGN

b=0, m=2, d=1.0' max

[illegible] - 6-HRS Runoff Calculation

AREA= 1.2 ACRES
AVERAGE BASIN SLOPE= 66.9 PERCENT
CURVE NUMBER= 78.7
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 440. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0233 HOURS QPCFS= 38.95 CFS QPIN=32.1899 INCHES
C3=158.6639 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.14	.5202	.0000	.0000	.0	.00
2.17	.5469	.0000	.0000	39.0	.00
2.19	.5736	.0004	.0004	12.5	.01
2.21	.6003	.0013	.0009	1.4	.04
2.24	.6270	.0026	.0014	.1	.06
2.26	.6537	.0045	.0019	.0	.09
2.28	.6804	.0068	.0023	.0	.12
2.31	.7071	.0096	.0028	.0	.14
2.33	.7339	.0128	.0032	.0	.16
2.35	.7606	.0164	.0036	.0	.19
2.38	.7873	.0205	.0041	.0	.21
2.40	.8140	.0250	.0045	.0	.23
2.42	.8407	.0298	.0049	.0	.25
2.45	.8674	.0351	.0052	.0	.27
2.47	.8941	.0407	.0056	.0	.29
2.49	.9209	.0467	.0060	.0	.31
2.52	.9347	.0499	.0033	.0	.21
2.54	.9420	.0517	.0017	.0	.12
2.56	.9492	.0534	.0018	.0	.10
2.59	.9564	.0552	.0018	.0	.09
2.61	.9636	.0570	.0018	.0	.10
2.63	.9708	.0588	.0018	.0	.10

HYDROGRAPH PEAK= .31 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .03 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-30
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

D-30

TOTAL AREA = 1748 * .00702 = 12.3 ac
UNDIST AREA = 1029 = 7.2 ac (25% OAK/ASPEN)
PAVED AREA = 122 = 0.9 ac
DIST AREA = = 4.2 ac

CN	A	Q
98	0.9	1.329
90	4.2	0.723
70	7.2	0.096
		$\bar{Q}$ = 0.401

$\overline{CN}$ = 82.8

PRECIP = 1.55'

HYD. LENGTH = 1450'

SLOPE: $\frac{9450 * 25 * 100}{12.3 * 43560}$ = 44:1

RUNOFF CALCULATION: Q = 4.5 cfs

DITCH DESIGN:

S_{min} = 10%
S_{max} = 12½%

DITCH CURRENTLY LINED WITH CONCRETE GUTTER ALONG ROAD. NO EROSION POTENTIAL

NO ADD'L DESIGN CONTEMPLATED

PROJECT : Valley Camp Coal - Ditch D-30 Runoff Calculation

AREA= 12.3 ACRES
AVERAGE BASIN SLOPE= 44.1 PERCENT
CURVE NUMBER= 82.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1450. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0654 HOURS QPCFS= 142.22 CFS QPIN=11.4670 INCHES
C3= 56.5206 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.04	.4067	.0000	.0000	.0	.00
2.06	.4254	.0000	.0000	13.5	.00
2.08	.4442	.0004	.0003	69.6	.00
2.09	.4629	.0011	.0007	123.7	.04
2.11	.4817	.0020	.0010	142.2	.11
2.13	.5004	.0033	.0013	128.8	.22
2.14	.5192	.0049	.0016	100.3	.38
2.16	.5380	.0068	.0019	70.4	.56
2.17	.5567	.0090	.0022	45.8	.76
2.19	.5755	.0114	.0024	28.1	.97
2.21	.5942	.0142	.0027	16.4	1.19
2.22	.6130	.0171	.0030	9.3	1.41
2.24	.6317	.0204	.0032	5.1	1.62
2.26	.6505	.0239	.0035	2.7	1.83
2.27	.6692	.0276	.0037	1.4	2.03
2.29	.6880	.0316	.0040	.7	2.24
2.31	.7067	.0358	.0042	.4	2.43
2.32	.7255	.0403	.0044	.2	2.62
2.34	.7442	.0449	.0047	.0	2.81
2.35	.7630	.0498	.0049	.0	2.99
2.37	.7818	.0549	.0051	.0	3.17
2.39	.8005	.0602	.0053	.0	3.35
2.40	.8193	.0657	.0055	.0	3.52
2.42	.8380	.0714	.0057	.0	3.68
2.44	.8568	.0773	.0059	.0	3.84
2.45	.8755	.0834	.0061	.0	4.00
2.47	.8943	.0897	.0063	.0	4.16
2.49	.9130	.0962	.0065	.0	4.31
2.50	.9305	.1023	.0062	.0	4.45
2.52	.9355	.1041	.0018	.0	4.50
2.53	.9406	.1060	.0018	.0	4.27
2.55	.9457	.1078	.0018	.0	3.77
2.57	.9508	.1097	.0019	.0	3.17
2.58	.9558	.1115	.0019	.0	2.62
2.60	.9609	.1134	.0019	.0	2.19

PROJECT : Valley Camp Coal - Ditch D-30 Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.62	.9660	.1153	.0019	.0	1.89

HYDROGRAPH PEAK= 4.50 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .41 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-31
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

D-31 (Convenience Ditch)

Total Area = 473 * 0.00702 = 3.3 acres
disturbed area = 1.9 acres
undisturbed area = 1.4 acres (25% Oak/Aspen)

CN	area	Q
70	1.4	0.096
90	1.9	0.723
		$\bar{Q}$ = 0.457

$\bar{CN}$ = 84.3

Precipitation = 1.55 in (10 yr, 6 hr)

hydraulic length = 700 feet

$$\text{slope} = \frac{(2300)(25)(100)}{43{,}560\ (3.3)} = 40.0\%$$

Run-Off Calculation: Q_{TOT} = 1.48 cfs

Convenience Ditch - No design anticipated OK

PROJECT : Valley Camp Coal - D-31 Runoff Calculations

AREA= 3.3 ACRES
AVERAGE BASIN SLOPE= 40.0 PERCENT
CURVE NUMBER= 84.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0365 HOURS QPCFS= 68.46 CFS QPIN=20.5723 INCHES
C3=101.4008 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.01	.3626	.0000	.0000	.0	.00
2.02	.3835	.0000	.0000	33.5	.00
2.04	.4044	.0005	.0005	68.5	.02
2.06	.4253	.0015	.0009	48.3	.07
2.08	.4462	.0028	.0014	22.0	.13
2.10	.4671	.0046	.0018	7.9	.21
2.11	.4880	.0068	.0022	2.4	.28
2.13	.5089	.0093	.0026	.7	.36
2.15	.5299	.0123	.0029	.2	.43
2.17	.5508	.0156	.0033	.0	.50
2.39	.8017	.0804	.0070	.0	1.21
2.41	.8226	.0876	.0072	.0	1.25
2.42	.8435	.0951	.0075	.0	1.30
2.44	.8644	.1028	.0077	.0	1.35
2.46	.8853	.1107	.0079	.0	1.39
2.48	.9062	.1189	.0082	.0	1.43
2.50	.9271	.1273	.0084	.0	1.48
2.52	.9349	.1304	.0032	.0	1.33
2.53	.9405	.1328	.0023	.0	.97
2.55	.9462	.1351	.0023	.0	.67
2.57	.9518	.1375	.0024	.0	.51
2.59	.9575	.1398	.0024	.0	.46
2.61	.9631	.1422	.0024	.0	.44

HYDROGRAPH PEAK= 1.48 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .13 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-32A, D-32B
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

D-32A, D-32B (Convenience Ditches)

Total Area = 845 * 0.00702 = 5.9 ac
undisturbed = = 5.3 ac
disturbed = = 0.6 ac

CN	A	Q
90	0.6	0.723
70	5.3	0.096
		$\bar{Q}$ = 0.160

$\bar{CN}$ = 73.8

Precipitation = 1.55 inches (10 yr. 6 hr)

hydraulic length = 820 feet

$$\text{slope} = \frac{(5000)(25)(100)}{(43{,}560)(5.9)} = 48.6\%$$

Run-off Calculation: Q_{TOT} = 0.58 cfs

Convenience Ditches - No design contemplated

PROJECT : Valley Camp Coal - D-32A, D-32B Runoff Calculations

AREA= 5.9 ACRES
AVERAGE BASIN SLOPE= 48.6 PERCENT
CURVE NUMBER= 73.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 820. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0519 HOURS QPCFS= 85.93 CFS QPIN=14.4441 INCHES
C3= 71.1952 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.30	.7032	.0000	.0000	.0	.00
2.32	.7230	.0000	.0000	17.4	.00
2.34	.7429	.0003	.0003	65.8	.00
2.35	.7627	.0008	.0005	85.9	.03
2.37	.7826	.0015	.0007	72.6	.07
2.39	.8024	.0023	.0009	48.3	.12
2.41	.8223	.0034	.0011	27.6	.18
2.42	.8421	.0047	.0013	14.2	.25
2.44	.8620	.0062	.0015	6.8	.32
2.46	.8818	.0079	.0017	3.1	.39
2.48	.9017	.0098	.0019	1.3	.46
2.49	.9216	.0119	.0021	.5	.53
2.51	.9331	.0132	.0013	.2	.58
2.53	.9385	.0138	.0006	.0	.56
2.54	.9438	.0144	.0006	.0	.49
2.56	.9492	.0151	.0006	.0	.39
2.58	.9545	.0158	.0007	.0	.32
2.60	.9599	.0164	.0007	.0	.27
2.61	.9653	.0171	.0007	.0	.25

HYDROGRAPH PEAK= .58 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .08 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-33A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 8 MAY 89

D-33A

TOTAL AREA	2037 * .00702	= 14.3 acres
PAVED AREA	189 *	= 1.3
RECLAIMED AREA	175 *	= 1.2
DISTURBED AREA	578 *	= 4.1
UNDISTURBED AREA	1095 *	= 7.7

CN	A	Q
98	1.3	1.329
90	4.1	0.723
85	1.2	0.484
70	7.7	0.096
		$\bar{Q}$ = 0.421

$\overline{CN}$ = 83.4

PRECIP = 1.55" (10YR-6HR)

HYD LENGTH = 2000'

$$\text{SLOPE} = \frac{10550 * 25 * 100}{14.3 * 43560} = 42.3\%$$

RUNOFF CALCULATION: Q = 5.36 cfs

DITCH DESIGN

Smin = 4% ?
Smax = 4% ?

DITCH CURRENTLY LINED WITH CONCRETE GUTTER ALONG ROAD. NO EROSION POTENTIAL

NO ADDL DESIGN CONTEMPLATED

PROJECT : Valley Camp Coal - Ditch D-33A Runoff Calculation

AREA= 14.3 ACRES
AVERAGE BASIN SLOPE= 42.3 PERCENT
CURVE NUMBER= 83.4
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0847 HOURS QPCFS= 127.74 CFS QPIN= 8.8588 INCHES
C3= 43.6652 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.03	.3930	.0000	.0000	.0	.00
2.05	.4124	.0001	.0001	6.4	.00
2.07	.4318	.0006	.0005	39.7	.00
2.08	.4512	.0014	.0008	84.8	.03
2.10	.4707	.0026	.0012	117.3	.09
2.12	.4901	.0041	.0015	127.7	.19
2.13	.5095	.0059	.0018	119.7	.34
2.15	.5289	.0081	.0022	101.0	.52
2.17	.5483	.0105	.0025	79.0	.74
2.18	.5678	.0133	.0028	58.3	.97
2.20	.5872	.0164	.0031	41.1	1.22
2.22	.6066	.0198	.0034	27.9	1.48
2.23	.6260	.0234	.0036	18.4	1.74
2.25	.6454	.0273	.0039	11.8	2.00
2.27	.6649	.0315	.0042	7.4	2.26
2.29	.6843	.0360	.0044	4.6	2.51
2.30	.7037	.0407	.0047	2.8	2.76
2.32	.7231	.0456	.0049	1.7	3.00
2.34	.7425	.0508	.0052	1.0	3.23
2.35	.7620	.0562	.0054	.6	3.46
2.37	.7814	.0619	.0057	.3	3.69
2.39	.8008	.0678	.0059	.2	3.90
2.40	.8202	.0739	.0061	.1	4.12
2.42	.8396	.0802	.0063	.0	4.33
2.44	.8591	.0867	.0065	.0	4.53
2.46	.8785	.0934	.0067	.0	4.73
2.47	.8979	.1003	.0069	.0	4.92
2.49	.9173	.1074	.0071	.0	5.11
2.51	.9318	.1129	.0054	.0	5.28
2.52	.9371	.1149	.0020	.0	5.36
2.54	.9423	.1169	.0020	.0	5.23
2.56	.9476	.1189	.0020	.0	4.87
2.57	.9528	.1209	.0020	.0	4.35
2.59	.9581	.1230	.0020	.0	3.78
2.61	.9633	.1250	.0021	.0	3.26

PROJECT : Valley Camp Coal - Ditch D-33A Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.62	.9686	.1271	.0021	.0	2.82

HYDROGRAPH PEAK= 5.36 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .50 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-33B
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

D-33B

TRIBUTARY AREAS: D-35; D-39A-B; D-38; D-36; D-33B

AREA: CHANGE PLANIMETER SCALE TO 20
Rdg: 817 A = 5.74 ac RATIO 0.00702

TOTAL	1905 * 0.00702 = 13.4 ac		
DIST.	1336	= 7.4 ac	CN = 90
UNDIST	569	= 4.0 ac	CN = 75
RECLAIMED		2.2 ac	CN = 85

CN RATIONAL SHOWN ON D-44B SHEETS

VOL. WEIGHT CN: (P = 1.55 in)

CN	A	Q	
90	7.4	0.723	$\bar{Q}$ = 0.526
75	4.0	0.185	
85	2.2	0.484	$\overline{CN}$ = 86.0

HYD. LENGTH: (UP DITCH 37) = 1630'

$$\text{SLOPE} = \frac{10160 * 25 * 100}{13.4 * 43560} = 43.5\%$$

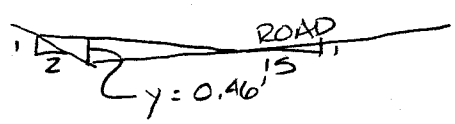
RUNOFF PREDICTION: Q = 6.6 cfs

CHANNEL DESIGN: (Channel currently uses a Belt Liner)

Smin: 4%
Smax: 4% PRELIMINARY CHECK W/ TRAP. CHANNEL SHOWS EXCESSIVE VELOCITIES.

USE ROAD TYPE CHANNEL.

b = 0	n = .03		
M_1 = 15	Q = 6.6		
M_2 = 2	S = 4%	V = 3.745 fps	NO LINING REQD



Id = 1.0'

PROJECT : Valley Camp Coal - Ditch D-33B Runoff Calculation

AREA= 13.4 ACRES
AVERAGE BASIN SLOPE= 43.5 PERCENT
CURVE NUMBER= 86.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1630. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0647 HOURS QPCFS= 156.51 CFS QPIN=11.5827 INCHES
C3= 57.0911 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.89	.3254	.0000	.0000	.0	.00
1.91	.3301	.0000	.0000	14.9	.00
1.93	.3349	.0000	.0000	76.7	.00
1.94	.3397	.0001	.0000	136.2	.00
1.96	.3444	.0002	.0000	156.5	.01
1.98	.3492	.0003	.0001	141.7	.03
1.99	.3540	.0005	.0001	110.3	.04
2.01	.3652	.0009	.0005	77.4	.06
2.02	.3837	.0020	.0011	50.3	.11
2.04	.4023	.0035	.0014	30.9	.22
2.06	.4209	.0053	.0018	18.1	.40
2.07	.4395	.0074	.0022	10.2	.63
2.09	.4580	.0100	.0025	5.6	.90
2.10	.4766	.0128	.0029	3.0	1.19
2.12	.4952	.0160	.0032	1.6	1.48
2.14	.5137	.0195	.0035	.8	1.77
2.15	.5323	.0233	.0038	.4	2.06
2.17	.5509	.0274	.0041	.2	2.34
2.19	.5694	.0318	.0044	.0	2.61
2.41	.8294	.1191	.0076	.0	5.68
2.43	.8480	.1269	.0078	.0	5.86
2.44	.8666	.1349	.0080	.0	6.03
2.46	.8851	.1431	.0082	.0	6.19
2.48	.9037	.1515	.0084	.0	6.36
2.49	.9223	.1600	.0085	.0	6.52
2.51	.9329	.1650	.0050	.0	6.61
2.53	.9379	.1674	.0024	.0	6.44
2.54	.9430	.1698	.0024	.0	5.86
2.56	.9480	.1721	.0024	.0	5.03
2.57	.9530	.1745	.0024	.0	4.17
2.59	.9580	.1770	.0024	.0	3.45
2.61	.9630	.1794	.0024	.0	2.91

HYDROGRAPH PEAK= 6.61 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .59 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	05-May-89
Project No.:	007.11.100	Time:	11:24 AM
Channel Section:	Ditch D-33B	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	6.60	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.04	ft/ft
	Max. Bottom Slope:	0.04	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.46	feet
	Qn/1.49(S)1/2=	0.666	
	A(R)2/3=	0.668	
	Required Depth:	0.96	feet
	Area:	1.80	ft2
	Perimeter:	7.94	feet
	Hydraulic Radius:	0.23	feet
	Velocity:	3.67	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.46	feet
	Qn/1.49(S)1/2=	0.666	
	A(R)2/3=	0.668	
	Required Depth:	0.96	feet
	Area:	1.80	ft2
	Perimeter:	7.94	feet
	Hydraulic Radius:	0.23	feet
	Velocity:	3.67	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.04	ft/ft
	Max. Bottom Slope:	0.04	ft/ft
	Channel Depth:	0.96	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-34A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

D-34A (RECLAIMED) - Small Oak Aspen Area Ignored - Calcs ∴ Conservative.

AREA: 189 * .00702 = 1.32c
HYD LENGTH = 450'
SLOPE = $\frac{1160' * 25 * 100}{1.3 * 43560}$ = 51.2%

CN = 85 (See D-44B design Sheets)
P = 1.55"

RUNOFF PREDICTION: Q = 0.64

CHANNEL DESIGN:

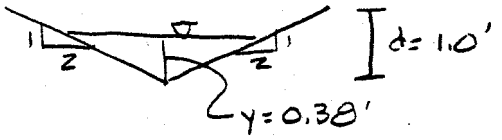
Smin = 2%
Smax = 2%

TRY TRAPEZOIDAL DESIGN

b = 0, m = 2, n = 0.03

V = 2.2 < 5 fps ok

NO LINING REQ'd



PROJECT : Valley Camp Coal - Ditch D-34A Runoff Calculation

AREA= 1.3 ACRES
AVERAGE BASIN SLOPE= 51.2 PERCENT
CURVE NUMBER= 85.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 450. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0221 HOURS QPCFS= 44.52 CFS QPIN=33.9588 INCHES
C3=167.3829 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.99	.3529	.0000	.0000	.0	.00
2.01	.3677	.0001	.0001	44.5	.00
2.03	.3930	.0009	.0008	14.3	.04
2.05	.4183	.0023	.0014	1.6	.08
2.08	.4437	.0044	.0021	.1	.12
2.10	.4690	.0072	.0027	.0	.15
2.36	.7730	.0808	.0086	.0	.51
2.39	.7983	.0897	.0090	.0	.54
2.41	.8236	.0991	.0094	.0	.56
2.43	.8490	.1088	.0097	.0	.58
2.45	.8743	.1189	.0101	.0	.60
2.47	.8996	.1293	.0104	.0	.62
2.50	.9250	.1400	.0107	.0	.64
2.52	.9355	.1446	.0046	.0	.37
2.54	.9423	.1476	.0030	.0	.22
2.56	.9492	.1506	.0030	.0	.19
2.58	.9560	.1536	.0030	.0	.18
2.61	.9629	.1567	.0031	.0	.18
2.63	.9697	.1597	.0031	.0	.19

HYDROGRAPH PEAK= .64 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .05 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	05-May-89
Project No.:	007.11.100	Time:	10:35 AM
Channel Section:	Ditch D-34A	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.64	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.38	feet
	Qn/1.49(S)1/2=	0.091	
	A(R)2/3=	0.089	
	Required Depth:	0.88	feet
	Area:	0.29	ft2
	Perimeter:	1.70	feet
	Hydraulic Radius:	0.17	feet
	Velocity:	2.22	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.38	feet
	Qn/1.49(S)1/2=	0.091	
	A(R)2/3=	0.089	
	Required Depth:	0.88	feet
	Area:	0.29	ft2
	Perimeter:	1.70	feet
	Hydraulic Radius:	0.17	feet
	Velocity:	2.22	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Channel Depth:	0.88	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-34B
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

D-34B

ALL DIST. EXCEPT FOR OAK/ASPEN AREA

TOTAL AREA = 435 * .00702 = 3.0 ac
OAK AREA = 67 * .00702 = 0.5 ac
DIST AREA = 2.5 ac

PRECIP = 1.55" (10 YR-6 HR)

VOL WEIGHTED CN.

CN	A	Q
40	0.5	0.155
90	2.5	0.723
		$\bar{Q}$ = 0.628

$\overline{CN}$ = 88.2

HYD LENGTH = 670'

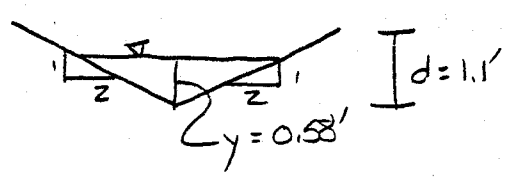
$$\text{SLOPE} = \frac{2610 * 25 * 100}{3.0 * 43560} = 50\%$$

RUNOFF CALCULATION: Q = 1.88 cfs

CHANNEL DESIGN:

Smin = 2%
Smax = 5%

TRY TRAP. CHANNEL.



NO LINING REQ'D

PROJECT : Valley Camp Coal - Ditch D-348 Runoff Calculation

AREA= 3.0 ACRES
AVERAGE BASIN SLOPE= 50.0 PERCENT
CURVE NUMBER= 88.2
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 670. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0273 HOURS QPCFS= 83.03 CFS QPIN=27.4469 INCHES
C3=135.2856 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.69	.2663	.0000	.0000	.0	.00
1.71	.2704	.0000	.0000	40.6	.00
1.72	.2744	.0000	.0000	83.0	.00
1.73	.2784	.0000	.0000	58.6	.00
1.75	.2824	.0002	.0000	26.7	.00
1.76	.2864	.0003	.0000	9.6	.01
1.78	.2905	.0004	.0001	3.0	.02
1.79	.2945	.0005	.0001	.8	.02
1.80	.2985	.0007	.0002	.2	.03
1.82	.3025	.0009	.0002	.0	.03
2.42	.8357	.1694	.0079	.0	1.71
2.43	.8514	.1774	.0080	.0	1.74
2.45	.8671	.1855	.0081	.0	1.77
2.46	.8827	.1938	.0083	.0	1.80
2.47	.8984	.2021	.0084	.0	1.82
2.49	.9141	.2106	.0085	.0	1.85
2.50	.9297	.2192	.0086	.0	1.88
2.51	.9342	.2217	.0024	.0	1.65
2.53	.9384	.2240	.0024	.0	1.14
2.54	.9426	.2264	.0024	.0	.78
2.55	.9469	.2288	.0024	.0	.61
2.57	.9511	.2311	.0024	.0	.55
2.58	.9553	.2335	.0024	.0	.54

HYDROGRAPH PEAK= 1.88 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .16 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	05-May-89
Project No.:	007.11.100	Time:	11:08 AM
Channel Section:	Ditch D-34B	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.88	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.58	feet
	Qn/1.49(S)1/2=	0.268	
	A(R)2/3=	0.274	
	Required Depth:	1.08	feet
	Area:	0.67	ft2
	Perimeter:	2.59	feet
	Hydraulic Radius:	0.26	feet
	Velocity:	2.79	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.48	feet
	Qn/1.49(S)1/2=	0.170	
	A(R)2/3=	0.165	
	Required Depth:	0.98	feet
	Area:	0.46	ft2
	Perimeter:	2.15	feet
	Hydraulic Radius:	0.21	feet
	Velocity:	4.08	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Channel Depth:	1.08	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-35
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

D-35

TRIBUTARY AREAS: D-42; D-37; D-35

AREA = 4.6 ACRES (3.9 ac disturbed, 0.7 ac reclaimed)

SLOPE = $\frac{2910 * 25 * 100}{4.6 * 43560}$ = 36.3%

HYD LENGTH = 1150'

CN = 90

P = 1.55"

CN	A	Q
90	3.9	0.723
85	0.7	0.484
		$\bar{Q}$ = 0.686

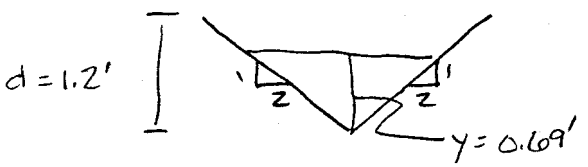
$\bar{CN}$ = 89.3

RUNOFF PREDICTION: Q = 3.0 cfs

CHANNEL DESIGN:

$S_{MIN} = S_{MAX}$ = 2% b = 0, m = 2, n = 0.03

USE TRIANGULAR CHANNEL



v = 3.2 fps < 5 NO LINING REQ'd

PROJECT : Valley Camp Coal - Ditch D-33 Runoff Calculation

AREA= 4.6 ACRES
AVERAGE BASIN SLOPE= 36.3 PERCENT
CURVE NUMBER= 89.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1150. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0473 HOURS QPCFS= 73.51 CFS QPIN=15.8485 INCHES
C3= 78.1173 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.59	.2366	.0000	.0000	.0	.00
1.61	.2412	.0000	.0000	14.9	.00
1.62	.2459	.0000	.0000	56.3	.00
1.64	.2505	.0000	.0000	73.5	.00
1.66	.2551	.0002	.0001	62.1	.00
1.67	.2598	.0003	.0001	41.3	.01
1.69	.2644	.0005	.0002	23.7	.02
1.70	.2691	.0007	.0002	12.2	.03
1.72	.2737	.0009	.0002	5.8	.04
1.73	.2784	.0012	.0003	2.6	.05
1.75	.2830	.0015	.0003	1.1	.06
1.77	.2877	.0018	.0003	.5	.07
1.78	.2923	.0022	.0004	.2	.08
1.80	.2969	.0026	.0004	.0	.09
2.40	.8119	.1850	.0097	.0	2.71
2.41	.8300	.1949	.0099	.0	2.76
2.43	.8481	.2049	.0101	.0	2.82
2.44	.8662	.2151	.0102	.0	2.87
2.46	.8843	.2255	.0104	.0	2.92
2.48	.9023	.2360	.0105	.0	2.97
2.49	.9204	.2467	.0107	.0	3.01
2.51	.9323	.2537	.0071	.0	3.00
2.52	.9372	.2567	.0029	.0	2.77
2.54	.9421	.2596	.0029	.0	2.30
2.55	.9470	.2626	.0030	.0	1.78
2.57	.9519	.2655	.0030	.0	1.39
2.59	.9567	.2685	.0030	.0	1.14

HYDROGRAPH PEAK= 3.01 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .26 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 05-May-89
Project No.: 007.11.100 — Time: 11:31 AM
Channel Section: Ditch D-35 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	3.00	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.69	feet
	Qn/1.49(S)1/2=	0.428	
	A(R)2/3=	0.435	
	Required Depth:	1.19	feet
	Area:	0.95	ft2
	Perimeter:	3.09	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	3.15	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.69	feet
	Qn/1.49(S)1/2=	0.428	
	A(R)2/3=	0.435	
	Required Depth:	1.19	feet
	Area:	0.95	ft2
	Perimeter:	3.09	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	3.15	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Channel Depth:	1.19	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-36
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Dan T
CHECKED
DATE 5/9/89

D-36 (Convenience Ditch)

Total Area = 517 * 0.00702 = 2.7 ac
undist. area = 310 = 1.9 ac (25% Oak/Aspen)
dist. area = = 0.8 ac

CN	A	Q
90	0.8	0.723
70	1.9	0.096
		$\bar{Q}$ = 0.282

$\bar{CN}$ = 79.0

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 550 feet

$$\text{slope} = \frac{(3{,}070)(25)(100)}{43{,}560\,(2.7)} = 65.3\ \%$$

Run-off Calculation: Q_{TOT} = 0.70 cfs

Convenience ditch - No design anticipated OK
(Small ditch)

PROJECT : Valley Camp Coal - D-34 Runoff Calculation

AREA= 2.7 ACRES
AVERAGE BASIN SLOPE= 65.3 PERCENT
CURVE NUMBER= 79.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 550. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0279 HOURS QPCFS= 73.10 CFS QPIN=26.8484 INCHES
C3=132.3358 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.15	.5266	.0000	.0000	.0	.00
2.18	.5586	.0003	.0003	73.1	.02
2.20	.5906	.0013	.0010	23.6	.08
2.23	.6226	.0030	.0017	2.6	.15
2.26	.6546	.0054	.0024	.2	.22
2.29	.6866	.0085	.0031	.0	.29
2.32	.7186	.0123	.0037	.0	.35
2.34	.7506	.0167	.0044	.0	.42
2.37	.7826	.0216	.0050	.0	.48
2.40	.8146	.0272	.0056	.0	.54
2.43	.8466	.0334	.0061	.0	.59
2.46	.8786	.0401	.0067	.0	.65
2.48	.9106	.0473	.0072	.0	.70
2.51	.9334	.0527	.0055	.0	.59
2.54	.9421	.0549	.0021	.0	.31
2.57	.9507	.0571	.0022	.0	.23
2.59	.9594	.0593	.0022	.0	.22
2.62	.9680	.0615	.0022	.0	.22
2.65	.9767	.0638	.0023	.0	.23

HYDROGRAPH PEAK= .70 cfs
TIME TO PEAK= 2.48 hours
RUNOFF VOLUME= .06 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-37
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 4MAY89

D-37 DESIGN

CN DETERMINATIONS SHOWN ON D-44B SHEETS

$P_{10\ YR-6HR} = 1.55$ in

AREA: 124.4 * 0.0035 = 3.75 ac (ALL AREA DISTURBED) USE CN=90
60 * " 04 ac

HYD. LENGTH = 1150 ft

WATERSHED SLOPE: CONT L = 2375
CONT I = 25'

$$\frac{2375 * 25 * 100}{3.75 * 43560} = 36.3\%$$

RUNOFF PREDICTION: Q = 2.6 cfs

CHANNEL DESIGN:

$S_{min} = 2\%$
$S_{max} = 18\%$ (Except for SHORT RIPRAP SECTION AT SWITCHBACK BY COAL PILE WHICH IS 30%)
Velocities will be higher - USE Road Ditch Design

$M_1 = 15$ $b = 0$ $Q = 2.6$
$M_2 = 2$ $\eta = .03$

Printout Shows Riprap REQUIRED ON 18% GRADE IMMEDIATELY BELOW CONCRETE SETTLING BASIN. CHANGE CRITERIA AND BREAK OUT UPPER DITCH SECTION - RECALCULATE FLOW.

AREA = Tributary Area to 18% Ditch Section running between Concrete Settling Basin and road intersection near Culvert C-40-42 inlet.

Area = 390 * .0035 = 1.37 ac
HYD. LENGTH = 500'
SLOPE : $\frac{840 * 25 * 100}{1.37 * 43560} = 35.2\%$

RUNOFF PREDICTION : $Q_{upper} = 0.99$ cfs

CHANNEL DESIGN: USE ROAD DITCH DESIGN

S = 18%; $M_1 = 15$, $M_2 = 2$, b = 0, $\eta = 0.03$ V = 4.0 < 5 ft

LINING NOT REQ'D

PROJECT : Valley Camp Coal - Ditch D-37 Runoff Prediction

AREA= 3.8 ACRES
AVERAGE BASIN SLOPE= 36.3 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1150. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0460 HOURS QPCFS= 61.65 CFS QPIN=16.3034 INCHES
C3= 80.3596 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.53	.2190	.0000	.0000	.0	.00
1.55	.2235	.0000	.0000	12.5	.00
1.56	.2280	.0000	.0000	47.2	.00
1.58	.2325	.0000	.0000	61.6	.00
1.59	.2370	.0002	.0001	52.1	.00
1.61	.2415	.0003	.0001	34.7	.01
1.62	.2461	.0005	.0002	19.8	.02
1.64	.2506	.0007	.0002	10.2	.03
1.66	.2551	.0009	.0002	4.9	.04
1.67	.2596	.0012	.0003	2.2	.04
1.69	.2641	.0015	.0003	.9	.05
1.70	.2686	.0019	.0003	.4	.06
1.72	.2731	.0022	.0004	.2	.07
1.73	.2777	.0026	.0004	.0	.08
2.41	.8231	.2109	.0101	.0	2.38
2.42	.8407	.2212	.0103	.0	2.42
2.44	.8583	.2316	.0104	.0	2.46
2.45	.8759	.2421	.0105	.0	2.50
2.47	.8934	.2528	.0107	.0	2.54
2.48	.9110	.2636	.0108	.0	2.57
2.50	.9286	.2745	.0109	.0	2.61
2.51	.9344	.2782	.0036	.0	2.55
2.53	.9391	.2812	.0030	.0	2.22
2.54	.9439	.2842	.0030	.0	1.76
2.56	.9486	.2872	.0030	.0	1.35
2.58	.9534	.2902	.0030	.0	1.07
2.59	.9581	.2932	.0030	.0	.90

HYDROGRAPH PEAK= 2.61 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .23 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: D-37

Date: 05-May-89
Time: 08:12 AM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.60	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.18	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.37	feet
	Qn/1.49(S)1/2=	0.371	
	A(R)2/3=	0.371	
	Required Depth:	0.87	feet
	Area:	1.16	ft2
	Perimeter:	6.37	feet
	Hydraulic Radius:	0.18	feet
	Velocity:	2.25	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.25	feet
	Qn/1.49(S)1/2=	0.124	
	A(R)2/3=	0.125	
	Required Depth:	0.75	feet
	Area:	0.51	ft2
	Perimeter:	4.23	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	5.10	ft/sec
	Riprap Ck (V<5?):	Required	

VEL. TOO HIGH - BREAK OUT UPPER STEEP AREA

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.18	ft/ft
	Channel Depth:	0.87	feet
	Riprap:	Required	

Comment:

PROJECT : Valley Camp Coal - Upper Section Ditch D-37 Runoff Prediction

AREA= 1.4 ACRES
AVERAGE BASIN SLOPE= 35.2 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0240 HOURS QPCFS= 43.18 CFS QPIN=31.2593 INCHES
C3=154.0771 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2197	.0000	.0000	.0	.00
1.56	.2267	.0000	.0000	43.2	.00
1.58	.2338	.0001	.0001	13.9	.00
1.61	.2409	.0003	.0002	1.5	.00
1.63	.2479	.0006	.0003	.1	.01
1.66	.2550	.0009	.0004	.0	.02
2.35	.7591	.1749	.0148	.0	.86
2.38	.7866	.1901	.0152	.0	.89
2.40	.8142	.2057	.0156	.0	.91
2.42	.8417	.2217	.0160	.0	.93
2.45	.8692	.2381	.0164	.0	.95
2.47	.8967	.2548	.0167	.0	.97
2.49	.9242	.2716	.0170	.0	.99
2.52	.9359	.2791	.0073	.0	.58
2.54	.9433	.2838	.0047	.0	.33
2.57	.9507	.2885	.0047	.0	.28
2.59	.9582	.2932	.0047	.0	.28
2.61	.9656	.2980	.0048	.0	.28
2.64	.9731	.3028	.0048	.0	.28

HYDROGRAPH PEAK= .99 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .08 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: Upper D-37

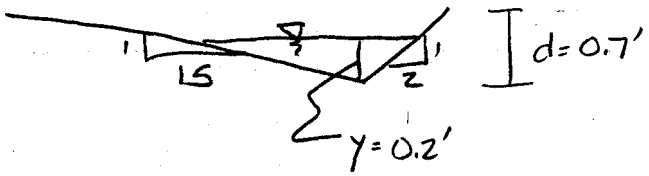
Date: 05-May-89
Time: 08:27 AM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.99	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.18	ft/ft
	Max. Bottom Slope:	0.18	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.047	
	A(R)2/3=	0.047	
	Required Depth:	0.67	feet
	Area:	0.25	ft2
	Perimeter:	2.94	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.03	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.047	
	A(R)2/3=	0.047	
	Required Depth:	0.67	feet
	Area:	0.25	ft2
	Perimeter:	2.94	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.03	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.18	ft/ft
	Max. Bottom Slope:	0.18	ft/ft
	Channel Depth:	0.67	feet
	Riprap:	Not Needed	

Comment:

UPPER SECTION - CROSS SECTION (18% Grade)



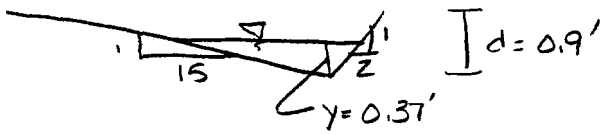
REMAINING SECTION OF DITCH (BELOW 18% GRADE)

SLOPE VARIES BETWEEN 2% AND 10% WITH 1 30% RIPRAPPED SECTION

FOR 2-10% SLOPES : Q=2.6 cfs (See Sheet 7)

$M_1 = 1.5$ $b=0$
$M_2 = 2$ $\eta = 0.03$ $V = 4.1 < 5$ ∝

NO LINING REQ'd



30% RIPRAP SECTION Q=2.6

From Sheet 8; $y = 0.22'$, $V = 8.1$ fps > 5.0 LINING REQ'd
$b = 1.0'$

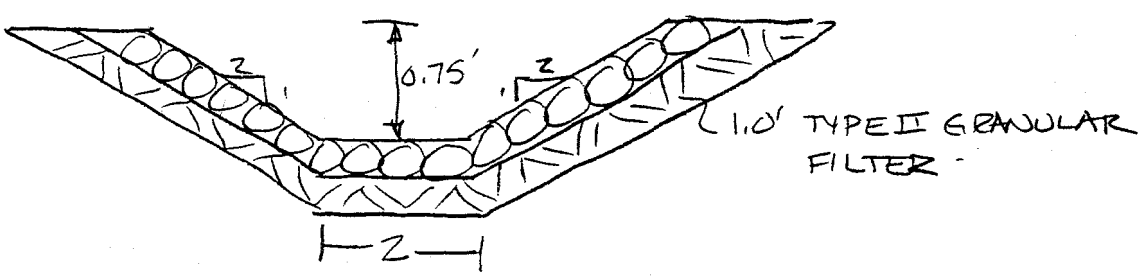
EXTRAPOLATING FROM "DESIGN OF STABLE CHANNELS WITH FLEXIBLE LININGS" FED. HIGHWAY ADMN - OCT 75 - SEE SHEET 9

GIVES $D_{50} \sim 1.0'$ $\eta = .0395(D_{50})^{1/6} \sim 0.04$

IF CHANNEL IS WIDENED TO 2.0' (Sheet 10)

$y = 0.19'$ AND $D_{50} = 0.75'$ USE $B = 2.0'$

USE 1.0' TYPE II GRANULAR FILTER AS PER "URBAN STORM DRAINAGE CRITERIA MANUAL" - VOL 2 - MARCH 1969 (T615-4)



Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: Lower D-37

Date: 05-May-89
Time: 08:33 AM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.60	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.10	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.37	feet
	Qn/1.49(S)1/2=	0.371	
	A(R)2/3=	0.371	
	Required Depth:	0.87	feet
	Area:	1.16	ft2
	Perimeter:	6.37	feet
	Hydraulic Radius:	0.18	feet
	Velocity:	2.25	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.27	feet
	Qn/1.49(S)1/2=	0.166	
	A(R)2/3=	0.166	
	Required Depth:	0.77	feet
	Area:	0.63	ft2
	Perimeter:	4.71	feet
	Hydraulic Radius:	0.13	feet
	Velocity:	4.10	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.10	ft/ft
	Channel Depth:	0.87	feet
	Riprap:	Not Needed	

Comment:

Trapezoidal Channel Flow Calculations using Mannings Equation

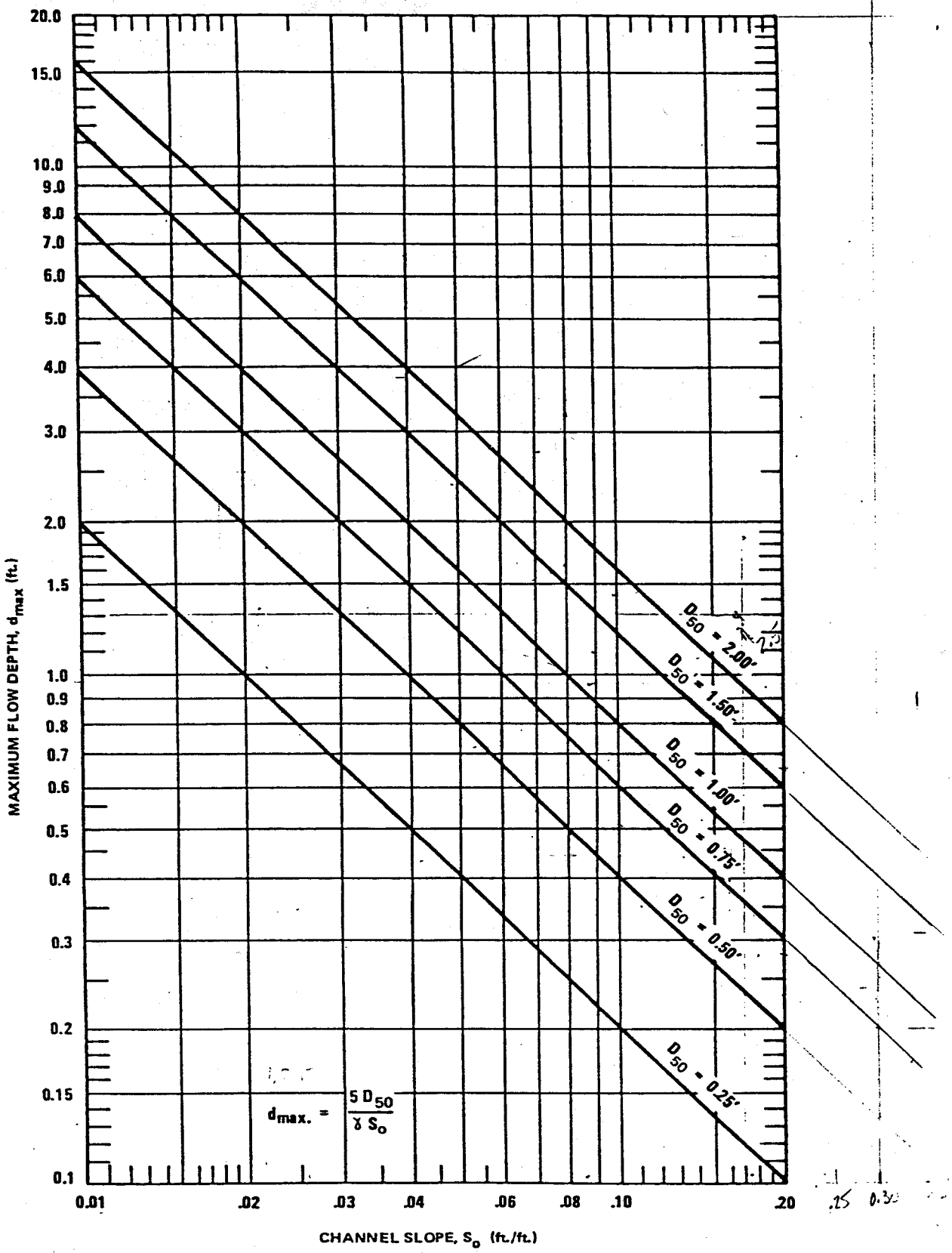
Client: Valley Camp Coal Company — Date: 05-May-89
Project No.: 007.11.100 — Time: 08:47 AM
Channel Section: Lower D-37 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.60	cfs
	Bottom Width:	1.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.30	ft/ft
	Max. Bottom Slope:	0.30	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.22	feet
	Qn/1.49(S)1/2=	0.096	
	A(R)2/3=	0.096	
	Required Depth:	0.72	feet
	Area:	0.32	ft2
	Perimeter:	2.00	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	8.06	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.22	feet
	Qn/1.49(S)1/2=	0.096	
	A(R)2/3=	0.096	
	Required Depth:	0.72	feet
	Area:	0.32	ft2
	Perimeter:	2.00	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	8.06	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	1.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.30	ft/ft
	Max. Bottom Slope:	0.30	ft/ft
	Channel Depth:	0.72	feet
	Riprap:	Required	

Comment:

Chart 27



MAXIMUM PERMISSIBLE DEPTH OF FLOW (d_{max})
FOR CHANNELS LINED WITH ROCK RIPRAP

$n = .0395 D_{50}^{1/6}$

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Co. Date: 12-Jul-89
Project No.: 007.11.100 Time: 03:13 PM
Channel Section: Lower D-37 Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.60	cfs
	Bottom Width:	2.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.040	
	Min. Bottom Slope:	0.300	ft/ft
	Max. Bottom Slope:	0.300	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.19	feet
	Qn/1.49(S)1/2=	0.128	
	A(R)2/3=	0.127	
	Required Depth:	0.69	feet
	Area:	0.44	ft2
	Perimeter:	2.83	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	5.93	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.19	feet
	Qn/1.49(S)1/2=	0.128	
	A(R)2/3=	0.127	
	Required Depth:	0.69	feet
	Area:	0.44	ft2
	Perimeter:	2.83	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	5.93	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	2.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	30.0	%
	Max. Bottom Slope:	30.0	%
	Min Channel Depth:	0.69	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

HANSEN ALLEN & LUCE INC

CLIENT Valley Crest
PROJECT Permit
FEATURE D-37
PROJECT NO. 007.11.100

SHEET 11 OF
COMPUTED DEH
CHECKED
DATE 5 MAY 89

RIPRAP GRADATION (From Drainage Criteria Manual) Table 5-1

RIPRAP TYPE L

INTERMEDIATE ROCK DIMENSION (inches)	% SMALLER THAN GIVEN SIZE BY WEIGHT
15	70-100
12	50-70
9	35-50
3	2-10

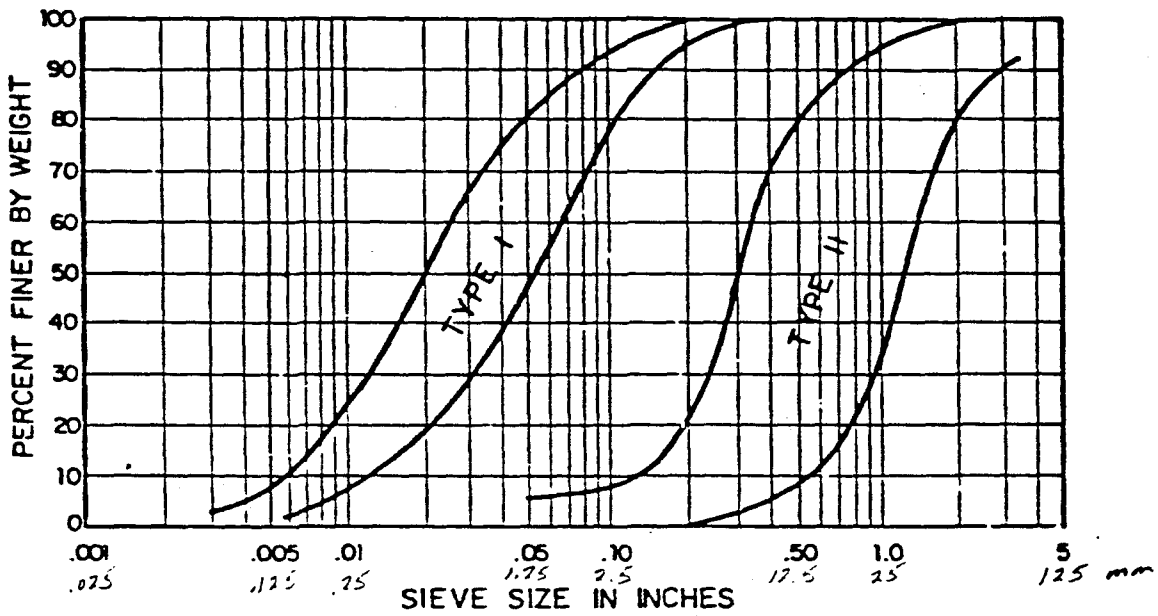


FIGURE 5-2. GRADATION CURVES FOR GRANULAR BEDDING

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

D-38

Total Area = 0.3 acres (Disturbed)

CN = 90

Precipitation = 1.55 inches (10yr, 6hr)

Hydraulic Length = 175 feet

$$\text{Slope} = \frac{(150)\,25(100)}{43560\,(0.3)} = 28.7\%$$

Calculated Runoff $Q_{TOT} = 0.22$ cfs

No ditch Design Anticipated. - USE GENERAL DESIGN

PROJECT : Valley Camp Coal - D-38 Runoff Calculation

AREA= .3 ACRES
AVERAGE BASIN SLOPE= 27.7 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 175. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0117 HOURS QPCFS= 19.43 CFS QPIN=64.2234 INCHES
C3=316.5573 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2199	.0000	.0000	.0	.00
1.55	.2234	.0000	.0000	19.4	.00
1.56	.2269	.0000	.0000	5.6	.00
1.57	.2305	.0000	.0000	.6	.00
1.58	.2340	.0001	.0000	.0	.00
2.42	.8428	.2224	.0081	.0	.21
2.44	.8566	.2306	.0081	.0	.21
2.45	.8704	.2388	.0082	.0	.21
2.46	.8841	.2471	.0083	.0	.21
2.47	.8979	.2555	.0084	.0	.21
2.48	.9116	.2640	.0085	.0	.22
2.50	.9254	.2725	.0086	.0	.22
2.51	.9325	.2770	.0044	.0	.14
2.52	.9362	.2793	.0023	.0	.08
2.53	.9399	.2817	.0023	.0	.06
2.54	.9436	.2840	.0023	.0	.06
2.56	.9474	.2864	.0024	.0	.06
2.57	.9511	.2887	.0024	.0	.06

HYDROGRAPH PEAK= .22 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .02 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-39A, D-39B
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/9/89

D-39A, D-39B (Convenience Ditches)

Total Area = 253 * 0.00702 = 1.8 acres

CN = 70 (25% Oak/Aspen)

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 450 feet

$$\text{slope} = \frac{(1100)(25)(100)}{(1.78)\,43{,}560} = 35.5\%$$

Run-Off Calculation: $Q_{TOT} = 0.06$ cfs

Convenience Ditches - No further design anticipated ok

PROJECT : Valley Camp Coal - D-39A, D-39B Runoff Calculations

AREA= 1.8 ACRES
AVERAGE BASIN SLOPE= 35.5 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 450. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0417 HOURS QPCFS= 32.61 CFS QPIN=17.9644 INCHES
CI= 88.5466 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.42	.8406	.0000	.0000	.0	.00
2.44	.8646	.0000	.0000	16.0	.00
2.46	.8885	.0002	.0002	32.6	.00
2.48	.9125	.0007	.0005	23.0	.01
2.51	.9317	.0013	.0006	10.5	.03
2.53	.9382	.0015	.0002	3.8	.04
2.55	.9447	.0018	.0002	1.2	.03
2.57	.9512	.0020	.0003	.3	.03
2.59	.9576	.0023	.0003	.0	.02
3.36	1.1747	.0219	.0007	.0	.06
3.38	1.1799	.0226	.0007	.0	.06
3.40	1.1851	.0233	.0007	.0	.06
3.42	1.1902	.0240	.0007	.0	.06
3.45	1.1954	.0247	.0007	.0	.06
3.47	1.2006	.0255	.0007	.0	.06
3.49	1.2058	.0262	.0007	.0	.06
3.51	1.2103	.0269	.0007	.0	.06
3.53	1.2139	.0274	.0005	.0	.06
3.55	1.2175	.0279	.0005	.0	.05
3.57	1.2210	.0285	.0005	.0	.05
3.59	1.2246	.0290	.0005	.0	.05
3.61	1.2281	.0296	.0005	.0	.05

HYDROGRAPH PEAK= .06 CFS
TIME TO PEAK= 3.49 Hours
RUNOFF VOLUME= .01 Acre-feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-42
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/8/89

D-42 (Convenience Ditch)

Total Area = 99 * 0.00702 = 0.7 ac

CN = 90 (disturbed)

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 275'

$$\text{Slope} = \frac{(450)(25)(100)}{43{,}560\,(0.7)} = 36.9\%$$

Run-off Calculation: $Q_{TOT} = 0.51$ cfs

Convenience Ditch - No further design anticipated

ac

AREA= .. ACRES
AVERAGE BASIN SLOPE= 36.9 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 275. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0145 HOURS QPCFS= 36.45 CFS QPIN=51.6334 INCHES
C3=254.5012 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2201	.0000	.0000	.0	.00
1.55	.2244	.0000	.0000	36.4	.00
1.57	.2287	.0000	.0000	11.8	.00
1.58	.2330	.0001	.0000	1.3	.00
1.60	.2372	.0002	.0000	.0	.00
2.41	.8233	.2110	.0096	.0	.47
2.42	.8400	.2207	.0097	.0	.48
2.44	.8566	.2306	.0098	.0	.49
2.45	.8732	.2405	.0100	.0	.49
2.46	.8899	.2506	.0101	.0	.50
2.48	.9065	.2608	.0102	.0	.50
2.49	.9231	.2711	.0103	.0	.51
2.51	.9326	.2771	.0060	.0	.35
2.52	.9371	.2799	.0028	.0	.19
2.54	.9416	.2827	.0028	.0	.15
2.55	.9461	.2856	.0029	.0	.14
2.57	.9506	.2884	.0029	.0	.14
2.58	.9551	.2913	.0029	.0	.14

HYDROGRAPH PEAK= .51 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .04 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE D-44A
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 4 MAY 89

D-44A DESIGN

CN determination shown on D-44B sheets $P_{10yr-6hr} = 1.55$ in

AREA: $R_{DG} = 434$ $A = 434 * 0.0035 = 1.52$ ac : TOTAL
0.53 : DISTURBED CN = 90
0.99 : UNDISTURBED CN = 70

Undist. Area is Approx 25% Oak/Aspen Complex

Area	CN	$Q_{10yr-6hr}$
0.53	90	0.723
0.99	70	0.096
1.52		$\bar{Q} = 0.315$

$\bar{CN} = 80$

HYD. LENGTH ~ 510'

WATERSHED SLOPE: $\frac{\text{Cont L} * \text{Cont Int} * 100}{\text{Area} * 43560}$

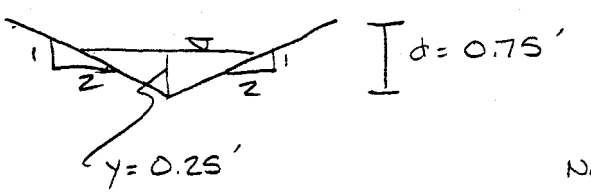
$= \frac{800 * 25 * 100}{1.52 * 43560} = 30.2\%$

RUNOFF PREDICTION:

$Q = 0.43$ cfs

CHANNEL DESIGN:

$S_{min} = 10\%$ $b = 0$
$S_{max} = 10\%$ $m_1 = m_2 = 2$



d = 0.75'

NO LINING REQ'D

PROJECT : Valley Camo Coal - Ditch D-44A Runoff Calculation

AREA= 1.5 ACRES
AVERAGE BASIN SLOPE= 30.2 PERCENT
CURVE NUMBER= 80.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 510. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0375 HOURS QPCFS= 30.66 CFS QPIN=20.0051 INCHES
C3= 98.6053 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.12	.4921	.0000	.0000	.0	.00
2.14	.5136	.0000	.0000	15.0	.00
2.16	.5351	.0005	.0004	30.7	.00
2.17	.5566	.0013	.0008	21.6	.03
2.19	.5781	.0024	.0011	9.9	.05
2.21	.5996	.0038	.0014	3.5	.08
2.23	.6211	.0056	.0018	1.1	.10
2.25	.6426	.0077	.0021	.3	.13
2.27	.6641	.0101	.0024	.0	.16
2.40	.8146	.0352	.0044	.0	.33
2.42	.8361	.0398	.0047	.0	.35
2.44	.8576	.0447	.0049	.0	.37
2.46	.8791	.0499	.0052	.0	.39
2.47	.9006	.0553	.0054	.0	.41
2.49	.9221	.0610	.0056	.0	.43
2.51	.9337	.0641	.0031	.0	.41
2.53	.9395	.0657	.0016	.0	.32
2.55	.9453	.0673	.0016	.0	.22
2.57	.9511	.0690	.0016	.0	.17
2.59	.9569	.0706	.0016	.0	.14

HYDROGRAPH PEAK= .43 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .04 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: D-44A

Date: 04-May-89
Time: 04:08 PM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.43	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.10	ft/ft
	Max. Bottom Slope:	0.10	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.25	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.75	feet
	Area:	0.12	ft2
	Perimeter:	1.10	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	3.58	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.25	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.75	feet
	Area:	0.12	ft2
	Perimeter:	1.10	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	3.58	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.10	ft/ft
	Max. Bottom Slope:	0.10	ft/ft
	Channel Depth:	0.75	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE RUNOFF HYDROLOGY - BELINA MINE AREA
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 4 MAY 89

DITCH 44B

START w/ UPPER SMALL DITCHES TO WEST

DITCH D-44B - Includes a portion of SAE 7 plus some undisturbed area,

MAP SCALE 1:100' RDG = 408 for 1.44 ac RATIO = 0.0035

Tributary Area = 506 * .0035 = 1.8 ac
Disturbed " = 78 = 0.3 ac
Undisturbed " = 1.5 ac

USING CONSISTENT CURVE NUMBERS AS DEVELOPED IN OUR FEB 89 SED. POND REPORT.

SAGE/GRASS AREAS, SOIL GROUP C, DENSITY 25%; CN = 75
OAK/ASPEN AREAS, SOIL GROUP C, DENSITY 25%; CN = 70
OAK/ASPEN AREAS, SOIL GROUP C, DENSITY 90%; CN = 40 *

* TAKEN FROM FIG 9.5 NEH4; PG 9.11

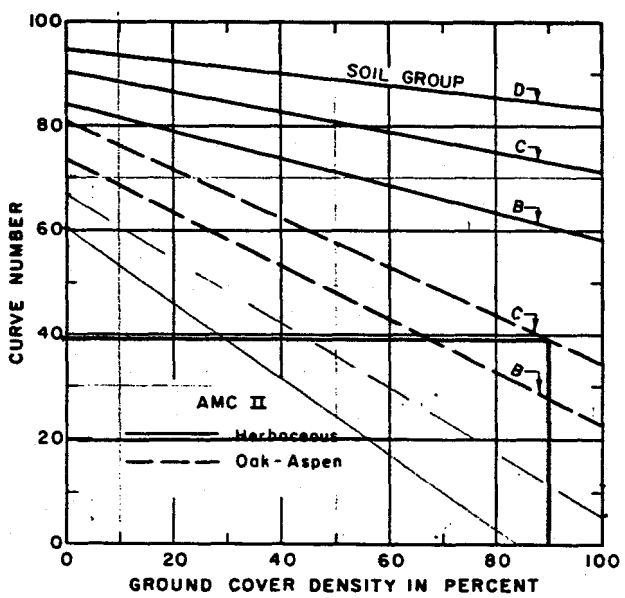


Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

DISTURBED AREAS CN = 90

RECLAIMED AREAS CN = 85

PAVED AREAS CN = 98

CN	S	CN	S
98	0.204	75	3.333
90	1.111	70	4.286
85	1.765	40	15.000

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE RUNOFF HYD.
PROJECT NO. 007.11.100

SHEET 2 OF
COMPUTED DEH
CHECKED
DATE 4 MAY 89

DITCH D-44B

Area	CN	Runoff Depth (in) 10YR-6HR
0.3	90	0.723
1.5	40	0.155
1.8	$\bar{Q}$ =	0.25

$\overline{CN}$ = 77.8

$P_{10YR-6HR}$ = 1.55 in - Hand Calc for Example of procedure

$$Q_{in} = \frac{(P-.2S)^2}{P+.8S} \quad \text{where } S = \frac{1000}{CN} - 10$$

$$P^2 - .4PS + .04S^2 = PQ + .8QS$$

$$0.04S^2 - .4S(P+2Q) - PQ + P^2 = 0 \qquad \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$b = -0.4(P+2Q) = -0.82$
$a = 0.04 = 0.04$
$c = P(P-Q) = 2.015$

$$S = \left[+0.82 \pm \sqrt{(-.82)^2 - 4(.04)\,2.015}\right] 0.08 = \frac{.82 \pm .592}{.08} = 17.65;\ 2.85$$

$$CN = \frac{1000}{S+10} = \frac{1000}{12.9} = 77.8 \quad \alpha$$

Hydraulic Length: 210 ft

Avg Slope: Measured from Map $\sim \frac{(900)25(100)}{43560\,(1.8)} = 28.7\%$

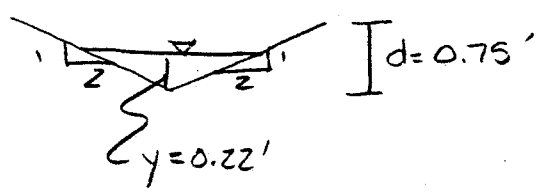
Hydro Results give Q = 0.37 cfs

Try Trap. Channel design:

$b = 0;\ m_1 = m_2 = 2;\ n = .03;\ Q = 0.4$

$S_{min} = 17\%$
$S_{max} = 21\%$ from Printout $V = 4.54 < 5$ - α

NO LINING REQ'd



PROJECT : Valley Camp Coal - D-448 Runoff Calculation

AREA= 1.8 ACRES
AVERAGE BASIN SLOPE= 28.7 PERCENT
CURVE NUMBER= 77.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 710. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0536 HOURS QPCFS= 25.40 CFS QPIN=13.9920 INCHES
C3= 68.9665 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.18	.5678	.0000	.0000	.0	.00
2.20	.5831	.0000	.0000	2.4	.00
2.21	.5985	.0003	.0002	12.4	.00
2.22	.6139	.0006	.0004	22.1	.00
2.24	.6293	.0012	.0005	25.4	.01
2.25	.6446	.0019	.0007	23.0	.02
2.26	.6600	.0027	.0008	17.9	.04
2.28	.6754	.0037	.0010	12.6	.05
2.29	.6907	.0048	.0011	8.2	.07
2.30	.7061	.0061	.0013	5.0	.09
2.32	.7215	.0076	.0014	2.9	.11
2.33	.7368	.0091	.0016	1.7	.13
2.35	.7522	.0109	.0017	.9	.15
2.36	.7676	.0127	.0019	.5	.17
2.37	.7830	.0147	.0020	.3	.19
2.39	.7983	.0168	.0021	.1	.21
2.40	.8137	.0191	.0023	.0	.23
2.41	.8291	.0215	.0024	.0	.25
2.43	.8444	.0240	.0025	.0	.27
2.44	.8598	.0266	.0026	.0	.29
2.45	.8752	.0294	.0028	.0	.30
2.47	.8905	.0322	.0029	.0	.32
2.48	.9059	.0352	.0030	.0	.34
2.49	.9213	.0384	.0031	.0	.35
2.51	.9318	.0406	.0022	.0	.37
2.52	.9360	.0414	.0009	.0	.37
2.53	.9401	.0423	.0009	.0	.34
2.55	.9443	.0432	.0009	.0	.30
2.56	.9484	.0442	.0009	.0	.25
2.57	.9526	.0451	.0009	.0	.21
2.58	.9567	.0460	.0009	.0	.18
2.60	.9608	.0469	.0009	.0	.14

HYDROGRAPH PEAK= .37 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .04 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 04-May-89
Project No.: 007.11.100 — Time: 03:38 PM
Channel Section: D-44B — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.40	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.17	ft/ft
	Max. Bottom Slope:	0.21	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.22	feet
	Qn/1.49(S)1/2=	0.020	
	A(R)2/3=	0.020	
	Required Depth:	0.72	feet
	Area:	0.09	ft2
	Perimeter:	0.97	feet
	Hydraulic Radius:	0.10	feet
	Velocity:	4.25	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.21	feet
	Qn/1.49(S)1/2=	0.018	
	A(R)2/3=	0.018	
	Required Depth:	0.71	feet
	Area:	0.09	ft2
	Perimeter:	0.94	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	4.54	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.17	ft/ft
	Max. Bottom Slope:	0.21	ft/ft
	Channel Depth:	0.72	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-1-32
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-1-32 (Permanent Structure)
Tributary Area → Ditch D-1

$Q_{TOT} = 3.9$ cfs (10 yr, 6 hr)

check pipe flow

32" CMP
$n = 0.024$
$S = 25\%$

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

$Q_{allow} = 132.0$ cfs OK

Since $Q_{allow} >> Q_{TOT}$ pipe flow not limiting
OK

check Inlet control

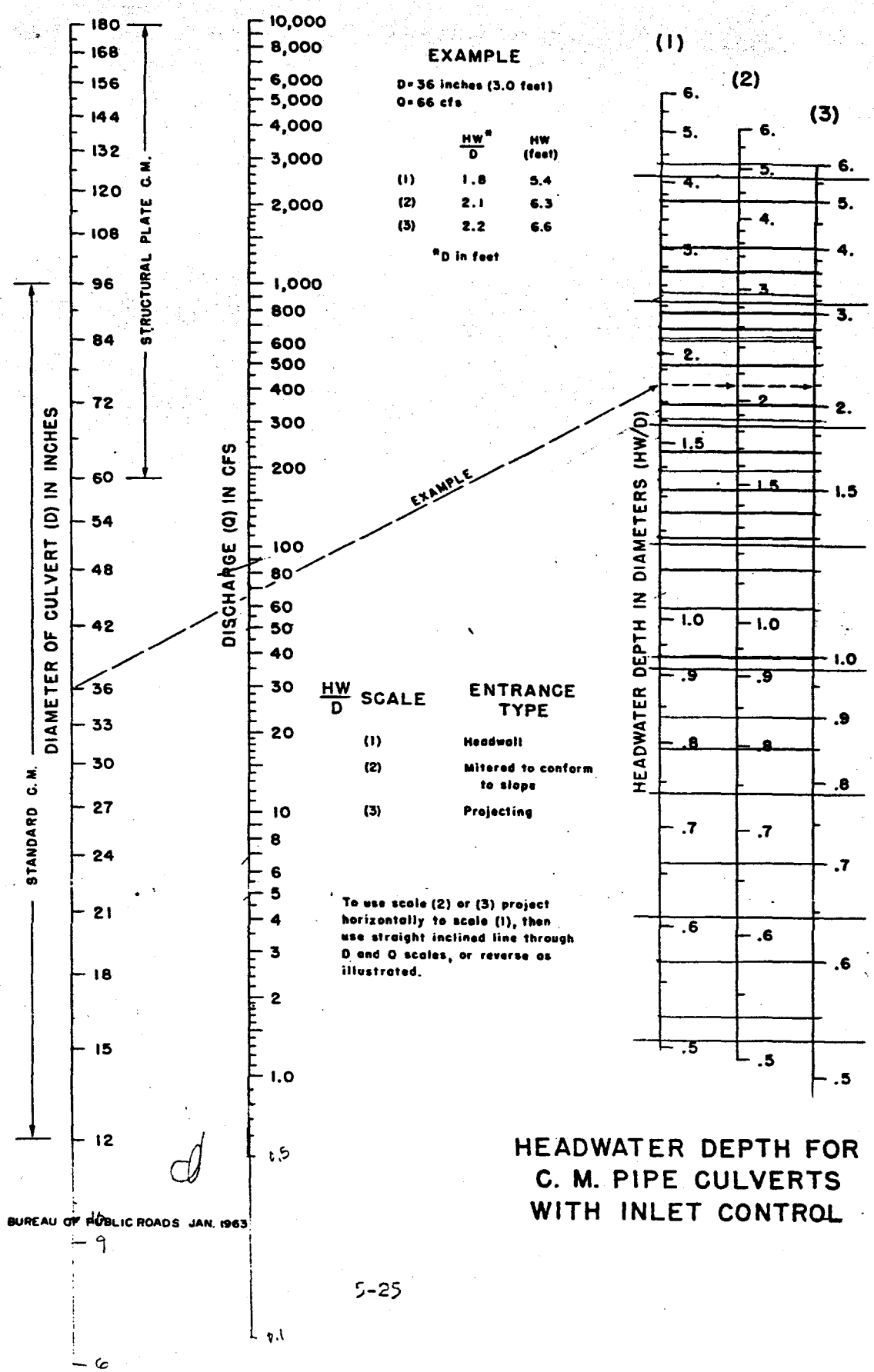
HW depth = 5.2'

$\frac{HW}{D} = 1.9$ Using Chart 5 assume projecting entrance

$Q_{HW} \approx 45.0$ cfs

Since $Q_{HW} > Q_{TOT}$ inlet control limit does not
OK

CHART 5



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

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 10/30/89

C-2-18

This culvert drains very little area and is used for the draining of a small area sometimes used for storage of equipment. Since there is no identifiable tributary area, no calculations are made.

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-3-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-3-18

Tributary Flow - D-3

$Q_{TOT} = 2.61$ cfs

Check Pipe Flow

18" CMP
$n = 0.024$
$S = 3\%$

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

$Q_{allow} = 9.86$ cfs OK

Since $Q_{allow} > Q_{TOT}$ pipe flow not limiting

Check Inlet Control

HW depth = 0.9' $\frac{HW}{D} = 2.7$

Using Chart 5 - Assume projecting entrance

$Q_{HW} = 12.5$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-4-42
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-4-42 (Permanent structure)

Total Area = 63 * 1.401 = 88 acres
90% Cover Oak/Aspen = 69 acres CN = 40
25% Cover Sage/Grass = 19 acres CN = 75

CN	A	Q
40	69	0.04
75	19	0.51

$\overline{Q} = 0.14$ $\overline{CN} = 61.7$

Precipitation = 2.25 inches (100 yr, 6 hr)

hydraulic length = 4,000 feet

$$\text{slope} = \frac{(16{,}000)(80)(100)}{43{,}560\,(88)} = 33.4\%$$

Calculated Runoff $Q_{TOT} = 3.96$ cfs

Check Pipe Flow

- 42" CMP
- $n = 0.024$
- $S = 3\%$

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

$Q_{allow} = 94.39$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting

Check Inlet Control

- HW depth = 6.5' $\frac{HW}{D} = 1.86$

Use Chart 5 - assume projecting entrance

$Q_{HW} = 90$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-4-42 Runoff Calculation

AREA= 88.0 ACRES
AVERAGE BASIN SLOPE= 33.4 PERCENT
CURVE NUMBER= 61.7
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 4000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3071 HOURS QPCFS= 216.73 CFS QPIN= 2.4424 INCHES
C3= 12.0387 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.40	1.1753	.0000	.0000	.0	.00
2.46	1.2776	.0002	.0002	10.9	.00
2.52	1.3581	.0021	.0019	67.3	.04
2.58	1.3857	.0033	.0011	143.9	.17
2.64	1.4133	.0046	.0014	199.0	.41
2.70	1.4410	.0062	.0016	216.7	.70
2.76	1.4686	.0080	.0018	203.0	1.01
2.82	1.4962	.0100	.0020	171.4	1.31
2.89	1.5239	.0123	.0022	134.0	1.62
2.95	1.5515	.0147	.0025	98.9	1.92
3.01	1.5783	.0173	.0026	69.7	2.22
3.07	1.6004	.0196	.0023	47.3	2.51
3.13	1.6225	.0220	.0024	31.2	2.77
3.19	1.6446	.0246	.0025	20.0	2.98
3.25	1.6667	.0273	.0027	12.6	3.15
3.32	1.6889	.0301	.0028	7.7	3.29
3.38	1.7110	.0330	.0029	4.7	3.43
3.44	1.7331	.0361	.0031	2.8	3.57
3.50	1.7551	.0393	.0032	1.7	3.72
3.56	1.7703	.0415	.0023	1.0	3.86
3.62	1.7855	.0438	.0023	.6	3.95
3.68	1.8007	.0462	.0024	.3	3.96
3.75	1.8159	.0487	.0024	.2	3.91
3.81	1.8311	.0511	.0025	.1	3.83
3.87	1.8463	.0537	.0026	.0	3.75
3.93	1.8615	.0563	.0026	.0	3.69
3.99	1.8767	.0590	.0027	.0	3.67
4.05	1.8907	.0615	.0025	.0	3.66

HYDROGRAPH PEAK= 3.96 cfs
TIME TO PEAK= 3.68 Hours
RUNOFF VOLUME= 1.02 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-5-18
PROJECT NO. 007.11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/18/89

C-5-18

Tributary Flow D-5A, D-5B

$Q_{5A} + Q_{5B} = (0.43 + 2.16)$ cfs

$Q_{TOT} = 2.59$ cfs

Check pipe characteristics

- 18" cast Iron
- $n = 0.014$
- $S = 3\%$

$Q_{allow} = \frac{1.49}{n} AR^{2/3} S^{1/2}$

$Q_{allow} = 16.89$ cfs ok

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 2.3'

$\frac{HW}{D} = 1.5$ assume projecting entrance or type A

Select most limiting solution using either chart 5 or 7

Chart 5 ⇒ $Q_5 = 9.0$ cfs

Chart 7 ⇒ $Q_7 = 10.5$ cfs

$Q_{HW} = 9.0$ cfs

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-6-18
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-6-18

Tributary Flow (C-5-18) 2.59 cfs
(D-6) 0.82 cfs
Small Area - Negligable
3.41 cfs

Check pipe flow

- 18" CMP
- $n = 0.024$
- $S = 2.5\%$

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

$Q_{allow} = 9.0$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 4.1 feet $\frac{HW}{D} = \frac{4.1}{1.5} = 2.7$

Use Chart 5 - Assume projecting entrance

$Q_{HW} = 13.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 10/30/89

C-7-24

Tributary Areas Ditch D-7A $Q = 0.57$
D-7B $Q = 1.27$
$Q_{TOT} = 1.84$ cfs

Check pipe flow:

- 24" CMP
- $n = 0.024$
- $S = 5\%$

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

$Q_{allow} = 27.4$ cfs >> Q_{TOT} ok

Pipe Flow not limiting

Check Inlet flow

- HW = 2.8'

$\frac{HW}{D} = 1.4$

Using Chart 5 - assume projecting Inlet

$Q_{HW} = 16.5$ cfs >> Q_{TOT} ok

Inlet Control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-8-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-8-18

Tributary Flows

D-8 = 1.17 cfs
D-9A, 9B = 0.07
Q_{TOT} = 1.24 cfs

Check Pipe Flow

- 18" CMP
- n = 0.024
- S = 4%

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

Q_{allow} = 11.4 cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 2.30

$\frac{HW}{D} = 1.5$

Use Chart 5
assume projecting entrance

Q_{HW} = 9.0 cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-9-15

Tributary Ditches D-9A, D-9B } $Q_{TOT} = 0.07$ cfs

Check Pipe Flow

- 15" CMP
- $n = 0.024$
- $S = 0.001$

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

$Q_{allow} = 1.1$ cfs $> Q_{TOT}$ OK

Pipe flow not limiting

Check Inlet Control

- $HW = 1.25$

$\frac{HW}{D} = 1.0$

from Chart 5 - Projecting Inlet

$Q_{HW} = 3.5$ cfs $> Q_{TOT}$ OK

Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-10-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-10-18.

Tributary Area Ditch D-10

$Q_{TOT} = 1.18$ cfs

Check Pipe flow

- 18" CMP
- $n = 0.024$
- $S = 10\%$

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

$Q_{allow} = 18.0$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 2.3 feet

$\frac{HW}{D} = \frac{2.3}{1.5} = 1.5$ Use chart 5 - assume projecting entrance

$Q_{HW} = 9.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-11-12
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-11-12:

Tributary Area = 940 * .000875 = 0.8 ac
disturbed = 840 * .000875 = 0.7 ac
paved = = 0.1 ac

CN	A	Q
90	0.7	0.72
98	0.1	1.33
		$\bar{Q}$=0.80

$\bar{CN}$=91.3

P= 1.55 inches (10 Yr, 6 hr)

hydraulic length= 300'

$$\text{slope} = \frac{(1425)(5)(100)}{43{,}560(0.8)} = 20.4\%$$

Calculated Runoff Q_{TOT} = 0.64 cfs

Check Pipe flow

- 12" CMP
- n=0.024
- S= 8%

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

Q_{allow} = 5.5 cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW= 16.0 ft (Seems high - Use 1.0')

$\frac{HW}{D} = 1$

Q_{HW} = 2.0 cfs OK

Inlet Control not limiting

PROJECT : Valley Camp Coal - C-11-12 Runoff Calculation

AREA= .8 ACRES
AVERAGE BASIN SLOPE= 20.4 PERCENT
CURVE NUMBER= 91.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 300. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0198 HOURS QPCFS= 30.51 CFS QPIN=37.8167 INCHES
C3=186.3984 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.39	.1898	.0000	.0000	.0	.00
1.41	.1932	.0000	.0000	30.5	.00
1.43	.1966	.0000	.0000	9.9	.00
1.45	.1999	.0000	.0000	1.1	.00
1.47	.2033	.0002	.0000	.0	.00
2.38	.7878	.2301	.0140	.0	.58
2.40	.8105	.2443	.0143	.0	.59
2.42	.8332	.2588	.0145	.0	.60
2.44	.8559	.2735	.0147	.0	.61
2.46	.8786	.2885	.0149	.0	.62
2.47	.9013	.3036	.0152	.0	.63
2.49	.9240	.3190	.0154	.0	.64
2.51	.9345	.3262	.0072	.0	.39
2.53	.9407	.3304	.0042	.0	.22
2.55	.9468	.3346	.0042	.0	.18
2.57	.9529	.3388	.0042	.0	.18
2.59	.9591	.3431	.0043	.0	.18
2.61	.9652	.3473	.0043	.0	.18

HYDROGRAPH PEAK= .64 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .05 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-12-24
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-12-24

Tributary Area = D-12A, D-12B

$Q_{D-12A} + Q_{D-12B} = 0.19 + 0.74$

$Q_{TOT} = 0.93$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 2\%$

$Q_{allow} = \frac{1.49}{n} AR^{2/3} S^{1/2}$

$Q_{allow} = 17.3$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 4.0'

$\frac{HW}{D} = 2.0$ Use Chart 5 - Assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-13-24

Tributary Ditch D-13A $Q_{TOT} = 0.60$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 30\%$

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

$Q_{allow} = 67.1$ cfs >> Q_{TOT} ok

Pipe Flow Not Limiting

Check Inlet Conditions

- HW = 3.0'

$\frac{HW}{D} = 1.5$

From Chart 5-
Assume projecting Inlet

$Q_{HW} = 18$ cfs >> Q_{TOT} ok

Inlet Control Not Limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-14-42
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/18/89

C-14-42 (Permanent structure)

Tributary Area = 173 * 1.401 = 242 Acres
90% Cover Oak/Aspen = 123 ac
25% Cover Sage/Grass = 119 ac

Ground cover taken by assuming that all North facing, and south facing slopes are characteristic.
North facing - 90% oak/Aspen CN = 40
South facing - 25% Sage/Grass CN = 75

CN	A	Q
40	123	0.04
75	119	0.51

$\bar{Q} = 0.27$ $\bar{CN} = 67.5$

Precipitation = 2.25" (100yr, 6hr)

hydraulic length = 5000 feet

$$\text{slope} = \frac{(10{,}000)(400)(100)}{43{,}560\ (242)} = 37.9\%$$

Calculated Run-Off $Q_{TOT} = 21.88$ cfs

Check Pipe Flow

- D = 42"
- n = 0.024
- S = 3% min

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

$Q_{allow} = 94.4$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting

Check Inlet Control

HW depth = 6.5' $\frac{HW}{D} = 1.86$ assume proj. entrance

from Chart 5

$Q_{HW} = 90.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet Control not limiting

PROJECT : Valley Camp Coal - C-14-42 Runoff Calculation

AREA= 242.0 ACRES
AVERAGE BASIN SLOPE= 37.9 PERCENT
CURVE NUMBER= 67.5
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2965 HOURS QPCFS= 617.23 CFS QPIN= 2.5294 INCHES
C3= 12.4672 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.25	.9395	.0000	.0000	.0	.00
2.31	1.0382	.0012	.0012	31.0	.04
2.37	1.1370	.0061	.0049	191.7	.37
2.43	1.2357	.0146	.0086	409.8	1.68
2.49	1.3345	.0266	.0120	566.6	4.68
2.55	1.3725	.0321	.0055	617.2	9.47
2.61	1.3992	.0362	.0041	578.2	14.64
2.67	1.4259	.0406	.0044	488.0	18.65
2.73	1.4525	.0452	.0046	381.7	20.97
2.79	1.4792	.0500	.0048	281.7	21.85
2.85	1.5059	.0550	.0050	198.5	21.88
2.91	1.5326	.0603	.0052	134.8	21.58
2.97	1.5593	.0657	.0055	88.8	21.27
3.02	1.5838	.0709	.0052	57.0	21.11
3.08	1.6051	.0756	.0047	35.8	21.08
3.14	1.6265	.0804	.0048	22.0	21.04
3.20	1.6478	.0853	.0049	13.4	20.92
3.26	1.6692	.0903	.0050	8.0	20.76
3.32	1.6905	.0955	.0052	4.7	20.63
3.38	1.7119	.1008	.0053	2.7	20.58
3.44	1.7332	.1062	.0054	1.6	20.65
3.50	1.7546	.1118	.0055	.9	20.82
3.56	1.7694	.1157	.0039	.5	21.03
3.62	1.7841	.1196	.0039	.3	21.03
3.68	1.7987	.1236	.0040	.2	20.68
3.74	1.8134	.1277	.0040	.0	20.07

HYDROGRAPH PEAK= 21.88 cfs
TIME TO PEAK= 2.85 Hours
RUNOFF VOLUME= 5.46 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-15-24
PROJECT NO. 007-11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-15-24

Tributary Flow = D-15

$Q_{TOT} = 1.57$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 5\%$

$Q_{allow} = \frac{1.49}{n} AR^{2/3} S^{1/2}$

$Q_{allow} = 27.4$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 3.2'

$\frac{HW}{D} = 1.6$

Use Chart 5 Assume projecting entrance

$Q_{HW} = 18.5$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit 1
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 10/30/89

C-16-24

Tributary Culvert C-15-24 $Q_{TOT} = 1.57$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 10\%$

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

$Q_{allow} = 38.7$ cfs >> Q_{TOT} ok

Pipe Flow not limiting

Check Inlet Conditions

- HW = 1.0'

$\frac{HW}{D} = 0.5$

From Chart 5
Assuming projecting Inlet

$Q_{HW} = 3.8$ cfs > Q_{TOT} ok

Inlet Conditions not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-17-21 + C-18-21

Tributary Ditches D18A, D18B } $Q_{TOT} = 0.59 + 0.47 = 1.06$ cfs

Check Pipe Flow

- 21" CMP
- $n = 0.024$
- $S = 1\%$

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

$Q_{allow} = 8.6$ cfs $> Q_{TOT}$ ✓

Pipe Flow not limiting

Check Inlet Conditions

- $HW = 1.75'$

$\frac{HW}{D} = 1.0$

From Chart 5
Assume projecting Inlet

$Q_{HW} = 8$ cfs $> Q_{TOT}$ ✓

Inlet Conditions not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-20-48, C-19-48
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/16/89

C-20-48, C-19-48

Total Area = 1060 * 1.401 = 1485 acres
90% cover Oak/Aspen = 761 acres
25% cover sage/grass = 724 acres

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 16,600 feet

$$\text{slope} = \frac{(63,500)(400)(100)}{43,560\,(1485)} = 39.3\%$$

CN	Area	Q
40	761	0.155
75	724	0.185

$\bar{Q} = 0.17$ $\bar{CN}_{10} = 74.26$

Calculated Run-off $Q_{TOT_{10yr}} = 77.0$ cfs

NOT APPLICABLE

For a 100 year, 6 hr

$P_{100} = 2.25$ inches

CN	A	Q
40	761	0.039
75	724	0.510

$\bar{Q} = 0.266$ $\bar{CN}_{100} = 67.4$

Calculated Run-off $Q_{TOT_{100yr}} = 118.8$ cfs

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-19-48
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-19-48

Culvert Analysis

$S = 6\%$
$n = 0.024$
48" CMP

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

$Q_{allow} = 190.6$ cfs OK

since $Q_{allow} > Q_{TOT}$ pipe flow not limiting

check Inlet Control

HW depth = 8.5'

assume projecting entrance using chart 5

$\frac{HW}{D} = \frac{8.5'}{4} = 2.1$

$Q_{HW} = 130$ cfs OK

since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

C-20-48

Culvert Analysis

$S = 4\%$
$n = 0.024$
48" CMP

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

$Q_{allow} = 155.6$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 9.0'

assume projecting entrance using chart 5

$\frac{HW}{D} = 2.25$

$Q_{HW} = 140$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-19-48, C-20-48 Runoff Calculation

10 yr, 6hr

AREA= 1485.0 ACRES
AVERAGE BASIN SLOPE= 39.3 PERCENT
CURVE NUMBER= 74.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 16600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .6315 HOURS QPCFS= 1778.42 CFS QPIN= 1.1877 INCHES
C3= 5.8539 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6700	.0000	.0000	.0	.00
2.40	.8149	.0042	.0042	89.2	.38
2.53	.9380	.0164	.0121	552.4	3.42
2.65	.9772	.0218	.0054	1180.6	12.18
2.78	1.0163	.0278	.0061	1632.6	24.75
2.90	1.0555	.0346	.0068	1778.4	37.66
3.03	1.0927	.0416	.0070	1665.9	48.97
3.16	1.1240	.0480	.0064	1406.2	58.13
3.28	1.1554	.0548	.0068	1099.9	64.99
3.41	1.1867	.0619	.0072	811.6	69.92
3.54	1.2152	.0688	.0068	572.0	73.50
3.66	1.2367	.0742	.0054	388.5	75.99
3.79	1.2583	.0797	.0055	255.8	77.04
3.92	1.2798	.0854	.0057	164.2	76.67
4.04	1.3007	.0911	.0057	103.1	75.38
4.17	1.3203	.0966	.0055	63.5	73.72
4.29	1.3398	.1023	.0056	38.5	72.03
4.42	1.3594	.1080	.0058	23.0	70.53
4.55	1.3775	.1135	.0054	13.6	69.36
4.67	1.3932	.1183	.0048	7.9	68.38
4.80	1.4089	.1231	.0049	4.6	67.25
4.93	1.4245	.1281	.0050	2.6	65.84
5.05	1.4402	.1331	.0050	1.5	64.33
5.18	1.4558	.1382	.0051	.8	62.96
5.30	1.4715	.1434	.0052	.5	61.90
5.43	1.4872	.1487	.0053	.3	61.28
5.56	1.5019	.1537	.0050	.1	60.95
5.68	1.5156	.1585	.0047	.0	60.82

HYDROGRAPH PEAK= 77.04 cfs
TIME TO PEAK= 3.79 Hours
RUNOFF VOLUME= 20.80 Acre-Feet

PROJECT : Valley Camp Coal - C-19-48, C-20-48 Runoff Calculation

100 Yr, 6hr

AREA= 1485.0 ACRES
AVERAGE BASIN SLOPE= 39.3 PERCENT
CURVE NUMBER= 67.4
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 16600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .7625 HOURS QPCFS= 1472.91 CFS QPIN= .9836 INCHES
C3= 4.8483 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.13	.7421	.0000	.0000	.0	.00
2.29	.9960	.0002	.0002	73.9	.01
2.44	1.2499	.0156	.0154	457.5	1.22
2.59	1.3916	.0342	.0186	977.8	8.60
2.74	1.4602	.0456	.0114	1352.1	24.66
2.90	1.5288	.0584	.0128	1472.9	45.45
3.05	1.5929	.0716	.0133	1379.7	66.08
3.20	1.6478	.0839	.0123	1164.6	83.77
3.35	1.7027	.0970	.0131	910.9	97.42
3.51	1.7568	.1108	.0137	672.2	107.35
3.66	1.7946	.1208	.0100	473.7	114.31
3.81	1.8323	.1312	.0104	321.7	118.05
3.96	1.8700	.1420	.0108	211.9	118.76
4.12	1.9051	.1523	.0103	136.0	117.40
4.27	1.9394	.1627	.0104	85.4	114.95
4.42	1.9738	.1733	.0107	52.6	112.21
4.57	2.0047	.1832	.0099	31.9	109.68
4.73	2.0322	.1921	.0089	19.0	107.33
4.88	2.0596	.2012	.0091	11.2	104.80
5.03	2.0871	.2105	.0093	6.5	102.06
5.18	2.1145	.2199	.0094	3.8	99.38
5.34	2.1419	.2295	.0096	2.2	97.12
5.49	2.1694	.2393	.0098	1.2	95.49
5.64	2.1936	.2480	.0088	.7	94.49
5.79	2.2177	.2568	.0088	.4	93.68
5.95	2.2417	.2657	.0089	.2	92.72
6.10	2.2417	.2657	.0000	.1	91.06
6.25	2.2417	.2657	.0000	.0	85.97

HYDROGRAPH PEAK= 118.76 cfs
TIME TO PEAK= 3.96 Hours
RUNOFF VOLUME= 32.88 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE C-21-48
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED DEH
CHECKED ___
DATE 12/14/89

C-21-48 PERMANENT STRUCTURE

FLOW TRIBUTARY

TOTAL AREA = 1479 * 1.401 = 2072 ac
90% OAK ASPEN 645 904
25% SAGE GRASS 834 1168

ASSUMING THAT NORTH & SOUTH FACING SLOPES ARE CHARACTERISTICALLY:

NORTH FACING 90% COVER OAK/ASPEN (CN = 70)
SOUTH FACING 25% COVER SAGE/GRASS (CN = 75)

CN	A	Q
70	904	0.10
75	1168	0.19
		$\bar{Q} = 0.15$

$\bar{CN} = 73$

PRECIPITATION = 1.55 inches (10 YR, 6 HR)

HYD. LENGTH = 12,000 ft

SLOPE = $\frac{(78{,}000)(400)(100)}{43{,}560\ (2072)} = 34.6\%$ $Q = 92.6$ cfs

CHECK PIPE FLOW

- D = 48"
- n = 0.024
- S = 1%

$Q = \frac{1.49}{n} A R^{2/3} S^{1/2} = 77.81$ cfs < 92.6 - Add Avail Head (33'-4 = 29' Available)

$S_f = \frac{29 + 0.01(250)}{250} = 0.126$

$Q = \frac{1.49}{n} A R^{2/3} (.126)^{1/2} = 276$ cfs >> 92.6 OK

CHECK INLET FLOW (USING "HYDRAULICS CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS")

PIPE LENGTH = 250 ft
HW DEPTH = 33 ft HW/D = 8.25 HW/D = 6.0 (Max Shown on Chart)

Q = 215 cfs - OK
for HW/D = 6.0

PIPE IS ADEQUATE

PROJECT : Valley Camp Coal - C-21-52 Runoff Calculation

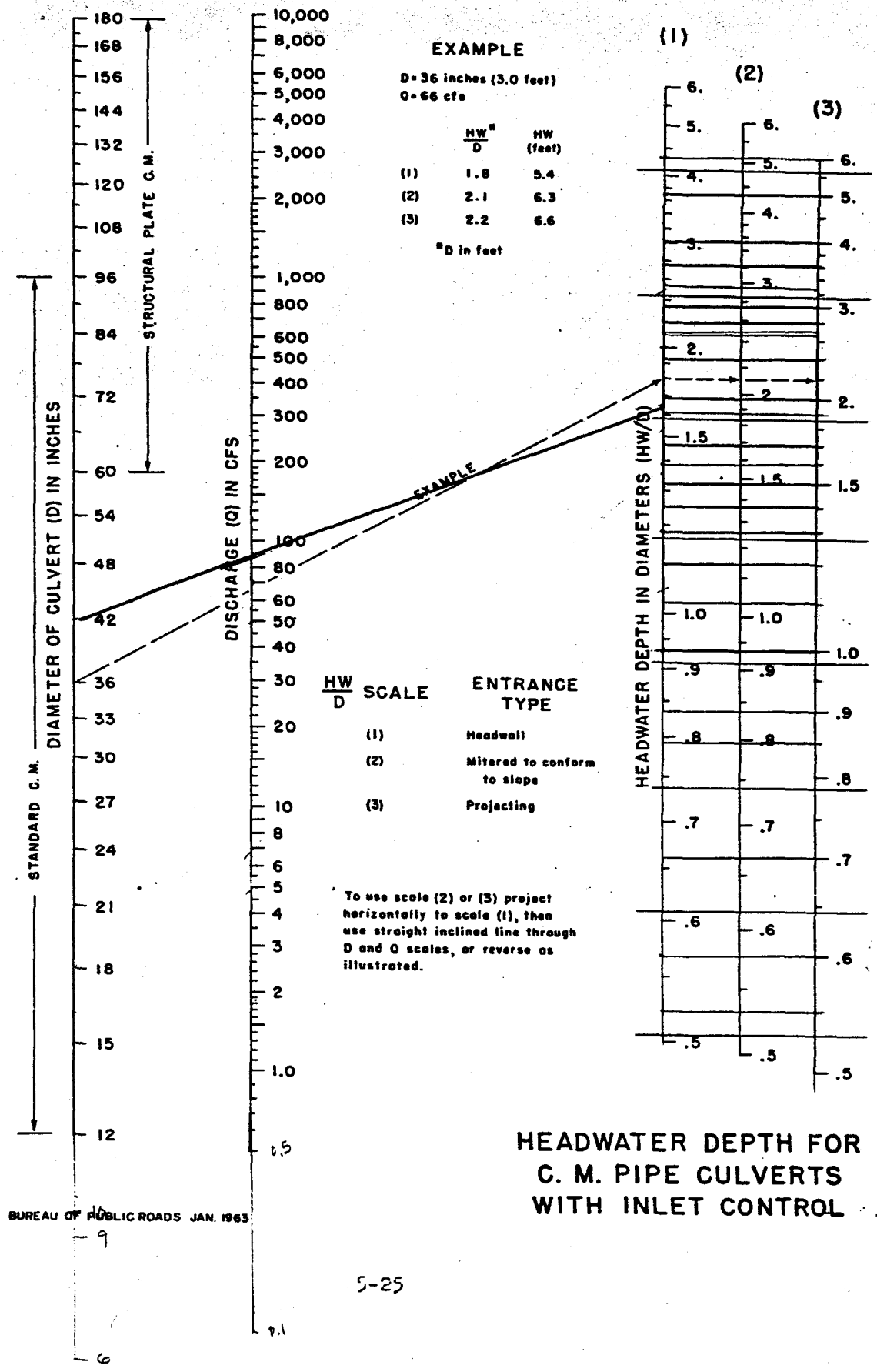
AREA= 2072.0 ACRES
AVERAGE BASIN SLOPE= 34.6 PERCENT
CURVE NUMBER= 73.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 12000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .5385 HOURS QPCFS= 2909.81 CFS QPIN= 1.3927 INCHES
C3= 6.8646 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6567	.0000	.0000	.0	.00
2.37	.7802	.0004	.0004	146.0	.06
2.48	.9038	.0070	.0065	903.8	1.35
2.58	.9563	.0120	.0050	1931.7	7.48
2.69	.9897	.0158	.0038	2671.2	18.87
2.80	1.0231	.0202	.0043	2909.8	32.51
2.91	1.0565	.0250	.0048	2725.7	45.63
3.02	1.0889	.0301	.0051	2300.8	57.15
3.12	1.1156	.0347	.0046	1799.6	66.87
3.23	1.1423	.0395	.0048	1327.9	74.59
3.34	1.1690	.0446	.0051	935.9	80.44
3.45	1.1957	.0500	.0054	635.6	84.97
3.55	1.2182	.0548	.0048	418.6	88.70
3.66	1.2366	.0588	.0040	268.7	91.43
3.77	1.2550	.0630	.0042	168.7	92.56
3.88	1.2733	.0673	.0043	103.9	92.13
3.98	1.2917	.0717	.0044	63.0	90.73
4.09	1.3086	.0758	.0042	37.6	89.06
4.20	1.3253	.0800	.0042	22.2	87.45
4.31	1.3420	.0843	.0043	12.9	86.02
4.42	1.3587	.0887	.0044	7.5	84.91
4.52	1.3747	.0930	.0043	4.3	84.21
4.63	1.3880	.0967	.0037	2.4	83.75
4.74	1.4014	.1004	.0037	1.4	83.00
4.85	1.4147	.1042	.0038	.8	81.73
4.95	1.4281	.1080	.0038	.4	80.14
5.06	1.4414	.1119	.0039	.2	78.58
5.17	1.4548	.1158	.0039	.1	77.31
5.28	1.4681	.1199	.0040	.0	76.47

HYDROGRAPH PEAK= 92.56 cfs
TIME TO PEAK= 3.77 Hours
RUNOFF VOLUME= 24.68 Acre-Feet

CHART 5



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

BUREAU OF PUBLIC ROADS JAN. 1963

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-22-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-22-24 (Permanent Structure)

Tributary Area = 16 * 1.401 = 22 acres
90% Cover Oak/Aspen CN = 70 = 20 ac
25% Cover Sage/grass CN = 75 = 2 ac

CN	A	Q
70	20	0.18
75	2	0.19

$\overline{Q} = 0.10$ $\overline{CN} = 70.5$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2,500 ft

$$\text{slope} = \frac{(6000)(80)(100)}{43{,}560\ (22)} = 50\%$$

Calculated Run-Off = $Q_{TOT} = 0.79$ cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 5.7%

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

$Q_{allow} = 29.3$ cfs ok

Pipe flow not limiting

Check Inlet Control

- HW depth = 2.8'

$\frac{HW}{D} = 1.4$ Use Chart 5 - assume proj. entrance

$Q_{HW} = 17.0$ cfs ok

Inlet control not limiting

PROJECT : Valley Camp Coal - C-22-24 Runoff Calculation

AREA= 22.0 ACRES
AVERAGE BASIN SLOPE= 50.0 PERCENT
CURVE NUMBER= 70.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1368 HOURS QPCFS= 121.60 CFS QPIN= 5.4813 INCHES
C3= 27.0175 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.41	.8246	.0000	.0000	.0	.00
2.44	.8560	.0000	.0000	6.1	.00
2.46	.8874	.0006	.0005	37.8	.00
2.49	.9187	.0016	.0010	80.7	.03
2.52	.9354	.0023	.0007	111.6	.09
2.54	.9439	.0027	.0004	121.6	.18
2.57	.9524	.0031	.0004	113.9	.25
2.60	.9609	.0036	.0005	96.1	.31
2.63	.9694	.0041	.0005	75.2	.35
2.65	.9779	.0046	.0005	55.5	.37
2.68	.9863	.0052	.0006	39.1	.39
2.71	.9948	.0057	.0006	26.6	.40
2.74	1.0033	.0064	.0006	17.5	.41
2.76	1.0118	.0070	.0007	11.2	.42
2.79	1.0203	.0077	.0007	7.0	.44
2.82	1.0288	.0084	.0007	4.3	.46
2.85	1.0372	.0092	.0007	2.6	.48
2.87	1.0457	.0099	.0008	1.6	.50
2.90	1.0542	.0107	.0008	.9	.52
2.93	1.0627	.0116	.0008	.5	.55
2.96	1.0712	.0124	.0009	.3	.57
2.98	1.0797	.0133	.0009	.2	.59
3.01	1.0882	.0142	.0009	.1	.62
3.04	1.0943	.0149	.0008	.0	.64
3.37	1.1757	.0254	.0010	.0	.71
3.39	1.1822	.0264	.0010	.0	.73
3.42	1.1893	.0274	.0010	.0	.74
3.45	1.1961	.0284	.0010	.0	.75
3.48	1.2029	.0294	.0010	.0	.77
3.50	1.2095	.0303	.0010	.0	.78
3.53	1.2141	.0312	.0007	.0	.79
3.56	1.2188	.0319	.0007	.0	.79
3.58	1.2235	.0327	.0006	.0	.78
3.61	1.2281	.0335	.0008	.0	.75

PROJECT : Valley Camp Coal - C-22-24 Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2328	.0342	.0008	.0	.72
3.67	1.2375	.0350	.0008	.0	.70
3.69	1.2421	.0358	.0008	.0	.67

HYDROGRAPH PEAK= .79 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .19 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-23-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED ___
CHECKED ___
DATE ___

C-23-24 (Permanent Structure)

Total Area = 16 + 1.401 = 22 acres
90% Cover Oak/Aspen (CN=70) = 20
25% Cover Sage/grass (CN=75) = 2

CN	A	Q
70	20	0.10
75	2	0.19
		$\bar{Q}$=0.10

$\bar{CN}$ = 70.5

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2,500 ft

$$\text{slope} = \frac{(6{,}000)(80)(100)}{43{,}560\ (22)} = 50\%$$

Calculated Runoff: Q_{TOT} = 0.79 cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 8%

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

Q_{allow} = 34.66 cfs OK

Pipe flow not limiting

Check Inlet Control

HW depth = 3.5'

$\frac{HW}{D}$ = 1.75

Use Chart 5 - assume projecting entrance

Q_{HW} = 20.0 cfs OK

Inlet Control not limiting

PROJECT : Valley Camp Coal - C-23-24 Runoff Calculation

AREA= 22.0 ACRES
AVERAGE BASIN SLOPE= 50.0 PERCENT
CURVE NUMBER= 70.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1368 HOURS QPCFS= 121.60 CFS QPIN= 5.4813 INCHES
C3= 27.0175 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.41	.8246	.0000	.0000	.0	.00
2.44	.8560	.0000	.0000	6.1	.00
2.46	.8874	.0006	.0005	37.8	.00
2.49	.9187	.0016	.0010	80.7	.03
2.52	.9354	.0023	.0007	111.6	.09
2.54	.9439	.0027	.0004	121.6	.18
2.57	.9524	.0031	.0004	113.9	.25
2.60	.9609	.0036	.0005	96.1	.31
2.63	.9694	.0041	.0005	75.2	.35
2.65	.9779	.0046	.0005	55.5	.37
2.68	.9863	.0052	.0006	39.1	.39
2.71	.9948	.0057	.0006	26.6	.40
2.74	1.0033	.0064	.0006	17.5	.41
2.76	1.0118	.0070	.0007	11.2	.42
2.79	1.0203	.0077	.0007	7.0	.44
2.82	1.0288	.0084	.0007	4.3	.46
2.85	1.0372	.0092	.0007	2.6	.48
2.87	1.0457	.0099	.0008	1.6	.50
2.90	1.0542	.0107	.0008	.9	.52
2.93	1.0627	.0116	.0008	.5	.55
2.96	1.0712	.0124	.0009	.3	.57
2.98	1.0797	.0133	.0009	.2	.59
3.01	1.0875	.0142	.0009	.1	.62
3.04	1.0943	.0149	.0008	.0	.64
3.37	1.1757	.0254	.0010	.0	.71
3.39	1.1825	.0264	.0010	.0	.73
3.42	1.1893	.0274	.0010	.0	.74
3.45	1.1961	.0284	.0010	.0	.75
3.48	1.2029	.0294	.0010	.0	.77
3.50	1.2095	.0305	.0010	.0	.78
3.53	1.2141	.0312	.0007	.0	.79
3.56	1.2188	.0319	.0007	.0	.79
3.58	1.2235	.0327	.0008	.0	.79
3.61	1.2281	.0335	.0008	.0	.79

PROJECT : Valley Camp Coal - C-23-24 Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2328	.0342	.0008	.0	.72
3.67	1.2375	.0350	.0008	.0	.70
3.69	1.2421	.0358	.0008	.0	.67

HYDROGRAPH PEAK= .79 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .19 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-24-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/19/89

C-24-24 (Permanent Structure)

Tributary Area = 9×1.401 = 20 acres

CN = 75 (25% Cover Sage/Grass)

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2000 ft

$$\text{slope} = \frac{(4000)(80)(100)}{43{,}560\,(20)} = 44.1\%$$

Calculated Run-off: $Q_{TOT} = 2.04$ cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 12%

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

$Q_{allow} = 42.45$ cfs OK

Pipe Flow not limiting

Check Inlet Control

- HW depth = 4.2'

$\frac{HW}{D} = 2.1$ Use Chart 5 assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Inlet control not limiting

PROJECT : Valley Camp Coal - C-24-34 Runoff Calculation

AREA= 20.0 ACRES
AVERAGE BASIN SLOPE= 44.1 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1075 HOURS QPCFS= 140.71 CFS QPIN= 6.9769 INCHES
C3= 34.3891 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6517	.0000	.0000	.0	.00
2.28	.6764	.0000	.0000	7.1	.00
2.30	.7010	.0004	.0003	43.7	.00
2.32	.7257	.0010	.0007	93.4	.02
2.34	.7503	.0020	.0010	129.2	.07
2.36	.7750	.0034	.0014	140.7	.16
2.39	.7997	.0051	.0017	131.8	.30
2.41	.8243	.0071	.0020	111.3	.49
2.43	.8490	.0095	.0023	87.0	.71
2.45	.8736	.0121	.0026	64.2	.96
2.47	.8983	.0150	.0030	45.3	1.23
2.49	.9230	.0183	.0032	30.7	1.51
2.52	.9348	.0200	.0017	20.2	1.78
2.54	.9414	.0209	.0010	13.0	1.98
2.56	.9481	.0219	.0010	8.2	2.04
2.58	.9548	.0229	.0010	5.0	1.98
2.60	.9614	.0239	.0010	3.0	1.83
2.62	.9681	.0250	.0010	1.8	1.65
2.64	.9747	.0261	.0011	1.1	1.48
2.67	.9814	.0272	.0011	.6	1.33
2.69	.9881	.0283	.0011	.4	1.22
2.71	.9947	.0294	.0011	.2	1.15
2.73	1.0014	.0305	.0012	.1	1.10
2.75	1.0081	.0317	.0012	.0	1.07

HYDROGRAPH PEAK= 2.04 cfs
TIME TO PEAK= 2.56 Hours
RUNOFF VOLUME= .31 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-25-36
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-25-36 (Permanent Structure)

Tributary Area = 108 * 1.401 = 151 acres
90% Cover Oak/Aspen (CN=70) = 78
25% Cover Sage/grass (CN=75) = 73

CN	A	Q
70	78	0.10
75	73	0.19

$\bar{Q} = 0.14$, $\overline{CN} = 72.7$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 5,500 feet

$$\text{slope} = \frac{(6{,}500)(400)(100)}{43{,}560\ (151)} = 39.5\%$$

Calculated Run-Off: $Q_{TOT} = 17.0$ cfs

Check Pipe Flow

- 36" CMP
- n = 0.024
- S = 12%

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

$Q_{allow} = 125.15$ cfs OK

Pipe Flow not limiting

Check Inlet Control

- HW depth = 22'

$\frac{HW}{D} = 7.33$

Use Chart 5 - assume projecting entrance

Extrapolation yields a flow of 130 cfs.

Inlet control not limiting

PROJECT : Valley Camp Coal - C-25-36 Runoff Calculation

AREA= 151.0 ACRES
AVERAGE BASIN SLOPE= 39.5 PERCENT
CURVE NUMBER= 72.7
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2523 HOURS QPCFS= 452.63 CFS QPIN= 2.9727 INCHES
C3= 14.6524 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.32	.7247	.0000	.0000	.0	.00
2.37	.7826	.0003	.0003	22.7	.00
2.42	.8405	.0021	.0018	140.6	.08
2.47	.8984	.0056	.0035	300.5	.41
2.52	.9371	.0088	.0032	415.5	1.22
2.57	.9527	.0103	.0015	452.6	2.41
2.62	.9684	.0119	.0016	424.0	3.60
2.67	.9840	.0136	.0017	357.9	4.49
2.72	.9997	.0154	.0018	279.9	5.05
2.78	1.0153	.0174	.0019	206.6	5.34
2.83	1.0309	.0194	.0020	145.6	5.49
2.88	1.0466	.0216	.0021	98.9	5.59
2.93	1.0622	.0238	.0023	65.1	5.69
2.98	1.0779	.0262	.0024	41.8	5.83
3.03	1.0918	.0284	.0022	26.2	6.01
3.08	1.1043	.0304	.0020	16.2	6.18
3.13	1.1168	.0325	.0021	9.8	6.31
3.18	1.1294	.0346	.0022	5.9	6.38
3.23	1.1419	.0368	.0022	3.5	6.42
3.28	1.1544	.0391	.0023	2.0	6.44
3.33	1.1669	.0415	.0023	1.2	6.48
3.38	1.1794	.0439	.0024	.7	6.55
3.43	1.1919	.0463	.0025	.4	6.64
3.48	1.2044	.0488	.0025	.2	6.76
3.53	1.2145	.0509	.0021	.1	6.88
3.58	1.2231	.0527	.0018	.0	6.96
3.63	1.2317	.0545	.0018	.0	6.92
3.68	1.2403	.0564	.0019	.0	6.77
3.73	1.2489	.0583	.0019	.0	6.56
3.78	1.2575	.0602	.0019	.0	6.34
3.83	1.2661	.0621	.0019	.0	6.16
3.89	1.2747	.0641	.0020	.0	6.02

HYDROGRAPH PEAK= 6.96 cfs
TIME TO PEAK= 3.58 Hours
RUNOFF VOLUME= 1.74 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-26-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-26-24 (Permanent Structure)

Tributary Area = 10. * 1.401 = 14 acres

CN = 75 (25% Sage/Grass)

Precipitation = 1.55 inches (10 yr, 6hr)

hydraulic length = 2,000 feet

$$\text{slope} = \frac{(4{,}000)(80)(100)}{43{,}560\ (14)} = 52.5\%$$

Calculated Run-Off: $Q_{10} = 1.48$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 18\%$

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

$Q_{allow} = 51.99$ cfs OK

Pipe Flow not limiting

Check Inlet Control

- HW depth = 4.0

$\frac{HW}{D} = 2.0$ Use Chart 5 assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Inlet control not limiting

PROJECT : Valley Camp Coal - C-26-24 Runoff Calculation

AREA= 14.0 ACRES
AVERAGE BASIN SLOPE= 52.5 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0985 HOURS QPCFS= 107.47 CFS QPIN= 7.6124 INCHES
C3= 37.5215 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6616	.0000	.0000	.0	.00
2.29	.6842	.0000	.0000	5.4	.00
2.31	.7068	.0005	.0004	33.4	.00
2.33	.7294	.0012	.0007	71.3	.02
2.34	.7520	.0021	.0010	98.7	.06
2.36	.7746	.0034	.0013	107.5	.14
2.38	.7972	.0049	.0015	100.7	.24
2.40	.8198	.0067	.0018	85.0	.37
2.42	.8424	.0088	.0021	66.5	.52
2.44	.8650	.0111	.0023	49.0	.68
2.46	.8876	.0137	.0026	34.6	.86
2.48	.9102	.0166	.0028	23.5	1.04
2.50	.9307	.0194	.0028	15.5	1.23
2.52	.9369	.0203	.0009	9.9	1.39
2.54	.9430	.0211	.0009	6.2	1.48
2.56	.9491	.0221	.0009	3.8	1.47
2.58	.9552	.0230	.0009	2.3	1.38
2.60	.9613	.0239	.0009	1.4	1.25
2.62	.9674	.0249	.0010	.8	1.12
2.64	.9735	.0259	.0010	.5	1.00
2.66	.9796	.0269	.0010	.3	.90
2.68	.9857	.0279	.0010	.2	.83
2.70	.9918	.0289	.0010	.0	.78

HYDROGRAPH PEAK= 1.48 cfs
TIME TO PEAK= 2.54 Hours
RUNOFF VOLUME= .22 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-27-24.

Tributary Area: Ditch UDD-2 Q = 0.57cfs (See HA&L, 1989 Sed. Pond Report)

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 43\%$

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

$Q_{allow} = 80.6$ cfs ok

Pipe flow not limiting

Check Inlet Control

- HW depth = 4.5'

$\frac{HW}{D} = 2.25$ Use Chart 5

Assume Projecting entrance

$Q_{HW} = 24$ cfs ok

Inlet Control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-28-24

Tributary Area : UDD-2 14.7ac ← from 1989 HA&L
Tributary Area 20.3ac Report on Sed. Ponds
35.0 ac

CN	A	Q
75	33.6	0.19
70	1.4	0.10
	35.0	

$\bar{Q} = 0.18$ $\bar{CN} = \underline{74.8}$

Slope from Tributary Area = $\frac{6800(80)100}{43560(20.3)} = 61.5\%$

Avg. Slope = $\frac{61.5(20.3)+37(14.7)}{35} = \underline{51.2\%}$

Precipitation = 1.55 inches (10yr, 6hr)

Hydraulic Length = 2350 feet

Calculated Runoff $Q_{TOT} = \underline{3.3\ cfs}$

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 30\%$

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

$Q_{allow} = \underline{67.12\ cfs}$ ✓

Pipe Flow not limiting

Check Inlet Control

- HW depth = 8.5'

$\frac{HW}{D} = 4.25$

Use Chart 5 - Assume Projecting Inlet

$Q_{HW} = 35.0\ cfs$

Inlet control not limiting

PROJECT : Valley Camp Coal - C-28-24 Runoff Calculation

AREA= 35.0 ACRES
AVERAGE BASIN SLOPE= 51.2 PERCENT
CURVE NUMBER= 74.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2350. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1142 HOURS QPCFS= 231.87 CFS QPIN= 6.5699 INCHES
C3= 32.3828 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6550	.0000	.0000	.0	.00
2.28	.6812	.0000	.0000	11.6	.00
2.31	.7074	.0003	.0003	72.0	.00
2.33	.7336	.0010	.0007	153.9	.03
2.35	.7597	.0021	.0011	212.9	.12
2.37	.7859	.0036	.0015	231.9	.28
2.40	.8121	.0055	.0018	217.2	.52
2.42	.8383	.0077	.0022	183.3	.85
2.44	.8645	.0102	.0026	143.4	1.25
2.47	.8907	.0131	.0029	105.8	1.71
2.49	.9169	.0164	.0032	74.6	2.19
2.51	.9335	.0186	.0022	50.6	2.69
2.53	.9406	.0196	.0010	33.4	3.09
2.56	.9477	.0206	.0010	21.4	3.30
2.58	.9548	.0216	.0010	13.4	3.27
2.60	.9618	.0227	.0011	8.3	3.07
2.63	.9689	.0238	.0011	5.0	2.80
2.65	.9760	.0249	.0011	3.0	2.52
2.67	.9831	.0260	.0011	1.8	2.28
2.69	.9901	.0272	.0012	1.0	2.10
2.72	.9972	.0283	.0012	.6	1.97
2.74	1.0043	.0295	.0012	.3	1.88
2.76	1.0114	.0307	.0012	.2	1.84
2.79	1.0185	.0320	.0012	.1	1.82
2.81	1.0255	.0333	.0013	.0	1.82

HYDROGRAPH PEAK= 3.30 cfs
TIME TO PEAK= 2.56 Hours
RUNOFF VOLUME= .53 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-29-16
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED PAW
CHECKED
DATE 5/9/89

C-29-16

Tributary Flow D-29A, D-29B

$Q_{TOT} = 1.14$ cfs

Check Pipe Flow

- 16" cast iron
- $n = 0.014$
- $S = 5\%$

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

$Q_{allow} = 15.9$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is acceptable OK

Check Inlet Control

HW depth = 16" $\frac{HW}{D} = 1$

Evaluate inlet based on 2 know charts from "Hydraulic Charts for the selection of Highway Culverts"

Chart 7 - assume type A $\Rightarrow Q_{HW_7} = 5$ cfs

Chart 5 - assume proj. entrance $Q_{HW_5} = 4.2$ cfs ←

Select lower value

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Calculations
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-30-24

Receives flow from D-30

flow D-30 = 4.5 cfs = Q_{TOT}

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 4\%$

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

$Q_{allow} = 24.5$ cfs

since $Q_{allow} > Q_{TOT}$ Culvert is Acceptable

Check Inlet Control

HW depth = 48" $\frac{HW}{D} = 2$

assume projecting entrance - Based on Chart 5 of Federal Highway Administration

$Q_{HW_5} = 21.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ inlet control does not limit

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-31-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED paul
CHECKED ___
DATE 5/9/89

C-31-18

Tributary Flow - D-31 1.48 cfs

Check Pipe Flow

- 18" CMP
- $n = 0.024$
- $S' = 18\%$

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

$Q_{allow} = 24.14$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

- HW depth = 21.6" $\frac{HW}{D} = 1.2$

from Chart 5 assume projecting entrance

$Q_{HW_5} = 7.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-32-36
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/9/89

C-32-36

Tributary Flow D-32A, D-32B

$Q_{TOT} = 0.58$ cfs

Check Pipe Flow

- 36" CMP
- $n = 0.024$
- $S = 4\%$

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

$Q_{allow} = 72.26$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

HW depth = 7.67' (drop box w/grate. Assume headwall entrance conditions to model inlet.)

$\frac{HW}{D} = 2.56$

from Chart 5 $Q_{HW_5} = 80.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11-100

SHEET ___ OF ___
COMPUTED paul
CHECKED
DATE 5/9/89

C-33-24

Receives flow from D-33A, D-33B

Flow D-33A = 5.36 cfs
D-33B = 6.6 cfs

Q_{TOT} = 11.96 cfs

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 17\%$

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

Q_{allow} = 50.5 cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is Adequate OK

Check Inlet Control

HW depth = 48" $\frac{HW}{D} = 2.0$

using Chart 5 ⇒ Q_{HW_5} = 22.0 cfs
assume projecting entrance

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control does not limit OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE

C-34-24

Receives flow from D-34A, D-34B

flow D-34A = 0.64 cfs
D-34B = 1.88 cfs

Q_{TOT} 2.52 cfs

Check culvert Characteristics

- 24" CMP
- $n = 0.024$
- $S = 30\%$

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

$Q_{allow} = 67.17$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is adequate

Check Inlet Control

HW depth = 4.3'

$$\frac{HW}{D} = \frac{4.3}{2} = 2.15$$

using Chart 5 ⇒ $Q_{HW_5} = 22.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control does not limit

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-35-18

Receives flow from C-36-12 and D-35

C-36-12 has 1.00 cfs
D-35 has 3.00 cfs

$Q_{TOT} = 4.00$ cfs

Check Pipe Characteristics

- 18" Cast Iron
- $n = 0.014$
- $S = 4\%$

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

$Q_{allow} = 16.89$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is Acceptable

Check Inlet Control

HW depth = $\frac{HW}{D} = 1.0$

assume projecting entrance

using Chart 5 $\Rightarrow Q_{HW_5} = 5.5$ cfs

using Chart 7 $\Rightarrow Q_{HW_7} = 6.5$ cfs

select limiting value

$Q_{HW_5} = 5.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-36-12
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED RWL
CHECKED ___
DATE 5/9/89

C-36-12

Trib Flow D-36, C-38-6

D-36 ⇒ 0.70
C-38-6 ⇒ 0.36

1.06 cfs = Q_{TOT}

Check Pipe Flow

- 12" CMP
- $n = 0.024$
- $S = 30\%$

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

$Q_{allow} = 10.57$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

HW depth = 2.2 feet $\frac{HW}{D} = 2.2$

assume projecting entrance

from Chart 5 ⇒ $Q_{HW_5} = 4.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-37-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-37-18

Receives all flow from D-37

$Q_{TOT} = 2.6$ cfs

Check Pipe Characteristics

- 18" Cast Iron
- $n = 0.014$
- $S = 2\%$

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

$Q_{allow} = 16.89$ cfs

Since $Q_{allow} > Q_{TOT}$ culvert acceptable

Check Inlet Control

HW depth = $\frac{HW}{D} = 1.0$

Check Chart 5 Assume projecting entrance

$Q_{HW_5} = 5.5$ cfs

Check Chart 7 Assume type A entrance

$Q_{HW_7} = 7.0$ cfs

Use limiting value $Q_{HW_5} = 5.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-38-6
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/8/89

C-38-6

Area tributary = 313 * 0.00702 = 2.2 acres

		Q		
CN = 70	A = 1.8	0.096	$\bar{Q} = 0.210$	$\overline{CN} = 76.1$
CN = 90	A = 0.4	0.723		

Precipitation = 1.55 inches (10 yr, 6 hr SCS)

hydraulic length = 570 feet

$$\text{Slope} = \frac{(1250)(25)(100)}{(2.2)43{,}560} = 32.6\%$$

Run-off Calculations $Q = 0.36$ cfs

Check Pipe Characteristics

- 6" CMP
- $n = 0.024$
- $S = 7\%$

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

$Q_{allow} = 0.80$ cfs

since $Q_{allow} > Q_{TOT}$ culvert acceptable

Check Inlet Control

$HW = 18''$ $\frac{HW}{D} = 3.0$

based upon an extrapolation of Chart 5

$Q_{HW_5} \approx 1.3$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-38-6 Runoff Calculation

AREA= 2.2 ACRES
AVERAGE BASIN SLOPE= 32.6 PERCENT
CURVE NUMBER= 76.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 570. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0444 HOURS QPCFS= 37.50 CFS QPIN=16.9046 INCHES
C3= 83.3230 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.23	.6241	.0000	.0000	.0	.00
2.25	.6411	.0000	.0000	7.6	.00
2.26	.6580	.0003	.0002	28.7	.00
2.28	.6750	.0007	.0004	37.5	.01
2.29	.6919	.0013	.0006	31.7	.03
2.31	.7089	.0020	.0008	21.1	.05
2.32	.7259	.0030	.0009	12.1	.07
2.34	.7428	.0040	.0011	6.2	.09
2.35	.7598	.0053	.0013	3.0	.12
2.37	.7768	.0067	.0014	1.3	.14
2.38	.7937	.0083	.0016	.6	.17
2.40	.8107	.0100	.0017	.2	.19
2.41	.8277	.0119	.0019	.0	.22
2.43	.8446	.0140	.0020	.0	.24
2.44	.8616	.0162	.0022	.0	.26
2.46	.8786	.0185	.0023	.0	.29
2.47	.8955	.0210	.0025	.0	.31
2.48	.9125	.0236	.0026	.0	.33
2.50	.9294	.0264	.0028	.0	.35
2.51	.9344	.0272	.0008	.0	.36
2.53	.9390	.0280	.0008	.0	.32
2.54	.9436	.0288	.0008	.0	.26
2.56	.9482	.0296	.0008	.0	.20
2.57	.9528	.0304	.0008	.0	.16
2.59	.9574	.0312	.0008	.0	.14
2.60	.9619	.0321	.0008	.0	.13

HYDROGRAPH PEAK= .36 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .04 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-39-8
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-39-8

Tributary Flow D-39A, D-39B

$Q_{TOT} = 0.06$ cfs

Check Pipe Flow

- 8" CMP
- $n = 0.024$
- $S = 8\%$

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

$Q_{allow} = 1.85$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

- HW depth = 1.9 feet $\frac{HW}{D} = 2.8$

Assume projecting entrance

from Chart 5 $Q_{HW_5} = 2.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-40-42
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED paul
CHECKED
DATE 5/8/89

(Permanent Structure)

C-40-42 tributary Area + culverts C-44-24, C-41-12

Trib. Area = 20 * 2.747 = 54.9 acres

CN = 70 (25% Oak/Aspen)

Precipitation = 1.55 inches (10 yr, 6 hr SCS)

Hydraulic length = 2,000 feet

$$\text{slope} = \frac{(8{,}500)(80)(100)}{(43{,}560)(54.9)} = 28.4\%$$

Run-Off Calculation: Q = 1.81 cfs $Q_{TOT} = 1.81 + 2.46 + 0.99$

$Q_{TOT} = 5.26$ cfs

Check Pipe Characteristics

- 42" CMP
- $n = 0.027$
- $S = 30\%$

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

$Q_{allow} = 265.33$ cfs

since $Q_{allow} >> Q$ culvert adequate

* For a 100 yr, 6 hr event

Precip = 2.25 in ⇒ Q = 10.88 cfs

$Q_{TOT} = 10.88 + 14.82 + 1.37 + 0.99$ ⇒ $Q_{TOT} = 28.06$ cfs

Note. even under the 100 yr event

$Q_{allow} > Q$ culvert still adequate

Check Inlet Control

HWI depth = 15' $\frac{HWI}{D} = \frac{15}{3.5} = 4.3$

assume projecting entrance

Using Chart 5 ⇒ $Q_{HW_5} = 140.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control does not limit

PROJECT : Valley Camp Coal - Culvert C-40-42 Capacity Calculations

AREA= 54.9 ACRES
AVERAGE BASIN SLOPE= 28.4 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1539 HOURS QPCFS= 269.71 CFS QPIN= 4.8720 INCHES
C3= 24.0139 ITERATIONS= 9 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.43	.8522	.0000	.0000	.0	.00
2.46	.8875	.0002	.0002	13.5	.00
2.49	.9229	.0010	.0008	83.8	.03
2.52	.9376	.0015	.0005	179.1	.11
2.56	.9472	.0019	.0004	247.6	.24
2.59	.9567	.0023	.0004	269.7	.37
2.62	.9662	.0027	.0004	252.6	.49
2.65	.9758	.0032	.0005	213.3	.58
2.68	.9853	.0037	.0005	166.8	.65
2.71	.9949	.0043	.0006	123.1	.71
2.74	1.0044	.0049	.0006	86.7	.77
2.77	1.0140	.0055	.0006	58.9	.82
2.80	1.0235	.0062	.0007	38.8	.89
2.83	1.0331	.0069	.0007	24.9	.94
2.86	1.0426	.0077	.0008	15.6	1.01
2.89	1.0521	.0085	.0008	9.6	1.07
2.92	1.0617	.0093	.0008	5.8	1.14
2.96	1.0712	.0102	.0009	3.5	1.20
2.99	1.0808	.0111	.0009	2.1	1.27
3.02	1.0893	.0119	.0008	1.2	1.33
3.05	1.0969	.0127	.0008	.7	1.39
3.08	1.1045	.0135	.0008	.4	1.43
3.11	1.1122	.0143	.0008	.2	1.45
3.14	1.1198	.0152	.0008	.1	1.46
3.17	1.1274	.0160	.0009	.0	1.47
2.43	.8522	.0000	.0000	.0	.00
2.46	.8875	.0002	.0002	13.5	.00
2.49	.9229	.0010	.0008	83.8	.03
2.52	.9376	.0015	.0005	179.1	.11
2.56	.9472	.0019	.0004	247.6	.24
2.59	.9567	.0023	.0004	269.7	.37
2.62	.9662	.0027	.0004	252.6	.49
2.65	.9758	.0032	.0005	213.3	.58
2.68	.9853	.0037	.0005	166.8	.65
2.71	.9949	.0043	.0006	123.1	.71

PROJECT : Valley Camp Coal - Culvert C-40-42 Capacity Calculations
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.74	1.0044	.0049	.0006	86.7	.77
2.77	1.0140	.0055	.0006	58.9	.82
2.80	1.0235	.0062	.0007	38.8	.88
2.83	1.0331	.0069	.0007	24.9	.94
2.86	1.0426	.0077	.0008	15.6	1.01
2.89	1.0521	.0085	.0008	9.6	1.07
2.92	1.0617	.0093	.0008	5.8	1.14
2.96	1.0712	.0102	.0009	3.5	1.20
2.99	1.0808	.0111	.0009	2.1	1.27
3.02	1.0893	.0119	.0008	1.2	1.33
3.05	1.0969	.0127	.0008	.7	1.39
3.08	1.1045	.0135	.0008	.4	1.43
3.11	1.1122	.0143	.0008	.2	1.45
3.14	1.1198	.0152	.0008	.1	1.46
3.17	1.1274	.0160	.0009	.0	1.47
3.20	1.1351	.0169	.0009	.0	1.48
3.23	1.1427	.0178	.0009	.0	1.49
3.26	1.1503	.0188	.0009	.0	1.51
3.29	1.1580	.0197	.0010	.0	1.54
3.33	1.1656	.0207	.0010	.0	1.57
3.36	1.1732	.0217	.0010	.0	1.60
3.39	1.1809	.0227	.0010	.0	1.63
3.42	1.1885	.0238	.0010	.0	1.67
3.45	1.1961	.0248	.0011	.0	1.71
3.48	1.2038	.0259	.0011	.0	1.75
3.51	1.2107	.0269	.0010	.0	1.79
3.54	1.2159	.0277	.0008	.0	1.81
3.57	1.2212	.0285	.0008	.0	1.81
3.60	1.2264	.0293	.0008	.0	1.78
3.63	1.2317	.0301	.0008	.0	1.72
3.66	1.2369	.0309	.0008	.0	1.66
3.69	1.2422	.0317	.0008	.0	1.60
3.73	1.2474	.0326	.0008	.0	1.56

HYDROGRAPH PEAK= 1.81 cfs
TIME TO PEAK= 3.54 Hours
RUNOFF VOLUME= .44 Acre-Feet

[illegible] (6 hour SCS)

AREA= 54.9 ACRES
AVERAGE BASIN SLOPE= 28.4 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1539 HOURS QPCFS= 269.71 CFS QPIN= 4.8720 INCHES
C3= 24.0139 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.19	.8270	.0000	.0000	.0	.00
2.22	.8783	.0001	.0001	13.5	.00
2.25	.9295	.0012	.0011	83.8	.02
2.28	.9808	.0035	.0023	179.1	.14
2.31	1.0321	.0069	.0034	247.6	.46
2.34	1.0833	.0113	.0045	269.7	1.05
2.37	1.1346	.0169	.0055	252.6	1.94
2.40	1.1858	.0234	.0065	213.3	3.10
2.43	1.2371	.0309	.0075	166.8	4.49
2.46	1.2884	.0394	.0085	123.1	6.03
2.49	1.3396	.0488	.0094	86.7	7.67
2.52	1.3610	.0530	.0042	58.9	9.29
2.56	1.3749	.0558	.0028	38.9	10.46
2.59	1.3888	.0587	.0029	24.9	10.88
2.62	1.4026	.0616	.0029	15.6	10.58
2.65	1.4165	.0646	.0030	9.6	9.81
2.68	1.4303	.0676	.0030	5.8	8.88
2.71	1.4442	.0707	.0031	3.5	7.98
2.74	1.4580	.0739	.0032	2.1	7.24
2.77	1.4719	.0771	.0032	1.2	6.68
2.80	1.4857	.0804	.0033	.7	6.30
2.83	1.4996	.0838	.0033	.4	6.07
2.86	1.5134	.0872	.0034	.2	5.95
2.89	1.5273	.0906	.0035	.1	5.90
2.92	1.5412	.0941	.0035	.0	5.92

HYDROGRAPH PEAK= 10.88 cfs
TIME TO PEAK= 2.59 Hours
RUNOFF VOLUME= 1.55 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culverts
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-41-12

Mine Discharge to concrete settling Ponds.

data based on records gathered by Vaughn Hansen Assoc from 9/77 to 10/83.

Max value measured. ⇒ 9/12/83 $\underline{0.99 \text{ cfs}} = Q_{TOT}$

Assume maximum value.

Check Pipe Characteristics

- 12" CMP
- $n = 0.024$
- $S = 17\%$

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

$\underline{Q_{allow} = 7.96 \text{ cfs}}$

Since $Q_{allow} > Q$ Culvert is acceptable

Check Inlet Control

Hwl depth = 2.4' $\frac{HW}{D} = 2.4$

assume projecting entrance

Use Chart 5 ⇒ $\underline{Q_{HW_5} = 4.5 \text{ cfs}}$

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-42-8
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/8/89

C-42-8

Tributary Area D-42

$Q_{TOT} = 0.51$ cfs

Check Pipe Flow

- $n = 0.024$
- 8" CMP
- $S = 5\%$

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

$Q_{allow} = 1.46$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting ok

Check Inlet Control

- HW depth = 2.67'

$$\frac{HW}{D} = \frac{2.67}{.67} = 4.0$$

assume projecting entrance

from Chart 5 $\Rightarrow$ $Q_{HW_5} = 2.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting ok

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Mine Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/8/89

C-43-8

Total Area = 184 * 0.00702 = 1.3 ac
Undist. Area = 57 * 0.00702 = 0.4 ac (25% Oak/Aspen)
Dist. Area = 130 * 0.00702 = 0.9 ac

CN	Area	Q
70	0.4	0.096
90	0.9	0.723

$\bar{Q} = 0.530$ $\bar{CN} = 86.1$

Precip = 1.55" (10 yr, 6 hr. SCS)

Hydraulic length = 325 feet

$$\text{slope} = \frac{(350)(25)(100)}{43{,}560\,(1.3)} = 24.3\%$$

Run-Off Calculation: $Q = 0.71$ cfs

Check Pipe Characteristics

8" CMP
$n = 0.024$
$S = 30\%$

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

$Q_{allow} = 3.59$ cfs

since $Q_{allow} > Q$ culvert adequate

For a 100 year, 6 hour event

$P = 2.25$ inches $\Rightarrow Q_{TOT} = 1.37$ cfs

since $Q_{allow} > Q_{TOT}$ culvert is acceptable

Check Inlet Control

HW depth = 2.17'

$$\frac{HW}{D} = \frac{2.17}{0.67} = 3.25$$

Use projecting entrance

Use Chart 5 $\Rightarrow Q_{HW_5} = 2.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

PROJECT : Valley Camp Coal - Culvert C-4C-8 Capacity Calculations

AREA= 1.3 ACRES
AVERAGE BASIN SLOPE= 24.3 PERCENT
CURVE NUMBER= 86.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 325. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0238 HOURS QPCFS= 41.38 CFS QPIN=31.5630 INCHES
C3=155.5737 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.88	.3212	.0000	.0000	.0	.00
1.90	.3282	.0000	.0000	41.4	.00
1.93	.3352	.0000	.0000	13.2	.00
1.95	.3422	.0002	.0001	1.5	.00
1.98	.3493	.0004	.0002	.1	.00
2.00	.3563	.0007	.0003	.0	.01
2.36	.7651	.0951	.0103	.0	.57
[illegible]	[illegible]	.1058	.0107	.0	.59
[illegible]	.8197	.1169	.0111	.0	.62
2.43	.8470	.1284	.0115	.0	.64
2.45	.8743	.1404	.0119	.0	.66
2.48	.9016	.1527	.0123	.0	.69
2.50	.9289	.1654	.0127	.0	.71
2.52	.9371	.1693	.0039	.0	.35
2.55	.9444	.1728	.0035	.0	.22
2.57	.9518	.1763	.0035	.0	.20
2.59	.9592	.1798	.0036	.0	.20
2.62	.9666	.1833	.0036	.0	.20
2.64	.9740	.1871	.0036	.0	.20

HYDROGRAPH PEAK= .71 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .06 Acre-Feet

[illegible] Valley Temp Pond - [illegible] 5-47-9 (100 yr, 6 hour SCS)

AREA= 1.3 ACRES
AVERAGE BASIN SLOPE= 24.3 PERCENT
CURVE NUMBER= 86.2
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 325. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0237 HOURS QPCFS= 41.53 CFS QPIN=31.6773 INCHES
C3=156.1375 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.52	.3109	.0000	.0000	.0	.00
1.54	.3211	.0000	.0000	41.5	.00
1.56	.3312	.0000	.0000	13.3	.00
1.59	.3413	.0003	.0002	1.5	.00
1.61	.3515	.0006	.0003	.1	.02
1.64	.3616	.0010	.0004	.0	.02
2.35	1.0941	.2522	.0212	.0	1.19
2.37	1.1336	.2740	.0218	.0	1.22
2.39	1.1730	.2964	.0224	.0	1.25
2.42	1.2125	.3193	.0229	.0	1.28
2.44	1.2519	.3428	.0234	.0	1.31
2.46	1.2914	.3667	.0239	.0	1.34
2.49	1.3309	.3911	.0244	.0	1.37
2.51	1.3555	.4066	.0155	.0	1.00
2.54	1.3662	.4133	.0067	.0	.52
2.56	1.3768	.4201	.0068	.0	.40
2.58	1.3875	.4269	.0068	.0	.38
2.61	1.3982	.4338	.0068	.0	.39
2.63	1.4088	.4406	.0069	.0	.39

HYDROGRAPH PEAK= 1.37 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .11 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/8/89

C-44-24

Total Area = 27*(2.747) = 74.2 Acres (25% Oak/Aspen)

CN = 70 (25% Oak/Aspen)

Precipitation = 1.55 inches (10 year, 6 hr SCS)

Hydraulic length = 2,000 feet

$$\text{slope} = \frac{(12,200)(80)(100)}{43,560\ (74.2)} = 30.2\%$$

Run-Off Calculation: $Q = 2.46$ cfs

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 8\%$

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

$Q_{allow} = 34.66$ cfs

Since $Q_{allow} > Q$ culvert adequate

* For a 100 year, 6hr event

Precip = 2.25 inches $\Rightarrow Q_{TOT}$ 14.82 cfs

$Q_{TOT} = 14.82 + 1.37$ ← From C-43-8 $Q_{TOT} = 16.19$ cfs

Note: even under the 24 hr. conditions

$Q_{allow} > Q$ ∴ culvert acceptable

Check Inlet Control

HW depth = 6.3 feet $\frac{HW}{D} = \frac{6.3}{2.0} = 3.15$

assume projecting entrance

Use Chart 5 $\Rightarrow Q_{HW_5} = 29.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

PROJECT : Valley Land Coal - Culvert C-44-24 Capacity Calculation

AREA= 74.2 ACRES
AVERAGE BASIN SLOPE= 30.2 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1493 HOURS QPCFS= 375.90 CFS QPIN= 5.0240 INCHES
C3= 24.7632 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.42	.8363	.0000	.0000	.0	.00
2.45	.8705	.0000	.0000	18.9	.00
2.48	.9048	.0005	.0005	116.8	.01
2.51	.9324	.0013	.0008	249.5	.08
2.54	.9417	.0016	.0003	345.1	.23
2.57	.9510	.0020	.0004	375.9	.42
2.60	.9602	.0024	.0004	352.1	.60
2.63	.9695	.0029	.0004	297.2	.74
2.66	.9787	.0034	.0005	232.5	.85
2.69	.9880	.0039	.0005	171.5	.93
2.72	.9972	.0044	.0006	120.9	1.00
2.75	1.0065	.0050	.0006	82.1	1.07
2.78	1.0157	.0057	.0006	54.1	1.14
2.81	1.0250	.0063	.0007	34.7	1.22
2.84	1.0343	.0070	.0007	21.9	1.30
2.87	1.0435	.0078	.0007	13.4	1.38
2.90	1.0528	.0085	.0008	8.1	1.47
2.93	1.0620	.0093	.0008	4.9	1.55
2.96	1.0713	.0102	.0008	2.9	1.64
2.99	1.0805	.0111	.0009	1.7	1.73
3.02	1.0888	.0119	.0008	1.0	1.81
3.05	1.0962	.0126	.0008	.6	1.89
3.08	1.1036	.0134	.0008	.3	1.94
3.10	1.1110	.0142	.0008	.2	1.97
3.13	1.1184	.0150	.0008	.0	1.98
3.37	1.1777	.0223	.0010	.0	2.20
3.40	1.1851	.0233	.0010	.0	2.24
3.43	1.1925	.0243	.0010	.0	2.29
3.46	1.1999	.0254	.0010	.0	2.33
3.49	1.2073	.0264	.0011	.0	2.40
3.52	1.2129	.0273	.0008	.0	2.44
3.55	1.2180	.0280	.0008	.0	2.46
3.58	1.2231	.0288	.0008	.0	2.44
3.61	1.2282	.0296	.0008	.0	2.37

PROJECT : Valley Camp Coal - Culvert C-44-24 Capacity Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2333	.0303	.0008	.0	2.29
3.67	1.2384	.0311	.0008	.0	2.21
3.70	1.2435	.0319	.0008	.0	2.14
3.73	1.2485	.0328	.0008	.0	2.09

HYDROGRAPH PEAK= 2.46 cfs
TIME TO PEAK= 3.55 Hours
RUNOFF VOLUME= .59 Acre-Feet

PROJECT : Valley Camp Coal - Culvert C-44-24 (100 yr, 6 hour SCS)

AREA= 74.2 ACRES
AVERAGE BASIN SLOPE= 30.2 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1493 HOURS QPCFS= 375.90 CFS QPIN= 5.0240 INCHES
C3= 24.7632 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.18	.8163	.0000	.0000	.0	.00
2.21	.8660	.0000	.0000	18.9	.00
2.24	.9157	.0008	.0008	116.8	.02
2.27	.9654	.0027	.0019	249.5	.13
2.30	1.0152	.0056	.0029	345.1	.47
2.33	1.0649	.0096	.0040	375.9	1.16
2.36	1.1146	.0146	.0050	352.1	2.24
2.39	1.1643	.0205	.0060	297.2	3.69
2.42	1.2140	.0274	.0069	232.5	5.45
2.45	1.2637	.0352	.0078	171.5	7.43
2.48	1.3134	.0439	.0087	120.9	9.57
2.51	1.3535	.0515	.0076	82.1	11.76
2.54	1.3670	.0542	.0027	54.1	13.69
2.57	1.3804	.0569	.0027	34.7	14.78
2.60	1.3939	.0597	.0028	21.8	14.82
2.63	1.4073	.0626	.0029	13.4	14.02
2.66	1.4207	.0655	.0029	8.1	12.79
2.69	1.4342	.0685	.0030	4.9	11.49
2.72	1.4476	.0715	.0030	2.9	10.32
2.75	1.4610	.0746	.0031	1.7	9.42
2.78	1.4745	.0777	.0031	1.0	8.77
2.81	1.4879	.0809	.0032	.6	8.34
2.84	1.5013	.0842	.0033	.3	8.09
2.87	1.5148	.0875	.0033	.2	7.98
2.90	1.5282	.0908	.0034	.0	7.95

HYDROGRAPH PEAK= 14.82 cfs
TIME TO PEAK= 2.60 Hours
RUNOFF VOLUME= 2.10 Acre-Feet

I- Undisturbed Area Runoff Channels

A- Drainage Basin Characteristics

Channel	Basin Area (acres)	Hydraulic Length ft	Watershed Slope %
UDA-1	6.7	700	27
UDA-2	14.7	1900	37
UDA-3	8.1	1500	32
UDA-4	5.5	1250	31
UDA-5	7.2	1100	28

$$\text{Watershed Slope} = \frac{L_c * CI}{DA} * 100$$

L_c = length of Contour lines.
CI = Contour Interval in feet.
DA = Drainage Area

Channel	L_c ft	CI ft	DA ft²	Slope %
UDA-1	1000	80	291,852	27
UDA-2	11,900	20	640,332	37
UDA-3	5,600	20	352,836	32
UDA-4	3750	20	239,580	31
UDA-5	4400	20	313,632	28

B- Curve Number

Use CN = 75 for Sage-grass cover
CN = 70 for ~~Aspen~~ Forest Cover
} See Calculations 9/18/88 for justification.

Channel	Area Sage-Grass ac	Area Aspen or Forest ac
UDA-1	6.7	0
UDA-2	1.4	13.3
UDA-3	8.1	0
UDA-4	0	5.5
UDA-5	0	7.2

HANSEN ALLEN & LUCE INC

CLIENT Valley County
PROJECT Hydrology - Future Facilities
FEATURE Runoff; Peak Flow Projections
PROJECT NO.

SHEET 2 OF 17
COMPUTED DMA
CHECKED
DATE 1/18/89

Weighted Curve #s based on runoff volume

Channel	Area ac	CN	10-yr 24-hr Runoff Depth in	Wt. CN based on Wt. Q
UAD-1	6.7	75	0.62	75
	0	70	0.43	
			WTQ = 0.62	
UAD-2	1.4	75	0.62	
	13.3	70	0.43	70.5 Use 71
			WTQ = 0.45	
UAD-3	8.1	75	0.62	
	0.0	70	0.43	75
			WTQ = 0.62	
UAD-4	0	75	0.62	
	5.5	70	0.43	70
			WTQ = 0.43	
UAD-5	0	75	0.62	
	7.2	70	0.43	70
			WTQ = 0.43	

10-yr 24-hr Precip = 2.45 inches

10-yr 6-hr Precip = 1.55 inches.

C- Peak Discharge Summary

Estimated Peak Discharge for Undisturbed Area Bypass Channels from 10-year, 24-hour and 10-year, 6-hour Precipitation Events.

CHANNEL	PEAK FLOW 10-YEAR, 24-HOUR (cfs)	PEAK FLOW 10-YEAR, 6-HOUR (cfs)
UD-1	4.5	.84
UD-2	6.4	.57
UD-3	5.1	.85
UD-4	2.3	.19
UD-5	3.0	.25

See Attached Printouts for Hydrograph output data.

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL UDD-1 ~~UD-1~~

AREA= 6.7 ACRES
AVERAGE BASIN SLOPE= 27.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0593 HOURS QPCFS= 85.42 CFS QPIN=12.6436 INCHES
C3= 62.3202 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.38	.6649	.0000	.0000	.0	.00
11.40	.6704	.0000	.0000	26.7	.00
11.42	.6758	.0000	.0000	78.6	.00
11.45	.6813	.0000	.0000	79.8	.00
11.47	.6868	.0001	.0000	52.5	.00
11.50	.6923	.0002	.0000	27.2	.01
11.52	.7290	.0011	.0009	12.1	.04
11.54	.7733	.0033	.0022	4.9	.14
11.57	.8177	.0065	.0032	1.8	.34
11.59	.8620	.0108	.0043	.6	.59
11.61	.9063	.0161	.0053	.2	.87
11.64	.9506	.0223	.0062	.0	1.16
11.85	1.3494	.1161	.0134	.0	3.38
11.88	1.3938	.1302	.0141	.0	3.59
11.90	1.4381	.1450	.0148	.0	3.79
11.92	1.4824	.1604	.0154	.0	3.98
11.95	1.5267	.1764	.0160	.0	4.17
11.97	1.5710	.1930	.0166	.0	4.35
12.00	1.6153	.2102	.0172	.0	4.52
12.02	1.6310	.2164	.0062	.0	4.38
12.04	1.6394	.2198	.0034	.0	3.55
12.07	1.6478	.2231	.0034	.0	2.51
12.09	1.6562	.2265	.0034	.0	1.74
12.11	1.6646	.2299	.0034	.0	1.30
12.14	1.6730	.2334	.0034	.0	1.10

HYDROGRAPH PEAK= 4.52 cfs
TIME TO PEAK= 12.00 Hours
RUNOFF VOLUME= .35 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL UDD-1 ~~UD-1~~

AREA= 6.7 ACRES
AVERAGE BASIN SLOPE= 27.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0593 HOURS QPCFS= 85.42 CFS QPIN=12.6436 INCHES
C3= 62.3202 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6559	.0000	.0000	.0	.00
2.28	.6832	.0000	.0000	26.7	.00
2.31	.7105	.0006	.0005	78.6	.02
2.33	.7378	.0015	.0009	79.8	.07
2.36	.7651	.0028	.0013	52.5	.15
2.38	.7924	.0046	.0017	27.2	.25
2.40	.8197	.0067	.0021	12.1	.36
2.43	.8470	.0093	.0025	4.9	.48
2.45	.8743	.0122	.0029	1.8	.59
2.48	.9016	.0155	.0033	.6	.70
2.50	.9289	.0191	.0037	.2	.81
2.52	.9371	.0203	.0012	.0	.84
2.55	.9444	.0214	.0011	.0	.71
2.57	.9518	.0225	.0011	.0	.54
2.59	.9592	.0236	.0011	.0	.42
2.62	.9666	.0248	.0012	.0	.36
2.64	.9740	.0259	.0012	.0	.34
2.67	.9813	.0271	.0012	.0	.33

HYDROGRAPH PEAK= .84 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .10 Acre-Feet

6/17

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-2~~ JDD-2

AREA= 14.7 ACRES
AVERAGE BASIN SLOPE= 37.0 PERCENT
CURVE NUMBER= 71.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1260 HOURS QPCFS= 88.25 CFS QPIN= 5.9534 INCHES
C3= 29.3443 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.56	.8133	.0000	.0000	.0	.00
11.59	.8602	.0005	.0005	4.4	.00
11.61	.9071	.0019	.0015	27.4	.02
11.64	.9540	.0045	.0025	58.6	.08
11.67	1.0010	.0079	.0035	81.0	.21
11.69	1.0479	.0124	.0044	88.2	.42
11.72	1.0948	.0177	.0053	82.7	.72
11.74	1.1417	.0239	.0062	69.8	1.09
11.77	1.1886	.0310	.0071	54.6	1.52
11.79	1.2355	.0389	.0079	40.3	1.98
11.82	1.2824	.0476	.0087	28.4	2.46
11.84	1.3293	.0571	.0095	19.3	2.96
11.87	1.3763	.0674	.0103	12.7	3.46
11.89	1.4232	.0784	.0110	8.1	3.95
11.92	1.4701	.0901	.0117	5.1	4.43
11.94	1.5170	.1024	.0124	3.2	4.91
11.97	1.5639	.1155	.0131	1.9	5.37
11.99	1.6108	.1292	.0137	1.1	5.82
12.02	1.6307	.1352	.0060	.7	6.22
12.04	1.6396	.1379	.0027	.4	6.40
12.07	1.6485	.1407	.0027	.2	6.21
12.09	1.6573	.1434	.0028	.1	5.69
12.12	1.6662	.1462	.0028	.0	4.98
12.14	1.6751	.1490	.0028	.0	4.22
12.17	1.6840	.1518	.0028	.0	3.54
12.19	1.6929	.1547	.0029	.0	2.98

HYDROGRAPH PEAK= 6.40 cfs
TIME TO PEAK= 12.04 Hours
RUNOFF VOLUME= .57 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-2~~ UDD-2

AREA= 14.7 ACRES
AVERAGE BASIN SLOPE= 37.0 PERCENT
CURVE NUMBER= 71.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1260 HOURS QPCFS= 88.25 CFS QPIN= 5.9534 INCHES
C3= 29.3443 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.39	.8078	.0000	.0000	.0	.00
2.42	.8367	.0000	.0000	4.4	.00
2.44	.8656	.0006	.0005	27.4	.00
2.47	.8945	.0014	.0009	58.6	.02
2.49	.9234	.0027	.0013	81.0	.07
2.52	.9360	.0034	.0007	88.2	.14
2.54	.9438	.0038	.0005	82.7	.22
2.57	.9517	.0043	.0005	69.8	.28
2.60	.9595	.0048	.0005	54.6	.32
2.62	.9673	.0053	.0005	40.3	.33
2.65	.9751	.0059	.0006	28.4	.34
2.67	.9829	.0065	.0006	19.3	.34
2.70	.9907	.0071	.0006	12.7	.33
2.72	.9985	.0077	.0006	8.1	.33
2.75	1.0063	.0084	.0007	5.1	.33
2.77	1.0141	.0091	.0007	3.2	.34
2.80	1.0220	.0098	.0007	1.9	.35
2.82	1.0298	.0105	.0007	1.1	.36
2.85	1.0376	.0113	.0008	.7	.37
2.87	1.0454	.0121	.0008	.4	.39
2.90	1.0532	.0129	.0008	.2	.40
2.92	1.0610	.0138	.0008	.1	.42
2.95	1.0688	.0146	.0009	.0	.43
3.38	1.1783	.0294	.0010	.0	.52
3.40	1.1845	.0304	.0010	.0	.53
3.43	1.1908	.0314	.0010	.0	.54
3.45	1.1970	.0324	.0010	.0	.55
3.48	1.2033	.0334	.0010	.0	.56
3.50	1.2094	.0344	.0010	.0	.57
3.53	1.2136	.0351	.0007	.0	.57
3.55	1.2179	.0359	.0007	.0	.57
3.58	1.2222	.0366	.0007	.0	.56
3.60	1.2265	.0373	.0007	.0	.54
3.63	1.2308	.0381	.0008	.0	.52

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-2~~ UDD-2
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.65	1.2351	.0388	.0008	.0	.50
3.68	1.2394	.0396	.0008	.0	.48

HYDROGRAPH PEAK= .57 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .14 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3

AREA= 8.1 ACRES
AVERAGE BASIN SLOPE= 32.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1002 HOURS QPCFS= 61.10 CFS QPIN= 7.4811 INCHES
C3= 36.8746 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.37	.6630	.0000	.0000	.0	.00
11.39	.6676	.0000	.0000	3.1	.00
11.41	.6722	.0000	.0000	19.0	.00
11.43	.6768	.0000	.0000	40.6	.00
11.45	.6815	.0000	.0000	56.1	.00
11.47	.6861	.0001	.0000	61.1	.00
11.49	.6907	.0002	.0000	57.2	.00
11.51	.7093	.0005	.0004	48.3	.00
11.53	.7466	.0019	.0013	37.8	.02
11.55	.7839	.0040	.0021	27.9	.06
11.57	.8213	.0069	.0029	19.7	.13
11.59	.8586	.0105	.0036	13.3	.26
11.61	.8959	.0148	.0043	8.8	.42
11.63	.9333	.0197	.0050	5.6	.63
11.65	.9706	.0254	.0057	3.5	.87
11.67	1.0079	.0317	.0063	2.2	1.12
11.69	1.0453	.0386	.0069	1.3	1.38
11.71	1.0826	.0461	.0075	.8	1.65
11.73	1.1199	.0543	.0081	.5	1.92
11.75	1.1573	.0629	.0087	.3	2.19
11.77	1.1946	.0722	.0092	.2	2.45
11.79	1.2319	.0820	.0098	.0	2.70
11.37	.6630	.0000	.0000	.0	.00
11.39	.6676	.0000	.0000	3.1	.00
11.41	.6722	.0000	.0000	19.0	.00
11.43	.6768	.0000	.0000	40.6	.00
11.45	.6815	.0000	.0000	56.1	.00
11.47	.6861	.0001	.0000	61.1	.00
11.49	.6907	.0002	.0000	57.2	.00
11.51	.7093	.0005	.0004	48.3	.00
11.53	.7466	.0019	.0013	37.8	.02
11.55	.7839	.0040	.0021	27.9	.06
11.57	.8213	.0069	.0029	19.7	.13
11.59	.8586	.0105	.0036	13.3	.26
11.61	.8959	.0148	.0043	8.8	.42

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.63	.9333	.0197	.0050	5.6	.63
11.65	.9706	.0254	.0057	3.5	.87
11.67	1.0079	.0317	.0063	2.2	1.12
11.69	1.0453	.0386	.0069	1.3	1.38
11.71	1.0826	.0461	.0075	.8	1.65
11.73	1.1199	.0543	.0081	.5	1.92
11.75	1.1573	.0629	.0087	.3	2.19
11.77	1.1946	.0722	.0092	.2	2.45
11.79	1.2319	.0820	.0098	.0	2.70
11.81	1.2693	.0923	.0103	.0	2.95
11.83	1.3066	.1031	.0108	.0	3.19
11.85	1.3439	.1144	.0113	.0	3.43
11.87	1.3813	.1262	.0118	.0	3.66
11.89	1.4186	.1384	.0122	.0	3.88
11.91	1.4559	.1511	.0127	.0	4.09
11.93	1.4933	.1642	.0131	.0	4.30
11.95	1.5306	.1778	.0136	.0	4.51
11.97	1.5679	.1918	.0140	.0	4.71
11.99	1.6053	.2062	.0144	.0	4.90
12.01	1.6278	.2151	.0089	.0	5.07
12.03	1.6349	.2179	.0028	.0	5.12
12.05	1.6420	.2208	.0028	.0	4.93
12.07	1.6490	.2236	.0028	.0	4.51
12.09	1.6561	.2265	.0029	.0	3.93
12.11	1.6632	.2293	.0029	.0	3.32
12.13	1.6702	.2322	.0029	.0	2.76
12.15	1.6773	.2351	.0029	.0	2.30

HYDROGRAPH PEAK= 5.12 cfs
TIME TO PEAK= 12.03 Hours
RUNOFF VOLUME= .42 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3

AREA= 8.1 ACRES
AVERAGE BASIN SLOPE= 32.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1002 HOURS QPCFS= 61.10 CFS QPIN= 7.4811 INCHES
C3= 36.8746 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6612	.0000	.0000	.0	.00
2.29	.6842	.0000	.0000	3.1	.00
2.31	.7072	.0005	.0004	19.0	.00
2.33	.7301	.0012	.0007	40.6	.01
2.35	.7531	.0022	.0010	56.1	.04
2.37	.7761	.0035	.0013	61.1	.08
2.39	.7991	.0051	.0016	57.2	.14
2.41	.8221	.0069	.0019	48.3	.21
2.43	.8451	.0091	.0021	37.8	.30
2.45	.8681	.0115	.0024	27.9	.40
2.47	.8911	.0142	.0027	19.7	.50
2.49	.9141	.0171	.0029	13.3	.61
2.51	.9319	.0196	.0025	8.8	.72
2.53	.9381	.0204	.0009	5.6	.81
2.55	.9444	.0214	.0009	3.5	.85
2.57	.9506	.0223	.0009	2.2	.84
2.59	.9568	.0232	.0009	1.3	.78
2.61	.9630	.0242	.0010	.8	.71
2.63	.9692	.0252	.0010	.5	.63
2.65	.9754	.0262	.0010	.3	.57
2.67	.9816	.0272	.0010	.2	.51
2.69	.9879	.0282	.0010	.0	.48

HYDROGRAPH PEAK= .85 cfs
TIME TO PEAK= 2.55 Hours
RUNOFF VOLUME= .12 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4

AREA= 5.5 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1012 HOURS QPCFS= 41.12 CFS QPIN= 7.4135 INCHES
C3= 36.5410 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.57	.8296	.0000	.0000	.0	.00
11.59	.8673	.0000	.0000	2.1	.00
11.61	.9050	.0005	.0005	12.8	.00
11.63	.9426	.0017	.0011	27.3	.00
11.65	.9803	.0034	.0018	37.7	.03
11.67	1.0180	.0058	.0024	41.1	.08
11.69	1.0556	.0088	.0030	38.5	.15
11.71	1.0933	.0123	.0035	32.5	.24
11.73	1.1310	.0164	.0041	25.4	.36
11.76	1.1687	.0211	.0047	18.8	.49
11.78	1.2063	.0263	.0052	13.2	.63
11.80	1.2440	.0320	.0057	9.0	.77
11.82	1.2817	.0383	.0062	5.9	.92
11.84	1.3194	.0450	.0067	3.8	1.07
11.86	1.3570	.0522	.0072	2.4	1.22
11.88	1.3947	.0599	.0077	1.5	1.36
11.90	1.4324	.0681	.0082	.9	1.51
11.92	1.4701	.0767	.0086	.5	1.65
11.94	1.5077	.0857	.0091	.3	1.78
11.96	1.5454	.0952	.0095	.2	1.92
11.98	1.5831	.1052	.0099	.1	2.05
12.00	1.6208	.1155	.0103	.0	2.18
12.02	1.6308	.1183	.0028	.0	2.29
12.04	1.6379	.1203	.0020	.0	2.31
12.06	1.6451	.1224	.0020	.0	2.20
12.08	1.6522	.1244	.0021	.0	1.98
12.10	1.6594	.1265	.0021	.0	1.71
12.12	1.6665	.1286	.0021	.0	1.44
12.14	1.6736	.1307	.0021	.0	1.20
12.16	1.6808	.1328	.0021	.0	1.01

HYDROGRAPH PEAK= 2.31 cfs
TIME TO PEAK= 12.04 Hours
RUNOFF VOLUME= .20 Acre-Feet

PROJECT : VALLEY CAMP 10-YR 6-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4

AREA= 5.5 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1012 HOURS QPCFS= 41.12 CFS QPIN= 7.4135 INCHES
C3= 36.5410 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.43	.8473	.0000	.0000	.0	.00
2.45	.8705	.0000	.0000	2.1	.00
2.47	.8937	.0003	.0003	12.8	.00
2.49	.9169	.0008	.0005	27.3	.00
2.51	.9327	.0013	.0005	37.7	.02
2.53	.9390	.0015	.0002	41.1	.03
2.55	.9453	.0018	.0002	38.5	.05
2.57	.9516	.0020	.0003	32.5	.06
2.59	.9578	.0023	.0003	25.4	.07
2.61	.9641	.0026	.0003	18.8	.07
2.63	.9704	.0029	.0003	13.2	.07
2.65	.9766	.0032	.0003	9.0	.08
2.67	.9829	.0036	.0003	5.9	.08
2.69	.9892	.0039	.0004	3.8	.08
2.71	.9955	.0043	.0004	2.4	.08
2.73	1.0017	.0047	.0004	1.5	.09
2.75	1.0080	.0051	.0004	.9	.09
2.77	1.0143	.0056	.0004	.5	.09
2.79	1.0206	.0060	.0004	.3	.10
2.81	1.0268	.0065	.0005	.2	.10
2.83	1.0331	.0069	.0005	.1	.11
2.85	1.0394	.0074	.0005	.0	.11
3.40	1.1840	.0232	.0007	.0	.17
3.42	1.1890	.0238	.0007	.0	.18
3.44	1.1940	.0245	.0007	.0	.18
3.46	1.1990	.0253	.0007	.0	.18
3.48	1.2040	.0260	.0007	.0	.18
3.50	1.2090	.0267	.0007	.0	.19
3.52	1.2125	.0272	.0005	.0	.19
3.54	1.2159	.0277	.0005	.0	.19
3.56	1.2194	.0282	.0005	.0	.18
3.58	1.2228	.0288	.0005	.0	.18
3.60	1.2263	.0293	.0005	.0	.17
3.62	1.2297	.0298	.0005	.0	.16

PROJECT : VALLEY CAMP 10-YR 6-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2332	.0303	.0005	.0	.16

HYDROGRAPH PEAK= .19 cfs
TIME TO PEAK= 3.52 Hours
RUNOFF VOLUME= .04 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-5~~ UDD-5

AREA= 7.2 ACRES
AVERAGE BASIN SLOPE= 28.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0961 HOURS QPCFS= 56.66 CFS QPIN= 7.8043 INCHES
C3= 38.4674 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.57	.8239	.0000	.0000	.0	.00
11.59	.8596	.0000	.0000	2.8	.00
11.61	.8954	.0003	.0003	17.6	.00
11.63	.9312	.0013	.0009	37.6	.00
11.65	.9670	.0027	.0015	52.0	.03
11.67	1.0028	.0048	.0020	56.7	.08
11.69	1.0386	.0074	.0026	53.1	.17
11.70	1.0744	.0105	.0031	44.8	.28
11.72	1.1101	.0141	.0036	35.0	.42
11.74	1.1459	.0182	.0041	25.9	.57
11.76	1.1817	.0229	.0046	18.2	.75
11.78	1.2175	.0280	.0051	12.4	.93
11.80	1.2533	.0335	.0056	8.2	1.11
11.82	1.2891	.0395	.0060	5.2	1.30
11.84	1.3249	.0460	.0065	3.3	1.48
11.86	1.3607	.0529	.0069	2.0	1.67
11.88	1.3964	.0603	.0073	1.2	1.85
11.90	1.4322	.0680	.0078	.7	2.03
11.92	1.4680	.0762	.0082	.4	2.20
11.94	1.5038	.0848	.0086	.3	2.37
11.95	1.5396	.0937	.0090	.1	2.54
11.97	1.5754	.1031	.0093	.0	2.70
11.99	1.6112	.1128	.0097	.0	2.86
12.01	1.6286	.1177	.0049	.0	3.00
12.03	1.6354	.1196	.0019	.0	3.05
12.05	1.6422	.1215	.0019	.0	2.95
12.07	1.6490	.1235	.0019	.0	2.69
12.09	1.6558	.1254	.0020	.0	2.35
12.11	1.6625	.1274	.0020	.0	1.99
12.13	1.6693	.1294	.0020	.0	1.66
12.15	1.6761	.1314	.0020	.0	1.39

HYDROGRAPH PEAK= 3.05 cfs
TIME TO PEAK= 12.03 Hours
RUNOFF VOLUME= .26 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-5~~ UDD-5

AREA= 7.2 ACRES
AVERAGE BASIN SLOPE= 28.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0961 HOURS QPCFS= 56.66 CFS QPIN= 7.8043 INCHES
C3= 38.4674 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.42	.8401	.0000	.0000	.0	.00
2.44	.8622	.0000	.0000	2.8	.00
2.46	.8842	.0002	.0002	17.6	.00
2.48	.9063	.0006	.0004	37.6	.00
2.50	.9283	.0012	.0006	52.0	.02
2.52	.9355	.0014	.0002	56.7	.03
2.54	.9415	.0016	.0002	53.1	.06
2.56	.9474	.0019	.0002	44.8	.08
2.58	.9534	.0021	.0003	35.0	.09
2.59	.9593	.0024	.0003	25.9	.09
2.61	.9653	.0027	.0003	18.2	.10
2.63	.9713	.0030	.0003	12.4	.10
2.65	.9772	.0033	.0003	8.2	.10
2.67	.9832	.0036	.0003	5.2	.10
2.69	.9891	.0039	.0003	3.3	.11
2.71	.9951	.0043	.0004	2.0	.11
2.73	1.0010	.0047	.0004	1.2	.11
2.75	1.0070	.0051	.0004	.7	.12
2.77	1.0130	.0055	.0004	.4	.12
2.79	1.0189	.0059	.0004	.3	.13
2.81	1.0249	.0063	.0004	.1	.13
2.83	1.0308	.0068	.0004	.0	.14
3.40	1.1847	.0233	.0006	.0	.23
3.42	1.1894	.0239	.0007	.0	.23
3.44	1.1942	.0246	.0007	.0	.23
3.46	1.1990	.0252	.0007	.0	.24
3.48	1.2037	.0259	.0007	.0	.24
3.50	1.2085	.0266	.0007	.0	.24
3.52	1.2119	.0271	.0005	.0	.25
3.54	1.2152	.0276	.0005	.0	.25
3.56	1.2185	.0281	.0005	.0	.24
3.57	1.2218	.0286	.0005	.0	.23
3.59	1.2250	.0291	.0005	.0	.22
3.61	1.2283	.0296	.0005	.0	.21

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-5~~ UDD-5
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.63	1.2316	.0301	.0005	.0	.21

HYDROGRAPH PEAK= .25 cfs
TIME TO PEAK= 3.52 Hours
RUNOFF VOLUME= .06 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT: VALLEY CAMP
PROJECT: PERMIT
FEATURE: UNDISTURBED DITCHES
PROJECT NO.:

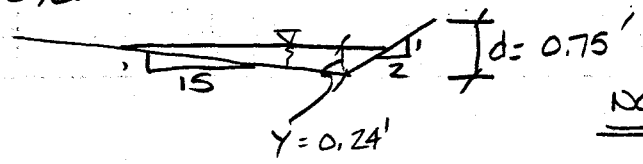
SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 2 MAY 89

UDD-1

ALL DESIGNS TO BE COMPLETED ACCORDING TO 30CFR REQUIREMENT OF A 10-YR-6HR EVENT AND AS PENDING IN NEW UTAH REG'S.

COMPUTER CALC'S SHOWN ON ATTACHED SHEETS (SHEET 2)

$S_{min} = 2\%$ $\eta = .03$ $M_1 = 15$ freeboard = 0.5'
$S_{max} = 20\%$ (field) $b = 0$ $M_2 = 2$
30% (off Map)
$Q_{design} = 0.84$ cfs



NO LINING REQ'd

UDD-2

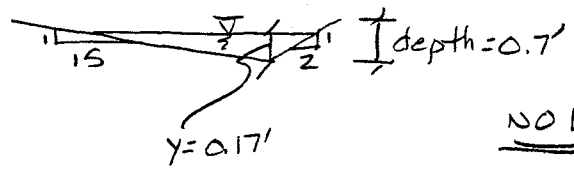
$Q_{design} = 0.57$ cfs

Try Triangular Section. $b = 0$ $S_{min} = 7\%$ > from Mapping
$\eta = .03$ $S_{max} = 23\%$ >
$M_1 = M_2 = 2$ freeboard = 0.5'

Velocity Check on Sheet 3 Shows vel > 5.0'

Change to Road Style design - (SHEET 3)

$b = 0$ $\eta = .03$
$M_1 = 15$ $S_{min} = 0.07$
$M_2 = 2$ $S_{max} = 0.23$

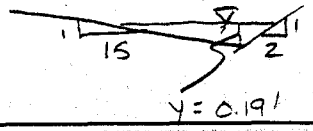


NO LINING REQ'd

UDD-3 $Q_{design} = 0.85$ cfs

$S_{min} = 7\%$ > from Mapping $b = 0$ freeboard = 0.5'
$S_{max} = 20\%$ < $M_1 = 15$
$M_2 = 2$

Use Road Style Design (SHEET 4)



NO LINING REQ'd

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	03-May-89
Project No.:	007.11.100	Time:	10:13 AM
Channel Section:	UDD-1 - Trial 1	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.84	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.30	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.120	
	A(R)2/3=	0.119	
	Required Depth:	0.74	feet
	Area:	0.49	ft2
	Perimeter:	4.16	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	1.70	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.15	feet
	Qn/1.49(S)1/2=	0.031	
	A(R)2/3=	0.031	
	Required Depth:	0.65	feet
	Area:	0.18	ft2
	Perimeter:	2.50	feet
	Hydraulic Radius:	0.07	feet
	Velocity:	4.70	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/mi
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.30	ft/ft
	Channel Depth:	0.74	feet
	Riprap:	Not Needed	

Comment:

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 02-May-89
Project No.: 007.11.100 — Time: 02:39 PM
Channel Section: UDD-2 - Trail 2 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.57	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.07	ft/ft
	Max. Bottom Slope:	0.23	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.043	
	A(R)2/3=	0.043	
	Required Depth:	0.67	feet
	Area:	0.23	ft2
	Perimeter:	2.85	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	2.46	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.13	feet
	Qn/1.49(S)1/2=	0.024	
	A(R)2/3=	0.023	
	Required Depth:	0.63	feet
	Area:	0.14	ft2
	Perimeter:	2.25	feet
	Hydraulic Radius:	0.06	feet
	Velocity:	3.97	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:

Side Slope 1:	15.0	1/m1
Side Slope 2:	2.0	1/m2
Min. Bottom Slope:	0.07	ft/ft
Max. Bottom Slope:	0.23	ft/ft
Channel Depth:	0.7	feet
Riprap:	Not Needed	

Comment: Channel Velocities < 5.0 fsp.
Design OK

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: UDD-3 - Trial 1

Date: 02-May-89
Time: 03:33 PM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.85	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.07	ft/ft
	Max. Bottom Slope:	0.20	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.19	feet
	Qn/1.49(S)1/2=	0.065	
	A(R)2/3=	0.065	
	Required Depth:	0.69	feet
	Area:	0.31	ft2
	Perimeter:	3.32	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	2.71	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.16	feet
	Qn/1.49(S)1/2=	0.038	
	A(R)2/3=	0.038	
	Required Depth:	0.66	feet
	Area:	0.21	ft2
	Perimeter:	2.71	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.06	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.07	ft/ft
	Max. Bottom Slope:	0.20	ft/ft
	Channel Depth:	0.69	feet
	Riprap:	Not Needed	

Comment: Build channel on existing scar

HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE UNDISTURBED DITCHES
PROJECT NO. 007.11.100

SHEET 5 OF
COMPUTED DEH
CHECKED
DATE 2 MAY 89

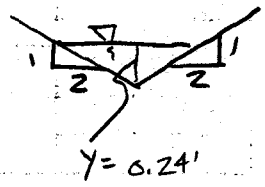
UDD-4

Qdesign = 0.19 cfs

b = 0
$M_1 = M_2 = 2$

$S_{min} = 2\%$, $S_{max} = 13\%$ } From Mapping

USE DITCH STYLE DESIGN (SHEET 6)



depth = 0.75'

NO LINING REQ'd

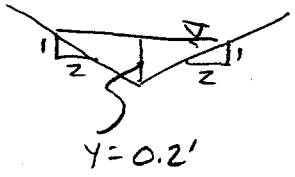
UDD-5

Qdesign = 0.25 cfs

b = 0
$M_1 = M_2 = 2$

$S_{min} = 12\%$, $S_{max} = 25\%$ } From Mapping

USE DITCH STYLE DESIGN (SHEET 7)



depth = 0.7'

NO LINING REQ'd

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 02-May-89
Project No.: 007.11.100 — Time: 03:41 PM
Channel Section: UDD-4 - Trial 1 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.19	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.13	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.74	feet
	Area:	0.12	ft2
	Perimeter:	1.08	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	1.62	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.18	feet
	Qn/1.49(S)1/2=	0.011	
	A(R)2/3=	0.011	
	Required Depth:	0.68	feet
	Area:	0.06	ft2
	Perimeter:	0.78	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	3.10	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.13	ft/ft
	Channel Depth:	0.74	feet
	Riprap:	Not Needed	

Comment:

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 02-May-89
Project No.: 007.11.100 — Time: 03:56 PM
Channel Section: UDD-5 - Trial 1 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.25	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.12	ft/ft
	Max. Bottom Slope:	0.25	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.20	feet
	Qn/1.49(S)1/2=	0.015	
	A(R)2/3=	0.015	
	Required Depth:	0.70	feet
	Area:	0.08	ft2
	Perimeter:	0.87	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	3.29	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.010	
	A(R)2/3=	0.010	
	Required Depth:	0.67	feet
	Area:	0.06	ft2
	Perimeter:	0.76	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.33	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	0.12	ft/ft
	Max. Bottom Slope:	0.25	ft/ft
	Channel Depth:	0.70	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit Response
FEATURE
PROJECT NO. 007.11.200

SHEET 1 OF 2
COMPUTED DEH
CHECKED
DATE 2 NOV 89

SAE's

SAE's Changed to ASCA's according to new DOGM Policy clarification.

ASCA #3 is dropped - Area has been added to Pond 3

AREA OF ASCA #3 = 0.11 ac

TOTAL AREA CONTAINED BY PONDS = 62.83 ac

POND	AREA
001A	11.53
2A	7.12
3A	7.08
4A	37.10
	62.83 ac

$Q(in) = \frac{(P-0.25)^2}{P+0.85}$

$CN = \frac{1000}{10+S}$

TRIBUTARY AREA FOR ASCA's

ASCA #	AREA Paved	Disturbed	Sage/Grass	Forest	TOTAL
1	—	1.13	—	—	1.13
2	0.11	1.00	—	—	1.11
3	0.75	0.87	—	0.5	2.12
4	—	0.19	—	—	0.19
5	—	1.16	—	—	1.16
6	—	0.95	—	—	0.95

Curve Numbers:

PAVED = 98
DISTURBED = 90
SAGE/GRASS = 75
FOREST = 70

$P_{10YR-24HR} = 2.45 in$

VOL = Q * AREA
Q = SCS Runoff Depth

ASCA #	Paved Area Q(in)	Vol(AF)	Dist. Area Q(in)	Vol(AF)	Sage/Grass Q(in)	Vol(AF)	Forest Area Q(in)	Vol(AF)	Runoff Vol (Ac-Ft)
1	2.22	—	1.49	0.14	—	—	—	—	0.14
2	2.22	0.02	1.49	0.12	—	—	—	—	0.14
3	2.22	0.14	1.49	0.11	—	—	0.13	0.02	0.27
4	2.22	—	1.49	0.02	—	—	—	—	0.02
5	2.22	—	1.49	0.14	—	—	—	—	0.14
6	2.22	—	1.49	0.12	—	—	—	—	0.12

HANSEN ALLEN & LUCE inc

CLIENT: VALLEY CAMP
PROJECT:
FEATURE:
PROJECT NO.: 007.11.200

SHEET 2 OF 2
COMPUTED: DEH
CHECKED:
DATE: 2 NOV 89

RUNOFF VOLUME INCLUDING TRIBUTARY AREAS

ASCA #	PAVED	DISTURBED	SAGE/GRASS	FOREST/ASPEN	TOTAL
1	—	1.13	—	—	1.13
2	0.60	1.00	—	—	1.60
3	0.75	0.87	—	0.50	2.12
4	—	0.19	—	0.37	0.56
5	—	1.16	—	—	1.16
6	—	0.95	1.00	1.34	3.29

ASCA #	PAVED		DISTURBED		SAGE/GRASS		FOREST/ASPEN		TOTAL RUNOFF VOLUME ac-ft
	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	
1	2.22	—	1.49	0.14	0.62	—	0.43	—	0.14
2	"	0.11	"	0.12	"	—	"	—	0.23
3	"	0.14	"	0.11	"	—	"	0.02	0.27
4	"	—	"	0.02	"	—	"	0.01	0.03
5	"	—	"	0.14	"	—	"	—	0.14
6	"	—	"	0.12	"	0.05	"	0.05	0.22

PERCENT AREA AS ASCA = $\frac{6.66\ ac}{62.83\ ac} * 100 = 10.6\%$

TOTAL POND RUNOFF VOLUME

POND #	10-YR, 24-Hr VOLUME (ac-ft)
001A	1.18
002A	0.94
003A	0.67
004A	3.15
TOTAL	5.94

ASCA Runoff Vol. as a % of Total Pond Runoff Vol = $\frac{0.83}{5.94} * 100 = 14.0\%$

APPENDIX R614-301-750

NPDES Discharge Permit

HANSEN ALLEN & LUCE INC

191939

Permit No.: UT-0022985

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
DENVER PLACE
999 18TH STREET, SUITE 500
DENVER, COLORADO 80202-2405

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. §1251 et seq; the "Act"),

Valley Camp of Utah, Inc.,

is authorized to discharge from a facility located in Sections 8, 17, and 30 of Township 13 South, Range 7 East, Carbon County, Utah,

to receiving waters named Pleasant Valley Creek and Whiskey Creek, both tributaries to the Price River,

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective March 1, 1988.

This permit and the authorization to discharge shall expire at midnight, July 31, 1992.

Signed this 8th day of February 1988.

Authorized Permitting Official

Max H. Dodson
Director
Water Management Division
Title

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The "30-day (and monthly) average," other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

2. The "7-day (and weekly) average," other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

3. "Daily Maximum" ("Daily Max.") is the maximum value allowable in any single sample or instantaneous measurement.

4. "Composite samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

   a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

   b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

A. Definitions (Continued)

c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,

d. Continuous collection of sample, with sample collection rate proportional to flow rate.

5. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

6. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

7. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

8. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

9. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. "Active mining area" means the areas on and beneath land used or disturbed in activity related to the extraction, removal, or recovery of coal from its natural deposits. This term excludes coal preparation plants, coal preparation plant associated areas and post-mining areas.

11. "Reclamation area" means the surface area of a coal mine which has been returned to required contour and on which revegetation (specifically, seeding or planting) work has commenced.

A. Definitions (Continued)

12. The term "10-year, 24-hour precipitation event" shall mean the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.," May 1961, and subsequent amendments or equivalent regional or rainfall probability information develped therefrom.

13. The term "coal preparation plant" means a facility where coal is crushed, screened, sized, cleaned, dried, or otherwise prepared and loaded for transit to a consuming facility.

14. The term "coal preparation plant associated areas" means the coal preparation plant yards, immediate access roads, coal refuse piles, and coal storage piles and facilities.

15. The term "settleable solids" is that matter measured by the volumetric method specified below:

The following procedure is used to determine settleable solids:

Fill an Imhoff cone to the one-liter mark with a thoroughly mixed sample. Allow to settle undisturbed for 45 minutes. Gently stir along the inside surface of the cone with a stirring rod. Allow to settle undisturbed for 15 minutes longer. Record the volume of settled material in the cone as milliliters per liter. Where a separation of settleable and floating material occurs, do not include the floating material in the reading.

16. "Director" means Director of the United States Environmental Protection Agency's Water Management Division.

17. "EPA" means the United States Environmental Protection Agency.

18. Acute toxicity occurs when 20 percent or more mortality is observed for either test species at any effluent concentration. Mortality in the control must simultaneously be 10 percent or less for the results to be considered valid.

19. Outfall Description: Outfalls 001, 002, and 003 discharge intermittently from surface runoff settling ponds adjacent to the train loadout facility into Pleasant Valley Creek; 004 discharges intermittently from a surface runoff settling pond adjacent to the mine into Whiskey Creek and 005 discharges into Whiskey Creek from a filter pond which receives mine water from underground operations.

B. Specific Limitations and Self-Monitoring Requirements

1. During the period beginning immediately and lasting through June 30, 1992, the permittee is authorized to discharge from Outfalls 001, 002, 003, 004 and 005 associated with active mining operations indicated on the area maps submitted and approved pursuant to Part IV, Q.1. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations			Monitoring Requirements	
	30-Day Average a/	7-Day Average a/	Daily Maximum a/	Measurement Frequency	Sample Type a/
Flow, gpd	N/A	N/A	N/A	2 x Month	Measured a/ c/
Total Suspended Solids, mg/L	25	35	70	2 x Month	Grab
Total Iron, mg/L	N/A	N/A	2.0 b/	Monthly	Grab
Total Dissolved Solids, mg/L	N/A	N/A	700 d/	Monthly	Grab

Oil and Grease shall not exceed 10 mg/L and shall be monitored monthly by a grab sample.

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units and shall be monitored monthly by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge of sanitary wastes.

2. See Schedule of Compliance. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at any point which is representative of each discharge prior to its mixing with the receiving stream and as indicated by the solid triangles on the current area maps submitted pursuant to Part IV, P.1.

a/ See Definitions, Part I.A. for definition of terms.

b/ If any Iron analysis exceeds this limitation, the State of Utah and the permittee shall review the actions necessary to achieve compliance with the limitation and the continued appropriateness of the limitation. In no event shall the discharge exceed a daily maximum limitation for Total Iron of seven (7) milligrams per liter.

c/ For the intermittent discharges, the duration of the discharge shall be reported.

d/ The total amount of Total Dissolved Solids (TDS) discharged from all outfalls is limited to one ton (2,000 pounds) per day of TDS.

B. Specific Limitations and Self-Monitoring Requirements (Active Mining Operations) (Continued)

3. Effective July 1, 1991, there shall be no acute toxicity in the discharge from outfall 005, the mine water filter pond discharge. (See Acute Toxicity definition Part I.A.)

4. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the following limitation instead of the Total Suspended Solids limitations contained in Part I, B.1.

Effluent Characteristic	Daily Maximum
Settleable Solids	0.5 mL/L

Settleable Solids shall be monitored weekly during periods of precipitation.

5. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the following limitations instead of the otherwise applicable limitations:

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units.

6. The operator shall have the burden of proof that the discharge or increase in discharge was caused by the applicable precipitation event described in Parts I, B.4. and B.5. The alternate limitations in Parts I, B.4. and B.5. shall not apply to treatment systems that treat underground mine water only.

B. Specific Limitations and Self-Monitoring Requirements

7. Whole Effluent Testing

Starting in the fourth quarter of calendar year 1988, the permittee shall, once each calendar quarter, conduct acute static replacement toxicity tests on a grab sample of the final effluent of outfall 005.

The replacement static toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms", EPA-600/4-85-013 (Rev. March 1985) and the "Region VIII EPA NPDES recommended acute test conditions". The permittee shall conduct an acute 48-hour static toxicity test using Ceriodaphnia sp. and an acute 96-hour static replacement toxicity test using fathead minnows five days (± 2 days) of age. After each 24 hours of the test period, the dilutions shall be replaced with freshly prepared dilutions of the original effluent sample. If more than 10 percent control mortality occurs, the test shall be repeated until satisfactory control survival is achieved.

If acute toxicity occurs in a routine test, an additional test shall be conducted within four weeks of the date of the initial sample. Should acute toxicity occur in the second test, testing shall occur once a month until further notified by the permit issuing authority.

Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar quarter (e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring reports submitted with DMRs due each July 28, October 28, and January 28). The format for the report shall be consistent with the February 1987 Region VIII Guidance for Biomonitoring Reporting, or its latest revision, and shall include all chemical and physical data as specified for the tests. If monthly testing is implemented, results shall be submitted with each monthly discharge monitoring report (e.g., the DMR and toxicity testing data for each month would be due by the 28th day of the following month).

If the results for the first four consecutive quarters of testing indicate no acute toxicity, the permittee may request the permit issuing authority to allow a reduction to quarterly acute toxicity testing on only one species. The permittee is to specify which species would be used in the testing. The permit issuing authority may approve or deny the request based on the biomonitoring results and other available information without an additional public notice. If the request is approved, the test procedures are to be the same as specified above for the test species.

B. Specific Limitations and Self-Monitoring Requirements

8. Toxicity Reduction Evaluation (TRE)

If acute toxicity is detected prior to July 1, 1991, and it is determined by the permit issuing authority that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. The purpose of the TRE will be to establish the cause of the toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity prior to the deadline for compliance contained in Part I.B.3. of this permit.

If the TRE establishes that the toxicity cannot be eliminated by the deadline contained in this permit, the permittee shall submit a proposed compliance plan to the permit issuing authority. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the permit issuing authority, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations, the permittee may:

a. Submit an alternative control program for compliance with the numerical requirements.

b. If necessary, provide a modified biomonitoring protocol which compensates for the pollutant(s) being controlled numerically.

If acceptable to the permit issuing authority, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the permit issuing authority, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the permit issuing authority, shall in no way relieve the permittee from the deadline for compliance contained in Part I.B.3. of this permit.

B. Specific Limitations and Self-Monitoring Requirements

9. Schedule of Compliance

a. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

(1) If there are any changes, corrections, or other modifications or adjustments of the location of the point source discharges, the Permittee shall submit a revised Area Map(s) as described in Part IV.Q. Such maps must be submitted 60 days prior to commencement of the discharge.

(2) If the required biomonitoring establishes toxicity, as determined by the permit issuing authority, an elimination of whole effluent toxicity must be achieved by July 1, 1991.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

D. Reporting of Monitoring Results. Effluent monitoring results obtained during the previous month shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the requirements of Signatory Requirements (see Part IV), and submitted to the Director, Water Management Division and the State agency at the following addresses:

original to: United States Environmental Protection Agency
Region VIII
Denver Place
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Attention: Water Management Division
Compliance Branch (8WM-C)

copy to: Utah Department of Health
Bureau of Water Pollution Control
P.O. Box 16690
Salt Lake City, Utah 84116-0690

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this NPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any noncompliance which may seriously endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the EPA, Region VIII, Emergency Response Branch at (303) 293-1788.

2. The following occurrences of noncompliance shall be reported by telephone to the EPA, Region VIII, Compliance Branch at (303) 293-1589 by the first workday (8:00 a.m. - 4:30 p.m. Mountain Time) following the day the permittee became aware of the circumstances:

   a. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G., Bypass of Treatment Facilities.);

   b. Any upset which exceeds any effluent limitation in the permit (See Part III.H., Upset Conditions.); or,

c. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit to be reported within 24 hours.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

4. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Compliance Branch, Water Management Division, Denver, Colorado, by phone, (303) 293-1589.

5. Reports shall be submitted to the addresses in Part II.D., Reporting of Monitoring Results.

J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D. are submitted. The reports shall contain the information listed in Part II.I.2.

K. Inspection and Entry. The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed $25,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, or 308 of the Act is subject to a fine of not less than $5,000, nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both. Except as provided in permit conditions on Part III.G., Bypass of Treatment Facilities and Part III.H., Upset Conditions, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

F. Removed Substances. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digestor supernatant and filter backwash shall not directly enter either the final effluent or waters of the United States by any other direct route.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. and 3. of this section. Return of removed substances, as described in Part III.F., to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 60 days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I., Twenty-four Hour Reporting.

3. Prohibition of bypass.

   a. Bypass is prohibited and the Director may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

      (3) The permittee submitted notices as required under paragraph 2. of this section.

   b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph 3.a. of this section.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated;

   c. The permittee submitted notice of the upset as required under Part II.I., Twenty-four Hour Notice of Noncompliance Reporting; and,

   d. The permittee complied with any remedial measures required under Part III.D., Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Director as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/L);

   b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

   c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or,

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/L);

   b. One milligram per liter (1 mg/L) for antimony:

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or,

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

IV. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or,

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Part IV.A.1.

B. Anticipated Noncompliance. The permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer;

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Director, and,

   b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2. must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Director. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2. above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2. above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

O. Water Quality Standard Requirement - Reopener Provision
This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to produce different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. A revision to the current 208 plan is approved and adopted which calls for different effluent limitations than contained in this permit.

P. Toxicity Limitation-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the biomonitoring protocol, or any other conditions related to the control of toxicants if one or more of the following events occur:

a. Toxicity was detected late in the life of the permit near or past the deadline for compliance.

b. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the permit issuing authority agrees with the conclusion.

c. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits, and the permit issuing authority agrees that numerical controls are the most appropriate course of action.

d. Following the implementation of numerical controls on toxicants, the permit issuing authority agrees that a modified biomonitoring protocol is necessary to compensate for those toxicants that are controlled numerically.

e. The TRE reveals other unique conditions or characteristics which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permits.

Q. OTHER REQUIREMENTS

1. Area Maps (Active Mining Operations)

a. Facilities which have already identified the location of each discharge need not submit an area map.

b. The permittee shall submit revised Area Map(s) to show any changes, corrections, or other modifications or adjustments of the location of the point source discharges. The purpose of this requirement is to assure that the Regional Administrator and the State of Utah are kept fully advised as to the current location of such discharges.

c. The revised Area Map(s) shall be submitted in the form specified below and shall be made from USGS topographical maps (7.5 or 15-minute series) or other appropriate sources as approved by the Regional Administrator or his designee. Each revised Area Map shall be 8 1/2 inches by 11 inches and shall be in black and white suitable to produce readable copies by rapid printing methods (Xerox, Dennison, Offset printing, etc.) or as approved by the Regional Administrator or his designee. Where additional 8 1/2 inch by 11 inch maps are required to show the area of operation, they shall be numbered and a key shall be shown on the first map. The first map section shall have the company name, mine/job name, address, and NPDES number clearly printed thereon. Also, one line of latitude and one line of longitude shall be marked on each map section. The Area Map(s) shall delineate the following, using the graphics as indicated:

(1) Existing Area of Operation _____ (Solid Outline)

(2) Existing point source ▲ (Solid Triangle)

(3) The projected area of operation for the next five years - - - - - - - - - - - - (Dashed Outline)

(4) Project point source for the next five years △ (Opened Triangle)

(5) The monitoring reports must indicate the active-inactive status of all discharge points which are listed on the current area maps. These discharge points shall be assigned numbers 001, 002, 003, etc.

2. Monitoring of a discharge may be terminated if either:

   (a) Sufficient data has been accumulated to show to the satisfaction of the Regional Administrator or his designee that the untreated discharge from an area where active mining has ceased will meet the limitations herein; or,

   (b) The discharge emanates from an area on which the State of Utah has released the grading bond or has taken other similar action.

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