PROJECT : Valley Camp Coal - D-7B Runoff Calculations

AREA= 1.6 ACRES
AVERAGE BASIN SLOPE= 13.5 PERCENT
CURVE NUMBER= 91.9
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0468 HOURS QPCFS= 25.87 CFS QPIN=16.0323 INCHES
C3= 79.0230 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.29	.1741	.0000	.0000	.0	.00
1.31	.1768	.0000	.0000	5.2	.00
1.33	.1794	.0000	.0000	19.8	.00
1.34	.1821	.0000	.0000	25.9	.00
1.36	.1848	.0000	.0000	21.9	.00
1.37	.1874	.0001	.0000	14.5	.00
1.39	.1901	.0002	.0000	8.3	.00
1.40	.1927	.0003	.0000	4.3	.00
1.42	.1954	.0004	.0001	2.1	.00
1.43	.1980	.0005	.0001	.9	.00
1.45	.2007	.0007	.0001	.4	.00
1.47	.2034	.0008	.0001	.2	.01
1.48	.2060	.0010	.0002	.0	.01
2.40	.8163	.2692	.0118	.0	1.18
2.42	.8342	.2812	.0119	.0	1.19
2.43	.8520	.2933	.0121	.0	1.21
2.45	.8699	.3055	.0122	.0	1.22
2.46	.8878	.3178	.0123	.0	1.24
2.48	.9057	.3303	.0125	.0	1.25
2.49	.9236	.3429	.0126	.0	1.27
2.51	.9331	.3496	.0068	.0	1.25
2.53	.9379	.3531	.0034	.0	1.13
2.54	.9428	.3565	.0034	.0	.92
2.56	.9476	.3600	.0035	.0	.71
2.57	.9524	.3634	.0035	.0	.55
2.59	.9573	.3669	.0035	.0	.46

HYDROGRAPH PEAK= 1.27 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .11 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	03:05 PM
Channel Section:	Ditch D-7B	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.27	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:	0.05	ft/ft
	Max. Bottom Slope:	0.11	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.25	feet
	Qn/1.49(S)1/2=	0.121	
	A(R)2/3=	0.121	
	Required Depth:	0.75	feet
	Area:	0.38	ft2
	Perimeter:	2.13	feet
	Hydraulic Radius:	0.18	feet
	Velocity:	3.33	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.20	feet
	Qn/1.49(S)1/2=	0.077	
	A(R)2/3=	0.078	
	Required Depth:	0.70	feet
	Area:	0.28	ft2
	Perimeter:	1.89	feet
	Hydraulic Radius:	0.15	feet
	Velocity:	4.54	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	1.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.05	ft/ft
	Max. Bottom Slope :	0.11	ft/ft
	Min. Channel Depth:	0.75	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-8
PROJECT NO. 007.11.100

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

D-8

Total Area = 857 * 0.00175 = 1.5 acres
disturbed = 757 = 1.3 ac
paved = 100 = 0.2 ac

CN	A	Q
90	1.3	0.723
98	0.2	1.329

$\bar{Q} = 0.804$ $\bar{CN} = 91.4$

Note: Drainage Area from C-11-12 also contributes to D-8 flow

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 600 feet

$$\text{slope} = \frac{(3400)(5)(100)}{43{,}560\,(1.5)} = 26.0\%$$

Calculated Runoff $Q_{TOT} = 1.17$ cfs

Ditch Design

$S_{min} = 2\%$

$S_{max} = 13\%$

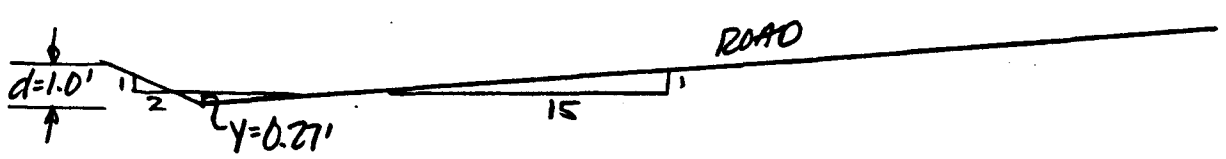
try trapezoidal Channel

$b = 0,\ m_1 = 2,\ m_2 = 15,\ n = 0.03$

Use Roadway Design

$V = 3.73$ ft/sec < 5.0 ft/sec OK

No lining required



PROJECT : Valley Camp Coal - D-8 Runoff Calculations

AREA= 1.5 ACRES
AVERAGE BASIN SLOPE= 26.0 PERCENT
CURVE NUMBER= 91.4
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0305 HOURS QPCFS= 37.25 CFS QPIN=24.6265 INCHES
C3=121.3839 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.37	.1872	.0000	.0000	.0	.00
1.39	.1898	.0000	.0000	18.2	.00
1.40	.1924	.0000	.0000	37.2	.00
1.42	.1950	.0000	.0000	26.3	.00
1.43	.1976	.0000	.0000	12.0	.00
1.45	.2002	.0002	.0000	4.3	.00
1.46	.2028	.0002	.0000	1.3	.00
1.48	.2054	.0003	.0000	.4	.00
1.49	.2080	.0004	.0000	.0	.00
2.41	.8226	.2555	.0112	.0	1.09
2.42	.8400	.2668	.0113	.0	1.11
2.44	.8575	.2782	.0114	.0	1.12
2.45	.8750	.2898	.0116	.0	1.13
2.47	.8924	.3015	.0117	.0	1.15
2.48	.9099	.3133	.0118	.0	1.16
2.50	.9274	.3252	.0119	.0	1.17
2.51	.9340	.3298	.0046	.0	1.05
2.53	.9387	.3330	.0033	.0	.76
2.54	.9435	.3363	.0033	.0	.52
2.56	.9482	.3396	.0033	.0	.39
2.57	.9529	.3429	.0033	.0	.35
2.59	.9576	.3461	.0033	.0	.33

HYDROGRAPH PEAK= 1.17 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .10 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	02:56 PM
Channel Section:	Ditch D-8	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.17	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:	0.13	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.27	feet
	Qn/1.49(S)1/2=	0.167	
	A(R)2/3=	0.168	
	Required Depth:	0.77	feet
	Area:	0.64	ft2
	Perimeter:	4.73	feet
	Hydraulic Radius:	0.13	feet
	Velocity:	1.83	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.19	feet
	Qn/1.49(S)1/2=	0.066	
	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:	3.73	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 :	0.13	ft/ft
	Min. Channel Depth:	0.77	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp Coal
PROJECT Permit
FEATURE D-9A, D-9B
PROJECT NO. 007.11.100

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

D-9A, D-9B (Convenience Ditches)

Total Area = 70 * 0.00175 = 0.1 Acres

CN = 90

Precipitation = 1.55 inches

hydraulic length = 125'

$$\text{slope} = \frac{(150)(5)(100)}{43{,}560\,(0.1)} = 17.2\%$$

The geometry of the basin does not fit the parameters necessary to run "HYDRO."

A comparison of the other basins in the immediate area, given the same storm are shown below:

Partial Summary of Ditch Capacity at Valcam

Ditch Number	Area (acres)	Slope (%)	CN	Runoff (cfs)
18A	2.1	43.0	78.1	0.46
13A	2.0	44.5	79.4	0.53
13B	2.2	43.7	80.7	0.67
18B	1.4	34.8	81.7	0.47
15	4.2	35.0	82.8	1.57
16A	5.1	31.6	84.3	2.13
3	5.6	41.8	85.5	2.61
5A	0.6	8.6	90.0	0.43
16B	0.7	33.6	90.0	0.50
7A	0.8	23.7	90.0	0.57
6	1.1	9.9	91.0	0.82
8	1.5	26.0	91.4	1.17

As noted, the basin in question differs from those available.

Alternate method - Calculate the time of concentration using the rational method - and re-run "HYDRO" with the new value

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp Coal
PROJECT Permit
FEATURE D-9A 9B
PROJECT NO. 007-11.100

SHEET 2 OF
COMPUTED Paul
CHECKED
DATE 5/15/89

A method for calculating the time of concentration is presented in Urban Storm Drainage Criteria Manual - Volume 1 by Wright-McLaughlin Engineers (March 1969)

$t_c = t_i + t_t$

where t_c = time of concentration (minutes)
t_i = overland flow time (minutes)
t_t = travel time in ditch - (assume to be < 1 min) ∴ negligible

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

where C_{10} = run-off coeff for 10 year freq
L = length overland flow
S = average basin slope (%)

for this basin

$C_{10} = 0.50$ (Railroad yard area most closely models the area.)

L = 110'
S = 17.2 → t_i = 4.4 minutes = 0.073 hours

Re-run "HYDRO" using calculated t_c

$Q_{TOT} = 0.07$ cfs

No further Design Anticipated

PROJECT : Valley Camp Coal - D-9A, D-9B Runoff Calculation

AREA= .1 ACRES
AVERAGE BASIN SLOPE= 17.2 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 125. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR
USER INPUT TIME OF CONCENTRATION= .07 HOURS

TP= .0488 HOURS QPCFS= 1.55 CFS QPIN=15.3809 INCHES
C3= 75.8125 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2221	.0000	.0000	.0	.00
1.56	.2269	.0000	.0000	.3	.00
1.58	.2317	.0000	.0000	1.2	.00
1.59	.2365	.0002	.0001	1.6	.00
1.61	.2413	.0003	.0001	1.3	.00
1.63	.2461	.0005	.0002	.9	.00
1.64	.2508	.0007	.0002	.5	.00
1.66	.2556	.0010	.0003	.3	.00
1.67	.2604	.0013	.0003	.1	.00
1.69	.2652	.0016	.0003	.0	.00
2.40	.8210	.2097	.0107	.0	.06
2.42	.8397	.2206	.0109	.0	.06
2.44	.8583	.2316	.0110	.0	.07
2.45	.8769	.2428	.0112	.0	.07
2.47	.8956	.2541	.0113	.0	.07
2.49	.9142	.2656	.0115	.0	.07
2.50	.9308	.2759	.0103	.0	.07
2.52	.9358	.2791	.0032	.0	.07
2.53	.9408	.2822	.0032	.0	.06
2.55	.9459	.2854	.0032	.0	.04
2.57	.9509	.2886	.0032	.0	.03
2.58	.9560	.2918	.0032	.0	.03
2.60	.9610	.2950	.0032	.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-10
PROJECT NO. 007.11.100

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

D-10

Total Area = 8.5 * 1.401 12.8 acres

CN = 75 (25% sage/grass)

Precipitation = 1.55 inches (10yr, 6 hr)

hydraulic length = 1800 ft

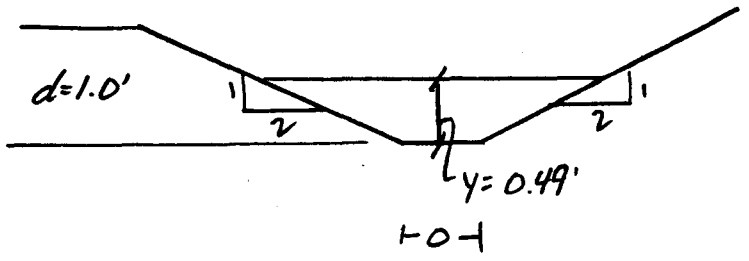
slope = $\frac{(17.00)(80)(100)}{43{,}560\,(12.8)}$ = 24.4 %

Calculated Runoff $Q_{TOT,10yr}$ = 1.18 cfs

Ditch Design

S_{min} = 2% try trapezoidal channel

S_{max} = 3% b = 0', m = 2, n = 0.03



V_{max} = 2.9 fps < 5.0 fps @

No Lining Required

PROJECT : Valley Camp Coal - D-10 Runoff Calculation

AREA= 12.8 ACRES
AVERAGE BASIN SLOPE= 24.4 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1800. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1328 HOURS QPCFS= 72.87 CFS QPIN= 5.6460 INCHES
C3= 27.8293 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6526	.0000	.0000	.0	.00
2.28	.6831	.0000	.0000	3.7	.00
2.31	.7135	.0006	.0006	22.6	.00
2.34	.7440	.0018	.0011	48.4	.02
2.36	.7745	.0034	.0016	66.9	.06
2.39	.8049	.0055	.0021	72.9	.14
2.42	.8354	.0081	.0026	68.3	.26
2.44	.8659	.0112	.0031	57.6	.41
2.47	.8964	.0148	.0036	45.1	.58
2.50	.9268	.0188	.0040	33.3	.78
2.52	.9374	.0203	.0015	23.4	.98
2.55	.9456	.0215	.0012	15.9	1.12
2.58	.9539	.0228	.0012	10.5	1.18
2.60	.9621	.0241	.0013	6.7	1.16
2.63	.9703	.0254	.0013	4.2	1.08
2.66	.9786	.0267	.0013	2.6	.99
2.68	.9868	.0281	.0014	1.6	.90
2.71	.9950	.0294	.0014	.9	.82
2.74	1.0033	.0309	.0014	.6	.77
2.76	1.0115	.0323	.0015	.3	.73
2.79	1.0197	.0338	.0015	.2	.71
2.82	1.0280	.0353	.0015	.1	.70
2.84	1.0362	.0369	.0015	.0	.70

HYDROGRAPH PEAK= 1.18 cfs
TIME TO PEAK= 2.58 Hours
RUNOFF VOLUME= .20 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	12-Jul-89
Project No.:	007.11.100	Time:	02:34 PM
Channel Section:	D-10	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.18	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:	0.020	ft/ft
	Max. Bottom Slope:	0.030	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.49	feet
	Qn/1.49(S)1/2=	0.168	
	A(R)2/3=	0.170	
	Required Depth:	0.99	feet
	Area:	0.47	ft2
	Perimeter:	2.17	feet
	Hydraulic Radius:	0.22	feet
	Velocity:	2.51	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.45	feet
	Qn/1.49(S)1/2=	0.138	
	A(R)2/3=	0.139	
	Required Depth:	0.95	feet
	Area:	0.41	ft2
	Perimeter:	2.01	feet
	Hydraulic Radius:	0.20	feet
	Velocity:	2.91	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:	2.0	%
	Max. Bottom Slope:	3.0	%
	Min Channel Depth:	0.99	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE INC

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

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

D-12A

Total Area = 110 * 0.00175 = 0.2 ac
paved = = 0.1 ac
dist = 0.1 ac

CN	A	Q
98	0.1	1.329
90	0.1	0.723

$\bar{Q} = 1.026$ $\bar{CN} = 94.6$

Precipitation = 1.55 inches (10 yr, 6hr)

hydraulic length = 200'

$$\text{slope} = \frac{(425)(5)(100)}{43{,}560\,(.2)} = 24.4\%$$

Note
The basin geometry does not allow "HYDRO" analysis.

Calculate t_c using Alternate Method

from "Urban Storm Drainage Criteria Manual - Vol 1 by Wright McLaughlin Engineers (March 1969)

$$t_c = t_i + t_t^0$$

where t_c = time of concentration (minutes)
t_i = overland flow time (minutes)
t_t = travel time in ditch (assume negligible)

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

where $L = 200'$
$S = 24.4\%$
$C_{10} = 0.50$

$t_c = t_i = 5.27$ minutes

$= 0.08777$ hours $\Rightarrow$ $Q_{TOT} = 0.19$ cfs

HANSEN ALLEN & LUCE INC

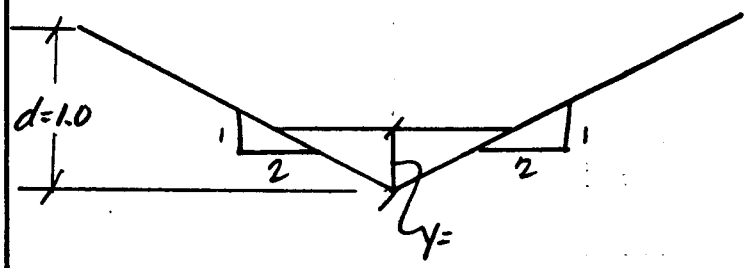
CLIENT Valley Camp
PROJECT Permit
FEATURE D-12A
PROJECT NO. 007.11.100

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

Ditch Design

try trapezoidal channel

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



$V=1.6$ ft/s <5.0 ft/s OK

∴ no lining required

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 DEK
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; $b=0,\ d=1.0,\ m=2$

PROJECT : Valley Camp Coal - D-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
2.63	.9712	.4088	.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
PROJECT Permit
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" $\Rightarrow$ $Q_{100} = 0.07$ cfs

No further design Anticipated

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

AREA= .1 ACRES
[illegible] 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'

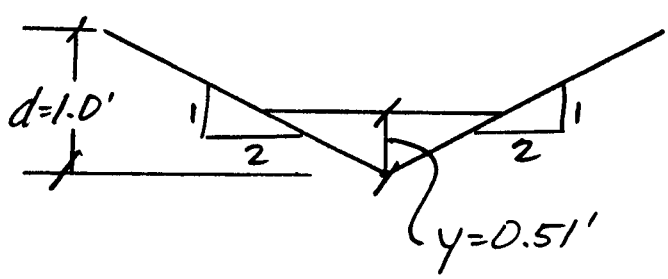
$$\text{slope} = \frac{(1150)(5)(100)}{(43{,}560)(1.6)} = 8.3\%$$

Calculated Runoff $Q_{TOT} = 1.35$ cfs

Ditch Design

$S_{min} = 2\%$ by trapezoidal Channel

$S_{max} = 2\%$ $b = 0,\ m = 2,\ n = 0.03$



$U = 2.60$ 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

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

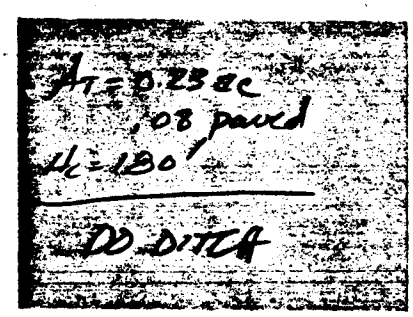
Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 180'

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

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

No further design anticipated



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

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

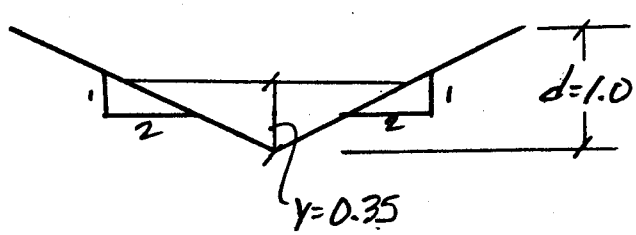
Ditch Design

$S_{min} = 3\%$

$S_{max} = 18\%$

try trapezoidal channel

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



$U = 4.8 < 5.0$ ft/sec

∴ No lining required

PROJECT : Valley Camp Coal - D-13A 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	.25
2.59	.9585	.0723	.0013	.0	.22

HYDROGRAPH PEAK= .60 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .05 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

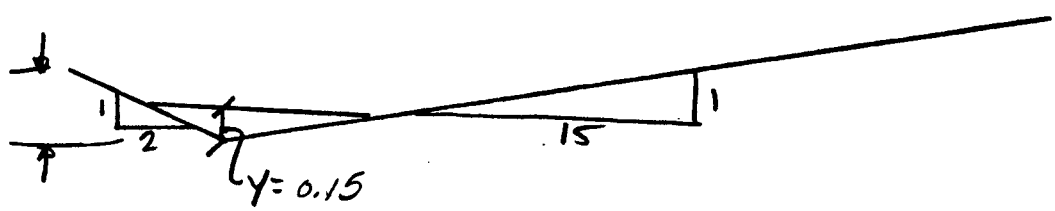
S_{min} = 15%

S_{max} = 35%

try trapezoidal Channel

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

Use Roadway Design



V_{max} = 4.6 ft/s < 5.0

∴ No lining required

[illegible] - [illegible] Runoff Computation

[illegible] 2.5 YEAR
[illegible] GAGE [illegible] [illegible]
CURVE NUMBER= [illegible]
[illegible] 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 870. FEET
MINIMUM INFILTRATION RATE= .00 INCH

TP= .0467 HOURS QPEAK= 35.60 CFS QPIN= 16.0467 INCHES
CN= 79.0943 ITERATIONS= 8 SD= 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	.4925	.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	.0047	.0013	11.4	.10
2.21	.6001	.0059	.0016	5.9	.13
2.23	.6180	.0077	.0018	2.8	.16
2.24	.6359	.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
2.44	.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	.9396	.0745	.0052	.0	.66
2.53	.9574	.0797	.0054	.0	.62
2.54	.9753	.0851	.0054	.0	.51
2.56	.9931	.0905	.0054	.0	.40
2.57	[illegible]	.0958	[illegible]	.0	.32
2.59	[illegible]	.0998	.0015	.0	.26
2.60	[illegible]	[illegible]	.0015	.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	

Valley Camp Coal - Pond 4 Survey Notes by Steve Tanner
Data Received 7/25/90
Top of Embankment: 8878

CRITICAL CROSS SECTION

Distance	Relative Elev.	Surveyed Elev.

EMERGENCY SPILLWAY PROFILE

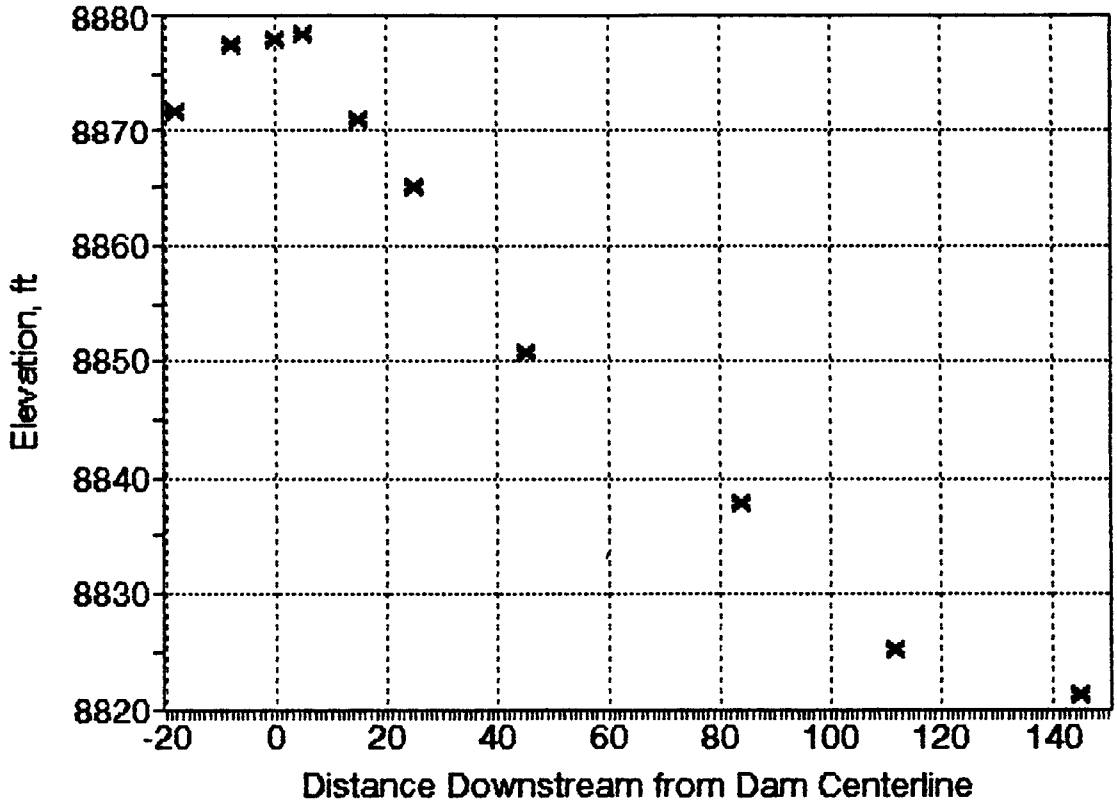
Relative Elev.	Surveyed Elev.
127.3	8805.3
127.5	8805.5
120.8	8798.8
118.9	8796.9
116.9	8794.9
114.8	8792.8
113.9	8791.9
110.9	8788.9
106.1	8784.1
103.8	8781.8
101.0	8779.0
97.5	8775.5

Distance	Relative Elev.	Surveyed Elev.
255		
260		
265		
275		
285		
295		
305		
315		
325		
335		
340		
360		

Valley Camp Coal - Pond 4 Survey Notes by Steve Tanner
Data Received 7/25/90
Top of Embankment: 8878

CRITICAL CROSS SECTION			EMERGENCY SPILLWAY PROFILE	
Distance	Relative Elev.	Surveyed Elev.	Relative Elev.	Surveyed Elev.
-18	93.8	8871.8		
-8	99.5	8877.5		
0	100.0	8878.0	200.0	8878.0
5	100.5	8878.5	199.7	8877.7
10			198.9	8876.9
15	93.0	8871.0	197.6	8875.6
20			196.4	8874.4
25	87.1	8865.1	194.4	8872.4
30			192.6	8870.6
35			189.3	8867.3
40			186.6	8864.6
45	72.8	8850.8		
50			183.7	8861.7
55			180.8	8858.8
60			178.7	8856.7
65			178.2	8856.2
70			175.9	8853.9
75			174.5	8852.5
80			174.7	8852.7
84	59.9	8837.9		
85			172.0	8850.0
90			169.8	8847.8
95			169.4	8847.4
100			169.5	8847.5
105			167.8	8845.8
110			166.7	8844.7
112	47.3	8825.3		
115			164.8	8842.8
120			163.5	8841.5
125			162.9	8840.9
130			161.7	8839.7
135			160.7	8838.7
140			158.7	8836.7
145	43.2	8821.2	158.4	8836.4
155			157.5	8835.5
165			156.0	8834.0
175			153.4	8831.4
180			150.9	8828.9
185			148.6	8826.6
190			148.0	8826.0
195			144.9	8822.9
205			142.6	8820.6
215			139.9	8817.9
225			137.9	8815.9
235			134.8	8812.8
245			132.2	8810.2
250			131.5	8809.5

Pond 004A - Critical Cross Section



APPENDIX R614-301-750

NPDES Discharge Permit

HANSEN ALLEN & LUCE INC

19797

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.

Max H. Dodson

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.

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.

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

October 15, 1986

Mr. Trevor G. Whiteside
Chief Engineer
Valley Camp of Utah, Inc.
Scofield Route
Helper, Utah 84526

Dear Mr. Whiteside:

Re: Approval of MRP Amendment, Modification of NPDES Permit, 6-inch Bypass Mine Water Discharge Line From Underground Abandoned Workings, Valley Camp of Utah, Inc., Belina Mine, ACT/007/001, Folder #4, Carbon County, Utah

On August 20, 1986 Valley Camp submitted a request to modify their existing NPDES Permit and construct a new 6" mine water discharge pipe from abandoned sections of the mine to the outlet of the Belina Mine filter pond (outfall No. 005). This request, although directed to the Environmental Protection Agency for formal approval, has been reviewed as a MRP permit amendment by the Division.

Currently, all mine water discharge, including both water from abandoned sections of the mine and working sections of the mine, is passed through the filter pond. The proposal requests to pass only water made in the active working sections of the mine through the filter pond and discharge water from the abandoned sections at the pond outlet. The system has been designed so that the monitoring and sampling station will include both discharges and be considered as only one discharge. This discharge will still be administered under the NPDES Permit and all effluent limitations will still apply. Therefore, the proposal is in line with the regulations and approval is hereby granted from the Division contingent upon approval from State Health and the Environmental Protection Agency.

Please contact me or David Cline, should you have any questions or need additional information.

Sincerely,

D. Wayne Hedberg

D. Wayne Hedberg
Permit Supervisor/
Reclamation Hydrologist

djh
cc: Allen Klein
Rob Waline, EPA
Marv Maxell, DEH
Dave Lof
Lowell Braxton
Dave Cline
Sue Linner

8992R/79

OCT 20 1986
VALLEY CAMP OF UTAH, INC.

#70

APPENDIX R614-301-750

NPDES Discharge Permit

HANSEN ALLEN & LUCE inc

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.

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.

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

October 15, 1986

Mr. Trevor G. Whiteside
Chief Engineer
Valley Camp of Utah, Inc.
Scofield Route
Helper, Utah 84526

Dear Mr. Whiteside:

Re: Approval of MRP Amendment, Modification of NPDES Permit, 6-inch Bypass Mine Water Discharge Line From Underground Abandoned Workings, Valley Camp of Utah, Inc., Belina Mine, ACT/007/001, Folder #4, Carbon County, Utah

On August 20, 1986 Valley Camp submitted a request to modify their existing NPDES Permit and construct a new 6" mine water discharge pipe from abandoned sections of the mine to the outlet of the Belina Mine filter pond (outfall No. 005). This request, although directed to the Environmental Protection Agency for formal approval, has been reviewed as a MRP permit amendment by the Division.

Currently, all mine water discharge, including both water from abandoned sections of the mine and working sections of the mine, is passed through the filter pond. The proposal requests to pass only water made in the active working sections of the mine through the filter pond and discharge water from the abandoned sections at the pond outlet. The system has been designed so that the monitoring and sampling station will include both discharges and be considered as only one discharge. This discharge will still be administered under the NPDES Permit and all effluent limitations will still apply. Therefore, the proposal is in line with the regulations and approval is hereby granted from the Division contingent upon approval from State Health and the Environmental Protection Agency.

Please contact me or David Cline, should you have any questions or need additional information.

Sincerely,

D. Wayne Hedberg

D. Wayne Hedberg
Permit Supervisor/
Reclamation Hydrologist

djh
cc: Allen Klein
Rob Waline, EPA
Marv Maxell, DEH
Dave Lof
Lowell Braxton
Dave Cline
Sue Linner

8992R/79

OCT 20 1986
VALLEY CAMP OF UTAH, INC.

#70

APPENDIX R614-301-760

Channel Reclamation Calculations

HANSEN ALLEN & LUCE inc

PRELIMINARY CHANNEL DESIGN FOR CHANNEL AT C-21-48

IF CULVERT IS TO BE REMOVED (AT UDOT'S REQUEST) FULL DESIGN SHOULD BE COMPLETED. THESE CALCULATIONS SHOW FEASIBILITY.

APPROXIMATE DATA: Channel Slope: 5/120 = 0.042 (4.2%)
Channel Width: 10'
Channel Side Slope: m = 2

from Culvert design Sheets, $Q_{100yr,6Hr} = 330$ cfs. (100yr, 6Hr)

Assume: D_{50} Req'd = 1.0', then $n = 0.0395\, D^{1/6} \sim 0.04$

$\frac{Qn}{1.49 S^{1/2}} = 43.34$

y	$AR^{2/3}$	
1.0	10.59	
2.0	36.33	
3.0	77.46	A = 31.68
2.2	43.28 ⇒	V = 10.42 fps

from Chart 27, "Flexible Linings $D_{50} \sim 1.25 - 1.50'$

Recalculate using corrected "n" value

$n = 0.0395\,(1.5)^{1/6} = 0.042$

$\frac{Qn}{1.49 S^{1/2}} = 45.51$

y	$AR^{2/3}$	
2.3	46.99	
2.2	43.28	A = 32.63
2.25	45.16 →	V = 10.12 fps

DOESN'T CHANGE: $\underline{D_{50} = 1.50'}$ $D_{max} = \frac{5 D_{50}}{\gamma S_0} = 2.9 \Rightarrow \underline{3.0'}$

FILTER BLANKET $\frac{D_{15}\,filter}{D_{85}\,base} < 5 < \frac{D_{15}\,filter}{D_{15}\,base} < 40$

filter Criteria, OR COULD USE 1.0' TYPE II GRANULAR FILTER AS PER OSM STDS, SEE OTHER RECLAMATION CALC'S FOR DETAILS ON TYPE II SPECS.

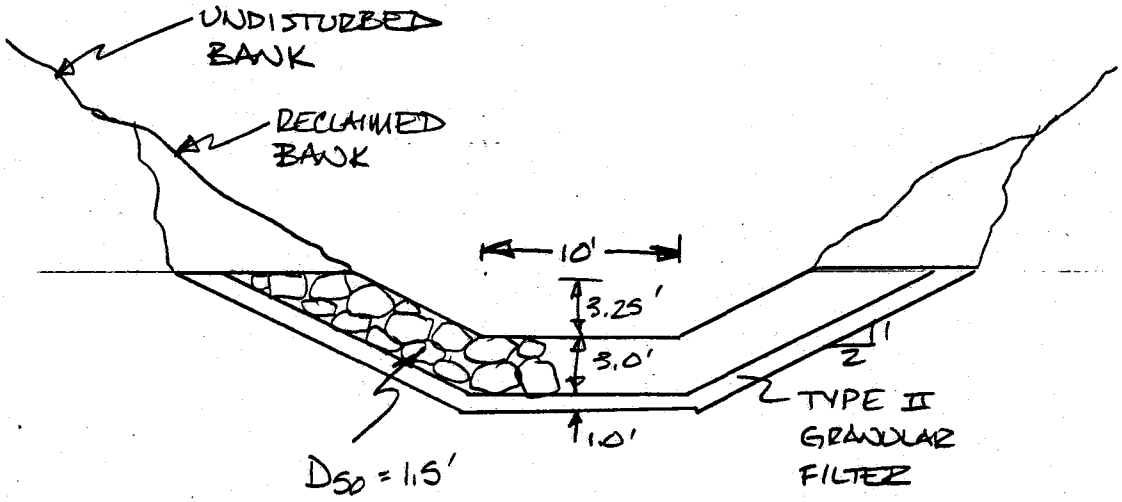
GENERAL: Riprap Thickness = 3.0'; Filter Thickness = 1.0'
Side Slope: 2:1; Channel depth = 2.25 + 1.0 = 3.25'

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 2 OF 2
COMPUTED DEH
CHECKED
DATE 26 SEPT 90

TYPICAL SECTION



NOTES:
- SIDES TO MATCH EXISTING EMBANKMENTS
- MEANDER CHANNEL TO MATCH NATURAL STREAM
- SHORT BENDS WILL REQUIRE CHECK OF DEPTH TO ACCOUNT FOR WAVE RUNUP.

Figures R614-301-760a thru R614-301-760d

REVIEW OF RECLAMATION POTENTIALS AT CULVERTS ALONG HAUL ROAD.

Culverts Reviewed herein include: C-22-24
C-23-24
C-24-24
C-26-24
C-26A-24
C-28-24

(C-25-36 designed independently)

C-22-24

Culvert utilized to remove collected road drainage. Upon reclamation, all flow will be overland in the area. No surface channelization will be planned as part of the reclamation, therefore no additional design is required.

C-23-24

Same conditions apply at this culvert as were found at C-22-24.

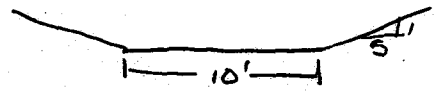
C-24-24

Upon reclamation the majority of area will experience overland flow. At this site however, some concentration of flow may exist.

Check 100yr-6Hr flow potential

$Q_{100yr,6Hr} = 1.2 cfs$

Simulate potential for erosion by using a 10' wide trapezoidal channel with .5:1 side slopes.

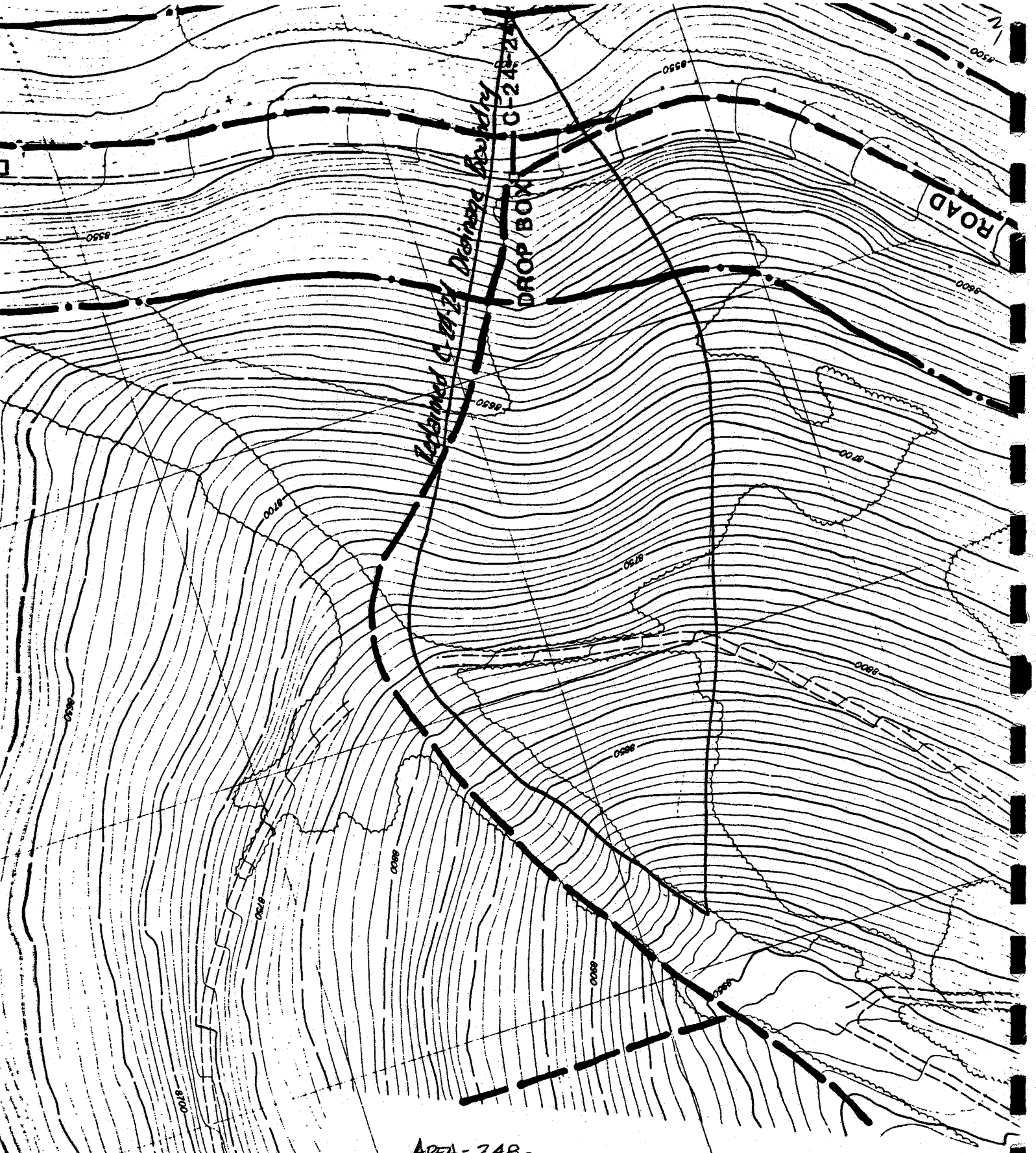


$n = 0.03$
$S = 0.54$

$\frac{Qn}{1.49 S^{1/2}} = 0.033$, $y \approx 0.03$, $V = 3.9 fps < 5.0$

For long term conditions, erosion will occur as a natural occurance. The design of specific erosion protection measures on this steep slope is impractical, nor do acceptable design methodologies exist.

Concrete is unacceptable due to 1) its relatively short life period and aesthetics, and 2) it would require



AREA = 2.48ac

SLOPE: CONT LENGTH = 2980'; CONT INT = 25'

$$\frac{2980' * 25' * 100}{2.48ac * 43560 ft^2/ac} = 69.0\%$$

HYD. LENGTH = 750'

CN = 75

PROJECT : Valley Camp Coal - Reclaimed C-24-24 - 100 Yr, 6 Hr Runoff

AREA= 2.5 ACRES
AVERAGE BASIN SLOPE= 69.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 750. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0392 HOURS QPCFS= 47.83 CFS QPIN=19.1268 INCHES
C3= 94.2759 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6476	.0000	.0000	.0	.00
2.09	.6693	.0000	.0000	9.7	.00
2.10	.6911	.0002	.0002	36.6	.00
2.12	.7129	.0006	.0005	47.8	.01
2.13	.7346	.0014	.0007	40.4	.03
2.14	.7564	.0024	.0010	26.9	.07
2.16	.7782	.0036	.0013	15.4	.11
2.17	.7999	.0051	.0015	7.9	.15
2.18	.8217	.0069	.0018	3.8	.20
2.20	.8434	.0089	.0020	1.7	.25
2.21	.8652	.0112	.0023	.7	.30
2.22	.8870	.0137	.0025	.3	.35
2.23	.9087	.0164	.0027	.1	.39
2.25	.9305	.0193	.0030	.0	.44
2.42	1.2134	.0770	.0056	.0	.97
2.43	1.2352	.0828	.0058	.0	1.01
2.44	1.2569	.0888	.0060	.0	1.05
2.46	1.2787	.0949	.0061	.0	1.08
2.47	1.3004	.1012	.0063	.0	1.11
2.48	1.3222	.1077	.0065	.0	1.15
2.50	1.3440	.1144	.0066	.0	1.18
2.51	1.3542	.1176	.0032	.0	1.18
2.52	1.3601	.1194	.0018	.0	1.06
2.54	1.3660	.1213	.0019	.0	.87
2.55	1.3719	.1231	.0019	.0	.67
2.56	1.3778	.1250	.0019	.0	.53
2.57	1.3837	.1269	.0019	.0	.45

HYDROGRAPH PEAK= 1.18 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .11 Acre-Feet

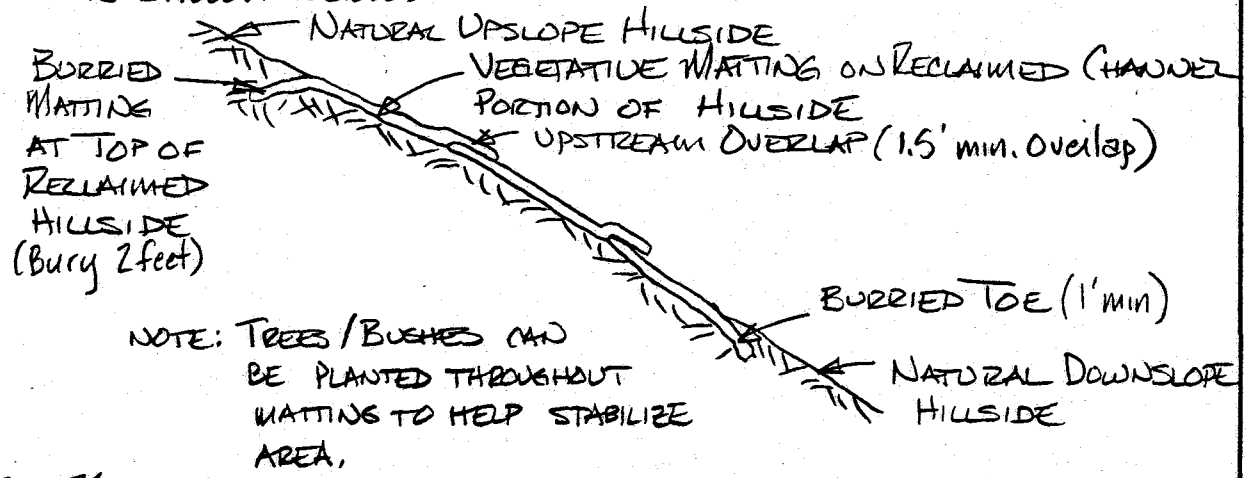
C-24-24 - Continued

that the concrete be extended to the bottom of Whisky Creek so that the energy could be dissipated.

Rock riprap is unstable on slopes found along the haul road. Designs of riprap are not meant to be applied to these conditions, and riprap used will likely not remain as a permanent structure.

The only feasible solution to protect against erosion may be to reclaim the area and install a vegetative matting along the intended flow path. New vegetative matting would help stabilize the soil along the flow path during the period of vegetation regrowth. The surrounding area is under a state of natural erosion. this method of reclamation may be the most reasonable option based upon 1) Current design methodologies, 2) current construction products, and 3) constructability. It is doubtful that any equipment could install properly a riprap channel on the local steep slopes because of the extended reach required both up and down slope from the reclaimed road.

A typical cross-section of a vegetative mat channel is shown below.



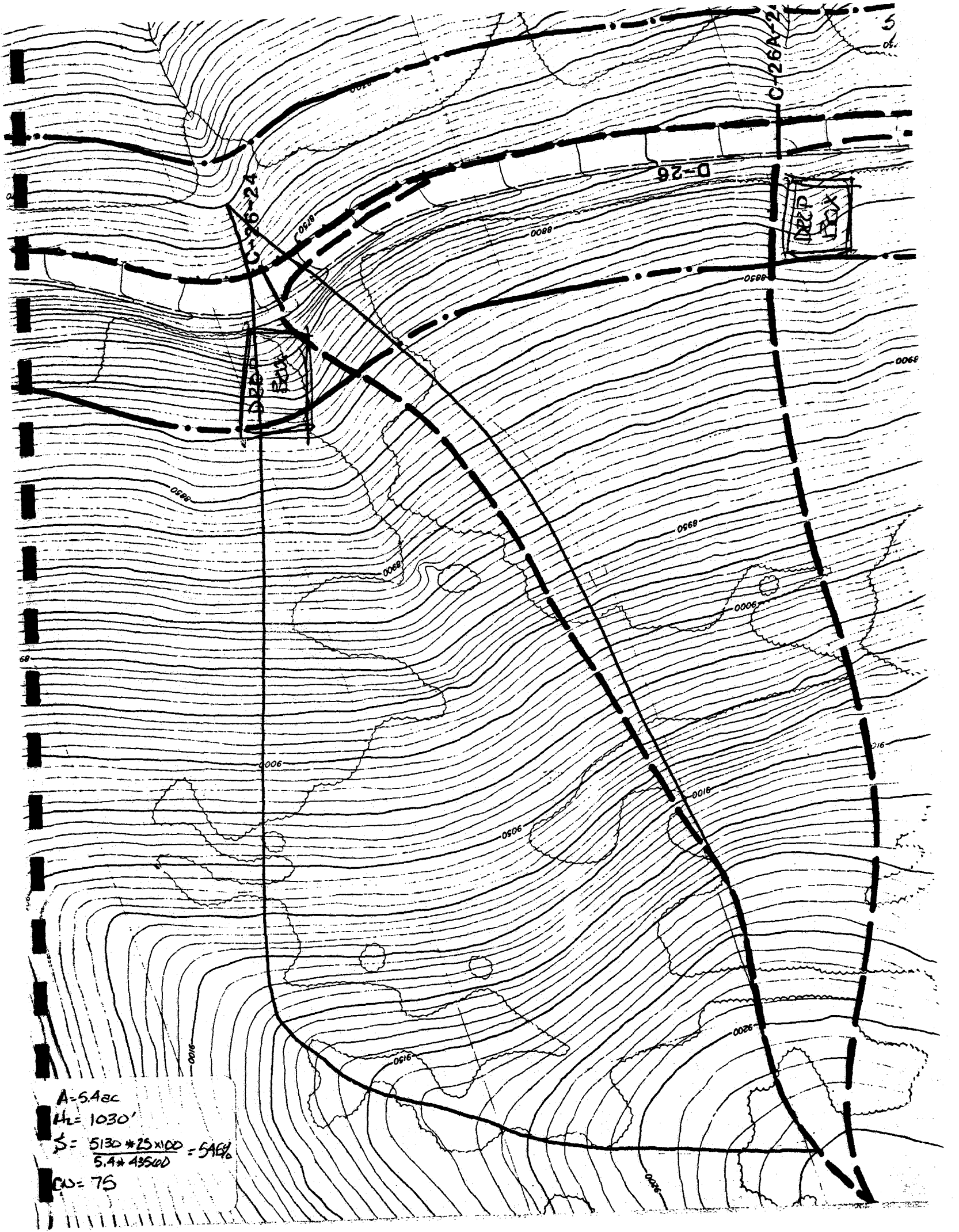
C-26-24

Same concerns as with C-24-24 apply here.

$Q_{100yr,6hr} = 2.5$ cfs Using $b = 10'$, $m = 5$ Trapezoidal Channel
$n = 0.03$, $S = 57\%$

$\frac{Qn}{1.49S^{1/2}} = 0.066$, $y = 0.05'$, $V = 4.9$ fps

Use Matting solution used at C-24-24.


C-26A-2
D-26
C-26-24
D-26
D-27
8850
8900
8950
9000
9050
9100
9150
9200
A=5.4ac
L= 1030'
S= 5130 * 25 x 100 / 5.4 * 43560 = 54%
CN= 75

PROJECT : Valley Camp Coal - Reclaimed C-26-24 - 100 Yr, 6 Hr Runoff

AREA= 5.4 ACRES
AVERAGE BASIN SLOPE= 54.5 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1030. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0569 HOURS QPCFS= 71.81 CFS QPIN=13.1885 INCHES
C3= 65.0060 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6442	.0000	.0000	.0	.00
2.09	.6679	.0000	.0000	6.8	.00
2.10	.6916	.0002	.0002	35.2	.00
2.12	.7153	.0007	.0005	62.5	.01
2.13	.7389	.0015	.0008	71.8	.04
2.15	.7626	.0027	.0012	65.0	.08
2.16	.7863	.0041	.0015	50.6	.15
2.18	.8100	.0059	.0018	35.5	.24
2.19	.8337	.0080	.0021	23.1	.34
2.20	.8573	.0103	.0023	14.2	.44
2.22	.8810	.0129	.0026	8.3	.55
2.23	.9047	.0159	.0029	4.7	.66
2.25	.9284	.0190	.0032	2.6	.78
2.26	.9520	.0225	.0035	1.4	.89
2.28	.9757	.0262	.0037	.7	.99
2.29	.9994	.0302	.0040	.4	1.10
2.30	1.0231	.0344	.0042	.2	1.21
2.32	1.0467	.0389	.0045	.0	1.31
2.43	1.2361	.0831	.0063	.0	2.07
2.45	1.2598	.0896	.0065	.0	2.15
2.46	1.2835	.0963	.0067	.0	2.24
2.47	1.3072	.1032	.0069	.0	2.32
2.49	1.3309	.1104	.0071	.0	2.40
2.50	1.3512	.1166	.0063	.0	2.48
2.52	1.3576	.1186	.0020	.0	2.49
2.53	1.3640	.1207	.0020	.0	2.34
2.55	1.3704	.1227	.0020	.0	2.06
2.56	1.3768	.1247	.0020	.0	1.73
2.57	1.3832	.1268	.0021	.0	1.43
2.59	1.3896	.1289	.0021	.0	1.20
2.60	1.3960	.1309	.0021	.0	1.04

HYDROGRAPH PEAK= 2.49 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .23 Acre-Feet

C-26A-24 Slight channelization occurs immediately above culvert - Check flow characteristics.

$Q_{100yr,6Hr} = 1.24$ cfs

Simulate using 10' Trapezoidal Channel.

$n = 0.03,\ b = 10,\ m = 5,\ S = 0.48$

$\frac{Qn}{1.49 S^{1/2}} = 0.04,\ y = 0.35',\ V = 3.5$ fps

Apply same concept as at C-24-24

Use Matting Solution as at C-24-24 and C-26-24.

C-27-24

Hillslope to be reclaimed without channel. Channel design not required. Regrade + Revegetate upon Phase II reclamation.

C-28-24 (Reclaimed Channel RC-4)

$Q_{100yr,6Hr} = 7.84$ cfs

Channel Slope ~ 0.27'/ft $\quad n = 0.0395\, D_{50}^{1/6}$

Check design according to OSM procedure - Use $b = 6'$, $m = 2$

Assume $D_{50} = 0.75'$ $\quad n = .0395(.75)^{1/6} = 0.04$

$\frac{Qn}{1.49 S^{1/2}} = 0.41,\ y = 0.2',\ V = 6.1$ fps

According to OSM procedure, Figure 5.4

DESIGN PARAMETERS

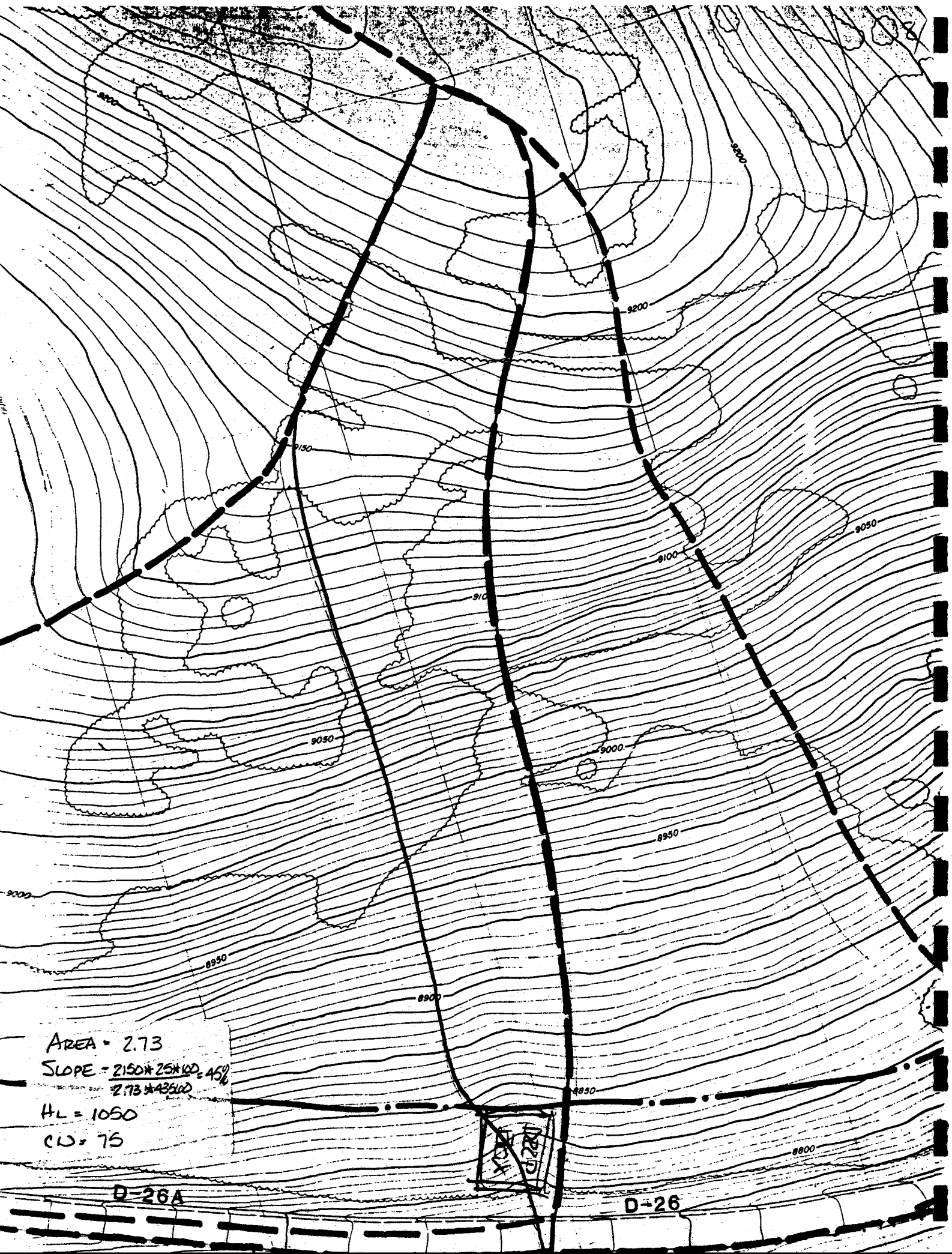
$D_{50} = 0.75'$

$D_{max} = 1.25 D_{50} = 0.94'$ USE 1.0' = Riprap Thickness

$D_{10-20} = D_{50}/(2 \text{ or } 3) = 0.25 - 0.38$ USE 0.25'

Use ≥ 0.5' freeboard. Total depth = 0.5 + 0.18 ⇒ 1.00' depth

Use 1.0' Type II granular Filter. Channel starts at Sta 0+00 at elev 8850 and extends to Sta 1+50 at elev 8890.



AREA = 2.73

SLOPE = $\frac{2150 * 25 * 100}{2.73 * 43560}$ = 45%

HL = 1050

CN = 75

PROJECT : Valley Camp Coal - Reclaimed C-26A-24 - 100 Yr, 6 Hr Runoff

AREA= 2.7 ACRES
AVERAGE BASIN SLOPE= 45.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1050. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0636 HOURS QPCFS= 32.49 CFS QPIN=11.8011 INCHES
C3= 58.1674 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6533	.0000	.0000	.0	.00
2.10	.6798	.0000	.0000	3.1	.00
2.11	.7063	.0005	.0004	15.9	.00
2.13	.7327	.0013	.0008	28.3	.01
2.15	.7592	.0025	.0012	32.5	.03
2.16	.7856	.0041	.0016	29.4	.06
2.18	.8121	.0061	.0020	22.9	.11
2.19	.8385	.0084	.0023	16.1	.16
2.21	.8650	.0111	.0027	10.4	.22
2.22	.8915	.0142	.0031	6.4	.28
2.24	.9179	.0176	.0034	3.8	.34
2.26	.9444	.0214	.0037	2.1	.40
2.27	.9708	.0254	.0041	1.2	.46
2.29	.9973	.0298	.0044	.6	.52
2.30	1.0237	.0345	.0047	.3	.58
2.32	1.0502	.0396	.0050	.2	.64
2.34	1.0767	.0449	.0053	.0	.70
2.35	1.1031	.0505	.0056	.0	.75
2.37	1.1296	.0564	.0059	.0	.81
2.38	1.1560	.0626	.0062	.0	.86
2.40	1.1825	.0691	.0065	.0	.92
2.42	1.2089	.0759	.0068	.0	.97
2.43	1.2354	.0829	.0070	.0	1.02
2.45	1.2618	.0902	.0073	.0	1.07
2.46	1.2883	.0977	.0075	.0	1.12
2.48	1.3148	.1055	.0078	.0	1.16
2.49	1.3412	.1135	.0080	.0	1.21
2.51	1.3548	.1177	.0042	.0	1.24
2.53	1.3619	.1200	.0022	.0	1.22
2.54	1.3691	.1223	.0023	.0	1.11
2.56	1.3762	.1245	.0023	.0	.95
2.57	1.3834	.1268	.0023	.0	.79
2.59	1.3905	.1291	.0023	.0	.66
2.61	1.3977	.1315	.0023	.0	.56

HYDROGRAPH PEAK= 1.24 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .12 Acre-Feet

EGEND:

HYDROLOGIC CERTIFICATION

VALLEY CAM

PROJECT : Valley Camp Coal - Reclaimed C-28-24 - 100 Yr. 6 Hr Runoff

AREA= 17.8 ACRES
AVERAGE BASIN SLOPE= 39.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0785 HOURS QPCFS= 171.52 CFS QPIN= 9.5559 INCHES
C3= 47.1009 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.09	.6634	.0000	.0000	.0	.00
2.10	.6896	.0002	.0002	8.6	.00
2.12	.7157	.0007	.0006	53.3	.01
2.13	.7418	.0017	.0009	113.9	.06
2.15	.7680	.0030	.0013	157.5	.15
2.17	.7941	.0047	.0017	171.5	.31
2.18	.8202	.0068	.0021	160.7	.53
2.20	.8464	.0092	.0024	135.6	.81
2.21	.8725	.0120	.0028	106.1	1.13
2.23	.8986	.0151	.0031	78.3	1.48
2.24	.9248	.0185	.0035	55.2	1.86
2.26	.9509	.0223	.0038	37.5	2.24
2.28	.9770	.0264	.0041	24.7	2.63
2.29	1.0032	.0309	.0044	15.8	3.02
2.31	1.0293	.0356	.0047	9.9	3.41
2.32	1.0554	.0406	.0050	6.1	3.79
2.34	1.0816	.0459	.0053	3.7	4.16
2.35	1.1077	.0515	.0056	2.2	4.53
2.37	1.1338	.0574	.0059	1.3	4.89
2.39	1.1600	.0636	.0062	.8	5.25
2.40	1.1861	.0700	.0064	.4	5.60
2.42	1.2123	.0767	.0067	.3	5.94
2.43	1.2384	.0837	.0070	.1	6.27
2.45	1.2645	.0909	.0072	.0	6.59
2.46	1.2907	.0984	.0075	.0	6.91
2.48	1.3168	.1061	.0077	.0	7.23
2.50	1.3429	.1141	.0080	.0	7.53
2.51	1.3552	.1179	.0038	.0	7.80
2.53	1.3622	.1201	.0022	.0	7.84
2.54	1.3693	.1223	.0022	.0	7.53
2.56	1.3763	.1246	.0023	.0	6.90
2.57	1.3834	.1268	.0023	.0	6.11
2.59	1.3905	.1291	.0023	.0	5.29
2.61	1.3975	.1314	.0023	.0	4.57
2.62	1.4046	.1338	.0023	.0	3.99

PROJECT : Valley Camp Coal - Reclaimed C-28-24 - 100 Yr, 6 Hr Runoff
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS

HYDROGRAPH PEAK= 7.84 cfs
TIME TO PEAK= 2.53 Hours
RUNOFF VOLUME= .76 Acre-Feet

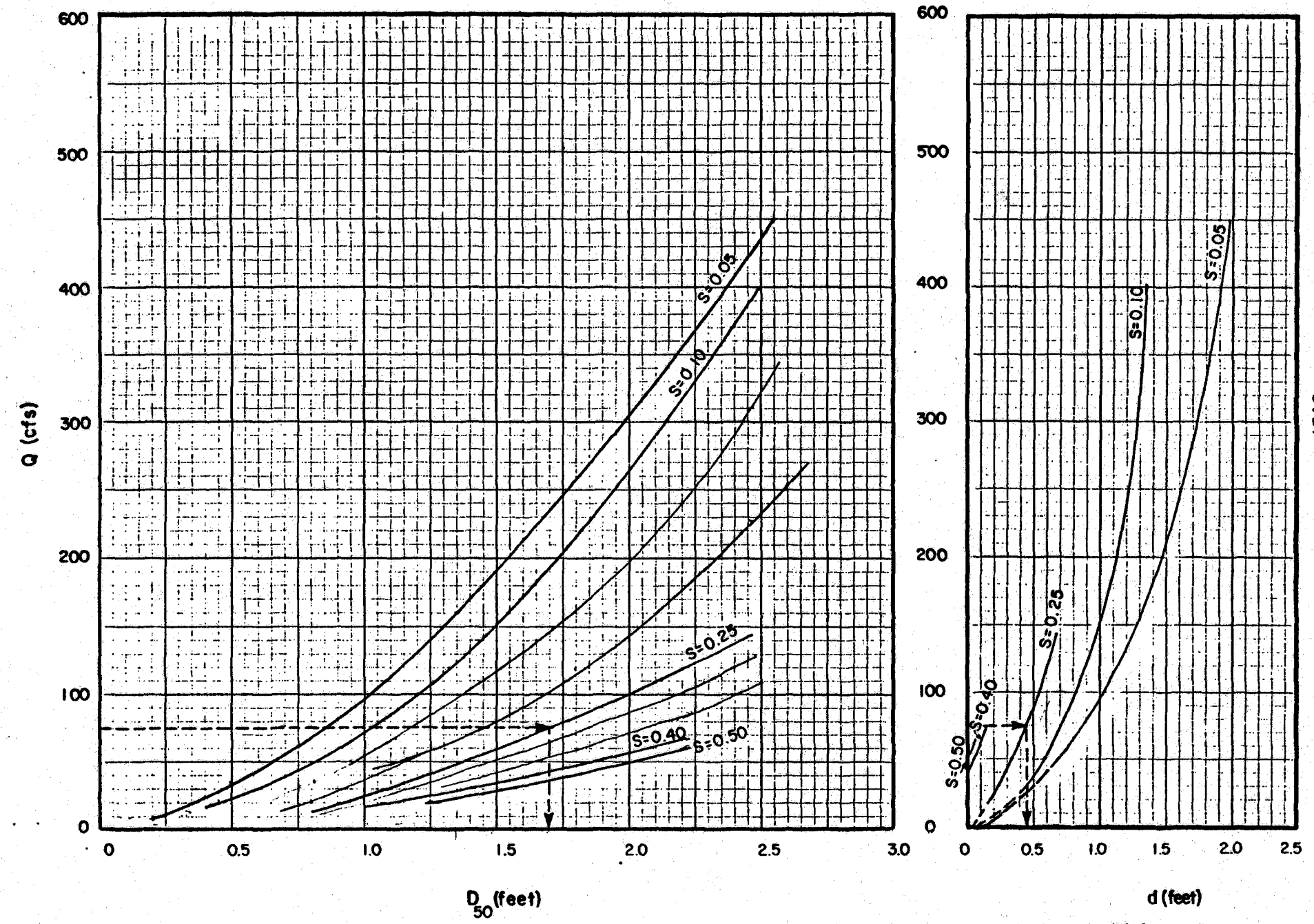


Figure 5.4. Steep slope riprap design, trapezoidal channels, 2:1 sideslopes, 6 ft base width.

CHECK FOR CHANNEL DESIGN ON HAUL ROAD @ BOWL (C-25-36) RC-4

Find Slope: $\Delta H = 8595 - 8475 = 120'$
$\Delta X = 380'$

$$\frac{120}{380} * 100 = 31.6\%$$

USE DATA FROM CULVERT C-25-36 TO CALC. 100 YR-6HR EVENT

$A = 151\,ac - 11\,ac = 140\,ac$
$S = 39.5\%$
$CN = 72.7$
$P = 2.3\,in$
$D = 6\,HR$
$H_L = 5000'$

11 acres now travels along road, when reclaimed it will not enter drainage
$Q_{100\,YR-6HR} = 341\,cfs$

Check Trapezoidal Channel design Possibilities

Calculations show that a $b = 10'$, $D_{50} = 1.75'$ gives $SF_b = 0.84$ which is unacceptable

In conversations with Rick Summers at DOGM, it was agreed that the solution did not appear reasonable - (Using Redbook) (See Sheets 4+5)
We decided to change methodology, and use the OSM Steep Channel Riprap Design Criteria. Because of the unproven nature of this design, Hansen, Allen & Luce and any successors will not warrant the stability of this design. It is recommended that a review and check of alternate designs be completed prior to reclamation.

From Figure 5.4 (Sheet 6)

$D_{50} = 1.3'$ USE 1.5'

$d = 0.1'$ USE CHANNEL DEPTH OF 1.0'

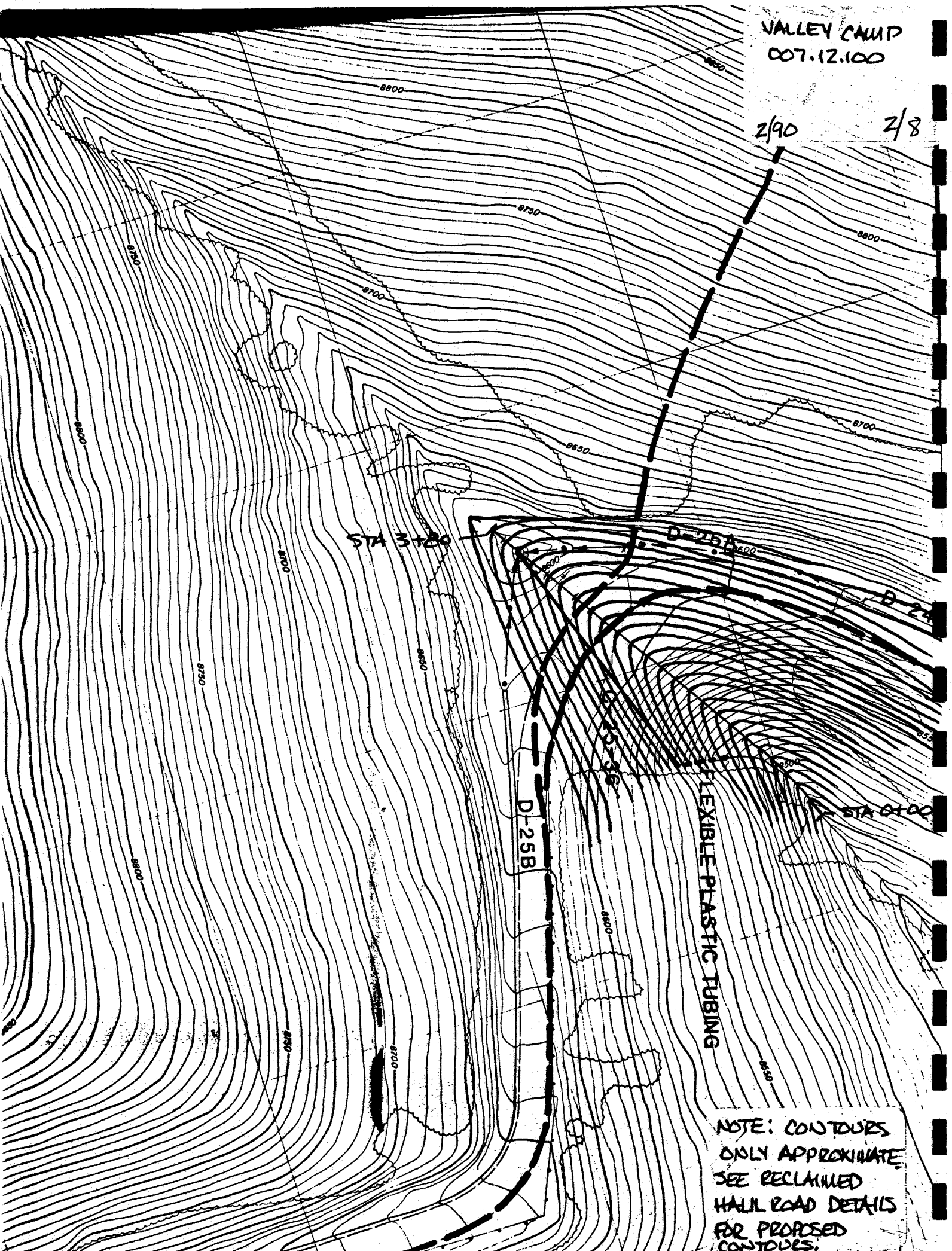
RIPRAP FILTER "TYPE II - 1.0' THICK"

$D_{max} = 1.25 D_{50} = 1.88'$ USE 2.0'

$\frac{D_{50}}{D_{10-20}} = 2-3$ $D_{10-20} = \frac{D_{50}}{2-3}$ $D_{10-20} = 0.75 - 0.50'$

VALLEY CAMP
007.12.100

2/90 2/8



NOTE: CONTOURS ONLY APPROXIMATE. SEE RECLAIMED HAUL ROAD DETAILS FOR PROPOSED CONTOURS.

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel Replacing C-25-36

AREA= 140.0 ACRES
AVERAGE BASIN SLOPE= 39.5 PERCENT
CURVE NUMBER= 72.7
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2523 HOURS QPCFS= 419.66 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
2.12	.7319	.0000	.0000	.0	.00
2.17	.8178	.0012	.0012	21.1	.02
2.22	.9037	.0060	.0048	130.4	.25
2.27	.9895	.0142	.0083	278.6	1.12
2.32	1.0754	.0258	.0116	385.2	3.11
2.37	1.1613	.0404	.0146	419.7	6.46
2.42	1.2472	.0579	.0175	393.1	11.15
2.47	1.3331	.0781	.0202	331.8	16.98
2.52	1.3905	.0931	.0150	259.5	23.45
2.57	1.4137	.0994	.0064	191.5	29.34
2.62	1.4369	.1059	.0065	135.0	33.06
2.67	1.4602	.1126	.0067	91.7	34.06
2.72	1.4834	.1195	.0069	60.4	32.94
2.78	1.5066	.1266	.0070	38.7	30.67
2.83	1.5298	.1338	.0072	24.3	28.10
2.88	1.5530	.1411	.0074	15.0	25.79
2.93	1.5762	.1487	.0075	9.1	23.98
2.98	1.5994	.1563	.0077	5.4	22.71
3.03	1.6201	.1633	.0070	3.2	21.91
3.08	1.6387	.1697	.0064	1.9	21.38
3.13	1.6572	.1762	.0065	1.1	20.92
3.18	1.6758	.1827	.0066	.6	20.44
3.23	1.6944	.1894	.0067	.3	19.97
3.28	1.7129	.1962	.0068	.2	19.56
3.33	1.7315	.2030	.0068	.1	19.26
3.38	1.7501	.2099	.0069	.0	19.07

HYDROGRAPH PEAK= 34.06 cfs
TIME TO PEAK= 2.67 Hours
RUNOFF VOLUME= 5.23 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:22 AM
Channel Section:	Reclaimed Culvert C-25-36	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	34.10	cfs
	Bottom Width:	10.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.316	ft/ft
	Max. Bottom Slope:	0.316	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.35	feet
	Qn/1.49(S)1/2=	1.755	
	A(R)2/3=	1.753	
	Required Depth:	0.85	feet
	Area:	3.81	ft2
	Perimeter:	12.18	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	8.96	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.35	feet
	Qn/1.49(S)1/2=	1.755	
	A(R)2/3=	1.753	
	Required Depth:	0.85	feet
	Area:	3.81	ft2
	Perimeter:	12.18	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	8.96	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	10.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	31.6	%
	Max. Bottom Slope:	31.6	%
	Min Channel Depth:	0.85	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:22 AM
Channel Section: Reclaimed Culvert C-25-36 Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	34.10	cfs
	Bottom Width:	10.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.32	ft/ft
	Max. Bottom Slope:	0.32	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.35	feet
	Depth (Max. S):	0.35	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.75	5.00	feet
T	6.80	6.80	lb/ft2
Nb	0.79	0.28	
Tmax	5.17	5.17	lb/ft2
Ns	0.60	0.21	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	33.02	14.71	degrees
Nsp	0.53	0.16	
SFb	0.84	1.53	
SFs	1.15	1.89	

UNREASONABLE SIZE

TOO LOW!

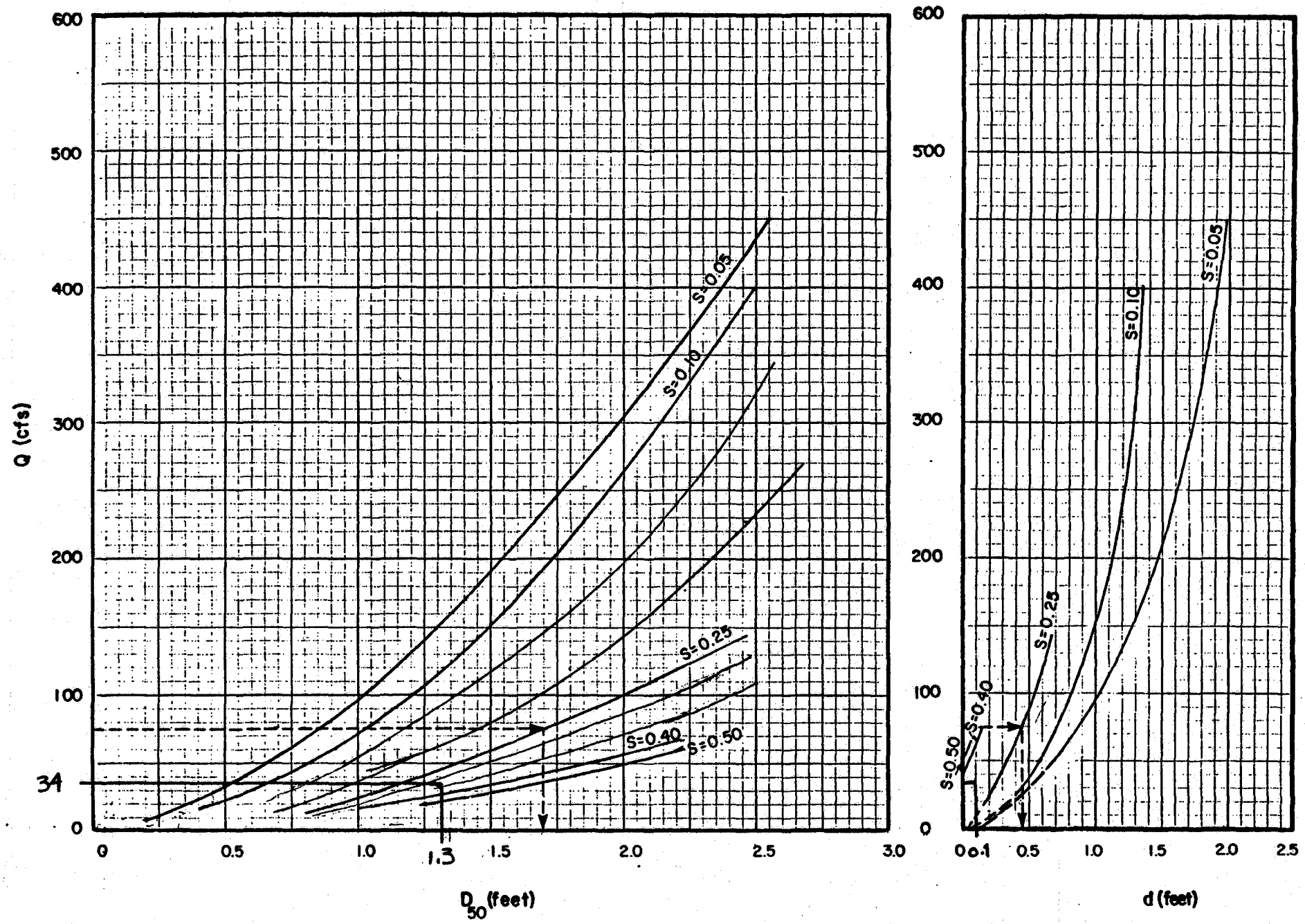
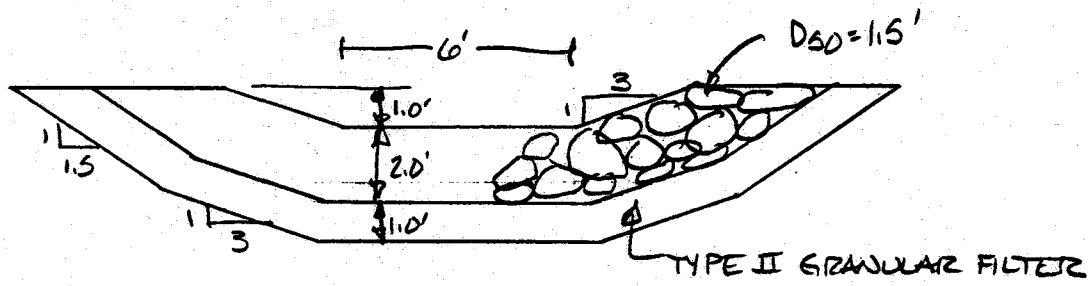


Figure 5.4. Steep slope riprap design, trapezoidal channels, 2:1 sideslopes, 6 ft base width.



TYPICAL SECTION

RIPRAP GRADATION (FROM FIGURES 1 - EXTRAPOLATED) PG 8

% PASSING BY WEIGHT	D_{50} (in)
70-100	24
50-70	20
35-50	18
2-10	5

USE INLET AND OUTLET DETAILS ALREADY DEVELOPED FOR OTHER CHANNELS.

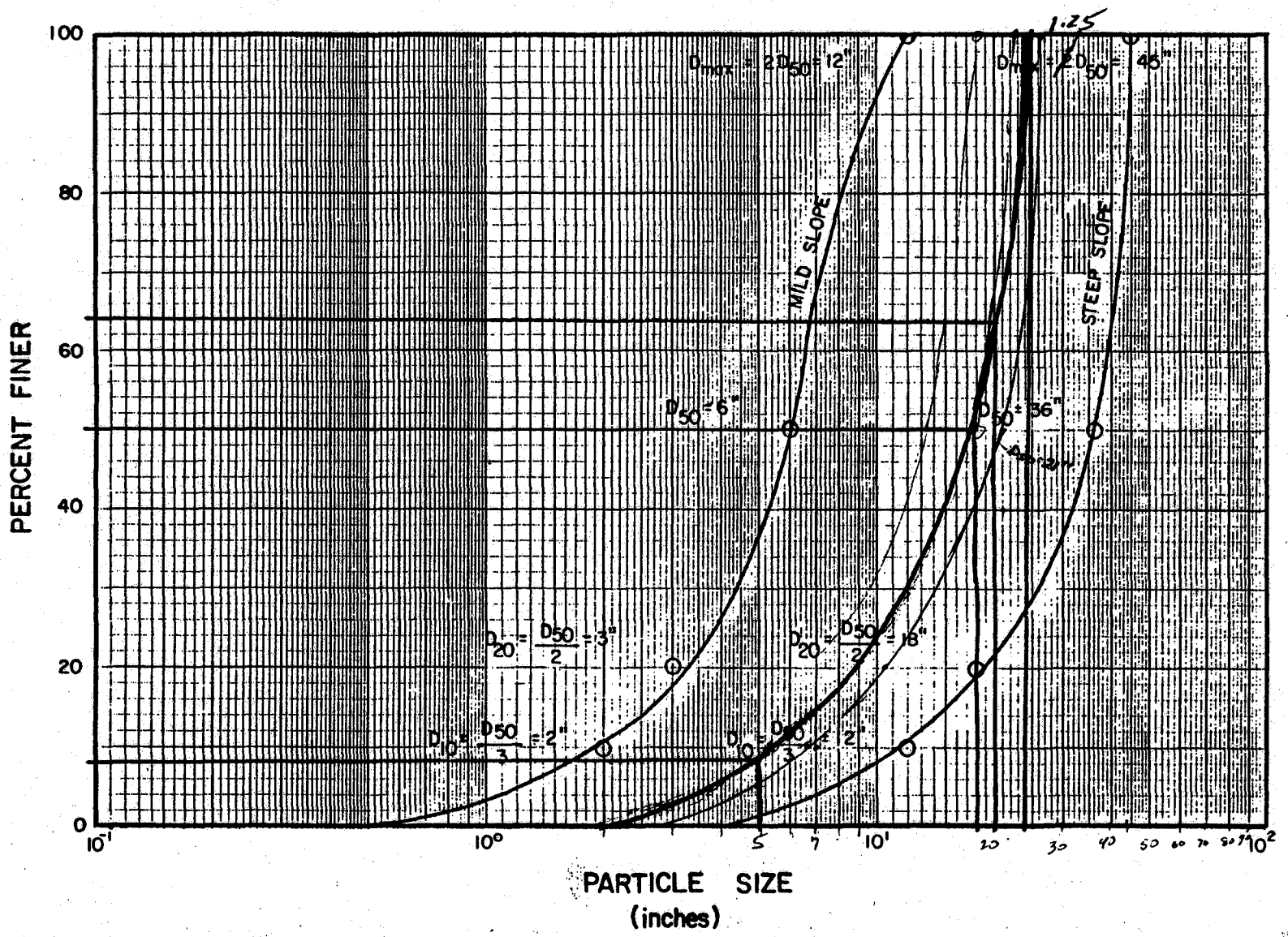


Figure 5.1. Definition sketch illustrating steep and mild slope riprap gradation based on recommended guidelines.

CHANNEL RECLAMATION - BELINA MINE AREA (DETERMINE FLOW IN CHANNEL TO ELEV ~8750' BELOW POND 4)
WHISKEY CREEK

COMPLETE CHANNEL (- RC-2)

Rdg: 7½ Min. Topo Sec 30 T13S, R7E = 436

$$\text{Area} = \frac{\left(\frac{5030+6050}{2}\right) * \left(\frac{5260+5280}{2}\right)}{43560\ ft^2/ac} = 609.8\ ac$$

Rdg: Sec 30, Zeroz Copy = 450 Multiplier = 1.3651

AREA = 356.4 ac

	AREA	CN	% COVER
PINE COVERED	193.7 ac	55	50*
SAGE/ASPEN COVERED	122.0 ac	70	25
DISTURBED/RECLAIMED	40.7 ac	85	—
	356.4 ac		

* Conservative

100 YR - 6 HR PRECIP = 2.3 in

AVG SLOPE: $\frac{\text{CONT. LENGTH} * \text{CONT INT} * 100}{\text{AREA} * 43560}$

CONT LENGTH = 33.5 in * 2000'/in = 67,000 ft
CONT INT = 80 ft

$$\frac{67{,}000' * 80' * 100}{356.4\ ac * 43560\ ft^2/ac} = 34.5\%$$

VOL. WEIGHTED CURVE NO.

CN	A	Q_i
55	193.7	0.05
70	122.0	0.36
85	40.7	1.02

$\bar{Q} = 0.27$ $\bar{CN} = 67.0$

HYD. LENGTH = 5000'

$Q_{100yr-6hr}$ = 32.2 cfs

FOR ENTIRE CHANNEL - BREAK OUT UPPER PORTION ABOVE ELEV 8935

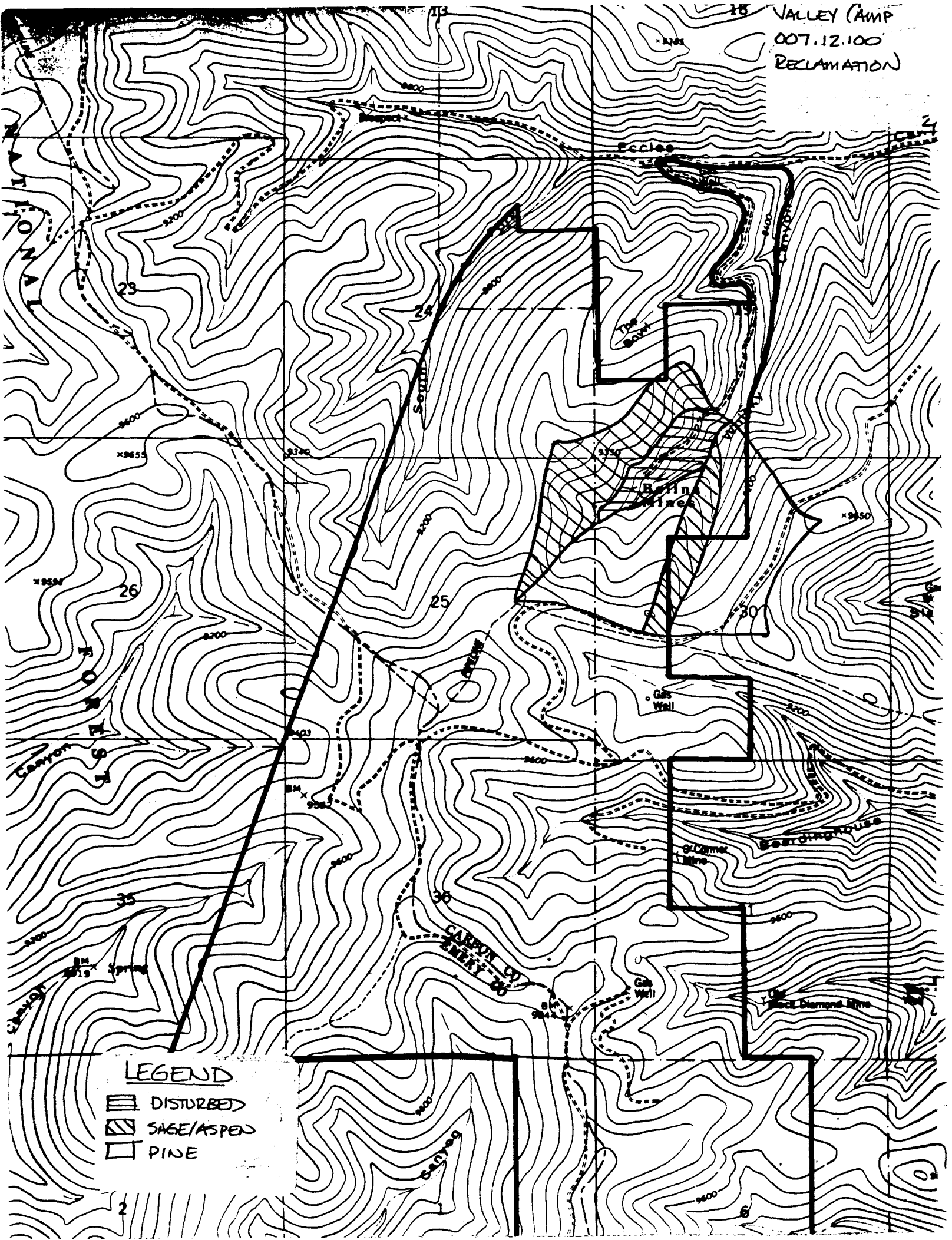
UPPER MAIN CHANNEL (RC-2)

UPPER AREA = 134.5 ac

	AREA	CN	Q_i
PINE COVERED	77.0	55	0.05
SAGE/ASPEN	46.0	70	0.36
DIST/RECLAIMED	11.5	85	1.02

$\bar{Q}_i = 0.24$ $\bar{CN} = 65.6$

VALLEY CAMP
007.12.100
RECLAMATION



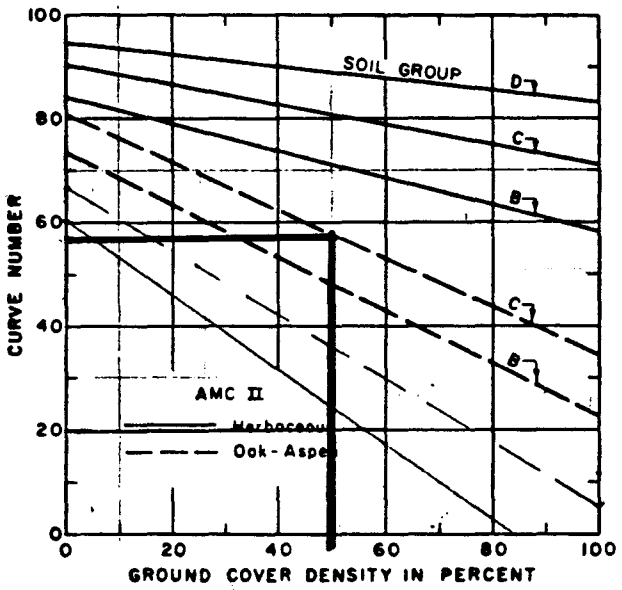


Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

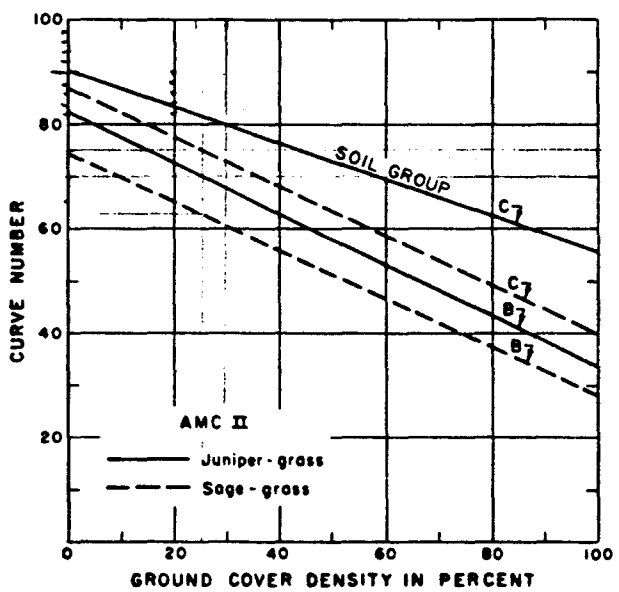


Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-2; 100 Yr 6 Hr

AREA= 356.4 ACRES
AVERAGE BASIN SLOPE= 34.5 PERCENT
CURVE NUMBER= 67.0
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

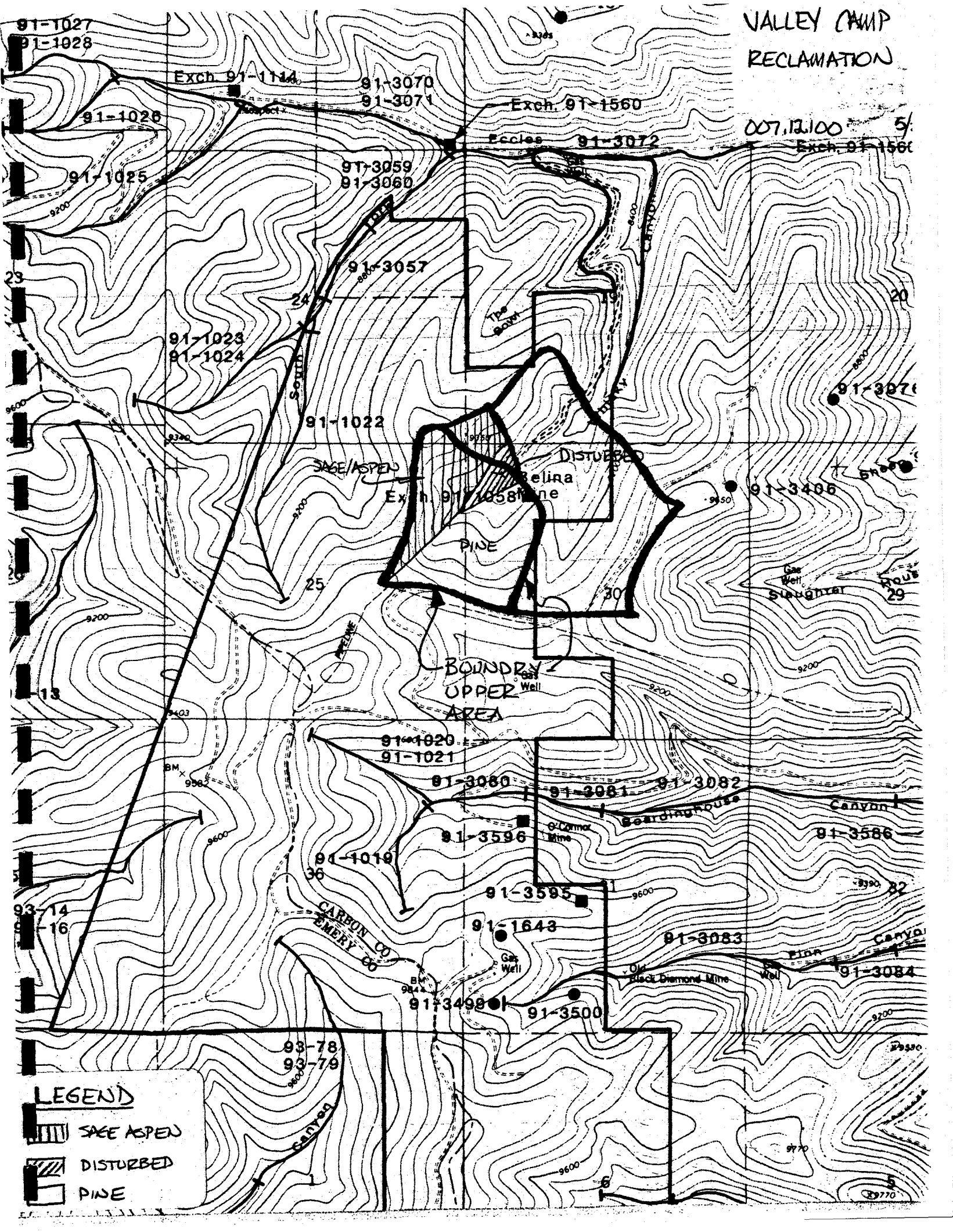
TP= .3149 HOURS QPCFS= 855.92 CFS QPIN= 2.3816 INCHES
C3= 11.7391 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.9839	.0000	.0000	.0	.00
2.33	1.0911	.0022	.0022	42.9	.10
2.39	1.1983	.0088	.0066	265.9	.88
2.46	1.3055	.0196	.0107	568.2	3.49
2.52	1.3888	.0306	.0110	785.7	8.84
2.58	1.4178	.0349	.0044	855.9	16.32
2.65	1.4468	.0396	.0046	801.8	23.50
2.71	1.4757	.0445	.0049	676.8	28.57
2.77	1.5047	.0496	.0051	529.3	31.26
2.83	1.5337	.0550	.0054	390.6	32.20
2.90	1.5627	.0606	.0056	275.3	32.21
2.96	1.5916	.0665	.0059	187.0	31.95
3.02	1.6185	.0722	.0057	123.1	31.76
3.09	1.6417	.0772	.0051	79.0	31.72
3.15	1.6648	.0824	.0052	49.6	31.64
3.21	1.6880	.0878	.0054	30.6	31.46
3.27	1.7112	.0933	.0055	18.5	31.23
3.34	1.7344	.0989	.0056	11.1	31.05
3.40	1.7575	.1047	.0058	6.5	31.00
3.46	1.7807	.1107	.0059	3.8	31.12
3.53	1.8008	.1159	.0053	2.2	31.37
3.59	1.8167	.1201	.0042	1.3	31.54
3.65	1.8327	.1244	.0043	.7	31.31
3.72	1.8486	.1288	.0044	.4	30.63
3.78	1.8645	.1332	.0044	.2	29.65
3.84	1.8805	.1377	.0045	.1	28.61
3.90	1.8964	.1423	.0046	.0	27.70

HYDROGRAPH PEAK= 32.21 cfs
TIME TO PEAK= 2.90 Hours
RUNOFF VOLUME= 8.20 Acre-Feet

VALLEY CAMP
RECLAMATION

007,12,100 5/



AVG SLOPE: $\frac{22500 * 80 * 100}{43560 * 134.5} = 30.72\%$

HYD. LENGTH = 1600 ft
P = 2.3 in

$Q_{100YR-6HR}$ = 13.4 cfs

SIDE CHANNEL - TO NORTH (RC-3)

	AREA	CN	Q_i
PINE COVERED	12.5	55	0.05
DIST/RECLAIMED	4.1	85	1.02
	16.6		

$\bar{Q}_i = 0.29$; $\overline{CN} = 67.5$

P = 2.3"
AVG. SLOPE ~ 31%
HYD. LENGTH = 900'

$Q_{100YR-6HR}$ = 3.1 cfs

RECLAIMED CHANNEL CHARACTERISTICS

	MIN SLOPE	MAX SLOPE
UPPER CHANNEL	3.6%*	33.0%
SIDE CHANNEL	6.3%*	100.0%**
LOWER CHANNEL	3.6%*	33.0%

* AT JUNCTION WITH SIDE CHANNEL
** AT EXTREME UPPER END

CHANGE GRADES TO ALLOW ACCEPTABLE RIPRAP D_{50} (SEE PG's 9+10)

ACCEPT MAX D_{50} = 1.75' - THIS GIVES D_{MAX} = 36" (3 ft)

PROJECT : Valley Camp of Utah, Inc. Reclaimed Upper Channel RC-2

AREA= 134.5 ACRES
AVERAGE BASIN SLOPE= 30.7 PERCENT
CURVE NUMBER= 65.6
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1392 HOURS QPCFS= 730.87 CFS QPIN= 5.3888 INCHES
C3= 26.5616 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.28	1.0097	.0000	.0000	.0	.00
2.31	1.0570	.0000	.0000	36.7	.00
2.34	1.1044	.0006	.0006	227.0	.02
2.37	1.1518	.0020	.0014	485.2	.19
2.39	1.1992	.0042	.0022	670.9	.68
2.42	1.2465	.0072	.0030	730.9	1.68
2.45	1.2939	.0109	.0038	684.6	3.25
2.48	1.3413	.0155	.0045	577.9	5.37
2.51	1.3823	.0199	.0045	452.0	7.93
2.53	1.3951	.0215	.0015	333.5	10.56
2.56	1.4079	.0230	.0016	235.1	12.51
2.59	1.4207	.0246	.0016	159.6	13.36
2.62	1.4336	.0263	.0017	105.1	13.26
2.64	1.4464	.0280	.0017	67.5	12.56
2.67	1.4592	.0298	.0018	42.4	11.65
2.70	1.4720	.0316	.0018	26.1	10.79
2.73	1.4848	.0335	.0019	15.8	10.10
2.76	1.4976	.0354	.0019	9.5	9.61
2.78	1.5104	.0373	.0020	5.6	9.32
2.81	1.5232	.0394	.0020	3.3	9.19
2.84	1.5360	.0414	.0021	1.9	9.19
2.87	1.5488	.0435	.0021	1.1	9.26
2.89	1.5616	.0457	.0022	.6	9.40
2.92	1.5744	.0479	.0022	.3	9.58
2.95	1.5872	.0501	.0023	.2	9.77
2.98	1.6000	.0524	.0023	.1	9.98
3.01	1.6122	.0547	.0022	.0	10.20

HYDROGRAPH PEAK= 13.36 cfs
TIME TO PEAK= 2.59 Hours
RUNOFF VOLUME= 2.69 Acre-Feet

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-3; 100 Yr 6 Hr

AREA= 16.6 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 67.5
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0832 HOURS QPCFS= 150.97 CFS QPIN= 9.0189 INCHES
C3= 44.4541 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.25	.9463	.0000	.0000	.0	.00
2.26	.9746	.0000	.0000	7.6	.00
2.28	1.0029	.0003	.0003	46.9	.00
2.30	1.0313	.0010	.0006	100.2	.02
2.31	1.0596	.0019	.0009	138.6	.07
2.33	1.0879	.0032	.0013	151.0	.16
2.34	1.1162	.0047	.0016	141.4	.30
2.36	1.1445	.0066	.0019	119.4	.49
2.38	1.1728	.0088	.0022	93.4	.71
2.39	1.2011	.0112	.0025	68.9	.95
2.41	1.2294	.0140	.0027	48.6	1.22
2.43	1.2577	.0170	.0030	33.0	1.50
2.44	1.2860	.0203	.0033	21.7	1.79
2.46	1.3143	.0239	.0036	13.9	2.07
2.48	1.3426	.0277	.0039	8.8	2.36
2.49	1.3709	.0319	.0041	5.4	2.65
2.51	1.3852	.0340	.0022	3.3	2.92
2.53	1.3928	.0352	.0012	2.0	3.09
2.54	1.4005	.0364	.0012	1.2	3.08
2.56	1.4081	.0377	.0012	.7	2.91
2.58	1.4158	.0389	.0012	.4	2.64
2.59	1.4235	.0402	.0013	.2	2.34
2.61	1.4311	.0415	.0013	.1	2.06
2.63	1.4388	.0428	.0013	.0	1.83

HYDROGRAPH PEAK= 3.09 cfs
TIME TO PEAK= 2.53 Hours
RUNOFF VOLUME= .40 Acre-Feet

FROM PRINTOUT (PG's 12-13) $S_{MAX} = 0.16$ TO PRODUCE $D_{MAX} = 1.75'$

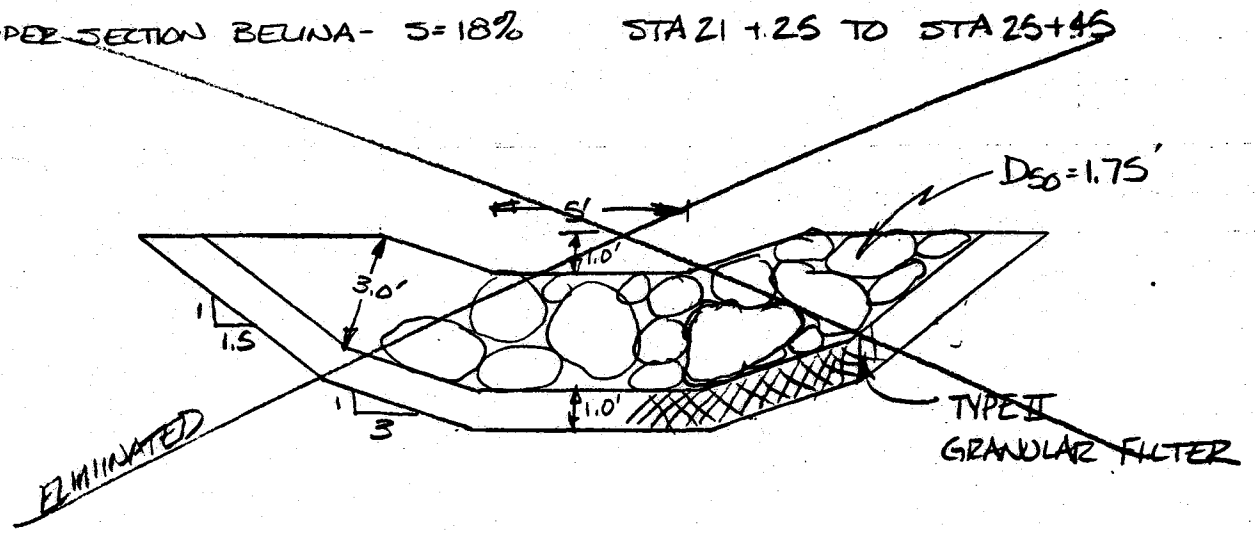
DRAW CONTOURS THROUGH STEEP AREAS WITH A $S_{MAX} = 16\%$

DESIGN CRITERIA

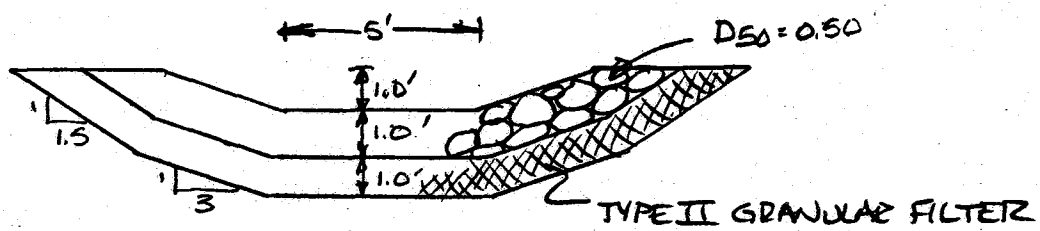
CHANNEL	Q (cfs)	b (ft)	m	S_{min} (%)	S_{max} (%)	d (ft)	D_{50} S_{min} (ft)	D_{50} S_{max} (ft)	D_{max} S_{min} (ft)	D_{max} S_{max} (ft)
UPPER	13.4	5	3	5.0	5.0	1.0	0.50	0.50	1.0	1.0
SIDE	3.1	5	3	32.0	32.0	0.75	1.75	1.75	3.0	3.0
LOWER	32.2	10	3	5.0	16.0	1.1	0.75	1.75	1.25	3.0

SHOW X-SECTIONS FOR CHANNELS

UPPER SECTION BELINA - S = 18% STA 21+25 TO STA 25+45



UPPER BELINA - S = 5.0 % STA 13+20 TO STA 17+95



Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:36 AM
Channel Section:	Channel RC-1; C-14-42 Outlet	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	32.20	cfs
	Bottom Width:	10.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.050	ft/ft
	Max. Bottom Slope:	0.160	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.57	feet
	Qn/1.49(S)1/2=	4.167	
	A(R)2/3=	4.152	
	Required Depth:	1.07	feet
	Area:	6.67	ft2
	Perimeter:	13.60	feet
	Hydraulic Radius:	0.49	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.41	feet
	Qn/1.49(S)1/2=	2.329	
	A(R)2/3=	2.354	
	Required Depth:	0.91	feet
	Area:	4.60	ft2
	Perimeter:	12.59	feet
	Hydraulic Radius:	0.37	feet
	Velocity:	6.99	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	10.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	5.0	%
	Max. Bottom Slope:	16.0	%
	Min Channel Depth:	1.07	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:36 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	32.20	cfs
	Bottom Width:	10.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.05	ft/ft
	Max. Bottom Slope:	0.16	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.57	feet
	Depth (Max. S):	0.41	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	0.75	1.75	feet
T	1.78	4.09	lb/ft2
Nb	0.48	0.48	
Tmax	1.35	3.11	lb/ft2
Ns	0.37	0.36	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	26.99	25.23	degrees
Nsp	0.28	0.28	
SFb	1.85	1.51	
SFs	1.61	1.58	

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:29 AM
Channel Section:	Channel RC-1; C-14-42 Outlet	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	13.40	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	0.50	feet
	Calc n Value:	0.035	
	Used:	0.035	
	Min. Bottom Slope:	0.050	ft/ft
	Max. Bottom Slope:	0.050	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.44	feet
	Qn/1.49(S)1/2=	1.411	
	A(R)2/3=	1.400	
	Required Depth:	0.94	feet
	Area:	2.78	ft2
	Perimeter:	7.78	feet
	Hydraulic Radius:	0.36	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.44	feet
	Qn/1.49(S)1/2=	1.411	
	A(R)2/3=	1.400	
	Required Depth:	0.94	feet
	Area:	2.78	ft2
	Perimeter:	7.78	feet
	Hydraulic Radius:	0.36	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	5.0	%
	Max. Bottom Slope:	5.0	%
	Min Channel Depth:	0.94	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:29 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	13.40	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.05	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.44	feet
	Depth (Max. S):	0.44	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	0.50	0.50	feet
T	1.37	1.37	lb/ft2
Nb	0.56	0.56	
Tmax	1.04	1.04	lb/ft2
Ns	0.43	0.43	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	30.42	30.42	degrees
Nsp	0.33	0.33	
SFb	1.62	1.62	
SFs	1.50	1.50	

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:31 AM
Channel Section:	Channel RC-1; C-14-42 Outlet	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	3.10	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.320	ft/ft
	Max. Bottom Slope:	0.320	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.13	feet
	Qn/1.49(S)1/2=	0.159	
	A(R)2/3=	0.160	
	Required Depth:	0.63	feet
	Area:	0.67	ft2
	Perimeter:	5.79	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	4.61	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.13	feet
	Qn/1.49(S)1/2=	0.159	
	A(R)2/3=	0.160	
	Required Depth:	0.63	feet
	Area:	0.67	ft2
	Perimeter:	5.79	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	4.61	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	32.0	%
	Max. Bottom Slope:	32.0	%
	Min Channel Depth:	0.63	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

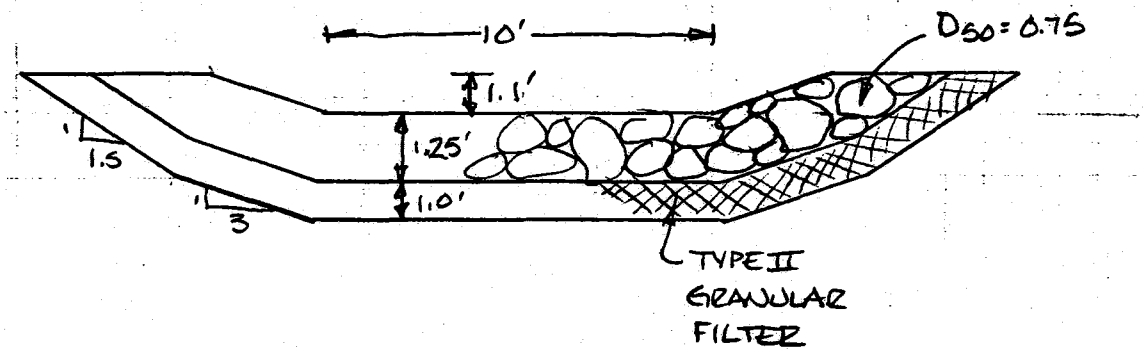
Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:31 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	3.10	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.32	ft/ft
	Max. Bottom Slope:	0.32	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.13	feet
	Depth (Max. S):	0.13	feet
	Angle Repose (Ar):	42	degrees

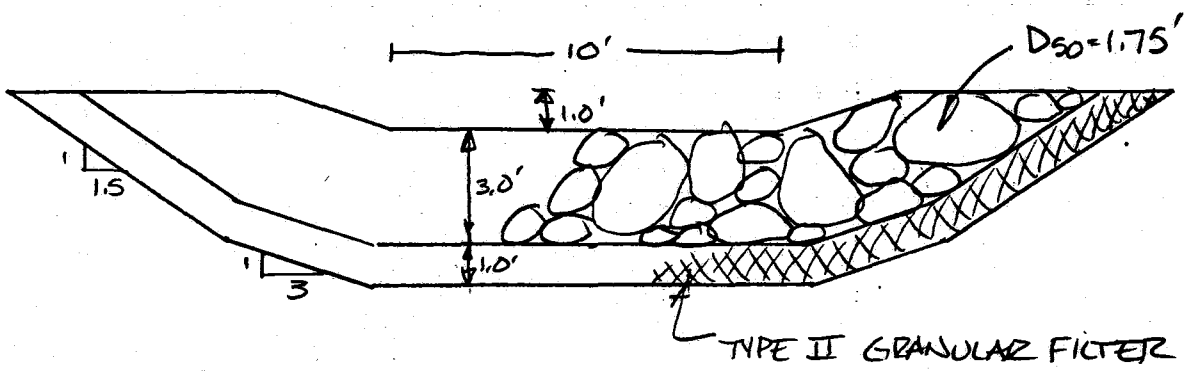
Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.75	1.75	feet
T	2.50	2.50	lb/ft2
Nb	0.29	0.29	
Tmax	1.90	1.90	lb/ft2
Ns	0.22	0.22	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	15.30	15.30	degrees
Nsp	0.17	0.17	
SFb	1.48	1.48	
SFs	1.86	1.86	

LOWER BELINA - S = 5.0% STA 11+00 TO STA 13+20



LOWER BELINA - S = 16% STA 0+00 TO STA 10+95



SIDE CHANNEL - S = 32% STA 0+00 TO STA 5+30

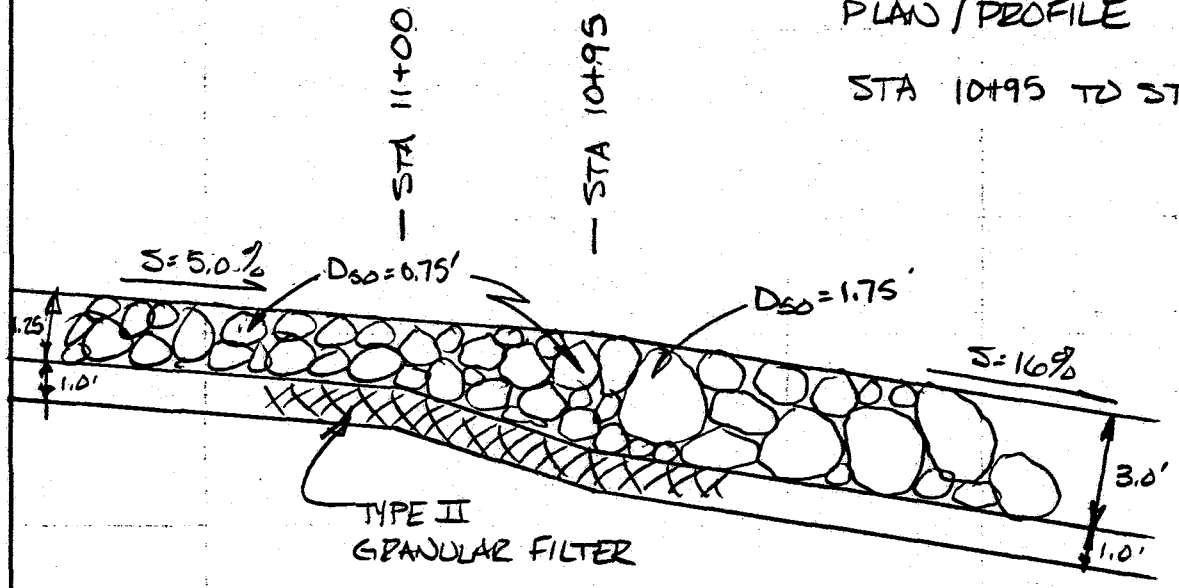
HANSEN ALLEN & LUCE INC

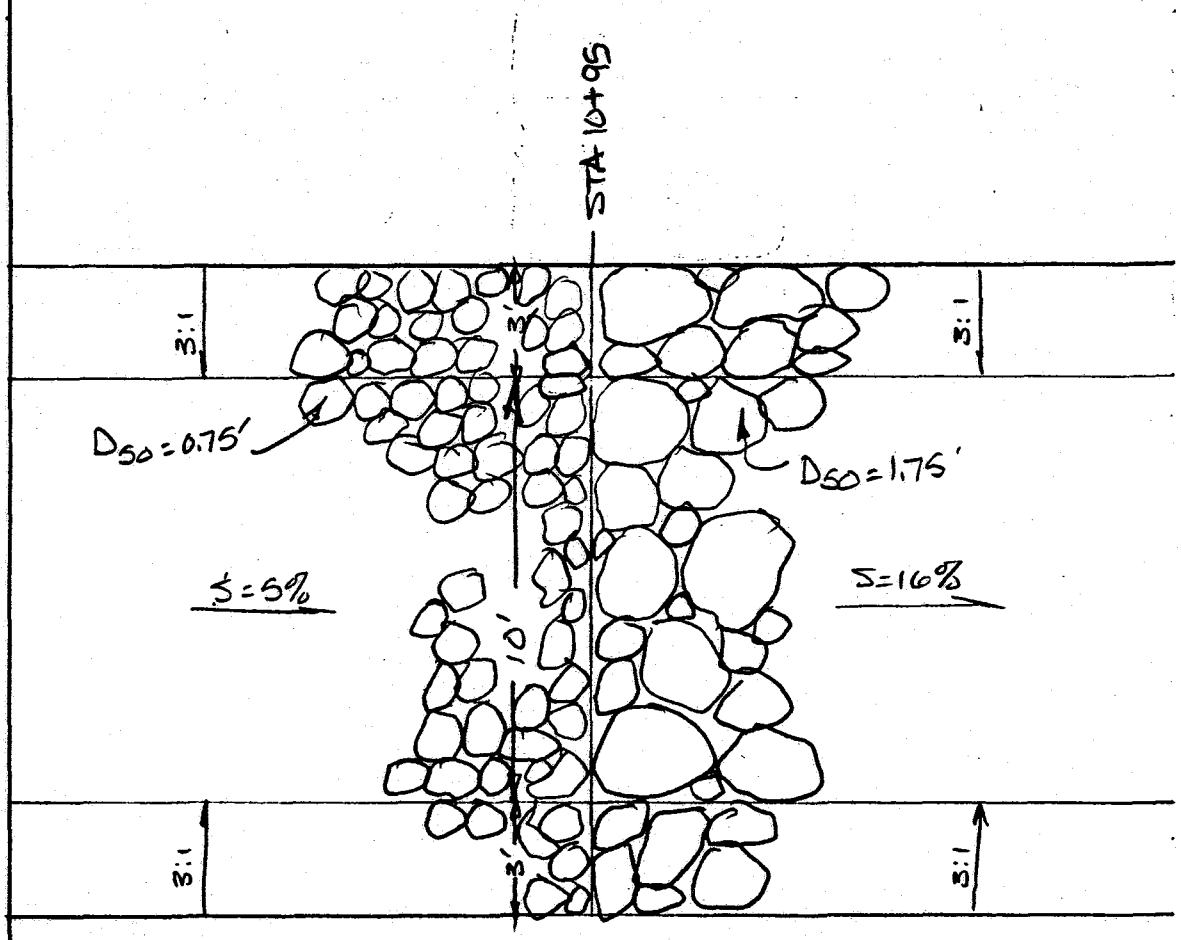
CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 17 OF 21
COMPUTED DEH
CHECKED
DATE 22 JAN 90

PLAN / PROFILE

STA 10+95 TO STA 11+00





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FEATURE
PROJECT NO. 007.12.100

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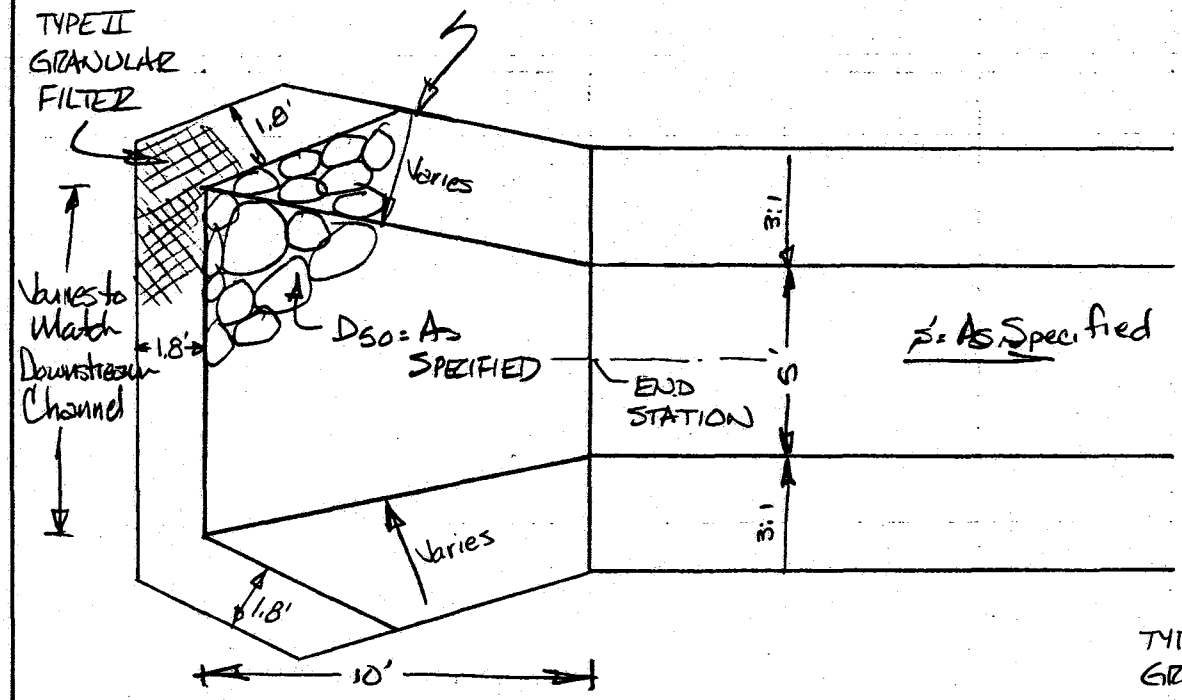
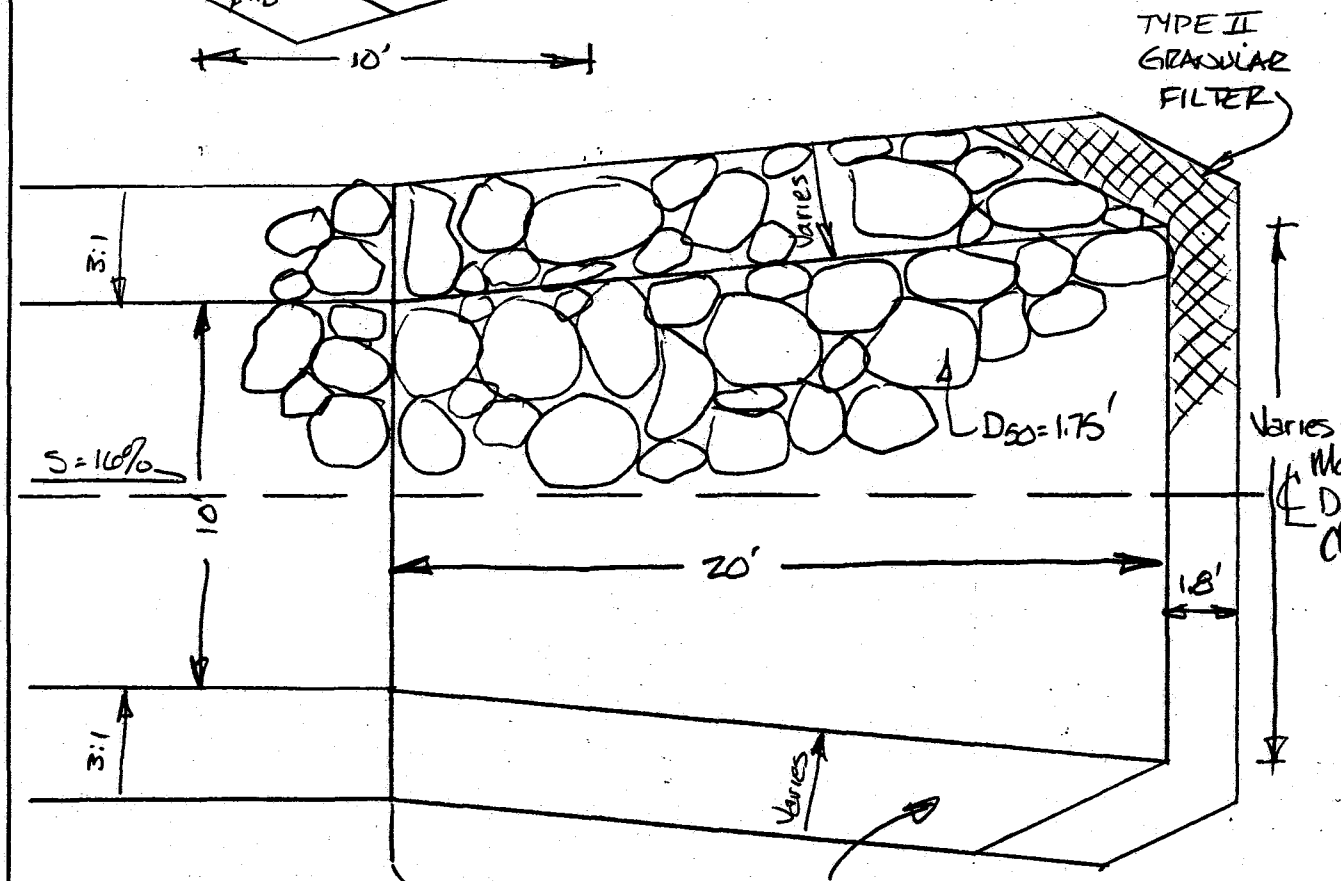
COMPUTED DEH
CHECKED
DATE 22 JAN 90

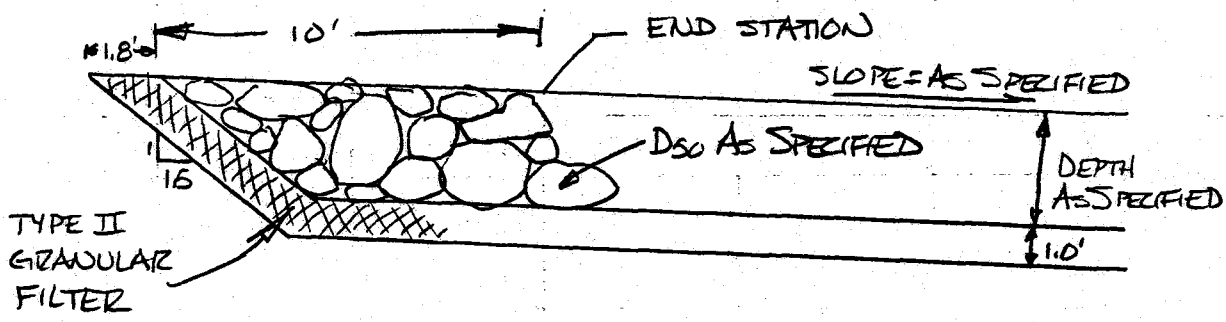
INLET DESIGN - UPPER CHANNEL (RIGHT & LEFT FORKS) STA 25+45
SIDE CHANNEL RIGHT STA 5+30
SIDE CHANNEL LEFT STA 0+60

SIDE SLOPES LAID BACK TO MATCH UPSTREAM CHANNEL. 2H:1V MAXIMUM TYPICAL

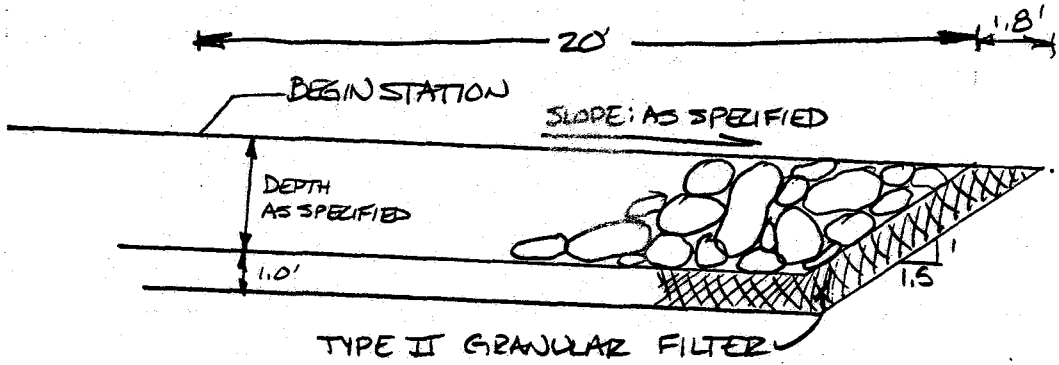




UPSTREAM INLET X-SECTION



DOWNSTREAM OUTLET SECTION



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FEATURE
PROJECT NO. 007.12.100

SHEET 20 OF 21
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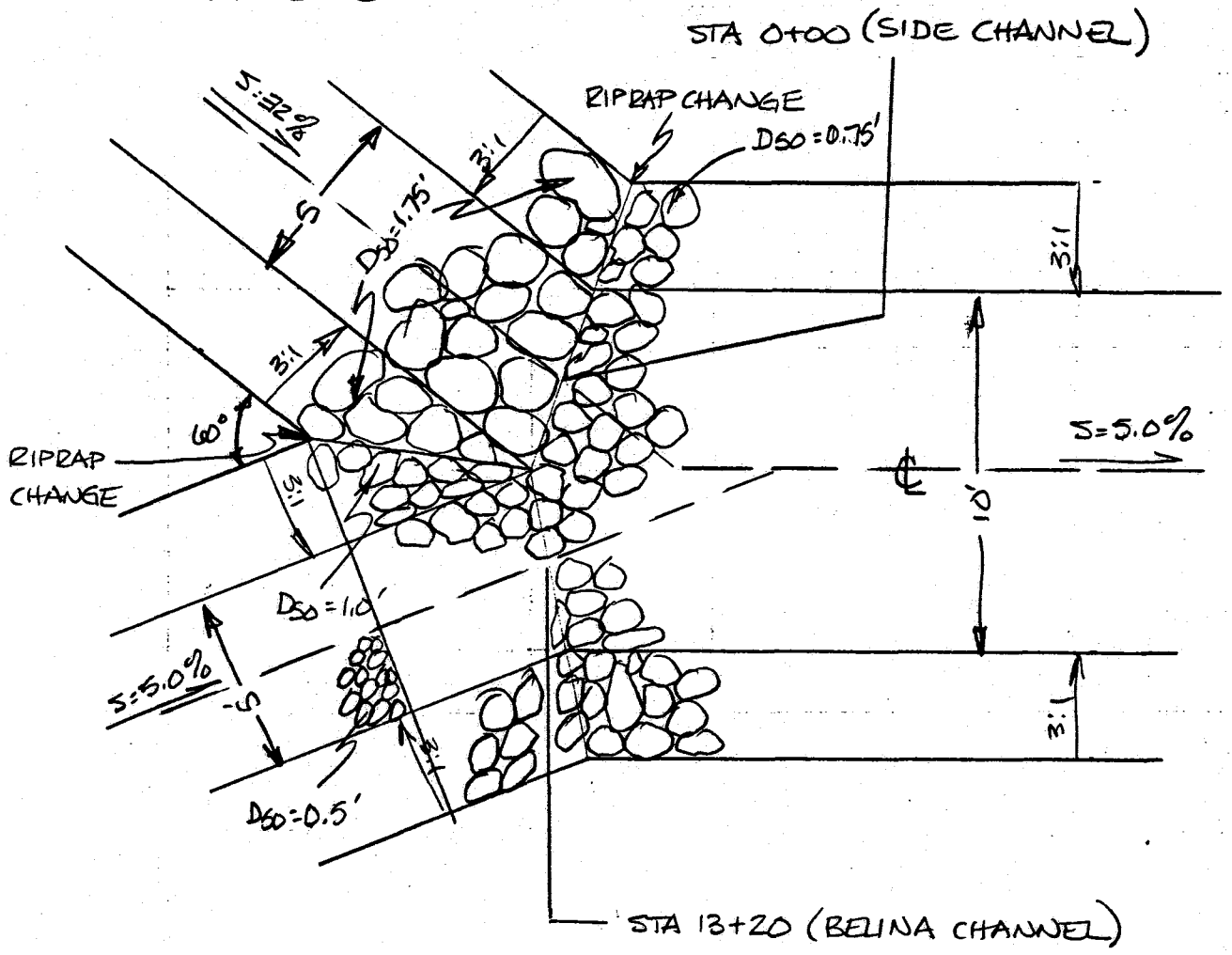
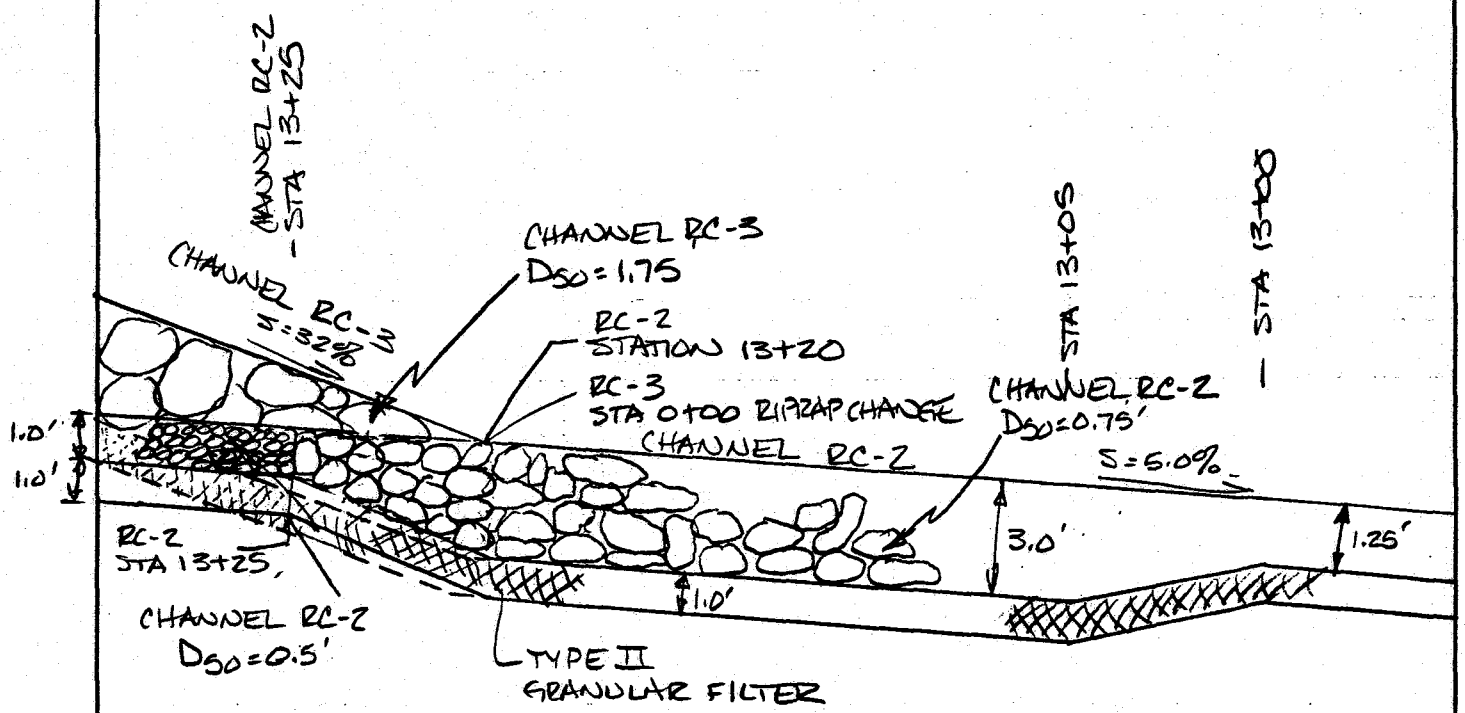
CHECKED
DATE 22 JAN 90

FORK - STA 13+20





JUNCTION CHANNEL RC-2 AND RC-3

NOTE: RIPRAP UPSTREAM OF STATION 13+20 IN CHANNEL RC-2 HAS D_{50} = 0.50 FT. RIPRAP D_{50}=0.75' USED DOWNSTREAM

RECLAIMED CHANNEL RC-1

ADD ADDITIONAL AREA TO C-14-42 DATA

C-14-42 CHARACTERISTICS

A = 242.0 Ac
S = 37.9%
CN = 67.5
P = 2.25 (USE 2.3")
D = 6HR
H_L = 5000'
Q_P = 21.9cfs

ADDITIONAL AREA: CALIBRATE = $\frac{1.43ac}{407}$ = 0.00353

AREA ABOVE C-14-42 = 1.33ac
AREA BELOW C-14-42 = 1.83ac } 3.16ac
AREA USED FOR C-14-42 = 242.00ac
245.2ac

SLOPE:
CONTOUR LENGTH (Add'l. AREA) = 6070'
CONTOUR INTERVAL = 5'

$$S = \frac{6070 * 5 * 100}{3.16 * 43560} = 22.0\%$$

$$\text{AVG SLOPE} = \frac{22 * 3.16 + 37.9 * 242}{245.2} = 37.7\%$$

CURVE NUMBER:

		AREA	Q
RECLAIMED	CN = 80	3.16	0.75
OAK / ASPEN	= 40	123	0.03
SAGE/GRASS	= 75	119	0.54
			$\bar{Q}$ = 0.29

CN = 67.4

H_L = 5000 + 1180 = 6180'

Q_{PEAK} = 23.0cfs

Channel Slopes Lower = 7.7% } USE S_{MAX} = 8%
Upper = 7.9% } S_{MIN} = 7.5%

D_{50} = 1.0' D_{MAX} = 1.75' USE TYPE II GRANULAR FILTER

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-1; 100 Yr 6 Hr

AREA= 245.2 ACRES
AVERAGE BASIN SLOPE= 37.7 PERCENT
CURVE NUMBER= 67.4
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 6180. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3531 HOURS QPCFS= 525.10 CFS QPIN= 2.1237 INCHES
C3= 10.4679 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.19	.8515	.0000	.0000	.0	.00
2.26	.9717	.0000	.0000	26.3	.00
2.33	1.0919	.0031	.0031	163.1	.08
2.40	1.2121	.0118	.0087	348.6	.74
2.47	1.3323	.0256	.0138	482.0	2.87
2.54	1.3996	.0355	.0099	525.1	7.04
2.61	1.4321	.0407	.0053	491.9	12.38
2.68	1.4646	.0463	.0056	415.2	17.19
2.75	1.4971	.0523	.0059	324.7	20.48
2.83	1.5296	.0585	.0063	239.6	22.22
2.90	1.5620	.0651	.0066	168.9	22.89
2.97	1.5945	.0720	.0069	114.7	23.02
3.04	1.6236	.0784	.0064	75.5	23.00
3.11	1.6496	.0843	.0059	48.5	22.94
3.18	1.6756	.0905	.0061	30.4	22.81
3.25	1.7016	.0968	.0063	18.8	22.62
3.32	1.7276	.1033	.0065	11.4	22.42
3.39	1.7536	.1099	.0067	6.8	22.29
3.46	1.7796	.1168	.0068	4.0	22.27
3.53	1.8019	.1228	.0060	2.3	22.37
3.60	1.8198	.1277	.0049	1.3	22.43
3.67	1.8377	.1327	.0050	.8	22.23
3.74	1.8555	.1378	.0051	.4	21.72
3.81	1.8734	.1430	.0052	.2	21.03
3.88	1.8913	.1482	.0052	.1	20.30
3.96	1.9092	.1535	.0053	.0	19.68

HYDROGRAPH PEAK= 23.02 cfs
TIME TO PEAK= 2.97 Hours
RUNOFF VOLUME= 5.80 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:25 AM
Channel Section:	Reclaimed Channel RC-1	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.00	feet
	Calc n Value:	0.040	
	Used:	0.040	
	Min. Bottom Slope:	0.075	ft/ft
	Max. Bottom Slope:	0.080	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.58	feet
	Qn/1.49(S)1/2=	2.261	
	A(R)2/3=	2.263	
	Required Depth:	1.08	feet
	Area:	3.87	ft2
	Perimeter:	8.64	feet
	Hydraulic Radius:	0.45	feet
	Velocity:	5.95	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.57	feet
	Qn/1.49(S)1/2=	2.189	
	A(R)2/3=	2.192	
	Required Depth:	1.07	feet
	Area:	3.78	ft2
	Perimeter:	8.57	feet
	Hydraulic Radius:	0.44	feet
	Velocity:	6.08	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	7.5	%
	Max. Bottom Slope:	8.0	%
	Min Channel Depth:	1.08	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

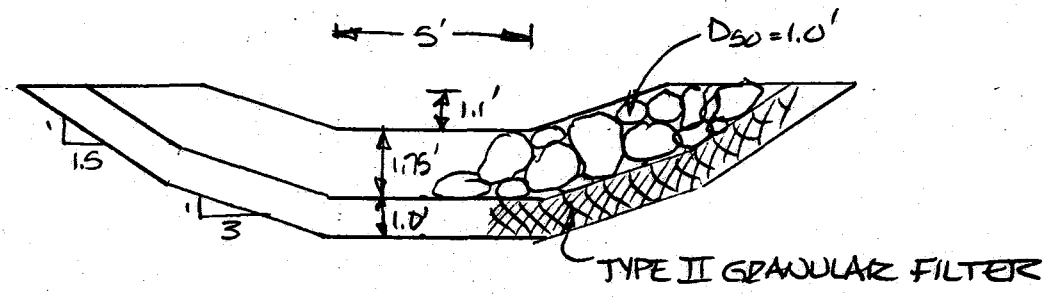
Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:25 AM
Channel Section: Reclaimed Channel RC-1 Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	23.00	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.08	ft/ft
	Max. Bottom Slope:	0.08	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.58	feet
	Depth (Max. S):	0.57	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.00	1.00	feet
T	2.69	2.82	lb/ft2
Nb	0.55	0.58	
Tmax	2.05	2.14	lb/ft2
Ns	0.42	0.44	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	29.55	30.58	degrees
Nsp	0.32	0.34	
SFb	1.58	1.50	
SFs	1.51	1.47	

RC-1 X-SECTION



INLET SECTION

USE SAME AS BELOW EXCEPT

D_{50} = 1.0' ; S = 7.9%

OUTLET SECTION

USE SAME AS BELOW EXCEPT

D_{50} = 1.0' ; S = 7.7% ; MAX OUTLET BOTTOM WIDTH = 10'
FLATTEN SIDE SLOPES TO ZERO AT CHANNEL END

PIPE INLET

DESIGN INLET + OUTLET TO CARRY 100YR-6 HR EVENT

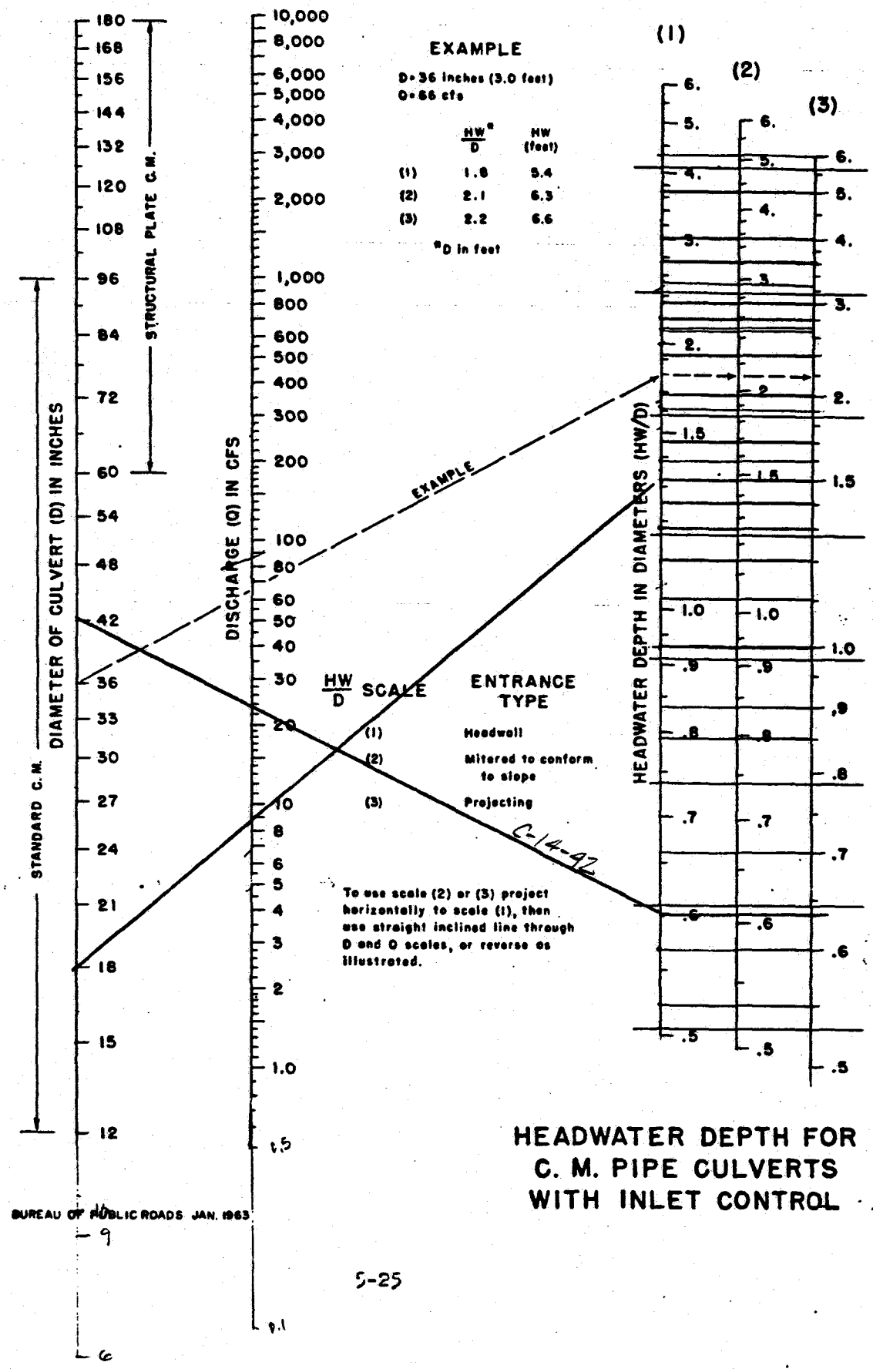
INLET D_{50} CAN USE SAME AS CHANNEL

OUTLET D_{50} BASED UPON CULVERT VELOCITY CHARACTERISTICS.

INLET FLOW (CHART 5) SHOWS HW/d = 0.65

42 * 0.65 = 27.3" = 2.3' RAISE RIPRAP TO D = 3.0'

CHART 5



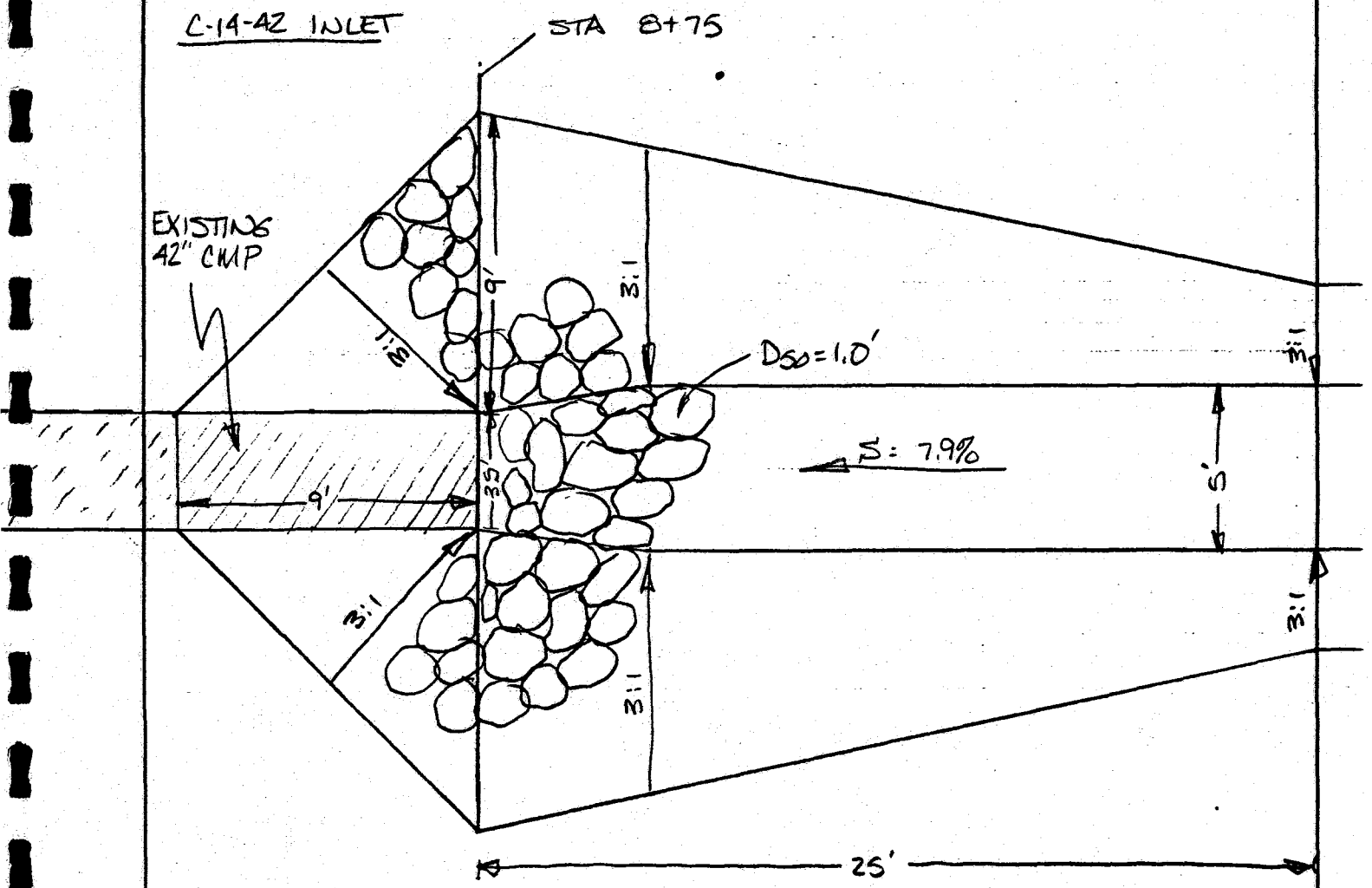
HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

HANSEN ALLEN & LUCE INC

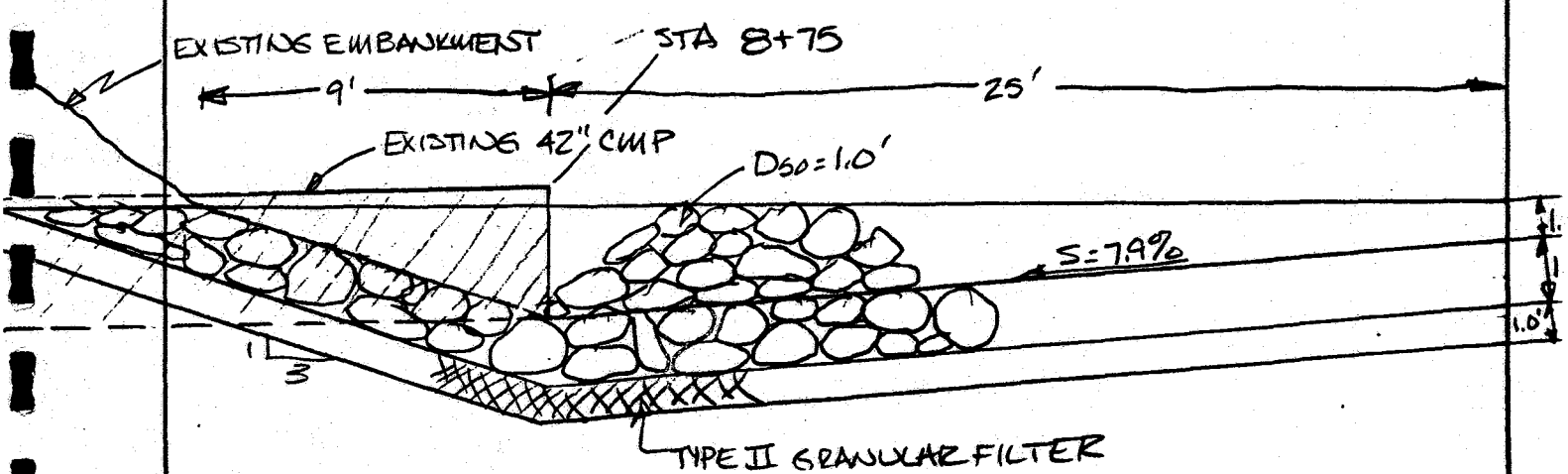
CLIENT VALLEY LAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 7 OF 12
COMPUTED DEH
CHECKED
DATE 25 JAN 90

C-14-42 INLET



C-14-42 INLET



C-14-42 OUTLET

DESIGN USING TRAPEZOIDAL CHANNEL DESIGN WITH b = 3.5'

From design, $D_{50} = 1.25'$; Carry 15' downstream as channel width increases, then return D_{50} to 1.0'. Also take Channel depth from normal depth + 1.0' @ OUTLET to design depth.

Calc. y_n: $Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$ Assume $S = \frac{10}{120} * 100 = 8.3\%$

$\frac{Qn}{1.49 S^{1/2}} = 1.283$

Y	$AR^{2/3}$	
1.0	1.568	A = 1.96
0.9	1.275	→ V = 11.75
0.91	1.303	

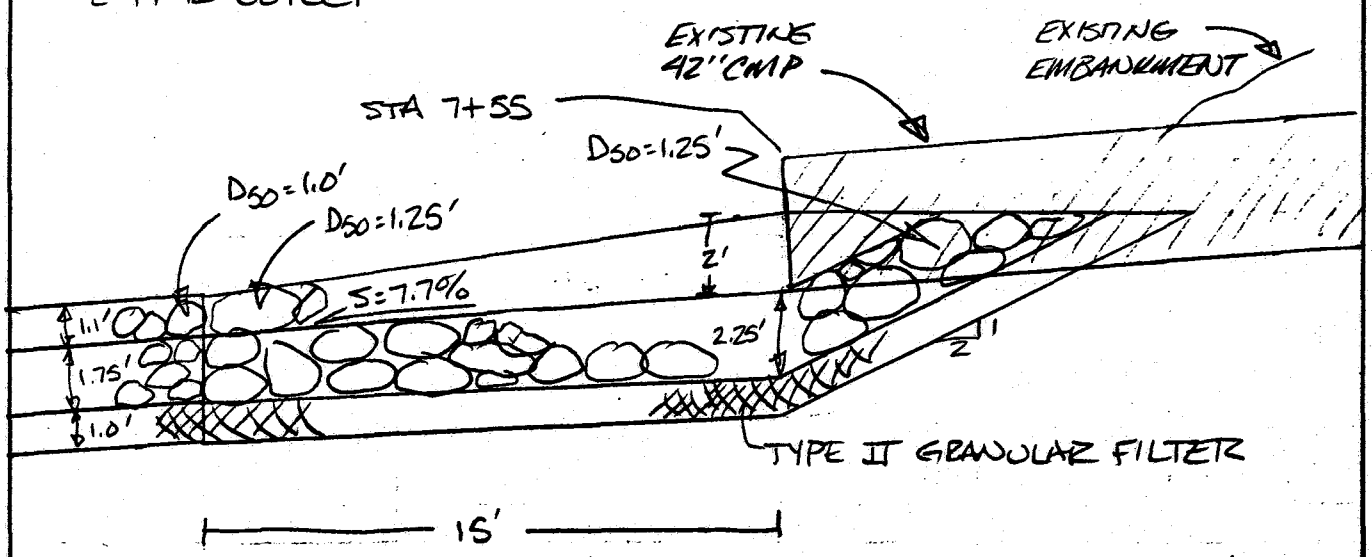
If S = 5% $\frac{Qn}{1.49 S^{1/2}} = 1.657$

Y	$AR^{2/3}$
1.1	1.885
1.05	1.724
1.01	1.596
1.02	1.629

Depth didn't change much, Start w/ Riprap depth = 2.0'

$D_{50} = 1.25'$, $D_{max} = 2.25'$
$D_{50} = 1.0'$, $D_{max} = 1.75'$

C-14-42 OUTLET



Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:27 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	3.5	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.25	feet
	Calc n Value:	0.041	
	Used:	0.041	
	Min. Bottom Slope:	0.077	ft/ft
	Max. Bottom Slope:	0.077	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.68	feet
	Qn/1.49(S)1/2=	2.287	
	A(R)2/3=	2.286	
	Required Depth:	1.18	feet
	Area:	3.73	ft2
	Perimeter:	7.77	feet
	Hydraulic Radius:	0.48	feet
	Velocity:	6.17	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.68	feet
	Qn/1.49(S)1/2=	2.287	
	A(R)2/3=	2.286	
	Required Depth:	1.18	feet
	Area:	3.73	ft2
	Perimeter:	7.77	feet
	Hydraulic Radius:	0.48	feet
	Velocity:	6.17	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	3.5	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	7.7	%
	Max. Bottom Slope:	7.7	%
	Min Channel Depth:	1.18	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:27 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	23.00	cfs
	Bottom Width:	3.50	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.08	ft/ft
	Max. Bottom Slope:	0.08	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.68	feet
	Depth (Max. S):	0.68	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

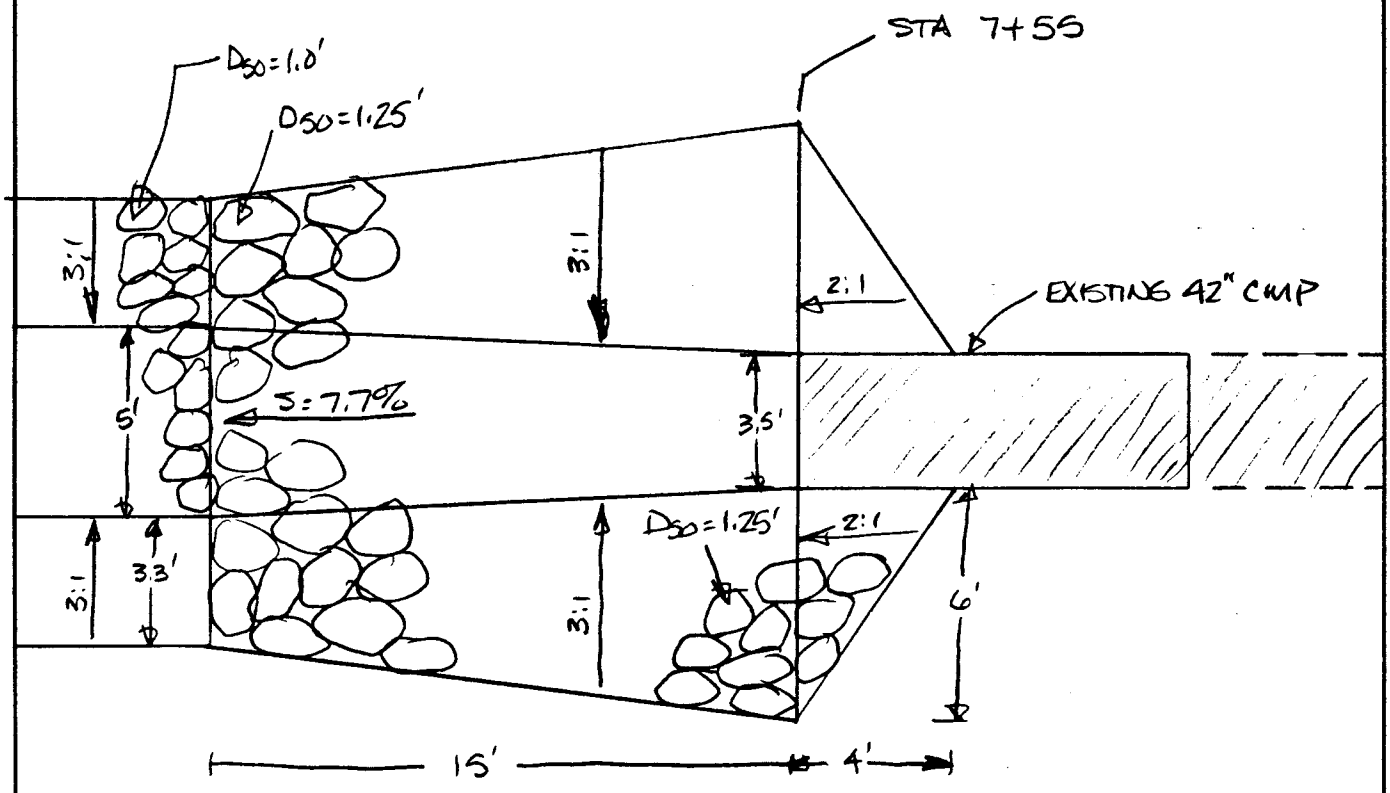
	Smin	Smax	
D50	1.25	1.25	feet
T	3.24	3.24	lb/ft2
Nb	0.53	0.53	
Tmax	2.46	2.46	lb/ft2
Ns	0.40	0.40	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	28.67	28.67	degrees
Nsp	0.31	0.31	
SFb	1.62	1.62	
SFs	1.53	1.53	

HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 11 OF 12
COMPUTED DEH
CHECKED
DATE 25 JAN 90

C-14-A2 OUTLET

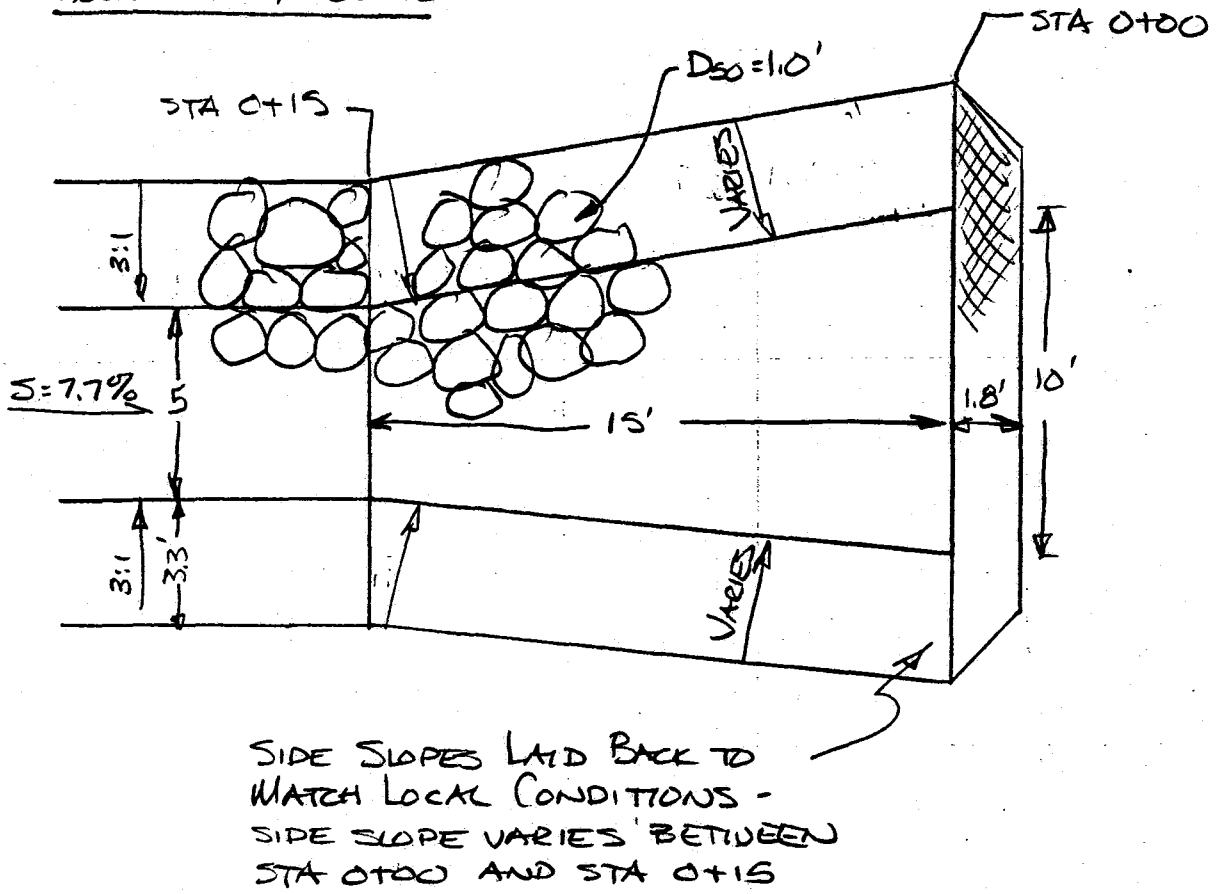


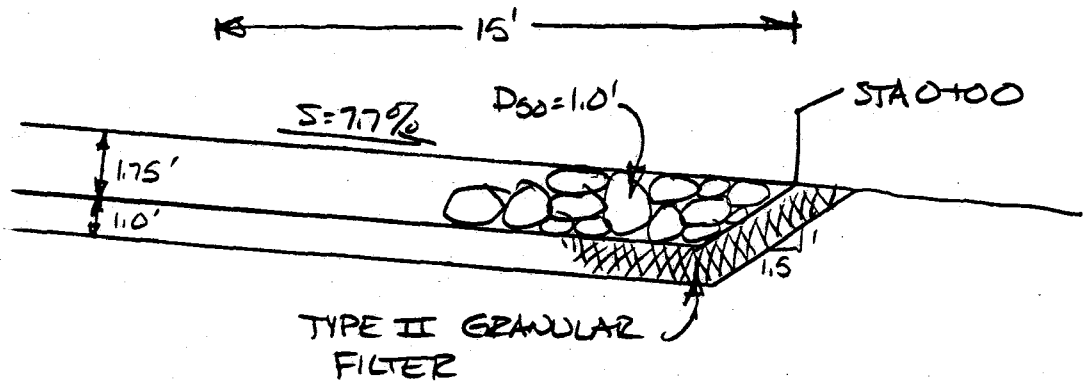
HANSEN ALLEN & LUCE INC

CLIENT: VALLEY CAMP
PROJECT: RECLAMATION
FEATURE:
PROJECT NO.: 007.12.100

SHEET 12 OF 12
COMPUTED: DEH
CHECKED:
DATE: 25 JAN 90

VALCAN RC-1 OUTLET





APPENDIX R614-301-760

Channel Reclamation Calculations

APPENDIX R614-301-800

Bonding and Insurance

Last Revised, July 1989
RECLAMATION AGREEMENT

Permit Number ACT/007/001
Date Permit Issued 8-24-84
Effective Date of Agreement 11-30-89

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

COAL RECLAMATION AGREEMENT

--ooOOoo--

For the purposes of this RECLAMATION AGREEMENT the terms below are defined as follows:

"PERMIT" (Mine Permit No.)	ACT/007/001 (County) Carbon
"MINE" (Name of Mine)	Belina Complex
"OPERATOR" (Company or Name)	Valley Camp of Utah, Inc.
(Address)	Scofield Route Helper, Utah 84526
"OPERATOR'S REGISTERED AGENT" (Name)	W. L. Wright, President & Chief Operating Officer
(Address)	Scofield Route Helper, Utah 84526
(Phone)	(801) 448-9456
"COMPANY OFFICERS":	James L. Litman, Vice President & Chief Executive Officer
"BOND TYPE" (Form of Bond)	Performance
"BOND" (Bond Amount-Dollars)	2.3 Million
(Year-Dollars)	1989
INSTITUTION (Bank or Agency)	Federal Insurance Company
POLICY OR ACCOUNT NUMBER	8099-56-50
"LIABILITY INSURANCE" (Exp.)	
(Insurance Company)	The Home Indemnity Company
"STATE":	Utah (Department of Natural Resources)
"DIVISION":	Division of Oil, Gas and Mining
"DIVISION DIRECTOR"	Dianne R. Nielson

EXHIBITS:

		Revision Dates		
"SURFACE DISTURBANCE"	Exhibit "A"			
"BONDING AGREEMENT"	Exhibit "B"			
"LIABILITY INSURANCE"	Exhibit "C"			
"STIPULATION TO CHANGE BOND"	Exhibit "D"			

RECLAMATION AGREEMENT

This RECLAMATION AGREEMENT (hereinafter referred to as "Agreement") is entered into by the Operator.

WHEREAS, on 8-24, 1989, the Division approved the Permit Application Package, hereinafter "PAP", submitted by Valley Camp of Utah, Inc., hereinafter "Operator"; and

WHEREAS, prior to issuance of a permit to conduct mining and reclamation operations on the property described in the PAP, hereinafter "Property", the Operator is obligated by Title 40-10-1, et seq., Utah Code Annotated (1953, as amended), hereinafter "Act", to file with the Division a bond ensuring the performance of the reclamation obligations in the manner and by the standards set forth in the PAP, the Act, and the State of Utah Division of Oil, Gas and Mining Rules pertaining to Coal Mining and Reclamation Activities, hereinafter "Rules"; and

WHEREAS, the Operator is ready and willing to file the bond in the amount and in a form acceptable to the Division and to perform all obligations imposed by the Division relating to the reclamation of the Property; and

WHEREAS, the Division is ready and willing to issue the subject a mining and reclamation permit upon acceptance and approval of the bond.

NOW, THEREFORE, the Division and the Operator agree as follows:

1. The provisions of the Act and the Rules are incorporated by reference herein and hereby made a part of this Agreement. Provisions of the Act or Rules shall supercede conflicting provisions of this Agreement.

2. The Operator shall provide a legal description of the property including the number of acres approved by the Division to be disturbed by surface mining and reclamation operations during the permit period. The description is attached as Exhibit "A", and is incorporated by reference and shall be referred to as the "Surface Disturbance".

3. The Operator shall provide a bond to the Division in the form and amount acceptable to the Division ensuring the performance of the reclamation obligations in the manner and by the standards set forth in the PAP, the Act and the Rules. Said bond is attached as Exhibit "B" and is incorporated by reference.

4. The Operator shall maintain in full force and effect the public liability insurance policy submitted as part of the permit application. The Division shall be listed as an additional insured on said policy.

5. In the event that the Surface Disturbance is increased through expansion of the coal mining and reclamation operations or decreased through partial reclamation, the Division shall adjust the bond as appropriate.

6. The Operator does hereby jointly and severally agree to indemnify and hold harmless the State of Utah and the Division from any claim, demand, liability, cost, charge, or suit initiated by a third party as a result of the Operator or Operator's agent or employees failure to abide by the terms and conditions of the approved PAP and this Agreement.

7. The terms and conditions of this Agreement are non-cancellable until such time as the Operator has satisfactorily, as determined by the Division, reclaimed the Surface Disturbance in accordance with the approved PAP, the Act, and the Rules. Notwithstanding the above, the Division may direct, or the Operator may request and the Division may approve, a modification to this Agreement.

8. The Operator may, at any time, submit a request to the Division to substitute the bonding method. The Division may approve the substitution if the bond meets the requirements of the Act and the Rules, but no bond shall be released until the Division has approved and accepted the replacement bond.

9. Any revision in the Surface Disturbance, the bond amount, the bond type, the liability insurance amount coverage, and/or the liability insurance company, or other revisions affecting the terms and conditions of this Agreement shall be submitted on the form entitled "Stipulation to Revise Reclamation Agreement" and shall be attached hereto as Exhibit "D".

10. This Agreement shall be governed and construed in accordance with the laws of the State. The Operator shall be liable for all costs required to comply with this agreement, including any attorney fees.

11. Any breach of the provisions of this Agreement, the Act, the Rules, or the PAP may, at the discretion of the Division, result in an order to cease coal mining and reclamation operations, revocation of the Operator's permit to conduct coal mining and reclamation operations and/or forfeiture of the bond.

RECLAMATION AGREEMENT

12. In the event of forfeiture, the Operator shall be liable for additional costs in excess of the bond amount which are required to comply with this Agreement. Any excess monies resulting from the forfeiture of the bond amount upon compliance with this contract shall be refunded to the appropriate party.

13. Each signatory below represents that he/she is authorized to execute this Agreement on behalf of the named party. Proof of such authorization is provided on a form acceptable to the Division and is attached hereto.

SO AGREED this 17th day of December, 1989

STATE OF UTAH:

Dianne R. Nielson, Director
Division of Oil, Gas and Mining

OPERATOR:

Walter L Wright
Company Officer - Position
Walter L. Wright, President & COO

Company Officer - Position
J.L. Litman
Vice Chairman & CEO

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

EXHIBIT "A"

SURFACE DISTURBANCE

LEGAL DESCRIPTION

Permit Number ACT/007/001
Effective Date

SURFACE DISTURBANCE
--ooOOoo--

In accordance with the RECLAMATION AGREEMENT, the OPERATOR intends to conduct coal mining and reclamation activities on or within the surface DISTURBANCE as described hereunder:

Total acres of SURFACE DISTURBANCE 79

Legal Description of SURFACE DISTURBANCE:

T.13S., R.7E., SLB&M

Parts of Section 8, 9, 17, 16, 19 & 30

EXHIBIT "B"

BONDING AGREEMENT

Surety Bond

Last Revised, July 1989
Exhibit "B" - BONDING AGREEMENT
SURETY BOND

Permit Number ACT/007/001
Expiration Date _____

(FEDERAL COAL)
SURETY BOND
--ooOOoo--

THIS SURETY BOND entered into and by and between the undersigned OPERATOR, and SURETY COMPANY, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors and assigns unto the State of Utah, Division of Oil, Gas and Mining, and, the U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE) in the penal sum of ($ 2,300,000.00 *) (Surety Bond Amount) for the timely performance of reclamation responsibilities of the surface disturbance described in Exhibit "A" of this Reclamation Agreement.

This SURETY BOND shall remain in effect until all applicable rules and the OPERATOR's reclamation obligation have been met and released by the Division of Oil, Gas and Mining.

Terms for release or adjustment of this BOND are as written and agreed to by the DIVISION and the OPERATOR in the RECLAMATION AGREEMENT incorporated by reference herein, to which this SURETY AGREEMENT has been attached as Exhibit "B".

* Bond Number 8099-56-50

Last Revised, July 1989
Exhibit "B" - BONDING AGREEMENT
SURETY BOND

So agreed this 17th day of November, 19 89.

FOR THE OPERATOR:

Valley Camp of Utah, Inc.
Operator (Company

Walter L Wright
Company Officer - Position
Walter L. Wright, President & COO

FOR THE SURETY COMPANY:

Federal Insurance Company
Surety (Company)

John Hunt
Company Officer - Position Attorney-in-Fact

ACCEPTED BY THE STATE OF UTAH:

Dianne R. Nielson
Director - Division of Oil, Gas and Mining

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

CHUBB GROUP of Insurance Companies

CHUBB

15 Mountain View Road, Warren, NJ 07060

COMPANY

RIDER to be attached to and form a part of
Bond No. 8099-56-50 wherein
FEDERAL INSURANCE COMPANY
is named as Surety, on behalf of
Valley Camp of Utah, Inc.
as Principal, in favor of State of Utah, Div. of Oil, Gas and Mining, and
U. S. Dept. of the Interior, Office of Surface Mining
in the sum of $1,521,000.00
dated 6/29/84 effective 6/29/84

IT IS HEREBY UNDERSTOOD AND AGREED that effective the 17th day of November, 1989
the penalty of this bond is increased
from One Million, Five Hundred Twenty One Thousand and 00/100 ($1,521,000.00)
to Two Million, Three Hundred Thousand and 00/100 ($2,300,000.00)
as to losses occurring after the 17th day of November, 1989

Provided, however, that the liability of the Principal and Surety hereon shall not be cumulative or in any event exceed the larger amount referred to herein.

The attached bond shall be subject to all its agreements, limitations and conditions except as herein expressly modified.

Signed, sealed and dated this 14th day of November, 19 89

Valley Camp of Utah, Inc.

By: Walter L Wright
(Principal)

Federal Insurance Company:

By: Mary Elizabeth Hammock
Mary Elizabeth Hammock, Attorney-in-Fact

ACCEPTED

By: [illegible]
(Obligee)

Form 15-02-72 (Ed. 8-75) (Formerly 12451)

PRINTED IN U.S.A.

POWER OF ATTORNEY

Know all Men by these Presents, That the **FEDERAL INSURANCE COMPANY**, 15 Mountain View Road, Warren, New Jersey, a New Jersey Corpo tion, has constituted and appointed, and does hereby constitute and appoint John W. Hunt, Ronald W. Brown, Mary Elizabeth Hammock, Muriel L. Hoh, M. Joan Norville of Winston Salem, North Carolina and Thomas W. Burk and Teresa T. Gwyn of Charlotte, North Carolina----------

each its true and lawful Attorney-in-Fact to execute under such designation in its name and to affix its corporate seal to and deliver for and on its behalf surety thereon or otherwise, bonds of any of the following classes, to-wit:

1. Bonds and Undertakings filed in any suit, matter or proceeding in any Court, or filed with any Sheriff or Magistrate, for the doing or not doing of anything specified in such Bond or Undertaking.
2. Surety bonds to the United States of America or any agency thereof, including those required or permitted under the laws or regulations relating to Custo or Internal Revenue; License and Permit Bonds or other indemnity bonds under the laws, ordinances or regulations of any State, City, Town, Villa Board or other body or organization, public or private; bonds to Transportation Companies, Lost Instrument bonds; Lease bonds, Workers' Compensation bonds, Miscellaneous Surety bonds and bonds on behalf of Notaries Public, Sheriffs, Deputy Sheriffs and similar public officials.
3. Bonds on behalf of contractors in connection with bids, proposals or contracts.

In Witness Whereof, the said **FEDERAL INSURANCE COMPANY** has, pursuant to its By-Laws, caused these presents to be signed by its Assistant Vice-President and Assistant Secretary and its corporate seal to be hereto affixed this 1st day of January 19 86

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

Richard D. O'Connor
Assistant Secretary

FEDERAL INSURANCE COMPANY
By
George McClellan
Assistant Vice-President

STATE OF NEW JERSEY
County of Somerset } SS.

On this 1st day of January 19 86, before me personally came Richard D. O'Connor to me known and by me known to be Assistant Secretary of the FEDERAL INSURANCE COMPANY, the corporation described in and which executed the foregoing Power of Attorney, and the said Richard D. O'Connor being by me duly sworn, did depose and say that he is Assistant Secretary of the FEDERAL INSURANCE COMPANY and knows the corporate seal thereof; that the seal affixed to the foregoing Power of Attorney is such corporate seal and was thereto affixed by authority of the By-La of said Company, and that he signed said Power of Attorney as Assistant Secretary of said Company by like authority; and that he is acquainted with George McClellan and knows him to be the Assistant Vice-Presid of said Company, and that the signature of said George McClellan subscribed to said Power of Attorney is in the genuine handwriting of said George McClellan and was thereto subscribed by authority of s By-Laws and in deponent's presence.

Notarial Seal

ALICE LEONARD NOTARY PUBLIC NEW JERSEY

Acknowledged and Sworn to before me
on the date above written.

ALICE LEONARD Notary Public

CERTIFICATION NOTARY PUBLIC OF NEW JERSEY
My Commission Expires June 28, 1988

STATE OF NEW JERSEY
County of Somerset } SS.

I, the undersigned, Assistant Secretary of the **FEDERAL INSURANCE COMPANY**, do hereby certify that the following is a true excerpt from the By-Laws of the said Company as adopted by its Board of Direct on March 11, 1953 and most recently amended March 11, 1983 and that this By-Law is in full force and effect.

"ARTICLE XVIII.

Section 2. All bonds, undertakings, contracts and other instruments other than as above for and on behalf of the Company which it is authorized by law or its charter to execute, may and shall be executed in the name and on behalf of the Company either by the Chairman or the Vice-Chairman or the President or a Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations, except that any one or more officers or attorneys-in-fact designated in any resolution of the Board of Directors or the Executive Committee, or in any power of attorney executed as provided for in Section 3 below, may execute any such bond, undertaking or other obligation as provided in such resolution or power of attorney.

Section 3. All powers of attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman or the Vice-Chairman or the President or a Vice-President or an Assistant Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed."

I further certify that said **FEDERAL INSURANCE COMPANY** is duly licensed to transact fidelity and surety business in each of the States of the United States of America, District of Columbia, Puerto Rico, and each of the Provinces of Canada with the exception of Prince Edward Island; and is also duly licensed to become sole surety on bonds, undertakings, etc., permitted or required by law.

I, the undersigned Assistant Secretary of **FEDERAL INSURANCE COMPANY**, do hereby certify that the foregoing Power of Attorney is in full force and effect.

Given under my hand and the seal of said Company at Warren, N.J., this 14th day of November 19 89

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

T. Mabley
Assistant Secretary

Form 21-10-0333 (Rev. 2-87) GENERAL

PRINTED IN U.S.A.

EXHIBIT "C"

LIABILITY INSURANCE

Revised November, 1987.

RECEIVED
JAN 22 1988
DIVISION OF
OIL, GAS & MINING

CERTIFICATE OF LIABILITY INSURANCE
Issued to:
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
--ooOOoo--

THIS IS TO CERTIFY THAT:

The Home Indemnity Company
(Name of Insurance Company)
P.O. Box 5160
Manchester, NH 03108
(Home Office Address of Insurance Company)

HAS ISSUED TO:

Valley Camp of Utah, Inc.*
(Name of Permit Applicant)
*Please refer to Item 13 of the Named Insured Endorsement on the policy

Valley Camp of Utah, Inc. (Mine Name)

ACT/007/001 (Permit Number)

CERTIFICATE OF INSURANCE:

GL 99 48 43 (Policy Number)

April 1, 1987 (Effective Date)

UNDER THE FOLLOWING TERMS AND CONDITIONS:

As Per UMC/SMC Part 800.60 Terms and Conditions for Liability Insurance;

A. The Division shall require the applicant to submit as part of its permit application a certificate issued by an insurance company authorized to do business in the state of Utah certifying that the applicant has a public liability insurance policy in force for the surface coal mining and reclamation operations for which the permit is sought. Such policy shall provide for personal injury and property damage protection in an amount adequate to compensate any persons injured or property damaged as a result of the surface coal mining and reclamation operations, including the use of explosives and who are entitled to compensation under the applicable provisions of state law. Minimum insurance coverage for bodily injury and property damage shall be $300,000 for each occurrence and $500,000 aggregate.

B. The policy shall be maintained in full force during the life of the permit or any renewal thereof, including the liability period necessary to complete all reclamation operations under this chapter.

CERTIFICATE OF LIABILITY INSURANCE

C. The policy shall include a rider requiring that the insurer notify the Division whenever substantive changes are made in the policy including any termination or failure to renew.

40-10-10 IN ACCORDANCE WITH THE ABOVE TERMS AND CONDITIONS, and the Utah Code Annotated ~~40-10-1 et seq~~., the Insurance Company hereby attests to the fact that coverage for said Permit Applicant is in accordance with the above stated requirements of the State of Utah and agrees to notify the Division of Oil, Gas and Mining in writing of any substantive change, including cancellation, failure to renew, or other material change. No change shall be effective until at least thirty (30) days after such notice is received by the Division.
NOTE: The stated policy contains an Absolute Pollution Exclusion

UNDERWRITING AGENT:

Patricia W. Settlemyre (Agent's Name) — 919/768-4190 (Phone)

Alexander & Alexander of the Carolinas Inc. (Company Name)

P. O. Box 2896 (Mailing Address) — Winston-Salem, NC 27102 (City, State, Zip Code)

The undersigned affirms that the above information is true and complete to the best of his or her knowlege and belief, and that he or she is an authorized representative of the above-named insurance company.

1-14-88, Patricia W. Settlemyre, Asst. Surety Manager
(Date, Signature and Title of Authorized Agent of Insurance Company)

Signed and sworn before me by Gloria M. Cook (Name)

this 14 day of February, 1988

Gloria M. Cook
(Signature)

My Commission Expires: 2-26-89
(Date)

7000R-28

EXHIBIT "D"

STIPULATION TO REVISE RECLAMATION AGREEMENT

Last Revised, July 1989
Exhibit "D" - STIPULATION TO REVISE RECLAMATION AGREEMENT

Permit Number ACT/007/001
Expiration Date _____

COAL
STIPULATION TO REVISE RECLAMATION AGREEMENT
--ooOOoo--

This STIPULATION TO REVISE RECLAMATION AGREEMENT entered into by and between the OPERATOR and DIVISION incorporates the following revisions or changes to the RECLAMATION AGREEMENT: (Identify and Describe Revisions Below)

The attached rider increases the existing bond amount.

In accordance with this STIPULATION TO REVISE RECLAMATION AGREEMENT, the following Exhibits have been replaced by the OPERATOR and are approved by the DIVISION:

x Replace the RECLAMATION AGREEMENT in its entirety.

__ Replace Exhibit "A" - SURFACE DISTURBANCE.

x Replace Exhibit "B" - BONDING AGREEMENT.

__ Replace Exhibit "C" - LIABILITY INSURANCE.

The BONDING amount is revised from ($ 1,521,000) to ($ 2,300,000).

The SURFACE DISTURBANCE is revised from _____ acres to _____ acres.

The EXPIRATION DATE is revised from _____ to _____.

Last Revised, July 1989
Exhibit "D" - STIPULATION TO REVISE RECLAMATION AGREEMENT

SO AGREED THIS 17th DAY OF November, 19 89.

FOR THE STATE OF UTAH:

Dianne R. Nielson
Director, Division of Oil, Gas and Mining

FOR THE OPERATOR:

Walter L Wright
Company Officer - Position
Walter L. Wright, President & COO

Company Officer - Position
J.L. Litman
Vice Chairman & CEO

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

CHUBB GROUP of Insurance Companies

CHUBB

15 Mountain View Road, Warren, NJ 07060

COMPANY

RIDER to be attached to and form a part of
Bond No. 8099-56-50 wherein
FEDERAL INSURANCE COMPANY
is named as Surety, on behalf of
Valley Camp of Utah, Inc.
as Principal, in favor of State of Utah, Div. of Oil, Gas and Mining, and
U. S. Dept. of the Interior, Office of Surface Mining
in the sum of $1,521,000.00
dated 6/29/84 effective 6/29/84

IT IS HEREBY UNDERSTOOD AND AGREED that effective the 17th day of November, 1989
the penalty of this bond is increased
from One Million, Five Hundred Twenty One Thousand and 00/100 ($1,521,000.00)
to Two Million, Three Hundred Thousand and 00/100 ($2,300,000.00)
as to losses occurring after the 17th day of November, 1989

Provided, however, that the liability of the Principal and Surety hereon shall not be cumulative or in any event exceed the larger amount referred to herein.

The attached bond shall be subject to all its agreements, limitations and conditions except as herein expressly modified.

Signed, sealed and dated this 14th day of November, 19 89

Valley Camp of Utah, Inc.

By: Walter L Wright
(Principal)

Federal Insurance Company:

By: Mary Elizabeth Hammock
Mary Elizabeth Hammock, Attorney-in-Fact

ACCEPTED

By: Donna P. Nelson
(Obligee)

Form 15-02-72 (Ed. 8-75) (Formerly 12451)

PRINTED IN U.S.A.

POWER OF ATTORNEY

Know all Men by these Presents, That the FEDERAL INSURANCE COMPANY, 15 Mountain View Road, Warren, New Jersey, a New Jersey Corporation, has constituted and appointed, and does hereby constitute and appoint John W. Hunt, Ronald W. Brown, Mary Elizabeth Hammock, Muriel L. Hoh, M. Joan Norville of Winston Salem, North Carolina and Thomas W. Burke and Teresa T. Gwyn of Charlotte, North Carolina----------

each its true and lawful Attorney-in-Fact to execute under such designation in its name and to affix its corporate seal to and deliver for and on its behalf surety thereon or otherwise, bonds of any of the following classes, to-wit:

1. Bonds and Undertakings filed in any suit, matter or proceeding in any Court, or filed with any Sheriff or Magistrate, for the doing or not doing of anything specified in such Bond or Undertaking.
2. Surety bonds to the United States of America or any agency thereof, including those required or permitted under the laws or regulations relating to Customs or Internal Revenue; License and Permit Bonds or other indemnity bonds under the laws, ordinances or regulations of any State, City, Town, Village, Board or other body or organization, public or private; bonds to Transportation Companies, Lost Instrument bonds; Lease bonds, Workers' Compensation bonds, Miscellaneous Surety bonds and bonds on behalf of Notaries Public, Sheriffs, Deputy Sheriffs and similar public officials.
3. Bonds on behalf of contractors in connection with bids, proposals or contracts.

In Witness Whereof, the said FEDERAL INSURANCE COMPANY has, pursuant to its By-Laws, caused these presents to be signed by its Assistant Vice-President and Assistant Secretary and its corporate seal to be hereto affixed this 1st day of January 19 86

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

Richard D. O'Connor
Assistant Secretary

FEDERAL INSURANCE COMPANY
By
George McClellan
Assistant Vice-President

STATE OF NEW JERSEY
County of Somerset } ss.

On this 1st day of January 1986, before me personally came Richard D. O'Connor to me known and by me known to be Assistant Secretary of the FEDERAL INSURANCE COMPANY, the corporation described in and which executed the foregoing Power of Attorney, and the said Richard D. O'Connor being by me duly sworn, did depose and say that he is Assistant Secretary of the FEDERAL INSURANCE COMPANY and knows the corporate seal thereof; that the seal affixed to the foregoing Power of Attorney is such corporate seal and was thereto affixed by authority of the By-Laws of said Company, and that he signed said Power of Attorney as Assistant Secretary of said Company by like authority; and that he is acquainted with George McClellan and knows him to be the Assistant Vice-President of said Company, and that the signature of said George McClellan subscribed to said Power of Attorney is in the genuine handwriting of said George McClellan and was thereto subscribed by authority of said By-Laws and in deponent's presence.

Notarial Seal

ALICE LEONARD NOTARY PUBLIC NEW JERSEY

Acknowledged and Sworn to before me
on the date above written.

ALICE LEONARD Notary Public

CERTIFICATION NOTARY PUBLIC OF NEW JERSEY
My Commission Expires June 28, 1988

STATE OF NEW JERSEY
County of Somerset } ss.

I, the undersigned, Assistant Secretary of the FEDERAL INSURANCE COMPANY, do hereby certify that the following is a true excerpt from the By-Laws of the said Company as adopted by its Board of Directors on March 11, 1953 and most recently amended March 11, 1983 and that this By-Law is in full force and effect.

"ARTICLE XVIII.

Section 2. All bonds, undertakings, contracts and other instruments other than as above for and on behalf of the Company which it is authorized by law or its charter to execute, may and shall be executed in the name and on behalf of the Company either by the Chairman or the Vice-Chairman or the President or a Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations, except that any one or more officers or attorneys-in-fact designated in any resolution of the Board of Directors or the Executive Committee, or in any power of attorney executed as provided for in Section 3 below, may execute any such bond, undertaking or other obligation as provided in such resolution or power of attorney.

Section 3. All powers of attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman or the Vice-Chairman or the President or a Vice-President or an Assistant Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed."

I further certify that said FEDERAL INSURANCE COMPANY is duly licensed to transact fidelity and surety business in each of the States of the United States of America, District of Columbia, Puerto Rico, and each of the Provinces of Canada with the exception of Prince Edward Island; and is also duly licensed to become sole surety on bonds, undertakings, etc., permitted or required by law.

I, the undersigned Assistant Secretary of FEDERAL INSURANCE COMPANY, do hereby certify that the foregoing Power of Attorney is in full force and effect.

Given under my hand and the seal of said Company at Warren, N.J., this 14th day of November 19 89

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

T. Mabley
Assistant Secretary

Form 21-10-0333 (Rev. 2-84) GENERAL

PRINTED IN U.S.A.

AFFIDAVITS OF QUALIFICATION

Last Revised, July 1989

AFFIDAVIT OF QUALIFICATION
OPERATOR
--ooOOoo--

I, Walter L. Wright, being first duly sworn under oath, deposes and says that he/~~she~~ is the (officer or agent) President & COO of Valley Camp of Utah, Inc. ; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said OPERATOR is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

(Signed) Walter L Wright
Name - Position
Walter L. Wright
President & COO

Subscribed and sworn to before me this 27th day of November, 1989.

Valerie A. Young
Notary Public

My Commission Expires:
Valerie A. Young
Carbon County, Utah
My Commission Expires August 12, 1990
_____, 19 ____.

Attest:

STATE OF Utah)
) ss:
COUNTY OF Carbon)

Last Revised, July 1989

AFFIDAVIT OF QUALIFICATION
OPERATOR
--ooOOoo--

I, James L. Litman, being first duly sworn under oath, deposes and says that he/~~she~~ is the (officer or agent) Vice Chairman & CEO of Valley Camp of Utah, Inc. ; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said OPERATOR is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

(Signed) James L. Litman
Name - Position
James L. Litman
Vice Chairman & CEO

Subscribed and sworn to before me this 20th day of November, 1989.

Barbara A. Buzard
Notary Public

Notarial Seal
Barbara A. Buzard, Notary Public
Oil City, Venango County
My Commission Expires April 26, 1993
Member, Pennsylvania Association of Notaries

My Commission Expires:

April 26, 1993.

Attest:

STATE OF Pennsylvania)
) ss:
COUNTY OF Venango)

Last Revised, July 1989

AFFIDAVIT OF QUALIFICATION
DIRECTOR
--ooOOoo--

I, Dianne R. Nielson, being first duly sworn under oath, deposes and says that she is the Director of the Division of Oil, Gas and Mining, Department of Natural Resources, State of Utah; and that she is duly authorized to execute and deliver the foregoing obligations; and that said DIRECTOR is authorized to execute the same by authority of law on behalf of the State of Utah.

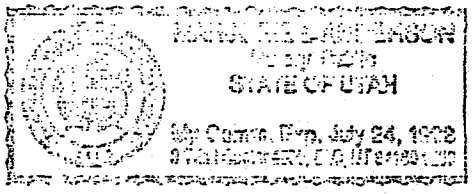
(Signed) Dianne R. Nielson
Dianne R. Nielson, Director
Division of Oil, Gas and Mining

Subscribed and sworn to before me this 31st day of November, 1989.

Marionia L. Henderson
Notary Public

My Commission Expires:

_____, 19 ____.



Attest:

STATE OF _____)
) ss:
COUNTY OF _____)